MAKUENI COUNTY CLUSTER PREPARATORY EXAMINATION 2016
Kenya Certificate of Secondary Education (K.C.S.E)
MATHEMATICS
Paper 1
July/August 2016
Time : 2 ½ Hours

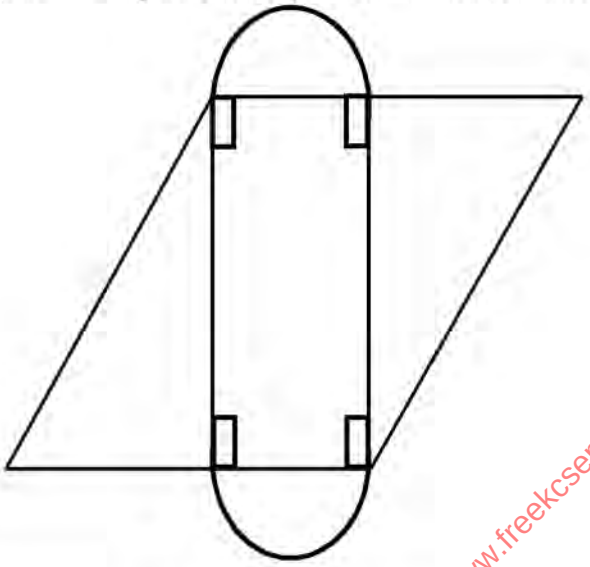
1. Without using calculators evaluate, (3 marks)

$$\frac{-2(5+4)-8\div 2+7}{-3x-6+2x-4}$$

2. Use tables of reciprocals to work out

$$\frac{3}{0.6725}+\frac{12}{0.152}$$ (3 marks)

3. Two containers have base area of 120cm² and 750 cm² respectively. Calculate the volume of the larger container in litres given the volume of the smaller container is 400cm³. (3 marks)
4. Two straight lines are perpendicular to each other at point M. One of the lines passes through (2, 6) and the equation of the other line is 2y + 3x -5 = 0. Calculate the co-ordinates of M. (4 Marks)
5. The figure below represents an opened collar cloth, find the distance around it. (Take $\pi = \frac{22}{7}$) (3 marks)



6. Solve for x in the given equation. (3 marks)
$64x - 121 = 7 - 4^{3x}$
7. (a) On line MN below construct angle of 45⁰ at point M using a ruler and a pair of compasses only. (1 mark)

(b) Hence mark a point A on MN such that MA: AN = 2:4 (3 marks)
8. A Kenyan company received US dollars 100,000. The money was converted into Kenya shillings in bank which buys and sells foreign currency as follows.

	Buying (in Kenya shillings)	Selling (in Kenya shillings)
1 US dollar	77.24	77.44
1 Sterling pound	121.93	122.24

(a) Calculate the amount of money in Kenya shillings the company received (2 marks)
(b) The company exchanged the Kenya shillings calculated in (a) above into sterling pounds to buy a car from Britain. Calculate the cost of the car to the nearest sterling pound. (2 marks)
9. Simplify the expression (3 marks)

$$\frac{4x-25x^3}{10x^2+19x+6}$$

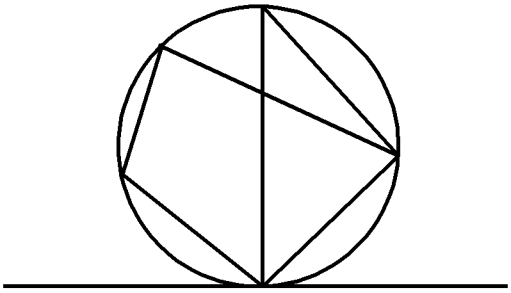
10. The sum of angles of a triangle is given by the expression $(2a + b)^0$ while that of a quadrilateral is given by $(13a - b)^0$. Calculate the values of a and b (4 marks)
11. Solve the following inequality and show your solution on a number line. (3 marks)
$4x - 3 \leq \frac{1}{2}(x + 8) < x + 5$

12. Solve for θ in the equation
Sin $(2\theta - 10) = -0.5$ for $0^0 \leq \theta \leq 360^0$ (3 marks)

13. A rostrum whose vertical height is 4cm is formed by cutting the top of a cone parallel to the base if the two radii of the frustrum are 6cm and 8cm respectively, determine the height of the original cone. (3 marks)

14. An alloy is made of aluminium, zinc and copper in the ratio 3 : 2 : 5 by mass. Find the mass of aluminium in a piece of alloy which contains 5.75 kg of copper. (2 marks)

15. In the circle below, ABCD is a cyclic quadrilateral angle ABC = 70^0, Angle BCF = 40^0 and angle CED = 35^0 if FCG is tangent to circle at C



Calculate
(i) $\angle GCD$ (1 mark)
(ii) $\angle BCD$ (1 mark)
(iii) $\angle BAD$ (1 mark)

16. The table below shows marks scored by 40 students in a mathematics test.

M arks	30-39	40-49	50-59	60-69	70-79
No of students	2	10	13	8	7

Calculate the median mark (3 marks)

SECTION II: 50 MARKS
(Answer any five questions)

17. Jane is a Sales executive earning a salary of KSh. 20,000 and a commission of 8% for the sales in excess of KSh. 100,000. If in January 2010 she earned a total of KSh. 48,000 in salaries and commissions.
(a) Determine the amount of sales she made in that month (4 marks)
(b) If the total sales in the month of February and March increased by 18% and then dropped by 25% respectively. Calculate
(i) Jane's commission in the month of February (3 marks)
(ii) her total earning in the month of March (3 marks)

18. (a) Fill in the table below for the function $y = 6 + x - x^2$

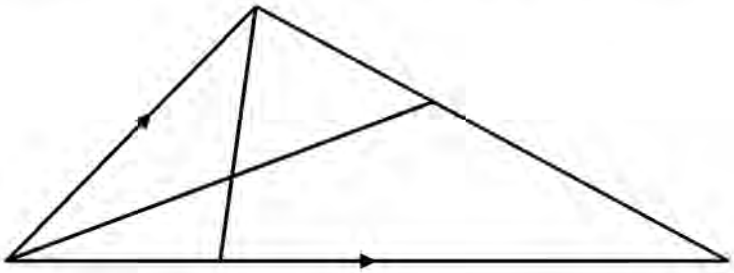
x	-4	-3	-2	-1	0	1	2	3	4	5
y		-6			6			0		-14

(b) Using the completed table values, draw graph of $y = 6 + x - x^2$ taking integral values of x in $-4 \leq x \leq 5$ (3 marks)
(c) Using the same axes draw the graph of $y = 2 - 2x$ (2 marks)
(d) From your graph, find the values of x which satisfy the simultaneous equations $y = 6 + x - x^2$ and $y - 2x$ (1 mark)
(e) Write down and simplify a quadratic equation which is satisfied by the values of x where the two graphs intersect. (2 marks)

19. A lorry left town A for town B at 6.50 p.m at an average speed of 60km/hr. After 1 hr 45 mins a car left two A for B at an average speed of 90km/hr. If A is 317 from B. Determine
(a) the distance of the lorry from town B when the car took off (3 marks)
(b) The distance the car travelled to catch up with the lorry (4 marks)
(c) What time of the day did the car catch up with the lorry? Give your answer in 24 hr system (3 marks)

20. Four towns P, Q, R and S are such that town Q is 150km on a bearing of 070^0 from town P. Town R is 200km on a bearing of 160^0 from town Q. Town S is due west of town R and 135km due south of town P.
(a) Draw a sketch diagram showing the positions of towns P, Q, R and S. (1 mark)
(b) Without using scale drawing calculate
(i) the distance PR (3 marks)
(ii) to 2 s.f the bearing of P from R (3 marks)
(c) Calculate to the nearest whole number the distance RS (3 marks)

21. In the diagram below $\overrightarrow{OA}$ = a and OB = b. The point P and Q are such that AP = $\frac{2}{3}AB$ and OQ = $\frac{1}{3}OA$



(a) Express AB,OP and BQ in terms of a and b (3 marks)
(b) If $\overrightarrow{OC}$= hOP and BC = kBQ. Express OC in two different ways and hence deduce
(i) the values of h and k (5 marks)
(ii) the vector OC in terms of a and b only (1 mark)
(iii) the ratio in which C divides BQ (1 mark)

22. Using a ruler and pair of compasses only for all the construction in this question. A plot of land ABCD is a parallelogram shaped such that AB = 800m, AD = 600m and angle BAD = 105°.
(a) Construct this plot of land using the scale 1cm : 100m
(b) Bisect angle ADC
(c) Drop a perpendicular from A to DC
(d) Locate a point H, which is equidistant from AD and DC and lies on the perpendicular from A to DC.
(e) Find the shortest distance from the house (H) to DC

23. Mwangi bought 2 cows and 6 goats for a total of KSh. 99200. If he had bought 3 cows and 4 goats he would have spend 3000 less.
(a) Form two equations to represent the above information. (2 marks)
(b) Use matrix method to determine the cost of a cow and that of a goat (4 marks)
(c) The businessman later sold the animals he had bought making a profit of 40% per cow and 30% per goat.
(i) Calculate the total amount of money he received (2 marks)
(ii) Determine, correct to 3 significant figures, the percentage profit the businessman made from the sale of animals. (2 marks)

24. The acceleration of a body moving along a straight line is $(-t + 4)$ m/s^2 and its velocity is v m/s after t seconds.
(a) (i) Express the velocity v in terms of t if the initial velocity of the body us 4 m/s (3 marks)
(ii) Find the velocity of the body after 3 seconds (2 marks)
(b) Calculate
(i) the time taken to attain maximum velocity (2 marks)
(ii) the distance covered by the body to attain the maximum velocity (3 marks)

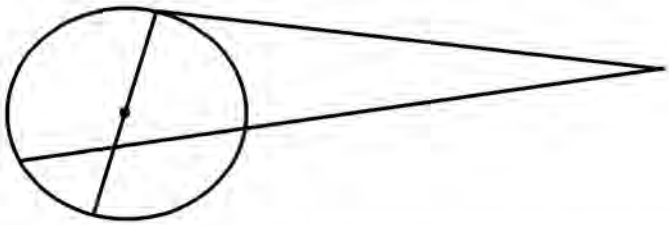
MAKUENI COUNTY CLUSTER PREPARATORY EXAMINATION 2016
Kenya Certificate of Secondary Education (K.C.S.E)
MATHEMATICS
Paper 2
July/August 2016
Time : 2 ½ Hours

SECTION I (50 MARKS)
Answer all questions in this section.

1. Use logarithms to evaluate (4 marks)

$$\frac{0.03989\ x\ \sqrt[3]{0.6736}}{(0.08976)^3}$$

2. A certain two-digit number is equivalent to five times the sum of the digits. It is found to be 9 less than the number formed when the digits are interchanged. Find the number. (3 marks)
3. Six men working 3 hours a day can lay 240 bricks. How many more bricks can 12 men lay working 2 hours per day. (3 marks)
4. In the figure below, PQ is a tangent to the circle at point Q. PQ meets chord SU produced at point P. QR is a diameter of the circle. O is the centre of the circle. QR meets SU at point T.



(i) Given that QP = 15cm and UP = 10cm. Calculate the length of line SU (2 marks)
(ii) If RT = 2.5cm and ST: TU = 5:3. Calculate the length of line QT (2 marks)

5. Find the greatest value of x if $\text{Log}_4 x + \frac{3}{2} = \text{Log}_x 4$ (4 marks)
6. Simplify $\frac{3\sqrt{7}+6\sqrt{2}}{4\sqrt{2}+2\sqrt{7}}$ as far as possible, leaving your answer in the simplified form possible (3 marks)
7. Expand $(2-\frac{1}{4}x)^5$ and use the first three terms to find the value of $(1.975)^5$ to four significant figures. (4 marks)
8. The points P(-6,-4) and Q (2,2) are the end points of the diameter of a circle.
(i) Find the co-ordinates of the centre of the circle. (1 mark)
(ii) Hence find the equation of the circle giving your answer in the form (2 marks)
$ax^2 + by^2 + cx + dy + k = 0$
9. A financial institution charges compound interest on money borrowed. A business woman borrowed Sh.16, 000 from the financial institution. She paid back Sh. 25,000 after 2 years. Find the interest rate per annum (3 marks)
10. Factorise completely (2 marks)
$45 - 5x^2$
11. Make n the subject of the formula (3 marks)

$$m = \sqrt[3]{\frac{ax^2n}{w-n}}$$

12. Given that $\overrightarrow{OA}$ is the position vector of A and $\overrightarrow{OA} = 3i - \frac{2}{3}j + \frac{1}{2}k$, while m is the midpoint of the line AB and $\overrightarrow{OM} = -i + \frac{5}{6}j$ determine vector AB. (3 marks)
13. The first, the third and the seventh terms of an increasing arithmetic progression are three consecutive terms of a G.P. If the first term of the A.P is 10. Find the common difference of the A.P (3 marks)
14. A triangle ABC is such that AB = 6cm, BC = 7cm and AC = 8cm. Calculate the size of angle ACB correct to 2 decimal places. (2 marks)
15. ABCD is a square of side 5cm. A point P moves inside this square so that AP≤PB and ∠APB ≥ 90°. Show by construction, the locus of P. (4 marks)

16. Mr. Mutua sold an article at 15% discount to a customer who paid Sh. 520 for it. What was the marked price of the article in shillings only. (2 marks)

SECTION II (50 MARKS)
(Answer any five questions)

17. In a certain year income tax for all the income earned was charged at the rate shown below.

Monthly taxable pay in KShs	Rate of tax % in each KShs
1-9680	10%
9681-18800	15%
18801-27920	20%
27921-37040	25%
Excess over KShs 37040	30%

Mrs. Mumo earned a basic salary of KShs. 32,000 and a house allowance of KShs. 10,000 per month. She claimed a tax relief of KSh 1056 per month. She had a life insurance policy and she claimed the maximum relief of KSh. 3000
Calculate
(a) The tax payable without relief (s) (5 marks)
(b) The tax paid after relief (2 marks)
Other than tax, the following deductions are made
(i) A service charge of Sh. 100
(ii) Health insurance fund Sh. 320
(iii) A co-operative loan of Sh. 3200
(iv) Burial benevolent fund of KSh. 200
(v) Risk fund KSh. 100
Calculate
(c) The total monthly deductions made from her income (2 marks)
(d) Her net income from her employment. (1 mark)

18. Seeds are collected and weighed to the nearest gram. The frequency distribution is given below.

Weight (gram)	10-13	14-17	18-21	22-25	26-29	30-33	34-37
Number of seed pods	20	25	32	48	35	27	23

Calculate to 1 decimal place
(a) The median height (3 marks)
(b) Using an assumed mean of 23.5
Calculate to 2 decimal places
(i) The mean height (4 marks)
(ii) The standard deviation (3 marks)

19. OABC is a parallelogram with vertices O (0, 0), A (2, 0), B (3, 2) and C (1, 2) O^{I}A^{I}B^{I}C^{I} is the image of OABC under the transformation matrix. $\begin{pmatrix} -3 & 0 \\ 0 & -3 \end{pmatrix}$
(a) (i) Find the co-ordinates of O^{I}A^{I}B^{I}C^{I} (2 marks)
(ii) On the grid provided draw OABC and O^{I}A^{I}B^{I}C^{I} (2 marks)
(b) (i) Find the O^{II}A^{II}B^{II}C^{II}, the image of O^{I}A^{I}B^{I}C^{I} under transformation matrix $\begin{bmatrix} 1 & 0 \\ 0 & -3 \end{bmatrix}$ (2 marks)
(ii) On the grid draw O^{II}A^{II}B^{II}C^{II} (1 mark)
(c) Find a single matrix that maps O^{II}A^{II}B^{II}C^{II} onto OABC (3 marks)

20. The probability of passing KCSE depends on the performance in the KCPE. If the candidate passes the KCPE, the probability of passing KCSE $\frac{4}{5}$. If the candidate fails in the KCPE, the probability of passing KCSE $\frac{3}{5}$. If a candidate passes KCSE the probability that, he/she will get employed is $\frac{5}{8}$. If she/he fails KCSE, the probability of getting employed $\frac{1}{3}$. The probability of passing KCPE $\frac{2}{3}$.
(a) Draw a well labelled tree diagram to represent the above information. (2 marks)
(b) Using the tree diagram, find the probability that a candidate
(i) Passes KCSE (2 marks)
(ii) Gets employed (2 marks)
(iii) Passes KCSE and gets employed. (2 marks)
(iv) Passes KCPE and does not get employment (2 marks)

21. (a) Complete the table below, giving the values correct to 2 decimal places.

x^0	0	30	60	90	120	150	180	210	240	270	300	330	360
Sin 2x	0		0.87		-0.87		0	0.87	0.87				0
3Cosx - 2	1	0.6			-3.5			-4.60			-0.5		1

(b) On the grid provided, draw the graphs of $y = \text{Sin } 2x$ and $y = 3 \text{ Cos} - 2$ for $0^0 \leq x \leq 360^0$ on the same axis. Use a scale of 1cm to represent 30^0 on the x-axis and 2cm to represent 1 unit on the y axis.

(c) Use the graph in (b) above to solve the equation $3\text{Cos } x - \text{Sin } 2x = 2$ (2 marks)

(d) State the amplitude of $y = 3 \text{ Cos } x - 2$ (1 mark)

22. The velocity v metres per second of a particle projected into space is given by the formula $v = 4t^2 - 2t + 9$, where t = time in seconds. Determine

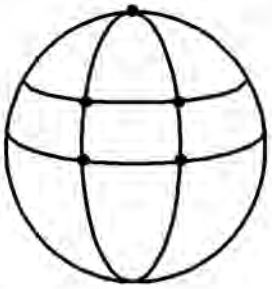
(a) Acceleration of the particle when $t = 2$ sec (3 marks)

(b) The value of t when acceleration is minimum. (2 marks)

(c) The velocity when the acceleration is minimum (2 marks)

(d) The distance covered between the 1st and 2nd seconds. (3 marks)

23. Four points P, Q, R and S are shown on the surface of the earth and point N is the North pole.



(a) Calculate the shortest distance in nautical miles between P (0^0, 35^0W) and Q (0^0,50^0E) measured along the equator. (2 marks)

(b) A helicopter flies from Q to N, then to P and finally back to Q using the shortest distance between any two points. Find the total distance travelled in kilometres. (3 marks)

(c) Another helicopter travels from P due north to S then due east to R and finally due south to Q. Calculate

(i) the total distance travelled in kilometres (3 marks)

(ii) the total time taken to the nearest hour if the helicopter flies at a speed of 200km/hr (2 marks)

(Take $\pi = \frac{22}{7}$ and Radius of the earth 6370km)

24. The manager of a cinema wishes to divide the seats available into two classes A and B. He has the following constraints.

(i) There are not more than 120 seats available.

(ii) There must be atleast twice as many B class seats as there are A class seats.

(iii) Class A seats are priced at Sh. 30 each and class B at Sh. 20 each and atleast Sh. 2000 should be collected at each show to meet the expenses.

(a) Write inequalities from the constraints listed above. (3 marks)

(b) On the grid provided plot the inequalities. (4 marks)

(c) Find the number of seats of each kind which will give the maximum profit and calculate this maximum profit. (3 marks)

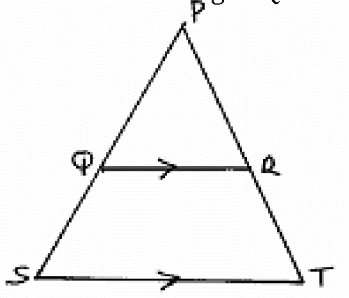
CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2016

121/1
MATHEMATICS
PAPER 1
JULY/AUGUST, 2016
TIME: 2½ HOURS

SECTION I: (50 MARKS)
Answer all the questions in this section in the spaces provided.

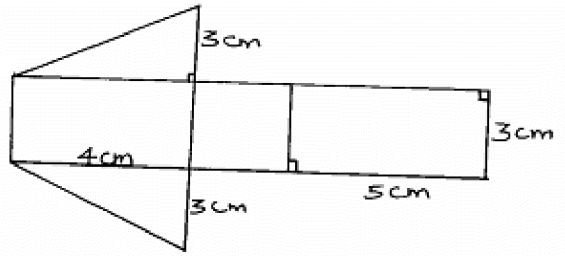
1. If $(5\chi + 6y) : (2\chi + 10y) = 22 : 10$ find $\chi : y$. (3mks)
2. A radio has a marked price of Sh.4000, Winnie managed to convince the shopkeeper to drop the marked price by 15% which he did. The shopkeeper still made a profit of 20¿. What was the shopkeeper's cost of the radio? (3mks)
3. Solve the following inequality and show your solution on a number line. (3mks)
$$4\chi - 3 \leq \tfrac{1}{2}(\chi + 8) < \chi + 5$$
4. Evaluate using square root, reciprocal and square tables only. (4mks)
$$\left[\frac{1}{\sqrt{0.7235}}\right]^2 - \frac{1}{10.56}$$
5. Find the equation of the perpendicular bisector of line AB where A is (3, 9) and B (7, 5) giving your answer in the form $a\chi + by + c = 0$. (3mks)
6. Simplify: $\dfrac{\chi^2 + \chi - 4\chi y - 4y}{(\chi + 1)(4y^2 - \chi y)}$. (3mks)
7. (a) A translation $T\begin{pmatrix} 4 \\ -1 \end{pmatrix}$ maps point P onto P^1 (6, 5). Find P. (1mk)

   (b) Point X^1 is the image of X (3, 2) under the same translation. Find the length of PX^1 leave your answer in surd form. (3mks)
8. Solve for θ in Cos 3θ = Sin 6θ. (2mks)
9. Find the value of χ in the following equation.
$64^{\chi+1} + 8^{2\chi} = 1040$ (4mks)
10. A tourist exchanged X US dollars for Kenya shilling when he arrived in Kenya. He spent three days in the country and paid Ksh.45,600 for expenses. He later left the country and exchanged the remainder back to US dollars. He went back with 1200 dollars. Find the value of X.
    Buying 1 US dollar = Ksh.98.36
    Selling 1US dollar = Ksh.98.54 (3mks)
11. Solve the simultaneous equations. (4mks)
$\chi y = 4$
$\chi + y = 5$
12. The image of P (5, 5) under an enlargement scale factor -2 is P^1(8, 7). Find the coordinates of the centre of enlargement. (3mks)
13. In the figure below, triangle PQR is similar to triangle PST and QS is parallel to ST. Given that the ratio PQ: PS is 3:5, find the ratio of the area of triangle PQR to that of the trapezium QRST. (3mks)



14. Ruto is 12 years old. In three years time he will be ⅓ of his fathers present age. How old was his father 12 years ago. (3mks)
15. Four interior angles of a hexagon are 100º, 140º, 125º and 105º. The fifth interior angle is four times the sixth angle. Find the fifth interior angle. (3mks)

16. The figure below shows a net of a solid.



(a) Sketch the solid of the net showing the hidden edges with dotted lines. (1mk)
(b) Find the surface area of the solid. (2mks)

SECTION II: (50 MARKS)

Answer only any FIVE questions in this section.

17. From a reservoir, water flows through a cylindrical pipe of diameter 0.2m at a rate of 0.35m/s.
(a) Determine the number of litres of water discharged from the reservoir in one hour. (4mks)
(b) The water flows from the reservoir for 18 hours per day for 25 days per month and serves a population of 2500 families. Determine the average consumption of water per family per month giving your answer to nearest 100 litres. (4mks)
(c) The water is charged at the rate of Sh.450 per 100 litres calculate the average water bill per family per month. (2mks)

18. Two airports A and B are such that B is 500km due east of A. Two planes P and Q take off from A and B respectively and at the same time. Plane P flies at 360km/hr on a bearing of 030º. Plane Q flies at 240km/hr on a bearing of 315º. The two planes land after 90 minutes. Using a scale of 1: 10,000,000.
(a) Show the positions of the planes after 90 minutes. (4mks)
(b) Find the distance between the planes after 90 minutes. (2mks)
(c) Find: (i) the bearing of plane P from plane Q. (2mks)
(ii) the bearing of plane Q from the plane P after 90 minutes. (2mks)

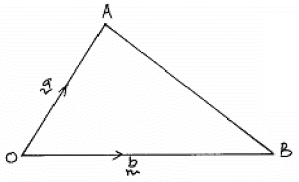
19. The marks scored by 50 students in a Geography examination are as follows.

60	54	40	67	53	73	37	55	62	43
44	69	39	32	45	58	48	67	39	51
46	59	40	52	61	48	23	60	59	47
65	58	74	47	40	59	68	51	50	50
71	51	26	36	38	70	46	40	51	42

(a) Prepare a frequency distribution table using a class interval of 10. (3mks)
(b) Draw a histogram to represent the distribution. (3mks)
(c) Use your histogram to estimate the modal class. (1mk)
(d) Calculate the percentage of students who scored in the range $50 < \chi \leq 70$. (3mks)

20. A bus left Makindu at 11.45am and travelled towards Mombasa at an average speed of 80km/h. A Nissan matatu left Makindu at 1.15pm on the same day and travelled along the same road at an average speed of 120km/h. The distance between Makindu and Mombasa is 400km.
(a) Determine the time of the day the Nissan overtook the bus. (5mks)
(b) Both vehicles continue towards Mombasa at their original speeds. Find how long the matatu had to wait at Mombasa before the bus arrived. (5mks)

21. The position vectors of points A and B in triangle OAB below are a and b respectively. Points M and N are on sides OA and AB respectively such that 3OM = OA and 2AN = 3NB.



(a) Express in terms of a and b.
(i) MB. (1mk)
(ii) ON. (1mk)
(b) ON and MB intersect at X. Given that MX = hMB and OX = K ON, where h and k are constants. Express OX in terms of
(i) a , b and k. (1mk)
(ii) a , b and h. (1mk)
(c) Determine the values of h and k. (4mks)
(d) Determine the ratio OX: XN. (2mks)

22. A group of young men decided to raise Ksh.480,000 to start a business. Before actual payment was made four members pulled out and each of the remaining had to pay an additional Ksh.20,000. Write an expression in terms of

P for.

(a) (i) Original contribution of each member. (1mk)

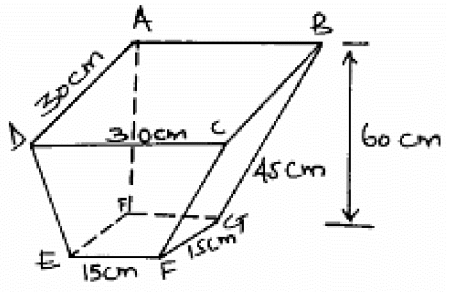
(ii) Contribution after withdrawal of four members. (1mk)

(b) Form an equation in P and hence determine the number of initial members. (5mks)

(c) Three men Kamau, James and Hassan shared Shs.480,000 such that Kamau: James is 3: 2 and James: Hassan is 4: 2. Find how much each got. (3mks)

23. The figure below shows an open waste paper basket in the form of a frustrum of a right square pyramid of height 60cm. The depth of the basket is 40cm and the other measurements are as shown in the figure.

(a) Find the capacity of the container. (5mks)



(b) The total surface area of the basket. (5mks)

24. The equation of a curve is $y = (\chi - 1)(\chi + 3)^2$.

(a) Find

(i) the χ-intercept of the cone. (2mks)

(ii) the y-intercept of the cone. (1mk)

(b) (i) Determine the stationary points of the curve. (2mks)

(ii) For each of the points in (b)(i) above, determine whether it is a maximum or a minimum. (2mks)

(c) Sketch the curve. (2mks)

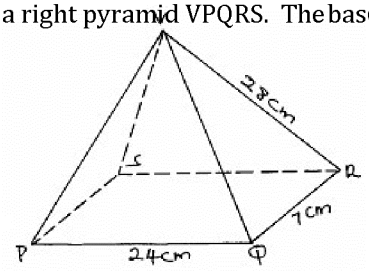
CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2016

121/2
MATHEMATICS
PAPER 2
JULY/AUGUST, 2016
TIME: 2½ HOURS

SECTION I: (50 MARKS)

Answer all the questions in this section in the spaces provided.

1. The length and breadth of a metal sheet are measured to the nearest centimetre and recorded as 25cm and 16cm respectively.
   (a) Find the maximum possible error in the area of the sheet. (1mk)
   (b) Calculate to one decimal place the percentage error in the area of the sheet. (2mks)
2. Given the column vectors
   $a = \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix}$, $b = \begin{pmatrix} 6 \\ -3 \\ 9 \end{pmatrix}$, $c = \begin{pmatrix} -3 \\ 2 \\ 3 \end{pmatrix}$ and that P = 2a - ⅓b + c
   express P as a column vector and hence calculate its magnitude to 3 significant figures. (3mks)
3. Solve for θ in the equation
   $6\cos^2\theta - \sin\theta - 4 = 0$ in the range $0^o \le \theta \le 180^o$. (3mks)
4. Expand $(1 - 2\chi)^6$ upto the term containing χ^3. Hence use the expansion to estimate 0.98^6 to four decimal places. (3mks)
5. Solve the equation:
   $3\log 4 - \log \chi = \log(\chi - 12)$ (4mks)
6. Make χ the subject of the formula.
   $\sqrt{\frac{(2\chi + r)^2}{4}} = \chi + r$ (3mks)
7. Wambua invested Sh.6400 at 15% per annum compound interest for 3 years.
   Muinde invested twice that amount at 12½% per annum simple interest for the same period of time. Find whose investment earned more interest and by how much. (4mks)
8. Rationalize the denominator and leave your answer in surd form.
   $\frac{3}{2\sqrt{5} - \sqrt{2}}$ (3mks)
9. A quantity P is partly constant and partly varies as the square of Q. When Q = 2, P = 40 and when Q = 3, P = 65, determine the value of P when Q = 4. (4mks)
10. Kamau sold a mixture of two types of coffee which were costing Sh.50 per kg and Sh.60 per kg at Sh.324 for 5kg of the mixture after making a profit of 20%. Find the ratio of the mixture. (3mks)
11. Evaluate: $\int_1^2 (3\chi^2 - 2\chi + 3)\,d\chi$. (3mks)
12. The figure below is a right pyramid VPQRS. The base PQRS is a rectangle whose length is 24cm and width 7cm.



   Find the angle between VR and the base. (3mks)
13. The diameter AB of a circle passes through point (-4, 1) and B (2, 1) find the equation of the circle and the radius. Leave your answer in the form $\chi^2 + y^2 + a\chi + by = c$. (3mks)
14. A point C is on a line PQ where PQ = 9cm, C divides PQ such that PC = $^4/_7$PQ.
    By construction locate C. (3mks)

15. A city P is (30ºN, 31ºE). Another city Q is located a distance of 4365 nautical miles east of P. Find the position of Q. (3mks)

16. In a transformation an object of area 64cm^2 is mapped onto image whose area is 32cm^2. Given that the matrix of transformation is $\begin{pmatrix} \chi+4 & \chi \\ 2 & 1 \end{pmatrix}$. Find the value of χ. (3mks)

SECTION II: (50 MARKS)

Answer only any FIVE questions in this section.

17. Mr. Omollo, a civil servant earns a basic salary of Sh.38,300 house allowance of Sh.12,000 and medical allowance of Sh.3,600 every month. He claims a family relief of Sh.1,172 and insurance relief of 3% of the premium paid. Using tax ratio table below.

Taxable income £/p.a	Tax Ksh/£
1 – 8800	2
8801 – 16800	3
16801 – 24800	5
24801 – 36800	7
36801 – 48800	9
Over 48800	10

(a) Calculate Mr. Omollo's annual taxable income in Kenya pound per annum. (2mks)
(b) Tax due every month from Mr. Omollo. (4mks)
(b) If further deductions are made every month from his salary:
- WCPS of 2% of basic salary.
- Life insurance premium of Sh.4600.
- Sacco loan repayment of Sh.14,200

Calculate
(i) Total deductions. (2mks)
(ii) His net pay for every month. (2mks)

18. Veterinary researchers were experimenting with a new drug on fowls in a research station. A sample of fowls which were known to have the disease was used. In this sample 30 fowls were treated with the drug and the remaining 18 fowls were not treated.

(a) Calculate the probability that a fowl selected at random from the sample as
(i) treated with the drug. (1mk)
(ii) not treated with the drug. (1mk)

(b) The probability that a fowl treated with the drug will die is $\frac{1}{10}$ while the probability that one which is not treated will die is $\frac{7}{10}$. Calculate the probability that a fowl picked at random from the sample is
(i) treated with the drug and will die. (2mks)
(ii) not treated with the drug and will die. (2mks)
(iii) treated with the drug and will not die. (2mks)
(iv) not treated with the drug and will not die. (2mks)

19. Two variables A and B are connected by the equation. A = kBn
Where k and n are constants.
The table below gives values of A and B.

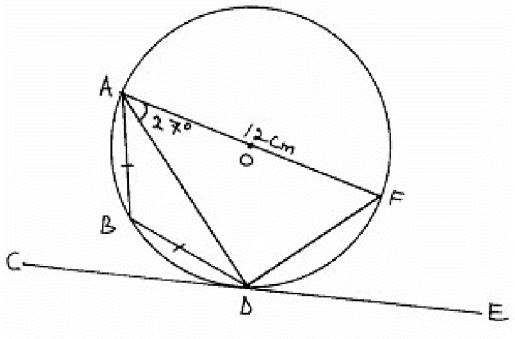
A	1.5	1.95	2.51	3.20	4.50
B	1.59	2.51	3.98	6.31	11.5

(a) Find a linear equation connecting A and B. (2mks)
(b) On square paper draw a suitable line graph to represent the relation in (a) above (scale 1cm to represent 0.1 units on both axis). (5mks)
(c) Use your graph to estimate the values of k and n in to one decimal place. (3mks)

20. (a) Using a ruler and a pair of compasses only construct triangle ABC such that AB = BC = 5cm and angle BAC = 30º. (3mks)
(b) Construct the locus of point T above AC such that 2 ∠ATC ≥ ABC. (3mks)
(c) Find the area within the locus of T that is outside triangle ABC. (4mks)

21. A tailor uses 6hrs to make a shirt and 4 hours to make a dress. It takes the tailor at least 240 hours to make X shirts and Y dresses. The labour cost of making a shirt is Sh.60 and that of a dress is Sh.70. The total labour cost should not exceed Sh.4200. The tailor must make at least 20 shirts and more than 16 dresses.
(a) Write inequalities to represent the above information. (4mks)
(b) Represent the inequalities in part (a) above on the grid provided. (4mks)
(c) If the tailor makes a profit of Sh.140 per shirt and Sh.180 per dress, use the graph in part (b) above to determine the maximum profit that the tailor can make. (2mks)

22. In the figure below, circle ABDF has centre O. CE is a tangent to the circle at D and AF = 12cm is the diameter, AB = BD and angle DAF = 27º.



(a) Find the size of
(i) Angle ADE. (2mks)
(ii) Angle ADB. (2mks)
(b) Find the length of
(i) AD. (2mks)
(ii) BD. (4mks)

23. The sum of 21st and 65th terms of a arithmetic sequence is 368. Given that the seventh term of the sequence is 40, find;
(a) the common difference. (3mks)
(b) the first term. (2mks)
(c) the sum of the first 16 terms of the AP. (2mks)
(d) Given further that the 1st, 5th and 13th terms of the arithmetic sequence form the first 3 consecutive terms of a geometric progression, find;
(i) common ratio. (1mk)
(ii) the sum of the first 20 terms of the G.P. (2mks)

24. (a) Complete the table for the functions $y = 3 \cos \chi$ and $y = 4 \sin (2\chi - 10)$. (2mks)

χ	0	15	30	45	60	75	90	105	120	135	150	165	180
$3 \cos \chi$	3.0		2.60		1.50		0	-0.75					-3.0
$4 \sin (2\chi - 10)$	-0.69	1.37		3.94	3.76		0.69		-3.06		-3.76		-0.69

(b) (i) Taking 1cm rep 15º on χ-axis and 1cm rep 2 units on y-axis on the same grid draw the graphs of the functions $y = 3 \cos \chi$ and $y = 4 \sin (2\chi - 10º)$. (5mks)
(ii) Hence solve for $3 \cos \chi = 4 \sin (2\chi - 10)$. (1mk)
(iii) From the graphs determine the period of the two curves. (2mks)

KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY JOINT EXAMINATION – 2016
121/1
MATHEMATICS
PAPER 1
JULY/AUGUST, 2016
TIME: 2½ HOURS

SECTION I: (50 MARKS)
Answer all the questions in the section.

1. Evaluate: $\frac{28-(-18)}{-2}-\frac{15-(-2)(-6)}{-3}$. (3mks)

2. John spent $^2/_3$ of his salary on food $^1/_3$ of the remainder on rent and saved the rest.
What fraction of his salary did he save? If he spent Sh.1200 on food, how much did he spend on rent. (3mks)

3. Given that $\sin\theta = \frac{1}{\sqrt{5}}$ where θ is an acute angle, find without using Mathematical tables or 'a calculator'.

(a) Cos θ in the form $a\sqrt{b}$. (2mks)

(b) Tan (90 - θ). (1mk)

4. Use tables 1 and table 2 below to find the average speed that the Nairobi-Mombasa passenger train uses to travel between Konza and Masongaleni. (3mks)
Table 1: Shows the rail distance in km between selected stations from Mombasa to Nairobi.
Table 2: Shows the departure and arrival time between selected stations from Mombasa to Nairobi.
Table 1 – is a travel table for a passenger train from Nairobi to Mombasa

w.e.f. 15/10/2001	Passenger train	
Station	ARR	DEP
Nairobi Yard		1900
Athi River	1952	1954
Konza	2055	2057
Sultan Hamad	2234	2236
Makindu	2354	2356
Kibwezi	0025	0027
Masongaleni	0057	0059
Mtito Andei	0158	0213
Voi	0423	0438
Mariakani	0718	0720
Mazeras	0740	0742
Mombasa	0825	

ARR – Arrival time at station
DEP – Departure time from station

Table 1

Nairobi	Athi River	Konza	Sultan Hamud	Makindu	Kibwezi	Masongaleni	Mtito Andei	Voi	Mariakani	Mazeras	Mombasa
29.6											
73.7	44.1										
130	100.4	56.3									
193.4	163.8	119.7	63.4								
215.3	185.7	141.6	85.3	21.9							
233.1	203.5	159.4	103.1	39.7	17.8						
266.6	237	192.9	136.6	73.2	51.3	33.5					
365.9	336.3	292.2	235.9	172.5	150.6	132.8	99.3				
492	462.4	418.3	362	298.6	276.7	258.9	225.4	126.7			
506.4	476.8	432.7	376.4	313	291.1	273.3	239.8	140.5	14.4		
530.3	500.7	456.6	400.3	336.9	315	297.2	263.7	164.4	38.3	23.9	

Table 2

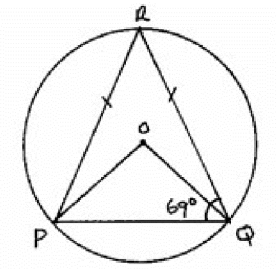
5. Solve the following simultaneous equations. (3mks)
$x^2 + y^2 = 26$
$x + y = 4$

6. A Kenyan company received US Dollars 100,000. The money were converted into Kenya shillings in a bank which buys and sells foreign currencies as follows.

	Buying (Ksh)	Selling (Ksh)
1 US Dollar	77.24	77.44
1 Sterling Pound	121.93	122.27

(a) Calculate the amount of money, in Kenya shillings, the company received. (2mks)

(b) The company exchanged the Kenya shillings calculated in (a) above, into sterling pounds to buy a car from Britain. Calculate the cost of the car to the nearest sterling pond. (2mks)

7. 

In the figure above O is the centre of the circle. Given that PR = QR and ∠PQR = 69º. Find ∠RQO.

8. Find the smallest number which leaves a reminder of 4 when divided by either 8 or 12 or 14. (2mks)

9. Find the integral value of χ which satisfy the inequality.
$3 + 2\chi < 3\chi - 1 \leq 2\chi + 7$ (3mks)

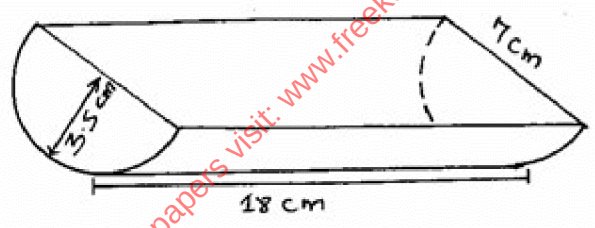
10. A line L is perpendicular to $2\chi + y = 3$ and passes through point (4, -1). Determine
(i) the equation of line L. (2 marks)
(ii) the acute angle that line L makes with the χ-axis. (1 mark)

11. The angle of elevation of the top of a storey building from point P is 23.61º. From another point Q six metres nearer to the base of the building, the angle of depression from the top of the building is 35º. Calculate to 1 decimal place the height of the building. (4mks)

12. State the amplitude and the period of the function $y = {}^{3}/_{2}\ \text{Cos}\ (2\chi + 30^{\circ})$. (2mks)

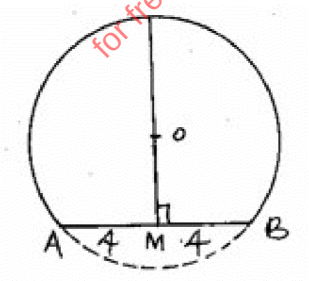
13. In a fund raising committee of 45 people, the ratio of men to women is 7: 2. Find the number of women required to join the existing committee so that the ratio of men to women is changed to 5: 4. (3mks)

14. The figure below is a semi-cylindrical solid of length 18cm and radius 3.5cm are shown.



Draw a labelled net of the sold. (3mks)

15. Find the radius of the circle whose major segment is given below if CM = AB = 8cm. (3mks)



16. Given that $P = 3^{y}$ express the equation $3^{2y-1} + 2 \times 3^{y-1}$ in terms of P.
Hence or otherwise find the value of y in the equation $3^{2y-1} + 2 \times 3^{y-1} = 1$. (3mks)

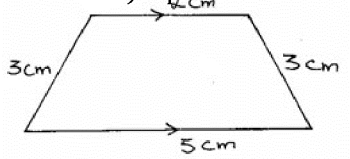
<u>SECTION II: (50 MARKS)</u>

Answer only ANY FIVE questions in this section.

17. Mutwapa Primary School is 30km on a bearing of 015º from a tourist hotel. The nearest town is 45km from the school on a bearing of 120º.
(a) Using a scale of 1cm to represent 15km, make a scale drawing of the positions of the school the tourist hotel and the town. (4mks)
(b) How far is the tourist hotel from the town? (2mks)
(c) What is the bearing of

(i) the town from the tourist hotel? (2mks)
(ii) the school from the town? (2mks)

18. The diagram below (not drawn to scale) represents the cross-section of a solid prism to 8.0cm.

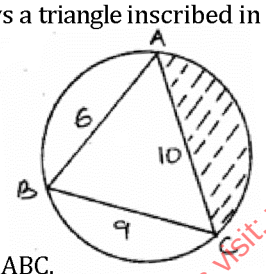


(a) Calculate the volume of the prism. (3mks)
(b) Given that the density of the prism is 5.75g/cm^3, calculate it's mass in grams. (2mks)
(c) A second prism is similar to the first one but is made of a different material.
The volume of the second prism is 246.24cm^3.
(i) Calculate the area of the cross-section of the second prism. (3mks)
(ii) Given that the ratio of the mass of the first prism to that of the second is 2: 5, find the density of the second prism. (2mks)

19. The distance between two towns A and B is 760km. A minibus left town A at 8: 15am and traveled towards B at an average speed of 90km/h. A matatu left B at 10:35am and on the same day and travelled towards A at an average speed of 110km/h.
(a) (i) How far from A did they meet? (4mks)
(ii) At what time did they meet? (2mks)
(b) A motorist starts from his home at 10:30am on the same day and travelled at an average speed of 100km/h. He arrived at B at the same time as the minibus. Calculate the distance from B to his home. (4mks)

20. A jet flies from town Q (60ºS, 24ºE) to town R (60ºS, 10ºW) and then due north for 1200 nautical miles to town S.
(a) Obtain the latitude of S. (3mks)
(b) Calculate the distance between Q and R in
(i) Nautical miles. (3mks)
(ii) km (2mks)
(c) Find the total flight time if the jet flies at an average speed of 800 knots. (2mks)

21. The figure below shows a triangle inscribed in a circle. AB = 6cm, BC = 9cm and AC = 10cm.



Calculate
(a) the interior angles of ΔABC. (5mks)
(b) the radius of the circle. (2mks)
(c) the area of the shaded part. (3mks)

22. A triangle has vertices A (1, 2), B (4, 4) and C (6, 2).
(a) Draw triangle ABC on the grid provided. (1mk)
(b) Construct the image triangle $A^1B^1C^1$ image of triangle ABC under a rotation of 90º clockwise about the origin. (2mks)
(c) Draw triangle $A^{11}B^{11}C^{11}$ the image of triangle $A^1B^1C^1$ under a reflection in line y = χ, state the coordinates of $A^{11}B^{11}C^{11}$ (3mks)
(d) Draw triangle $A^{111}B^{111}C^{111}$ the image of triangle $A^{11}B^{11}C^{11}$ under a reflection in the line y = 0 and state the coordinates of its vertices. (2mks)
(e) Describe a single transformation that maps triangle $A^{11}B^{11}C^{11}$ onto triangle ABC. (2mks)

23. In triangle OAB, OA = a and OB = b . Points P and T divide OB and AB in the ratio 2:3 and 1:3 respectively. Lines OT and AP intersect at Q.
(a) Draw the diagram to represent the above information. (1mk)
(b) Express OP and AP in term of a and b . (2mks)
(c) Express OT in terms of a and b . (1mk)
(d) Given further that OQ = tOT and AQ = sAP, express OQ in two ways and hence find the values of s and t. (6mks)

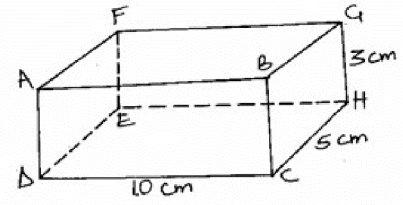
24. The velocity of a particle, Vm/s, moving in a straight line after t seconds is given by $V = 3t^2 - 3t - 6$
Find:-
(i) The acceleration of the particle after 2 seconds. (2mks)
(ii) The distance covered by the particle between t = 1 and t = 4 seconds. (3mks)
(iii) The time when the particle is momentarily at rest. (2mks)
(iv) The minimum velocity attained by the particle. (3mks)

KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY

121/2
MATHEMATICS
PAPER 2
JULY/AUGUST, 2016
TIME: 2½ HOURS

SECTION I: (50 MARKS)
Answer all the questions in the section.

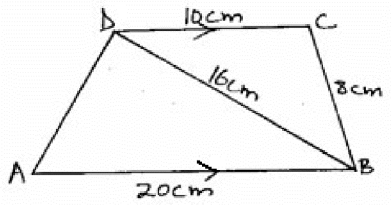
1. Evaluate using logarithms. (4 marks)
$$\sqrt[3]{\frac{(0.07432)^2 \times (48.38)^3}{8458}}$$
2. A rectangular plot measures 31.4m by 28.3m. What is the percentage error in getting it's area. (3 marks)
3. Make M the subject in $K = \left(\frac{MV^2}{\chi + M}\right)^{\frac{1}{2}}$. (3 marks)
4. Solve the equation.
Sin $(2\chi - 30º) = {}^1/_2$ for $0º \le x \le 360º$. (3 marks)
5. y varies inversely as the square of χ. The difference between the value of y when $\chi = 6$ and when $\chi = 10$ is 16. Find the law connecting χ and y. (3 marks)
6. (a) Without using a calculator, expand $(10 - 2\chi)^5$. (2 marks)
(b) Use your expansion in (a) above to find the value of $(9.8)^5$. (1 mark)
7. Solve the simultaneous equation.
$\text{Log}_3 (2\chi + y) = 2$
$\text{Log}_2 (3\chi + 4y) = 4$ (3 marks)
8. Find the inverse of the matrix $\begin{pmatrix} 2 & -2 \\ 3 & 1 \end{pmatrix}$ hence use the matrix method to solve the simultaneous equations. (3 marks)
$2\chi - 2y = 6$
$3\chi + y = 5$
9. A shopkeeper mixes sugar costing Sh.40 per kg with another type which costs Sh.60 per kg. Find the ratio in which the two types should be mixed so that if a kilogram of the mixture is sold at Sh.55, a profit of 10% is realised. (3 marks)
10. A point R divides vector PQ in the ratio 5: -2. Find the coordinates of R given that P (3, -6) and Q (-9, 2). (3 marks)
11. χ and Y are complementary angles and $Tan\ \chi = 3\sqrt{3}$. Find the value of $\frac{1}{2 - Tan\ y}$ hence rationalize the surd. (3 marks)
12. Find the distance between the centre A of a circle whose equation is $2\chi^2 + 2y^2 + 6\chi + 10y + 7 = 0$ and point B (-4, 1). (3 marks)
13. The figure is a cuboid. The dimensions of the cuboid are 10cm by 5cm by 3cm.



(a) Find the angle between.
(i) lines CG and DE. (2 marks)
(ii) lines FG and DB. (2 marks)

14. Simplify: $\frac{\chi - 3}{\chi + 3} - \frac{\chi^2 - 3\chi}{\chi^2 - 9}$. (3 marks)
15. Evaluate: $\int_3^5 (\chi^3 - 7\chi^2 + 7\chi + 15)\, d\chi$. (3 marks)

16. In the figure below ABCD is a trapezium with DC parallel to AB. DC = 10cm, BC = 8cm, DB = 16cm and AB = 20cm.



(a) Calculate the sine of angle BDC. (2 marks)
(b) Hence calculate the area of ΔABD. (1 mark)

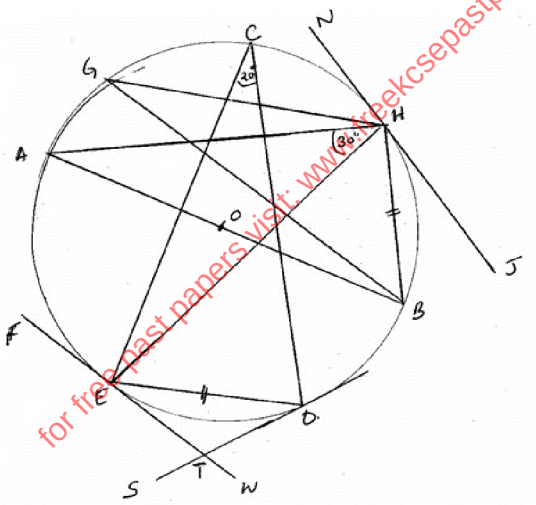
SECTION II: (50 MARKS)

Answer only ANY FIVE questions in this section.

17. (a) A die and a coin (both fair) are thrown on a horizontal floor.
(i) List all the possible outcomes. (2 marks)
(ii) Find the probability of getting even number on the die and a tail on the coin or an odd number on the die and a head on the coin. (3 marks)
(iii) Find the probability of getting a number greater than or equal to 3 on the die and a head on the coin. (2 marks)

(b) The probability that a student gets grade A in Mathematics is $\frac{9}{10}$. If she gets grade A in Mathematics then the probability that she gets grade A in Physics is $\frac{4}{5}$. If she does not get grade A in Mathematics then the probability that she gets grade A in Physics is $\frac{3}{8}$. Calculate the probability that she gets grade A in Physics only. (3 marks)

18. The figure below shows a circle centre O, AB is a diameter. Chords ED and BH are equal NHJ, FET, STD are tangents to the circle angle ECD = 20º and ∠AHE = 30º. The figure is not drawn to scale.



Determine angles.
(i) EHB. (2 marks)
(ii) ETS. (2 marks)
(iii) HGB. (2 marks)
(iv) EHJ. (2 marks)
(v) AOE. (2 marks)

19. An arithmetic progression has the first term as a and the common difference as d.
(a) Write in terms of a and d, the 3rd, 9th and 25th terms of the progression. (1 mark)
(b) The progression is increasing and the 3rd, 9th and 25th terms form the first three consecutive terms of a geometric series. If the sum of the 7th term and twice the 6th term of the arithmetic progression is 78.Calculate:
The first term and the common difference of the arithmetic progression. (6 marks)
(b) Find the sum of the first nine terms of the A.P. (3 marks)

20. The table below shows tax rates in the year 2012.

Income in K£ p.a.	Rates of tax in %
1 – 5208	10
5209 - 9744	15
9745 – 14292	20
14293 - 18840	25
Over 18840	30

(a) Mrs. Mwangi pays Ksh.5400 as PAYE. She is entitled to a house allowance of Ksh.9000p.m and claims a monthly tax relief of Ksh.1093.
Calculate;
(i) Her gross tax per annum. (2 marks)
(ii) Her monthly basic salary in Ksh. (6 marks)
(b) She also has monthly contributions as follows:
(i) Cooperative society contribution of Ksh.2000.
(ii) Loan repayment of Ksh.2500.
Calculate her net monthly salary. (2 marks)

21. The table below shows the marks scored by students in a Mathematics test.

Marks	30 - 39	40 - 49	50 - 54	55 - 59	60 - 64	65 - 69
No. of students	6	20	19	20	20	15

(a) Calculate the median mark. (3 marks)
(b) Using an assumed mean of 52, calculate the mean mark. (3 marks)
(c) On the grid provided, draw a histogram to represent the information shown above. (4 marks)

22. (a) Draw the graph of the function.
$y = 6\chi + \chi^2 - \chi^3$ for $-3 \leq x \leq 4$
(b) By drawing a suitable straight line(s) on the graph in (a) above estimate the roots of the following equations.
(i) $6\chi + \chi^2 - \chi^3 = 0$
(ii) $2\chi + \chi^2 - \chi^3 = 0$

23. In a school trip there were χ buses and y luxury vans. Each bus was hired at Ksh.1000 and could carry 60 students. Each van was hired at Ksh.2000 and could carry 30 students.
(a) Express the following statements as inequalities in χ and y.
(i) There must be some van or vans. (1 mark)
(ii) There should at least 3 buses. (1 mark)
(iii) The school should be not spend more than Ksh.18000 on the trip. (1 mark)
(iv) Not more than 420 students are to go on the trip. (1 mark)
(b) Illustrate inequalities graphically. (4 marks)
(c) Use your graph to determine the maximum number of students that can go on the trip and corresponding expenditure. (2 marks)

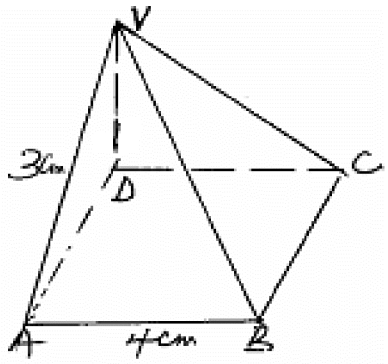
24. Using a ruler and compasses only.
(i) Construct a parallelogram ABCD such that AB = 10cm, BC = 7cm and angle ABC = 105º. (3 marks)
(ii) Construct the loci of P and Q within the parallelogram such that AP ≤ 4cm and BQ ≤ 6cm. (3 marks)
(iii) Calculate the area within the parallelogram but outside regions bounded by the loci of P and Q. (4 marks)

KAHURO/MURANG'A EAST JOINT EXAMINATION – 2016
Kenya Certificate of Secondary Education
121/1
MATHEMATICS ALT A
PAPER 1
JULY/AUGUST, 2016
TIME: 2½ HOURS

SECTION I: (50 MARKS)

Answer all the questions in this section in the spaces provided.

1. Find the greatest number which when divided into 167, 260 and 389 leaves remainders of 11, 8 and 5 respectively. (2 marks)
2. The figure below shows a right pyramid with a square base of 4cm and a slant height of 3cm. Draw the net of the pyramid. (3 marks)



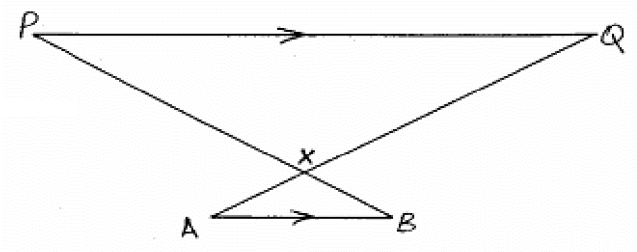
3. A tourist arrived in Kenya with 10000 US dollar which he converted to Kshs on arrival. He spent Kshs.428,500 and converted the remaining amount to sterling pounds. How much did he receive in sterling pounds. The currency exchange rates of the day were as follows:-

Currency	Buying	Selling
1 Sterling pound	135.50	135.97
1 US dollar	72.23	72.65

4. Without using calculators evaluate:
$$\frac{\frac{1}{2} + 2\frac{4}{5} \text{ of } 8 \div 6\left(2 \times 4\frac{2}{5}\right)}{\frac{1}{2} \text{ of } 6\left(8 \div 3\frac{1}{3}\right)}$$ (3 marks)
5. A man on top of a tower 300m sees two cars P and Q on a straight level road.
The angle of depression of P was 48° and that of Q was 28°. Calculate the distance between the two cars. (Give your answer to 2d.p.). (3 marks)
6. Solve for χ and y in the simultaneous equation. (3 marks)
$3^{2\chi} \times 3^{y} = 27$
$2^{\chi - y} \times 2^{\chi} = 32$
7. Use tables of squares, square roots and reciprocals to evaluate
$$\sqrt{\frac{1}{0.2365} + \frac{20}{2.6228^{2}}}$$ (4 marks)
8. Given $Cos\ \chi = \frac{5}{13}$, find the values of the following without using tables or calculators.
(a) Sin χ (1 mark)
(b) $Tan^{2}(90 - \chi)$. (2 marks)
9. Line L_1 passes through the points A (2, -4) and B (6, -8). Find the equation of the line L_2, the perpendicular bisector of AB leaving your answer in the form $a\chi + by + c = 0$. (3 marks)
10. A point P has co-ordinates (2, 4, 6).
If PQ = 10i + 2j + 4k , find
(i) the co-ordinates of Q. (2 marks)
(ii) the length of PQ. (1 mark)
11. The volume of a cube is $1728cm^3$. Calculate to 1 decimal place, the length of the diagonal of a face of the cube. (3 marks)
12. Find all the integral values of χ which satisfy the inequality

$3(1+\chi) \leq 5\chi - 11 \leq \chi + 45$. (3 marks)

13. In the figure below AB // PQ. PB and AQ meet at X. Given that PQ = 15, AB = 2.5 and AQ = 10.5cm, find AX. (3 marks)



(3 marks)

14. Simplify the expression:

$$\frac{(\chi+1)(4y^2-\chi y)}{\chi^2+\chi-4\chi y-4y}$$

15. A circle centre O has the equation $\chi^2 + y^2 = 4$. The area of the circle in the first quadrant is divided into 5 vertical strips each of width 0.4cm.

(a) Use the equation of the circle to complete the table below for values of y correct to 2d.p..

χ	0	0.4	0.8	1.2	1.6	2.0
y	2.00			1.60		0

(1 mark)

(b) Use the trapezoidal rule to estimate the area of the circle. (3 marks)

16. Find the area in hectares of a coffee field whose measurements are entered in a field book as shown below. Take XY = 200m as the baseline. (4 marks)

	Y	
	180	40 to Q
To R 80	140	
To S 160	100	
	40	100 to P
	X	

SECTION B: (50 MARKS)

Answer any FIVE questions from this section.

17. A transport company wishes to transport 288 tonnes of stones to sites P and Q.
The company pays Shs.48,000 to transport 48 tonnes for every 28km. James transported 96 tonnes to site P, 49km away.

(a) Find how much he was paid. (3 marks)

(b) James spends Shs.6000 to transport every 8 tonnes of stones to site P.
Calculate her total profit. (3 marks)

(c) Kimani transported the remaining stones to site Q, 84km away. If he made 44% profit, find his transport cost. (4 marks)

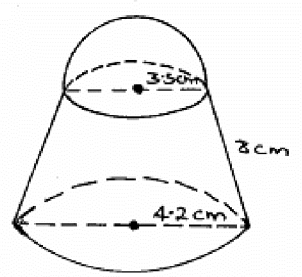
18. A trailer left town P at 11.45am and travelled towards town Q at an average speed of 60km/hr. A car left town P at 2.15pm on the same day and travelled along the same road at an average speed of 100km/hr. The distance between towns P and Q is 500km.

(a) Calculate the time of the day when the car overtook the trailer. (4 marks)

(b) The distance from P when the car overtook the trailer. (3 marks)

(c) After overtaking the trailer both vehicles continued towards Q at their original speeds. Find how long the car had to wait at town Q before the trailer arrived. (3 marks)

19. The figure below represents a solid made up of a conical frustrum and a hemispherical top. The slant height of the frustrum is 8cm and its base radius is 4.2cm.



If the radius of the hemispherical top is 3.5cm.

(a) Find the area of:

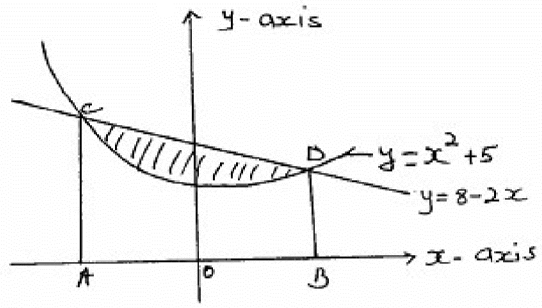
(i) the circular base. (2 marks)

(ii) the curved surface area of the frustrum. (4 marks)

(iii) the hemispherical surface. (2 marks)

(b) A similar solid has a total surface area of $81.51cm^2$. Determine the radius of its base. (2 marks)

20. The diagram below, not drawn to scale, shows part of the curve $y = x^2 + 5$ and the line $y = 8 - 2x$. The line intersects the curve at points C and D. Lines AC and BD are parallel to the y-axis.



(a) Determine the coordinates of C and D. (4 marks)

(b) Use integration to calculate the area bounded by the curve and the x-axis between points C and D. (3 marks)

(c) Calculate the area enclosed by the lines CD, CA BD and the x-axis. (2 marks)

(d) Determine the area of the shaded region. (1 mark)

21. Three people Kariuki, Juma and Mwangi are having their homes situated within the same town. Mwangi's home is 10km away from Juma's home on a bearing of 150°. Kariuki's home is N30°E from Mwangi's home and on a bearing of 135° from Juma's home.

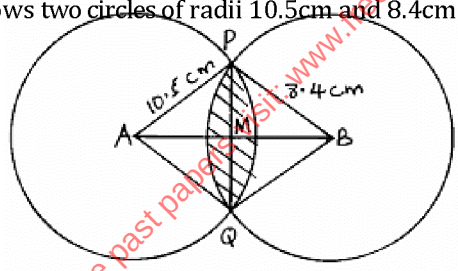
(a) Using a scale 1cm represent 2km, show the relative position of the three homes. (4 marks)

(b) Using your diagram, determine;

(i) bearing of Juma's home from Kariuki's home. (1 mark)

(ii) distance of Mwangi's home from Kariuki's home. (2 marks)

22. The figure below shows two circles of radii 10.5cm and 8.4cm and with centres A and B respectively. The common cord PQ is 9cm.



(a) Calculate angle PAQ. (2 marks)

(b) Calculate angle PBQ. (2 marks)

(c) Calculate the area of the shaded part. (6 marks)

23. Using a ruler and a pair of compasses only.

(i) Construct line AB = 6cm. (1 mark)

(ii) Construct triangle DAB where angle DAB = 75° and AB = BD. (2 marks)

(iii) Complete the parallelogram ABCD. (1 mark)

(iv) Drop a perpendicular from A to BD and hence find the area of the parallelogram. (3 marks)

(v) Construct a circle to touch line BC, AB produced and DC produced.
Measure its radius. (3 marks)

24. Two towns X and Y lie on the same latitude in the southern hemisphere. When it is 9,00am at X, the time at Y is 11.00am.

(a) Given that the longitude of X is 12°E, find the longitude of Y. (3 marks)

(b) A plane leave X for Y and takes 2 hours to arrive at Y travelling at 600km/hr along a parallel of latitude. Find.

(i) the radius of circle of latitude on which towns X and Y lies. (3 marks)

(ii) The positions of the two towns. (4 marks)

KAHURO/MURANG'A EAST JOINT EXAMINATION – 2016

Kenya Certificate of Secondary Education
121/2
MATHEMATICS ALT A
PAPER 2
JULY/AUGUST, 2016
TIME: 2½ HOURS

SECTION I: (50 MARKS)

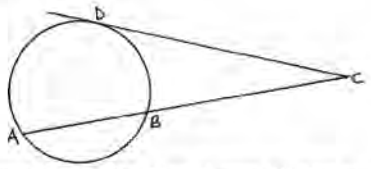
1. Use logarithms to evaluate, correct to 4 decimal places.
$$\sqrt{\frac{7.24 + 3.072}{23.2\ Cos\ 70^o}}$$ (4 marks)

2. Make R the subject of the formula
$A = \prod (R + r)(R - r)$ (3 marks)

3. The seventh term of an arithmetic sequence is 17, three times the third term is 3. Calculate the first term and the common difference of the sequence. (3 marks)

4. Find the value of χ given that
$\begin{pmatrix} \chi & 6 \\ 4 & \chi - 2 \end{pmatrix}$ is a singular matrix. (2 marks)

5. In the figure below DC is a tangent to the circle at point D. Given that ABC is straight line where AB 9.45cm and BC = 5cm. Find the length of DC. (3 marks)



6. Tap A can fill a bath in 4min. Tap B can fill the same bath in 6min and tap C can empty the bath in 8min.
(a) Calculate how long it would take to fill the bath if all the taps were left running. (2 marks)
(b) Calculate how long it would take to fill the bath if all taps were left running for 3min after which tap C is closed. (2 marks)

7. Rose cocoa beans cost Sh.60 per kg while Wairimu beans cost Sh.90 per kg. In what ratio should they be mixed such that by selling the mixture at Sh.84 per kg, a profit of 20% is made. (3 marks)

8. A point Q divides a line PR internally in the ratio 2: 1 and a point T divides the line internally in the ratio 3: 1. In what ratio does T divide PQ? (3 marks)

9. Given that $y = \frac{\chi(\chi^2 - 1)}{\chi + 1}$ is the equation of a curve, find the gradient of the tangent to the curve at the point (2, 4). (3 marks)

10. Find the quartile deviation of the data below 2, 4, 6, 8, 10, 5, 6, 9, 4, 6. (3 marks)

11. Under a shear with χ-axis invariant a square with vertices A (1, 0), B (3, 0), C (3, 2) and D (1, 2) is mapped onto a parallelogram with vertices A^1 (1, 0), B^1 (3, 0), C^1 (7, 2) and D^1 (5, 2). Find the shear matrix. (3 marks)

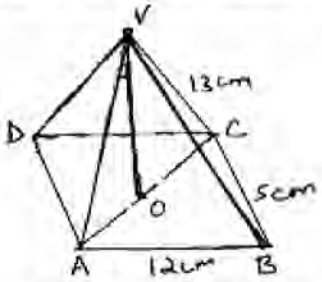
12. Find the value of χ given that $\log(15 - 5\chi) - 1 = \log(3\chi - 4)$. (3 marks)

13. Simplify, without using tables or calculators
$\frac{1 - Cos\ 60^o\ Sin\ 60^o}{1 + Cos\ 30^o\ Sin\ 30^o}$ leaving your answer in the form $a + b\sqrt{c}$. (4 marks)

14. A triangle ABC is such that AB = 9cm, BC = 7cm and AC = 11cm. Find the radius of a circle which passes through A, B and C correct to 2d.p. (3 marks)

15. Find the percentage error in using 0.67 as an estimate of $^2/_3$. (3 marks)

16. In the figure below, VABCD is a right pyramid on a rectangular base. Point O is vertically below the vertex V. AB = 12cm, BC = 5cm and CV = 13cm.



Calculate the angle between the edge CV and the base ABCD. (3 marks)

SECTION B: (50 MARKS)

Answer any FIVE questions from this section.

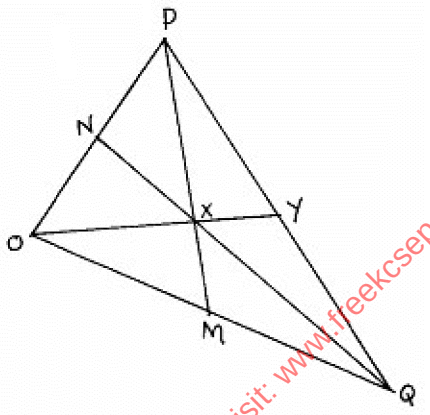
17. Mobile dealer sells phones of two types Nokia and Motorola. The price of one Nokia and one Motorola phone is Ksh.2000 and Ksh.1600 respectively. The dealer wishes to have at least fifty mobile phones. The number of Nokia phones should be at least the same as those of Motorola phone. He has Ksh.120000 to spend on phones.
If he purchases χ Nokia phones and y Motorola phones:
(a) Write down all the inequalities to represent the above information. (4 marks)
(b) Represent the inequalities in part (a) above on the grid provided. (4 marks)
(c) The profit on a Nokia phone is Ksh.200 and that on a Motorola phone is Ksh.300. Find the number of phones of each type he should stock. (3 marks)

18. Given that $-2\chi^2 - 3\chi + 11 = y$
(a) Complete the table below.

χ	-4	-3	-2	-1	0	1	2	3
y	-9		9		11		-3	

(2 marks)
(b) On the grid provided draw the graph of $y = -2\chi^2 - 3\chi + 11$ for values of χ from -4 to 3. (3 marks)
(c) Use the graph to solve.
$-2\chi^2 - 3\chi + 11 = 0$ (2 marks)
$-2\chi^2 - 5\chi + 10 = 0$ (3 marks)

19. The figure below triangle OPQ in which OP = p and OQ = q . M and N are points on OQ and OP respectively such that ON = NP = 1: 3 and OM: MQ = 2: 1.



(a) Express the following vectors in terms of p and q.
(i) PM.
(ii) QN.
(iii) PQ.
(b) Lines PN and QN intersect at X such that PX = hpm and QX = KQN. Express OX in two different ways and find the value of h and K. (6 marks)
(c) OX produced meets PQ at Y such that PY: YQ = 3: 2. Using the ratio theorem or otherwise, find OY in terms of p and q. (1 mark)

20. Income tax is charged on annual income at the rate shown below.

Taxable income K£ p.a.	Rate Ksh. Per £
1 – 2300	2
2301 – 6900	3
6901 – 9200	5
9201 - 11500	7
11501 and over	9

Mr. Njoroge earn a basic salary of Ksh.15000 per month and lives in a company house for which he pays a nominal-rent of Ksh.1250 per month. He enjoys personal relief of Ksh.1056 per month and insurance relief of Sh.270 per month. Calculate.
(a) Taxable pay is the employee's salary + 15¿ of salary less his taxable income nominal rent. Calculate Njoroge's taxable income in K£ p.a. (3 marks)
(b) The amount of tax he pays per month in Kenya shillings. (5 marks)
(c) His net monthly salary in shillings. (2 marks)

21. Use ruler and compasses only for all constructions in this question.
(a) Construct triangle ABC given that AC = 6cm, AB = 5.6cm and angle BAC = 75°. Measure BC. (3 marks)
(b) L_1 is the locus of points equidistant from BA and BC. Construct L_1. (2 marks)

(c) Construct L_2, the perpendicular from C to AB. (2 marks
(d) L_1 and L_2 meet at P. Locate P. (1 mark)
(e) Find the point inside the triangle which is furthest from point P.
What is the distance of that point from P? (2 marks)

22. The table below shows marks scored by 40 candidates in an examination.

Marks	Frequency
11 – 20	1
21 – 30	5
31 – 40	8
41 – 50	9
51 – 60	8
61 – 70	4
71 – 80	2
81 - 90	3

Using an assumed mean of 45.5 estimate:
(i) Mean. (3 marks)
(ii) Standard deviation. (3 marks)
(iii) Calculate the quartile deviation. (4 marks)

23. Two bags X and Y contains ten and eight balls respectively. Bag X has 6 green and 4 red balls while bag Y has 3 and 5 red balls. A bag is selected at random
and 2 balls selected without replacement.
(a) Draw a tree diagram to represent the above information. (4 marks)
(b) Find the probability of selecting a green ball the first time. (2 marks)
(c) What is the probability of selecting at most one red ball? (2 marks)
(d) Find the probability of selecting two green balls. (2 marks)

24. The length and the width of a rectangular are $(6\chi - 1)$ and $(\chi - 2)$ respectively. If the length and the width are increased by 4cm the new area is thrice that of the initial rectangle.
(a) Find the dimension of the initial rectangle. (6 marks)
(b) By what percentage does the area of the rectangle increase after the change? (2 marks)
(c) What is the difference in size between the length and the width of the initial length? (2 marks)

GATAGA SUB COUNTY FORM FOUR END OF TERM II EXAMINATION 2016
Kenya Certificate of Secondary Education (K.C.S.E)

121/1
MATHEMATICS
PAPER 1
JULY / AUGUST 2016
2 ½ HOURS

Section 1 (50 mks)
Answer all questions in this section in the spaces provided.

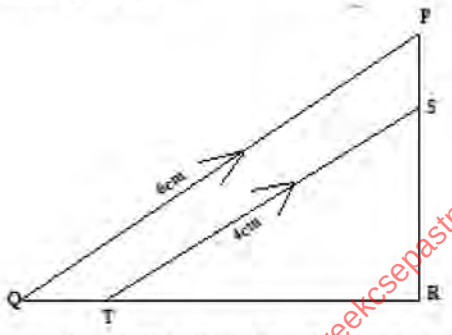
1. Given that $\frac{{}^{3}/_{5} \text{ of } 60 - 2^{2}/_{3} \times 1^{1}/_{2}}{5^{5}/_{8} + 1^{7}/_{9} - {}^{5}/_{2} \text{ of } {}^{12}/_{5} + 2^{4}/_{5} \div {}^{7}/_{10}} = \frac{p}{q}$

find ${}^{p}/_{q}$ (3 mks)

2. X (4, -3) and Y (-3, -2) are points on a straight line. Find the equation of the perpendicular bisector xy, write your answer in the form $\frac{x}{a} + \frac{y}{b} = 1$

3. A two digit number is such that the sum of its digit is ten. If the digits are reversed the number formed exceeds the original number by 18. Find the number. (3 mks)

4. The figure below represents a field where PQ and ST are two parallel fences. If the area of the field STR is 648cm^2. Calculate the area enclosed by PQTS. (4 mks)



5. Water and ethanol are mixed such that the ratio of the volume of water to that of ethanol; is 3:1. Taking the density of water as 1g/cm^3 and that of ethanol as 1.2g/cm^3, find the mass in grams of 2.5 litres of the mixture. (3 mks)

6. Given the inequalities $x - 5 \leq 3x - 8 < 2x - 3$.

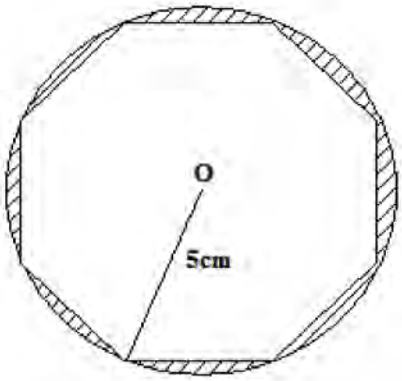
a) Solve the inequalities and represent the solution on a number line. (3 mks)

7. Use the tables of squares, cubes, cuberoots and reciprocals to evaluate

$$\frac{5}{(0.293)^3} - \sqrt[3]{(4.125)^2}$$

(4 mks)

8. A regular octagon is inscribed in a circle of radius 5cm as shown in the diagram below. Find the area of the shaded region to 1d.p. (4 mks)



9. Simplify the expression. (3 mks)

$$\frac{2x - 2}{6x^2 - x - 12} \div \frac{x - 1}{2x - 3}$$

10. Mike paid sh. 180 for a shirt after getting a discount of 10%. The shopkeeper made a profit of 20% on the sale of the shirt. What percentage profit would the shopkeeper have made if no discount wasallowed?

(3 mks)

11. Determine the semi-interquartile range for the following set of data. (3 mks)
9, 4, 5, 7, 4, 6, 1, 2, 6, 8, 7
12. Find the value of n in (3 mks)
$4^{n+1} + 2^{2n+1} = 384$
13. Given that a = 3i - 2j + k and b = 4i + j - 3k find the magnitude of c if c = 3a + 2b to 4 significant figures. (3 mks)

14. ABC is an isosceles triangle such that AB = BC and angle BAC = 120^0. The perpendicular distance from A to BC is $\sqrt{3}$ cm. Calculate the dimensions of triangle. (3 mks)

15. Without using tables or calculators evaluate
$\frac{0.015 + 0.45 \div 1.5}{-4.9 \times 0.2 + 0.07}$ (3 mks)
16. To fence a shamba it requires 3 men working 8 hours a day for 5 days. How long will it take 10 men working 6 hours a day if they work at the same rate? (2 mks)

SECTION II (50 MARKS)

Answer ONLY five questions in this section.

17. A carpenter constructed a closed wooden box with internal measurements 1.5m long, 0.8m wide and 0.4m high. The wood used in constructing the box was 1.0cm thick and had a density of $0.6g/cm^3$.

a) Determine:-

i) Volume of the wood used in constructing the box in cm^3. (4 mks)
ii) Mass of the box in kilograms. Give answer to one decimal place. (2 mks)

b) Identical cylindrical tins of diameter 10cm, height 20cm with a mass of 120g each, were packed into the box. Calculate:-

i) the maximum number of the tins that can be packed. (2 mks)
ii) The total mass of box and the tins in kg. (2 mks)

18. a) On the grid provided draw triangle QRS given Q(0, 0), R(2, 0) and S(2, 1). (1 mk)
b) Triangle QRS is reflected in the line y = x to give triangle $Q^1R^1S^1$. Draw $Q^1R^1S^1$ on the same axes and state its coordinates. (3 mks)
c) Triangle $Q^1R^1S^1$ is then rotated 180^0 centre (0,0) to give triangle $Q^{11}R^{11}S^{11}$. Find its coordinates and hence plot the image. (1 mk)
d) Find a single matrix of transformation that would map triangle $Q^{11}R^{11}S^{11}$ onto triangle QRS. (3 mks)
e) What type of congruency is existing between triangle $Q^{11}R^{11}S^{11}$ and triangle $Q^1R^1S^1$. (1 mk)

19. Three towns X, Y and Z are such that Y is 150km from X on a bearing of 060^0. The bearing of Z from X is 125^0. The bearing of Z from Y is 160^0. Using a scale of 1cm represents 30km.

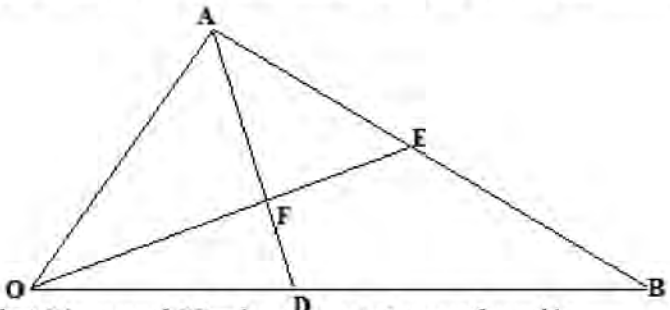
a) Show the relative positions of towns X, Y and Z. (3 mks)
b) Determine the distance between towns X and Z. (2 mks)
c) A plane flies from town X on a bearing of 340^0 at 300km/hr. After 45 minutes of flying to another town P the pilot decides to fly directly to town Z. Determine

i) the time it would take to reach town Z from town P. (3 mks)
ii) The bearing of town Z from P. (1 mk)

20. Nairobi and Eldoret are 600km apart. At 9.20a.m a lorry leaves for Nairobi at a speed of 60km/hr. At 10.00a.m a car leaves Eldoret for Nairobi along the same route at 120km/hr.

a) Calculate the time the lorry arrived at Nairobi. (2 mks)
b) Find the time when the car overtakes the lorry. (4 mks)
c) Find the distance from Nairobi to the overtaking point. (2 mks)
d) Calculate how far the lorry is from Eldoret when the car arrives at Nairobi. (2 mks)

21. In the figure below, E is the midpoint of AB, OD:DB = 2:3 and F is the point of intersection of OE and AD.



a) Given that OA = a and OB = b, express in terms of a and b. (2 mks)
i) OE

ii) AD

b) Given further DF = tDA OF = sOE

i) Express OF in two ways. (3mks)

ii) Hence find the values of S amd t. (3mks)

c) Show that O, F and E are collinear. (2 mks)

21. a) Complete the table below for the function $y = 2x^2 - 4x - 9$ in range $-4 \leq x \leq 5$. (3 mks)

x	-4	-3	-2	-1	0	1	2	3	4	5
y										

b) On the grid provided draw the graph of $y = 2x^2 - 4x - 9$ (3 mks)

c) Use the graph in (b) above to solve the quadratic equations.

i) $2x^2 - 4x - 9 = 0$ (1 mk)

ii) $2x^2 - 6x - 12 = 0$ (2 mks)

d) Determine the coordinates of the turning point of the curve by calculation. (2 mks)

22. A particle moves along a straight line OS, Such that its distance S meters from the point O at time t seconds is given by $S = t^3 - 9t^2 + 15t$. Find:-

a) Where the particle is at t = 1 (2 mks)

b) At what time the particle is momentarily at rest. (3 mks)

c) The acceleration at t = 2. (3 mks)

d) The maximum velocity attained by the particle. (2 mks)

23.

a) Using a ruler and a pair of compasses only. Construct triangle ABC in which AB = 7cm, BC = 6.5cm and angle $BAC = 60^0$. (3 mks)

b) On the same side of AB as C.

Determine the locus of a point P such that angle $APB = 60^0$ and AP = 4cm. (4 mks)

c) Locate a point T on AB such that the angle ATC is 90^0. Hence calculate the area of triangle ABC. (3mks)

GATAGA SUB COUNTY FORM FOUR END OF TERM II EXAMINATION 2016
Kenya Certificate of Secondary Education (K.C.S.E)

121/2
MATHEMATICS
PAPER 2
JULY / AUGUST 2016
2 ½ HOURS

Section A (50 mks)

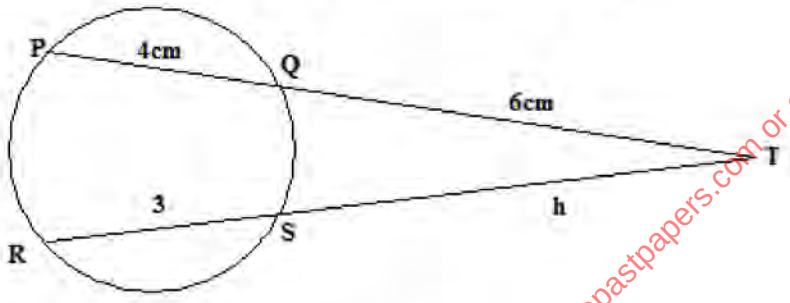
Answer all the questions in this section in the spaces provided.

1. Use logarithms to evaluate. (3 mks)
$$\left[\frac{8.2 \times 61.5 \times 4.07}{3.14 \times 10.9^2}\right]^{1/4}$$
Leave your answer 4 d.p.

2. A rectangular flower garden measures 15.2m long and 10.56m wide. Find the percentage error in calculating the area of the garden to 3d.p. (3 mks)

3. Use matrix method to solve the equations; (4 mks)
$\text{Log}_2(2x + y) = 4$
$\text{Log}_{17}(3x + 4y) = 1$

4. In the figure below, chords PQ and RS intersect externally at T.



Given that PQ = 4cm, QT = 6cm and RS = 3cm, find RT. (3 mks)

5. Make P the subject of the formula in the simplest form. (3 mks)
$$\frac{1}{H} = \sqrt[3]{\frac{RP + GP}{2}}$$

6. Solve the equation $6x^2 - 10x - 2 = 0$ by completing the square method. Leave your answer in surd form. (3 mks)

7. Expand $(1 - {}^1/_3x)^5$ upto the fourth term. Hence evaluate $(0.97)^5$ correct to 4d.p. (4 mks)

8. Solve the equation $\text{Cos}\theta - 2\text{Sin}^2\theta + 1 = 0$ for $-\pi^c \leq \theta \leq \pi^c$ (4 mks)

9. Evaluate (2 mks)
$$\left[x^3 - 2x^{-1} - 5\right]_{-2}^{1}$$

10. M(30^0N, 75^0W) and N(30^0N, 105^0E) are two points on the earth's surface. Find the shortest distance between them in km. (Take R = 6370km and $\pi = {}^{22}/_7$). (3 mks)

11. A tailor intends to buy a sewing machine which costs sh. 52,000. he borrows money from the bank. The loan has to be repaid at the end of the second year. The bank charges an interest of 24% p.a compounded semi-annually calculate the total amount payable to the bank to the nearest 10 shilling. (3 mks)

12. A quantity P is partly constant and partly varies as the square of Q. When Q = 2, P = 40 and when Q = 3, P = 65. Determine the value of P when Q = 4. (3 mks)

13. A coffee trader buys two grades of coffee at sh. 80 and sh. 100 per packet. Find the ratio at which she should mix them so that by selling the mixture at sh. 120 per packet, a profit of 25% is realised. (3 mks)

14. Your school is to participate in the County ball games finals. The probability of winning football and volleyball is ${}^2/_3$ and ${}^1/_4$ respectively. Find the probability of winning atleast one game. (3 mks)

15. The first term of A.P is -3. If the sum of the first five terms is 25.
a) Find the common difference. (2 mks)
b) Hence withe the 9th term. (1mk)

16. Find the centre and radius of a circle whose equation is $x^2 + y^2 - 4x + 6y + 4 = 0$. (3 mks)

SECTION B (50 MARKS)

ANSWER ONLY FIVE QUESTIONS IN THIS SECTION

17. A ship leaves Island Q(15^0N, 30^0E) and sails due West to Island R taking 80 hours. Given that its average speed was 24 knots;

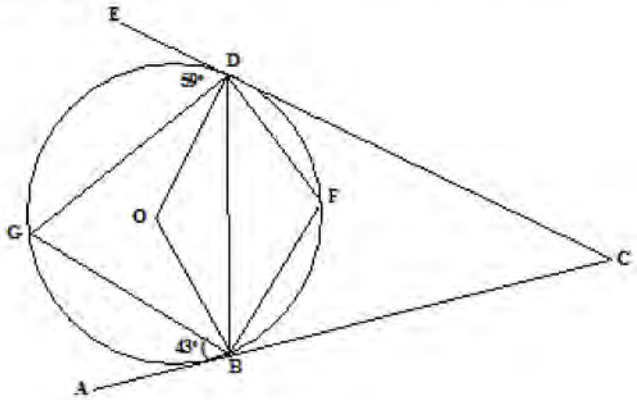
a) Find the position of Island R. (3mks)

b) Calculate the distance between the two Islands in kilometres. (Take radius of the earth to be 6370km) (4 mks)

c) If the local time at Q is 2.00p.m, find the local time at R. (3 mks)

d) Find the circumference of the latitude 30^0N in nautical miles to 2 decimal places. (2mks)

18. In the figure below $< EDG = 59^0$ and $< ABG = 43^0$. The lines EDC and ABC are tangents to the circle at D and B respectively and DF = BF.



Find giving reasons:-

a) <DGB (2 mks)

b) Obtuse angle DOB (2 mks)

c) <DFB (2 mks)

d) <BCD (2 mks)

e) GDF (2 mks)

19. a) Complete the table below. (2 mks)

x	0	30	60	90	120	150	180	210	240	270	300	330	360
$y = \text{Sin}(x + 30^0)$	0.50	_	_		_	0.00	-0.5	_	_	_	__	__	0.50
$y = 2\text{Cos}(x + 30^0)$	1.73	-	0.00	-	-1.73	-	-	-	-	-	-	-2.00	1.73

b) On the same axes, draw the graphs of $y = \text{Sin}(x + 30^0)$ and $y = 2\text{Cos}(x + 30^0)$. (4 mks)

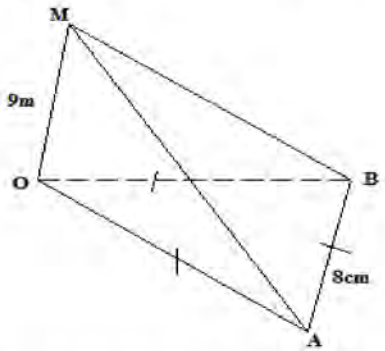
c) Use your graph to solve the equation.

i) $2\text{Cos}(x + 30^0) = \text{Sin}(x + 30^0)$ (1 mks)

ii) $\text{Cos}(x + 30^0) = -{}^1/_2$ (2 mks)

d) State the amplitude of each curve. (1 mk)

20. An electric post OM, 9m high is held vertically by two wires MA and MB as shown below.



Points O, A and B are on the same level ground. Given that triangle OAB is equilateral with sides 8cm:-

a) Find:-
   i) Angle AMB (3 mks)
   ii) The angle between planes AMB and OAB. (3 mks)

b) If the four triangular shapes formed were covered with metallic plates, find the surface area of the metal used. (4 mks)

21. The distribution of marks of 80 students is shown in the table below.

Marks	0 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100
Frequency	1	6	10	20	15	5	14	5	3	1

a) Draw a cumulative frequency curve for the distribution above. (4 mks)

b) From the graph, estimate;
   i) The median. (1 mk)
   ii) Semi-interquartile range. (3 mks)
   iii) The pass mark if 60% of the students are to pass. (2 mks)

22. a) Use the trapezium rule with 10 strips to estimate the area bounded by the curve $y = x^2 - 3x - 4$ and the lines $x = -4$, $x = 1$ and the x axis. (5 mks)

   b) Calculate the exact area in (a) above and hence determine the percentage error in the estimate. (5 mks)

23. a) Three quantities P, Q and R are such that

i) P varies as the square of Q and inversely as the square root of R. Given that $P = 20$ when $Q = 5$ and $R = 9$. Find P when $Q = 7$ and $R = 25$. (4 mks)

ii) If Q is increased by 20% and R decreased by 36% find the percentage changes in P. (3 mks)

b) Two matrices M and N are such that $M = \begin{pmatrix} x & 2 \\ 1 & -3 \end{pmatrix}$ and $N = \begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}$ Given that the determinant of $MN = 48$.

Find the value of x. (3 mks)

24. A factory employs unskilled, workers who earn sh. 6,000 per month and skilled workers who earn sh. 15,000 per month. The monthly wage bills must not exceed sh. 150,000. The machines require a maximum of 50 operators. Labour regulations demand that the number of skilled workers should be atmost half the number of unskilled workers.

a) If x is the number of unskilled workers and y the number of skilled workers, write down the inequalities for the above situation. (3 mks)

b) Illustrate the results in (a) above on a graph. (5 mks)

c) From your graph, obtain the range within which the number of unskilled labourers must lie. (2 mks)

	Diff = 19.20 - 15.00 = 1920 1500 420 4hr 20min M1 $4\frac{1}{3}$ x 60 = 260km		c) $v = 3t^2 - 18t + 15$ $a = 6t - 18$ at t = 2 $a = 6(2) - 18$ $= 12 - 18 = -6m/s^2$ d) at max velocity a = 0 6t - 18 = 0 6t = 18 t = 3 $V = 3(3)^2 - 18(3) + 15$ 27 - 54 + 15 = -1.2m
21	OE = OA + AE $= a + \frac{1}{2}(b - a)$ B1 $= \frac{1}{2}a + \frac{1}{2}b$ AD = AO + $\frac{2}{5}$OB $= \frac{2}{5}b - a$ B1 b) i) OF = S($\frac{1}{2}a + \frac{1}{2}b$) $= \frac{5}{2}a + \frac{5}{2}b$ B1 ii) OF = OD + DF $\frac{2}{5}b + t$AD $= \frac{2}{5}b - t(\frac{2}{5}b - a)$ B1 $= \frac{2}{5}b + \frac{2}{5}tb - ta$ $= (\frac{2}{5} + \frac{2}{5}t)b - ta$ B1 Thus $\frac{5}{2} = -t$ also $\frac{2}{5} + \frac{2}{5}t = \frac{5}{2}$ $\Rightarrow \frac{2}{5} + \frac{2}{5}t = -t$ $\frac{2}{5}t + t = \frac{-2}{5}$ $\frac{7}{5}t = \frac{-2}{5}$ $t = \frac{-2}{7}$ B1 Thus 5 = -2t $= \frac{4}{7}$ B1 c) OE = KOF $\Rightarrow \frac{1}{2}a + \frac{1}{2}b = \frac{2}{7}k(a + b)$ M1 $\frac{1}{2} = \frac{2}{7}k \Rightarrow k = \frac{7}{4}$ A1 also O is a common point B1		
23	a) $S = t^3 - 9t^2 + 15t$ at t =1 $S = (1)^3 - 9(1) + 15(1)$ 1 - 9 + 15 = 7 b) at rest $\frac{ds}{dt} = 0$ $3t^2 - 18t + 15 = 0$ $t^2 - 6t + 5 = 0$ $t^2 - 5t - t + 5 = 0$ t(t - 5) -1(t - 5) = 0 (t - 1) (t - 5) = 0 t = 1 or 5		

KIGUMO SUB-COUNTY CLUSTER EXAMINATION 2016
Kenya Certificate of Secondary Education (K.C.S.E)

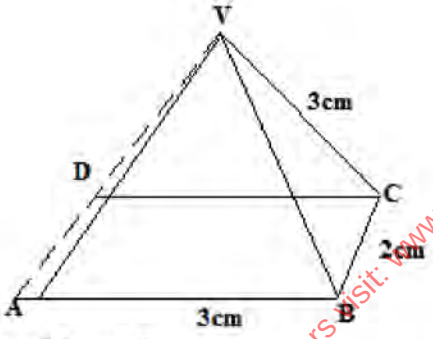
121/1
MATHEMATICS ALT. A
PAPER 1
JULY / AUGUST 2016
2 ½ HOURS

Section 1 (50 mks)
Answer all questions in this section in the spaces provided.

1. Use logarithm tables to evaluate. (4 mks)

$$\sqrt{\frac{122.6 \times 0.396}{(3.563)^2}}$$

2. The numbers zero to ten are written and then the square of numbers are listed in descending order to have the number m.
   a) State m. (1 mk)
   b) State the total value of the ten's digit in m. (1 mk)
3. Three taps A, B can fill a tank in 6 and 9 hours respectively, while tap C can empty the tank in 12 hours. Tap A and B are opened for two hours to fill the tank and then tap C opened after two hours.
a) Find the proportion of the tank filled after two hours. (1 mk)
b) Find how long the three taps take to fill the tank. (2 mk)
4. A metallic cube of side 6cm has a mass of 1.8kg. Calculate the density of the material making the cube. (3 mk)
5. The interior angle of a regular polygon is five times it's exterior angle.
a) Find the number of sides of the polygon. (3 mk)
b) Find the sum of interior angles. (1 mk)
6. The figure below shows a rectangular based pyramid.



a) Draw the net of the solid. (3 mk)
7. Given that R = 2a - 3b where $a = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$ and $b = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$
a) Find vector R. (2 mk)
b) Find R^1 the image of R under a translation vector $\begin{bmatrix} 2 \\ -3 \end{bmatrix}$ (1 mk)

8. Calculate the equation of a perpendicular bisector to the equation $3x + 2y = 4$ which passes through A(6, 4) and B(2, 0). (3 mk)
9. The table below show marks obtained by 50 students in mathematics exam.

Marks	0 - 10	10 - 15	15 - 20	20 - 30	30 - 35	35 - 40	40 - 50
No. of students	3	6	5	12	8	9	7

a) On the grid provided draw a histogram to represent the above data. (3 mk)
10. Simplify (3 mk)

$$\frac{x^2 - 4y^2}{x^2 - 6xy + 8y^2}$$

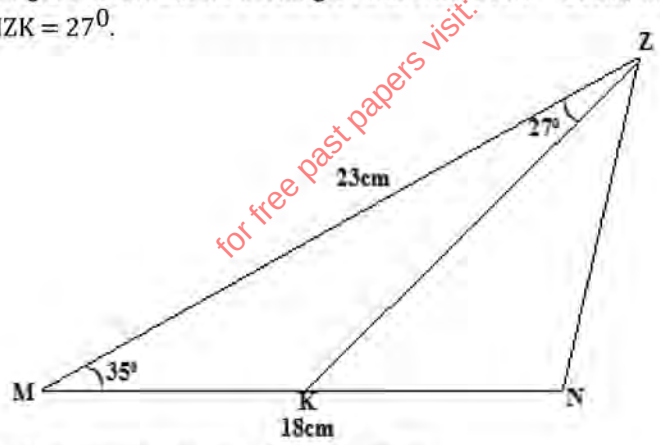
11. Mutua cycled at a speed of 10km/hr from home for 20 minutes before increasing his speed to 15km/h in the next fifteen minutes to reach school.
a) Sketch a speed time graph for the motion. (1 mk)
b) From the graph determine the distance from Mutua's home to school to 3 decimal places. (3 mk)
12. The surface area of a cube is 311.04 determine the diagonal of the cube. (3 mk)

13. A boy bought two English text and five Chemistry texts for three thousands nine hundreds but if he could have bought three English texts and two Chemistry texts similar to the first ones he could have paid one thousand and nine hundred less. Calculate the cost of an English and Chemistry book. (3 mk)
14. A salesman bought a TV valued at fourty two thousands on hire purchase terms where he paid a down payment of fifteen thousands and then paid for one and half years three thousand shillings per month installment.
a) Calculate the amount he paid on hire purchase. (2 mk)
b) Calculate the percentage profit the seller made. (1 mk)
15. Find the equation of the tangent to the curve $y = x^3 - 2x + 2$ at the point $x = 2$. (3 mk)
16. Solve the inequality
$20 - x > 5 + 2x \geq x + 5$ (3 mk)

Section II

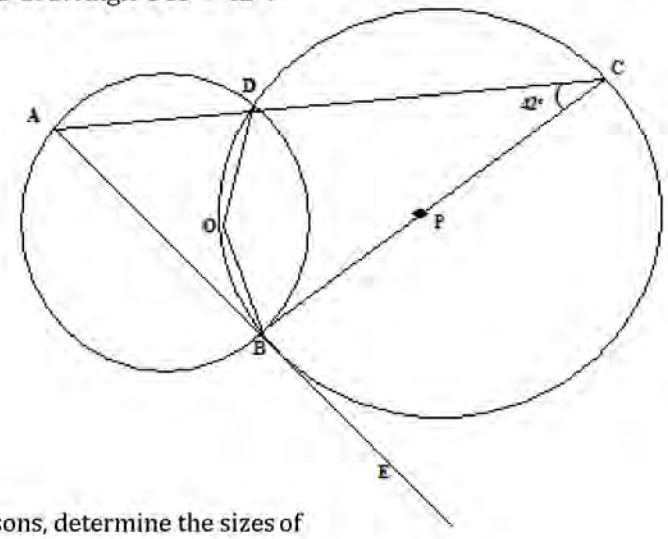
Answer only five questions in this section

17. Three businessmen decided to contribute a total of one million, four hundreds thousands to buy a Nissan matatu in the ratio of 1 : 2 : 4 in a year.
a) Find the amount of money contributed by each. (3 mk)
b) In the next two and a half years the matatu was in business earning an average of twenty five thousands per month and after that period they sold the matatu at nine hundred thousands; find the amount
i) Of money the matatu earned to members after two and a half years. (3 mk)
ii) The profit earned when the matatu was sold after the business. (2 mk)
iii) The percentage profit to the buying price of the matatu. (2 mk)
18. The distance between two towns is two hundred kilometres. Kamau drove at a speed of x km/h to cover the distance but Odhiambo increased his speed by 20km/hr and arrived half an hour earlier than Kamau. Find
a) The speed of each (5 mk)
b) If both travelled from opposite directions at their earlier speed; Kamau starting the journey at 8.00a.m and Odhiambo at 8.45a.m.
i) Calculate the distance covered by Kamau by 8.45a.m. (1 mk)
ii) At what time did the two meet. (3 mk)
iii) What is the distance covered by Kamau at the time they met. (1 mk)
19. Using a ruler and a pair of compasses only construct
a) the triangle ABC in which BC = 10cm, AB = 6cm and $\angle CAB = 90^0$. (2 mk)
b) a rhombus BCDE such that $\angle CBE = 120^0$. (2 mk)
c) a perpendicular from F, the point of intersection of the diagonals of the rhombus to meet BE at G measure FG. (2 mk)
20. The figure below shows a triangle MNZ where MN = 18cm, MZ = 23cm and K is a point on MN ; $\angle ZMN = 35^0$ while $\angle MZK = 27^0$.



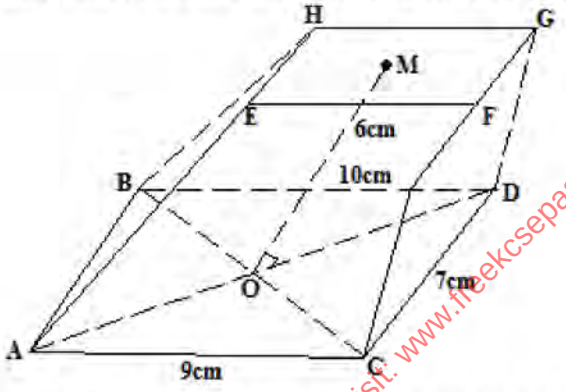
Calculate, correct to three decimal places
a) The length of MK. (3 mk)
b) The length of NZ. (3 mk)
c) The area of triangle MNZ. (2 mk)
d) The size of $\angle KZN$. (2 mk)

21. In the figure below points O and P are centres of intersecting circles ABD and BCD respectively. Line ABE is a tangent to circle BCD at B. Angle BCD = 42^0.



a) Stating reasons, determine the sizes of
i) <CBD (2 mk)
ii) Reflex <BOD (3 mk)
iii) <DAB (2 mk)
b) Show that triangle ABD is isosceles. (3 mk)

22. The figure below shows a frustrum ABCDFGHE cut from a pyramid.



CD = 7cm, AC = 9cm, FE = 6cm and the perpendicular height of the frustrum MO = 10cm, AE = BH = CF = DG = 13cm.
Calculate
i) The height of the pyramid of which the frustrum was made. (2 mk)
ii) The slant height of the frustrum. (2 mk)
iii) The length of the line AG. (2 mk)
iv) The volume of the frustrum. (4 mk)

23. The points A (-2, 4) and B(3, -6) lies on a straight line AB; find
i) The equation of line perpendicular to AB and passes at A. (3 mk)
ii) The equation of a line parallel to AB and pass through the point (3, -1). (3 mk)
b) The points B and C are translated by the vector $M = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$ find
i) the images of B and C. (2 mk)
ii) The equation of the line of the images of b (i) above. (2 mk)

24. The table below shows the values of y for the curve $y = x^2 + x + 1$, correct to 2 decimal point.

x	0.5	1.5	2.5	3.5	4.5	5.5	6.5
y	1.75	4.75			25.75		49.75

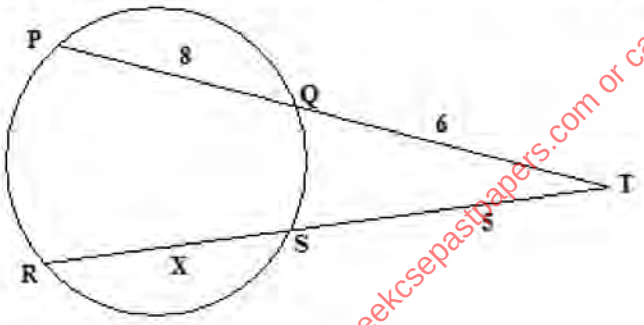
a) i) Fill in the value of y in the spaces above. (2 mk)
ii) Using the mid-ordinate rule and of a unit width; find the area under the curve $y = x^2 + x + 1$ for values of x $0 \leq x \leq 7$. (3 mk)
iii) Find the exact area under the curve in a (ii) above. (3 mk)
iv) Determine the percentage error in finding the area by mid-ordinate rule. (2 mk)
d) a circle to touch all the sides of the rhombus. (1 mk)
e) determine the area in the rhombus that lies outside the circle.

KIGUMO SUB-COUNTY CLUSTER EXAMINATION 2016
Kenya Certificate of Secondary Education (K.C.S.E)

121/2
MATHEMATICS ALT. A
PAPER 2
JULY / AUGUST 2016
2 ½ HOURS

Section 1 (50 mks)
Answer all questions in this section in the spaces provided.

1. Factorise $x(x+1) - y(y+1)$ (3 mks)
2. Make t the subject of the formula. (3 mks)
   $L = \frac{pt}{t-x}$
3. The area of a rectangle is $15cm^2$. The rectangle is transformed by the matrix T where $T = \begin{pmatrix} 3 & 2 \\ 1 & 2 \end{pmatrix}$
   Calculate the area of the image. (2 mks)
4. The position vector of P and q is $3i - 2j + k$ and $2i + j - 3k$ respectively. Determine the column vector PQ and hence calculate its length to 2 decimal places. (3 mks)
5. Solve for x (3 mks)
   $3\log_{10}2 + 2\log_{10}3 - \log_{10}(x+2) = 1$
6. Two chords PQ and RS are produced to meet at T. Given that PQ = 8cm, QT = 6cm and ST = 5cm. Find the length RS. (3 mks)



7. H varies as V and inversely as the square of r. Find the percentage change in h if V is increased by 20% and at the same time r is increased by 50%. (3 mks)
8. Calculate the value of a plot worthy ksh. 250,000 at 3 years. If it appreciates at 12.5% per annum to the nearest whole unit. (3 mks)
9. Solve for x.
   $4\sin x = 3$ for $0 \leq x \leq 360^0$. (3 mks)
10. a) Expand
    $(1 + {}^1/_2x)^6$ upto the 5th term. (2 mks)
    b) Use the expansion above to find the value of $(1.2)^6$. (2 mks)
11. P(20^0N, 5^0E) and Q(K^0N, 5^0E) are two points on the earth surface. If the shortest distance between them along the line of longitude is 3000nm. Find the value of k. (3 mks)
12. A trader bought grade A tea at sh. 150 per kg and grade B at sh. 100 per kg. She mixed them to make a blend. Which she sold at a profit of 20%. If the selling price was sh. 144 per kg. Find the ratio in which she mixed grade A to grade B. (4 mks)
13. Find the radius and the centre of a circle given by the equation.
    $x^2 + y^2 = 4x + 6y - 9$ (3 mks)
14. Rationalise the denominator and simplify completely. (3 mks)
    $\frac{3}{2\sqrt{6}+\sqrt{3}}$
15. Given matrix $m = \begin{pmatrix} 3 & -4 \\ 5 & 2 \end{pmatrix}$ find its inverse m^{-1}.

    Hence solve the simultaneous equation below using matrix method.
    $3x - 4y = 17$
    $5x + 2y = 11$ (3 mks)

16. The probability of Odhiambo wearing a jacket is $^2/_3$. If he does not wear the jacket the probability that it rains is $^1/_3$. Find the probability that he wears the jacket and it does not rain. (3 mks)

Section II

Answer only five questions in this section

17. Jane and Mary can dig a shamba in 12 and 15 days respectively. Jane did the work for three days alone and she was joined by Mary on the 4th day and both of them worked for next two days. Find

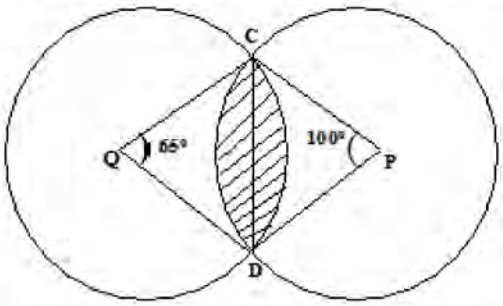
i) The proportion of the work Jane had done before she was joined by Mary. (2 mks)

ii) The work they had done in the first 5 days. (3 mks)

iii) The work remaining undone by the end of the first five days. (1mk)

iv) After five days they were joined by John who can dig the shamba alone in 10 days. How long will the three take to clear the remaining proportion of work. (4 mks)

18. In the figure below the circle centre Q radius 21cm represent the number of people in a town in Kenya who are affected with HIV/AIDS. The circle with centre P radius 14cm represent the number of people in the same town who are infected with T.B. The shaded area represents the number of people infected with both HIV/AIDS and TB.



Calculate:

a) The area of the circle representing the number of people infected with HIV/AIDS. (2 mks)

b) The area representing those infected with TB. (2 mks)

c) The area representing those infected with both HIV/AIDS and TB. (6 mks)

19. The following table shows the rate at which income tax was charged during a certain year.

Monthly taxable income in Kenya shillings	Tax rate per cent (%)
0 - 9860	10%
9861 - 19720	15%
19721 - 29580	20%
29581 - 39440	25%
39441 - 49300	30%
49301 - 59160	35%
Over 59160	40%

A civil servant earns a basic salary of ksh. 35 750 and a monthly house allowance of sh. 12 500. The civil servant is entitled to a personal relief of sh. 1062 per month.

a) Calculate his net monthly tax. (6 mks)

b) Apart from the salary the following deductions are also made from his monthly income.
WCPS at 2% of the basic salary.
Loan repayment ksh. 1325
NHIF sh. 480
Calculate his net monthly earnings. (4 mks)

20. The 2nd, 6th and 14th term of an A.P forms the first three consecutive terms of a G.P.

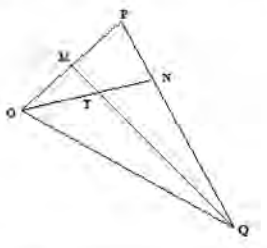
a) Find the common ratio of the G.P. (5 mks)

b) Given that the common difference of the AP is 2 find

i) The 1st and the 5th terms of the G.P. (3 mks)

ii) The sum of the first 6 terms of the G.P. (2 mks)

21. In the figure below OP = p and OQ = q. M and N are points on OP and PQ respectively, such that OM:MP = 3:2 and PN:NQ = 1:3. Lines ON and QM meet at T.



a) Express the following in terms of p and q. (3mks)
   i) PQ
   ii) ON
   iii) QM
b) Given that OT = kON and QT = hQM. Express OT in two different ways hence solve for h and k. (5 mks)
c) Find the ratio OT:TN and QT:TM. (2 mks)

22. a) Fill the table for the curves given by; $y = 3\ Sin\ (2x + 30^0)$ and $y = Cos2x$ for values of x in the range $0 \leq x \leq 180^0$. (2 mks)

x	0^0	15^0	30^0	45^0	60^0	75^0	90^0	105^0	120^0	135^0	150^0	165^0	180^0
$y = 3Sin\ (2x + 30^0)$	1.5		3	2.6	1.5		-1.5			-1.00	-1.50	0	1.5
$y = Cos2x$	1		0.5	0		-0.87	-1.0	-0.87	0.5			0.87	1

b) Using 1cm to represent 15^0 on the horizontal axis and 1cm to represent 1 unit on the vertical axis draw the graphs of $y = 3Sin\ (2x + 30^0)$ and $y = cos\ 2x$ using the same grid. (4 mks)
c) Use your graphs to solve the equation $3\ Sin\ (2x + 30^0) = Cos2x$. (1 mk)
d) Determine the following from your graph.
   i) Amplitude of $y = 3Sin(2x + 30^0)$. (1 mk)
   ii) Period of $y = 3Sin(2x + 30^0)$ (1 mk)
   iii) Period of $y = Cos\ 2x$ (1 mk)

23. The heights of 100 maize plants were measured to the nearest centimeter and the results recorded in the table below.

Height x(cm)	frequency	d	d^2	fd	fd^2	cf
25 - 29	5			-15		
30 - 34	12					17
35 - 39	18	-1	1	-18		35
40 - 44	30	0	0	0		65
45 - 49	17					82
50 - 54	11	2				
54 - 59	7	3				100

a) Complete the table. (2 mks)
b) Calculate to the two decimal places.
   i) Mean (3 mks)
   ii) The standard deviation (3 mks)
   iii) The median (2 mks)

24. A businessman sells two types of mobile phones Samsung and Nokia. The price of one Samsung and one Nokia is ksh. 2000 and ksh. 1600 respectively. He wishes to have at least 20 mobile phones. The number of Samsung phones, should be less or equal to the number of Nokia phones. he has ksh. 96 000 to spend. The profit for Samsung phone is sh. 500 per phone while that of Nokia phone is sh. 300 per phone.
   If he buys x Samsung phone and y Nokia phones.
a) Write all the five inequalities representing the information above. (3 mks)
b) Represent the inequalities in (a) above on the graph paper provided. (4 mks)
c) Find the number of phones he should sell to make maximum profit. (2 mks)
d) Determine the maximum profit. (1 mk)

MOKASA JOINT EXAMINATION - 2016
Kenya Certificate to Secondary Education
MATHEMATICS (PAPER 1)

SECTION A (50 MARKS)
Answer all questions in this section in the spaces provided

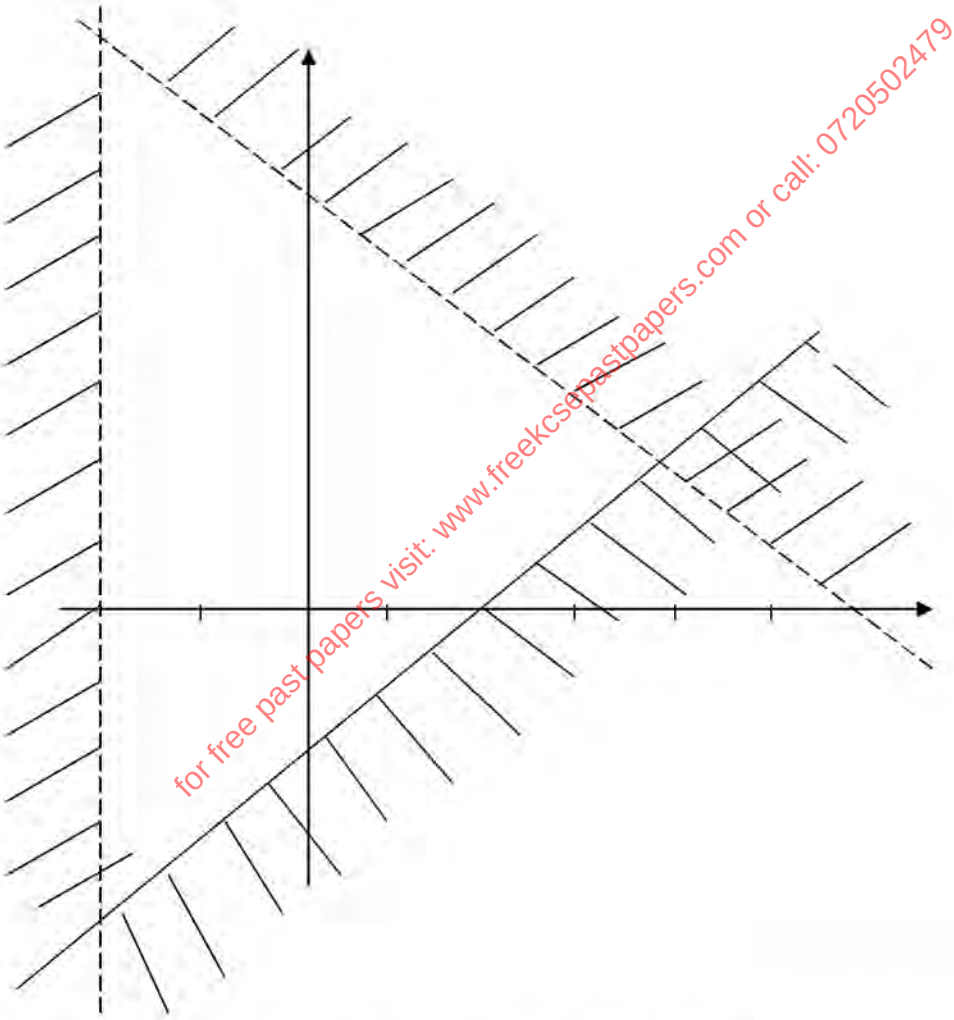
1. Simplify without using table or a calculator to its lowest form. (3 marks)

$$1\frac{3}{4} - \frac{7}{16} \text{ of } 1\frac{11}{49} \div \left(\frac{3}{21} + \frac{11}{28}\right)$$

2. Abraham's money box contains only sh. 5 coins and sh. 10 coins. There are 24 coins and their total value is sh. 150. Find how many of each kind of coins there are in the box. (3 marks)

3. The gradient of a straight line M_1 passing through the points P (3, 4) and Q(x, y) is $\frac{-3}{2}$.
A line M_2 is perpendicular to M_1 and passes through the points Q and R (2, -1). Determine the values of X and Y. (3 marks)

4. Three inequalities define the region R shown below. Form the inequalities. (3 marks)



5. Given that a = 10.5, b = 9.6 and c = 1.4 all correct to the decimal place. Find the percentage error involved in the calculation of $\frac{a+b}{c}$ to 1 d.p. (3 marks)

6. The GCD of three numbers is 4 while the LCM is 360. If two of the numbers are 24 and 40. List two other possible numbers. (3 marks)

7. Given that $\frac{dy}{dx} = 2x^2 + 3$ and that y = 3 when x = 0, find the value of y when $x = \frac{1}{3}$. (3 marks)

8. After buying 52 Sterling pounds, a businessman decided to exchange his money for US dollars. Using the following currency exchange rate, calculate to 3s.f. the number of dollars he ended up with.
1 US dollars ($) = ksh. 89.75

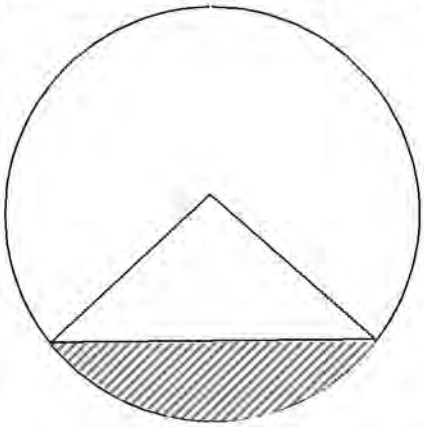
1 Sterling pound (£) = ksh. 135.47 (3 marks)

9. Solve for X and Y in (3 marks)

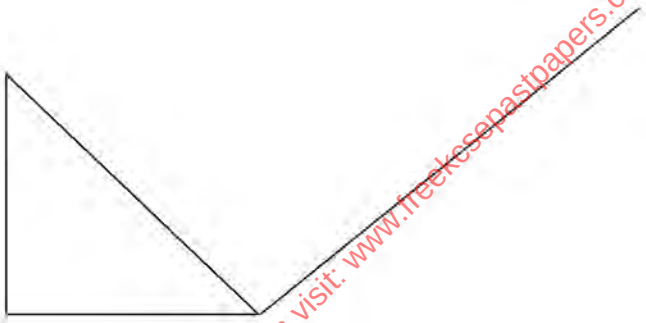
$$4^x \times 4^y = 1$$
$$3^{2x-y} = 81$$

10. Given the number 11055. Show that the number is divisible by 3, 5 and 11 using necessary divisibility tests. (3 marks)

11. Calculate the area of the shaded region in the figure below, given that;
OX = OY = 10cm and XY = 16 cm. (Take $\pi = 3.142$) (4 marks)



12. The figure below represents a model of a prism ABCDEF drawn to scale. Complete the prism. (3 marks)



13. Use reciprocal table to find the value of $\frac{1}{0.325}$. Hence evaluate $\frac{\sqrt[3]{0.000125}}{0.325}$. (3 marks)

14. A poultry farmer has brown and white chicken; the brown chicken are twice as many as the white ones; of the white chicken $^2/_5$ are layers while the rest are cockerels; of the brown ones $^5/_{12}$ are layers while the rest are cockerels. If the chicken is picked at random in the dark, find the probability that it will be a cockerel. (3 marks)

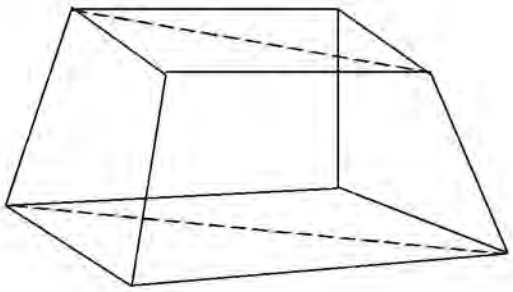
15. Triangle PQR has vertices P(3, 2), Q(-1, 1) and R(-3, -1). Under a rotation the vertices of $P^lQ^lR^l$ are $P^l(1, 4)$, $Q^l(2, 0)$ and $R^l(4, -1)$. By construction find the centre and angle of rotation. (4 marks)

SECTION B (50 MARKS)

*Answer any **five** questions in this section*

17. Three hundred and sixty litres of a homogenous paint is made by mixing three types of paints A, B and C. The ratio by volume of paint A to paint B is 3:2 and paint B to paint C is 1:2. Paint A costs shs. 180 per litre, paint B shs. 240 per litre and paint C shs. 127.50 per litre and paint C shs. 127.50 per litre.
(a) The volume of each type of paint in the mixture. (5 marks)
(b) The amount of money spent in making one litre of the mixture. (3 marks)
(c) The percentage profit made by selling the mixture at shs. 221 per litre. (2 marks)

18. The figure below is a solid frustum of a rectangular base ABCD and top rectangular EFGH. Given that AB = 6cm, AC = 10cm, HF = 5cm, FG = 4cm and CF =25cm.



Calculate:

(a) The height of the pyramid it was cut from giving your answer to the nearest whole number. (2 marks)

(b) The surface area of the frustum. (5 marks)

(c) The volume of the frustum. (3 marks)

19. (a) Complete the table below for the function $y = \frac{1}{2}\sin 2x$ where $0^0 \leq x \leq 360^0$. (2 marks)

x	0^0	30^0	60^0	90^0	120^0	150^0	180^0	210^0	240^0	270^0	300^0	330^0	360^0
2x	0^0	60^0	120^0	180^0	240^0	300^0	360^0	420^0	480^0	540^0	600^0	660^0	720^0
Sin 2x	0^0	0.866		0					-0.866	0			
$y = \frac{1}{2}\sin 2x$	0	0.433		0									

(b) On the grid provided, draw the graph of the function $y = \frac{1}{2}\sin 2x$ for $0^0 \leq x \leq 360^0$ using the scale 1 cm for 30^0 On the horizontal axis and 4cm for 1 unit of y-axis. (3 marks)

20. Using a ruler and a pair of compass only; Construct rectangle ABCD whose sides are AB = 10cm and BC = 7cm.
Use the figure to:

(a) Find the point R and S on AD and DC respectively, such that R is equidistant from AD and S is equidistant from DC. (2 marks)

(b) Shade the region within the rectangle in which a variable point X must lie given that X satisfies the following conditions.

(i) $X > 2cm$ from RS (3 marks)

(ii) X is nearer to AB than to BC (3 marks)

(iii) BX is more than 5cm (2 marks)

21. A youth group decided to raise ksh. 480,000 to buy a piece of land costing ksh. 80,000 per hectare. Before the actual payment was made, four of the members pulled out and each of those remaining had to pay an additional ksh. 20,000.

(a) If the original number of the group members was X, write down;

(i) An expression of how much was contributed originally. (1 mark)

(ii) An expression of how much the remaining members were to contribute after the four pulled out. (1 mark)

(b) Determine the number of members who actually contributed towards the purchase of the land. (4 marks)

(c) Calculate the ratio of the supposed original contribution for the new contribution. (2 marks)

(d) If the land was sub-divided equally, find the size of land each member got. (2 marks)

22. A train moving at 40km/h is moving in the same direction with a truck on a road parallel to the railway line at a speed of 75km/h. The truck takes 1 ¼ min to overtake the train completely.

(a) Given that the truck is 5m long. Determine the length of the train in metres. (6 marks)

(b) The truck and the train continued moving parallel to each other at the original speeds. Calculate the distance between them after 10 mins 15 sec from the time the truck overtook the train. (2 marks)

(c) The truck stopped 50 minutes after overtaking the train. How long did the train take to catch up with the truck? (2 marks)

23. (a) Given that the position vectors of A, B and C are;

$$a = \begin{pmatrix} 3 \\ 2 \end{pmatrix}, b = \begin{pmatrix} 4 \\ 6 \end{pmatrix}, c = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$$

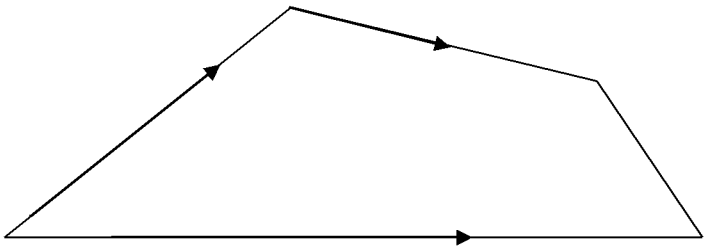
Find;

(i) AC (1 mark)

(ii) AB (1 mark)

(iii) BC (1 mark)

(b) In the figure below, OR = 5**a**, OP = 5**b**, and PQ = 2**a** – **b**



(i) Express as simply as possible, vectors OQ and RQ in terms of **a** and **b**. (2 marks)

(ii) Given that line PQ produced meet at X and that PX = k PQ and OX = h OR where k and h are constants; form an equation connecting k, h, **a** and **b**. Hence deduce the values of k and h. (5 marks)

24. Mr. Kamau earns a basic salary of ksh. 30,000 per month. He gets medical allowance of ksh. 4000 per month. He occupies a company house for which he pays a nominal rent of ksh. 1000 per month. He enjoys a tax relief of ksh. 600 per month. The following PAYE is in operation.

Income K£ P.a.	Rate of tax in Ksh. (£)
0 – 3600	2
3601 – 7200	3
7201 – 10800	5
10801 – 14400	7
14401 – 18000	9
18001 and over	10

(a) Calculate Kamau's taxable income in Kenya pounds per annum. (3 marks)

(b) Calculate Kamau's PAYE in Kenya shillings per month. (4 marks)

(i) In addition to the PAYE the following deductions were made on his salary every month.WCPs at 2% of basic salary

(ii) NHIF of ksh. 300

(iii) Cooperatives shares and loan recovery totaling ksh. 2,500 per month. Calculate Kamau's net pay in ksh. per month. (3 marks)

MOKASA JOINT EXAMINATIONS
Kenya Certificate of Secondary Education (K.C.S.E)
121/2
MATHEMATICS
PAPER 2
MARCH/APRIL 2016
TIME: 2 ½ HOURS

1. Use logarithm tables to evaluate: (4 marks)

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$$

2. The external and internal diameters of a cement pipe are 20cm and 14cm respectively. Calculate the volume of cement required to prepare 1.4m long. Give your answer in cm^3. (3 marks)

3. Make h the subject of the formula (3 marks)

$$\frac{E}{X} = \sqrt{\frac{h - 0.5}{I - h}}$$

4. Solve for x in the equation $2\,Sin^2x - 1 = C0s^2x + \sin$ for $0^0 \leq x \leq 390^0$
5. The points A(-4,1) and B(-2,5) are the end points of a diameter of a circle. Determine the coordinates of the centre of the circle, hence calculate the equation in the form:
$x^2 + y^2 = 2ax - 2by + c + d$ ---- $= 0$
6. Solve the quadratic equation $3x^2 - 4x = 2$ (3 marks)
7. Evaluate by rationalizing the denominator and leaving your answer in surd form. (3 marks)

$$\frac{\sqrt{8}}{1 + Cos45^0}$$

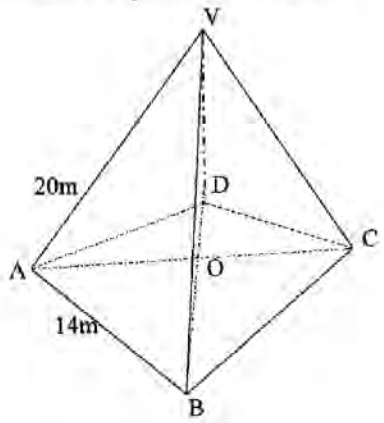
8. Expand $(2 + 3x)^6$ up to the term x^2. Hence use your expansion to estimate $(2.09)^6$ (3 marks)
9. Two quantities M and N are such that M varies partly as N and partly as the square of N. Determine the relationship between M and N given that when M is 1050, N = 10 and when M = 2200, N = 20. (3 marks)
10. A dealer has two types of grades of tea, A and B. Grade A costs sh 140 per kg. Grade B costs sh. 160 per kg. If the dealer mixes A and B in the ratio 3:5 to make a brand of tea which he sells at sh. 180 per kg, calculate the percentage profit that he makes. (3 marks)
11. Onyango bought a refrigerator whose cash price is sh. 84,000 on hire purchase. He made a cash deposit of sh. 20,000 and the 15 monthly instalments of shs. 6,000. Calculate the rate of interest per month. (3 marks)
12. Given that OA = 2i + 5k and OB = 7i – 5j. A point T is on AB such that 2AT = 3TB. Calculate the magnitude of OT to 4 significant figures. (3 marks)
13. Find the sum of A.P having 15 terms, the fourth term being -3.2 and the eight term 8.4 (3 marks)
14. Use matrix methods to solve the following simultaneous equation (4 marks)
15. The volumes of two similar cylinders are $3240cm^2$ and $960cm^3$. If the surface area of the larger cylinder was $792cm^2$. find the surface area of the smaller cylinder. (3 marks)
16. Estimate the area bounded by the curve $y = ½ x^2 + 1$, x = 0, x = 3 and the x-axis using the mid-ordinate rule. Use three strips (3 marks)

SECTION B: (50 marks)

17. The angle of elevation of the top of a flag post from a point P on a level ground is 20^0. The angle of elevation of the top of the flag post from another point Q nearer to the flag post and 110m from P is 32^0. Q is between P and the flag post.

a) Draw a sketch diagram to show the above arrangement (2 marks)
b) calculate correct to 2 d.p
(i) The distance from the point Q to the top of the flag post (5 marks)
(ii) The length of the rope tied from the top of the flag post to the point P on the ground, if 0.5m of the rope is used for tying the knots. (3 marks)

18. The diagram below shows a right pyramid with a square base ABCD and vertex V. O is the centre of the base. AB = 14m, VA = 20m and N is the midpoint of BC.



Find;

a) The lengths of BO, VO and VN (3 marks)
b) The angle between VO and plane VBC (3 marks)
c) The angle between VB and base ABCD (2 marks)
d) The angle between VDC and VBC (2 marks)

19. A number of students were asked to cut 30cm lengths of binding wire without measuring. Later 100 pieces area collected and measured correct to the nearest 0.1 cm the data below was collected.

Length l (cm)	28.0 – 28.4	28.5 – 28.9	29.0 – 29.4	29.5 – 29.9	30.0 – 30.4	30.5 – 30.9	31.0 – 31.4	31.5 – 31.9
Frequency	5	8	30	X	10	20	10	4

a) i) Calculate the value of x (1 mark)
ii) State the modal class (1 mark)
b) Using 29.7 as a working mean calculate;
i) the mean (4 marks)
ii) the standard deviation (4 marks)

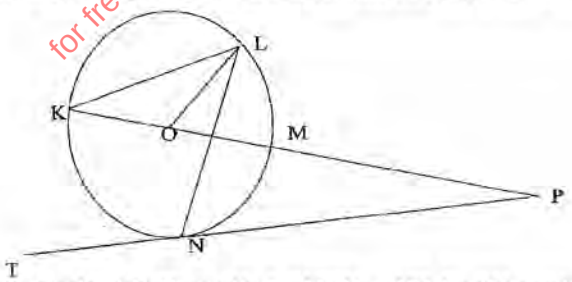
20. A transformation represented by matrix $\begin{bmatrix} 2 & 1 \\ 1 & -2 \end{bmatrix}$
Maps A(0,0), B(2,0), C(2,3) and D(0,3) onto $A^1B^1C^1$ and D^1 respectively

a) Draw ABCD and its image $A^1B^1C^1D^1$ (4 marks)

b) A transformation represented by $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$ maps $A^1B^1C^1D^1$ on $A^{11}B^{11}C^{11}D^{11}$. Plot $A^{11}B^{11}C^{11}D^{11}$ on the same graph. (3 marks)

c) Determine the matrix of a single transformation that maps $A^{11}B^{11}C^{11}D^{11}$ onto ABCD (3 marks)

21. In the figure K, L, M and N are points on the circumference of a circle centre O. The points K, O, M and P lie on a straight line.



PT is a tangent to the circle at N. Given that <MKN = 40^0. find the values of the following angles stating reasons.

a) <MLN (2 marks)
b) <OLN (2 marks)
c) <LNP (2 marks)
d) <MPN (2 marks)
e) <KLM (2 marks)

22. The position of 3 cities P, Q and R are (15^0, 20^0W) (50^0N, 20^0W) and (50^0, 60^0E) respectively.

a) Find the distance in nautical miles between:
(i) Cities p and Q (2 marks)
(ii) Cities P and R, via city Q (3 marks)

b) A plane left city P at 0250h and flew to city Q where it stopped for 3 hours then flew on to city R, maintaining a ground speed of 900 knots throughout.
   (i) The local time city R when the plane left city P (3 marks)
   (ii) The local time (t the nearest minute) at city R when the plane landed at R. (2 marks)

23. The table below is for function $y = x^3 - 7x + 6$ for the range $-3 \leq x \leq 3$.

X	-3	-2	-1.5	-1	0	1	1.5	2	3
Y									

a) Complete the table above. (2 marks)
b) Draw the graph of the function $y = x^3 - 7x + 6$ for the range $-3 \leq x \leq 3$ (3 marks)
c) Use the graph above to estimate the roots of the following;
(i) $x^3 = 7x - 6$ (1 mark)
(ii) $-x^3 + 8x - 2 = 0$ (2 marks)
d) By drawing a tangent, estimate the gradient of the curve $y = x^3 - 7x + 6$ at $x = -2$ (2 marks)

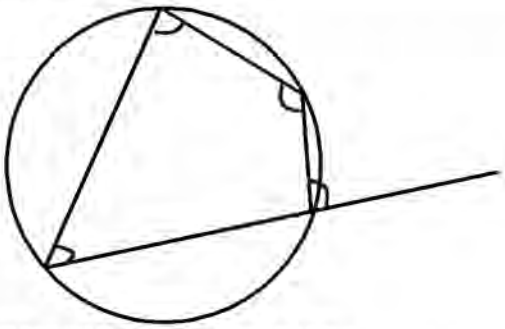
24. a) The acceleration of a particle t seconds after passing a fixed point P is given by $a = 3t - 3$. Given that the velocity of the particle when $t = 2$ is 5 m/s, find;
   (i) Its velocity when $t = 4$ seconds (3 marks)
   (ii) Its displacement at this time (3 marks)
   (iii) find the exact area bounded by the graph $x = 9y - y^3$ and the y-axis (4 marks)

KUWED JOINT EXAMINATION COUNCIL 2016

Kenya Certificate of Secondary Education (K.C.S.E)
MATHEMATICS
Paper 1
July/August 2016
Time: 2 ½ Hours

SECTION A (50 MARKS)
ALL QUESTIONS IN THIS SECTION

1. The recurring decimal $4.\dot{2}\dot{3}$ can be expressed as $\frac{x}{y}$ find the value of y – x. (3 marks)
2. The perimeter of a sector of a circle of radius 7cm is 22.8cm. Calculate the angle that arc subtends at the center of the circle. (3 marks)
3. The figure alongside shows a cyclic quadrilateral PQRS in which PQT is a straight line. $\angle LQT = 50^0$ and $\angle SPQ = 72^0$ find angles marked x^0 and y^0. (3 marks)

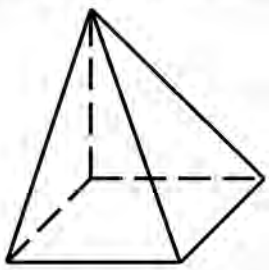


4. (a) Express the number 7056 in its prime factors. (1 mark)
   (b) Hence calculate $\sqrt{7056}$ leaving your answer in prime factors. (2 marks)
5. Evaluate $\int_1^3 (x^2 - 2x)\,dx$ (3 marks)
6. A line L is perpendicular to $2x + y = 3$ and passes through the point (4, -1). Calculate the acute angle the line L makes with x – axis. (3 marks)
7. Simplify: $\frac{12x^2 - 16x}{20 - 11x - 3x^2}$ (4 marks)
8. Find the reciprocal of 0.342 hence or otherwise evaluate, $\frac{\sqrt{0.0625}}{0.342}$ correct to 2 decimal places. (3 marks)
9. Construct triangle PQR such that PQ = 7cm, QR = 5cm and $\angle LPQ = 30^0$. Construct locus of L_1 of points equidistant from P and Q to meet the locus L_2 of points equidistant from Q and R at M. Measure PM. (4 marks)
10. The distance between town A and B is 288km. A car travelling at 108km/he started from town A at 11.35 a.m. and travelled to town B. At what time did the car reach its destination. (Give your answer in 24 hr clock) (3 marks)
11. John an American tourist arrived in Kenya with 10000 dollars and converted the whole amount into Kenyan shillings. He spent KSh. 390,000 and changed the balance to sterling pounds before leaving for United Kingdom. A Kenyan bank buys and sells foreign currencies asshown.

	Buying (KSh.)	Selling (KSh)
1 US dollar	105.24	106.10
1 Sterling pound	132.51	133.05

Calculate the amount he received to the nearest sterling pound (4 marks)

12. Below is a right pyramid of sides 4cm and slant edges are all 6cm long.

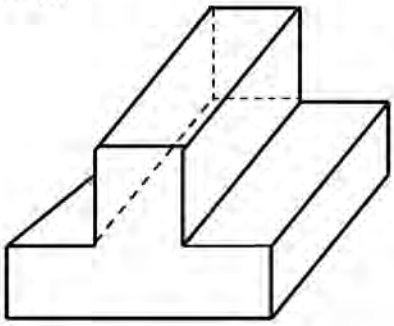


Draw the net of the pyramid hence find total surface area of the pyramid. (4 marks)

13. Solve the inequality and state the integral values of $4 - 3x < x + 12 \leq -\frac{3x+29}{2}$ (3 marks)

14. Solve for x in the equation. (3 marks)
$2^{(2x-1)} \times 16^{(2x-1)} = 1$

15. The diagram below represents a solid block of wood which is 40cm long. All other dimensions are in cm and all angles are right angles.



(a) Calculate the volume of the block in cm^3. (2 marks)
(b) Calculate the density of the block in kg/m^3 if the block has a mass of 23.04kg. (2 marks)

16. Given that determinant of $\begin{pmatrix} 3 & n \\ 7 & 0 \end{pmatrix}$ = 2 x determinant of $\begin{pmatrix} m & 2 \\ n & 2 \end{pmatrix}$ find n. (3 marks

SECTION II (50 Marks)
Answer any Five Questions in this section

17. The table below shows marks obtained by 40 form four students of Maji Nyingi Secondary School in Ukwala Township in Biology end term examination.

60	70	72	40	52	60	22	31	78	53
56	55	28	67	63	54	57	48	47	56
55	62	72	78	75	38	37	44	62	64
58	39	45	48	56	59	65	58	50	58

(a) Make a grouped frequency table using classes 20 – 29, 30 – 39, 40 – 49 etc (4 marks)
(b) (i) State the modal class. (1 mark)
(ii) On the graph paper provided draw both a frequency histogram and a frequency polygon on the same axes

18. A solid is made of a conical frustum and a hemispherical as shown in the figure below. The dimensions are as indicated in the diagram.

(a) Find the area of
(i) The circular base (2 marks)
(ii) The curved surface of frustum (4 marks)
(iii) The hemispherical surface (2 marks)
(b) A similar solid has a total area of $81.cm^2$. Determine the radius ofits base (2 marks)

19. A number of people working at a factory decided to raise KSh. 72,000 to buy a plot of land. Each person was to contribute the same amount. Before contributions five people retired from working at the factory and thus does not contribute. The same target of KSh. 72,000 was still to be met by the remaining.

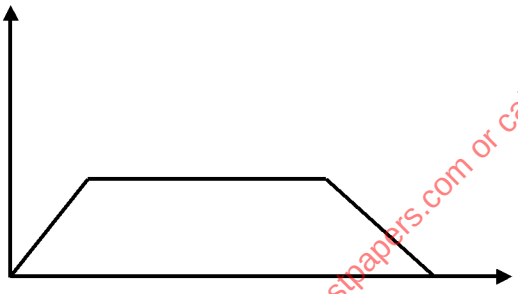
(a) If n stands for the number of people working in the factory originally, show that the increase in the contribution per person was $\frac{360,000}{n(n-5)}$ (3 marks)

(b) If the increase in contribution per person Sh. 1200, find the number of people originally working at the factory. (4 marks)

(c) Calculate the percentage increase in the contributions per person caused by retirement, giving your answer to one decimal place. (3 marks)

20. Three warships A,B and C are at sea such that ship B is 500km on a bearing N30^{0}E from ship A, ship C is 700km from ship B on a bearing of 120^0. An enemy ship D is sighted 800km due south of ship B.
(a) Taking a scale of 1cm to represent 100km locate the positions of ships A, B C and D. (4 marks)
(b) Find the bearing of
(i) ship A from D (1 mark)
(ii) ship D from C (1mark)

(c) Use scale drawing to determine the distance between
(i) D and A (1 mark)
(ii) C and D (1 mark)
(d) Measure the angle DAC and angle BCD (2 marks)
21. The points P (1, 5), Q (2 , 2) R (1 ,1) and S (4,2) are vertices of a quadrilateral PQRS.
(a) On the grid provided, draw the quadrilateral PQRS. (2 marks)
(b) On the same grid draw $P^IQ^IR^IS^I$ the image of PQRS under a rotation of positive quarter turn about the origin. State the coordinates of $P^IQ^IR^I$ and SI. (3 marks)
(c) The points $P^{II}Q^{II}R^{II}S^{II}$ are images of $P^IQ^IR^IS^I$ under a reflection in the x – axis, on the same grid draw quadrilateral $P^IQ^IR^IS^{II}$ and state its coordinates. (3 marks)
(d) Quadrilateral $P^{II}Q^{II}R^{II}S^{II}$ is the image of PQRS under a certain reflection. On your graph draw the mirror line L_1 for the reflection and state its equation. (3 marks)
22. The diagram below shows the speed-time graph for a train travelling between two stations. The train starts from rest and accelerates uniformly for 150 seconds. It then travels at a constant speed for 300 seconds and finally decelerates uniformly for 200 seconds.



Given that the distance between the two stations is 10450m, calculate the
(a) maximum speed in km/h the train attained (3 marks)
(b) acceleration during the first part of journey (2 marks)
(c) distance the train travelled during the last 100 seconds (3 marks)
(d) time the train takes to travel the first half of the journey (3 marks)
23. A trader sold an article at KSh. 4800 after allowing his customer a 12% discount on the marked price of the article. In so doing he made a profit of 45%.
(a) Calculate to 2 decimal place
(i) the marked price of an item (3 marks)
(ii) price at which the trader had bought the article (2 marks)
(b) If the trader had sold the same article without giving a discount, calculate the percentage profit he would have made (3 marks)
(c) To clear his stock the trader decided to sell the remaining articles at a loss of 12.5%. Calculate the price at which he sold each article (2 marks)
24. A particle starts off from OM with a velocity V m/s given by $V = at^4 - \frac{1}{2}t^2 + bt$. Its acceleration is 1 m/s initially and its displacement is 6m after 2 seconds. Find
(a) The value of a and b (3 marks)
(b) (i) The velocity after 4 seconds (3 marks)
(ii) The acceleration after 4 seconds (2 marks)
(iii) The displacement from O when t = 4s (2 marks)

KUWED JOINT EXAMINATION COUNCIL 2016

Kenya Certificate of Secondary Education (K.C.S.E)
MATHEMATICS
Paper 1
July/August 2016
Time: 2 ½ Hours

1. Simplify $(1+\sqrt{2}(1-\sqrt{2})$ (1 mark)

   hence evaluate $\frac{1}{1-\sqrt{2}}$ to 3 significant form given that $\sqrt{2}=1.4142$ (2 marks)
2. Mr. Ogingo Onur invested KSh. 100,000 at 11% simple interest for 3 years and KSh. 150,000 at x% simple interest for 3 years. If the total interest earned was KSh. 79,000, calculate the value of x. (3 marks)
3. Construct a circle centre P and radius 3cm, construct a tangent from point Q 7cm from the centre P to touch the circle at R. Measure the length of QR. (4 marks)
4. Matrix A is given by $\begin{pmatrix} p & 4 \\ -3 & q \end{pmatrix}$

   (a) Determine A^2 (2 marks)

   (b) If $A^2=\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, determine the possible pairs of values of p and q (2 marks)
5. Find the range of values within which the difference of 3.492 – 2.141 lies (3 marks)
6. Make x the subject of the formula in $\sqrt{\frac{x^2-m}{m}}=\frac{a^2}{b}$ (3 marks)
7. Three people Odago, Oronyi and Nyamohanga working together, take 30 min to do some work. Odago and Oronyi together would take 40 minutes, Odago and Nyamohanga together would take 45 minutes. How long would each take working alone. (3 marks)
8. In a transformation, an object with area $9cm^2$ is mapped onto an image whose area is $54cm^2$, given that the matrix of transformation is $\begin{pmatrix} x & x-1 \\ 2 & 4 \end{pmatrix}$ find the value of x. (3 marks)
9. Two variables m and n are such that m is directly proportional to x and n ism inversely proportional to x. When x = 2 their sum is 8 and when x = 3 their sum is 7. Find the constants of proportionally. (4 marks)
10. Determine the quartile deviation for the following set of numbers (3 marks)
    4,9,5,4,7,6,2,1,6,7,8
11. Solve the equation (3 marks)
    $\text{Log}_{10}(6x-2)-1=\text{Log}_{10}(x-3)$
12. with co-ordinates (7,5) and (-3,-1) are the ends of a diameter of a circle centre M. Determine

(a) the co-ordinates of m. (1 mark)
(b) the equation of the circle, expressing if in the form $x^2+y^2+ax+by+c=0$. Where a, b and c are constants. (3 marks)

13. Two places A and B are A (36°N, 125°E) and B (36°N, 55°W) respectively. Calculate the shortest distance in nautical miles between A and B. (3 marks)
14. Expand and simplify the expression. (3 marks)
    $\left(x+\frac{1}{2}\right)^3+\left(x-\frac{1}{2}\right)^3$
15. A point Z is the mid-point of CD. Given that the position vectors of C and D are i – j + k and $2i+\frac{3}{2}k$ respectively, find the position vector of D in terms of i, j and k. (3 marks)
16. Solve the equation $\sin(3x+30^0)=\frac{\sqrt{3}}{2}$ from $0^0\leq x\leq 90^0$ (4 marks)

SECTION B: 50 MARKS

Answer any FIVE questions in this section

17. Two boys A and B contain identical balls except for the colours. Bag A contains 4 red balls and two yellow balls. Bag B contains 2 red balls and 3 yellow balls.

(a) If a ball is drawn at random, find the probability that the ball is redin colour. (4 marks)
(b) 4 two balls are drawn at random one ball at a time with replacement, find the probability that
(i) draw the tree diagram are yellow. (4 marks)
(ii) find the probability that the two balls drawn are both yellow (4 marks)
(iii) find the probability that the balls drawn are ofdifferent colours. (2 marks)

18. The table below shows monthly income tax rates for year 2016.

Monthly taxable in KSh.	Tax rates (percentages)
1 – 9680	10%
9681-18800	15%
18801-27920	20%
27921-37040	25%
37041 and above	30%

In the year 2016, Robi's monthly earnings were as follows:

Basic salary	KSh. 20,800
Non taxable risk allowance	KSh. 2,500
House allowance	KSh. 11,800
Medical allowance	KSh. 2,800
Transport	KSh. 540

Robi was entitled to a monthly tax relief of KSh. 1900. Calculate

(i) his monthly taxable income (2 marks)
(ii) the net tax paid by Robi per annum (6 marks)
(iii) the monthly net salary earned by Robi (2 marks)

19. The product of the first three terms of a geometric progression is 64. If the first term is a and the common ratio is r.
(a) Express r in terms of a. (3 marks)
(b) Given that the sum of the three terms is 14.
(i) Find the values of a and r and hence write down two possible sequence each upto the fourth term. (5 marks)
(iii) Find the product of the 40^{th} terms of the two sequences. (2 marks)

20. (a) Complete the table below, giving your values correct to 2 decimal places.

x^0	0	30	60	90	120	150	180
$\sin x^0$	0	1		2			
$1 - \cos x^0$			0.5	1			2

(b) On the grid provided, using the same scale and axes draw the graphs of $y = 2\sin x0$ and $y + \cos x = 1$ for $0^0 \leq x \leq 180^0$.
Take the scale: 2cm for 300 on the x – axis
2cm for 1 unit on the y – axis
(c) Use the graph in (b) above to
(i) Solve the equation $2 \sin x - 1 = 1 \cos x$ (1mark)
(ii) determine the range of values of x for which $2 \sin x^0 \geq 1 - \cos x^0$ (1 mark)
(iii) State the amplitude of $2 \sin x$ (1 mark)

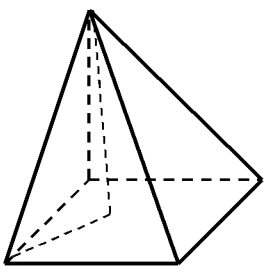
21. The table below shows the distribution of marks in a mathematical test done by 100 form fours at Mahando School in 2015 pre-mock.

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
No. of students	12	25	20	15	8	7	11	2

(a) State the modal class (1 mark)
(b) Draw accumulative frequency curve to represent the above data. (4 marks)
(c) Use the above graph to estimate
(i) the median (1 mark)
(ii) the quartile deviation (2 marks)
(iii) The pass mark if 60% of the students passed (2 marks)

22. (a) Draw the graph of the function given below on the grid provided in the range $0 \leq x \leq 6$ $y = 2x^2 - 7x - 2$ (5 marks)
(b) Use the graph in (a) above to estimate the area under curve using the mid ordinate rule with six strips between the curve $y = 2x^2 - 7x - 2$, x – axis, $x = 0$ and $x = 6$ (5 marks)

23. ABCDV is a right pyramid on a square base ABCD of side 4cm, the slant edges of the pyramid are 6cm long.



(a) Find the height VO (2 marks)
(b) Find the angle
(i) that VA makes with the plane (3 marks)

(ii) between ABCD and VAD (3 marks)
(iii) between VA and BC. (2 marks)

24. A building contractor has two lorries A and B, used to transport atleast 42 tonnes of sand to a building site. Lorry A carries 8 tonnes of sand per trip while lorry A uses 4 litres of fuel per trip while lorry B uses 8 litres per trip, the lorries are to use less than 320 litres of fuel. The number of trips made by lorry A should be less than 3 times the number of trips made by lorry B. Lorry A should make more than 20 trips.
(a) Taking x to represent the number of trips made by lorry A and y to represent the number of trips made by lorry B. Write the inequalilties that represent the above information. (4 marks)
(b) On the grid provided, draw the inequalities. (4 marks)
(c) Use the graph in (b) to determine the number of trips made by lorry A and by lorry B to deliver greatest amount of sand. (2 marks)

NANDI NORTH AND NANDI CENTRAL SUB-COUNTIES JOINT EXAMINATIONS 2016
121/1
MATHEMATICS ALT. A
PAPER 1
JULY / AUGUST 2016
TIME: 2½ HOURS

SECTION 1: (50 MARKS)
Answer ALL Questions in this section

1. Solve for x
$3x^2 + 5x - 12 = 0$ (3mks)

2. Use reciprocal tables to evaluate y if:

$$\frac{1}{15.4} + \frac{1}{25} = \frac{1}{y}$$

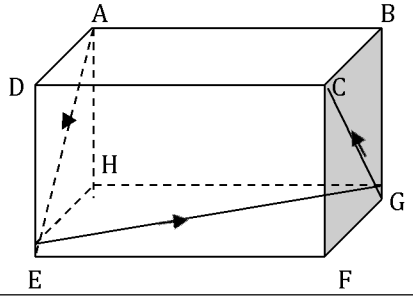
3. The GCD and the LCM of three numbers are 12 and 120 respectively. If two of the numbers are 24 and 36, find the third number. (3mks)
4. It takes 40 road construction workers 8 days working 10 hours a day to complete a section of a road. How many days would 60 Road Construction Workers working 8 hours a day take to complete the same section of the road working at the same rate? (3mks)
5. Solve for x in the equation: (3mks)
$8^{x-1} \times 2^{x+2} = 4^{3-x}$
6. A Kenyan athlete left the USA for Japan with 1000 US dollars. While in Japan he bought a watch worth 300 US dollars. He later left Japan for Kenya where he converted the remaining amount in US dollars to Kenyan Shillings. Using the table below, find:-

1 US Dollar	= 116 Japanese Yen
1 US Dollar	= 80 Kenyan shillings

(i) The cost of the watch in Japanese Yen. (1mk)
(ii) How much he got in Kenyan shillings after converting the remaining amount at the end of the journey. (2mks)
7. Solve the simultaneous equations using substitution method if $z = 2$. (4mks)
$z + x + y = 9$
$z + 2x - y = 7$
8. Given the inequalities:
$x + 1 \leq 2x + 3 < x + 5$
(a) Solve the inequalities. (2mks)
(b) Use the integral values of x that satisfy the inequalities of the combined solution. (1mk)
9. If Q is (x,y), P is (-2,5) and B is (4,-3) and that PQ = 3QB, find the value of x and y. (3mks)
10. A rectangular lawn measures 50m by 40m. There is a path of width 1m all around it. What is the area of the path in hectares? (Give your answer correct to 2d.p). (3mks)
11. A cylindrical water tank has a diameter of 2.1m. To begin with, it is three quarters full of water. A leak starts at the bottom so that it loses 30 litres of water in 1¼ hours. How long will it take for the water level to fall by 0.5m? (Give your answer in days). (3mks)
12. Without using a calculator, evaluate:- (3mks)

$$\frac{2\frac{2}{5} + \frac{1}{3} \text{ of } 3\frac{3}{5} - 4\frac{5}{6}}{1\frac{3}{4} - 2\frac{1}{5} \div 1\frac{2}{3} + 3\frac{1}{4}}$$

13. On the surface of a square box A B C D E F G H of side 2cm a continuous path A E G C is drawn as shown y the arrows below.



(a) Draw and label a net of the square box. (2mks)
(b) On the net, show the path. (2mks)

14. A regular polygon with 3x sides has interior angle 40^0 greater than of one with x sides. What is x? (3mks)
15. A line makes an angle of 68.2^0 with the $x-axis$. Given that the line passes through (-2,3) , find the equation of the line in the form $y=mx+c$. (3mks)
16. The sides of a triangular plot of land are 170m, 190m and 210m. find the angles of the plot. (3mks)

SECTION II (50 MARKS)

Answer any five questions in this section

17. The table below shows marks scored by 40 students in a test.

Marks	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
Frequency	1	5	8	12	7	4	2	1
Cumulative Frequency	1	6	14	26	33	37	39	40

(a) Calculate the lower and upper quartiles. (4mks)
(b) If 30% of the students failed the test, find the pass mark. (3mks)
(c) The pass mark was set at 25 marks. How many students passed the test? (3mks)

18. Measurements of a maize field using a baseline XY were recorded as shown below in metres.

```
                    Y
                    240
TO  R   160         190
                    180     75      TO      Q
                    150     50      TO      P
TO  S   100         120
                    100     100     TO      N
TO  T   30          50
                    20      20      TO      M
                    X
```

(a) Show the map of the maize field by scale drawing. (4mks)
(b) Find the area of the field in hectares. (4mks)
(c) If the cost of one hectare is Ksh. 65,000, find the cost of the maize field. (2mks)

19. The fences AB, BC, CD and DA of a game reserve are straight lines such that B is 16km on a bearing of $N40^0E$ from A; C is directly South of B and East of A and D is 12km on a bearing of $S60^0E$ from C.

(a) Using a scale of 1cm to represent 2km, show the above information in a scale drawing. (3mks)
(b) From the scale drawing, determine:-
(i) The distance, in kilomeres of A from D. (2mks)
(ii) The bearing of A from D. (2mks)
(c) Calculate the area of the game reserve A B C D in square kilometres. (3mks)

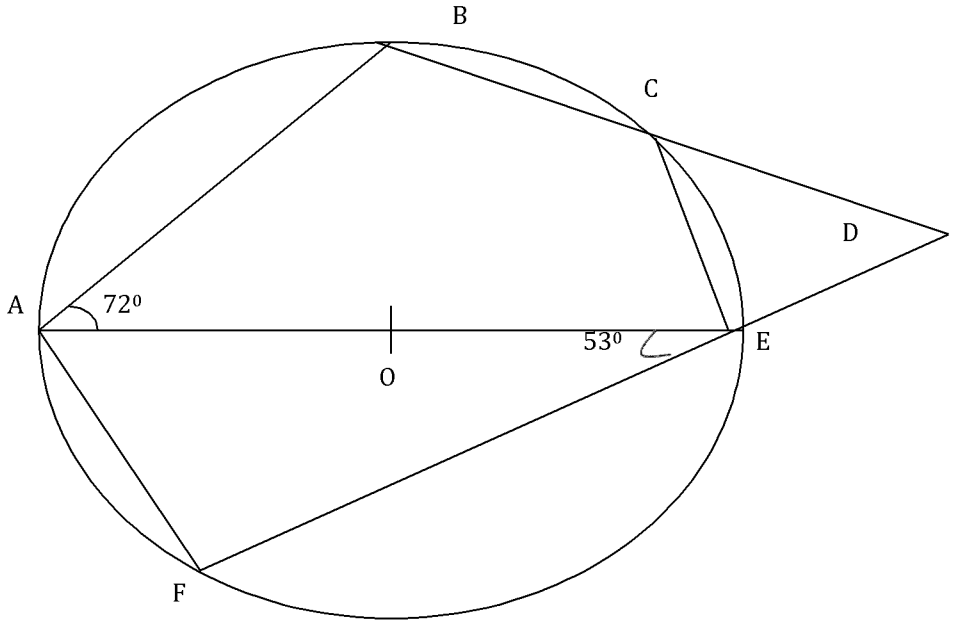
20. Mr. Tirop made a journey of 800km partly by bus and partly by car. He started his journey at 6.00a.m. by bus which traveled at 60km/h. After alighting from the bus, he took a lunch break of 25 minutes. He then continued his journey by car which traveled at 80km/h. The whole journey took 10½ hours.

(a) Determine:-
(i) The distance traveled by car. (4mks)
(ii) The time Mr. Tirop started traveling by car. (3mks)
(b) The car developed a mechanical problem after travelling 180km. It took 10 minutes to rectify the problem. Find the time taken to complete the remaining part of the journey. (3mks)

21. A number of school staff in a certain school in Nandi County formed a welfare society with an intention of purchasing a 250 acre farm going at a Ksh. 120,000 per acre but after some time, the committed realized that they could not raise the required amount in time and so they decided to recruit 20 more members and this reduced the contribution of each member by Shs. 250,000. Find:-

(a) The original number of welfare society members. (6mks)
(b) The new contribution per member when new members joined the Sacco. (2mks)
(c) After buying the farm, it was subdivided equally among all members. Determine how much land each member got. (2mks)

22. In the figure below, AOE is the diameter of the circle. $\angle$ BAE = 72^0 and $\angle$ AEF = 53^0, while $\angle$ CBE = 40^0.



Giving reasons, calculate angle:-

(i) BCE (2mks)
(ii) EDC (2mks)
(iii) BEC (2mks)
(iv) BOE (2mks)
(v) FCE (2mks)

23. Using a ruler and compasses only:-

(a) Construct a triangle ABC such that AB = 5cm AC = 6cm, angle BAC = 67.5^0 measure BC. (4mks)
(b) On the same diagram construct a circle which passes through the vertices of the triangle ABC. Measure the radius. (3mks)
(c) Calculate the area of the part that is outside the triangle but within the circle. (3mks)

24. The height of a model cylindrical tank is 5cm while the height of the actual tank is 4 metres. Find:-

(a) Linear scale factor. (2mks)
(b) Diameter of the model tank given the diameter of the actual tank is 560cm. (2mks)
(c) Capacity of the actual tank in litres. (3mks)
(d) If the above water tank belongs to three families which uses the drinking water in the ratio 2:3:5 per day, find the amount of water used by each family per day. (3mks)

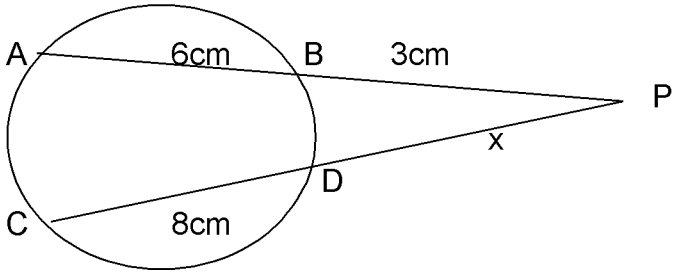
NANDI NORTH AND NANDI CENTRAL JOINT EXAMINATIONS 2016
121/2
MATHEMATICS ALT. A
PAPER 2
JULY / AUGUST 2016
TIME: 2½ HOURS

SECTION 1: (50 MARKS)
Answer ALL Questions in this section

1. Given that $2 \le A \le 4$ and $0.1 \le B \le 0.2$. Find the minimum value of $\frac{AB}{A-B}$ (3mks)
2. Calculate the shortest distance between X $(40^0 N, 80^0 W)$ and Y $(40^0 N, 100^0 E)$ in kilometers taking $\pi = \frac{22}{7}$ and radius = 6370km. (Give your answer to the nearest whole number. (3mks)
3. Evaluate the following leaving your answer in surd form. (3mks)
$$\frac{11}{\sqrt{7}-\sqrt{3}} - \frac{5}{\sqrt{7}+\sqrt{3}}$$
4. Given the arithmetic sequence 4, 11, 18, ... Find:
   (a) The common difference. (1mk)
   (b) The sum of the first eight terms. (2mks)
5. (a) Find the expansion in ascending powers of x of $\left(1-\frac{x}{3}\right)^7$ up to the term in x^2. (2mks)
   (b) Hence evaluate $(0.99)^7$ to four significant figures. (2mks)
6. The cost of maize flour and millet flour is Ksh. 40 and Ksh. 52 respectively. Calculate the ratio in which they were mixed if a profit of 15% was made by selling the mixture at ksh. 52.90 per kilogram. (3mks)
7. The matrix $\begin{pmatrix} x & -3 \\ 0 & x-1 \end{pmatrix}$ is a singular matrix. Find the values of x. (3mks)
8. Ever week the number of absentees in a school was recorded. This was done for 39 weeks. These observations were tabulated as shown below:-

Number of absentees	0-3	4-7	8-11	12-15	16-19	20-23
(Number of weeks)	6	9	8	11	3	2

   Estimate the median absentee rate per week in the school. (3mks)
9. Alicent Jepkoech bought a machine at sh. 110,000. If depreciation is 15%p.a, calculate the number of years it will take for the value to depreciate to sh. 60,000. (4mks)
10. Find the value of x without using mathematical tables in the following:- (3mks)
$$Log_8(x+5) - \log_8(x-3) = \frac{2}{3}$$
11. Use table of logarithms to evaluate: (4mks)
$$\left(\frac{6.79 \times 0.391}{\log 5}\right)^{\frac{3}{-4}}$$
12. What must be added to $x^2 + 10x$ to make it a perfect square? (2mks)
13. A boy at the top of a cliff 30m high observes two boats P and Q at the sea. The boats and the foot of the cliff are in the same straight line. The angle of depression from the boy to P and Q are 42^0 and 27^0 respectively. Calculate the distance between the two boats. (3mks)
14. A body is moving in a straight line such that its velocity Vm/s after t seconds is given by $v = 5t^2 - \frac{1}{2}t + 3$. Find the distance traveled during the third second. (4mks)
15. Find the length of DP in the figure below. (3mks)



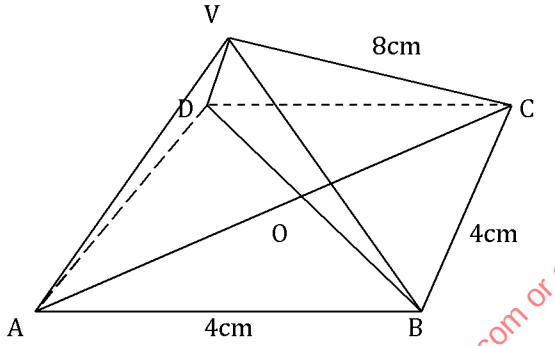
16. If θ is an obtuse angle, solve the equation: (2mks)

$$\sin\theta = \log\left(\tan 75^{0}\right)$$

SECTION II (50 MARKS)

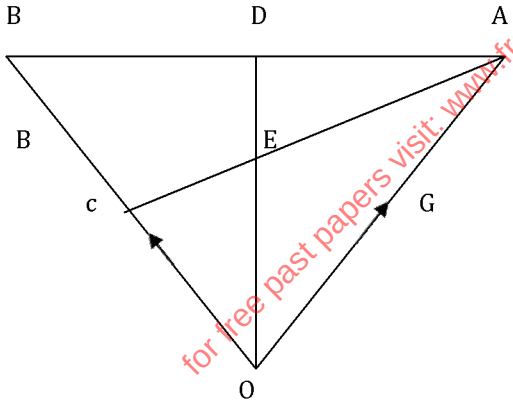
Answer any five questions in this section

17. The figure below shows a right pyramid on a square base ABCD of sides 4cm. VA=VB=VC=VD=8cm.



(a) Find the height VO of the pyramid. (3mks)
(b) The angle between slant edge and the base ABCD. (3mks)
(c) The angle between the planes VCB and ABCD. (2mks)
(d) Find the volume of the pyramid in litres. (2mks)

18. The figure below shows ΔOAB in which BD:DAA = 1:2, OE:ED = 3:2 and c is the midpoint of OB.



(a) Given that OA = a and OB = b express the following vectors in terms of:
(i) AB (1mk)
(ii) OD (2mks)
(iii) AE (2mks)
(b) Show that points A, E and C lie on a straight line. Hence, determine the ratio of CE:EA. (5mks)

19. Two quantities P and n, are connected by the equation $P = AK^{n}$, where A and K are constants. The table below shows some corresponding values of n and P.

n	2	4	6	8	10
P	9.8	19.4	37.4	74.0	144.0

(a) State the linear equation connecting P and n. (2mks)
(b) On the grid provided, draw a suitable straight line. (5mks)
(c) Use your graph to estimate the value of A and k. (3mks)

20. The points P(2,1), Q(4,1), R(4,3) and S(3,3) are co-ordinates of a quadrilateral.

(c) On the grid provided and using a scale of 2cm to represent 2 units on both axes and taking $-8 \le x \le 8$ and $-5 \le y \le 8$, draw and label the quadrilateral PQRS. (1mk)

(d) Find the co-ordinates of $P'Q'R'S'$ under the transformation M = $\begin{pmatrix} 1 & 1 \\ 2 & 0 \end{pmatrix}$ of the object. (2mks)

(e) The image of PQRS under the transformation represented by the matrix, M is $P'Q'R'S'$. Draw and label $P'Q'R'S'$ on the same grid. (1mk)

(f) The matrix N = $\begin{pmatrix} -2 & 1 \\ 0 & 1 \end{pmatrix}$. The image of quadrilateral $P'Q'R'S'$ under the transformation represented by the matrix N is $P'Q'R'S'$. Draw and label $P'Q'R'S'$ on the same grid. (3mks)

(g) Determine the matrix that maps PQRS directly onto $P'Q'R'S'$. (3mks)

21. Three athletes Peter, Mark and John have the probability of $\frac{1}{3}$, $\frac{3}{4}$ and $\frac{2}{5}$ respectively to qualify for the finals of the high jump. If their attempts are independent, determine the probabilities that:-

(a) All will qualify for the final. (2mks)
(b) At least two of them will qualify. (2mks)
(c) Neither will qualify. (2mks)
(d) Only one will qualify. (2mks)
(e) Only Peter will qualify. (2mks)

22. Two types of bread type x = 200cm², type y = 300cm². The pan is 1.5m by 1.2m and number of type y should be more than twice the number of type x. Profit of type x is sh. 2 and that of type y is sh.1.
Form all the inequalities and determine the maximum profit. (10mks)

23. The table below shows monthly income tax rates.

Monthly taxable pay (in K£)	Rate of tax (Ksh. per £)
1 – 342	2
343 – 684	3
685 – 1026	4
1027 – 1368	5
1369 – 1710	6
1710 and above	7

Sylvin Mukeza who is a civil servant earns a monthly salary of Ksh. 20,000 and is provided with a house at a nominal rent of Ksh. 700 per month.

(a) Calculate Mukeza's taxable monthly pay in K£. (2mks)
(b) Calculate the total tax Mukeza pays in K£. (4mks)
(c) If Mukeza is entitled to a personal tax relief of Ksh. 600 per month, what is the payable tax? (1mk)
(d) Mukeza has the following deductions made on her pay:
Loan repayments of Ksh. 2100 per month, NSSF Ksh. 200 per month and WCPS calculated a 2% of the monthly salary.
Calculate Mukeza's net pay. (2mks)

24. (a) Use the trapezoidal rule to find the area under a curve $y = x^2+1$ from x=1 to x=15 using seven strips. (5mks)
(b) Using the method of integration, find the actual area under the curve $y=x^2+1$ from x=1 to x=15. (3mks)
(c) Find the percentage error involved in using the trapezoidal rule to find the area under the curve to 4d.p. (2mks)

NANDI EAST, NANDI SOUTH & TINDERET SUB-COUNTIES JOINT EVALUATION 2016

121 / 1
MATHEMATICS ALT. A
PAPER 1
JULY / AUGUST 2016
TIME: 2½ HOURS

SECTION 1: (50 MARKS)
Answer ALL Questions in this section

1. Without using a calculator, evaluate:- (2mks)

$$\frac{-2(5+3)-8\div 2+5}{-3\times -5+-2\times 4}$$

2. Use mathematical tables to solve to 2 decimal places the value of: (3mks)

$$4.857^2-\frac{1}{0.3386}$$

3. The line which passes through the points P(4,a) and (2a,2) is parallel to line whose equation is 2y – 3x = 6). Find the value of a. (3mks)
4. A saleslady sold goods whose marked price was sh. 340,000 ata discount of 3%. She was paid sh. 16,490 as commission for the sale. Calculate the percentage rate of commission she was paid. (3mks)
5. Solve $2^2-5x-3=0$ using completion of squares method. (3mks)
6. A solid metal cuboid measuring 7.2cm long, 4.8cm wide and 2.4cm high is melted down and casted into a spherical ball. Calculate to 2 decimal places the radius of the ball. (Take π= 3.142) (4mks)
7. Simplify the ratio x:y = 2:3, find the ratio (5x-2y) : (x+y) (3mks)
8. Simplify the following expression by reducing into a single fraction. (3mks)

$$\frac{2x-3}{3}-\frac{x-2}{2}-\frac{1-x}{4}$$

9. Line AB = 7.2cm, $\angle AB_1B_2=30^0$ and $B_1B_2=9.7cm$. Using line AB, divide line B_1B_2 into six equal intervals and measure the length of 3 intervals (Use ruler and a pair of compass only). (3mks)
10. Solve the following simultaneous equation using matrix method. (4mks)
    3x – 56 = -9
    5x + 2y = 16
11. In a form one class there are 5 more boys than girls. On a certain day, one quarter of the boys and one fifth of the girls went for a science contest. If 8 students from this class went to the science contest, find the number of students in the class. (3mks)
12. Simplify: (3mks)

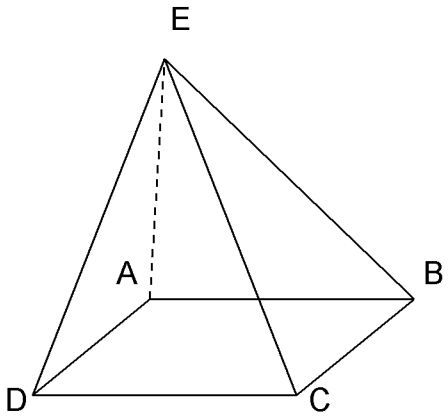
$$\frac{x-2}{x+2}-\frac{2x-4}{x^2-4}$$

13. Find the number of sides of a regular polygon whose interior angle is five times the exterior angle. (3mks)
14. Object A of area 10cm² is mapped onto image B of area 60cm² by a transformation matrix whose matrix is given by $P=\begin{pmatrix} x & 4 \\ 3 & x+3 \end{pmatrix}$ find the value of x. (3mks)
15. Find the integral values that satisfy the inequalities and represent it on the number line. (3mks)

$$4x-6\geq x-12$$

$$8-3x\geq 2x-7$$

16. Draw the net of the figure below. (3mks)
AB = BC = CD = AD = 4cm
AE = BE = CE = DE = 5cm



SECTION II (50 MARKS)
Answer any five questions in this section

17. A cylindrical container has a capacity of 1.12 litres. The container is designed such that the new container is similar to the old container and has a capacity of 3.78 litres.
(a) Determine in the simplest terms possible:-
(i) The volume scale factor of this enlargement. (2mks)
(ii) The linear scale factor. (2mks)
(iii) The area scale factor. (2mks)
(b) Calculate the height of the new container given the height of the old container is 15cm. (2mks)
(c) The surface area of the new container is 540cm^2. What is the surface area of the old container? (2mks)

18. The following measurements were recorded in a field book using XY as the base line. XY = 40m.

		Y		
C	60	340		
		300	120	D
		240	160	E
		220	160	F
B	100	140		
A	120	80		
		X		

(a) Using a scale of 1:4000, draw an accurate map of the farm. (4mks)
(b) Determine the actual area of the farm in hectares. (4mks)
(c) If the farm is on sale at sh. 80000 per hectare, find how much the farm costs. (2mks)

19. The angle of elevation of the top of a flagpole from a point A on a level ground is 13^0. The angle of elevation of the top of the flagpole from another point B nearer the pole and 12m from A is 30^0. Find:-
(a) (i) The height of the flagpole. (5mks)
(ii) The distance from point B to the top of the flagpole. (2mks)
(b) The distance from point A to the top of the flagpole. (3mks)

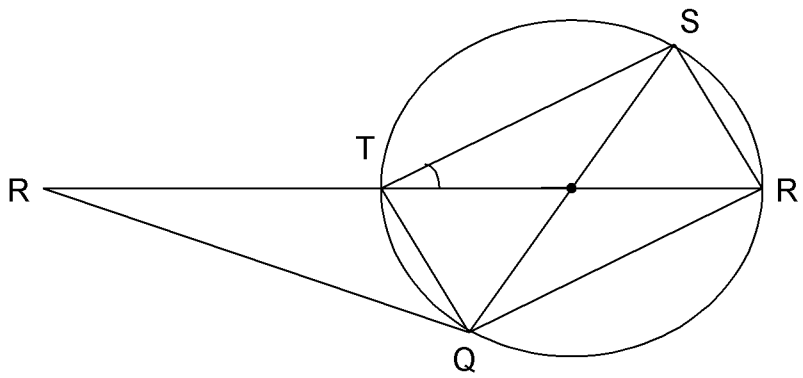
20. Forty students in form two class were weighed and their masses recorded to the nearest kilogram as shown below.

45	48	56	39	47	36	45	49	50	46
37	46	33	43	51	42	47	36	42	48
47	40	46	41	45	43	46	50	38	45
54	42	51	39	42	45	44	35	52	46

(a) Using class interval of 5kg, tabulate this data in a frequency table, the first class being 33 – 37. (3mks)
(b) Modify the table and use if to calculate mean mass of the students. (3mks)
(c) Estimate the median mass of the students. (4mks)

21. A Matatu and a Nissan left town A for town B 240km away at 8.00am travelling at a speed of 90km/hr and 120km/h respectively. After 20 minutes the Nissan had a puncture which took 30 minutes to mend.
(a) How far from town A did the Nissan catch up with the Matatu? (6mks)
(b) At what time did the Nissan catch up with the Matatu? (1mk)
(c) At what time did the Matatu reach town B? (3mks)

22. The diagram below shows a circle centre O. PQ is a tangent to the circle at Q and PTOR is a straight line QRST is a cyclic
quadrilateral in which angle RTS = 35^0 and RT and QS are diameters.



Giving reasons for your answer, find the size of:-
(a) Acute angle ROS. (2mks)
(b) Angle RQS. (2mks)
(c) Angle PQR. (2mks)
(d) Angle QPT. (2mks)
(e) Angle PQT. (2mks)

23. (a) Draw the graph of $y = 3x(4-x)$ for $x = 1$ to $x = 5$ (3mks)
(b) Hence use Trapezoidal rule to estimate the area bounded by the curve, the x-axis and the lines $x = 1$ and $x = 5$. (3mks)
(c) Find the exact area and use it to find the percentage error in the area. (4mks)

24. In a certain mathematical relationship, the values of P and Q are found to obey the relationship $Q = CP + KP^2$ where C and K are constans.

P	1	2	3	4	5	6
Q	3.2	6.75	10.8	15.1	20	25.2

(a) By drawing a suitable straight line graph, determine the values of C and K. (8mks)
(b) Hence write the relationship between P and Q. (1mk)
(c) Determine the value of Q when P = 7. (1mk)

NANDI EAST, NANDI SOUTH & TINDERET SUB-COUNTIES JOINT EVALUATION 2016

121 / 2
MATHEMATICS ALT. A
PAPER 2
JULY / AUGUST 2016
TIME: 2½ HOURS

SECTION I: (50 MARKS)
Answer ALL the Questions in this section in the spaces provided.

1. Evaluate using logarithms:

$$\sqrt{\frac{0.03215 \times 1.439}{0.0485}}$$

2. The surface area of a sphere is given as $4\pi r^2$. If there is an error of 0.24% in r and an error of 0.15% in π, calculate the percentage error in its surface area. (3mks)

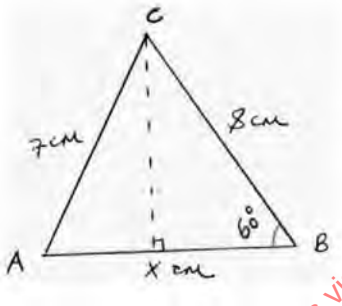
3. Simplify $\frac{3}{\sqrt{7}-2} + \frac{1}{\sqrt{7}}$ leaving your answer in the form $a + b\sqrt{c}$, where a, b and c are rational numbers. (3mks)

4. Make s the subject of the formula:

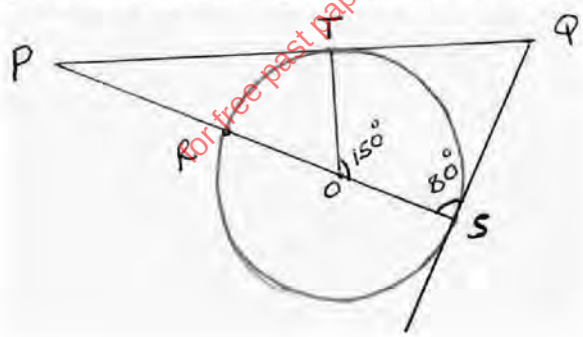
$$\sqrt{p} = r\sqrt{w - as^2}$$

5. Solve the equation $2sin^2 30 = \frac{1}{2}\ for - 90^0 \leq \theta \leq 90^0$ (3mks)

6. The figure below shows triangle ABC where AB = xcm, BC = 8cm, AC = 7cm and $< ABC = 60^0$. Calculate the area of the triangle correct to 2 significant figures. (3mks)



7. In the figure below, PQ is the tangent to the circle centre O and SORP is a straight line. Angle PSQ = 80⁰ and TOS = 150⁰.



(a) Find angle SPQ. (2mks)
(b) Find angle RTO. (1mk)

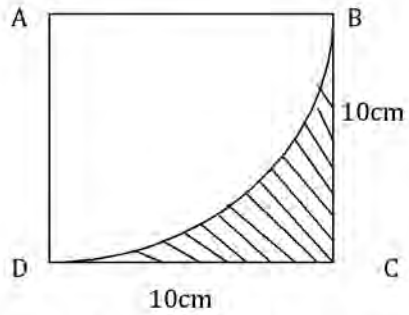
8. Solve for x in; $3 - log_{10}x^2 = \left(\frac{1}{log x^{10}}\right)^2$ (4mks)

9. A hosepipe can fill water butt in 5 minutes; the outlet tap can empty it in 6 minutes. The hosepipe is started with the tank empty and the tap opened, but this is noticed after three minutes and the tap is closed. How much longer does the butt take to fill? (3mks)

10. P,Q and R are three quantities such that P varies directly as a square of Q and inversely as a square root of R. If Q increases by 10% and R decreases by 25%, find the percentage increase in P. (3mks)
11. Calculate the standard deviation for the following set of data: (3mks)
    34, 61, 49, 57, 53, 37, 59
12. Expand and simplify the expression: (3mks)

$$\left(x+\frac{1}{x}\right)^2-\left(x-\frac{1}{x}\right)^4$$

13. Find the equation of the normal curve $y=(x-1)(x+3)$ at point where the curve cuts the y-axis. (3mks)
14. Calculate the area of the shaded region in the square below, given that BD is an arc of a circle whose center is at A. (3mks)



15. Three grades of tea: A, B and C costing shs. 280, shs. 190 and shs. 170 per kg respectively are mixed in the ratio 3:4:k. Find the value of k for which when the mixture is sodl at shs. 250per kg, 25% profit is realized. (3mks)
16. The points A(-6,-2) and B(2,-4) are ends of a diameter of a circle. Find:-
    (a) Find the co-ordinates of the centre. (1mk)
    (b) The equation of the circle in the form $x^2+y^2+ax+by+c=0$ where a, b and c are constants. (2mks)

SECTION II (50 MARKS)

Answer any five questions in this section

17. The table below shows the tax rates for the year 2015.

TAXABLE MONTHLY INCOME IN (KSHS)	TAX PAYABLE RATES (%)
1 – 9860	10
9,861 – 18,800	15
18,801 – 27,920	20
27,921 – 37,040	25
37,041 – And above	30

Tonny's monthly earnings in 2014 were as follows:-

Basic salary	Kshs. 35,000
House allowance	Kshs. 12,000
Medical allowance	Kshs. 2,800
Commuter allowance	Kshs. 5,000

If Tonny is entitled a tax relief of kshs. 1162, calculate:-

(a) His monthly taxable income (2mks)
(b) Tax he paid. (6mks)
(c) Tonny joins an insurance cover and he is further given 8% tax relief. Calculate his net pay. (2mks)

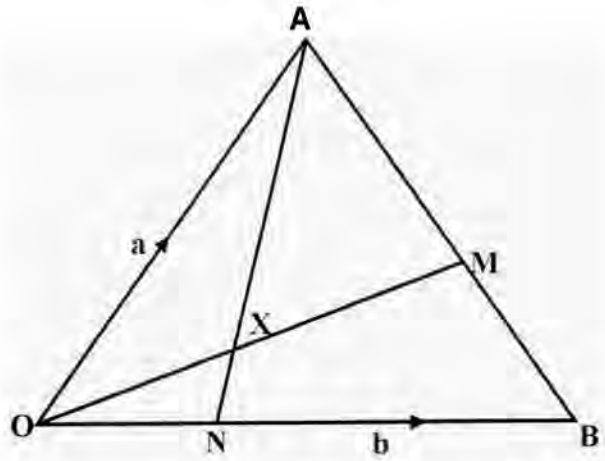
18. The first term of an arithmetic sequences is (2x + 1) and the common difference is (x+1). The product of the first and second term is zero.
(a) Find the value of x. (2mks)
(b) Find the three terms of the two possible sequences. (4mks)
(c) The first 3 terms of a geometric progression are the first, fourth and tenth terms of an arithmetic sequence. Given that, the first term of a geometric progression is 6, find the common difference (d) of the arithmetic progression. (4mks)

19. An aeroplane left town $P(65^0N, 15^0E)$ to another town $Q(65^0N, 165^0W)$ at a speed of 200 knots using the shortest route.
(a) (i) Find the distance travelled in nautical miles. (2mks)
    (ii) The time taken to travel from P to Q in hours. (2mks)
(b) Another aeroplane left P at 1:30p.m. local time and travelled to $T(65^0N, 60^0E)$ along the parallel of latitude. Find:-

(i) The distance between towns P and T to the nearest km. $\left(Take\ \pi = \frac{22}{7}\ and\ R = 6370km\right)$ (3mks)

(ii) The local time of arrival at town T; if the plane flew at a speed of 470km/hr. (3mks)

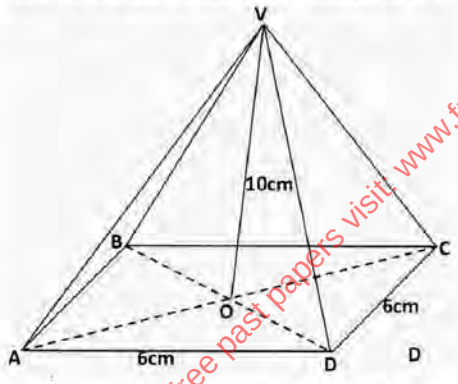
20. In the figure below OAB is a triangle, OA =a, OB = b. point M lies on AB such that AM:MB=1:3 and N lies on OB such that OB:BN = 7:-5. Line OM and AN intersect at X.



(a) Express in terms of a and b;
(i) OM (2mks)
(ii) AN (1mk)

(b) Given that OX = kOM and AX = hAN where k and h are scalars.
(i) Write down two expressions for OX in terms of a, b, h and k. (2mks)
(ii) Find the values of h and k. (4mks)

21. The figure below is a square based pyramid ABCDV with AD = DC = 6cm, and height VO = 10cm.



(a) State the projection of VA on the base ABCD. (1mk)

(b) Find:
(i) The length of VA. (3mks)
(ii) The angle between VA and ABCD. (2mks)
(iii) The angle between the planes VDC and ABCD. (2mks)
(iv) Volume of the pyramid. (2mks)

22. A shop is stocked with plates, which come from two suppliers A and B. They are bought in the ration 3:5 respectively 10% of plates from A are defective and 6% of plates from B are defective.

(a) A buyer chooses a plate at random. Find the probability that:
(i) It is from A. (2mks)
(ii) It is from B and it is defective. (2mks)
(iii) It is defective. (2mks)

(b) Two plates are chosen at random. Find the probability that:
(i) Both are defective. (2mks)
(ii) At least one is not defective. (2mks)

23. (a) Using only a ruler and a pair of compasses draw a line AB of length 8cm long. Hence draw the locus of all points P such that angle APB = 52.50. (5mks)

(b) If the region above represents a map of an estate drawn to a scale of 1cm representing 1km. Show the region to be fenced if AMB $\leq 90^0$ by shading the unwanted region. (3mks)

(c) Find the area of this region. (2mks)

24. During installation of electricity bulbs in street lighting, a dealer is required to supply two types of bulbs A and B. The total number of bulbs should not be more than 400. He must supply more of A than B and type A bulbs should not be more than 300 and B should not be less than 80.
    (a) Write down in terms of x and y all inequalities representing the information above. (3mks)
    (b) On the grid provided draw all the inequalities and shade the unwanted region. (4mks)
    (c) If type A costs Kshs. 450 per piece and B Kshs. 350 per piece and that the higher the cost the higher the profit:
    (i) Use the graph to determine the number of each type of bulb that he should supply to maximize profit. (1mk)
    (ii) Calculate the maximum cost of lighting the streets. (2mks)

KAMDARA JET 2016
121/1
MATHEMATICS
JULY/AUGUST, 2016
PAPER 1
TIME: 2½ HOURS

SECTION I (50 MARKS)

Answer ALL the questions in this section

1. Without using a calculator or a mathematical table evaluate. (3 marks)

$$\frac{\frac{6}{7}of\frac{14}{3}\div 8\times\frac{2}{3}}{-2\times 3+(14\div 7)\times -3}$$

2. By using substitution $y = 3^x$ or otherwise solve, (4 marks)

$$9^{x+1}-3^x=3^{x+3}-3$$

3. Simplify: $\dfrac{12x^2-27}{4-(2x+1)}$ (3 marks)

4. A line L_1 is perpendicular to the line $2x - 3y + 6 = 0$. Find the angle made by line L_1 and x axis. (3 marks)

5. Three – fifths of a certain work is done on the first day. On the second day, $\frac{3}{4}$ of the remainder is completed. If on the third day $\frac{7}{8}$ of what remained is done, what fraction of the work still remains to be done? (3 marks)

6. A bank in Kenya buys and sells foreign currency as shown in the table below.

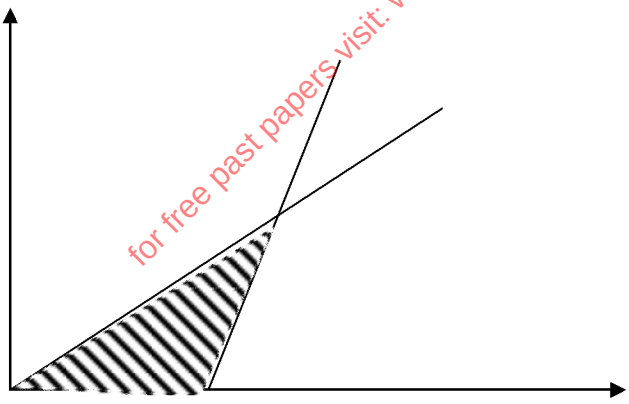
	Buying	Selling
1 US dollar	100.87	100.97
1 Sterling pound	147.27	147.43

An American tourist came to Kenya with 15000 US dollars and converted the whole of it into Ksh. He then spent Ksh. 650,000 and converted the remaining money to sterling pounds. Calculate to the nearest pound the amount of money he remained with. (3 marks)

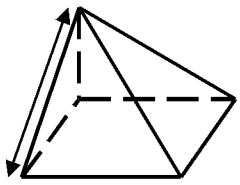
7. Use logarithm tables to evaluate $\dfrac{(0.07284)^2}{\sqrt[3]{0.06195}}$ (4 marks)

8. Under an enlargement scale factor -2, the image of A(2,4) is A'(-1 ,-2). Under the same enlargement, the image of D(x ,y) is D'(3, -2). Find the coordinates of the object D. (3 marks)

9. The figure below shows two lines $2x - y = 6$ and $y = \frac{1}{2}x$, intersecting. Calculate the area of shaded regions. (4marks)



10. The diagram below represents a right pyramid on a square base of side 3cm. The slant edge of the pyramid is 4cm.



(a) Draw a labeled net of the pyramid. (2 Marks)
(b) On the net drawn, measure the height of a triangular face from the top of the pyramid. (1 Mark)

11. A salesman is paid a salary of Sh. 10,000 per month. He is also paid a commission on sales above Sh. 100,000. In one month he sold goods worth Sh. 500,000. If his total earning that month was Sh. 56,000. Calculate the rate of

commission. (3 marks)

12. Solve the following inequality and state the integral solutions. (3 marks)
$\frac{1}{2}(24-4x) > 6(3x-\frac{4}{3}) \geq -\frac{2}{3}(42+3x)$

13. A regular polygon is such that its exterior angle is one eighth the size of interior angle. Find the number of sides of the polygon. (3 marks)

14. The position vector of P is OP = 2i – 3j and M is the mid – point of PQ. Given OM = i + 4j, Obtain the vector PQ. (3 marks)

15. A liquid spray of mass 384 g is packed in a cylindrical container of internal radius 3.2 cm. Given that the density of the liquid is 0.6g/cm^3, calculate to 2 decimal places the height of liquid in the container (3 marks)

16. Given that sin $(2\Theta + 30) = \cos(\Theta - 60)$. Find the value of tan Θ to two decimal places. (2 marks)

SECTION II (50 MARKS)

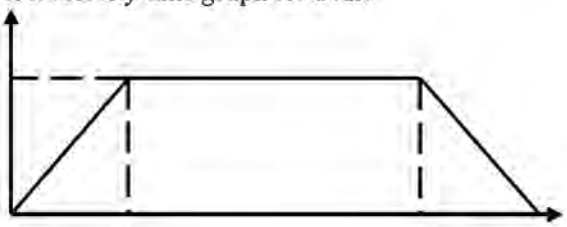
Answer any FIVE questions only in this section

17. Water flows through a circular pipe of cross-sectional area of 6.16cm^2 at a uniform speed of 10cm per second. At 6.00 a.m. water starts flowing through the pipe into an empty tank of base area are 3m^2.

a) What will be the depth of the water at 8.30 a.m.? (5 marks)

b) If the tank is 1.2m high and a hole at the bottom through which water leaks at a rate of 11.6cm^3 per second. Determine the time at which the tank will be filled. (5 marks)

18. (a) The figure below is a velocity time graph for a car.



(i) Find the total distance travelled by the car. (2 marks)

(ii) Calculate the deceleration of the car. (2 marks)

(b) A car left Nairobi towards Eldoret at 7.12 a.m. at an average speed of 90km/h. At 8.22 a.m., a bus left Eldoret for Nairobi at an average speed of 72km/hr. The distance between the two towns is 348km. Calculate:

i) the time when the two vehicles met. (4 marks)

ii) the distance from Nairobi to the meeting place. (2 marks)

19. Using a ruler and a pair of compass only.

a) Construct a triangle ABC in which AB=8cm, BC=7.5 cm and <ABC = 112.5^0. (3 marks)
Measure length of AC. (1 mark)

b) By shading the required region show the locus of P within triangle ABC such that

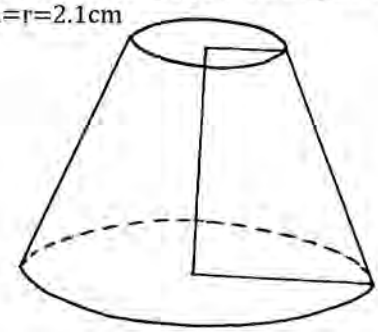
i) AP ≤ BP

ii) AP>3 (2 marks)

c) Construct a normal line from C to meet AB at D. (1 mark)

d) Locate the locus of R in the same diagram such that the area of the triangle ARB is $\frac{3}{4}$ area of triangle ABC. (3 marks)

20. The diagram below represents a solid consisting of a hemispherical bottom and a conical frustum at the top.
O_1O_2=4cm, O_2B=R=4.9cm O_1A=r=2.1cm



a) Determine the height of the chopped off cone and hence the height of the bigger cone. (2 marks)

b) Calculate the surface area of the solid. (4marks)

c) Calculate the volume of the solid. (4marks)

a) Complete the table given below for the equation $y = -2\chi^2 + 3\chi + 3$ for the range $-2 \leq x \leq 3.5$ by filling in the blank spaces. (2 marks)

x	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3	3.5
y		-6		1						-2		-11

(b) Use the values from the table above to draw the graph of $y = -2\chi^2 + 3\chi + 3$. (3 marks)

(c) Use your graph to:

(i) Determine the integral values of χ in the graphs range which satisfy the inequality $2\chi^2 - 3\chi - 3 \geq 3$. (3 marks)

(ii) Solve $-2\chi^2 + 2\chi + 5 = 0$. (2 marks)

21. Triangle ABC has vertices A(3, 1), B(4, 4) and C(5, 2). The triangle is rotated through 90^0 about (1, 1) to give A'B'C'. Triangle A'B'C' is then reflected on the line $y - x = 0$ onto A''B''C''. triangle A''B''C'' then undergoes enlargement scale factor – 1 through the origin to give A'''B'''C'''.

(a) On the graph paper, draw triangles A'B'C', A''B''C'' and A'''B'''C'''. (8 marks)

(b) Describe the type of congruence between:

i) ΔABC and ΔA'B'C'

ii) ΔA'B'C' and ΔA''B''C'' (2 marks)

22. The table below shows patients who attend a clinic in one week and were grouped by age as shown in the table below.

Age x years	$0 \leq x < 5$	$5 \leq x < 15$	$15 \leq x < 25$	$25 \leq x < 45$	$45 \leq x < 75$
Number of patients	14	41	59	70	15

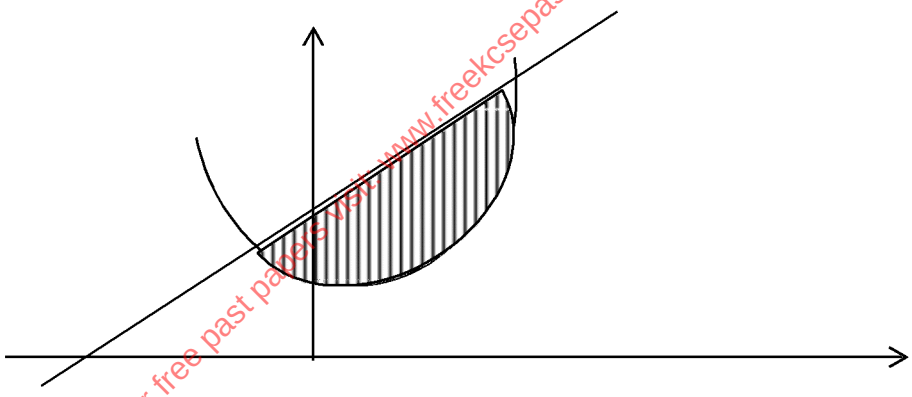
(a) Estimate the mean age (4 mark)

(b) On the grid provided draw a histogram to represent the distribution. (3 marks)
(Use the scales: 1cm to represent 5 units on the horizontal axis 2 cm to represent 5unit on the vertical axis)

(c) i) State the group in which the median mark lies (1 mark)

ii) A vertical line drawn through the median mark divides the total area of the histogram into two equal. Using this information estimate the median mark. (2 marks)

23. The figure below shows curve of $y = 2x^2 + 4x + 3$ and a straight line intersecting the curves at A and B.



If the x – intercept is -3.5 and y – intercept as 7, find

a) The Equation of the straight line. (2 marks)

b) The coordinates of A and B. (4 marks)

c) The area of the shaded region. (4 marks)

KAMDARA JET 2016

121/2
MATHEMATICS
JULY/AUGUST, 2016
PAPER 2
TIME: 2½ HOURS

SECTION I (50 MARKS)

Answer all the questions in this section in the spaces provided below each question.

1. Using an assumed mean of 50, calculate the standard deviation of the marks obtained in a test recorded as follows:
50, 52, 45, 40, 55, 51 56, 48, 55, 60 (2 marks)

2. Make x the subject of the formula $P = \frac{1}{2}\sqrt{\frac{x+2w}{4x+3R}}$ (3 marks)

3. Find the value of x in the equation (4 marks)
$\text{Log}_3 X - 4\log_X 3 = -3$

4. a) Expand the binomial $(2 - \frac{1}{4}x)^5$ (2 marks)
b) Using the first 4 terms of the binomial above solve for 1.75^5 (2 marks)

5. a) Find the inverse of the matrix $\begin{pmatrix} 1 & 1 \\ 3 & 1 \end{pmatrix}$ (1 mark)

b) Hence determine the point of intersection of the lines (2 marks)
$x + y = 7$
$3x + y = 15$

6. Rationalise the denominator and simplify the answer completely.
$\frac{\sqrt{3}}{1+\sqrt{2}} + \frac{2+5\sqrt{3}}{\sqrt{3}-\sqrt{2}}$ (3Marks)

7. Solve for x in the trigonometric equation $4\cos^2 x + 4\sin^2 x = 16\sin^2 x \cos^2 x$ in $0^0 \leq x \leq 360^0$ (3 marks)

8. The mass of a cylinder of a small material varies jointly as the square of the radius and as the height. If the radius is increased by 20% and the height by 10%. Find the percentage increase in mass. (3 marks)

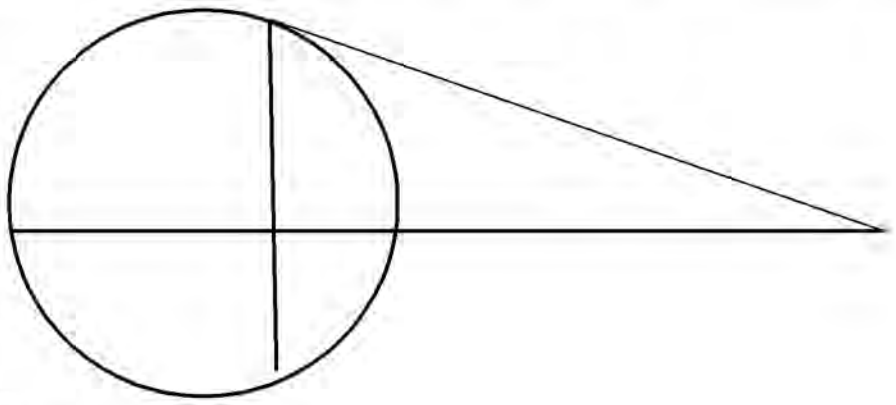
9. Given that the dimensions of a rectangle are 20.0cm and 25.0. Find the percentage error in calculating the area. (3 marks)

10. Maina bought a new laptop on hire purchase. The cash value of the laptop was Ksh. 56,000. He paid a deposit of Ksh. 14,000 followed by 24 equal monthly installments of Ksh. 3500 each. Calculate the monthly rate at which the compound interest was charged.
(3marks)

11. Find the equation of tangent to a curve $x^2 = 4y+1$ at the point (2, 0.75) (3 marks)

12. Object A of area $12cm^2$ is mapped onto its image B of area $72cm^2$ by a transformation. Whose matrix is given by p $= \begin{pmatrix} x & 4 \\ 3 & x+3 \end{pmatrix}$. Find the positive values of x (3 marks)

13. In the figure below, AB is a tangent, meeting chord CDE at B. AD = 5cm, CD = 4cm, DF = 2cm, EB = 7.5cm and DE = x cm.

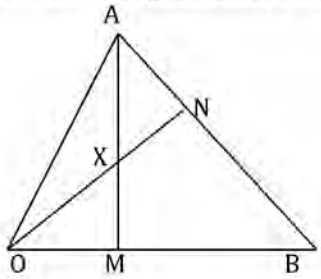


Determine:
(a) The value of x (1mark)
(b) The length of AB. (2 marks)

14. A ship covers 60km on a bearing of 230°. If then it changes course and heads due west for 80km, determine its direct distance from the starting point. (3 marks)
15 Find the centre and the radius of the circle whose equation is $x^2 + y^2 - 7x + 6 + 11y = 0$ (3marks)
16. The 2nd, 4th and 7th terms of A.P are the first 3 consecutive terms of a G.P. Find:
    (a) The common ratio (2Marks)
    (b) The sum of the first eight terms of the G.P if the common difference of the A.P is 2. (2Marks)

SECTION II(50 MARKS)
Answer ONLY FIVE questions in this section in the spaces provided.

17.



In the figure above, M divides line OB in the ratio 1:2 and N divides $\overrightarrow{AB}$ in the ratio 2:3 $\overrightarrow{AM}$ and $\overrightarrow{ON}$ intersect at X. Given $\overrightarrow{OA} = 2\underset{\sim}{a}$ and $\overrightarrow{OM} = \underset{\sim}{b}$:

a) Find in terms of a and b :

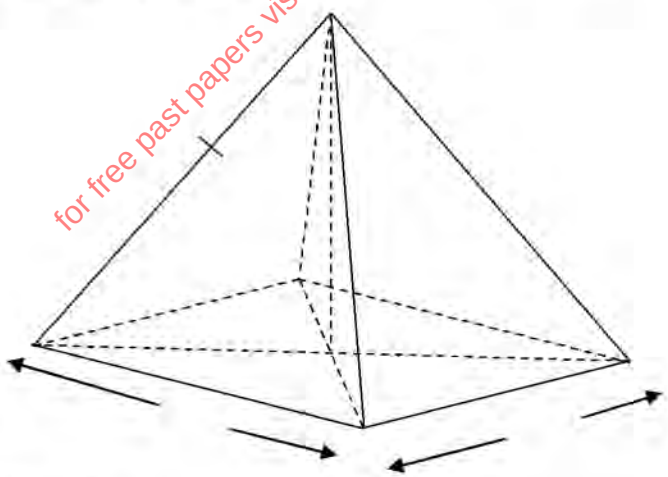
(i) $\overrightarrow{AB}$ (1 mark)
(ii) $\overrightarrow{AM}$ (1 mark)
(iii) $\overrightarrow{ON}$ (1 mark)

b) If $\overrightarrow{AX} = h\overrightarrow{AM}$ and $\overrightarrow{OX} = K\overrightarrow{ON}$ where h and k are scalars

(i) Express $\overrightarrow{OX}$ in two ways. (2 marks)
Hence find the value of h and k (4 marks)

c) Find the ratio of $\overrightarrow{AM}:\overrightarrow{MX}$ (1 mark)

18. The figure below shows a right pyramid with a rectangular base. The length of the rectangular base is 15cm and the width is 8cm. The slant edges are all equal to 20cm.



Calculate
a) The volume of the pyramid. (3 marks)
b) The angle VAB makes with ABCD (3 marks)
c) The angle plane XBD makes with VBD given that point X lies on VA such that VX: XA = 2: 3 (4 marks)

19. The number x is chosen at random from the set (0,3,6,9) and the number y is chosen at random from the set (0,2,4,6,8). Calculate the probability of each of the following separate events.
    (i) $x > 6$ (1 mark)
    (ii) $x + y = 11$ (2 marks)
    (iii) $x > y$ (3 marks)
    (iv) $xy = 0$ (2 marks)
    (v) $10x + y < 34$ (2 marks)

20. P and Q are two points on the same parallel of latitude $66^{o}25^{1}$, whose longitudes differ by 120^{o}. Calculate in kilometres. Radius of the earth =6370.

a) The radius of the parallel of latitude where P and Q lie. (2 marks)
b) The distance of P and Q measured along the parallel of latitude. (2 marks)
c) (i) find the length of the straight line joining PQ (2 marks)
(ii) Find the distance between P and Q along the same latitude in nautical miles. (2 marks)
(iii) If an aircraft took 30min to fly from P to Q, Calculate its speed in knots. (2 marks)

21. a) Use the trapezium rule to estimate the area between the curve $y = 3x^2 + 1$, lines x=1 and x=3 and x-axis. Use five ordinates. (5 marks)
b) Using integration method find the exact area under a curve $y=3x^2+1$ (3 marks)
c) Find the percentage error in estimating the area. (2 marks)

22. The table below shows the rate at which income tax is charged for all income earned in a month in 2015.

Taxable Income p.m (Kenya pound)	Rate in % per Kenya pound
1 -236	10%
237 -472	15%
473 -708	20%
709 – 944	25%
945 and over	30%

A total of Ksh. 14,500 is deducted from Mrs. Momanyi monthly salary .She is entitled to a house allowance of Ksh. 8,000 a person relief of Ksh. 1064 month and Monthly insurance relief at the rate of 15% of the premium paid.
. Every month she pays the following.

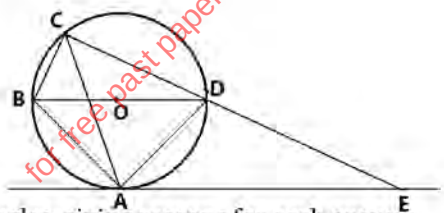
(i) Electricity bill shs.780
(ii) Water bill shs. 560
(iii) Co-operative shares shs. 1200
(iv) Loan repayment Ksh. 5000
(v) Monthly insurance premiums of Ksh 1260

(a) Calculate her P.A.Y.E (2Marks)
(b) Calculate her monthly taxable income . (6Marks)
(c) Calculate her basic salary per month (2Marks)

23. Mr. Wanyama wishes to take student from wonderful mixed secondary school for a tour. The total number of pupils to be taken should not exceed 60. Each girl must contribute sh.10,000 and each boy sh.15,000 and money to be contributed must not exceed sh.120,000. If this trip is to be successful the number of boys must conditionally be greater than girls.

a) Write down five inequalities to represent this information taking the number of boys and girls to be x and y respectively. (4 marks)
b) Represent the above information on the graph paper below. (4 marks)
c) What is the optimum number of boys and girls to be taken in order to be minimise cost. (2 mark)

24. In the figure below, line BD is the diameter of the circle, centre O and AE is a tangent.
Angle CBA = 110^{0} and angle BAC =26^{0}.

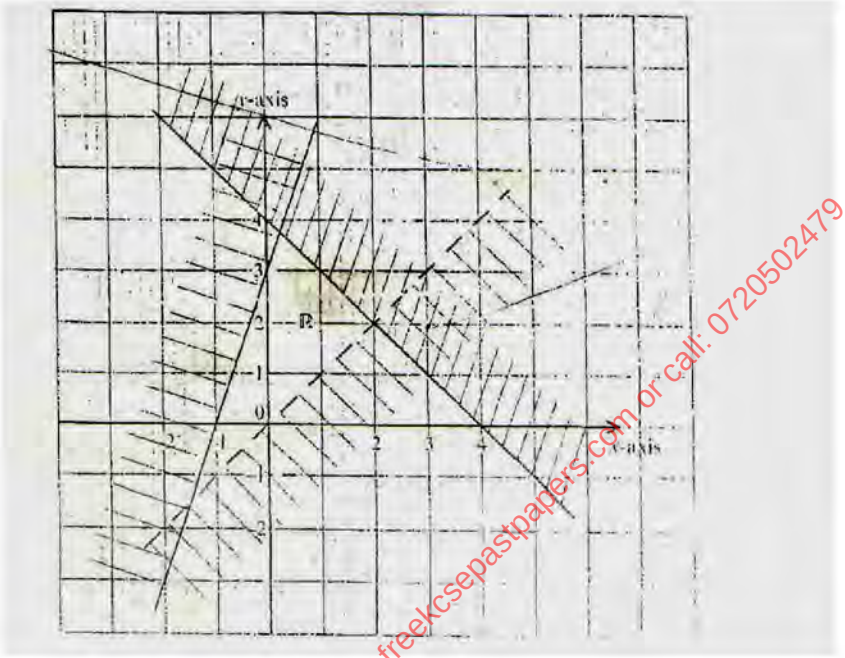


Find the following angles, giving reasons for each answer.

a) $\angle ABD$ (3marks)
b) $\angle DAE$ (1mk)
c) $\angle AED$ (3marks)
d) $\angle AOD$ (3marks)

(3 mks)

12. All prime numbers less than ten are arranged in descending order to form a number.
    (a) Write down the number formed (1 mk)
    (b) State the total value of the second digit in the number formed in (a) above (1 mk)
13. A rectangular tank of base 2.4m by 2.8 and a height of 3m contain 3,600 litres of water initially. Water flows into the tank at the rate of 0.5 litres per second. Calculate the time in hours and minutes, required to fill the tank (4 mks)
14. The sum of interior angles of a regular polygon is 1440^0. (2 mks)
    (i) Find the number of sides of the polygon (1 mk(
15. Find the greatest common factor of x^2y^2 and $4xy^4$. Hence simplify completely the expression $x^3y^2 - 4xy^4$ (4 mks)
16. Form the three inequalities that satisfy the given region R. (3 mks)



SECTION II (50 MARKS)

Answer any five questions from this section

17. The figure below represents a model of a solid structure in the shape of a frustum of a cone with hemispherical top. The diameter of the hemispherical part is 70cm and is equal to the diameter of the top of the frustum. The frustum has a base diameter of 28cm and slant height of 60cm.

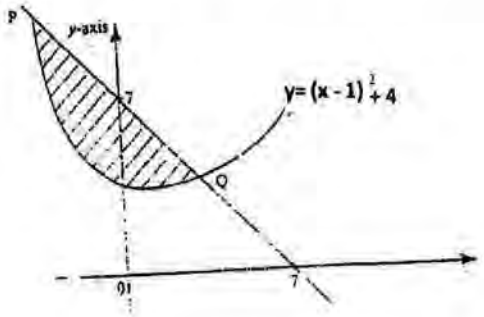
Calculate
    (a) the area of hemispherical surface. (4 mks)
    (b) the surface area of the curved surface (4 mks)
    (c) the total surface area of the model (2 mks)
18. (a) Complete the table below in the blank spaces. (2 mks)

x	0^0	15^0	30^0	45^0	60^0	75^0	90^0	105^0	120^0	135^0	150^0	165^0	180^0
3 cos x	3	2.598	1.5	0	-1.5	-2.598	-3	-2.598	-1.5	0	1.5		
2 sin $(2x + 30^0)$	1		2	1.732	1	0		-1.732	-2	-1.732	-1	0	1

    (b) On the grid provided draw, on the same axis, the graph of $y = 3 \cos 2x$ and $y = 2 \sin (2x + 30^0)$ for $0^0 \leq x \geq 180^0$. Take the scale: 1cm for 150 on the x axis and 2cm for 1 unit on the y – axis. (5 mks)

(c) Use your graph to estimate the range of value of x for which $3 \cos 2x \leq \sin (2x + 30^0)$. Give your answer to the nearest degree. (3 mks)

19. A carpenter constructed a closed wooden box with internal measurements 1.5 metres long, 0.8 metres wide and 0.4 metres high. The wood used in constructing the box was 1.0cm thick and had a density of 0.6g/cm^3.
    (a) Determine the:
        (i) volume in cm3, of the wood used in constructing the box (4 mks)
        (ii) mass of the box in kilograms, correct to 1 decimal place. (2 mks)
    (b) Identical cylindrical tins of diameter 10cm, height 20cm with a mass of 120g each were packed in the box. Calculate the:
        (i) maximum number of tins that were packed. (2 mks)
        (ii) total mass of the box with the tins. (2 mks)
20. (a) The bill for completely covering the floor of a rectangular room with carpet cost Shs. 70 per square metre is Sh. 1960. If one side of the room is X m long; find the length of the other side.
    (b) By leaving a uniform width of ½ m uncovered all round, Shs. 700 could have been saved. Use this information to form an equation in x. (4 mks)
    (c) Solve the equation and hence find the dimensions of the room. (3 mks)
21. The diagram below shows a straight line intersecting the curve y = (x – y)2 + 4 at the points P and Q. The line cuts x-axis at (7,0) and y axis at (0,7)



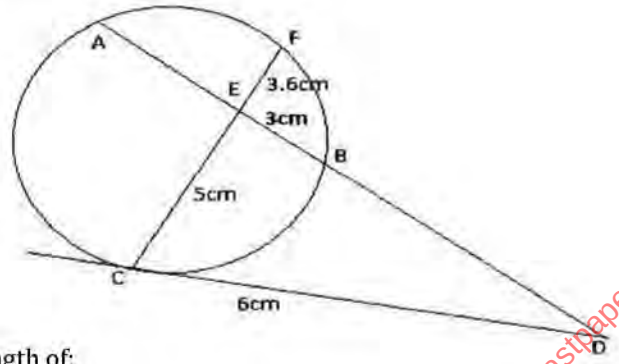
    (a) Find the equation of the straight line in the form of y = mx + c (3 mks)
    (b) Find the coordinates of P and Q (3 mks)
    (c) Calculate the area of the shaded region. (4 mks)
22. (a) Given that the matrix A = $\begin{pmatrix} 2 & 3 \\ 3 & 4 \end{pmatrix}$. Find A-1 the inverse of A (2 mks)
    (b) George bought 200 bags of sugar and 300 bags of rice for a total of KShs. 850,000. Kimani bought 90 bags of sugar and 120 bags of rice for a total of KShs. 360,000. If the price of a bag of sugar is KShs. X and that of rice is KShs. Y,
        (i) Form two equations to represent the information above (2 mks)
        (ii) Use the matrix A^{-1} to find the prices of one bag of each item. (4 mks)
    (c) Ogola bought 225 bags of sugar and 360 bags of rice. He was given a total discount of KShs. 33,300. If the discount on the price of a bag of rice was 2%, calculate the percentage discount on the price of a bag of sugar. (4 mks)
23. Using ruler and compasses only construct triangle ABC such that AB = 4cm, BC = 5cm and ∠ABC = 120^0.
    (a) Measure AC. (3 mks)
    (b) On the diagram, construct a circle which passes through the vertices of the triangle ABC. (2 mks)
    (c) Measure the radius of the circle (1 mk)
    (d) Measure the shortest distance from the centre of the circle to line BC. (1 mk)
    (e) Hence calculate the area of triangle ABC. (2 mks)
24. John bought 3 brands of tea A, B and C. The cost price of the brands were Sh. 25, Sh. 30 and Sh. 45 per kilogram respectively. He mixed the brands in the ratio of 5 : 2 : 1 respectively. After selling the mixture, made a profit of 20%.
    (a) How much profit did he make per kilogram of the mixture? (4 mks)
    (b) After one year, the cost price of each brand was increased by 12%
        (i) For how much did he sell one kilogram of the mixture to make 20% profit to the nearest cent. (3 mks)
        (ii) What would have been his percentage profit if he sold one kilogram of the mixture at Shs. 40.25? (3 mks)

LONDIANI SUB-COUNTY JOINT EXAMINATIONS
Kenya Certificate of Secondary Education (K.C.S.E)
PAPER 2
MATHEMATICS
TIME: 2 ½ HOURS

1. The roots of a quadratic equation in x are -2 and 1. From the equation in the form $x^2 + bx + c = 0$ (3 mks)
2. Make d the subject of the formula (3 mks)

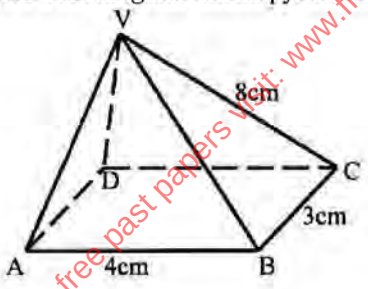
$a = b\sqrt{\left(\frac{d+e}{5f}\right)}$

3. A plane flies continuously for 3 hours 50 minutes from A (500N, 280W) to B(500N, 120E). Calculate to 2 decimal places the shortest distance covered by the plane from A to B in kilometres, along the parallel of latitude. Use $\pi = \frac{22}{7}$ and R = 6370km. (3 mks)
4. Solve the equation log (6x – 2) – 1 = log (x – 3). (3 mks)
5. Find the radius and centre of circle whose equations is given as $x^2 + y^2 + 3x + 2 = 0$ (3 mks)
6. In the figure below, CD is the tangent to the circle at C. AEBD and CEF are straight lines. EC = 5cm, EF = 3.6cm, EB = 3cm, EB = 3cm and CD = 6cm.

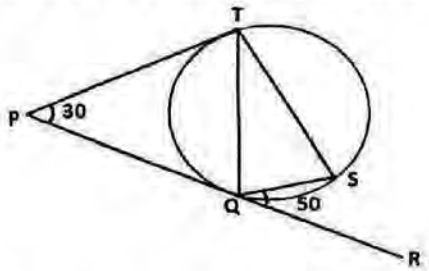


Find the length of:
(a) AE (2 mks)
(b) BD (3 mks)

7. The figure below shows a rectangular based pyramid. Find the angle between the planes ABCD and ABV. (3 mks)



8. On the figure below PQR and PT are tangents to the circle at Q and T respectively. Angle RPT = 30⁰ and angle RQS = 500. Giving reasons for your answer, find the size of angle PTS. (2 mks)

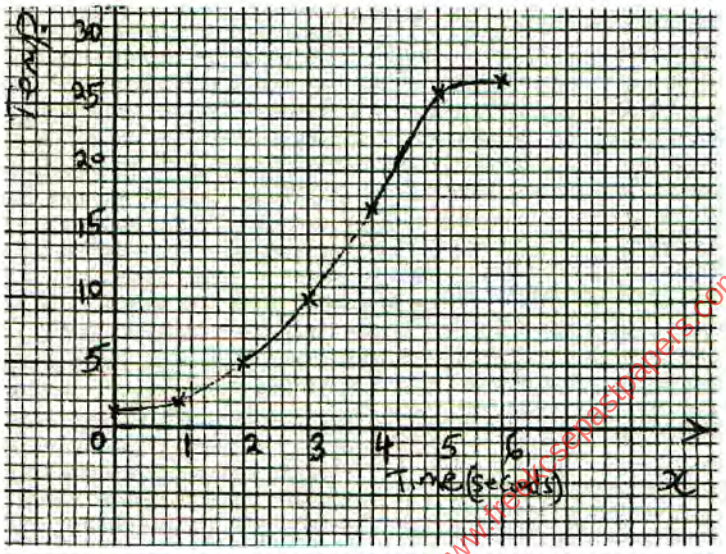


9. If x = 44 and y = 20.1, calculate the greatest possible percentage error in x – y. Give your answer to 1 decimal place. (3 mks)
10. Simplify $\frac{3-2\sqrt{3}}{3+2\sqrt{3}}$ giving your answer in the form $a + b\sqrt{c}$ (3 mks)
11. (a) Expand and simplify $(2 + 2y)5$ in ascending powers of y (1 mk)
    (b) Hence use the first 4 terms of the expansions in (a) above to approximate $(2.02)5$ (2 mks)

12. Construct rectangle ABCD with AB = 10cm, and AD = 6cm. By shading unwanted regions, locate the point P within the rectangle such that:
    (i) AP ≤ BP
    (ii) Angle APB ≥ 90⁰.
13. A two digit number is made by combining cards labelled with the digits 1, 4, 6 and 9 at random. The cards are picked at random with replacement.
    (a) Make a table of possible numbers that can be made. (1 mk)
    (b) Find the probability that the number formed is a prime number or an even number (2 mks)
14. P varies directly as the square of Q and inversely as the square root of R. If Q is reduced by 10% and R is increased by 20%. Find the percentage change in P (4 mks)
15. Fill in the table below and use the mid-ordinate rule to find the area bounded by the curve y = x2 – 1 from x = -7 and x = -1 using 6 strips. (3 mks)
    Table of $y = x^2 - 1$

X	-7	-6.5	-6	-5.5	-5	-4.5	-4	-3.5	-3	-2.5	-2	-1.5	-1
Y	48		35		24		15		8		3		0

16. The following is the graph of temperature against time.



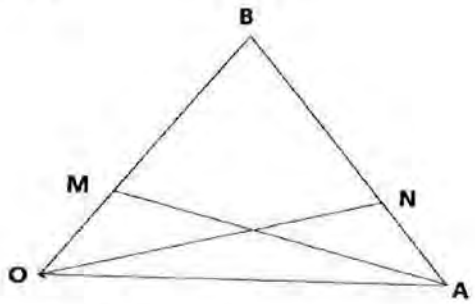
    Find the average rate of change between 1st and 3.5th seconds. (3 mks)

SECTION II: (50 MARKS). Answer any five questions in the spaces provided.

17. The following table shows the distribution of marks obtained by 50 students.

Marks	45-49	50-54	55-59	60-64	65-69	70-74	75-79
Frequency	3	15	13	9	4	1	5

    Calculate
    (i) mean (4 mks)
    (ii) variance (4 mks)
    (iii) standard deviation (2 mks)
18. The diagram below shows triangle OAB in which OM:MB = 1:3 and AN:NB = 1:2. The lines ON and AM meet at X. OA = a and OB = b.



    (a) Express the following vectors in terms of a and b.
        (i) AB 1 mk)
        (ii) AM (1 mk)

(iii) ON (2 mks)

(b) You are also given that OX = hON and AX == kAM. Express OX in two ways hence solve for h and k. (5 mks)

(c) Show that A, X and M are collinear (2 mks)

19. The transformation T and S are defined as follows:

T = Reflection in the line y = x

S = Positive quarter turn about the origin

The points A (3,7), B(3,4) and C (-1,4) are the vertices of triangle ABC whose image under T is triangle $A^IB^IC^I$.

(a) On the grid provided, draw triangle ABC and its image under T. (3 mks)

(b) State the coordinates of $A^{II}B^{II}C^{II}$ (1 mk)

(c) Draw triangle $A^{II}B^{II}C^{II}$ the image of $A^IB^IC^I$ under S. (1 mk)

(d) Find a single transformation that maps ABC onto $A^{II}B^{II}C^{II}$ (3 mks)

20. The table below shows monthly income tax rates for the year 2010.

Monthly taxable income in KSh.	Tax rate (percentage)
1 – 9680	10%
9681-18800	15%
18801-27920	20%
27921-37040	25%
37041 and above	30%

An employee earned a basic salary of Sh. 45000, commuter allowance of Sh. 6000 per month and is provided with a free house so that 15% of the basic salary will add to the taxable income. If his nominal rent is Sh. 1000 and provided with a personal relief of Sh. 1160 per month.

Calculate:

(a) The employee's taxable income per month in KSh. (2 mks)

(b) The monthly tax paid by the employee (6 mks)

(c) If he pays a WCPS of Sh. 500 and a loan repayment of Sh. 300 per month, calculate the employee's net salary per month. (2 mks)

21. (a) Complete the table of the function: $y + 3 + x - 2x^2$ (2 mks)

x	-3	-2	-1	0	1	2	3
-2x2	-18	-8		0	-2		
3	3	3	3	3	3	3	3
y-18					2		

(b) Draw the graph of the function: $y + 3 + x - 2x^2$ on the graph paper provided. (3 mks)

(c) Use your graph to solve:

(i) $3 + x - 2x^2 = 0$ (1 mk)

(ii) $8 + 2x^2 = 0$ (2 mks)

(iii) $3 + 2x - 2x2 = 0$ (2 mks)

22. (a) The first term of a G.P is 4 and the common ratio is 2. Find the greatest number of the terms that will give a sum less than 40. (3 mks)

(b) The second, fourth and seventh terms of an A.P are the first three consecutive terms of a G.P. Find

(i) the common ratio (3 mks)

(ii) the sum of the first 8 terms of the G.P (2 mks)

(iii) the 10^{th} term of the A.P (2 mks)

23. A carpenter makes two types of chairs for Excel Secondary School. To make a type A chair requires 6 man-hours whereas a type B chair requires 4 man-hours. The cost of material for type A is Sh. 120 and that of type B is Sh. 100. The total weekly cost of material for all chairs should not exceed Sh. 6000. The carpenter has to abide by the following conditions:

(i) A contract to supply 15 of type A and 10 of type B per week has to be fulfilled.

(ii) Only 300 man-hours are available each week.

(a) Form all the inequalities satisfying these conditions by letting x and y represents the number of chairs per week for type A and B respectively. (4 mks)

(b) Represent this information on the grid provided and show the required region by shading out the unwanted. (4 mks)

(c) If the profit per chair on type A is Sh. 80 and that of Sh. 60, determine the maximum values of x and y. (1 mk)

(d) Calculate the maximum profit (1 mk)

24. A ball is thrown upwards and its height after t seconds is S = 10t – 4t2

Find;

(a) The time when the greatest height was reached. (3 mks)

(b) The greatest height reached (2 mks)

(c) The time when the particle returns to its original position (2 mks)

(d) The velocity of the ball after 3 seconds (2 mks)

(e) The acceleration (1 mk)

KIMA JOINT EVALUATION EXAM 2016
121/1
MATHEMATICS
PAPER 1
TIME 2 ½ HRS
JUJY/ AUGUST 2016
SECTION I (50 MARKS)

Answer ALL the questions in this Section in the spaces provided

1. Without using a calculator or mathematical table evaluate; (3marks)

$$\frac{2\frac{1}{5}+\frac{2}{3}\text{of}\,3\frac{3}{4}-4\frac{1}{5}}{1\frac{1}{4}-2\frac{2}{5}\div 1\frac{1}{3}+3\frac{3}{4}}$$

2. Simplify completely; (3marks)

$$\frac{3a^2+5ab-2b^2}{b^2-9a^2}$$

3. A seven sided polygon has two of its interior angles as 140° and 160° and the remaining angles are equal. Find the size of one of the equal angles. (3marks)
4. The figure below shows triangle PQR in which PR.= 12cm, T is a point on PR such that TR = 4cm. Line ST is parallel to QR if the area of triangle PQR is 336cm2. Find the area of the quadrilateral QRTS. (3mks)

5. The gradient of a straight line L_1 passing through the points P(3,4) and Q(a, b) is $\frac{3}{2}$. A line L_2 is perpendicular to line L_1 and passes through the points Q and R (2, -1). Determine the values of a and b. (4marks)
6. Four machines give out signals at intervals of 24, 27, 30 and 50 seconds respectively. At 5.00pm all the four machines give out a signal simultaneously. Find the time this will happen again. (3 marks)
7. Determine the integral values of x that satisfies the following inequalities (3mks)

$$-18-3x\leq 2x-\frac{1}{2}\leq 20-\frac{3x}{2}$$

8. Given that Sin $\theta=\frac{2}{3}$ and θ is an acute angle, find without using tables or calculators
   (a) tan θ, giving your answer in surd form. (2mks)
   (b) Cos (90 – θ) (1mk)
9. The table below shows the number of goals scored in 40 soccer matches during a certain season.

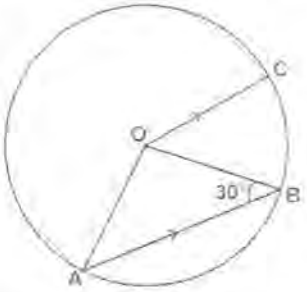
No. of goals	0	1	2	3	4	5	6	7
No. of matches	3	9	6	8	5	5	2	2

   Calculate the mean number of goals scored per match (3mks)
10. Use the table of cube roots, square and reciprocals to evaluate the following correct to 4 s.f (4mks)

$$\frac{3}{(0.0136)1/3}-\frac{2}{(3.72)^2}$$

11. A Kenyan business bought good from Japan worth 2,950,000 Japanese Yen, on arrival in Kenya custom duty of 20% was charges on the value of the goods. If the exchange rates were as follows;
    1 US dollar = 118 Japanese Yen
    I US dollar = 76 Kenyan shillings
    Calculate the duty paid in Kenya shillings (3mks)
12. Last year, Nafula was four times as old as her son, Wekesa. In four years time, the sum of their ages will be 53. Determine their present ages. (3marks)

13. O is the centre of the circle. Given AB is parallel to OC and $\angle ABO = 30°$. Find $\angle ACO$. (3 marks)



14. A tank can be filled by a tap A in 20 minutes. The same tank can be emptied when full in 30 minutes by tap B. Both taps are turned on at the same time and B turned off after 10 minutes starting with an empty tank. Find the time taken to fill the tank. (3marks)
15. Determine the two possible values of a for which; (3 marks)

$\int_0^a \left(\frac{x^2-1}{x+1}\right)dx=12$

16. A circle of radius 4.9cm fits exactly inside a square. Find the area of the space between the circle and the square. (3marks)

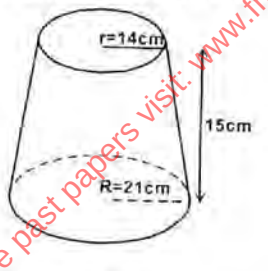
SECTION II (50 MARKS)

Answer only FIVE questions from this section in the spaces provided

17. A car leaves town X from town Y 120km away at an average speed of speed of 70km/h at 8.00am. A the same time a bus leaves town Y for town X at an average speed of 50km/hr. At 8.15am, a cyclist leaves town Y for town X at an average speed of 30km/hr.

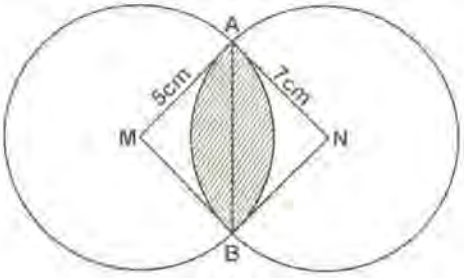
(a) Calculate the time when the bus meets the car. (3marks)
(b) Calculate the distance between the car and the bus by the time the cyclist meets the car. (4 marks)
(c) If the bus upon reaching town X rests for 10 minutes then starts its journey back to Y, calculate how far from X the bus meets the cyclist. (3marks)

18. The diagram represents a solid frustrum with base radius of 21cm and top radius 14cm. The height of the frustrum is 15cm and is made of a metal material whose density is 2g/cm3.



(a) Calculate
  (i) the volume of metal in the frustrum. (5marks)
  (ii) the mass of the frustum in kg. (2 marks)
(b) The frustrum is melted and recast into a solid sphere. In the process, 20% of the metal is lost. Calculate to decimal place the radius of the sphere. (3marks)

19. Two circles centres M and N have radii 5cm and 7cm respectively. If the two circles shares a common chord AB of length 6cm.



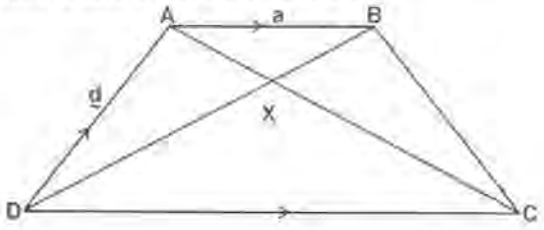
Calculate the area of the shaded region to 4 significant figures. (10marks)

20. Four cities A, B, C and D are such that town B is 1500km due East of town A. Town C is 1800km due North of town B. Town D is on a bearing of 330° from town A and on a bearing of 300° from C.

a) Use a ruler and compasses only to show the position of town A, B, Cand D. (Take a scale of 1cm = 300km) (5marks)

b) Determine;
(i) the distance AD (2marks)
(ii) the distance CD (2marks)
(iii) the bearing of town D from town B (1 mark)

21. In the figure below, ABCD is a trapezium. AB is parallel to DC, diagonals AC and DB intersect at X and DC = 2AB, AB = a, DA = d AX = kAC and DX = hDB, where h and k areconstants.



a) Find in terms of a and d
i) BC (1mark)
ii) AX (2marks)
iii) DX (1mark)
b) Determine;
i) The values of h and k (5marks)
ii) The ratio in which X divides BD. (1mark)

22. On the grid provided, draw the square whose vertices are A(6, -2), B(7, -2) C(7, -1) and D(6, -1). (1 mark)
b) On the same grid draw;
(i) $A^1B^1C^1D^1$, the image of ABCD, under an enlargement scale factor 3, centre (9, -4) (3 marks)
(ii) $A^{11}B^{11}C^{11}D^{11}$ the image of $A^1B^1C^1D^1$ under a reflection in the line x = 0 (2 marks)
(iii) $A^{111}B^{111}C^{111}D^{111}$ the image of $A^{11}B^{11}C^{11}D^{11}$ under a rotation of +90° about (0, 0) (2 marks)
c) Describe a single transformation that maps $A^1B^1C^1D^1$ onto $A^{111}B^{111}C^{111}D^{111}$ (2marks)

23. a) Draw the graph of $y=3+2x-2x^2$ for the interval $\leq x \leq 4$ on the grid provided. Fill the table below and use the scale of 1cm represent 1 unit on the x-axis and I cm represents 2 units on the y-axis

X	-3	-2	-1	0	1	2	3	4
3	3	3	3	3	3	3	3	3
2x		-6		0		4		8
$-2x^2$	-18		-2		-2			-32
Y		-11		3			-9	

b) From your graph;
i) solve the equation $3+2x-2x^2=0$ (1mk)
ii) find the value of x if $2x^3-3x=0$ (2mks)
c) Determine;
i) The value of x for which y is the greatest (1mk)
ii) Solution satisfying in equally: $\leq 3-x$ (1mk)

24. The velocity of a particle t seconds after passing a fixed point O, is given by $V= at^2 + bt$ m/s, where a and b are constants. Given that its velocity is 2m/s when t = 1 sec and it returns to 0 when t = 4.5 secs, calculate;
a. the values of a and b (4marks)
b. Hence find;
i) The values of t when the particle is instantaneously at rest. (2marks)
ii) The total distance travelled by the particle during the first 4 seconds. (2marks)
iii) The minimum velocity attained by the particle. (2marks)

KIMA JOINT EVALUATION EXAM 2016
121/2
MATHEMATICS
PAPER 2
TIME 2 ½ HRS
JUJY/ AUGUST 2016

SECTION I (50 MARKS)
Answer ALL the questions in this Section in the spaces provided

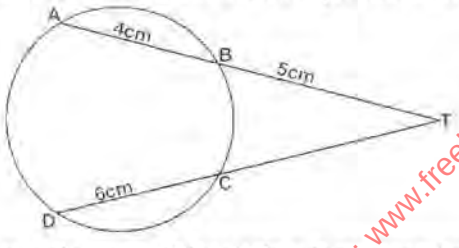
1. Use logarithms table to evaluate giving your answer to 3s.f. (4marks)

$$\left(\frac{3.58x\ 0.0271}{\log 4.2}\right)^{-2/3}$$

2. Simplify $\frac{3-\sqrt{7}}{3+\sqrt{7}} - \frac{\sqrt{7}}{3-\sqrt{7}}$ = leaving your answer in the form a +b $\sqrt{7}$ where a and b are constants. (3marks)
3. a) Expand $(1 + 3x)^5$ (1mark)
   b) Hence by using the first 4 terms of the expansion, evaluate $(0.97)^5$ (2marks)
4. The cost C of producing N items varies partly as N and partly as the inverse of N to produce two items it costs Ksh 135 and to produce three items it costs Ksh 140. Find the equation connecting Cand N. (3 marks)
5. Make x the subject of the formula. (3marks)

$$P=\sqrt{\frac{x-2w}{4x+3R}}$$

6. In a GP the sum of the 2nd and 3rd terms is 24 and the sum of the 3rd and 4th terms is 72. Find the first term and the common ratio. (3marks)
7. Find without using log tables or calculators the value of x which satisfy the equation. (3 marks)
   $Log_3(x^2 - 9) = 2Log_3 3 + 1$
8. In the figure below, chords AB and CD are produced to meet at T. AB=4cm, BT CD=6cm. Find the length of DT.



9. Find the radius and centre of the circle whose equationis
   $3x2 + 3y2 - 12y + 18y - 9 = 0$ (3 marks)
10. The measurements of the radius and height of a cylinder are given as 8cm and 9.5am respectively. Calculate the percentage error in the volume ofthe cylinder. (3mks)
11. Vector OA = 6i - 2j + 3k and OB = -2i + 3j - k. A point C divides AB in the ratio of 3:1. Find AC in terms of i, j and k. (3 marks)
12. If $\begin{pmatrix} -5 & -8 \\ 3 & 5 \end{pmatrix}$ evaluate P2, hence use the matrix method to solve the simultaneous equations. (3 marks)
    $-5x = 8y + 2$
    $3x = -5y + 1$
13. In what ratio should grade P of tea costing sh 450 per kg be mixed with grade Q of tea costing sh.350 per leg so that a profit of 10% is made by selling the mixture at sh 451 per kg? (3marks)
14. The probability that it rains on a certain day is 0.8. If it rains the probability that Onguti comes to school late is 0.7 but otherwise it is 0.4 if he comes to school late, the probability that he fails an exercise is 0.8 but if he comes early the probability of foiling an exercise is 0.3. Find,
(a) the probability that it rains, he comes to schools early and he fails the exercise. (2marks)
(b) the probability that he passes his exercise. (2marks)
15. If $\frac{2}{3}$ is a rot of $6x^2 + kx - 2 = 0$. Find the value of k and theother root (3marks)
16. Solve the equation $2Cos(3t + 60°) = -0.5$ for $0° \leq t \leq 180°$ (3marks)

SECTION II (50 MARKS)

Answer only FIVE questions from this section in the spaces provided

17. Income rates for income earned were charged as follows;

Income in Ksh p.m	Rate in Ksh per Ksh 20
1 - 84,000	2
8,401 - 18.000	o
18,001 - 30,000	4
30,001 -36,000	5
36,001 -48,000	6
48,001 and above	7

Mr. Wandera a civil servant earns a basic salary of Ksh 30.000. His house allowances is Ksh 12,000 per month. Other allowances are commuter allowance of Ksh 2,500 and medical allowance of Ksh 3,500 he is entitled to a family relief of Ksh 1240 per month. Determine;

(a) i)His taxable income per month (2marks)

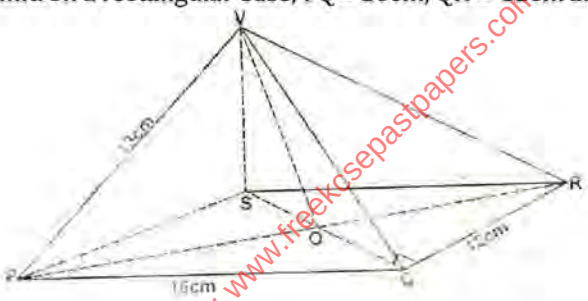
(b) His net tax per month (5marks)

(c) In addition, the following deductions are made;

NHIF	Ksh. 250
Service charge	Ksh. 150
Loan repayment	Ksh 6,000
Co-operative shares	Ksh 2600

Calculate his net salary per month. (3marks)

18. The figure below is a pyramid on a rectangular base, PQ= 16cm, QR = 12cm and VP= 13cm



Find;

(a) The length of the QS (2mks)

(b) The height of the pyramid (2 marks)

(c) The angle between VQ and the base (2 marks)

(d) The angle between plane VQR and the base. (4 marks)

19. Two towns A and B lie on the same parallel of latitude 60°N. If the longitude of A and B are 42°W and 29°E respectively.

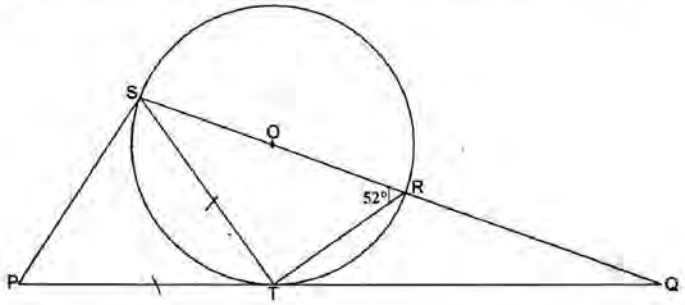
(a) Find the distance between A and B in nautical miles along the parallel of latitude. (2 marks)

(b) Find the local time at A if at B is 1.00pm. (2marks)

(c) Find the shortest distance between A and B along the earth's surface in km
(Take 7x=-22/7 and R = 6370km). (3marks)

(d) If C is another town due South of A and 10010km away from A, find the co-ordinates of C. (3 marks)

20. In the diagram below O is the centre. PTQ is a tangent at T. If PT = ST and ZSRT =52°. Determine the size of the angles below giving reasons.



(a) ∠PTS (2mks)

(b) ∠ RTQ (2mks)

(c) ∠ TSR (2mks)

(d) $< TQR$ (2mks)

(e) $< RSQ$ (2 mks)

21. a) Find the table for the curves given by $y=-3\sin(2x + 30°)$ and $y = \cos 2x$ for x values in the range $0 \leq x \leq 180°$.

x°	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
$y = 3\sin(2x + 30)$	1.5		3		1.5		-1.5			-2.60	-1.50		1.5
$y = \cos 2x$	1			0		-0.866		-0.866	-0.5			0.866	1

b) Using the scale horizontal axis 1cm represent 30°, vertical axis 1cm represent 1 unit, draw the graphs of $y = 3\sin(2x + 30)$ and $y = \cos 2x$. (4marks)

c) Use your graph to solve the equation $3\sin(2x + 30) = \cos 2x$. (I mark)

d) Determine the following from your graph;

(i) Amplitude of $y = 3\sin(2x + 30)$ (1mark)

(ii) Period of $y = 3\sin(2x + 30)$ (1 mark)

(iii) Period of $y = \cos 2x$ (1 mark)

22. A theatre has a seating capacity of 250 people. The charges are sh 100 for an ordinary seat and sh.160 for a special seat. It costs sh 16,000 to stage a show and the theatre must make a profit. There are never more than 200 ordinary seats and for a show to take place, at least 50 ordinary seats must be occupied. The number of special seats is always less than twice the number of ordinary seats,

(a) Taking x to be the number of ordinary seats and y the number of special seats, write down all the inequalities representing the information above. (4marks)

(b) On a graph paper, show the region represented by the above inequalities. (4marks)

(c) Determine the number of seats of each that should be booked in order to maximize profit. (2 marks)

23. Construct a triangle PQR such that PQ = 10cm, QR = 9cm and RP = 8cm. (2 marks)

(i) Construct the locus of the point X such that it is equidistant from Q and R. (2 marks)

(ii) Construct the locus of the point Y such that PY = 6cm and mark with the letter Y, the point where the locus meets PR. (2 marks)

(iii) By shading the wanted regions show the region bounded by the three loci by the letter T such that,

$QT \geq TR$

$PT \leq 6cm$

$< PRT \geq < QRT$

Label the region required by the letter T. (4marks)

24. The table below shows marks scored by 42 students in a test.

Marks	25-34	34-44	45-54	55-64	65-74	75-84	85 -94
No. of students							

(a) State the modal class and modal frequency for the data above. (2marks)

(b) Using the assumed mean of 59.5, calculate;

(i) The mean (4marks)

(ii) The variance (3marks)

(iii) The standard deviation (1mark)

MAARA SUB – COUNTY FORM 4 JOINT EXAMINATIONS
121/1
MATHEMATICS
PAPER 1
JULY/AUGUST 2016

SECTION I

1. Evaluate (3marks)

$$\frac{8 \div -2 - (-4)x2}{6 - 56 \div 7}$$

2. Work out;

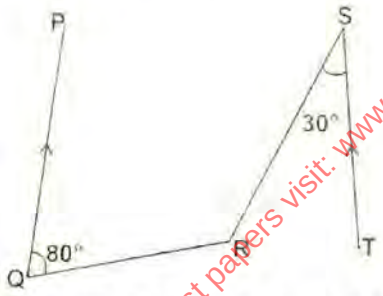
$$\frac{1}{2}\left[\frac{3}{5} + \frac{1}{4} x \left(\frac{7}{3} - \frac{3}{7}\right) of\ 1\frac{1}{2} \div 5\right]$$

3. The solid shown below consists of a cylinder and hemisphere of equal diameter of 14cm. If the length of the solid is 22cm, find its volume.

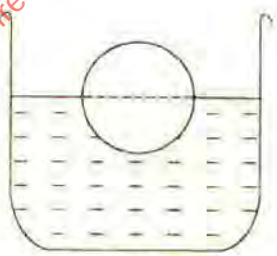
4. Use mathematical tables to evaluate

$$\sqrt{\frac{0.2893\ x\ 6.443}{42.92\ \div 8.9332}}$$

5. In the figure below, PQ// ST, < PQR = 80⁰ and DRST = 30⁰. Find < QRS obtuse. (3marks)

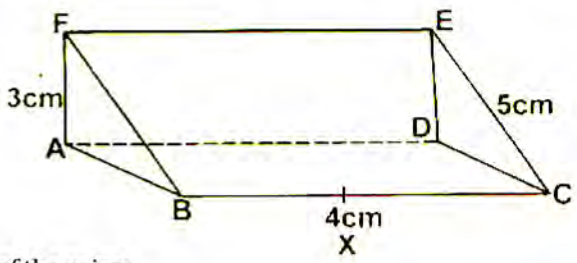


6. The solid sphere of radius 7cm floats with half of it outside in the liquid as shown.



Given that the density of the liquid is 1200kg/m³, calculate the mass of the liquid displaced. (4marks)

7. The figure below represents a triangular prism ABCDEF. X is a mid-point o BC.



i) Draw the net of the prism (2marks)

ii) Find the distance DX (1mark)

8. A tourist came to Kenya with US dollars 10,000. He changed it into Kenya shillings and spent Kshs. 100,000 on touring. Using the exchange rate below, determine in US dollars the balance he had after touring to the nearest US dollar. (3 marks)

	Buying	Selling
1 US Dollar	Kshs. 78.51	Kshs. 78.46

9. A regular polygon has the sum of its interior angles as 1440^0. Find the value of its interior angle. (3marks)

10. The coordinates of points O,P,Q and R are (0,0), (3,4) , (11,6) and (8,2) respectively. A point T is such that the vectors OT, QP and QR satisfy the vector equation.

$$\underset{\sim}{OT} = \underset{\sim}{QP} + \frac{1}{2}\underset{\sim}{QR}$$

Find the coordinates of T. (3marks)

11. Given that $9^{2x} \times 2^y = 72$. find the value of x and y.

12. Two buses X and Y leave town A and B which are 60km apart at an average speed of 70km/hr and 30km/he respectively. Find how far from town A do the buses meet. (3marks)

13. Simplify completely (3marks)

$$\frac{a^2 + a - 3ab - 3b}{(a+1)(3b^2 = ab)}$$

14. Given that 3θ is an acute angle and $\sin 3\theta = \cos 2\theta$. Find the value of θ. (3marks)

15. A line which joins the points A(3,k) and B(-2,5) is parallel to another line whose equation is $5y + 2x = 10$. Find the value of k. (3marks)

16. One side of a square is increased by 4cm while the other side is reduced by 6cm. the area of the rectangle so formed is $24cm^2$. Find the length of the side of the square. (3marks)

SECTION II : (50MARKS)

Answer any five questions in this section in the spaces provided.

17. a) i) $P^1Q^1R^1$ is the image of PQR with vertices P(4,2), Q(1,1) and R(5,1) under an enlargement. If P^1 is (-6,-4), Q^1(-3,-3) and R^1(-7,-3). Draw triangles PQR and $P^1Q^1R^1$ (2marks)

b) $P^{11}Q^{11}R^{11}$ is the image of PQR under a translation $T = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$. Write down the coordinates of P^{11},Q^{11}, and R^{11} and draw it. (2marks)

c) P^{111}, Q^{111}, R^{111}, with vertices (-6,2), (-3,1) and (-7,1) respectively is the image of PQR under transformation T. describe T fully. Draw $P^{111}Q^{111}R^{111}$. (2marks)

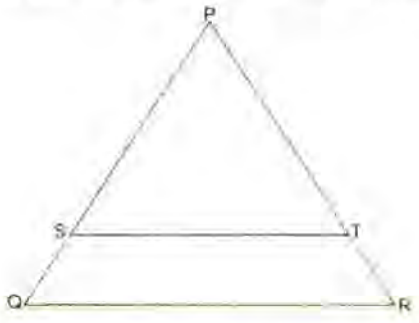
d) $P_4Q_4R_4$ is the image of PQR under a rotation $+90^0$ about the origin. State the coordinates of $P_4Q_4R_4$. (2marks)

18. The table below show marks obtained by 100 candidates at Kanga Secondary School in Mathematics examination.

Marks	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85-94
Frequency	6	14	24	14	x	10	6	4

a) Determine the value of x. (2marks)
b) State the modal class. (1mark)
c) Calculate the mean mark (4marks)
d) Calculate the median mark. (3marks)

19. a) The figure below shown triangle PQR in which PR = 12cm, T is a point on PR such that TR = 4cm. Line ST is parallel to QR. If the area of PQR is $336cm^3$. Find the area of quadrilateral. (3marks)



b) i) On the grid provided plot ΔABC where A(2,4), B(1,3) and C(3,3) and A^1(2,2), C^1(0,0) and B^1(-4,0). (2marks)

ii) Identify the transformation that map ΔABC to $\Delta A^1B^1C^1$ (2marks)

iii) Plot $\Delta A^{11}B^{11}C^{11}$ the image of $\Delta A^1B^1C^1$ under an enlargement s.f.2.5 with same centre of enlargement as in (ii) above. (3marks)

20.

a) A salesman earns a basic salary of shs. 22000 per month. In addition he is paid a commission of 2% for goods worth above shs. 60,000 but not more than shs. 90,000 and a commission of 3% for goods over 90,000. In a certain month he sold goods worth shs. 150,000. What was his total earnings forthat month. (4marks)

b) If Maina sells a bag of cabbages for shs. 520, he makes a profit. If he had to sell the bag for shs. 420 he would make a loss. If the profit is three times the loss, find how much he paid for the bagof cabbages. (3marks)

c) Otieno bought a used car at shs. 500,000. He spent a further shs. 75,000 on it for repairs and modification. He then sold it at 20% profit. How much did he get from the sale. (3marks)

21.

a) Find the range of values of x which satisfy the following inequalities simultaneously.

$4x - 6 \geq x - 12$

$8 - 3x > 2x - 7$ (3marks)

b) Represent this range of values of x on a number line. (1mark)

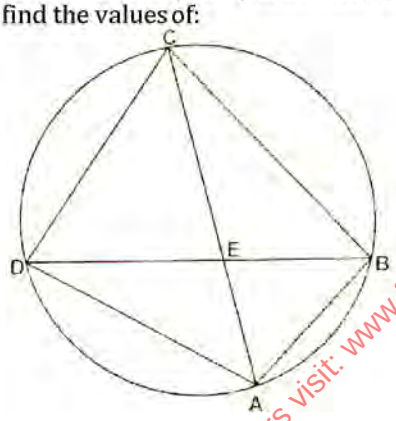
c) By drawing appropriate straight lines and shading the unwanted region, illustrate on graph paper the region which satisfies all the inequalities given.

i) $2y + 5x \geq 10$

ii) $2y - x > 2$

iii) $y \leq 5$ (6marks)

22. In the figure below, ABCD is a cyclic quadrilateral and that nagle ABD = 42^0 and angle BAC = 58^0 and angle DBC = 36^0 Giving reasons, find the values of:



a) $\angle DAC$ (2marks)

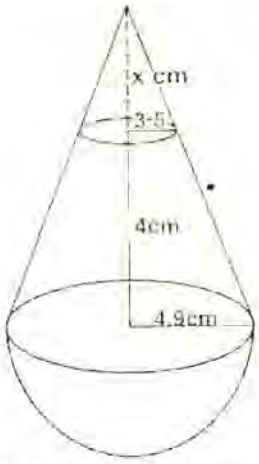
b) $\angle ADB$ (2marks)

c) $\angle ACD$ (2marks)

d) $\angle CDB$ (2marks)

e) $\angle CEB$ (2marks)

23. The diagram below represents a solid consisting of a hemispherical bottom and a conical frustum at the top.

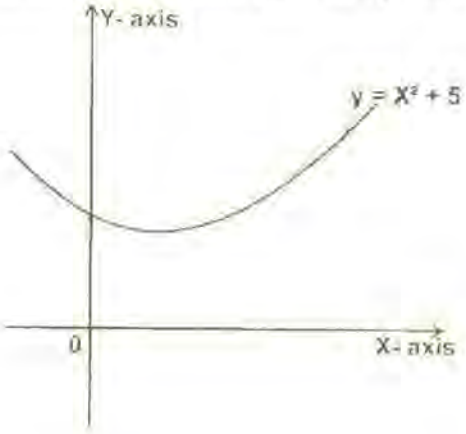


a. Determine the value of x and hence the height of the big one. (2marks)

b. i) Calculate (i) the surface area of the solid. (4marks)

ii) The volume of the solid. (4marks)

24. The diagram below is a sketch of the curve $y = x^2 + 5$



a) Use the mid-ordinate rule with strips to estimate the area enclosed by the curve the x-axis, the y – axis and the line x = 3) (5marks)

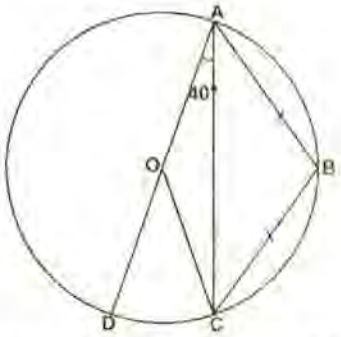
b) Use integration to find the same area. (3marks)

c) Calculate the percentage error to 2d.p made by the mid-ordinate rule. (2marks)

MAARA SUB – COUNTY FORM 4 JOINT EXAMINATIONS
121/2
MATHEMATICS
PAPER 2
JULY/AUGUST 2016

SECTIONS I : (50 MARKS)
Answer all the questions in this section in the spaces provided.

1. The radius and height of a cylinder were recorded as 10.5cm and 84.0cm respectively. Calculate the percentage error in the volume of the cylinder correct to 2 d.p (4marks)
2. Simplify $\frac{3}{\sqrt{5}-2} + \frac{1}{\sqrt{5}}$ leaving the answer in the form $a + \sqrt{c}$, where a. b and c arerational numbers. (3marks)
3. Given that $y = \frac{2p-r}{p+3r}$, express p in terms of y and r. (3marks)
4. Matrix $P = \begin{pmatrix} 3 & -5 \\ 5 & 2 \end{pmatrix}$. Find P^{-1}. The inverse of P, hence solve the equations.
   $3a - 5b = -9$
   $5a + 2b = 16$
5. A quantity v is partly contant and partly varies as u. if u = 1 when v = 12 and u =3. When v = 22. Find the value of v when u = 5. (3marks)
6. In the figure below, O is the centre of the circle and AOD is a straight line. If AB = BC and angle DAC = 40^0 Calculate angle BAC. (3marks)



7. Machine A can do a piece of work in 6 hours while machine B can do the same work in 9 hours. Machine A was set to do the piece of work but after 3 ½ hours, it broke down and machine B did the rest of the work. Find how long machine B took to do the rest of the work. (3marks)
8. Expand and simplify $(1 - 2y)^5$ upto the term y^3 hence calculate the approximate value of $(0.98)^5$ to 4 decimal places. (3 marks)
9. By completing the square method solve the equation $9 + 3x - 2x^2 = 0$ leaving your answer in surd form. (3marks)
10. A bag contains 10 balls of which 3 are red, 5 are white and 2are green. Another bag contains 12balls of which 4 are red, 3 are white and 5 are green. A bag is chosen at random and then a ball chosen at random from the bag. Find the probability that the ball so chosen is red. (3marks)
11. A man deposits shs. 50,000 in an investment account which pays 12% interest per annum compounded semi-annually. Find the amount in the account after three years. (3marks)
12. Solve for x in the equation (3marks)

$$\log_{10}(3x + 2) - 1 = \log_{10}(x - 4)$$

13. Given that the area under the curve $y = ax^2 + 3$ and the lines x = 0 and x = 2 square units. Find the value of a. (3marks)
14. Given that the circle whose equation is $x^2 + y^2 - 7x + 2y + c = 0$ passes through (2,1). Find the value of c and state the coordinate of the centre. (3marks)
15. A ship leaves an island (5^0N, 45^0W) and sails due east for 120 hours to another island. The average speed of the ship is 27knots. Find the position of the second island. (3marks)
16. A soap factory produced soaps at the rate of 10,000 pieces per hour. The rate of production decreased by 20% every hour.
    a) Find the number of the pieces of soap during the third hour. (2marks)
    b) Calculate the total number of pieces of soap produced in the first four hours. (2marks)

SECTION II : (50 MARKS)

Answer any five questions in this section in the spaces provided.

17. A parallelogram whose vertices are A(1,0), B(3,0), C(4,2) and D(2,2) is mapped into $A^1B^1C^1D^1$ by a transformation M. Under the transformation, the images of A and C are $A^1(0, 1)$ and $C^1(-2, 4)$ respectively.

a) Find the matrix M. (3marks)

b) By finding other coordinates of the image, plot the parallelogram ABCD and its image on the grid provided. (4 marks)

c) Find the transformation that would map $A^1B^1C^1D^1$ back to ABCD and its image on the grid provided. (4marks)

18. The table shown the masses in kg of some Form four students in a school.

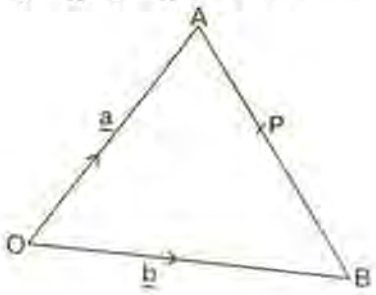
Mass	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No. of students	5	12	15	28	8	4	6	2

a) (i) Calculate the median mark. (3marks)

(ii) Using an assumed mean of 54.5, calculate the mean mass. (4marks)

(iii) Calculate the standard deviation of the data, give your answer correct 2 decimal places (3marks)

19. In triangle OAB, $\overset{OA}{\sim} = \overset{a}{\sim}$, $\overset{OB}{\sim} = \overset{b}{\sim}$ and P lies on AB such that AP = 3 : 5



a) Find in terms of $\overset{a}{\sim}$ and $\overset{b}{\sim}$ the vectors.

(i) $\overset{AB}{\sim}$ (1mark)

(ii) $\overset{AP}{\sim}$ (1 mark)

(iii) $\overset{BP}{\sim}$ (1 mark)

(iv) $\overset{OP}{\sim}$ (1 mark)

b) Point Q is on OP such that $\overset{AQ}{\sim} = -\frac{5}{8}a + \frac{9}{40}$b. Find the ration OQ : QP. (3marks)

c) The position vectors of points P and Q are $\overset{4i}{\sim} = \overset{3j}{\sim} + \overset{2k}{\sim}$ and $\overset{6k}{\sim}$ respectively. Express vector $\overset{PQ}{\sim}$ in terms of unit vectors $\overset{i}{\sim}$, $\overset{j}{\sim}$ and $\overset{k}{\sim}$. Hence find the length of PQ, leaving your answer to 2 decimal places. (3marks)

20.

a. Using a ruler and a pair of compasses only, construct triangle ABC with AB = AC = 5.0cm and angle BAC = 105^0 (3marks)

b. Draw the locus of T such that <CTB = 70^0 and T is on the other side of A. (2marks)

c. Drop a perpendicular from A to meet BC at R. (2marks)

d. Calculate the area of ΔABC (3marks)

21. The table below shows monthly income taxes.

Monthly taxable pay in K£	Rate of tax in Kshs. Per £
1 – 342	2
343 – 984	3
985 – 1026	4
1027 – 1368	5
1369 – 1710	6
Over 1710	7

A civil servant earns a salary of shs. 20,000 and is provided with a house at a nominal rent of sh. 7,000 per month and personal relief of sh 600p.m

a) Taxable pay is the employee's salary and 15¿ of the basic salary less nominal rent. Calculate the civil servants taxable income in £ (3 marks)

b) Calculate the monthly total tax. (5 marks)

c) Calculate the employees P.A.Y.E (2marks)

22.

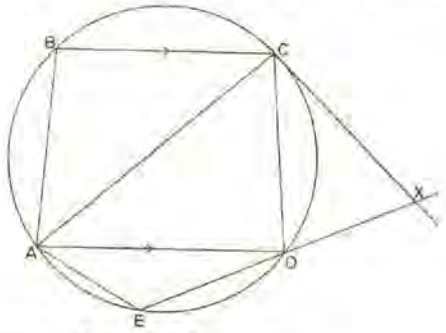
a) Make b the subject of the formula. (3marks)

$a = \frac{bd}{\sqrt{b^2+d}}$

b) Three quanties P, Q and R are such that P varies directly as Q and inversely as the square root of R. When P = 8, Q = 10 and R = 16. Determine the equation connecting P, Q and R. (3 marks)

c) The mass of wire m grams (g) is partly a constant and partly varies as the square of its thickness t mm. when t = 2mm, m = 40g and when t = 3mm, m = 65g. Determine the value of m when t= 4mm. (4 marks)

23. In the figure below, ABCDE is a pentagon inscribed in a circle. CX is a tangent to the circle at C and EDX is a straight line $< ADE = 34^0$, $<CAD = 40^0$, AB = BC and BC is parallel to AD.



Giving reasons in each case, determine:

a) <ABC (2marks)

b) < ACD (2marks)

c) <EAD (2 marks)

d) <CXD (2 marks)

e) Given that ED = 5cm and DX = 4cm, calculate length CX. (2marks)

24. The table below gives some values of

$y = \sin 2\theta \ and \ Cos\theta \ for -225^0 \leq \theta \leq 225^0$

a) Complete the table

θ	-225^0	-180^0	-135^0	-90^0	-45^0	0^0	45^0	90^0	180^0	225^0
$Y = \sin 2\theta^0$	-1.0	1.0			0.0			-1.0		1.0
$Y = 2\cos\theta^0$	-1.4	1.4			2			-1.4		-1.4

b) On the same axes, draw the graphs of $y = \sin\theta$ and $y = \cos\theta$ (4marks)

c) Use your graph to find the values of θ for which $\sin\theta - 2\cos\theta = 0$ (2marks)

d) What is the period of $y = \sin 2\theta$ and the amplitude of $y = 2\ 2\cos\theta$ (2marks)

NTIMA/ NYAKI AND MUNICIPALITY CLUSTEREVALUATION 2016
121/1
MATHEMATICS
PAPER 1
JULY/AUGUST 2016

SECTION 1 (50 MARKS)
Answer all the questions in this section in the spaces provided.

1. Evaluate the following. (3marks)

$$\frac{\frac{1}{2}of\ 18 \div -3 + 2\frac{1}{2}\ x\ \frac{3}{-5}}{\frac{1}{2} + 3\frac{3}{4} \div \frac{3}{4}}$$

2. The exterior angle of a regular polygon is equal to one-third of the interior – angle. Calculate the number of sides of the polygon. (3marks)
3. Simplify $\frac{x+2y}{2} - \frac{3x-y}{5}$ (3marks)
4. The currency exchange rates of a given bank are as follows:-

Currency	Buying (sh)	|Selling (sh)
1Sterling Pound	145.80	146.20
1 US Dollar	100.80	101.00

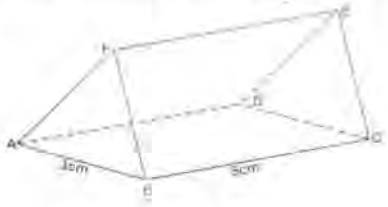
A tourist arrived in Kenya with 7000 US Dollars which he converted to Kenya Shillings upon arrival. He spent Kshs. 332,790 and converted the remaining to Sterling Pounds. How many pounds did he receive. (3marks)

5. A worker in a construction site is paid shs. 12 an hour for the normal working hours and sh. 15 for each hour worked overtime. In one week the worker worked for a total of 81 hours and was paid shs. 1071 in total. Determine the number of worked overtime and normal.
(4marks)
6. Solve the following inequality and state the integral values. (3marks)
$2x - 1 < 7 + x \leq 3x + 2$
7. A solid spere is made of a metal which has a density of $8.9cm^3$. given that its radius is 4.5cm, calculate the mass of the sphere in grams to the nearest whole number.
Take $\pi = 3.142$. (3marks)
8. Simplify (3marks)

$$\frac{2x^2 - 5xy + 2y^2}{x^2 - 4y^2}$$

9. Determine the equation of a line passing through point $(3, -\frac{1}{3})$ and perpendicular to a line whose equation is $y = \frac{3}{2}x$ $-\frac{4}{3}$
(3marks)
10. Solve the y in the equation (3marks)
$27^y + 3^{3y} - 5 = 49$
11. Solve the following quadratic equation by completing the square. (3marks)
$2y^2 - 7y + 6 = 0$
12. The circle whose arc length is 2.2m substends an angle of 60^0 at the centre. Calculate the area of the minor segment of the circle. Take $\pi = \frac{22}{7}$
(4marks)
13. A boy walks directly from a point M towards the bottom of a tree 200m away. After covering 150m, he observes that the angle of elevation of the top of the tree is 40^0. Determine the angle of elevation of the top of the tree from M. (3marks)
14. A translation vector $\begin{pmatrix} x & -1 \\ 2 & -y \end{pmatrix}$ maps a point A(4,6) onto A^1 (9,12). Find the values of x any y. (3marks)
15. Find the mean, mode and median of the following numbers. (3marks)
5,9,4,7,9,6,10,8,3,9,6,8

16. The figure below is a triangular prism ABCDEF with sides AB = BF = AF and BC = AD = EF = 5cm.



a) Draw the net of the solid (2marks)
b) Measure length AC (1mark)

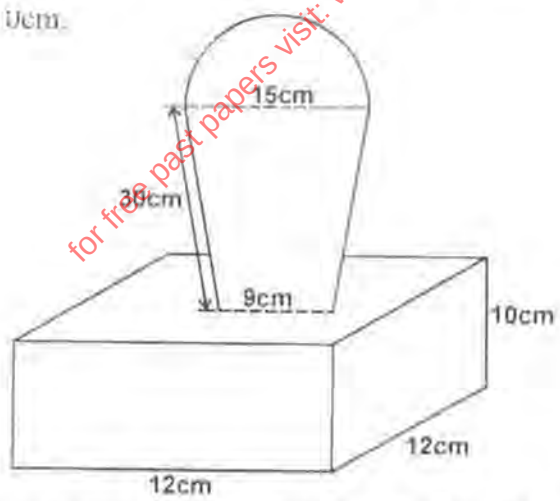
SECTION II (50 MARKS)
Answer ANY FIVE questions from this section in the spaces provided.

17. Mr Kinyua bought three cars A,B and C for a total of shs. 1,500,000. The amounts he paid for those cars were in the rations 3 : 5 : 7.
1. Calculate the amount he paid for each car. (3marks)
2. When he sold the cars, he made a profit of 12%. Calculate the profit he made on the sale of the cars. (1mark)
3. When he sold the cars he made a profit of 25% on car A and a loss of 10% on B. calculate:
   i) The profit he made on car A. (1mark)
   ii) The percentage profit he made on car C (5marks)

18. A particle moves along a straight line so after t seconds, its velocity is given by $v = 2t^2 - 3t - 5$
a) Find the velocity of the body at $t = 3$ (2marks)
b) Find the value of t when the body is momentarily at rest. (3marks)
c) Find the acceleration of the body at $t = 2$sec. (2marks)
d) Find the distance travelled by the body during the third second. (3marks)

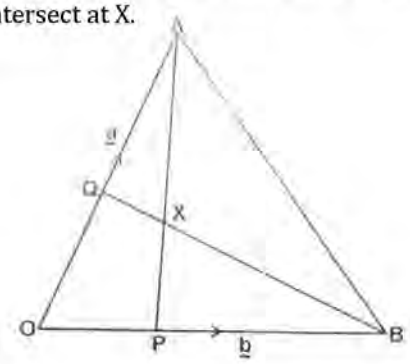
19. A cyclist leaves Kerugoya town for Sagana at 11.30a.m and travels at an average speed of 15km / h. 30 minutes later, a bus leaves Kerugoya from Sagana arriving there at 12.30p.m. Kerugoya is 30km from Sagana.
a) Determine the average speed of the bus. (2marks)
b) Determine
a. The distance from Kerugoya where the cylist met the bus. (4marks)
b. The time they met. (2marks)
c) Find the time when the cyclist arrived in Sagana. (2 marks)

20. The figure below represents a model of a world cup in the shape of a cuboid base and a frustum of a cone with a hemisphere top. The diameter of the hemispherical part is 15cm and the base diameter is 9cm with a slant height of 30cm.



Calculate the following giving your answer to 2.d.p (take $\pi - 3.142$)
a. Volume of the hemispherical part. (2marks)
b.
i) The slant height of the cone from which the frustrum was cut. (2marks)
ii) The volume of the conical frustum. (4marks)
iii) The total volume of the solid. (2 marks)

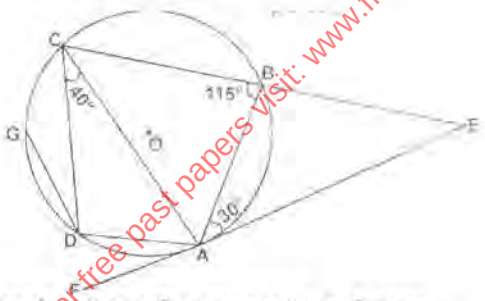
21. In triangle OAB, OA = **a**, OB = **b**, M is the midpoint of AB such that OP = $^2/_5$ OB and Q is a point on OA such that OQ = ¼ OA. AP and BQ intersect at X.



a) Express the following vectors in terms **a** and **b**
i) OM (1mark)
ii) BQ (1mark)
iii) AP (1 mark)
b) Given that Ax = kAP and BX = tBQ, express OX in terms of
i) **a**,**b**, and t
ii) **a**,**b**, and k
iii) hence find the numerical values of *k* and *t*
c) determine the ration AX : XP (1mark)

22. points P,Q,R and S are points on a map whose scale is 1 : 1,000,000. Q is 74km on a bearing of 300⁰ from P. point R is 110km on a bearing of 075⁰ from Q. Point S is 46km due south of P.
a. show by scale drawing the relative positions of P, Q, R and S. (4marks)
b. Using the figure in (a) above. Find the:
i. Distance RS (2 marks)
ii. Bearing of S from R (1 mark)
c. Determine the shortest distance between points Q and S. (2 marks)
d. Find the distance on the map between points P and R. (1 mark)

23. The figure below shows a circle centre O. FAE is a tangent to the circle. ABCGD are points on the circumference. Angle BAE = 30⁰, angle ABC = 115⁰ and angle ACD = 40⁰



Find the following angles giving the reasons in each case.
a. $\angle BCA$ (2marks)
b. $\angle ADC$ (2marks)
c. $\angle COB$ (2marks)
d. $\angle DGA$ (2marks)
e. $\angle BEA$ (2marks)

24. The vertices of a triangle are A (2,4), B(1,2), and C(5,2). On the grid provided draw.
a) Triangle ABC (1mark)
b) Triangle $A^1B^1C^1$ the image of ABC under a positive quarter turn about the origin. (2marks)
c) Triangle $A^{11}B^{11}C^{11}$ the image of $A^1B^1C^1$ under a reflection in the line y = x (2marks)
d) Triangle $A^{111}B^{111}C^{111}$ the image of $A^{11}B^{11}C^{11}$ under an enlargement scale factor – 2 about (1, -3) and state its coordinates. (3marks)
e) Describe fully a single transformation that maps triangle ABC onto $A^{11}B^{11}C^{11}$ (2marks)

NTIMA/ NYAKI AND MUNICIPALITY CLUSTEREVALUATION 2016
121/2
MATHEMATICS
PAPER 2
JULY/AUGUST 2016

SECTION 1 (50 MARKS)

Answer all the question in this section in the spaces provided.

1. Use logarithims to 4d.p to evaluate the following (4marks)

$$\left(\frac{14.21 \times 0.013}{212.5}\right)^{1/3}$$

2. The base and perpendicular height of a triangle are measured as 8.2cm and 6.3cm respectively. Calculate the percentage error in calculating the area correct to 3 d.p. (3marks)
3. Make y the subject of the formula. (3marks)

$$B = \sqrt[3]{\frac{2y+3}{4y-5}}$$

4. Solve for x given. (3marks)

$$\log_4 48 + \log_4 24 - 2\log_4 x = \frac{5}{2}$$

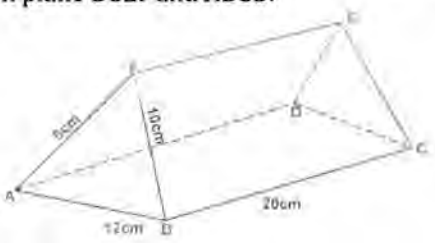
5. A quantity P is partly constant and partly varies as the square of Q. given that P = 10 when Q = 2 and P = 15 when Q = 3. Write down the equation connecting P and Q. (3marks)
6. Solve the θ in the range $-90^0 \leq \theta \leq 90^0$ given $\cos(\theta + 10) = 2$ (3marks) 7.
a. Expand. $(1 - 2x)^6$ (2marks)
b. Use the first 3 terms of your expansion in (a) above to estimate the value of $(0.98)^6$ (2marks)
8. Determine the radius and coordinates of the centre of a circle whose equation is (3marks)
$2x^2 - 16y + 2y^2 + 12x + 18 = 0$
9. Mr. Guantai bought a new car for shs. 800,000. After 5 years he sold it through a second hand car dealer who charged a commission of 4% for the sale of the car. If Mr. Guantai received shs. 480,000. Calculate the annual rate of depreciation of the car as a percentage to the nearest whole number. (3marks)
10. Simplify the following (3 marks)

$$\frac{\sqrt{3}}{2\sqrt{3}+\sqrt{2}} - \frac{\sqrt{3}}{2\sqrt{3}-\sqrt{2}}$$

11. Two taps A and B can fill a water bath in 8 minutes and 10 minutes respectively. Tap A is opened for 2 minutes the closed. Tap B is later opened for one minute then closed. How long will the two taps take running together to fill the remaining part of the water bath? (3marks)
12. On line AB 4cm long, construct and show the locus of P such that $<APB = 60^0$ (3marks)
13. The position vectors of A and B are $-3i - 2j - k$ and $4i - j + 3k$ respectively. Express AB as a column vector hence calculate its length leaving your answer to 2d.p. (3marks)
14. Use squares and reciprocal tables to work out (3marks)

$$\frac{16}{0.064} + (0.036)^2$$

15. The function of a curve is given by $y = 3x^2 + 4x + 2$ find the equation of a tangent to this curve at the point (2,22) (3marks)
16. The figure below shows a triangular prism with dimensions as shown below.
Calculate the angle between plane BCEF and ABCD. (3marks)



Section II (50 Marks)

Answer ONLY FIVE questions from this section in the spaces provided.

17. The table below shows income tax rates.

Monthly taxable pay in sh	Rate of tax in sh per K£
1-17400	2
17401-34600	3
34601 -51800	4
51801-69000	5
69001- and above	6

Kamau earns a monthly basic salary of Kshs. 45,000. He was given taxable allowances amounting to Kshs. 20480 per month.

a) Calculate Kamau's gross income tax per month. (4marks)

b) Kamau is entitled to a personal tax relief of shs. 1162 per month. Determine his net income per month. (2marks)

c) Kamau received a 50% increase on his basic salary. Calculate the corresponding percentage increase on his income tax. (4marks)

18. The table below shows the marks scored in a maths test by form four students in a certain school.

Marks	20-29	30-39	40-49	50-59	60-69	70-79
No. of students	2	5	10	12	8	3

a) State the modal class and the modal frequency. (2marks)

b) By using the assumed mean of 44.5, calculate the

a. Mean (3marks)

b. Variance (3marks)

c. Standard deviation (2 marks)

19. The positions of airport P and Q are (60°N, 45°W) and (60°N, k°E) respectively. It takes a plane 5 hrs to travel due East from P to Q at an average speed of600 knots. By taking R = 6370km and $\pi = {}^{22}/_{7}$

a) Calculate the value of k. (3 marks)

b) The local time at P is 10.45a.m. what is the local timeat Q when the plane reaches there. (4marks)

c) Find the distance PQ measured along a circle of latitude to the nearest km. (3marks)

20.

a. Complete the table below for the function $y = 2x^2 + 3x + 4$ for the range $-2 \leq x \leq 3.5$ by filling in the blank spaces.

X	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3	3.5
y		-5		2	4	5	5	4		-1		-10

b. Use the values from the table above to plot the graph of $y = 2x^3 + 3x + 4$

c. Use your graph to

i) Solve the equation $-2x^2 + 3x + 4 = x + 2$ (3marks)

ii) Determine the ranges of values of x which satisfy the inequality.
$-2x^2 + 3x + 4 \leq -2$ (2marks)

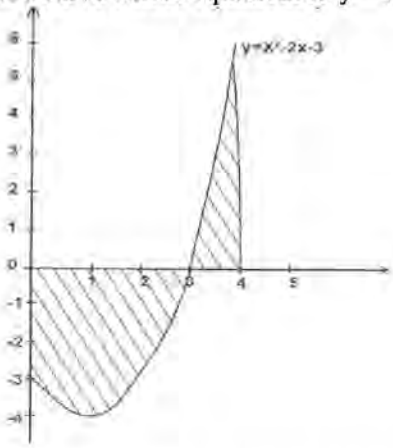
21. A farmer intends to keep goats and cows in his farm. The total number of goats and cows must not exceed 60. The cost of keeping one goat is shs. 50 per day while that of a cow is shs. 200 per day. The farmer can afford only shs. 4,000 per day for animal keeping. The farmer has to have at least 10goats and at least 4 cows. By taking x to be the number of goats and y to be the number of cows.

a. Write down all inequalities to represent the information given above. (4marks)

b. Represent the inequalities above on the grid below by shading the unwanted region. (4marks)

c. Given that each goat gives a maximum profit of shs. 2000 and each cow gives a maximum profit of shs 15,000 upon sale, determine the number of goats and cows that the farmer can keep to obtain maximum profit. (2marks)

22. The figure below is a sketch of a curve whose equations is $y = x^2 - 2x - 3$



a) Use the trapezium rule with 4 strips to estimate the area bounded by the curve, the x-axis and line x =0 and x = 4. (3marks)

b) Find the area bounded by the curve $y = x^2 - 2x - 3$ the axis and line x = 0 and x = 4 by integration. (4marks)

c) Assuming that the area determined by integration to be the actual area, calculate the percentage error in using the trapezium rule. (3 marks)

23.

a. The probability that Peter will be selected for his school hockey team is $^1/_3$. If he is selected for the hockey team, then the probability that he will be selected for basketball is ¼. If he is not selected for hockey, then the probability of being selected of basketball is $^4/_7$.

i) Draw a tree diagram to represent the above information (2marks)

ii) Using the tree diagram or otherwise, calculate the probability that Peter is selected for at least one of the teams. (3marks)

b. A coin is biased such that it shows a tail with a probability of $^1/_3$. The same coin is tossed three times, Find the probability of obtaining.

i) Two nails on the first two tosses (1mark)

ii) A head , a tail and a tail in that order (1 mark)

iii) Two heads and one tail (3marks)

24. Three consecutive terms of a G.P are y + 2, y – 2, andy -5 (3marks)

a) The value of y.

b) The common ratio (1mark)

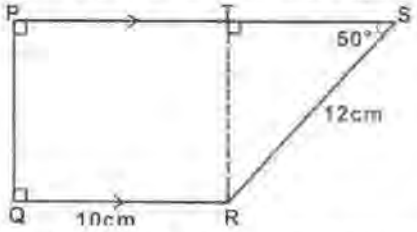
c) If y+2 is the third term of the G.P, find

a. The first term giving your answer as a fraction. (3marks)

b. The sum of the first five terms correct to 2 decimal places. (3marks)

KERICHO SUB-COUNTY JOINT EXAMINATIONS 2016
Kenya Certificate of Secondary Education (K.C.S.E)
PAPER 1
MATHEMATICS
TIME: 2 ½ HOURS

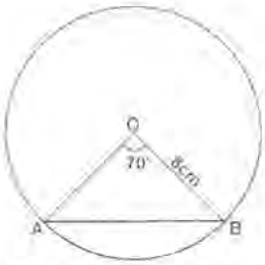
1. Kevin was given Sh. 1200 pocket money on opening day. On the way to school he spent $\frac{5}{12}$ of the money. During a school outing he spent ¼ of the remainder. On visiting day, his father left him Sh. 250. What fraction of the original money did he have after visiting. (4 marks)
2. Find the reciprocal of 27.56 correct to 2 significant figures, hence evaluate (3 marks)
$\frac{\sqrt[3]{0.512}}{27.56}$
3. Find the equation of the perpendicular bisector of the line AB where A is (3,9) and B is (7,5) giving your answer in the form of $ax + by + c = 0$ (3 marks)
4. The following figure shows a trapezium PQRS in which PS is parallel to QR. Line PQ is perpendicular to PS and QR as shown. Side QR = 10cm, RS = 12CM and angle PRS = 50^0.



Calculate to one decimal place, the area of trapezium. (4 marks)
5. If $1 - \left(\frac{1}{2}\right)^n = \frac{242}{243}$, find the value of n. (3 marks)
6. A closed cylindrical container has a total surface area of $1672cm^2$. If its radius is 14cm, calculate its capacity to 3 d.p (Take $\pi = \frac{22}{7}$). (3 marks)
7. A tourist arrived in Kenya with sterling pound £4680, all of which he exchanged into Kenya shillings. He spent KSh. 52,352 while in Kenya and converted the rest of the money into US dollars. Calculate the amount he received in US dollars. The exchange rates were as follows. (3 marks)

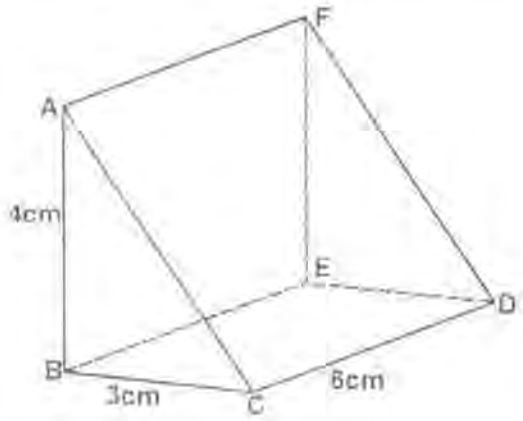
Currency	Buying	Selling
US dollars $	65.20	69.10
Sterling pound £	123.40	131.80

8. Given that OP = 3i – 2j and OQ = 8i – 5j. Find the magnitude of PQ to 3 significant figures. (3 marks)
9. Simplify: $\frac{2x^2 - 3xy - 2y^2}{4x^2 - y^2}$ (3 marks)
10. Four alarm bells are set to ring at intervals of 15 minutes, 10 minutes, 8 minutes and 6 minutes. The bells will next ring together at 10.00 a.m. Find the time in 24 hour clock system the bells had last rang together. (3 minutes)
11. (a) Using a ruler and a pair of compasses only, construct a rhombus ABCD such that angle DAB = 600 and diagonal AC = 9cm.
(b) Measure the length of diagonal BD. (1 mark)
12. State all the integral values of a which satisfy the inequality. (3 marks)
$\frac{}{4} \leq \frac{}{5} \leq \frac{}{6}$
13. The sum of inferior angles of a regular polygon is 1440^0. Find the size of each exterior angle. (3 marks)
14. The figure below shows a circle centre O and radius 8cm, chord AB subtends an angle of 700 at the centre of the circle. Calculate to 1 d.p the length of the major arc. (Take $\pi = \frac{22}{7}$) (2 marks)



15. A is now four times as old as his son. Five years ago was exactly one and half times as old as his son will be ten years from now. Determine the sum of their present ages. (3 marks)

16. Draw the net of the solid given below, hence find its surface area. (3 marks)



SECTION II: (50 MARKS)

Answer only FIVE questions from this section

17. A carton measures 50cm long, 40cm wide and 30cm high and has a mass of 1.5kg when empty. The carton is filled with packets of tea leaves each measuring 15cm by 10cm by 5cm. Each packet has a mass of 250g.

(a) Calculate:

(i) the number of packets in the carton. (2 marks)

(ii) the mass in kilograms of packets of tea leaves in the carton. (2 marks)

(iii) the total mass of the full carton. (2 marks)

(b) A similar carton is 75cm long and has a mass of 1.95kg when empty. This carton is filled with such packets of tea leaves. Calculate the total mass in kilogram of carton and tea leaves. (4 marks)

18. The masses of a number of Form 4 students were measured to the nearest kilogram and recorded in the table as shown below.

40	39	37	41	43	41	43	38	40	43
45	42	47	48	46	49	50	53	46	47
39	44	48	51	46	46	54	45	44	52
50	54	52	47	52	51	53	49	44	52
46	43	50	49	48	47	46	48	51	41

(a) Find the modal class. (1 mark)

(b) Using a class width of 3, and starting with the least mass, make a frequency distribution table for the data. (3 marks)

(c) Use the table in (b) above to calculate to 2 decimal place:

(i) the mean mass (3 marks)

(ii) the median mass (3 marks)

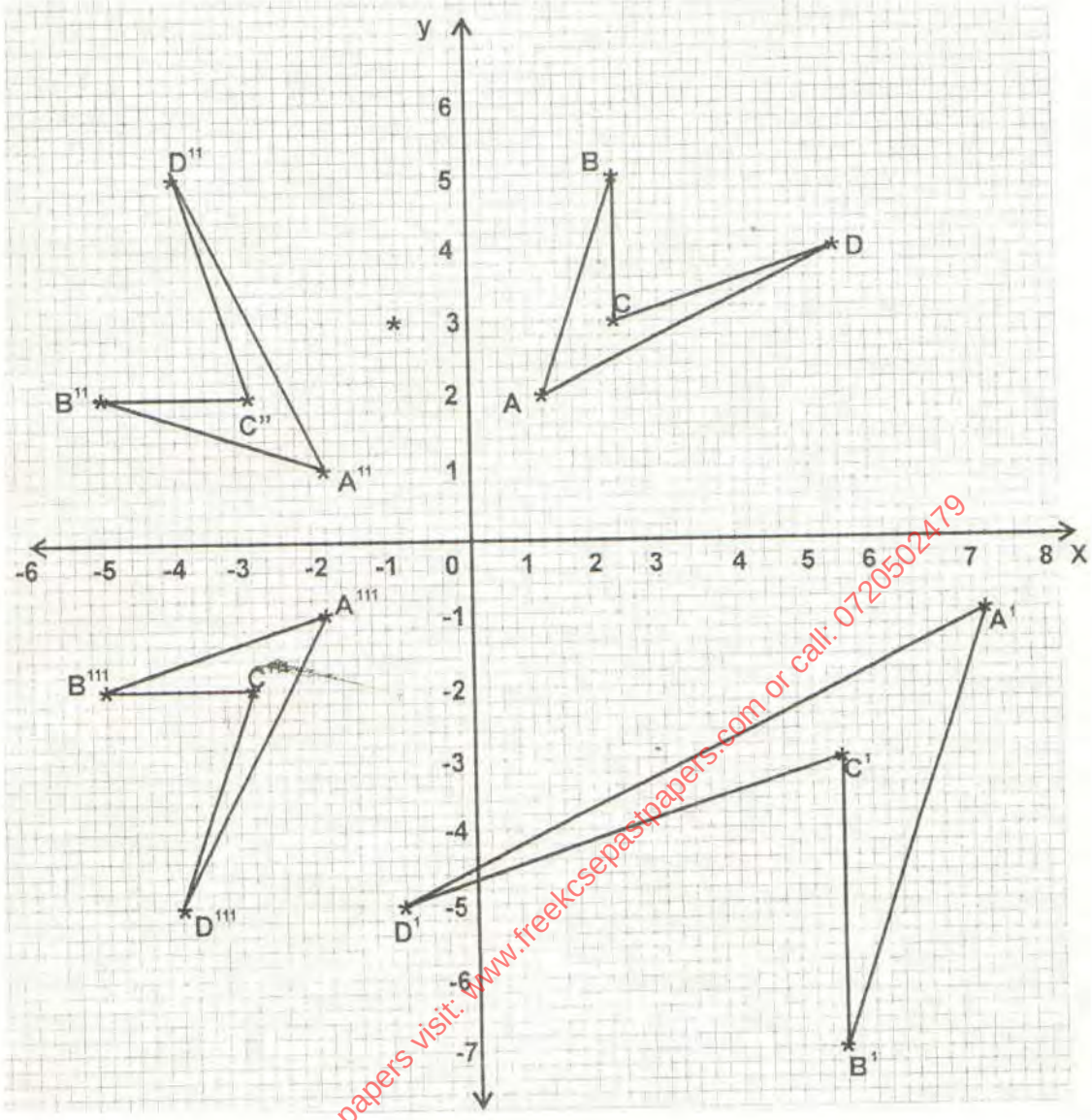
19. Using a pair of compasses and a ruler only, construct:

(a) Triangle XYZ in which XY = 6cm, YZ = 5cm and angle XYZ = 600. (3 marks)

(b) A circle that touches all the three sides of a triangle. Measure the radius. (4 marks)

(c) Determine the area inside the triangle that lies outside the circle correct to 2 decimal places. (Take $\pi = 3.142$)

20. The diagram below shows a quadrilateral ABCD and its images $A^IB^IC^ID^I$. $A^{II}B^{II}C^{II}D^{II}$ and $A^{III}B^{III}C^{III}D^{III}$ under various transformations.



(a) $A^IB^IC^ID^I$ is an enlargement of ABCD

(i) Use construction to locate the centre of enlargement and state its coordinates. (3 marks)

(ii) State the scale factor of the enlargement. (1 mark)

(b) $A^{II}B^{II}C^{II}D^{II}$ is the image of ABCD under rotation.

(i) Use construction to locate the centre of rotation and state its coordinates. (3 marks)

(ii) State the angle of rotation. (1 mark)

(c) $A^{III}B^{III}C^{III}D^{III}$ is the image of ABCD under a reflection.

(i) Construct the mirror line on the diagram. (1 mark)

(ii) Find the equation of the mirror line. (1 mark)

21. Two towns A and B are 570km apart. A bus left town B at 9.00 a.m at an average speed of 100km/hr. A motorist started from town A at 10.30 a.m for town B and travelled at an average speed of 140km/hr. After meeting with the bus, the motorist stopped for 20 minutes to refuel.

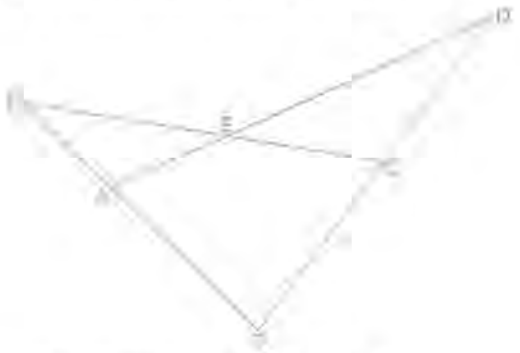
Determine:

(a) how far from town B the bus and the motorist met. (4 marks)

(b) the time the bus and the motorist met. (2 marks)

(c) the time at which the motorist arrived at town B (4 marks)

22. In the figure below, OA = a, AB = ½a and OC = CD = c



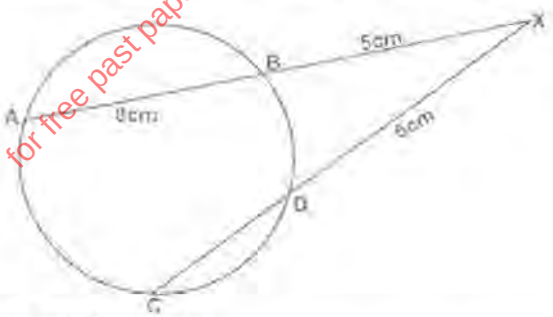
(a) Express the following vectors in terms of a and c
(i) BC (2 marks)
(ii) AD (2 marks)
(b) (i) Lines BC and AD meet at E such that BE = mBC and AE = nAD where m and n are scalars. Find the values of m and n. (5 marks)
(ii) State the ratio AE:EC (1 mark)

23. Three friendly warships A, B and C are at sea such that ship B is 300km on a bearing of 250W from ship A. Ship C is 420km on a bearing of 2150 from ship B. An enemy warship D is reported to be 450km from ship C and due south of ship A.
(a) Draw an accurate drawing showing the relative positions of ships A, B, Cand D. (5 marks)
(Use scale 1cm = 60 km)
(b) Use the scale drawing to determine:
(i) the distance of ship D from ship A (1 mark)
(ii) the distance and bearing of ship D from ship B (2 marks)
(iii) the bearing of ship D from ship C (2 marks)

24. Given that function of a curve as $y = \frac{1}{3}x^3 - \frac{3}{2}x^2 - 4x + 9$
(a) Find the stationary points of the curve. (4 marks)
(b) Determine the nature of the stationary points. (4 marks)
(c) Sketch the curve. (2 marks)

KERICHO SUB-COUNTY JOINT EXAMINATIONS 2016
Kenya Certificate of Secondary Education (K.C.S.E)
PAPER 2
MATHEMATICS
TIME: 2 ½ HOURS

1. Use logarithms to evaluate: (4 marks)
$$\sqrt{\frac{4.6 \times \tan 30}{8.42 + \log 17}}$$
2. Square has sides of length 3.6cm. Calculate the relative error in its area to 4 S.F. (3 marks)
3. The base radius of a cylinder is increased by 10% while its height decreases by 10%. Calculate the percentage change in volume. (3 marks)
4. Draw triangle XYZ such that XY = 8cm, YZ = 6cm and angle XYZ = 400. Construct the locus of points equidistant from X and Y to meet the locus of points equidistant from XY and XZ at R. Measure RZ. (4 marks)
5. (a) Expand and simplify $(1 + x)^4 - (1 - x)^4$ (2 marks)
   (c) Hence use your result in (a) above to evaluate $(1 + \sqrt{5})4$ given your answer in the form of $\sqrt{b}$. (3 marks)
6. A square garden is enclosed by a path of width 1 metre. If the area of the path is 64cm2, determine the perimeter of the outer boundary of the path. (3 marks)
7. Evaluate without using tables. (3 marks)
   Log (3x + 8) – 3 log 2 = (log (x – 4)
8. Three craftsmen take 10 ½ hours to wire a building. How many more craftsmen working at the same rate will complete the work in 5 ¼ hours. (3 marks)
9. Calculate the standard deviation of the following data 7, 3, 4, 6 and 10. Giving your answer to two decimal places. (3 marks)
10. Find the equation of a circle whose diameter has the end points (-2,5) and (4,1). Giving your answer in the form of $x^2 + y^2 + ax + by + c = 0$ where a, b and c are integers. (4 marks)
11. Find the height and the radius of a closed cylinder of volume πcm^3 which has the least surface area. (3 marks)
12. Express the following in surd form and simplify by rationalizing the denominator. Giving your answer in the form $a + b\sqrt{c}$
    (3 marks)
$$\frac{1}{\cos 60 - \sin 45}$$
13. OP = 5i + 3j – 2k and OQ = -i + 3j + 4k are position vectors. If R is a point that divides PQ in the ratio 8: - 5, find the position vector of R in unit vectors. (3 marks)
14. Make x the subject of the formula. (3 marks)
$$\frac{q}{r} = \frac{mx - 2}{nx + 3}$$
15. Chords AB and CD of a circle meet at X as shown in the figure below. If AB = 8cm, BX = 5cm and DX = 6cm.



Calculate the length of chord CD to 1 d.p (2 marks)
16. Two similar containers have masses 256kg and 64kg respectively. If the surface area of the smaller container has an area of 810cm², what is the area of the corresponding surface of the larger container. (3 marks)

SECTION II. (50 MARKS)

Answer only FIVE questions from this section

17. Kimutai earns K£12000 per annum and is housed by the company at a nominal rate of KSh. 2000 per month, 15% of his basic salary is added to his income for the purposes of taxation. He gets family relief of K£1320 p.a and is entitled to a relief of 10% of his insurance of K£800 p.a.

Income K£p.a	Rate
1 – 2100	10%
2101 – 4200	15%
4201	6300
6301-8400	35%
Over 8400	45%

(a) Calculate his taxable income. (2 marks)
(b) Calculate his PAYE. (5 marks)
(c) Kimutai;s other deductions includes
W.C.P.S Sh. 600 p.m
N.H.I.F Sh. 500 p.m
Calculate Kimutai's net monthly salary. (3 marks)

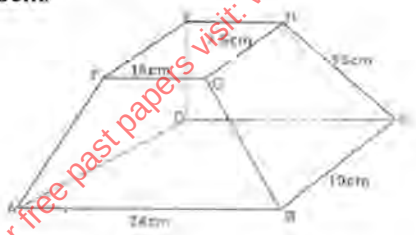
18. A plane J flies from a point K(40°N, 45°W) to a point L (35°N, 45°W) and then onto a point M (35°N,135°E)
(a) Determine the distance from K to L in km. (Take R = 6370 km) (2 marks)
(b) Determine in nautical miles
(i) the shortest distance between L and M along the great circle (2 marks)
(ii) the longest distance between L and M along small circle (to the nearest tens) (2 marks)
(c) Find the difference in time taken to the nearest minute when J flies along the shortest and longest routes if its speed is 420 knots in both cases. (4 marks)

19. (a) Complete the table below for the function $y = x^2 - 3x - 4$ (2 marks)

x	-4	-3	-2	-1	0	1
y						

(b) Use the trapezoidal rule with 5 strips to estimate the area bounded by the curve y = x2 – 3x – 4, x = -4 and x = 1 and
the x –axis (3 marks)
(c) Calculate the exact area in (b) (3 marks)
(d) Determine the percentage error in estimating the area. (2 marks)

20. The figure below shows a frustum ABCDEFGH of a right pyramid. AB = 24cm, BC = 10cm, FG = 18cm, GH = 7.5cm and AF = BG = CH = DE = 15cm.



Determine:
(a) the altitude of the pyramid. (2 marks)
(b) the angle between
(i) AF and the base ABCD (3 marks)
(ii) the planes ABCF and ABCD (3 marks)
(iii) FE and GB (2 marks)

21. The 1st, the 7th and 25th terms of an arithmetic progression are the first three consecutive terms of a geometrical progression. The 20th terms of the arithmetic progression is 22. Find:
(a) (i) the first term and common difference of the arithmetic progression. (4 marks)
(ii) the sum of the first 40 terms of the arithmetic progression. (2 marks)
(b) (i) the 10th term of geometric progression. (2 marks)
(ii) the sum of the first 10 terms of the geometric progression. (2 marks)

22. The values of x and y are such that y varies inversely as the square of x and x > 0

x	2	4	8		12	16
y	240			9.6		

(a) Find the constant of proportionality between y and x^2 (2 marks)
(b) Complete the table above (2 marks)
(c) Plot a graph of y against x2 (4 marks)
(d) Use the graph to:
(i) determine the value of y when x = 3 (1 mark)

(ii) determine the value of x when y = 10 (1 mark)

23. Form four class at Ngomngetet Secondary School has 45 girls and 35 boys. The probability of a girl completing the secondary school course is $\frac{3}{5}$ while that of a boy is $\frac{4}{5}$.

(a) A student is picked at random from the class. Find the probability that:
(i) the student picked is a boy and will complete the school course. (2 marks)
(ii) the student will not complete the course. (3 marks)
(b) If two students are picked at random from the class, find the probability that
(i) both are girls (2 marks)
(ii) both of the same gender and will complete the course (3 marks)

24. A firm has a fleet of vans and truck. Each van can carry 9 crates and 3 cartons. Each truck can carry 4 crates and 10 cartons. The firm has to deliver not more than 36 crates and at least 30 cartons.

(a) If x vans and y trucks are available to make the delivery:
(i) Write 4 inequalities that must be satisfied by x and y (3 marks)
(ii) Graph the inequalities (4 marks)
(b) Given that the cost of using a truck is four times that of using a van, determine the number of vehicles that may give the maximum and minimum costs. (3 marks)

GATUNDU SUB COUNTY FORM FOUR 2016 EVALUATION EXAM

121/1
MATHEMATICS
PAPER I
JULY/AUGUST 2016
TIME: 2 ½ HOURS

SECTION 1.
Answer all questions in the spaces provided below each question in this section.

1. Use logarithms to 4 decimal places to evaluate: (4 Mks)

$$\left(\frac{0.8741 \times \sqrt{0.1365}}{\text{Log } 92.84}\right)^{1/3}$$

2. A line L_1 passes through the point P(-1,2) and Q(2,-7)
   (i) Find the equation of a line which is perpendicular to line L_1 and passes through point R(5,5) (3 Mks)
   (ii) Find the mid-point of line QR. (1 Mk)
3. What is the value of x if; (3 Mks)

$$\frac{27^{x-1}}{3^{2x-1}} = 81^{2x}$$

4. Given that $\underline{a} = 2\underline{i} - 3\underline{j} + \underline{k}$, $\underline{b} = 3\underline{i} - 4\underline{j} - \underline{k}$ and $\underline{c} = \underline{j} + 3\underline{k}$ and that $R = 3\underline{a} - \underline{b} + \underline{c}$ find the magnitude of R correct to 3 significant figures. (3 Mks)
5. Solve the simultaneous inequalities below and state the negative values of x that satisfy the inequalities $\frac{1}{4}x - 3 \leq x + 2 \leq 21 - 2x$ (3 Mks)
6. A tourist arrived in Kenya from Britain with 9600 UK sterling pounds (UK £). He converted the pounds to Kenya shilling at a commission of 5%. While in Kenya, he spent ¾ of his money. He changed the balance to US dollar after his stay. If he was not charged any commission for the last transaction, using the exchange rates below, calculate to the nearest US dollar he received. (3 Mks)

	Buying	Selling
1 US dollar	63.00	63.20
1 UK £	125.30	125.95

7. Two consecutive odd numbers are such that the difference is thrice the small number and twice the larger number is 21. Find the sum of the numbers. (3 Mks)
8. Two similar container hold 2000cm³ and 6.75 litres respectively. If the smaller container is 16cm in diameter, what is the radius of the larger container? (3 Mks)
9. A piece of land is shared among 10 people, such that the first one get 3 hectares, the second one gets 4.5 hectares, the third gets 6 hectares, the fourth 7.5 hectares and so on.
   (i) How much land does the 10th person get? (2 Mks)
   (ii) What is the total area of land shared (1 Mk)
10. Given that $4x^2 - 32x - 20 + k$ is a perfect square find the value of K. (3 Mks)
11. 5kg of maize costing Sh. 32.20 a kilo were mixed with 6kg of beans sh 50 a kilo and 1kg of sorghum costing sh 19.00 a kilo. If the selling price of 1kg of the mixture is sh 48.00, calculate the percentage profit. (3 Mks)
12. The exterior angle of a regular polygon of side 16cm is 18°. Calculate the area of the polygon to 2 d.p (4 Mks)
13. Express in surd form and simplify by rationalizing the denominator; (3 Mks)

$$\frac{1 + \text{Cos } 30^\circ}{1 - \text{Sin } 60^\circ}$$

14. Without using tables or a calculator evaluate. (2 Mks)

$$\frac{3.8 \times 0.016}{10 \times 0.0076}$$

15. Three men working 8 hours daily can complete a piece of work in 5 days. Find how long it will take 10 men working 6 hours a day to complete the same work. (3 Mks)
16. Given the equation $m = \frac{1}{4}(3h^2 + 8ah + 3a^2)$ Calculate the exact value of m, when h = 20 and a = -5. (3 Mks)

SECTION 11.
Answer any 5 questions in this section.

17. A teacher paid Ksh 1,200 for some packets of coloured pieces of chalk and paid the same amount for some packets of white pieces of chalk. The price of a packet of the white pieces was Ksh 10 less than that of coloured pieces. The teacher got 4 more packets of the white pieces than the packets of the coloured pieces.
(a) Taking x to be the number of packets of the coloured pieces that the teacher bought.
(i) Find an expression for the price per packet of each type of the pieces of chalk. (2 Mks)

(ii) Form an equation in x and hence determine the number of packets of the coloured and white pieces of chalk the teacher bought. (5 Mks)

(b) The teacher sold all the packets at the same price per packet making a project of $28^1/_3$ %. Calculate the selling price of each packet. (3 Mks)

18. (a) Complete the table below for the function.

$Y = 3x2 - 2x - 1$ for $-3 \leq x \leq 4$

X	-3	-2	-1	0	1	2	3	4
y		15				7		

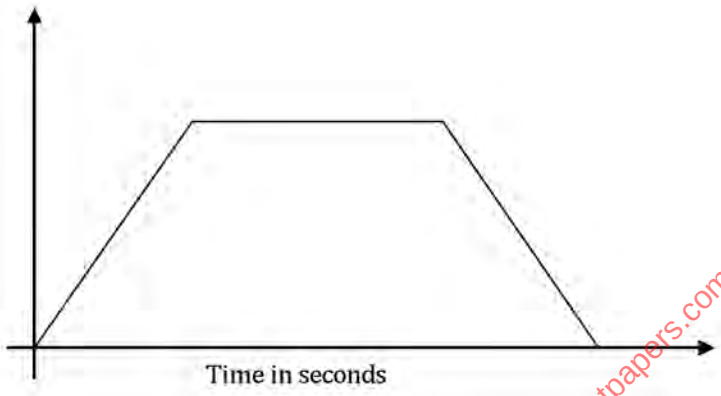
(2Mks)

(b) Draw the graph of $y = 3x^2 - 2x - 1$ on the grid provided below. (3 Mks)

(c) Draw the line $y = 3x + 1$ on the same axes, hence find the values of x for which $y = 3x + 1$ and $Y = 3x^2 - 2x - 1$ are equal

(d) Write down a simplified quadratic equation whose roots are the solutions of the simultaneous equations in (c) above.

19. The diagram below shows the velocity time graph for a train travelling between two stations. The train starts from rest and accelerates uniformly for 150 seconds. It then travel at constant speed for 300 sec and finally decelerates uniformly for 200 sec. Given that the distance between the two stations is 10450m, calculate;



(a) The maximum speed in km/h the train attained. (3 Mks)

(b) The acceleration. (2 Mks)

(c) Distance the train travelled during the last 100 seconds. (2 Mks)

(d) Time the train takes to travel the first half of the journey. (3 Mks)

20. (a) Using a ruler and a pair of compasses only construct a rhombus ABCD such that AB = 6cm and angle ABC = 135° (4 Mks)

(b) Drop a perpendicular from C to AB, extended meeting at N. Measure BN and CN. (3 Mk)

(c) Bisect < DAB, let the two bisector meet at M measure MA. (1 Mk)

(e) Determine the area of triangle ABM. (2 Mks)

21. (a) Two martrices P and Q are such that $P = \begin{pmatrix} k & 4 \\ 3 & 2 \end{pmatrix}$ and $Q = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$. Given that the determinant of PQ = 4, find the value of k. (3 Mks)

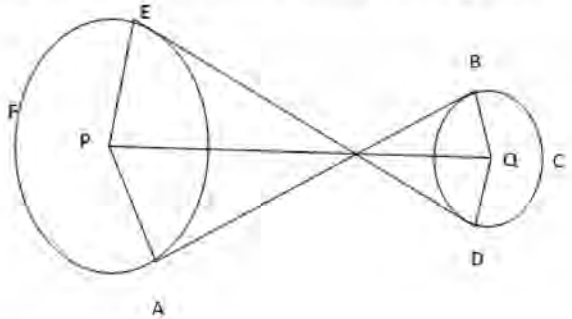
(b) Find M^{-1} the inverse of matrix $M = \begin{pmatrix} 5 & 6 \\ 7 & 9 \end{pmatrix}$ (2 Mks)

(c) Omondi bought 5 plates and 6 mugs for a total of ksh 2440. Ali bought 7 plates and 9 mugs for a total of Ksh 3560.

(i) Form a matrix equation to represent the above information. (2 Mks)

(ii) Use matrix method to find out price of plates and that of mugs. (3 Mks)

22. The figure below shows two pulleys whose centers are 30cm apart connected by belt ABCDEF. The pulley center P has a radius of 13cm and the pulley center Q has a radius of 4cm.



Calculate:-

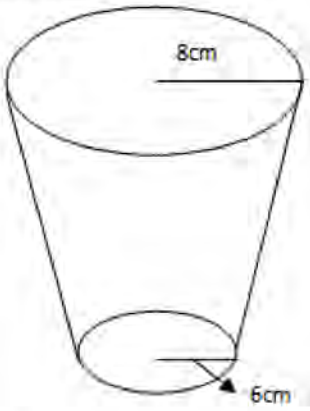
(a) The length AB. (2 Mks)
(b) The reflex angles EPA and BQD. (2 Mks)
(c) The arc length AFE and BCD. (4 Mks)
(d) The total length of the belt. (2 Mks)

23. The displacement s metres of a moving particle after t seconds is given by $s = 2t^3 - 5t^2 + 4t + 2$

Determine:-

(a) The velocity of the particle when $t = 2$. (3 Mks)
(b) The value of t when the particle is momentarily at rest. (3 Mks)
(c) The displacement when the particle is momentarily at rest. (3 Mks)
(d) The acceleration of the particle when $t = 5$. (2 Mks)

24. A pail is in shape of a container frustrum with base radius 6cm and top radius 8cm. The slant height of the pail is 30cm as shown below. The pail is full of water.



(a) Calculate the volume of water. (6 Mks)
(b) All the water is poured into cylindrical container of circular radius 7cm; if the cylinder has the height of 35cm, calculate the surface area of the cylinder which is not in contact with water. (4 Mks)

GATUNDU SOUTH JOINED EVALUATION EXAMINATION

121/2
MATHEMATICS PAPER 2
JULY/AUGUST 2016
TIME: 2 ½ HOURS

SECTION I 50 MARKS.

1. Solve for y in the equation.
$2\text{Log}_{10}y + \text{Log}_{10}5 = \text{Log}_{10}10 + 2\text{Log}_{10}4$. (3mks)

2. Make W the subject of the formulae (3mks)

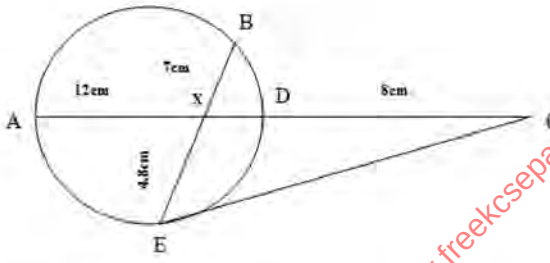
$$g = \frac{w}{d}\sqrt{\left(\frac{b^2 - k^2}{W}\right)}$$

3. Simplify $\frac{6}{\sqrt{5}-\sqrt{3}} - \frac{4}{\sqrt{5}+\sqrt{3}}$ giving your answer in the form $\sqrt{a} + b\sqrt{c}$ where a , b and c are constants. (3mks)

4. In a maths test, the scores of 10 form 4 students we as follows.
70,65,64,61,57,57,55,54,52 and 45. Calculate the standard deviation of the scores. (4mks)

5 (i) Expand and simplify $(1 - 3x)^5$ up to the term in x^3. (2mks)
(ii) Hence use your expansion to estimate $(0.97)^5$ correct to 4 decimal places. (2mks)

6. In the figure above EC is a tangent to the circle at E. AXDC and BXE are straight lines. AX= 12cm, DC = 8cm, EX = 4.8cm and XB = 7cm. Find the length of;



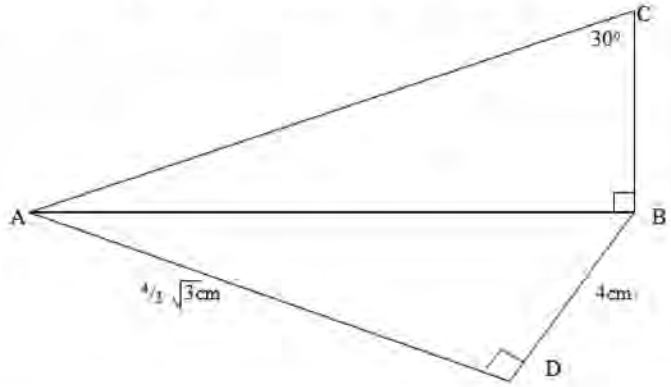
(a) XD. (2mks)
(b) EC (2mks)

7. A bag contains 7 green and 5 red tennis balls. Two are drawn without replacements. Find the probabilities that
(a) Both are green. (1mk)
(b) At least one is green. (2mks)

8. The length and breadth of a sheet of metal are measured to the nearest centimeter and recorded as 25.0cm and 16cm respectively.
(a) Find the maximum possible error in the area of the sheet. (1mk)
(b) Calculate to one decimal place the percentage error in the area of the sheet. (2mks)

9. Given that line XY = 6.5cm construct the locus of P such that $\angle XPB = 90^o$. (2mks)

10. In the figure below $\angle ACB = 30^o$, $\angle ABC = \angle ADB = 90^o$, AD = $^4/_3\sqrt{3}$ and DB = 4cm.Calculate the length of ;



(a) AB (1mk)
(b) CB. (2mks)

11. The equation of a circle is given by $4t^2 + 4s^2 - 8t + 20s - 7 = 0$. Determine the co-ordinates of the centre and radius of the circle. (3mks)
12. Given that $\tan 65^o = 3 + \sqrt{5}$, without using tables or a calculator determine $\tan 25^o$. (3mks)
13. In a transformation, an object with an area of $10cm^2$ is mapped onto an image whose area is $60cm^2$. Given that the matrix of the transformation is $\begin{pmatrix} y & y-1 \\ 2 & 4 \end{pmatrix}$, find the value of y. (3mks)
14. A cube of copper was found to have a mass of 0.630kg. What are the dimensions of the cube? Given that the density of copper is $8.94g/cm^3$ find its volume. (2mks)
15. A staff canteen at a military camp is open as shown in the schedule below.

	Monday to Friday	Saturday	Sunday
Opening time	0645 h	0730 h	0845 h
Closing time	1730 h	1730 h	1200 h

An employee who operates the canteen is paid a kshs 25 per hour at the shop. How much is her weekly pay. (3mks)

16. Under enlargement A(1,3) is mapped onto A1 (4,4) and C (5,1) is mapped onto C1 (12,0) determine the centre and linear scale factor of the enlargement. (4mks)

ATTEMPT ANY FIVE QUESTIONS
SECTION II (50 MARKS)

17. Mr. Kamau has two children whose age difference is 5 years. Twice the sum of the ages of the two children is equal to the age of the parent.
(a) Taking y to be the age of the elder child, write an expression for:
(i) The age of the younger child. (1mk)
(ii) The age of the parent. (1mk)
(b) In twenty years time, the product of the children's ages will be 15 times the age of their parent.
(i) Form an equation in y and hence determine the present possible ages of the elder child. (4mks)
(ii) Find the present possible ages of the parent. (2mks)
(iii) Determine the possible ages of the young child in 20 years time. (2mks)

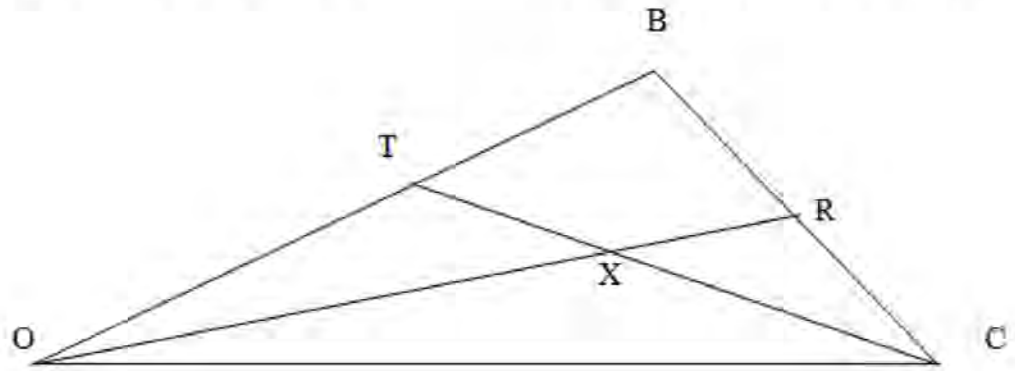
18. The table below shows income tax rate for a certain year.

Monthly income in Kenya shillings (Kshs)	Tax rate in Kenya shillings per pound.
0 – 10 164	2
10 165 – 19 740	3
19 741 – 29 316	4
29 317 – 38 892	5
Over 38 892	6

A tax relief of Kshs 1162 per month was allowed. In a certain month, of that year, an employee's taxable income in the fifth band was Kshs 2108.
(a) Calculate
(i) the employee's total taxable income in that month. (2mks)
(ii) The tax payable by the employee in that month. (5mks)

18. (b) The employee's income included a house allowance of Kshs 15 000 per month. The employee contributed 6¿ of basic salary to a co-operative society. Calculate the employees net pay for that month. (3mks)

19. In the figure below OBC is a triangle in which OT – ¾ OB and BR: RC = 2:1. Line OR and TC meets at x



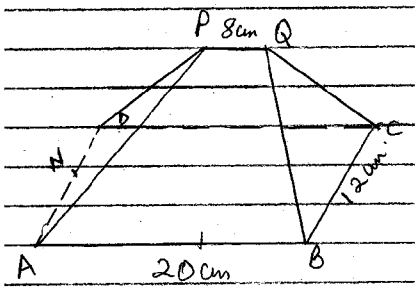
(a) Given that OB – b and OC =C. Express the following vectors in terms of b and c.
(i) BC (1mk)
(ii) QR (2mks)
(iii) TC (1mk)
(b) Given further that TX = m TC and OX = n OR, Determine the values of m and n (6mks)

20. (a) Complete the table below for the functions y = sin x and y = 2 sin (x + 30°) for 0°≤ x≤ =360°

X	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
Sinx	0	0.5	0.87		+0.87	0.5	0		-0.87	-1		-0.5	0
2sin(x+30°)	1		2	1.73		0	-1	-1.73		-1.73	-1	0	1

(b) On the same axis, draw the graphs of y = sinx and y = 2sin (x+30) for 0°≤x≤ =360° (4mks)
c) (i) State the amplitude of the graph y = 2sin (x + 30) (1mk)
(ii) State the period of the graph y = sin x. (1mk)
(iii) Use your graph to solve.
Sin x – 2 sin (x + 30) = 0 (2mks)

21. The figure below shows a plan of a roof with a rectangular base ABCD, AB = 20cm and BC = 12cm. The edge PQ = 8cm and is centrally placed. The faces ADP and BCQ are equilateral triangle. N is the mid-point of AD.



Calculate to 2 d.p
(a) The length of PN. (2mks)
(b) The height of P above the base ABCD. (3mks)
(c) The angle between ABQP and ABCD. (2mks)
(d) The obtuse angle between the lines PQ and DB. (3mks)

22. The first three terms of a geometric series are: 2x, x -8, and 2x + 5 respectively.
(a) Find the possible values of x. (4mks)
(b) For the value of x being an integer, find:
(i) The value of the eleventh term (3mks)
(ii) The sum of the first 15 terms. (3mks)

23. The table below shows the distribution of marks of 100 form four students in a mathematics examination.

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
No. of student	2	8	15	18	17	14	10	8	6	2

(a) Using a suitable scale, draw a cumulative frequency curve to represent the above information on the provided grid (4mks)
(b) Using your graph estimate the
(i) median (1mk)
(ii) Semi-inter quartile range (3mks)
(iii) Number of students who passed if pass mark was 43% (2mks)

24. An aircraft leaves town P(30°S, 17°E) and moves directly northwards to Q (60°N, 17°E). It then moved at an average speed of 300 knots for 8 hours westwards to town R. Determine
(a) The distance PQ in nautical miles. (2mks)
(b) The position of town R. (4mks)
(c) The local time at R if local time at Q is 3.12pm. (2mks)
(d) The total distance moved from P to R in kilometers. (take 1nm = 1.853km) 2mks)

KASSU JET EXAMINATION

Kenya Certificate of Secondary Education
121/1
MATHEMATICS
PAPER I
JUNE 2016
2 ½ HOURS

SECTION A 50 MARKS

1. Evaluate $\dfrac{\frac{3}{4}+1\frac{5}{7}\div\frac{4}{7}\ of\ 2\frac{1}{3}}{\left(1\frac{3}{7}-\frac{5}{8}\right)x\frac{2}{3}}$ (3marks)

2. Solve for x in $\sin(x-15)-\cos(x+5)=0$ (2marks)

3. The LCM of two numbers is 328,600 and the GCD is 20. If one of the numbers is 1240, use prime factorization method, find the other number. (3 marks)

4. A sperical solid lead of diameter 12cm weighs 6.4kg. How much would a similar solid of a diameter 10cm weigh? (3marks)

5. Without using a calculator or mathematical tables evaluate,

$$\frac{\left(\frac{1}{81}\right)^{\frac{1}{4}}\times(256)^{\frac{1}{2}}\times 3^{5}}{(729)^{\frac{1}{3}}\times 72^{2}}$$ (3marks)

6. On arrival to Kenya a Canadian tourist exchanged his Canadian dollars for Ksh 199 690. Given that the currency exchange rate was 1 Canadian dollar = Ksh 52.55 and that the bank charged him 5% commission, find the number of dollars he exchanged. (3 marks)

7. By using completing square method, solve for x *in* $4x^2-3x-6=0$ (3marks)

8. Simplify the following. (3 Marks)

$$\frac{2x-4}{12-3x^2}\cdot\frac{1}{3x+6}$$

9. The matrix $\begin{bmatrix} x & 1 \\ x+5 & x+5 \end{bmatrix}$ maps a triangle ABC onto a straight line. Determine the possible values of x. (3 marks)

10. Using the tables of squares, square roots and reciprocal $3.0452 \times \dfrac{6}{\sqrt{49.24}}$ (4marks)

11. Find the percentage error in the quotient in $9.16cm \div 2.0cm$ (4marks)

12. The position vectors $\mathbf{a}=\begin{pmatrix}-1\\5\\2\end{pmatrix}$ $\mathbf{b}=\begin{pmatrix}2\\1\\-3\end{pmatrix}$ and $\mathbf{c}=\begin{pmatrix}-8\\7\\13\end{pmatrix}$. Find the scalars S and T such that $S\mathbf{a}+T\mathbf{b}=\mathbf{c}$. (3 marks)

13. The following data represents the enrolment of students in 12 colleges

564	553	566	554	563	563
657	556	553	554	651	559

Calculate the quartile deviation (3 marks)

14. The density of a sphere of diameter p cm is 2.68 g/cm³ and that of another sphere is diameter Q cm is 14.23 g/cm³. Determine the volume of sphere Q that would have the same mass as 80cm³. (3marks)

15. Solve and represent the integral values of the linear inequalities given below on a number line.

$\frac{4}{3}-\frac{x-2}{x}\geq 1$, $-2-\frac{2}{3}x<x+8$ (3marks)

16. Find the equation of the normal to the curve $y=x^3-2x^2+3x-1$ at the point (2,5) (3marks)

SECTION B (50 MARKS)

17. A straight line L_1 has its x-intercept and y-intercept as -6 and 4 respectively.

a) Write its equation in the form ax +by +c =0 where a, b, and care integers (3marks)
b) Another line L_2 which is parallel to L_1 in (a) above passes through (2,3k) and (-k,8). Find the value of k. (2marks)
c) Find the equation of the perpendicular bisector to the line L_1 (3marks)
d) Calculate the angle which L_1 makes with the x-axis (2marks)

18. A man spent $\frac{1}{9}$ of his salary on food and $\frac{1}{4}$ of the remainder n electricity and water bills. He paid fees with 20% of his

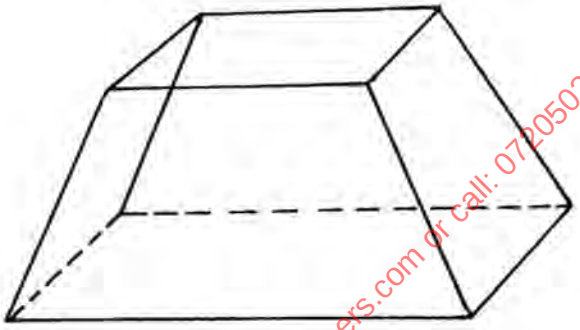
salary and invested 16% of what was left into a business. After taking a game drive on which he spent Ksh 2000, he saved Ksh 5350. Calculate:

(a) His total monthly earnings. (4 marks)
(b) How much he spent on fees. (2 marks)
(c) How much he invested. (2 marks)
(d) The percentage of the salary saved. (2 marks)

19. Every Sunday Alex drives a distance of 80km on a bearing of 074^0 to pick up his brother John to go to church. The church is 75km from John's house on a bearing of S50°E. After church they drive a distance of 100km on a bearing of 260^0 to check on their father before Alex drives to John's home to drop him off then proceeds to his house.

(a) Using a scale of 1cm to represent 10km, show the relative positions of these places. (4 marks)
(b) Use your diagram to determine:
(i) the true bearing of Alex's home from their father's house. (1 mark)
(ii) the compass bearing of the father's home from John's home. (1 mark)
(iii) the distance between John's home and the father's home. (2 marks)
(iv) the total distance Alex travels every Sunday. (2 marks)

20. The figure below shows solid frustum of a pyramid with a square top of side 12cm and a square base of side 20cm. The slant edge of the frustum is 16cm.



a) Calculate the total surface area of the frustum (4marks)
b) Calculate the volume of the solid frustum. (4marks)
c) Calculate the angle between the planes BCHG and the base EFGH. (2mark

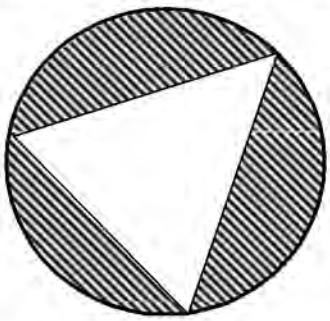
21. (a) A radio station tower was built in two sections. From a point 870m from the base of the tower, the angle of elevation of the top of the first section is 25^0 and the angle of elevation of the top of the second section is 40^0. What is the height of the top section of the tower? (5marks)

(b) Two vertical poles on horizontal ground are 60m apart. The shorter pole is 3m high. The angle of depression of the top of the shorter pole from the top of the longer pole is 20^0. Using scale drawing, find the length of the longer pole.(5 marks)

22. Coast bus left Nairobi at 8.00a.m. and traveled towards Mombasa at an average speed of 80km/hr. at 8.30am, Lamu bus left Mombasa towards Nairobi at an average speed of 120km/h. Given that the distance between Nairobi and Mombasa is 400km; determine:

(i) The time Lamu Bus arrived in Nairobi. (2marks)
(ii) The time the two buses met. (4marks)
(iii) The distance from Nairobi to the point where the buses met. (2marks)
(iv) How far Coast Bus is from Mombasa when Lamu bus arrives in Nairobi. (2marks)

23. Triangle PQR is inscribed in the circle. PQ = 7.8cm, PR = 6.6cm and QR = 5.9cm.



Find;

(a) size of angle QPR (3 Marks)
(b) the radius of the circle. (3 Marks)
(c) the area of the shaded region. (4Marks)

24. (a) Find the stationary points of the curve to (1 d.p) (6 marks)

$$y = \frac{(x+2)(x-1)}{(x-4)^{-1}}$$

(b) Find the x and y intercepts of the curve above. (2 marks)
(c) Sketch the curve. (2 marks)

KASSU JOINT EVALUATION TEST (J.E.T)
Kenya Certificate of Secondary Education (K.C.S.E)

121/2
MATHEMATICS
PAPER 2
2 ½ HOURS
JUNE 2016

SECTION A 50 MARKS

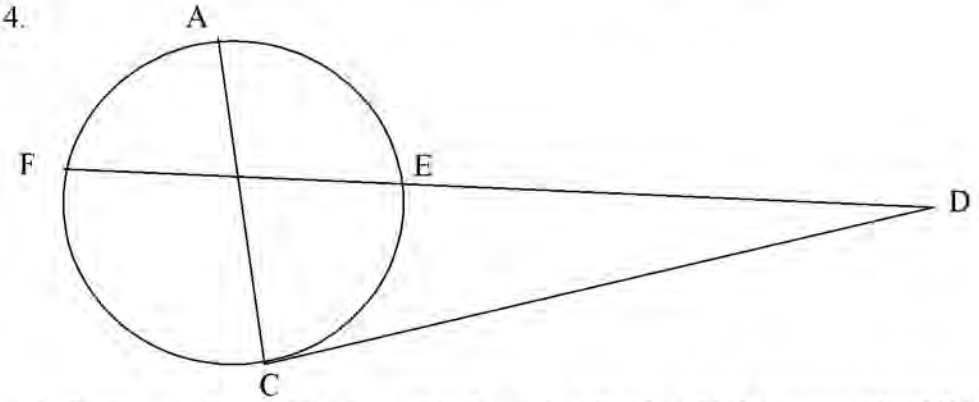
1. Use logarithm tables to evaluate; $\sqrt[3]{\dfrac{648\times 0.0079}{(968-94)\div 0.0046}}$ (3mks)
2. The middle digit of a number between 100 and 1000 is zero, and the sum of the other digits is 11. If the digits are reversed the number so formed exceeds the original by 495. Find the number. (3 mks)
3. Without using mathematical tables or a calculator evaluate

$$\sqrt{\frac{0.3-0.098 \div (0.84-0.14)}{(0.28+0.12)\div 0.8 \times 0.5}}$$

Leaving the answer as a decimal (3 marks)
4. Expand $(0.07)^5$ using binomial theorem giving your answer to four significant figures (3marks)
5. Solve for θ in the equation $\sin(3\theta + 120^0) = \frac{\sqrt{3}}{2}$ in the range $0 \leq \theta \leq 180^0$. (3 marks)
6. Rationalize the denominator leaving your answer in the form $a + \sqrt{c}$ where a, b and c are constants

$$\frac{5-2\sqrt{3}}{2+3\sqrt{3}}$$

(3marks)
7. A farmer bought a machine at a current price of Ksh 224,000. If the depreciation rate is 5% in every 3 months. Calculate the sum of its value in 3 years ago and 3 years' time. (3marks)
8. Without using logarithm table or calculators, find the value of p in the equation.
   $\log n^3 + \log 4n = 10 \log 2 - \log {}^2/_8)$ (3marks)
9. Using mid-ordinates rules, estimate the area under the curve $y = \frac{1}{2}x^2 - 2$, using six strips between x=2 and x=8 and x-axis (3marks)
10. (a) Using a pair of compass and a ruler only Construct a triangle PQR in which PQ=QR=4cm and angle QPR= 30^0. (2mks)
    (b) A point T is always on the same side of PQ as R and angle PRQ=angle PTQ. Construct the locus of T and describe it. (2marks)
11. R is partly constant and partly varies as the square of q. when R = 5, q = q and R = 21, when q = 3. Find the value of R when q = 5. (3marks)
12. The first, the third and the seventh term of an increasing arithmetic progression are three consecutive terms of a geometric progression. If the first term of the arithmetic progression is 10, find the common difference of the arithmetic progression (3marks)
13. The equation of a circle is $x^2 - 8x + y^2 + 12y + 16 = 0$
    Determine the coordinates of the Centre of the circle and its radius. (3 Marks)
14.

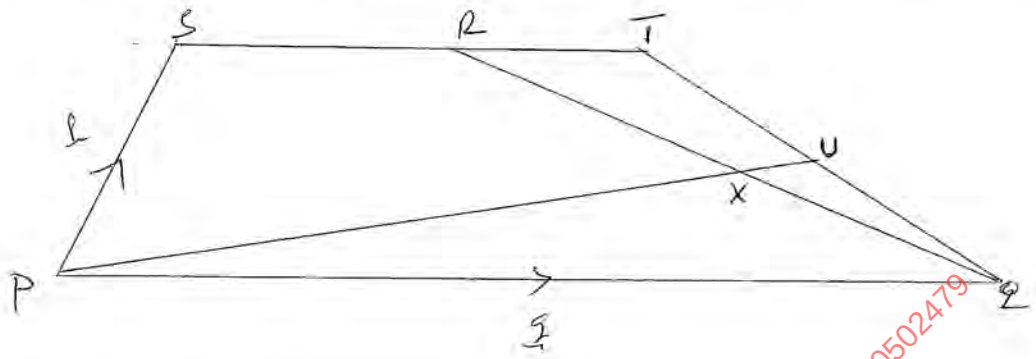


In the diagram above CD is a tangent to the circle at C. AC and FD intersect at B. FED is a straight line. Given that CD = 10 cm, AB = 2 cm AC = 8 cm, FB = 3 cm. Find the length ED. 4marks
15. The cost of 2 brands of coffee A and B per kilogram are 59.40 and Sh.72 respectively. The two brands are mixed in the ratio x:y and sold at a profit o9f 20% above the cost. If the selling price per kilogram mixture is Ksh.72. find the value of x and y (3mks)

16. Evaluate $\int_{-1}^{-} \frac{2x^3 - 3x^2 - 8x + 12}{} dx$ (3marks)

SECTION B 50 MARKS

17. In the trapezium shown $\overrightarrow{PQ} = 3\overrightarrow{ST}$. T divides SR in the ratio 4 :1 and U is the midpoint of QT. PU and QR intersect at X. PX = hPU and QX = kQR.



Given that PQ = q and PS = p

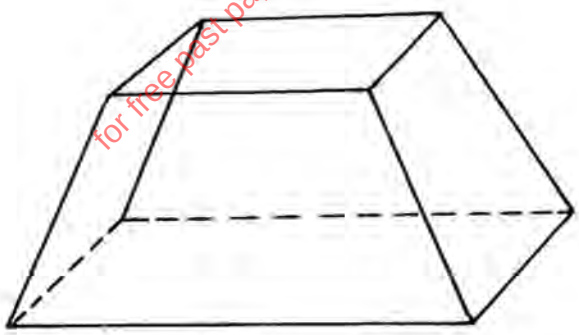
(a) Express QR in terms of P and q (1mark)
(b) Express PX in terms of P, q and h. (2marks)
(c) Express PX in terms of P, q and k. (3marks)
(d) Hence; obtains the values of h ad k. (3marks)
(e) Determine the ratio in which X divides QR. (1mark)

18. The table below shows the distribution of marks of 40 candidates in a test

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Frequency	2	2	3	x	12	5	2	3	1	1

(a) (i) Find the value of x (1mark)
(ii) State the modal class (1mark)
(iii) Calculate the median (4marks)
(iv) Calculate the mean. (4marks)

19. The figure below is a frustum of a rectangular pyramid with AB=12CM, EF=8CM,BC=9CM and height of 6 CM



Calculate:

a) the full height of the pyramid 2 marks
b) angle that the plane ABFE makes with the base ABCD 2marks
c) angle that AG makes with the base ABCD 3marks
d) angle that AC makes with line AE 1mark
e) angle that plane BCGF makes with the base ABCD 2marks

20. a) A point a (35° N, 40°W) and b (40°S, 40°W), Calculate the distance between A and B in Kilometers. Take earth radius o be 6370 km. answer to 1 d.p. (3mks)
b) A and B are points on latitude 70°C. Their longitudes are 62°W and 118° E respectively. Find the distance from A to B along a parallel of latitude. (4mks)
c) Peter was in Mombasa 39°E and Mary was in Banju 17°W. Calculate the time difference between the two.

(3mks)

21. ABCD is a quadrilateral with vertices as follows: A (3, 1), B (2, 4) C (4, 3) and D (5, 1)

(a) (i) On the grid provided draw the quadrilateral ABCD and the image A'B'C'D' under a transformation With matrix $\begin{bmatrix} 0 & -1 \\ 1 & \end{bmatrix}$. Find the co-ordinates of A'B'C'D' (3mks)

Describe the transformation that maps ABCD onto A'B'C'D' fully (1mk)

(b) A transformation represented by the matrix $\begin{bmatrix} 1 & \\ 0 & -1 \end{bmatrix}$ maps A'B'C'D' onto A''B''C''D'' find the co-ordinates of A''B''C''D''.

Plot A''B''C''D'' on the same grid. (3mks)

(c) Determine a single transformation that maps A''B''C''D'' onto ABCD. Describe this transformation fully. (3mks)

22. The table below shows the income tax rates in Kenya.

Income in K£ per month	Rate in Ksh / K£
1 - 325	2
326 - 975	3
976 - 1300	5
1301 - 1625	6
Over 1625	7.5

(a) Mr. Sigei is a public servant who lives in a government house and pays a nominal rent of Ksh. 1220 per month. He earns a basic salary of Ksh. 24,800 and taxable allowances of Ksh. 13,380 per month. He is entitled to a monthly tax relief of Ksh. 1120. Calculate his monthly

i) Taxable income in K£. (2mks)
ii) Gross tax. (3mks)
iii) Tax due (2mks)

(b) Apart from income tax, the following monthly deductions are made from his salary.

i) HELB loan repayment Ksh. 2400
ii) NHIF Ksh 320
iii) 2% basic salary as union dues.

Calculate Mr. Sigei's monthly net salary. (3mks)

23. An airline has to fly 1000 passengers and 35000 kg of luggage from Nairobi to Kampala. Two types of aircrafts are available. Type A takes 100 passengers and 2000 kg of luggage. Type B takes 60 passengers and 3000 kg of luggage. The airline must not use more than 16 aircrafts altogether.

(a) if the airline hires x type A aircrafts and y type B aircrafts, write down 3 inequalities to represent the information above. (3mks)

(b) Draw the inequalities on a grid. (3mks)

(c) Find the minimum number of aircrafts the airline could use. (1mk)

(d) If the cost of hiring charges for each aircraft is sh 100,000 and sh 120,000 for type A and b respectively, find:

(i) The number of planes of each type that should minimize the cost (2mks)
(ii) Minimum cost (1mk

24. In a mathematics test, the probability of 3 students, Kamau, Otieno and Mwala passing are ⅔, ¾ and ⅚ respectively

(a) Draw a tree diagram to represent this information (3 marks)

(b) Use the tree diagram to find the probability that:

(i) All the three students will fail (2 marks)
(ii) At least two students will pass. (3 marks)
(iii) Only one student will pass (2 marks)

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2016
121/1
MATHEMATICS ALT. A
PAPER 1
JULY / AUGUST 2016
2 ½ HOURS

SECTION I (50 marks)
Answer ALL questions

1. Evaluate (3mks)

$$\frac{3}{8}\text{ of}\left(7\frac{3}{5}-\frac{1}{3}\left(3\frac{1}{3}+\frac{5}{4}\right)\div\frac{5}{12}\right)$$

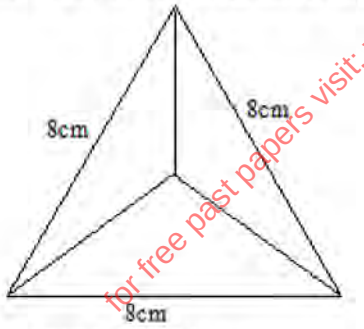
2. Solve for x in the equation (3mks)

$$\left(\frac{1}{2}\right)^{3x}\left(\frac{1}{8}\right)^{1-x}=32$$

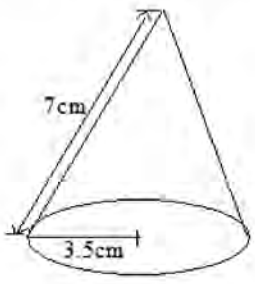
3. A house agent's commission on the sale of a house is 5¿ of the first k£3500 of the selling price and 2 ½ % of the remainder.
   a) Calculate the agent's commission on a house selling for k£10 000. (2mks)
   b) If this selling price is increased by 10¿ calculate the increase in the agent's commission. (2mks)
4. James walking to college takes 69 minutes. If lectures start at 8.10am and he left home at 0635 hours, by how many minutes did he arrive before or after the lectures started. (3mks)
5. A straight line passes through (-3, -4) and is perpendicular to the line whose equation is $3x + 2y = 11$ and intersects the x-axis and y-axis at points A and B respectively. Find the length of AB. (3mks)
6. A matrix $P = \begin{pmatrix} 2 & -1 \\ -4 & 3 \end{pmatrix}$, $Q = \begin{pmatrix} a \\ b \end{pmatrix}$ and $R = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ Find the values of a and b given that PQ = R using matrix method. (3mks)
7. Given that $x - y = 3$ and $3x + y = 9$, simplify and hence find the value of (3mks)

$$\frac{3x^2 - 4xy + y^2}{9x^2 - y^2}$$

8. A man 186cm tall, stands on a level ground 100m away from the foot of a vertical pole. He observes the angle of elevation of the top of the pole to be 20.4^0. Calculate the height of the pole in metres. (Give your answer to 4(3mks)
9. The figure below shows a solid regular tetra pack of side 8cm.



   Find the surface area of the solid. (3mks)
10. Find the equation of the normal to the curve $y = x^3 + 2x + 1$ at (1,4). (4mks)
11. Sixteen men working at the rate of 9 hours a day can complete a piece of work in 14 days. How many more men working at the rate of 7 hours a day would complete the same job in 12 days. (3mks)
12. The size of each interior angle of a regular polygon is six times the size of the exterior angle. Find the number of sides of the polygon. (3mks)
13. The figure below is a cone whose base radius is 3.5cm and slant height 7cm. The net of the cone is a sector of a circle.



a) Find the angle subtended at the centre of the sector. (2mks)
b) Draw the net of the solid. (1mk)

14. A map is drawn to a scale 1 : 200 000. What area in Km^2 is represented by a rectangle 2cm by 2.5cm. (2mks)
15. Without using a calculator, evaluate

$$\frac{5 \times 6 + (-76) \div 4 + 27 \div 3}{(-15) \div 3 \times (-4)}$$

(3mks)

16. A trouser whose marked price is Ksh. 800 is sold to a customer after allowing him a discount of 13%. If the retailer makes a profit of 20%. Find how much the retailer paid for the trouser. (3mks)

SECTION II (50 Marks)
Answer any five questions in this section

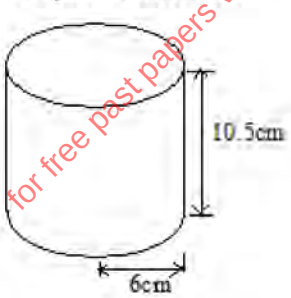
17. The marks scored by a group of students in a Mathematics contest were as recorded in the table below.

Marks	Frequency
40-44	5
45-49	5
50-54	7
55-59	6
60-64	13
65-69	3
70-74	5
75-79	3
80-84	3

a) i) State the modal frequency. (1mk)
ii) Estimate the median mark. (4mks)
b) Using the above data, calculate the mean mark to 1 decimal point. (5mks)

18. A particle moves along a straight line such that it's displacement, S (m) from a given point is $S = t^3 - 3t^2 + 5$.
Where t is time in seconds find
a) the displacement of the particle at t = 3. (2mks)
b) the velocity of the particle when t = 3. (3mks)
c) the values of t when the particle is momentarily at rest. (3mks)
d) the acceleration of the particle when t = 4. (2mks)

19. The figure below shows a cylindrical solid of radius 6cm and height 10.5cm in which a right cone has be scooped out at one end.



a) Find the volume of the remaining solid. (3mks)
b) The conical empty part is filled with a liquid of density $3.4g/cm^3$. If the cylinder is made up of a material of density $2.8g/cm^3$, find density of the whole figure. (4mks
c) If all the inner and outer surfaces of the solid in 17(a) above were painted with red paint, calculate the total surface area covered by the red paint. (3mks)

20. A ship leaves port K for port M through port L. L is 200km on a bearing of 230^0 from K. M is 400km on a bearing of 150^0 from L.
a) Using a scale of 1 : 4 000 000, draw a diagram to show the relative positions of the three ports K, L and M. (3mks)
b) If the ship sailed directly from K to M at an average speed of 70Km/h , find how long it would take to arrive at M. (2mks)
c) Determine.
i) How far M is to the south of K. (2mks)
ii) The shortest distance from L to the direct path KM. (2mks)
d) What is the bearing of K from M. (1mk)

21. a) A matatu travelling at 99km/h passes a check point at 9.00a.m. A police patrol car traveling at 132km/hr in the same direction passes through the police check point at 9.15 a.m. If the matatu and the police patrol car continue at their uniform speeds.

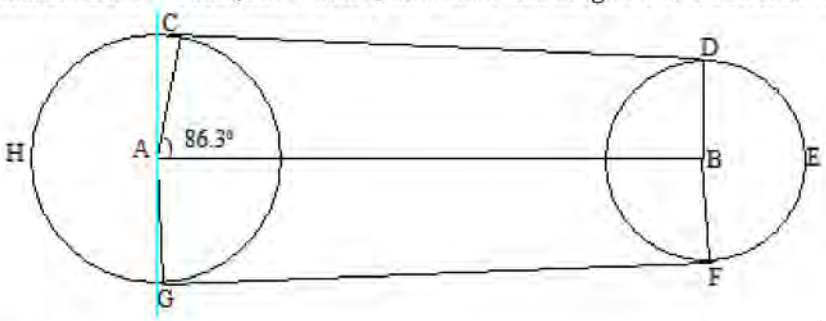
i) How many minutes does it take the police patrol car to overtake the matatu? (2mks)

ii) How far from the police check point will the patrol car catch up with the matatu? (2mks)

iii) What time of the day will the patrol car overtake the matatu. (2mks)

b) Two passenger trains A and B which are 240m apart and travelling at 164km/hr and 88km/hr respectively approach one another on a straight line. Train A is 150 metres long and train B is 100m long. Determine the time in seconds that elapses before the two trains completely pass each other. (4mks)

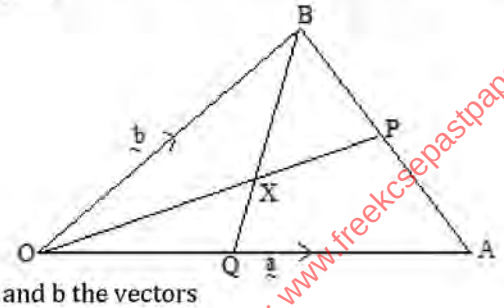
22. The figure below represents two pulley wheels, centres A and B with a rubber band CDEFGHC stretched round them. Radius of wheel centre A = 16cm, AB = 30cm, CD and GF are tangents to the circles. $<CAB = 86.3^0$.



a) Calculate the length of CD. (3mks)

b) Find the angle ABD. (1mk)

23. Below is a triangle OAB, OA is the vector a and OB the vector b. The point P and Q are such that AP = 1/3 AB and OQ =1/3 OA. OP meet BQ at X.



a) Express in terms of a and b the vectors

i) AB (1mk)

ii) OP (1mk)

iii) BQ (1mk)

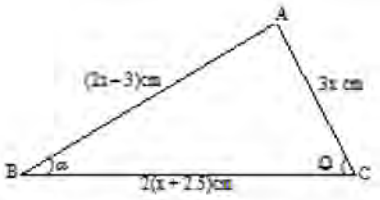
b) If OX = kOP and BX = mBQ express vector OX in two different ways. (2mks)

c) Hence, find the values of k and m. (4mks)

d) Express vector OX in terms of a and b only. (1mk)

c) Find the length of the belt that would go round the pulley CDEFGHC. (6mks)

24. Triangle ABC below has an area of $30cm^2$. In the triangle, $< ABC = \alpha$, $< ACB = \theta$ and $\sin \theta = \cos \theta$ (Hint $< BAC = 90^0$)
Sides AB = (2x – 3)cm, AC = 3xcm and BC = 2(x + 2.5)cm



From the triangle, find

a) the value of x. (3mks)

b) the perimeter of the triangle. (2mks)

c) the perpendicular height from A to base BC. (2mks)

d) the size of angle α . (1mk)

e) the radius of an arc of a circle that passes through B, A and C. (2mks)

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2016
121/2
MATHEMATICS ALT. A
PAPER 2
JULY / AUGUST 2016
2 ½ HOURS

Section 1 (50 marks)
Answer ALL questions.

1. Use mathematical table to evaluate (3mks)

$$\sqrt[3]{\frac{4.68 \times 0.1324^2}{5 \log 7}}$$

2. Make b the subject of the formula. (3mks)

$$t = \sqrt{\frac{a - b}{a + ab}}$$

3. Find the integral values of x which satisfy the following pair of simultaneous inequalities.
$3 - x \leq 1 - \frac{1}{2} x$
$-\frac{1}{2}(x - 5) \leq 7 - x$ (3mks)

4. Find $(1 - 2x)^6$ up to the term in x^3.
Use your expansion to evaluate
0.98^6 (3mks)

5. Solve the equation
$2 \cos 4x = -1$ for $0 \leq x \leq 180^0$. (3mks)

6. A cold water tap can fill a bath in 9 minutes while a hot water tap can fill it in 6 minutes. The drainage pipe can empty it in 4 minutes. The cold and the hot water taps are left running for 2 minutes after which all the three taps are left running. Find how long it takes to fill the bath. (3mks)

7. Solve for x if:
$\log_{10}(x^2 - 9) - \log_{10}(x + 3) - 2 = 0$ (3mks)

8. Write the expression below in surd form and rationalise the denominator.

$$\frac{1 - \cos 60^0}{1 + \tan 30^0}$$ (3mks)

9. The numbers 8, x and 2 are the first three terms of a G.P
i) Find the two possible values of x. (2mks)
ii) Find the sum of the first five terms of the G.P if common ratio is negative. (2mks)

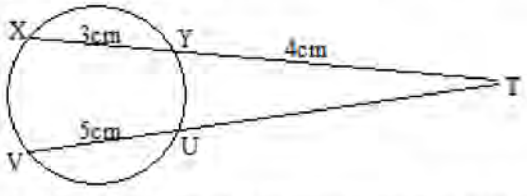
10. The data below shows the ages in months at which six babies started walking; 9, 11, 12, 13, 11 and 10. Find the exact value of variance without using a calculator. (3mks)

11. Two variable x and y are such that x varies partly as y and partly as the square root of y.
Given that $x = 30$ when $y = 9$ and $x = 14$ when $y = 16$, find x when $y = 36$. (4mks)

12. The equation of a circle is given as $x^2 + 2x + y^2 - 16y = 16$
Find the radius and the co-ordinates of the centre of the circle. (3mks)

13. A rectangular card measures 3.5cm by 1.4cm. Find the absolute error in the area of the card. (3mks)

14. In the figure, find the length UT. (3mks)



15. An industrialist has 450 litres of a chemical which is 75% pure. He made the chemical by mixing two brands: brand A which is 70% pure and brand B which if 90% pure. Find the amount of the 90% pure chemical used. (3mks)

16. The volume of two similar cylinders are $2197cm^3$ and $343cm^3$. If the area of the curred surface of the smaller cylinder is $98cm^2$, find the area of the curred surface of the larger cylinder. (3mks)

SECTION 2 (5 marks)
Answer any five questions

17. a) $y = x^2 + x + 8$

x	0	1	2	3	4	5	6	7	8
y			14		28				80

(2mks)

b) Use the completed table and mid-ordinate rule with 4 ordinates to estimate the area bounded by the curve and lines $y = 0, x = 0$ and $x = 8$. (2mks)
c) Use integration method of find the exact area in (b) above. (4mks)
d) Calculate the percentage error in estimating the area using the mid-ordinate rule. (2mks)

18. The probability that Hilda, Lucy and Caroline will be late for breakfast on any one morning are , 1/3 and 1/5 respectively. Using a probability tree diagram or otherwise, find the probability that:
i) None of them will be late. (2mks)
ii) Only one of the them will be late. (3mks)
iii) At least one of them will be late. (3mks)
iv) At most one of them will be late. (2mks)

19. The position of two towns are A(30^0S, 20^0W) and B(30^0S, 80^0E). Find
a) the difference in longitude between the two towns. (1mk)
b) the distance between A and B along the parallel of latitude in
i) km (Take $\pi = 22/7$) and radius of earth = 6370km. (3mks)
ii) nm (2mks)
c) find local time in town B when it is 1.45p.m in town A. (4mks)

20. A number of nurses working at Afya Health Centre decided to raise sh 144 000 to buy a plot of land. Each person was to contribute the same amount. Before the contributions were collected, five of the nurses retired. This meant that the remaining contributors had to pay more to meet the target.
a) If there were n nurses originally, find the expression of the increase in contribution per person. (3mks)
b) If the increase in the contribution per person was sh 2 400, find the number of nurses originally at the health centre. (3mks)
c) How much would each person have contributed if the five people had not retired. (2mks)
d) Find the percentage increase per person because of the retirement. (2mks)

21. A farmer has at least 50 acres of land on which he plans to plant potatoes and cabbages. Each acre of potatoes requires 6 men and each acre of cabbages requires 2 men. The farmer has 240 men available and he must plant at least 10 acres of potatoes. The profit on potatoes is Ksh 1 000 per acre and on cabbages is Ksh 1 200 per acre. If he plants x acres of potatoes and y acres of cabbages.
a) Write down three inequalities in x and y to describe this information. (3mks)
b) Represent these inequalities graphically. (4mks)
c) Use your graph to determine the number of acres for each crop which will give maximum profit and hence find the maximum profit. (3mks)

22. The cost of a minibus was sh 950 000. It depreciated in value by 5% per year for the first two years and by 15% per year for the subsequent years.
a) Calculate the value of the minibus after 5 years. (3mks)
b) After 5 years, the minibus was sold through a dealer at 25% more than it's value to Mr. Owino. If the dealers'; sale price was to be taken as it's value after depreciation, calculate the average monthly rate of depreciation for the 5 years.

23. The quadrilateral ABCD is such that A(-5, -3), B(-4, 0), C (-3, -4) and D (-4,-2)

a) If matrix $T = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ maps ABCD onto A'B'C'D', determine the co-ordinates of A'B'C'D' (2mks)
b) On the grid provided draw
i) ABCD and it's image A'B'C'D'. (2mks)
ii) A''B''C''D'' the image of A'B'C'D' under the reflection on the line $y - x = 0$ (3mks)
c) Find a single matrix that maps ABCD to A''B''C''D''. (2mks)
d) Describe the transformation fully. (1mk)

24. a) Complete the table below for the function $y = x^3 + 3x^2 - 4x - 12$ for $-4 \leq x \leq 2$.

x	-4	-3.5	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1.5	2
y	-4.1			1.1	0	-2.6		-9.4		-13.1	-7.9	

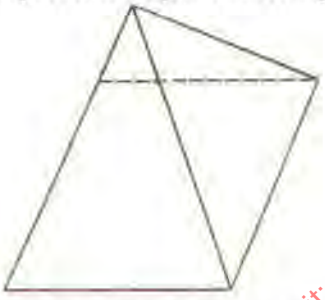
(2 mks)

b) On the grid provided draw the graph of $y = x^3 + 3x^2 - 4x - 12$ for $-4 \leq x \leq 2$. (3mks)
c) Use your graph to find the roots of the following equation.
i) $x^3 + 3x^2 - 4x - 12 = 0$ (1mk)
ii) $6 + 5x - 3x^2 - x^3 = 0$ (3mks)
iii) $x^3 + 3x^2 - 4x - 12 = -5$ (1mk)

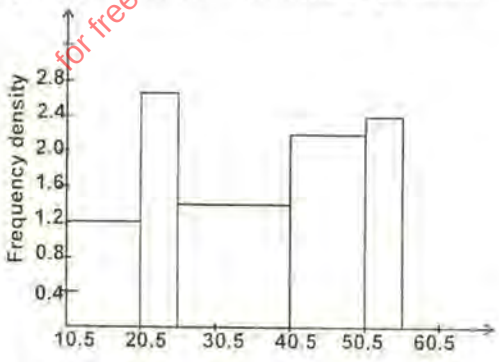
MERU SOUTH FORM 4 JOINT EVALUATION 2016
121/1
MATHEMATICS
Paper 1
Time : 2 ½ Hours

SECTION 1 (50 MARKS)
Answer all the questions in this section in the spaces provided

1. (a) Write 74088 as a product of it's prime factors. (1 marks)
   (b) Using the prime factors in (a) above, find the cuberoot of 74088. (2 marks)
2. Waiganjo who is a beef farmer decides to share his stock among family members. His wife got $\frac{1}{3}$ of the stock. John got half of the remainder while Linda got $\frac{2}{3}$ of the remainder after John's share and the rest went to Karani. If Karani got 100 cows, how many cows was Waiganjo having altogether? (3 marks)
3. Use reciprocals, cube and cuberoot tables to evaluate to 4 significant figure the expression. (3 marks)
   $\sqrt[3]{\frac{2}{2.621} + 3.021^3}$
4. Use logarithms tables only to evaluate (4 marks)
   $\sqrt[3]{\frac{\sin 46}{4.87 \times \log 1.089}}$
5. A rectangular metallic plate has a thickness of 2.5mm, a width of 40cm and a length of 60cm. It has a mass of 5.04kg. Calculate the density of the metal in g/cm^3 (3 marks)
6. Given that Sin (3x + 30) = Cos 2x and x is an acute angle find
   (a) The value of x (2 marks)
   (b) Tan x (1 mark)
7. The solid below represents a square based right pyramid of side 3cm. The slant height is 4cm. Draw its net.

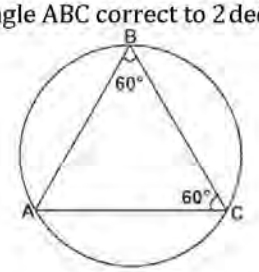


8. An electrician made a loss of 30% by selling a pocket radio at KShs 1400. What profit would he have made had he sold the radio at KSh. 2300? (3 marks)
9. The sum of the interior angles of a regular n-sided polygon is 2880^0. Calculate the value of n hence the size of an exterior angle of the polygon correct to 3 decimal place. (3 marks)
10. Develop a frequency distribution table from the graph below. (4 marks)



11. Given $\left(\frac{1}{125}\right)^t \times 9^{\frac{1}{4}x} = 675$, find the values of t and x. (3 marks)
12. Solve the inequality $3 - x \leq x < \frac{2x+7}{3}$ (3 marks)
13. An arc length of 8cm subtends an angle of 16^0 at the centre of circle. Find the area of the enclosed sector. (3 marks)
14. Njeru bought two pairs of socks and three vests at KShs 1050. Hassan bought four vests and three pairs of socks from the same shop as Njeru at an extra KShs 400. How much would one pay for one pair of socks and two vests. (4 marks)

15. The figure below is a circle of radius 5cm. Points A, B and C are vertices of the triangle. If ∠ABC = ∠ACB = 600, calculate the area of triangle ABC correct to 2 decimal places. (3 marks)

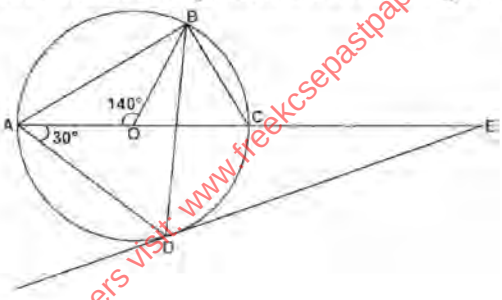


16. Three quantities x, y and z are such that x varies directly as the square of y and inversely as the square root of z. Given that y is increased by 5% and z decreased by 36%, find the percentage change in x. (3 marks)

SECTION II(50 MARKS)

Answer only FIVE questions from this section

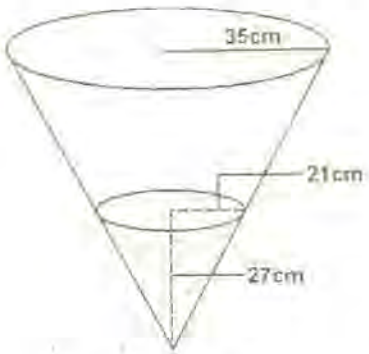
17. (a) Points A, B and Q lie on a straight line such that AQ = 7cm and AB = 5cm. Using a pair of compasses and ruler only construct triangle ABC such that ∠BAC = 75⁰ and BC= 7cm. (3 marks)
    (b) From C drop a perpendicular to meet line AB at N. Measure CN. (2 marks)
    (c) Bisect ∠CBQ. Draw a perpendicular line at Q to meet bisector of CBQ at O. (2marks)
    (d) Draw a circle that touches line BC and line AQ at Q. Measure the radius of the circle. (2 marks)
18. A triangular plot PQR is such that PQ = 18m, QR = 20m and PR = 20m
    (a) Calculate the
    (i) area of the plot in square metres to 2 decimal places. (3 marks)
    (ii) acute angle between the edges PQ and QR to the nearest whole number. (2 marks)
    (b) A circular fence passes through P, Q and R. A water tap is to be installed inside the plot such that the tap is equidistant from each of the vertices P, Q and R. Calculate the
    (i) Distance of the tap from vertex P. (3 marks)
    (ii) Area between the circular fence and the triangular plot. (2 marks)
19. In the figure below A, B and D are points on the circumference of a circle centre O. The points A, O, C and E are on straight line ED is a tangent to the circle at D. Angle AOB = 140⁰ and angle CAD = 30⁰.



    (a) ∠CBD (2 marks)
    (b) ∠OBD (2 marks)
    (c) ∠BDE (2 marks)
    (d) ∠CED (2 marks)
    (e) ∠BCD (2 marks)
20. (a) Using a scale of 1cm to represent 1 unit on both axes draw triangle PQR such that P(2,1), Q (4,2) and R(2,4) (2 marks)
    (b) Triangle $P^{I}Q^{I}R^{I}$ is the triangle PQR after an enlargement centre (0,2) and scale factor -2. Draw and label triangle PIQIR on the same axes as (a) above. (3 marks)
    (c) Triangle $P^{II}Q^{II}R^{II}$ undergoes a positive quarter turn about the origin to give triangle $P^{III}Q^{III}R^{III}$. Draw and label triangle $P^{III}Q^{III}R^{III}$. (3 marks)
21. A growth group decided to raise KShs. 960,000 to buy a piece of land costing KShs 80,000 per hectare. Before they paid four of them pulled out and those that remained were supposed to pay an additional KShs 40,000.
    (a) If the initial number of the members was *n*, write down
    (i) An expression of what each was to contribute originally. (1 mark)
    (ii) An expression of what each of remaining members contributed. (1 mark)
    (b) Calculate the number of members who were initially in the group.
    Using the expressions in (a) above. (5 marks)
    (c) If the land was subdivided equally, calculate what size each member got. (2 marks)
22. (a) Three warships A, B and C are at sea such that ship is 500km on bearing N30⁰E from ship A. Ship C is 700km from ship on a bearing of 120⁰. An enemy ship D is sighted 800km due south of ship B. Taking a scale of 1cm to represent 100km, locate the positions of ships A, B, C and D. (4 marks)
    (b) From your scale drawing, find the bearing of
    (i) Ship A from D. (1 mark)
    (ii) Ship D from C. (1 mark)

(c) Use your scale drawing also to find the distance between.
(i) D and C. (2 marks)
(ii) A and D (2 marks)

23. The diagram below represent a conical vessel of radius 35cm which stands vertically. The vessel contain water to a depth of 27cm. The radius of water surface in the vessel is 21cm.



(a) Calculate
(i) volume of water in the vessel in $3cm^3$. (2 marks)
(ii) the volume of the part of the vessel which is empty. (6 marks)
(b) When a metallic ball was submerged in water the water level rose by 9. Calculate the new radius of water in the vessel. (2 marks)

24. (a) Identify the location and nature of the turning points for the function $y = 2x^3 - 3x^2 - 12x + 8$ (8 marks)
(b) Identify the y-intercept of the function $y = 2x^3 - 3x^2 - 12x + 8$ (1 mark)
(c) Hence sketch the curve of the function $y = 2x^3 - 3x^2 - 12x + 8$ (1 mark)

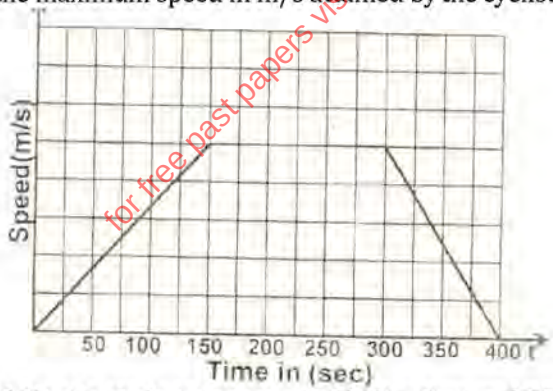
MERU SOUTH FORM 4 JOINT EVALUATION 2016
121/2
MATHEMATICS
Paper 2
Time : 2 ½ Hours

SECTION I (50 MARKS)
Answer all the questions in this section in the spaces provided

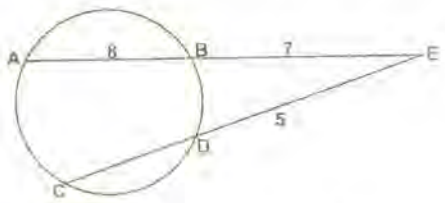
1. Solve $\text{Log}_3x^2 + \text{Log}_3 24 = 4$ (4 marks)
2. Given that a = 3.25 and d = 2.5, find the percentage error in the sum of a + d giving your answer correct to 2 decimal places. (3 marks)
3. The first three consecutive terms of a geometric progression are 2, x and 8. Find the value of x. (3 marks)
4. Evaluate $\frac{1+\sqrt{5}}{3+\sqrt{5}} + \frac{1+\sqrt{5}}{3-\sqrt{5}}$ without using calculators or tables. (3 marks)
5. The table below shows the height of 50 students in a class in a school in Meru South.

Height cm	150-159	160-169	170-179	180-189	190-199	200-209
Number of students		9	12		7	4
Cumulative frequency		11		39		

   (a) Complete the table above by filling in the correct values on the black spaces. (1 mark)
   (b) Calculate the median height of the students. (2 marks)
6. Given that $\text{Sin } x = \frac{\sqrt{3}}{2}$ and x is an acute angle.
   Find without using mathematical tables or calculators tan (90 –x) leaving the answer in surd form. (3 marks)
7. Under a certain transformation the images of points A(1,0) and B(0,0) are A^1 (3,2) and BI(5,6) respectively. Identify the transformation matrix. (2 marks)
8. (a) Expand and simplify $\left(1+\frac{1}{4}\right)^4$ (2 marks)
   (b) Use your expansion in part (a) above to find the approximate value of $(0.98)^4$ correct to 4 significant figures. (2 marks)
9. Find the coordinate at which the circle $x^2 + y^2 - 6x + 4y - 12 = 0$ cut the y-axis. (3 marks)
10. Find the value of k such that $kx^2 - 30x + 25$ is a perfect square. (3 marks)
11. A and B are matrices such that $A = \begin{pmatrix} 0 & 2 \\ 0 & x-1 \end{pmatrix}$ and $B = \begin{pmatrix} x & 2 \\ 1 & -2 \end{pmatrix}$. If A + B is singular, find the possible values of x. (3 marks)
12. The graph below represents the motion of a cyclist from home to schools in one of the schools in Meru South District. Given that the cyclist cycled at a constant speed for 150 seconds and that the distance from home to school is given in 2.75km, find the maximum speed in m/s attained by the cyclist. (4 marks)



13. Chords AB and CD of a circle intersect at E. If AB = 8cm and BE = 7cm and BE = 7cm and DE = 5cm, what is the length of chord CD?

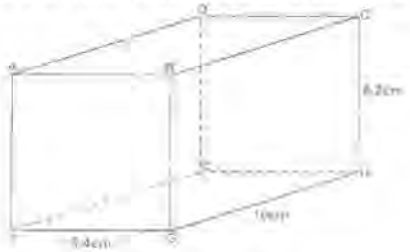


14. A Kenyan bank buys and sells foreign currencies as shown below.

	Buying (KShs)	Selling (KShs)
1 Euro	112.40	112.65
100 Japanese Yen	90.26	90.46

A tourist travelling from Sweden arrived in Kenya, with 8000 Euros. He converted all the 8000 Euros to Kenyan shillings at the bank. While in Kenya he spend KShs 627,820 and converted the remaining money to Japanese Yen at the bank. Calculate the amount of Japanese Yen he received. (4 marks)

15. The diagram below represents a cuboid ABCDEFGH in which FG = 64cm, GH = 10cm and HC = 8.2cm.



Calculate the size of the angle between the lines AB and FH. (2 marks)

16. If $\overrightarrow{OA} = 12i + 8j + 20k$ and $\overrightarrow{OB} = 16i + 4j + 32k$. Find the position vector of a point which divides AB internally in the ratio 3:1. (3 marks)

SECTION II (50 MARKS)

Answer ANY FIVE questions in this section in the spaces provided

17. The average daily production from a sample of 50 cows in a survey was recorded and summed as follows.

Daily milk production	0-4	5-9	10-14	15-19	20-24	25-29
Number of cows	4	15	5	12	10	4

(a) Using an assumed mean of 17 litres estimate;
(i) The mean milk production for the cows. (4 marks)
(ii) The standard deviation. (5 marks)
(b) State the modal class. (1 mark)

18. (a) Given the series; $-7 + 1 + 9 + ... + 145$, find
(i) The number of terms of the series. (3 marks)
(ii) The 11^{th} term of the series. (2 marks)
(c) The seventh term of a GP is 2 while the fourth term of the same progression is 54. Find the common ratio. (3 marks)

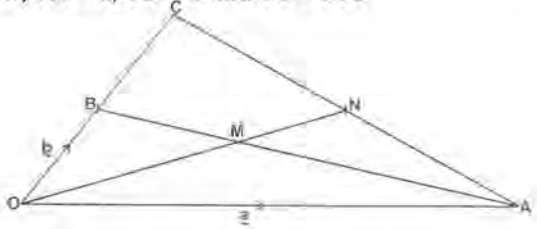
19. Kinyua has 3 red balls, 4 green balls and 3 white balls in a bag.
(a) Given that all the balls are identical in size except for the colour and that two balls are drawn at random one after the other, without replacement, determine the probability that;
(i) The two balls are both red. (2 marks)
(ii) It is a red and green ball. (2 marks)
(b) If the balls are picked and then replaced, determine the probability that
(i) The two balls are both red (2 marks)
(ii) It is a red and a green ball. (2 marks)
(iii) None of the balls is red in colour (2 marks)

20. The table below shows income tax rates of a certain year.

Monthly income (KSh)	Tax rates (%)
Upto 9680	10
9681-18800	15
18801-27920	20
27921-37040	25
Over 37040	30

In that year Mr. Mwangi's monthly earnings were as follows:
Basic salary KShs 19600, House allowance KSh 6,000, medical allowance KShs. 2840 and travelling allowance KShs 5,000 . Mr. Mwangi was entitled to a monthly personal relief of KShs 1056 and an insurance relief of 15% of premium.
(a) Calculate:
(i) Mwangi's taxable income per month. (2 marks)
(ii) Monthly tax by Mwangi if he paid a monthly insurance premium of KShs 3200 (4 marks)
(b) Bob deposited KSs 150,000 in a bank which paid compound interest. If at the end of second year the total amount in the bank was KShs 213,315, calculate the rate of interest p.a. (4 marks)

21. In the figure below, OA = a, OB = b and OC = 3OB



(a) Express the following vectors in terms of a and b
(i) AB = (1 mark)
(ii) AC (1 mark)
(b) (i) Given that AM = ¾ AB and AN = ½ AC, express OM and ON in terms of a and b (4 marks)
(ii) Hence show that points O, M and N are collinear. (4 marks)

22. (a) Complete the table below giving your answer your values correct to 2 decimal places. (2 marks)

x^0	0	30	60	90	120	150	180	210	240	270	300	330	360
2 sin	0	1		2		1							0
Cos x			0.5				-1	0.87			0.5		
1 – Cos x	0		0.5	1			2			1			

(b) On the grid provided and using the same axes draw the graphs of y = 2 Sin x and y = 1 – Cos for $00 \leq x \leq 360^0$.
(c) Use your graph in (b) above to
(i) Solve the equation 2 Sin x + Cos $x^0 = 1$ (2 marks)
(ii) Determine the range of values of x for which 2 Sin $x^0 > 1$ Cos x^0 (1 mark)

23. (a) Complete the table below for the function y = x2 + 3x – 4, given $-5 \leq x \leq 3$.

x	-5	-4	-3	-2	-1	0	1	2	3
y	6				-4				14

(b) Using a scale if 1cm to represent 2 units on y – axis and 1cm to represent 1 unit on x-axis draw the graph of y + 4 = x2 + 3x on the provided graph. (3 marks)
(c) Use your graph to solve the equation below.
(i) $x^2 + 3x - 4 = 0$ (2 marks)
(ii) x2 + 3x – 4 = 2x + 1 (2 marks)
(d) Write down the quadratic equation in its simplest form whose solution is the same as that of c (ii) above (1mark)

24. (a) The cost (c) of hiring a school bus is partly constant and partly varies as the distance to be covered. John hired the bus for a journey of 10km and was charged KShs 13,000 while Jane hired the same bus for a journey of 23km and was charged KShs. 23,400. Find the amount that a journey of 40km would be charged. (5 marks)
(b) Three variables P, Q and R are such that P varies as the square of Q and inversely as R. If P is halved and R is also halved find the percentage change in Q.

THARAKA NORTH/SOUTH SUB-COUNTIES JOINT EVALUATION 2016

Kenya Certificate of Secondary Education

121/1

MATHEMATICS

Paper 1

Time : 2 ½ Hours

SECTION 1 (50 MARKS)

Answer all the questions in this section in the spaces provided

1. Evaluate the without using tables or calculators. (4 marks)

$$\sqrt[3]{\frac{0.726 \times 409.6}{0.1728}}$$

2. Kawira, Mukami and Ngugi shared Shs. 870 such that the ratio of Kawira's share to Mukami's share was $\frac{1}{2} : \frac{1}{3}$, while the ratio of Mukami's share to Ngugi's was $\frac{2}{3} : \frac{3}{4}$. How much did Ngugi get? (3 marks)

3. Wanyama on arrival in Kenya to play Harambee Stars against Uganda Cranes converted 6000 Euros into Kenyan shillings. During his stay in Kenya he spent KShs 260,000 and converted the remaining amount into US Dollars before travelling back to England, using the exchange rates below, find how many US Dollars he got

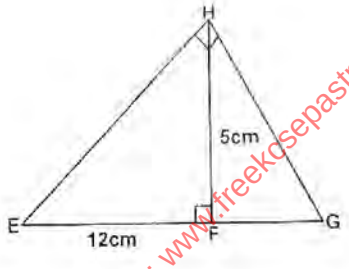
Currency	Buying (KShs)	Selling (KShs)
1 US Dollar	96.20	96.90
1 Euro	112.32	112.83

4. The sum of 4 consecutive odd integers is greater than 24. Determine the first 4 such integers. (3 marks)

5. Simplify $(8y)^{\frac{2}{3}} x\, y^{\frac{4}{3}} = 6 \div 2y^{-2}$ (3 marks)

6. A solid consists of a come and a hemisphere. The common diameter of the hemisphere is 12cm and the slanting height of the cone is 10cm. Calculate correct to 2 d.p, the surface area of the solid. (3 marks)

7. In the figure below, $\angle EHG = \angle EFH = 90^0$, HF = 5cm and EF = 12cm. Calculate the length HG and FH. (4 marks)



8. Simplify $\frac{3x^2 + 5x - 2}{9x^2 - 1}$ (3 marks)

9. An interior angle of a regular polygon is nine time its exterior angle. Find the number of sides of the polygon.(3 marks)

10. Use the table below of reciprocals cuberoots to evaluate leaving your answer in 4 d.p (3 marks)

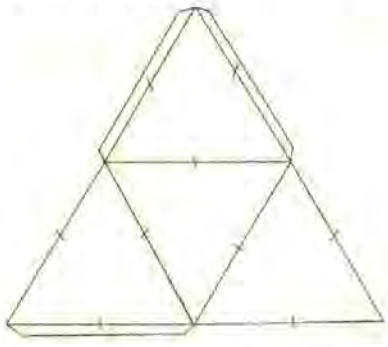
$$\frac{2}{\sqrt[3]{6.859}} + \sqrt{0.2468}$$

11. A square based brass plate is 2mm high and has a mass of 10.5kg. The density of the brass is 8.4g/cm3. Calculate the length of the plate in centimeter. (3 marks)

12. The scale of a map is 1 : 50,000. Find the actual area in hectares of a region represented by a triangle of sides 6cm by 7cm by 8cm. (Give your answer to the nearest whole number) (4 marks)

13. A watch which looses a half-minute every hour was set to read the correct time at 0545h on Monday. Determine the time in the 12 hour system the watch will show on the following Friday at 1945h. (3 marks)

14. Sketch the solid whose net is given below. (2 marks)



15. A metal dealer cuts a metal bar exactly into equal pieces of either 15cm long or 18cm long. Find the least number of the metal that he can cut up into such pieces. (2 marks)

16. Solve for x in the equation Sin $(2x - 30^0)$ = Cos $(40 + 3x)^0$ for $0^0 \leq x \leq 90^0$. (3 marks)

SECTION II (50 MARKS)

Answer ANY 5 questions in this section in the spaces provided.

17. A bus left Makindu at 11.45 am and travelled towards Mombasa at an average speed of 80km/h. A Nissan matatu left Makindu at 1.15 pm on the same day and travelled along the same road at an average speed of 120km/hr. The distance between Makindu and Mombasa is 400km.

(a) Determine the time of the day the Nissan overtook the bus. (5 marks)

(b) Both vehicles continue towards Mombasa at their original speeds. Find how long the Matatu had to wait at Mombasa before the bus arrived. (5 marks)

18. Mutua spent Shs. 10,500 to buy a number of shirts and a number of trousers from a wholesaler at Shs. 150 per shirt and Shs 300 per trouser. Muthengi bought the same number of shirts and trousers from another wholesaler where he paid 20% more for a shirt and 10% less for a trouser. Muthengi spent Shs. 300 more than Mutua.

(a) Determine the number of shirts and trousers each man bought. (4 marks)

(b) Mutua sold all his clothes at a profit of 50% per shirt and 30% per trouser. How much profit did he make? (3 marks)

(c) Muthengi sold all his clothes at a profit of 45% per shirt and 60% per trouser. Calculate the percentage profit he madeon the sale of all his clothes. (3 marks)

19. (a) Using a ruler and compasses only to construct triangle ABC in which BC = AC = 6cm and angle ACB = 135°. (3 marks)

(b) Measure AB. (1 mark)

(c) Drop a perpendicular from A to meet BC produced at D. (1 mark)

(d) Measure AD and hence calculate the area of triangle ABC. (2 marks)

(e) Mark a point P on AD such that the area of triangle PBC is half the area of triangle ABC. (1 mark)

(f) Complete triangle PBC and measure angle PBC. (2 marks)

20. (a) On the Cartesian plane below, draw the quadtrilateral PQRS with vertices.
P(4,6), Q(6,3), R(4,4) and S(2,3) (1 mark)

(b) Draw $P^IQ^IR^IS^I$ the image of PQRS under the transformation defined by the translation vector $T = \begin{pmatrix} -7 \\ -6 \end{pmatrix}$. Write down the coordinates of $P^IQ^IR^IS^I$. (2 marks)

(c) $P^{II}Q^{II}R^{II}S^{II}$ is image $P^IQ^IS^I$ when reflected in the line y = 1. One the same plane, draw $P^{II}Q^{II}R^{II}S^{II}$ (2 marks)

(d) Draw $P^{III}Q^{III}R^{III}S^{III}$ the image $P^{II}Q^{II}R^{II}S^{II}$ when reflected in the y – x = 0 (2 marks)

(e) Find by construction, the centre of the rotation the maps $P^{III}Q^{III}R^{III}S^{III}$ onto PQRS and hence determine the coordinates of the centre of the rotation and the angle of the rotation. (3 marks)

21. Nyongesa is a sales executive earning a salary of KSh. 120,000 and a commission of 8% for the sales in excess of KShs 1,000,000. If in January he earned a total of KShs. 480,000 in salaries and commission.

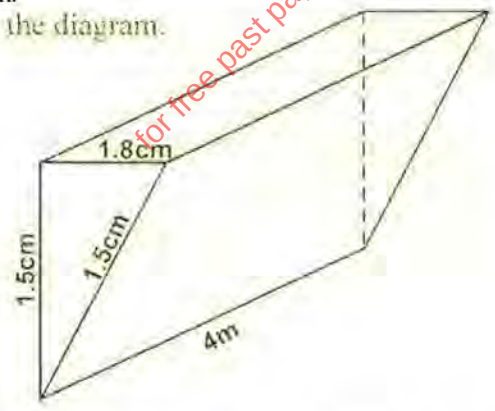
(a) Determine the amount of sales he made in the month of January. (4 marks)

(b) If the sales in the month of February increased by 18% and in the month of March dropped by 30% respectively. Calculate:-

(i) Nyongesa's commission in the month of February. (3 marks)

(ii) His total earning in the month of March. (3 marks)

22. The diagram below shows a trough which is 4m long and has a triangular cross-section. All dimensions are shown on the diagram.



(a) Calculate

(i) the cross-sectional area of the trough in square metres. (2 marks)

(ii) the capacity of the trough in litres (2 marks)

(b) The trough which is initially one third full of water is filled by a pipe which delivers water at the rate of 0.8 litres per second. How long does it take to fill the trough? (2 marks)

(c) The trough in (a) above is initially half full of water. Water is added to the trough using a cylindrical bucket of radius 15cm and height 30cm. How many bucketful of water must be added in order to fill the trough (4marks)

23. The following measures were recorded in a field book using XY as the baseline XY = 400m.

	Y	
C60	340	
	300	120
	240	160E
	220	160F
B100	140	
A120	80	
	X	

(a) Using a scale of 1: 4000 draw an accurate map of the farm (4 marks)
(b) Determine the actual area of the farm in hectares. (4 marks)
(c) If the farm is on scale at Shs. 80,000 per hectare, find how much the farm costs. (2 marks)
24. (a) Solve the simultaneous inequality below and represent the combined solution on a number line. (4 marks)
(b) On the grid provided, illustrate the region which satisfies all the inequalities below. (6 marks)
(i) $3y - 2x \geq 3$
(ii) $2y - x < 10$
(iii) $y + x \leq 5$
(iv) $x < 6$

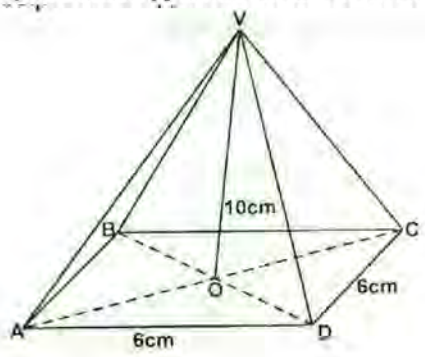
THARAKA NORTH/SOUTH SUB-COUNTIES JOINT EVALUATION 2016
Kenya Certificate of Secondary Education
121/2
MATHEMATICS
Paper 2
Time : 2 ½ Hours

SECTION 1 (50 MARKS)
Answer all the questions in this section in the spaces provided

1. Use a calculator to evaluate. (1 mark)
$$\frac{\sin 480^0 - \cos 765}{\tan 225^0 - \cos(-330^0)}$$
2. Solve the equation $3\cos x = 2\sin^2 x$, where $0^0 \le x \le 360^0$ (4 marks)
3. Simplify $(1+\sqrt{3})(1-\sqrt{3})$. Hence evaluate $\frac{1}{1+\sqrt{3}}$ to 3 s.f. given that $\sqrt{3} = 1.7321$ (3 marks)
4. Obtain the binomial expression for $(1-2x)^5$. Use your expansion to evaluate $(0.98)^5$ to five places of decimal. (4 marks)
5. The marks of 5 pupils in a test were as follows.
53, 41, 60, 80 and 56. Calculate the standard deviation. (4 marks)
6. The curve $y = ax2 + bx + c$ passes through point (1,0). The tangent to the curve when $x = 5$ is parallel to the line $y = 6x$. Given that the curve has a maximum at point (2,3). Find the value of a, b and c. (3 marks)
7. Evaluate $\int_0^2 (x^4 - 22x^2)dx$ (3 marks)
8. Given that $8 \le y \le 12$ and $1 \le x \le 6$, find the maximum value of $\left(\frac{x+y}{y-x}\right)$ (2 marks)
9. Make x the subject of the formulae. $P = \left(\frac{xy}{x+y}\right)^{\frac{1}{2}}$ (3 marks)
10. Under a transformation whose matrix is $A = \begin{pmatrix} a-2 & -2 \\ a & a \end{pmatrix}$, a triangle whose area is 12.5cm2 is mapped onto a triangle whose area is 50cm². Find two possible values of a. (4 marks)
11. Find the centre and the radius of a circle whose equation is $x^2 - 4x + y^2 - 5 = 0$ (3 marks)
12. A trader mixes 3 sacks of sugar which cost Shs. 900 per sack of 60kg with 5 sacks of sugar which costs Shs. 700 per sack of 70kg. He sells the mixture at Shs. 950 per sack of 80kg. Calculate the profit or loss the trader makes. (3 marks)
13. A merchant bought a car for Shs. 40,000. Its depreciation rate is estimated at 10% per annum of its value at the beginning of each year. What will be the value of the car at the end of four years? (3 marks)
14. Given that $A = \begin{pmatrix} 4 & 3 \\ -1 & ? \end{pmatrix}$ and $C = \begin{pmatrix} 14 & 17 \\ -4 & ? \end{pmatrix}$ find B if $A^2 + B = C$ (3 marks)
15. Solve for m in the equation. $3^{4(m+1)} + 3^{4m} = 246$ (3 marks)
16. Three quantities P, Q and R are such that P varies directly as Q and inversely as squareroot of R. Find the percentage change in P if Q is decreased by 40% and R increased by 44%. (4 marks)

SECTION II (50 MARKS)
Answer ANY 5 questions in this section in the spaces provided.

17. A particle in a straight-line such that its displacement 5 (metres) from a given point is $s = t^3 - 6t^2 + 2t + 3$ where t is time in seconds. Find
(a) The displacement of the particle at $t = 3$. (2 marks)
(b) The velocity of the particle where $t = 4$. (2 marks)
(c) The value of t where the particle is momentarily at rest. (3 marks)
(d) The acceleration of the particle when $t = 4$. (3 marks)
18. The figure below is a square based pyramid ABCDV with AD = DC = 6cm, and height VO = 10cm.



(a) State the projection of VA on the base ABCD (1 mark)
(b) Find:

(i) The length of VA (3 marks)
(ii) The angle between VA and ABCD (2 marks)
(iii) The angle between the planes VDC and ABCD (2 marks)
(iv) Volume of the pyramid. (2 marks)

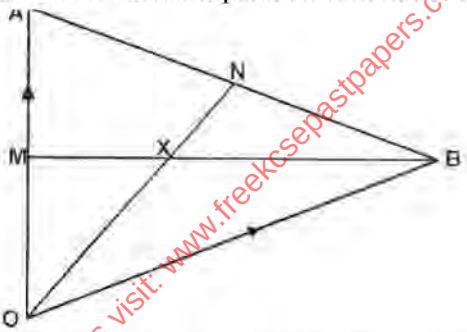
19. (a) Write down the first three terms of the sequence whose nth term is 5n – 2 (2 marks)
(b) The third term of a geometric sequence is 18 and the sixth term is 486. Find the first term and the common ratio. (3 marks)
(c) The first and last term of a AP with 34 terms are 8 and -90 respectively. Find the sum of the first 34 terms. (2 terms)
(d) The 2nd, 4th and 7th of an AP are the first 3 consecutive terms of a GP. Find the common ratio if the first term is 2. (3 terms)

20. The probability of a candidate passing her secondary examination is $\frac{4}{5}$. If she passes her examination the probability of her joining the university is $\frac{2}{3}$. If she fails her examinations, the probability of her joining the university is $\frac{1}{4}$. If she joins the university the probability of her getting a job is $\frac{6}{7}$ and if she doesn't join the university the probability of her getting a job is $\frac{2}{9}$. Using a tree diagram, find:

(a) the probability that she fails her examination. (3 marks)
(b) find the probability that she got a job after failing her secondary examination. (2 marks)
(c) the probability that she joins the university. (2 marks)
(d) the probability that she did not get a job. (3 marks)

21. (a) Using the trapezium rule with seven ordinates, estimate the area of the region bounded by the curve $y = -x^2 + 6x + 1$, the lines $x = 0$, $y = 0$ and $x = 6$. (5 marks)
(b) Calculate
(i) the area of the region in (a) above by integration. (3 marks)
(ii) the percentage error of the estimated area to the actual area of the region, correct to two decimal places. (2 marks)

22. In the figure below OA = a and OB = b. M is the midpoint of OA and AN : NB = 2 : 1



(a) Express in terms of a and b
(i) BA (1 mark)
(ii) BN (1 mark)
(iii) ON (2 marks)
(b) Given that $\overrightarrow{BX} = h\overrightarrow{BM}$ and $\overrightarrow{OX} = k\overrightarrow{ON}$ determine the values of h and k. (6 marks)

23. A globe representing the earth has a radius of 0.5m, points A (0°,10W°), B(0°,35°E), P(60°N, 110°E) and Q(60°N,120°W) are marked on the globe.
(a) Find the length of arc AB, leaving your answer in terms of π. (3 marks)
(b) If O is the centre of the latitude 60°N, find the area of the minor sector OPQ. (4 marks)
(c) If the local time at Q is 10.30 am on Monday. Determine the local time at P. (3 marks)

24. Income tax is charged on annual income at the rate shown below.

Taxable annual income	Rate shs per £
1 – 2300	2
2301 – 4600	3
4601-6900	5
6901-9200	7
9201-11500	9
11501 and over	10

Mr. Mati is single and earns Shs. 12000 per month. He lives in a company house for which he pays nominal rent of KShs 1000 per month. In addition, he claims a single relief of KShs 1056 per month and an insurance relief of KShs 480 per month.
Calculate
(i) Mr. Mati's taxable income (3 marks)
(ii) Calculate the amount of tax he pays per month in shillings. (5 marks)
(iii) Calculate Mr. Mati's net monthly salary. (2 marks)

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2016
Kenya Certificate of Secondary Education
MATHEMATICS
Paper - 121/1
July/August 2016
Time: 2½ hours

SECTION 1 (50 MARKS)
Answer all the questions in this section in the spaces provided.

1. Evaluate $\dfrac{\frac{3}{4}+1\frac{5}{7}\div\frac{4}{7}of\,2\frac{1}{3}}{\left(1\frac{3}{7}-\frac{5}{8}\right)\times\frac{2}{3}}$ (3 marks)

2. A fruit juice dealer sell the juice in packets of 300ml, 500ml and 750ml. Find the size of the smallest container that can fill each of the packets and leave a remainder of 200ml. (3 marks)
3. The length of a rectangle is (3x + 1) cm. Its width is 3cm shorter than its length. Given that its area is 28cm^2. Find its length. (3 marks)
4. In a fundraising committee of 45 people, the ratio of men to women is 7 : 2. Find the number of women required to join the existing committee so that the ratio of men to women changes to 5 : 4. (3 marks)
5. Given that $\log(a/b) = 4.5$ and $\log(a^5b^2) = 5$. Solve for a and b. (4 marks)
6. Atieno is now four times as old as her daughter and six times as old as her son. Twelve years from now the sum of the ages of her daughter and the son will be 9 years less than hers. Calculate Atieno's present age. (3 marks)
7. Using tables of Reciprocals find the value of M if. (4 marks)

$$\frac{1}{M}=\frac{13}{0.156}-\frac{3}{0.6375}$$

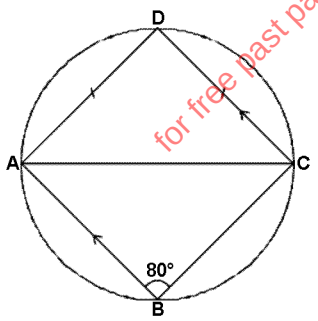
8. If the expression $9x^2 - 30xy + (q + 13y^2)$ is a perfect square, find the value of q. (3 marks)
9. The angle of elevation of a top of a building from a point P is 45°. From a point Q, which is 10m from P towards the base of the building ,the angle of elevation is 48°. Calculate the height of the building to one decimal place. (4 marks)
10. A perpendicular line is drawn from a point Q(4, 6) to the line $5y + 4x = 20$. Find its equation in the form $ay + bx = c$ where a, b and c are integers. (3 marks)
11. The surface area of two similar cylindrical water tanks are 50m^2 and 162m^2. Given that the volume of the larger tank is 36450m^3, find the volume of water in the smaller tank if it is a half full. (4 marks)
12. Without using mathematical tables or calculators, find the value of q given that. (2 marks)

$$Sin(2\theta-40)^\circ = Cos(3\theta+30)^\circ$$

13. Factorise $kl - ml - kn + mn$. Hence use it to simplify the expression. (3 marks)

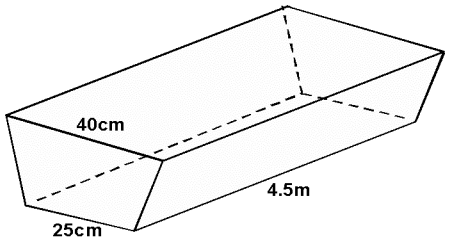
$$\frac{(kl-ml-kn+mn)(l+n)}{n^2-l^2}$$

14. ABCD is a cyclic quadrilateral in which AD = DC and AB is parallel to CD.



Given that angle ABC = 80°, find the sizes of angles DAC, BAC and BCD. (3 marks)

15. The figure below shows a trough which is 40cm wide at the top and 25cm at the bottom. The trough is 20cm deep and 4.5 m long.



Calculate the capacity of the trough in litres. (3 marks)

16. Without using mathematical tables or a calculator evaluate, (2 marks)

$$\frac{2.7 \times 2.04}{300 \times 0.054}$$

SECTION 11 (50 MARKS)

Answer ANY FIVE the questions in this section in the spaces provided.

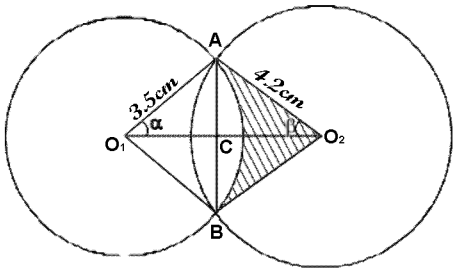
17. Three teachers Michael, Peter and Apollo decided to buy a plot. The plot owner offered the plot at Kshs 2.8 million but agreed to be paid 65% of the value as initial deposit in the ratio 5 : 3 : 2 respectively and that the remaining amount be paid after two years including an additional 5% of the initial value for processing the plot documents. The total balance was to be paid in the same ratio as the deposit.

a) How much of the deposit did each teacher contribute? (5 marks)

b) What amount of money were the teachers to pay at the end of the two years? (3 marks)

c) How much of the total value did Apollo pay? (2 marks)

18. Two circles of radii 3.5cm and 4.2cm with centres O_1 and O_2 respectively intersect at points A and B as shown in the figure below. The distance between the two centres is 6cm.



Calculate the

a) length O_1 C to three decimal places. (2 marks)

b) sizes of $< AO_1B$ and $< AO_2B$ to the nearest degree. (4 marks)

c) area of quadrilateral O_1AO_2B, to two decimal places. (2 marks)

d) shaded area correct to two significant figures. (2 marks)
(Take $p = {}^{22}/_{7}$)

19. Two friends Jane and Tom live 40km apart. One day Jane left her house at 9.00am and cycled towards Tom's house at an average speed of 15km/h. Tom left at 10.30am on the same day and cycled towards Jane's house at an average speed of 25km/h.

a) Determine :

i) the distance form Jane's house where the two friends met. (4 marks)

ii) the time they met. (2 marks)

iii) how far Jane was from Tom's house when they met. (2 marks)

b) The two friends took 10 minutes at the meeting point and then they cycled to Tom's house at an average speed of 12km/h. Find the time they arrived at Tom's house. (2 marks)

20. a) On the grid provided; plot the points A(2, 8), B(1,1), C(3, 4) and D(6, 2) and join them to form quadrilateral ABCD. (2 marks)

b) Locate and plot on the same grid the points A^1, B^1, C^1 and D^1 which are images of A, B, C and D respectively under the reflection in the y-axis. Join the points to form quadrilateral $A^1B^1C^1D^1$ and state the co-ordinates of its vertices. (3 marks)

c) Quadrilateral $A^{11}B^{11}C^{11}D^{11}$ is the image of $A^1B^1C^1D^1$ under enlargement centre origin and scale fact -1. On the same grid draw quadrilateral $A^{11}B^{11}C^{11}D^{11}$ and state the co-ordinates of its vertices. (3 marks)

d) Quadrilateral $A^{11}B^{11}C^{11}D^{11}$ is the image of ABCD under a certain transformation T. Describe transformation T fully. (2 marks)

21. The table below is for the function $y = (3 - x)(x + 1)$

x	-3	-2	-1	0	1	2	3	4
y	-12				4			

a) Complete the table (2 marks)

b) Use the values from the table above to draw the graph of $y = (3 - x)(x + 1)$. Using the following scale; Horizontal axis : 2cm for 1 unit ; vertical axis : 1cm for 1 unit. (3 marks)

c) Use your graph in part (b) above to solve the following quadratic equations:.

i) $-x^2 + 2x + 3 = 0$ (1 mark)

ii) $-x^2 + x + 6 = 0$ (4 marks)

22. The heights (in cm) of some seedlings in a nursery are recorded in the table below.

Height (cm)	1.0 - 1.4	1.5 - 1.9	2.0 - 2.4	2.5 - 2.9
No. of seedlings	2	6	4	8

a) Calculate the mean height of the seedlings in the nursery. (4 marks)
b) Estimate the median height of the seedlings in the nursery. (3 marks)
c) On the grid provided, draw a frequency polygon to represent the information. (3 marks)

23. A particle moves along a straight line such that its displacement s in metres is given by $s = t^3 - 4t^2 - 16t + 4$, where t is time in seconds. Find
a) the displacement of the particle when $t = 4$ seconds. (2 marks)
b) the velocity of the particle when $t = 4$ seconds. (3 marks)
c) the value of t when the particle is momentarily at rest. (3 marks)
d) the acceleration of the particle when $t = 2$ seconds. (2 marks)

24. A three digit number is such that the sum of its hundreds and ten digit is 10. When the number is divided by its hundreds digit, the quotient is 108. If the number is divided by the sum of all the digits, the quotient is 36. Find the number. (10 marks)

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2016
Kenya Certificate of Secondary Education
MATHEMATICS

Paper - 121/
July/August 2016
Time: 2½ hours

SECTION 1 (50 MARKS)
Answer all the questions in this section in the spaces provided.

1. Use logarithms, correct to 4 significant figures to evaluate: (4 marks)

$$\left(\frac{\log 13.7}{0.8452 \times 69.3}\right)^{\frac{1}{3}}$$

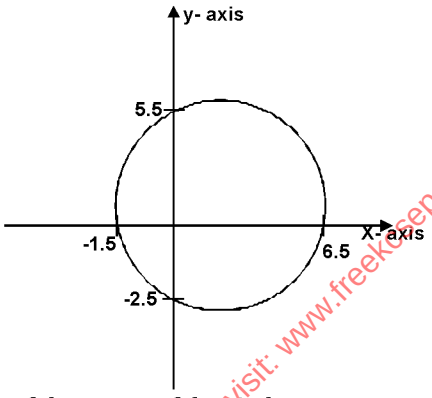
2. A quadratic curve passes through the points $(-\sqrt{3}, 0)$ and $(\sqrt{3}, 0)$. Find the equation of the curve in the form $y = ax^2 + b$ where a and b are integers. (2 marks)

3. Given that $\frac{3}{3+\sqrt{5}} + \frac{3\sqrt{5}}{3-\sqrt{5}} = a + b\sqrt{5}$. Find the values of a and b. (3 marks)

4. A trader mixes imported sugar costing Kshs 100 per kilogram with local sugar costing Kshs 150 per kilogram. When he sells the mixture at Kshs 165 he makes a profit of 44%. Find the ratio in which he mixes the two types of sugar. (3 marks)

5. Solve the equation $8\sin^2 x + 2\cos x - 5 = 0$ for $0° \leq x° \leq 180$ giving your answers to two decimal places. (4 marks)

6. The diagram below shows a sketch of a circle drawn in the Cartesian plane such that it cuts the axes at x=-1.5, x = 6.5, y = 5.5 and y = -2.5



a) State the co-ordinates of the centre of the circle. (1 mark)
b) State the radius of the circle in surd form. (1 mark)
c) Find the equation of the circle in the form $ax^2 + ay^2 + bx + cy + d$ where a, b, c and d are integers. (2 marks)

7. a) Expand and simplify $(1 - \frac{1}{2}x)^5$ in ascending powers of x up to the term x^3. (1 mark)
   b) Use the expansion above to estimate the value of $(0.98)^5$ to 3 decimal places. (2 marks)

8. Make R the subject of the formula; (3 marks)

$$m = \frac{CR}{\sqrt[3]{R^3 - C}}$$

9. The position vectors of points A and B are -i + j - 8k and 2i + 3j - 2k respectively. Find the magnitude of the AB. (3 marks)

10. A quantity P is a partly constant and party varies inversely as Q. Q = 9 when P = 3 and Q = 18 when P = 9. Find P when Q = 12. (4 marks)

11. The marks scored by a student in a test of 11 subjects were as follows.

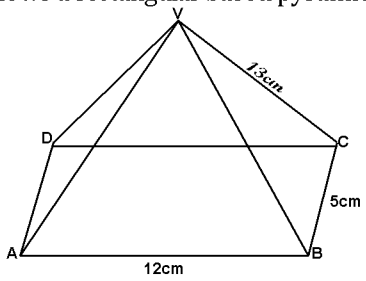
Subject	Marks
English	40
Kiswahili	90
Mathematics	50
Biology	40
Physics	70
Chemistry	60
History	20
Geography	10
CRE	60
Computer	70
French	80

Determine the quartile deviation of the student's scores. (3 marks)

12. A triangle ABC is such that : AB is exactly 10cm; BC is 4.0cm and AC is 12.2cm measured to the nearest 2 millimetres. Calculate the maximum possible perimeter of the triangle. (2 marks)

13. The sum of the first n terms of the sequence : 216, 72, 24 . . . .is $323^{5}/_{9}$, Determine the value of n. (3 marks)

14. The diagram below shows a rectangular based pyramid in which AB = 12cm, BC=5cm and AV=BV=CV=DV=13cm.



Calculate the angle plane DAV makes with the base ABCD correct to 4 significant figures. (3 marks)

15. Five men working for eight hours daily complete a piece of work in three days. How long will it take twelve men working for five hours daily to complete the same piece of work. (3 marks)

16. The points P and Q are 7.4cm apart. By construction locate the locus of R such that PR = 2.5cm and ∠PRQ = 90° (3 marks)

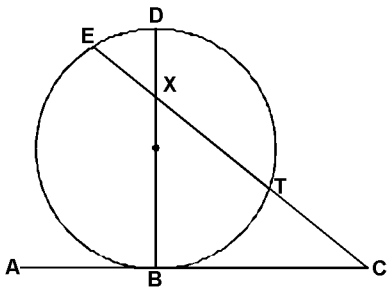
SECTION 11 (50 MARKS)

Answer ANY FIVE questions in this section in the spaces provided.

17. A square A(-3, -3), B(-6, -3), C(-6, 0), D(-3, 0) is transformed by the matrix
    a) Draw ABCD and its image $A^1B^1C^1D^1$ under P on the grid provided below. (4 marks)
    b) $A^{11}B^{11}C^{11}D^{11}$ is the image of $A^1B^1C^1D^1$ under a transformation represented by the matrix .
    State the co-ordinates of $A^{11}B^{11}C^{11}D^{11}$ and draw it on the same grid above. (3 marks)
    c) State a single matrix that maps $A^{11}B^{11}C^{11}D^{11}$ onto ABCD. (3 marks)

18. **a)** A plane leaves Airport A(40°S, 36°W) at 1400 hrs on Monday and flies due North to airport B (50°N, 36°W). Calculate the distance the plane covers in kilometres. (Take p = $^{22}/_{7}$ and R = 6370km) (3 marks)
    b) After a 45 minutes stoppage at B, the plane flies due East to airport C, a distance of 2550 nautical miles from B. Find
    i) the position of C. (4 marks)
    ii) The local time the plane lands at C if its average speed for the whole journey is 1200km/hr
    (Take 1 nautical mile = 1.854km) (3 marks)

19. The diagram below not drawn to scale shows a circle in which BD is the diameter and ABC is a tangent to the circle at point B. EXTC is a straight line.



Given that BC = 6cm, BX=8cm, EX=2cm. Calculate

i) XC (2 marks)

ii) TC (2 marks)

iii) DX (3 marks)

iv) The radius of the circle (2 marks)

v) Angle BCE (1 mark)

20. a) Complete the table below.

x°	-30°	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°
Sin (x + 30)°	0.00	0.50		1.00	0.87		0.00		-0.87		-0.87
Cos (x - 15)°	0.71		0.97		0.26	-0.26		0.97		-0.71	-0.26

(2 marks)

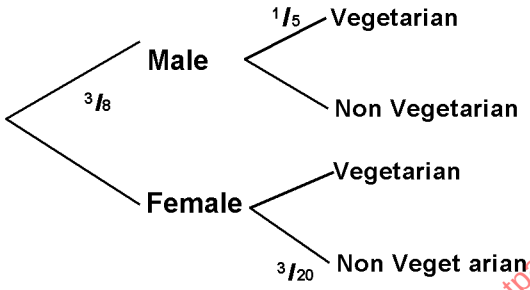
b) Draw the graph of y = sin (x + 30)° and y = Cos (x - 15)° for -30° £ x £ 270° on the same grid. Take 1 cm to represent 30° on the x-axis and 1 cm to represent 0.2 units on the y-axis (5 marks)

c) Using your graph drawn in (b) above.

i) Find the values of x for which Cos (x - 15)° - Sin (x - 30)° = 0 (2 marks)

ii) State the co-ordinates of the turning point of the curve for the function y = cos (x -15)° on the negative section of y - axis. (1 mark)

21. A survey was conducted in a county of 160,00 adults to determine the relationship between their gender and eating habits. The result was presented in a tree diagram as shown below.



a) Complete the tree diagram using appropriate fractions . (2 marks)

b) Determine the number of adults who are non vegetarian. (2 marks)

c) An adult is selected at random from the county, find the probability that she is a female vegetarian. (2 marks)

d) The adults were put in two groups: vegetarians verses non-vegetarians. Thereafter an adult is picked from each group. Determine the probability that the two adults picked are both male. (4 marks)

22. The table below shows annual income tax rates for the year 2010

INCOME (K£ p.a)	Tax (shs per k£)
1 - 4800	2
4801 - 9600	3
9601- 14400	5
14401 - 19200	7
19201 - 24000	9
24001 and above	10

Mr. Karani's monthly earnings were as follows:-

Basic salary = Kshs 24,000

House allowance = Kshs 12,000

Medical allowance = Kshs 1,800

a) Using the tax table above, calculate Mr. Karani's net Pay-As-You-Earn (PAYE) per month if his monthly family relief is Kshs 1,410. (6 marks)

b) If Mr. Karani pays Kshs 280 for NHIF, Ksh 3200 for hire purchase and Kshs 5,250 for loan repayment, calculate his net monthly salary. (4 marks)

23. A rectangular field measures 20 metres by 16 metres. A path of uniform width x - metres is made all round it. This make the area of the field to reduce in the ratio 7 : 16.

a) Find an expression in x for the new length (1 mark)

b) Find the expression in x for the new area. (1 mark)

c) Find the possible value of x (4 marks)

d) The remaining area of the field is divided among three siblings Abdi, Bor and Celine such that the ratio of Abdi to Bor's is 3 : 4 while that of Bor's to Celine's is 6 : 5. Find the difference between the area of Celine's share and Abdi's share. (4 marks)

24. A school has to transport atleast 420 students to a championship. The school uses two vans A and B. Van A carries 40 students per trip while B carries 60 students per trip. The vans are to use less than 320 litres of fuel. Van A uses 20 litres per trip while B uses 40 litres per trip.
The number of trips made by Van A should be less than 3 times the number of trips made by van B.
Van A should make more than 5 trips.

a) Taking x to represent the trips made by van A and y to represent the trips made by van B, represent the above information in linear inequalities of $x$and y. (4 marks)

b) On the grid provided below draw the inequalities above. (4 marks)

c) Use the inequalities above to determine the number of trips made by A and B that would help minimise the cost of fuel used for the trips. (2 marks)

GUCHA SOUTH EVALUATION TEST (GSET)
Kenya Certificate of Secondary Education
MATHEMATICS
Paper 1
July/August 2016
Time: 2½ Hours

SECTION I : (50 MARKS)
Attempt all questio ns in this section.

1. Evaluate : (3 marks)

$$\frac{\sqrt{\frac{1}{4}\text{ of } 3\frac{1}{2} + \frac{3}{2}\left(\frac{5}{2} - \frac{2}{3}\right)}}{\frac{3}{4}\text{ of } 2\frac{1}{2} \div \frac{1}{4}}$$

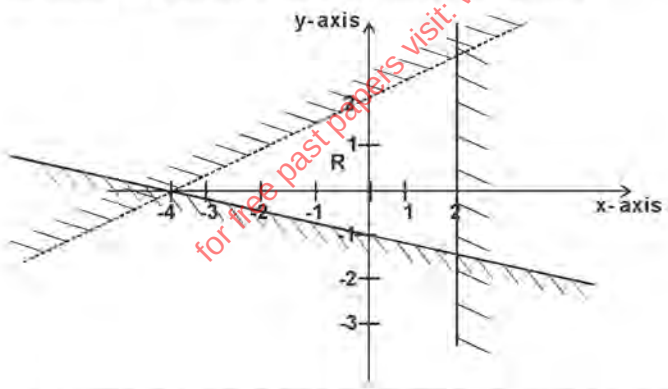
2. Simplify the expression (3 marks)

$$\frac{4x^2 - y^2}{2x^2 - 3xy - 2y^2}$$

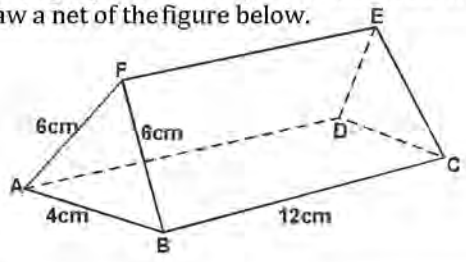
3. The prime numbers less than 10 are multiplied to form a number
   a) Write down the number formed. (2 marks)
   b) State the total value of the first digit in the number formed in 2(a) above. (1 mark)
4. Joyce exchanged Ksh.600,000 to Sterling pounds. After settling the bills worth £1200, she changed the balance to Euros. She then purchased goods worthy 200 Euros. Using the exchange rates below, calculate her balance in Kenyan shillings. (4 marks)

	Buying (Ksh)	Selling (Ksh)
1 Sterling pound	114.20	114.50
1 Euro	101.20	101.30

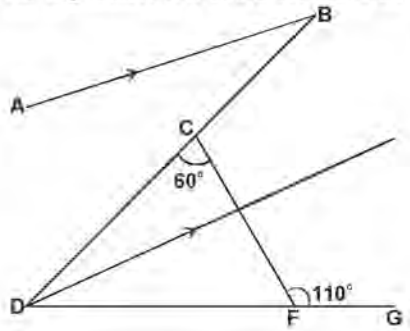
5. Solve for x in the following equation (3 marks)
   $9^x(27^{x-1}) = \tan 45^o$
6. If OA = 2i - 4k and OB = -2i + j - k. Find |AB| (3 marks)
7. Under an enlargement with scale factor -3, the point P(3, 6) is mapped onto P¹(7, 18). Find the centre of enlargement hence image of a point Q(1, 1) under the same enlargement. (4 marks)
8. Form the three inequalities that satisfy the given region R. (3 marks)



9. The interior angle of a polygon is 90° more than its exterior angle. Find the number of sides of the polygon. (3 marks)
10. An 890kg culvert is made of a hollow cylindrical material with outer radius of 76cm and interval radius of 64cm and length 3m. Determine the density of the material used in its construction in kg/m³ correct to 1 decimal place. (Take p = 3.142) (3 marks)
11. A van leaves town X at 6.45a.m and travels towards town Y 400km away at an average speed of 80km/hr at 8.00a.m, a truck left Y for X at an average speed of 60km/hr. At what time will the two vehicles meet. (3 marks)
12. Using a scale of 1 : 2 draw a net of the figure below. (3 marks)



13. In the figure below AB is parallel to DE. DE bisects ĐBDG and ĐDCF = 60° and ĐCFG = 110°



Find
a) ∠CDF (2 marks)
b) ∠ABD (1 mark)

14. The mean of five numbers is 20. The mean of the first three numbers is 16. The fifth number is greater than the fourth by 8. Find the fifth number. (3 marks)

15. The line -nx + 2y = 3 passes through the point (-3, 1). Calculate:
i) The angle the line makes with x-axis. (2 marks)
ii) The x-intercept of the line (1 mark)

16. Determine the equation of normal to the curve $y = x^2 - 3x + 2$ at a poit (-2, 3) giving your answer in the form ax + by = c (3 marks)

SECTION II : (50 MARKS)
Attempt only five questions

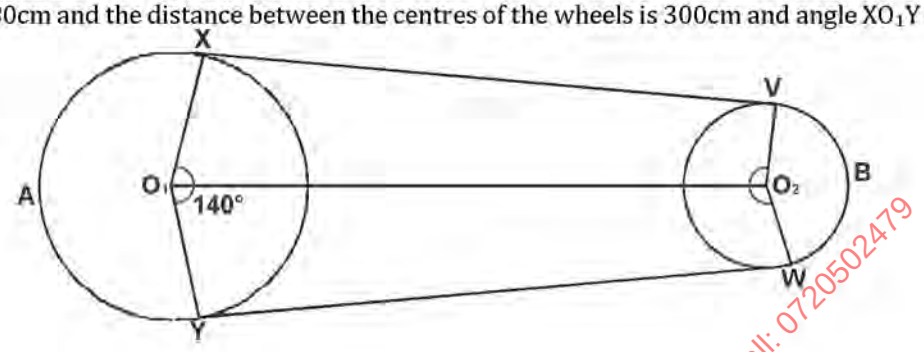
17. Every Saturday Alex drives a distance of 80km on a bearing of 074° to pick up his brother John to go to church. The church is 75km from John's house on a bearing of S50°E. After church they drive a distance of 100km on a bearing of 260° to check on their father before Alex drives to John's home to drop him off then proceed to his house.
a) Using a scale of 1cm to represent 10km show the relative positions of these places. (4 marks)
b) Use your diagram to determine
i) the true bearing of Alex's home from their father's house. (1 mark)
ii) the compass bearing of the father's home from John's home (1 mark)
iii) the distance between John's home and the father's home (2 marks)
iv) the total distance Alex travels every Saturday. (2 marks)

18. In the figure below the tap cone was formed from a sector of area 42pcm²

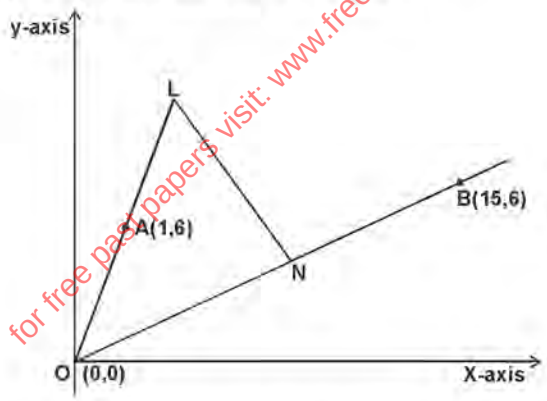
Calculate in terms of p
a) The total surface area of the shape (4 marks)
b) The volume of the shape (6 marks)

19. The British government hired two planes to airlift football fans to South Africa for the world cup tournament. Each plane took 10½ hours to reach its destination. Boeing 747 has carrying capacity of 300 people and consumes fuel at 120 litres per minutes. It makes 5 strips at full capacity. Boeing 740 has carrying capacity of 140 people and consumes fuel at 200 litres per minutes. It makes 8 strips at full capacity. If the government sponsored the fans one way at the cost of 800 dollars per fan, calculate:
a) The total number of fans airlifted to South Africa. (2 marks)
b) The total cost of fuel used if one litre cost 0.3 dollars. (4 marks)
c) The total collection in dollars made by each plane. (2 marks)
c) The net profit made by each plane (2 marks)

20. A quadrilateral ABCD has vertices A(3, 7), B(5, 5), C(3, 1) and D(1, 5).
    a) On the grid provided plot the quadrilateral ABCD (2 marks)
    b) $A^1B^1C^1D^1$ is the image of ABCD under a translation $\begin{pmatrix} 5 \\ -1 \end{pmatrix}$. Plot $A^1B^1C^1D^1$ and state its coordinates. (2 marks)
    c) Plot $A^{11}B^{11}C^{11}D^{11}$ the image of $A^1B^1C^1D^1$ after a rotation about the origin through a positive quarter turn. State its coordinates. (3 marks)
    d) $A^{111}B^{111}C^{111}D^{111}$ is the image of $A^{11}B^{11}C^{11}D^{11}$ after a reflection on the line y = 0. Plot $A^{111}B^{111}C^{111}D^{111}$ and state its coordinates. (3 marks)
21. Using a ruler and pair of compass only construct
    a) A line PQ 8cm long. On the line construct triangle PQR such that ĐQPR = 75° and line PR = 7cm. Measure line QR. (4 marks)
    b) Construct a circumcircle of triangle PQR and measure its radius. (3 marks)
    c) Calculate the difference in area between the circle and the triangle. (3 marks)
22. The figure below shows a pulley system where a conveyor belt is tied round two wheels. The radius of the larger wheel is 180cm and the distance between the centres of the wheels is 300cm and angle $XO_1Y = 140°$. ($p = {}^{22}/_{7}$)



    Determine :
    a) Length XV (2 marks)
    b) VBW (4 marks)
    c) XAY (2 marks)
    d) Total length of conveyor belt (2 marks)
23. In the diagram below, the coordinates of points A and B are (1, 6) and (15, 6) respectively. Point N is on OB such that 3ON = 2OB. Line OA is produced to L such that OL = 3OA.



    a) Find vector LN (2 marks)
    b) Given that a point M is on LN such that LM : MN = 3 : 4 find the coordinates of M. (2 marks)
    c) If line OM is produced to T such that OM : MT = 6 : 1.
    i) Find the position vector of T (2 marks)
    ii) Show that points L, T and B are collinear (4 marks)
24. a) Complete the table below for the function $y = x^2 + 3$ (2 marks)

x	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
y	4		7			15.25	19		27		39

    b) Use the mid-ordinate rule with five strips to estimate the area bounded by the curve $y = x^2 + 3$, the line x = 1 and the line x = 6 (2 marks)
    c) Use integration to find the exact area in (b) above. (3 marks)
    d) Calculate the percentage error arising from the use of mid-ordinate rule. (3 marks)

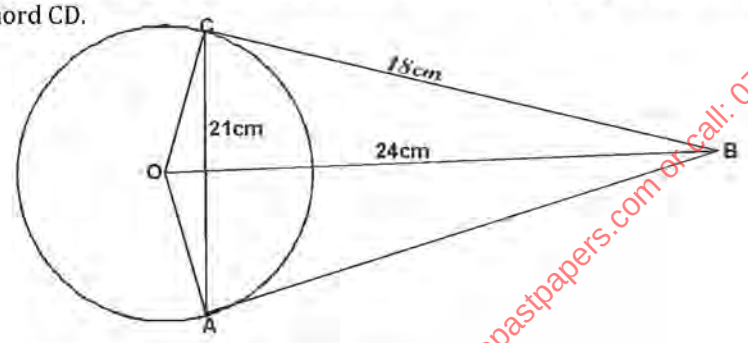
GUCHA SOUTH EVALUATION TEST (GSET)
Kenya Certificate of Secondary Education
MATHEMATICS
Paper 2
July/August 2016
Time: 2½ Hours

SECTION I : (50 MARKS)
Answer all questions from this section.

1. Use logarithm table to calculate the value of : (4 marks)

$$\sqrt[3]{\frac{0.7214 \times 20.37}{69.8}}$$

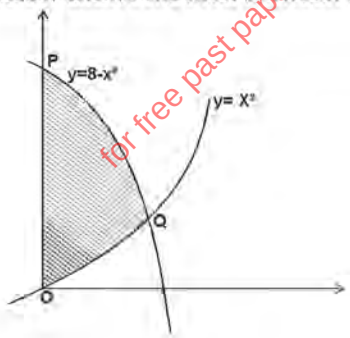
2. It is given that $\frac{8\sqrt{5}}{\sqrt{7}-\sqrt{5}} = a + b\sqrt{c}$. Find the values of a, b and c. (3 marks)
3. In the figure below determine the length of the minor arc AC correct to 4 s.f where AB and BC are tangents to the circle whose centre is O at points A and C respectively. Also OB = 24cm, BC = 18cm and AC = 21cm. (4 marks)
4. M = (2, 3, 4) and N = (7, 11, 14). Find vector MN in terms of i, j and k. Use this answer to find the distance from M to N correct to 2d.p. (3 marks)
5. Chords AB and CD in the figure shown below intersect externally at Q. If AB = 5cm, BQ = 6cm and DQ = 4cm. Calculate the length of chord CD. (2 marks)



6. Make b the subject of the formula (3 marks)

$$t = \sqrt{\frac{a-b}{1+ab}}$$

7. If x lies between 0° and 360° and sin x° = 0.2588. Find two values of x° (2 marks)
8. Calculate the percentage error involved in finding the value of 8.6 ÷ 3.4 (3 marks)
9. The diagram below shows the area between the curves $y = x^2$ and $y = 8 - x^2$ and the y-axis.



a) Find the coordinates of points P and Q. (2 marks)
b) Find the area of the shaded region. (5 marks)

10. Under a transformation whose matrix is $M = \begin{pmatrix} x-2 & \frac{1}{2} \\ 8 & x \end{pmatrix}$ a triangle whose area is 12.5cm² is mapped onto a triangle whose area is 50cm². Find the possible values of x. (3 marks)
11. Six men take 56 hours to pack 2240 parcels. Find the number of hours 5 men would take to pack 2500 parcels if they worked at the same rate. (2 marks)
12. Given that y partly varies as x and partly varies inversely as x^2. If y = 3 when x = 1 and y = 5 when x = ½, calculate the value of y when x = $^3/_2$ (4 marks)
13. Find the number of terms in the sequence

3, 7, 11 ....., ..., ..., 83 (2 marks)

14. By completing the square solve $x^2 + 5x + 3 = 0$ (3 marks)

15. a) Expand and simplify $\left(1+\frac{5}{x}\right)^6$ to the 4th term. (2 marks)

b) Use your expansion in (a) above to approximate the value of $(3.5)^6$ (2 marks)

16. In form 3 a student is required to take either Geography or History but not both. In Etago division the total number of students taking Geography and history is not more than 300. Students taking History are more than the Geography ones but less than twice the ones taking Geography. Geography students are not less than 50 while History students are not more than 200. If x represents History students and y represents Geography students. Write down 5 inequalities representing the above information. (3 marks)

SECTION II : (50 MARKS)

Answer ONLY FIVE questions from this section.

17. The table below shows the rates of taxation in a certain year.

Monthly income in Kshs.	Tax rate in Ksh. each
Upto 9680	10%
from 9681 to 18800	15%
from 18801 to 27920	20%
from 27921 to 37040	25%
Over 37040	30%

In that year Opiyo was earning a basic salary of Ksh.21000 per month. In addition he was entitled to a house allowance of Ksh.12,000, commuter allowance of Ksh.3040 and a personal relief of Ksh.1056 per month.

a) Calculate how much income tax Opiyo paid per month. (7 marks)

b) Opiyo's other deductions per month were:
Cooperative society contributions shs.2000
Loan repayment shs.2500
Calculate his net salary per month. (3 marks)

18. The position of two towns A and B are A(40°S, 28°E), B(40°S, 52°W). Find :

a) The difference in longitude between A and B (2 marks)

b) i) The distance from A to B along a circle of latitude in nautical miles. (2 marks)

ii) In kilometres (2 marks)

c) Town C is 4800km due North of town B. Find the latitude of town C. (Take radius of the earth to be 6370km) (4 marks)

19. Box M has 2 green balls and 3 yellow balls. Box N has 5 green balls and 4 yellow balls. A box is selected at random and two balls are drawn from it in succession without replacement.

a) Draw a tree diagram to represent the information above. (2 marks)

b) Find the probability that :

i) they are both green (3 marks)

ii) they are both yellow and from box N (2 marks)

iii) the second ball is yellow (3 marks)

20. Taps X and Y can fill a tank in 3hrs and 5hrs respectively, while tap Z can empty the same tank in 4 hours.

a) If tap Z is closed, how long will it take taps X and Y to fill the tank ? (5 marks)

b) Calculate the time it will take to fill the tank when the three taps X, Y and X are left open and running ? (5 marks)

21. The table below shows exam marks obtained by 40 pupils.

8	33	45	45	19
11	34	43	29	28
26	16	22	38	39
37	17	25	34	41
22	26	33	27	40
41	21	32	17	22
18	25	27	35	40
23	36	30	44	42

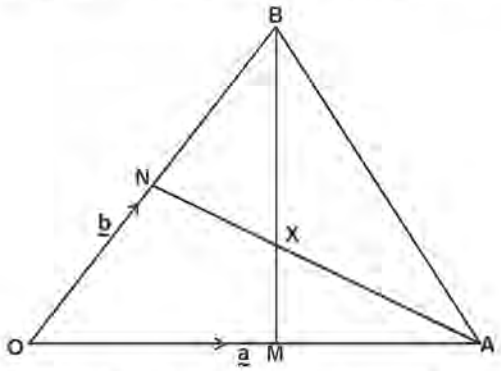
a) Make a frequency distribution table using a class interval of 10 with marks starting from 1 - 10. (2 marks)

b) From the frequency distribution table in (a) above calculate :

i) the standard deviation using assumed mean of 25.5 (4 marks)

ii) the interquartile range (4 marks)

22. In triangle OAB, M and N are points on OA and OB respectively such that OM : MA = 2 : 3 and ON : NB = 2 : 1. AN and BM intersect at X as shown in the diagram below.



a) Given that OA = a and OB = b. Express in terms of a or b.
i) BM (1 mark)
ii) AN (1 mark)

b) Taking BX = tBM and AX = hAN. Where t and h are scalars, find two expressions for OX, hence find the values of h and t. (8 marks)

23. An ant moves along a straight line so that t seconds after observation is commenced, its distance in metres from a fixed point O in the line is given by $h = 12 - 6t + 2t^3$. Calculate:

a) The distance after 2 seconds (2 marks)
b) The speed of the ant when t = 3 seconds. (3 marks)
c) The acceleration of the ant when t = 2 seconds (3 marks)
d) The value of t for which the ant is momentarily at rest. (2 marks)

24. a) Copy and complete the following table for $y = 5 \sin (2x + 30)$ for $0^o \leq x \leq 360^o$

x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
y		5.0			-5.0			5.0		-2.5			2.5

b) On the grid provided, draw the graph of $y = 5 \sin (2x + 30)$. Use a scale of 1cm to represent 30° on the x-axis and 1cm to represent 1 unit on the y-axis. (3 marks)
c) State the amplitude and work out the period of the wave. (2 marks)
d) Use your graph above to find the range of values of x for which $5 \sin(2x + 30) < 1$ (3 marks)

GUCHA SOUTH EVALUATION TEST (GSET)
Kenya Certificate of Secondary Education
MATHEMATICS
Paper 1
July/August 2016
Time: 2½ Hours

1

Num $\frac{1}{2}$ of $\frac{7}{2} + \frac{3}{2}\begin{pmatrix}11\\6\end{pmatrix}$

$= \frac{7}{4} + \frac{11}{4}$

$= \frac{18}{4}$

Den $\frac{3}{4}$ of $\frac{5}{2} \div \frac{1}{4}$

$= \frac{15}{8} \times \frac{4}{1}$

$= \frac{15}{2}$

$\frac{18}{4} \div \frac{15}{2} = \frac{18}{4} \times \frac{2}{15}$

$= \frac{3}{5}$

2

Num $4x^2 - y^2 = (2x + y)(2x - y)$

Den $2x^2 - 4xy + xy - 2y^2$

$2x(x - 2y) + y(x - 2y)$

$(2x + y)(x - 2y)$

$\frac{(2x + y)(2x - y)}{(2x + y)(x - 2y)}$

$= \frac{2x - y}{x - 2y}$

3

a) Prime numbers 2, 3, 5, 7

$= 2 \times 3 \times 5 \times 7$

$= 210$

b) 200

4

£1200 to Ksh.$= 1200 \times 114.20$

$= 137040$

Balance $600000 - 137040 = 462,960$

Ksh.to Euros $= \frac{462960}{101.30}$

$= 4570.188$

Balance $= 4570.188 - 200 = 4370.188$

Balance in Ksh. $= 4370.188 \times 101.20$

$=$ Ksh.442,263

5

$9^x(27^{x-1}) = 1$

$3^{2x}(3^{3(x-1)} = 3^o$

$3^{5x-3} = 3^o$

$5x - 3 = 0$

$x = {}^3/_5$

6

$AB = OB - OA$

$\begin{pmatrix}-2\\1\\-1\end{pmatrix} - \begin{pmatrix}2\\0\\-4\end{pmatrix}$

$= \begin{pmatrix}-4\\1\\3\end{pmatrix}$

$|AB| = \sqrt{16 + 1 + 9}$

$= 5.099$

7

$\begin{pmatrix}x\\y\end{pmatrix} = \frac{3}{4}\begin{pmatrix}3\\6\end{pmatrix} + \frac{1}{4}\begin{pmatrix}7\\18\end{pmatrix}$

$= \begin{pmatrix}4\\9\end{pmatrix}$

centre is (4, 9)

$\frac{1}{4}\begin{pmatrix}x\\y\end{pmatrix} = \begin{pmatrix}4\\9\end{pmatrix} - \frac{3}{4}\begin{pmatrix}1\\1\end{pmatrix}$

$\frac{1}{4}x = \frac{13}{4}$

$x = 13$

$\frac{1}{4}y = \frac{33}{4}$

$y = 33$

(13, 33)

8

L_1 (-4, 0) and (0, 2)

$M_1 = \frac{2 - 0}{0 + 4} = \frac{1}{2}$

$\frac{y - 2}{x} = \frac{1}{2}$

$2y - 4 < x$

L_2 (-4, 0) and (0, -1)

$M_2 = \frac{-1 - 0}{0 + 4} = \frac{-1}{4}$

$\frac{y + 1}{x - 0} = \frac{-1}{4}$

$4y + 4 \geq -x$

L_3 $x \leq 2$

9

$x + x + 90 = 180$

$2x = 90$

$x = 45$

No of sides $= \frac{360}{45}$

$= 8$

10

Volume of culvert $= pL(R^2 - r^2)$

$= 3.142 \times 3\,(0.76^2 - 0.64^2)$

$= 1.584m^3$

Density $= \frac{m}{v}$

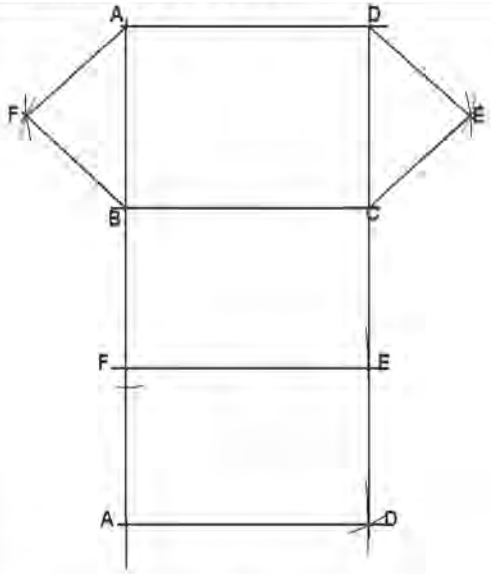
$= \frac{810}{1.584}$

$= 561.9kg/m^3$

11

Distance covered by van by 8.00a.m
$= 80 \times {}^{5}/_{4}$
$= 100$km
Remaining distance $= 400 - 100$
$= 300$km
Relative speed $= 80 + 60$
$= 140$km/h
Time taken $= \frac{300}{140}$
$= 2{}^{1}/_{7}$hrs (2hrs 8min)
Time $= 8.00 + 2.08 = 10.08$a.m

12



13

a) $\sqrt{CFD} = 180 - 100 = 70^{o}$
$\sqrt{CDF} = 180 - (60 + 70)$
$= 50^{o}$
b) $\sqrt{ABD} = BDE = 25^{o}$

14

$5 \times 20 - 3 \times 16 = 52$
Let the 5th be y
$(y - 8) + y = 52$
$y = 30$

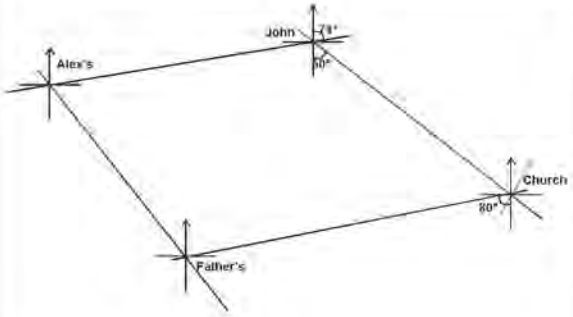
15

$-nx + 2y = 3(-3, 1)$
$-n(-3) + 2 \times 1 = 3$
$n = {}^{1}/_{3}$
$-{}^{1}/_{3}x + 2y =$
$3\ y = {}^{1}/_{6}x +$
${}^{3}/_{2}$ Tan q =
${}^{1}/_{6}$
$q = \tan^{-1}({}^{1}/_{6})$
$q = 9.462^{o}$
ii) $-{}^{1}/_{3}x + 0 = 3$

16

$y = x^2 - 3x + 1$
$\frac{dy}{dx} = 2x - 3$
$= -7$
$m^2 = \frac{1}{7}$
$\frac{y - 3}{x + 2} = \frac{1}{7}$
$x - 7y = -23$

17



b) i) N40°W $\pm 1^{o}$
ii) $212^{o} \pm 1^{o}$
iii) $7.7\text{cm} \times 10 \pm 0.1$
$= 77$km
iv) $80 + 75 + 100 + 77 = 412$km

18

a) S.A of cylindrical part $= 2\pi \times 3 \times 7 = 42\pi\text{cm}^3$
S.A of hemisphere $= 2 \times \pi \times 3^2$
$= 18\text{pcm}^3$
S.A of cone $= 42\pi\text{cm}^2$
total S.A $= 42\pi + 18p + 42p$
$= 102\pi\text{cm}^2$
b) $\pi rl = 42\pi\text{cm}^2$
$l = \frac{42\pi}{\pi \times 3}$
$= 14$cm
$h = \sqrt{14^2 - 3^2}$
$= 13.67$cm
Volume of cone $= {}^{1}/_{3} \times \pi \times 3^2 \times 13.67$
$= 41.01\pi\text{cm}^3$
Volume of cylinder $= \pi r^2 h$
$= \pi \times 3^2 \times 7$
$= 63\pi\text{cm}^3$
Volume of hemisphere $= {}^{2}/_{3}\pi r^2$
$= {}^{2}/_{3}\pi \times 3^2$
$= 18\pi\text{cm}^3$
Total volume $= (41.01\pi + 63\pi + 18\pi)$
$= 122.01\pi\text{cm}^3$

19

a) $(300 \times 5) + (140 \times 8)$
$= 1500 + 1120$
$= 2620$ fans
b) Cost of fuel
Boeing 745 $= 120 \times 10.5 \times 60 \times 5 \times 2 \times 0.3$
$= 226800$ dollars
Boeing 740 $= 200 \times 10.5 \times 60 \times 8 \times 2 \times 0.3$
$= 604800$ dollars
c) Total collections
Boeing 747 $= 300 \times 5 \times 800$
$= 1200000$ dollars
Boeing 740 $= 140 \times 8 \times 800$
$= 896000$ dollars
Net profit
Boeing 747 $= 1200000 - 226800$
$= 9732000$
Boeing 740 $= 896000 - 604800$
$= 291200$

20

$A^1 = \begin{pmatrix}3\\7\end{pmatrix} + \begin{pmatrix}3\\-1\end{pmatrix} = \begin{pmatrix}6\\6\end{pmatrix}$ $A^1 = (6,6)$

$B^1 = \begin{pmatrix}5\\5\end{pmatrix} + \begin{pmatrix}3\\-1\end{pmatrix} = \begin{pmatrix}8\\4\end{pmatrix}$ $B^1(8,4)$

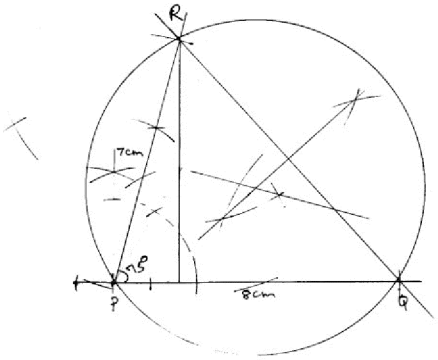
$C^1 = \begin{pmatrix}3\\1\end{pmatrix} + \begin{pmatrix}3\\-1\end{pmatrix} = \begin{pmatrix}6\\0\end{pmatrix}$ $C^1 = (6,0)$

$D^1 = \begin{pmatrix}1\\5\end{pmatrix} + \begin{pmatrix}3\\-1\end{pmatrix} = \begin{pmatrix}4\\4\end{pmatrix}$ $D^1 = (4,4)$

c) $P(a, b) \rightarrow P^1 (-b, +a)$
$A^1(6, 6) \rightarrow A^{11}(-6, 6$
$B^1(8, 4) \rightarrow B^{11}(-4, 8)$
$C^1(6, 0) \rightarrow C^1(0, 6)$
$D^1(4, 4) \rightarrow D^1(-4, 4)$

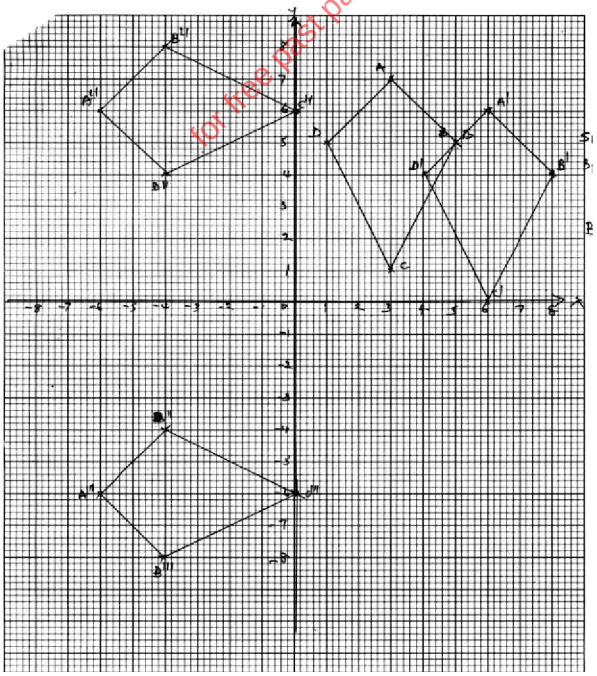
d) $A^{111}(-6, -6)$ $B^{111}(-4, -8)$ $C^{111}(0, -6)$ $D^{111}(-4, -4)$

21



QR = 8.0cm $\pm$ 0.1
Radius = 5cm
Area of circle = $^{22}/_{7}$ x 5 x 5 = 78.57
Area of D = ½ x 8 x 6.7 = 26.8
Area of region = 78.57 - 26.8 = 51.77cm^2

20



22

a) $\sin 70 = \frac{XV}{300}$
$XV = 300 \times \sin 70$
$= 281.91$

b) $\text{Cos } 70^o = \frac{180 - r^2}{300}$
$r^2 = 180 - 102.61$
$= 77.39\text{cm}$
$VBW = \frac{140}{360} \times 22 \times 2 \times 77.39$
$= 189.18\text{cm}^3$

c) $XAY = \frac{200}{360} \times \frac{22}{7} \times 2 \times 180$
$= 691.43\text{cm}$

d) $189.18 + 691.43 + (2 \times 281.91)$
$= 1444.43$

23

a) $LN = LO + ON$
$= -3OA + {}^2/_3OB$
$= -3\begin{pmatrix}1\\0\end{pmatrix} + \frac{2}{3}\begin{pmatrix}15\\6\end{pmatrix}$
$= \begin{pmatrix}7\\-14\end{pmatrix}$

b) $OM = {}^4/_7OL + {}^3/_7ON$
$= \frac{4}{7}\begin{pmatrix}3\\18\end{pmatrix} + \frac{3}{7}\begin{pmatrix}10\\4\end{pmatrix}$
$= \begin{pmatrix}6\\12\end{pmatrix}$
M (6, 12)

c) i) $OT = \frac{7}{6}OM$
$= \frac{7}{6}\begin{pmatrix}6\\12\end{pmatrix}$
$= \begin{pmatrix}7\\14\end{pmatrix}$

ii) L(3, 18) T (7, 14) and B(15, 6)
$LT = \begin{pmatrix}7\\14\end{pmatrix} - \begin{pmatrix}3\\18\end{pmatrix} = \begin{pmatrix}4\\-4\end{pmatrix}$
$LB = \begin{pmatrix}15\\6\end{pmatrix} - \begin{pmatrix}3\\18\end{pmatrix} = \begin{pmatrix}12\\-12\end{pmatrix}$
3LT = LB
LT // LB point L is commo
∴ L, T and B are collinear

24

a) $y = x^2 + 3$

x	1	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
y	4	5.25	7	9.25	12	15.3	19	23.3	27	33.3	39

b) A $= h\{y_1 + y_2 + ... + y_n\}$
$= 1(5.25 + 9.25 + 15.25 + 23.25 + 33.25)$
$= 86.25\ (86¼)$

c) $\int_{\ }^{\ } (x^3 + 3)dx$

$= \frac{x^3}{3} + 3x$

$= \left(\frac{6^3}{3} - 3x6\right) - \left(\frac{1^3}{3} + 3x1\right)$

$= 90 - 3^1/_3$
$= 86^2/_3$ square units

d) $\frac{86^2/_3 - 86^1/_4 \times 100}{80^2/_3}$
$= {}^5/_{12} \times \frac{100}{86^2/_3}$
$= 0.48\%$

GUCHA SOUTH EVALUATION TEST (GSET)
Kenya Certificate of Secondary Education
MATHEMATICS
Paper 2
July/August 2016

1

No	log
0.7214	1.8582 +
20.37	1.3090
	1.1672
69.8	1.8439
	1.3233
	3
	$\bar{1}.7744$
	= 0.5948

2

$$\frac{8\sqrt{5}}{\sqrt{7}-\sqrt{5}} \times \frac{\sqrt{7}+\sqrt{5}}{\sqrt{7}+\sqrt{5}}$$
$$= \frac{8\sqrt{35}+40}{7-5}$$
$$= \frac{8\sqrt{35}+40}{2}$$
$$= 4\sqrt{35}+20$$
a = 20, b = 4, c = 35

3

Radius OC = $24^2 - 18^2$
= 15.87
$\sin \angle AOB = \frac{18}{24}$
$\angle AOB = 48.59°$
$\angle AOC = 2 \times 48.59°$
= 97.18°
minor arc AC = $\frac{97.18°}{360} \times \frac{22}{7} \times 2 \times 15.87$
= 26.93cm

4

$$MN = \begin{pmatrix}7\\11\\14\end{pmatrix} - \begin{pmatrix}2\\3\\4\end{pmatrix} = \begin{pmatrix}5\\8\\10\end{pmatrix}$$

$5\underset{\sim}{i} + 8\underset{\sim}{j} + 10\underset{\sim}{k}$

distance = $\sqrt{(5)^2 + (8)^2 + (10)^2}$
= 13.75 units

5

AQ x QX = CD x QD
9 x 6 = (CD * 4)4
CD = 9.5cm

6

$t^2 = \frac{a-b}{1+ab}$
$t^2 + abt^2 = a - b$
$abt^2 + b = a - t^2$
$b = \frac{a - t^2}{at^2 + 1}$

7

$\sin^{-1} 0.2588 = 15°$
other value x = 180° - 15
= 165°

8

Actual value = 8.6 x 3.4
= 29.24
Max value = 8.65 x 3.45
= 29.8425
Min value = 8.55 x 3.35
= 28.6425
% error = $\frac{28.8425 - 28.6425}{2 \times 29.24} \times 100$
= 2.052%

9

a) At P x = 0
$y = 8 - (0)^2 = 8$
coordinate of P (0, 8)
$x^2 = 8 - x^2$
$x = \sqrt{4} = 2$
coordinates of Q(2, 4)
P(0, 8) Q(2, 4)

10

$x(x - 2) - (-2x) = \frac{50}{12.5}$
$x^2 - 2x + 2x = 4$
$x^2 = 4$
$x = \pm\sqrt{4}$
= +2 or x = -2

11

min	hrs	parcels
6	56	2240
5		2500

No. of hrs = $\frac{6}{5} \times \frac{2500}{2240} \times 56$
= 75hrs

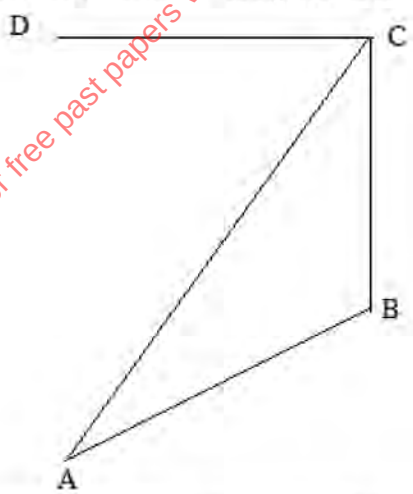
12

$y = kx + \frac{m}{x^2}$
$\Rightarrow k + m = 3$
$x = \frac{1}{2}$ $y = 5$
$\Rightarrow \frac{1}{2}k + 4m = 5$
$k + m = 3$
$k + 8m = 10$
$-7m = -7$
$m = 1$
$\Rightarrow k = 2$
$y = 2x + \frac{1}{x^2}$
$x = \frac{3}{2}$

KIRINYAGA WEST SUB-COUNTY EFFECTIVE '40' EXAMINATION 2016
Kenya Certificate of Secondary Education (K.C.S.E)
121/1
MATHEMATICS ALT. A
PAPER 1
JULY / AUGUST 2016
2 ½ HOURS

SECTION I (50 MARKS)
Answer ALL the questions. in the spaces provided.

1. Evaluate (3 marks)
$$\frac{-8 \div 4 + 12 \times 7 - 4 \times 6}{84 \div 7 \times 2}$$
2. Solve the inequalities $x + 5 < 3x + 2 \leq x + 11$ and state the integral values satisfying it. (3mks)
3. Evaluate using logarithm tables (4 marks)
$$\sqrt[3]{\frac{(3.196)^2 \times 0.0243}{20.46}}$$
4. Simplify $\frac{9t^2 - 25a^2}{6t^2 - 19at + 15a^2}$ (3 marks)
5. A piece of copper wire is bent into the shape of an isosceles triangle. The base angles are each 70^0 and the height of the triangle is 7cm. Calculate the 3 s.f. the length of the wire. (3 marks)
6. A salelady is paid a salary of K£ 850 per month. She also gets a commission of 3% on the amount of money from her sales. In July she earned a salary of Ksh 35,600. Calculate the value of her sales in the month. (3mks)
7. Make x the subject of the formula (3 marks)
$$t = \sqrt[3]{\frac{ay - bx}{mx - n}}$$
8. A regular polygon has an interior angle of 150^0 and a side of length 10cm.
   a) How many sides does the polygon have? (1mk)
   b) Find the area of the polygon. (3mks)
9. Find the height of water in a cylindrical container of base radius 3.5 cm if water in a full cube of side 5.5cm is poured into the cylinder. Use $p = {}^{22}/_{7}$. (3mks)
10. Given that $a = 2i - 3j + k$, $b = -i - 2j$ and $c = -2i + 2j + 2k$, evaluate:
    $|2a - 3b - 2c|$ to 2 decimal places. (3mks)
11. Find the equation of a perpendicular bisector of line PQ in the form $ay + bx = c$ if the co-ordinates of P and Q are (–2, 6) and (4, –2) respectively. (3mks)
12. Below is part of a sketch of a wedge ABCDE. complete the sketch. (3mks)



13. Use the trapezium rule with five trapezia to determine the area bounded by the curve $y = x^2 + 2$, the line $y = 0$, $x = 0$ and $x = 5$ to 3 s.f. (4mks)
14. Given that $a = 2$, $b = 3$ and $C = -2$ evaluate: (2mks)
$$\frac{\frac{1}{4}a^2 - 2b - 4c}{\frac{1}{3}(b^3 - 3c)}$$

15. It takes 30 workers 6 days working 8 hours a day to harvest maize in a farm. How many days would 50 workers working 6 hours a day take to harvest the maize? (3mks)

16. B is on a bearing of N30^{0}E from A and C is due East of B. The distance from A to B is 600km and the distance from B to C is 400km. Calculate the distance from A to C. (3mks)

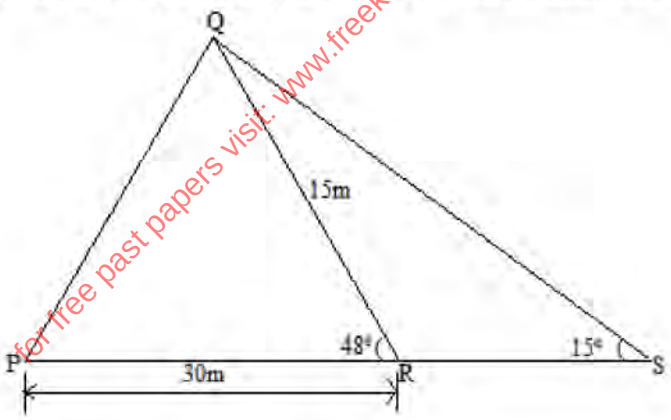
SECTION II (50 MARKS)
Choose any five questions

17. In the year 2001 the price of a sofa set in a shop was Ksh 12,000.
a) Calculate the amount received from the sales of 240 sets that year. (2 mks)
b) In the year 2002 the price of each sofa set increased by 25% while the number of sets sold decreases by 10%
i) Calculate the percentage increase in the amount received from the sales. (3mks)
ii) If at the end of the year 2002 the price of each sofa set changed in the ratio 16 : 15. Calculate the price of each sofa set in the year 2003. (1mk)
c) The number of sofa sets sold in the year 2003 was p% less than the number sold in the year 2002. Calculate the value of p given that the amount received from the sales in the years were equal. (4mks)

18. Two grocers Koech and Amina bought fruits from a fruit farm. Koech bought 20 paw paws, 15 mangoes and 12 melons. Amina bought 30 paw paws, 10 mangoes and 7 melons. The prices of a paw paw, a mango and melon were sh 10, sh 15 and sh 50 respectively.
a) i) Represent the number of fruits bought by Koech and Amina using a 2 x3 matrix. (1mk)
ii) The prices of the items bought using a 3 x 1 matrix. (1mk)
b) Use the matrices in (a) above to determine the total expenditure incurred by each person and hence the difference in their expenditure. (3mks)
c) Amina and Koech also bought millet and sorghum. Koech bought 24kg of millet and 18kg of sorghum and paid sh 7 920. Amina bought 35kg of millet and 16kg of sorghum and paid sh 9 500. Use matrix method to find the price of one kilogram of millet and one kilogram of sorghum. (5mks)

19. Using a pair of compasses and ruler only construct:
i) a rhombus ABCD of side 7cm and one interior angle of 120^0. (3mks)
ii) a perpendicular from P the point of intersection of the diagonals to meet AB at Q. Measure PQ. (2mks)
iii) a circle to touch all the sides of the rhombus. (2mks)
iv) express the area of the rhombus that lies outside the circle as a percentage of the area of the circle. (3mks)

20. The figure below represent two neighbouring plots with QR as their common boundary.



Find to 2 d.p.
i) The length of boundary PQ. (3mks)
ii) The length of boundary RS. (3mks)
iii) The angle RQS. (1mk)
iv) Area of triangle QRS. (3mks)

21. a) Find the equation of a straight line L_1 that passes through the points P(-6, -3) and Q(1,3) in the form ay + bx = c where a, b and c are constants. (2mks)
b) A second line L_2 is parallel to L_1 and passes through (2, -3). Find the equation of L_2 in the form y = mx +c. (2mks)
c) A third line L_3 passes through (2, 3) and is perpendicular to L_1. Find the equation of L_3. (2mks)
d) Use the matrix method to find the co-ordinates of R the point where L_1 and L_3 intersect. (4mks)

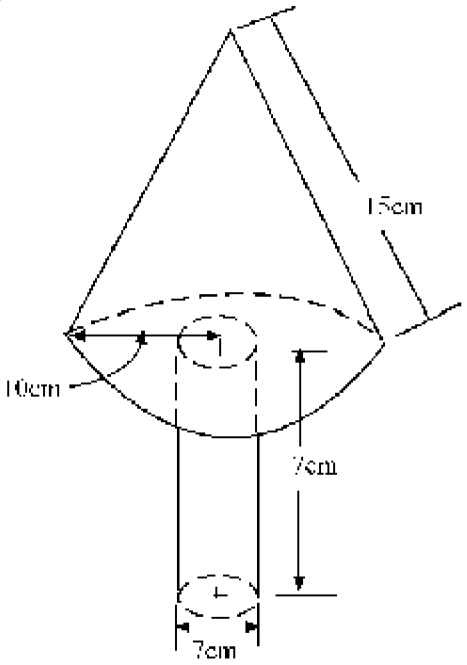
22. a) On the grid below draw a triangle whose vertices are A(-1, -1) , B(-3, 1) and C(-3, 3). (1mk)

b) Draw the image of the triangle under reflection in the line y = x. (2mks)

c) With (0, -4) as a centre and a linear scale of -2, draw the image of the first image of the triangle. Give the co-ordinates of A'', B'' and C''. (4mks)

d) If the area of A''B''C'' is 32cm^2, find the area of A'B'C' (3mks)

23. The diagram below represents an ice-cream whose top is a cone of slant height 15cm and base radius 10cm. The handle of the ice cream is a cylinder of diameter 7cm and length use p = 3.142
Calculate to 1 d.p:



a) the height of the conical part of the ice cream. (2mks)

b) volume of the material used in making the handle (2mks)

c) volume of the material used in making the top of the ice cream. (2mks)

d) the external surface area of the ice cream. (4mks)

24. The gradient of the curve $y = 3x^3 + 2x^2 - qx + 4$ at $x = 2$ is 39.

a) Find:

i) the value of q (3mks)

ii) the equation of the tangent to the curve at x = 1 in the form ay + bx = c (3mks)

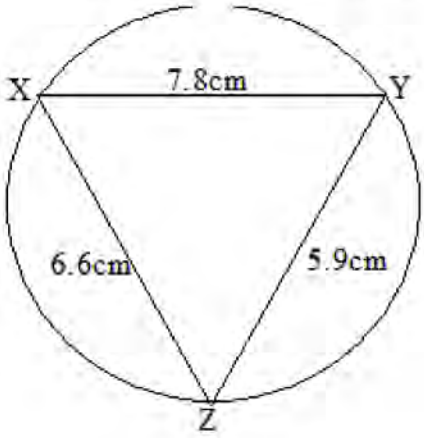
b) the co-ordinates of the turning points of the curve. (2mks)

c) Find the co-ordinates of the maximum turning point of the curve. (2mks)

KIRINYAGA WEST SUB-COUNTY EFFECTIVE '40' EXAMINATION 2016
Kenya Certificate of Secondary Education (K.C.S.E)
121/2
MATHEMATICS ALT. A
PAPER2
JULY / AUGUST 2016
2 ½ HOURS

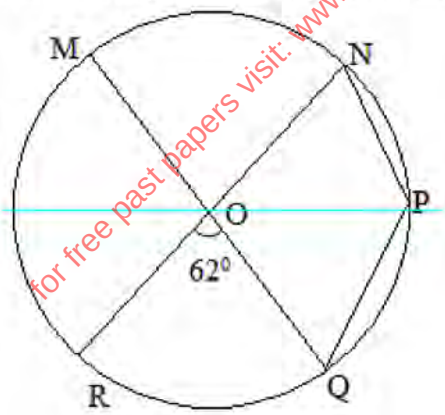
SECTION I (50 Marks)
Answer all the questions in this section in the space provided.

1. The dimensions of a rectangle are 10cm and 15cm to the nearest cm. Find the percentage error in the area of the rectangle. (3mks)
2. A solid is in the shape of a triangular based pyramid with the base in the shape of an equilateral triangle of sides 2cm and weight h cm is submerged into a beaker containing $20cm^3$ of water. If the water level increases to $21cm^3$, determine the value of h giving your answer in surd form. (3mks)
3. Triangle XYZ is inscribed in the circle. XY = 7.8cm, XZ = 6.6cm and YZ = 5.9cm.



Find
a) The largest angle of the triangle. (2mks)
b) The radius of the circle, correct to one decimal place. (2mks)

4. The fig below shows circle MNPQ, centre O. MQ and NR are straight lines. If $<ROQ = 62^0$, find the measure of <NPQ (3mks)



5. Two numbers are in the ration 5 : 7 when 15 is added to each number, the ratio changes to 5 : 6 find the two numbers. (3mks)
6. The length of a rectangle exceeds its breadth by 4cm. If the length were halved and the breath increased by 5cm, the area would be decreased by $35cm^2$. Find the dimensions of rectangle. (3 mks)
7. Without using mathematical tables or calculators
$4\log_3 a - 2 = \log_3 (x^2 - 55)$ (3mks)
8. Simplify the following expression $\left(2x + \frac{1}{x}\right)^4 + \left[2x - \frac{1}{x}\right]^4$ (3mks)
9. Given the equation to a circle is $2x^2 + 2y^2 - 2x + 6y - 13 = 0$. Find the centre and the radius of the circle. (3mks)

10. Using a ruler and a pair of compasses only construct the locus of a point P such that angle APB = 60^0 given that line AB = 6cm. (3mks)
11. At an initiation party, every two people shared a plate of mashed potatoes between them. Every three people shared a plate of rice and every four people shared a plate of meat. If 65 plates were used in total how many people were there? (3mks)
12. By selling a radio at sh. 800 each, a profit of 25% would be made on the cost of manufacture. 2000 of these radio were sold for sh 240, while the perfect ones were still sold for sh 800. Express the total profit as a percentage of the total cost of manufacture assuming that all 2000 radius were sold. (3mks)
13. Find the equation of the tangent at the point (0, -3) to the curve $y = 3x^3 - 4x^2 + 2x - 3$. (3mks)
14. An aircraft is 360nm North of the Equator and 600nm East of town P which is on the same latitude as the aircraft but has longitude 5^0W. Calculate the latitude and the longitude of the aircraft. (3mks)
15. Solve for $\text{Sin}(2x + 20^0) = \text{Cos}\frac{x}{3}$ (3mks)
16. Vector $\overrightarrow{OP} = \begin{pmatrix}2\\1\end{pmatrix}$ and $\overrightarrow{OQ} = \begin{pmatrix}6\\p\end{pmatrix}$ point x is on OQ such that XQ = 20OX and point y is on PQ such that PY = 3YQ. Express $\overrightarrow{XY}$ as a column vector. (4mks)

SECTION II (50 Marks)

Answer any five questions from this section in the spaces provided.

17. a) The current price of a vehicle is sh 500,000. If the vehicle depreciates at a rate of 15% p.a. Find the number of years it will take for its value to fall to sh 180,000. (4mks)

b) The cash price of a cooker is sh 9,000. A customer bought the cooker by paying 15 monthly installments of sh 950 each calculate

i) The carrying charge (3mks)

ii) The rate of interest. (3mks)

18. A geometric progression (G.P.) is such that the product of its first three terms is 8,000.

a) Taking the first term as a and the common ratio as r express in terms of a. (3mks)

b) The sum of the first three terms in (a) above is 78. Determine the first term and the common ratio of two possible sequences. Hence write the first 6 terms of the two sequences. (5mks)

c) Find the product of the 8^{th} term of the two sequences. (2mks)

19. The equation of the curve are given by y = 2 sinx and y = sin (2x – 30) complete the table below for y = 2 sin x and y = sin (2x – 30) for $0^0 \leq x \leq 360$. (2mks)

x	30	60	90	120	150	180	210	240	270	300	330	360
y = 2 sin x	0			1.7		0	-1	-1.7				0
y = sin (2x – 30)		1		-0.5		-.05	0.5	-.05		-0.5		-0.5

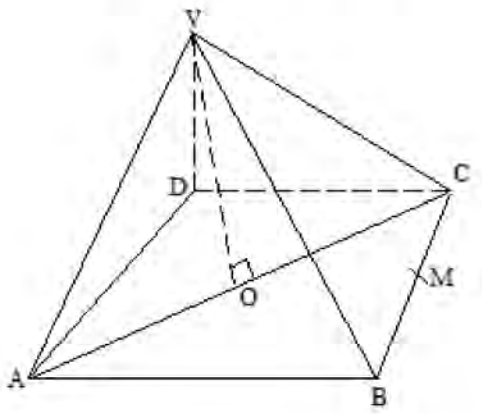
a) On the same grid provided, draw the graph of y = 2 sin x and y = (2x – 30) (4mks)

b) State the amplitude and period of the two curves. (2mks)

c) Use your graph to solve

2 Sin x = Sin (2x – 30) (2mks)

20. The figure below shows a right pyramid standing on square base of side 10cm. M is the midpoint of BC and the vertical height VO= 12cm.



a) Calculate to 2 d.p.
i) The length of the projection of line VA on the plane ABCD. (2mks)
ii) The size of the angle between line VA and the plane ABCD. (2mks)
b) Find the size of the angle between the planes VBC and ABCD. (3mks)
c) Calculate the length of the line VM and hence the total surface area of the pyramid. (3mks)

21. Three quantities m, n and P are such that m is directly proportional to the cube root of n and m varies inversely as the square of P.
a) If m = 0.625 when n = 8 and p = 4. Find m when n = 64 and p = 3. (5mks)
b) If n is increased by 33.1% and p decreases by 18%, find the percentage increase in m. (5mks)

22. A particle moves along a straight line such that it's displacement s metres from a given point is $s = t^3 - 5t^2 + 3t + 4$ where t is time in seconds. Find:
a) The displacement of the particle at t = 5. (2mks)
b) The velocity of the particle when t = 5. (3mks)
c) The value of t when the particles is momentarily at rest. (3mks)
d) The acceleration of the particles when t = 2. (2mks)

23. The age distribution of workers in a factory is given in following table.

Age (yrs)	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55
Frequency	2	10	12	23	10	8	2	3

a) State the modal class. (1mk)
b) Calculate the median age. (3mks)
c) Using 36 as the assumed mean calculate
i) Mean (3mks)
ii) The standard deviation (3mks)

24. a) Given the transformation matrices

$$T_1 = \begin{pmatrix} 2 & 1 \\ -1 & -2 \end{pmatrix} \text{ and } T_2 = \begin{pmatrix} 3 & 1 \\ 1 & 3 \end{pmatrix}$$

Write a single matrix T representing transformation T_1 followed by T_2. (3mks)
b) Find the inverse of T (2mks)
c) The point P''(7, -11) Q''(-7, -3). R'' (-8, 16) and S'' (8, 8) are images of PQRS respectively under T_1 followed by T_2. Write down the co-ordinates of PQRS. (5mks)

GITHUNGURI SUB COUNTY FORM 4 JOINT EXAMIANTION
Kenya Certificate of Secondary Education
MATHEMATICS
Paper 1
July/August 2016
TIME: 2½ HOURS

SECTION I (50 Marks)
Answer all the questions in this section in the spaces provided.

1. Evaluate: $\frac{44 - -28}{12 \times -2} - \frac{8^2 \times -12 - 24}{96 \div -12 \times 9}$ (3 marks)

2. A basket ball team play 10 matches in a tournament. The following are scores in each match.
9, 15, 17, 16, 7, 20, 21, 15, 10, 12
Determine:
(a) the mode. (1 mark)
(b) the median. (2 marks)

3. A wholesaler sold a cell phone to a retailer making a profit of 20%. The retailer later sold the cell phone for Ksh.3120 making a profit of 30% calculate the amount of money the wholesaler had paid for the cell phone. (3 marks)

4. Find x if $\text{Cos}(3x - 30^{\circ}) = \text{Sin}(7x + 50^{\circ})$ (3 marks)

5. Find the integral values of x which satisfy the following inequality.
$2x + 3 > 5x - 3 > -8$ (3 marks)

6. The exterior angle of a regular polygon is $(x - 50)^{\circ}$ and the interior angle is $(2x + 20)^{\circ}$. Find the number of sides of the polygon. (3 marks)

7. A line P passes through the point (-2, 5) and has a gradient of $\frac{-3}{4}$. Another line Q is perpendicular to P and meets it at a point where $y = \frac{1}{2}$ find equation of Q. (3 marks)

8. Simplify the expression completely.
$$\frac{(x+2y)(x-2y) - (x-2y)^2}{x^2 - 4y^2}$$ (3 marks)

9. The mass of two similar solid are 324g and 768g. Find
(a) height of the smaller solid if the height of the bigger solid is 20cm. (2 marks)
(b) the surface area of the smaller solid if the surface area of the bigger solid is 40cm^2. (2 marks)

10. A cylindrical pipe 5 metres long has an internal diameter 28 millimetres and an external diameter of 42 millimetres. The density of the material that makes the pipe is 1.45g/cm^3. Calculate the mass of the pipe in kilograms.
$\left(Take\ \pi = \frac{22}{7}\right)$. (4 marks)

11. Simplify: $\frac{32^{\frac{-1}{5}} \times 8100^{\frac{3}{4}}}{8^{\frac{-1}{3}} \times 5^{\frac{1}{2}} \times 4^{\frac{1}{2}} \times 4^{\frac{1}{4}}}$. (3 marks)

12. Three men working for 8 hours a day take 6 days to dig a trench 9metres long. How long would 5 men working 4 hours a day take to dig a trench 45 metres long. (3 marks)

13. The mass of a mixture A of beans and maize is 72kg. The ratio of beans to maize is 3: 5 respectively. Find the mass of maize in the mixture. (3 marks)

14. A square toilet is covered by a number of whole rectangular tiles of sides 60cm by 48cm. Calculate the least possible area of the room in square metres. (3 marks)

15. The ratio of Eunice's cows to goats is 5:4. On a certain market day he sold a ¼ of the goats and1/5 of the cows. If she had sold 5 more animals from the herd only 2/3 of the original number could have been left. How many animals were there before the sale? (3 marks)

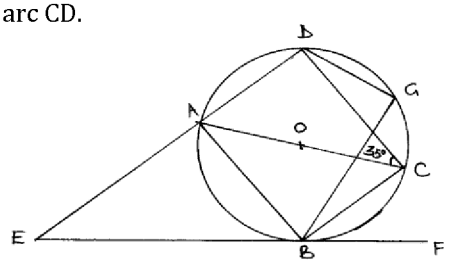
16. Solve for x in $\frac{7x+1}{9} - \frac{3x-1}{7} = 2$ (3 marks)

SECTION II (50 Marks)
Answer five (5) questions ONLY in this section

17. Four towns, R,TK and G are such that T is 84km directly to the North of R and K on a bearing of 295° from R at a distance of 60km. G is on a bearing of 340° from k a distance. Using a scale of 1cm to represent 10km, make an accurate scale drawing to show the position of the towns. (4 marks)

Find:
(a) The distance and bearing of T from K (2 marks)
(b) The distance and bearing of G from T (2 marks)
(c) The bearing of R from G and the distance between them (2 marks)

18. In the figure below AOC is a diameter of the circle centre O. AB = BC and ∠ACD = 35°, EBF is a tangent to the circle at B. G is a point on minor arc CD.



Calculate the size of the following angles giving reasons in each case.
(a) ∠BCD. (2 marks)
(b) Obtuse angle BOD. (2 marks)
(c) ∠BAD. (2 marks)
(d) ∠CGD. (2 marks)
(e) ∠AEB. (2 marks)

19. The table below shows the rates at which income tax is charged on annual income.

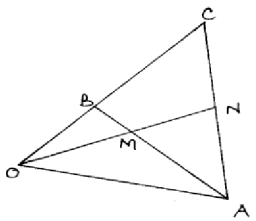
Annual taxable income (K£)	Rates (Shs. Per K£)
1 – 2800	3
2801 - 4600	5
4601 – 7200	6
7201 – 9000	7
9001 – 11800	9
11801 – 13600	10
Over 13600	12

A company employee earns a gross monthly salary of Ksh.18600. He is housed by the company and as a result, his taxable income is increased by 15%. If the employee is married and claims a monthly family relief of Shs.250, calculate
(a) his taxable income. (2 marks)
(b) his net salary per month. (8 marks)

20. The displacement S metres of a moving particle after t seconds is given by $S = 2t^3 - 5t^2 + 4t + 2$
Determine
(a) the velocity of the particle when t = 2. (3 marks)
(b) the value(s) of t when the particle is momentarily at rest. (3 marks)
(c) the displacement when the particle is momentarily at rest. (2 marks)
(d) the acceleration of the particle when t = 5. (2 marks)

21. Triangle ABC has vertices A (1, 2), B (2, 3) and C (4, 1) while triangle $A^1B^1C^1$ has vertices $A^1(1, -2)$, $B^1(2, -3)$ and $C^1(4, -1)$.
(a) Draw triangle ABC and $A^1B^1C^1$ on the same grid. (2 marks)
(b) Describe fully a single transformation that maps triangle ABC onto triangle $A^1B^1C^1$. (2 marks)
(c) On the same grid draw triangle $A^{11}B^{11}C^{11}$ the image of triangle ABC under a reflection in line $Y = -\chi$. (2 marks)
(d) Draw $\Delta A^{111}B^{111}C^{111}$ such that it can be mapped onto triangle ABC by a negative quarter turn about the origin. (2 marks)
(e) Find the matrix of transformation that maps triangle ABC onto triangle $A^{111}B^{111}C^{111}$. (2 marks)

22. In the figure below, $\underset{\sim}{OA} = \underset{\sim}{a}$, $\underset{\sim}{OB} = \underset{\sim}{b}$ and $\underset{\sim}{OC} = 3\underset{\sim}{OB}$.



(a) Express in terms of **a** and **b**.
(i) $\underset{\sim}{AB}$ (1 mark)
(ii) $\underset{\sim}{AC}$ (1 mark)

(b) Given that $\underset{\sim}{AM} = \frac{3}{4}\underset{\sim}{AB}$ and $\underset{\sim}{AN} = \frac{1}{2}\underset{\sim}{AC}$, express $\underset{\sim}{OM}$ and $\underset{\sim}{ON}$ in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$. (4 marks)

(c) Hence show that O, M and N are collinear. (4 marks)

23. An arithmetic progression (AP) has the first term a and the common difference d.

(a) Write down the third, ninth and twenty fifth terms of the AP in terms of a and d. (1mark)

(b) The AP above is increasing and the third, ninth and twenty fifth terms form the first three consecutive terms of a Geometric Progression (G.P) The sum of the seventh and twice the sixth terms of the AP is 78. Calculate:-

(i) the first term and common difference of the AP. (5 marks)

(ii) the sum of the first nine terms of the AP. (2 marks)

(iii) The difference between the fourth and the seventh terms of an increasing AP. (2 marks)

24. (a) Complete the table below for the function $y = (3-x)(x+1)$ (2 marks)

x	-3	-2	-1	0	1	2	3	4
x+1	-2	-1		1		3	4	
3-x	6	5	4		2	1		-1
y	-12	-5		3	4		0	-5

(b) Use the values in the table to draw the graph of $y = (3-x)(x+1)$. Use the following scale.

Horizontal axis 2cm for 1 unit

Vertical axis 1cm for 1 unit. (3 marks)

(c) Use your graph in part (b) above to solve the following quadratic equations

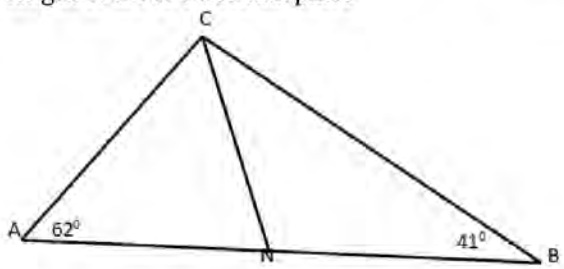
(i) $-x^2 + 2x + 3 = 0$ (2 marks)

(ii) $-x^2 + x + 6 = 0$ (3 marks)

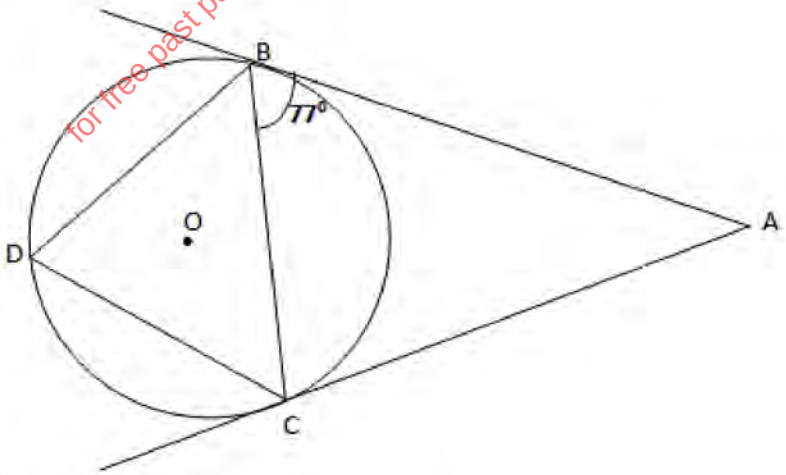
GITHUNGURI SUB COUNTY FORM 4 JOINT EXAMIANTION
Kenya Certificate of Secondary Education
MATHEMATICS
Paper 2
July/August 2016
TIME: 2½ HOURS

SECTION I (50 Marks)
ANSWER ALL QUESTIONS IN THIS SECTION

1. Given that 2n,3n, 4n + 2 are consecutive terms of geometric progression determine the value of n (3 marks)
2. A object A of area 10cm² is mapped onto its image B of area 60cm² by a transformation whose matrix is given by $P=\begin{pmatrix} x & 4 \\ 3 & x+3 \end{pmatrix}$. Find the possible value of x (3 marks)
3. Make k the subject of the formula and simplify (3 marks)
$$t = \frac{2y+1}{\sqrt{2ky+k}}$$
4. The points A(-2,2) and B(6,2) are the ends of a chord of a circle. If the chord is 3 units from the Centre of the circle, find the Centre and radius of the circle, in the form $(x-a)^2+(y-b)^2=r^2$ (4 marks)
5. In the figure below $<A = 62^0$, $<B = 41^0$, BC = 8.4cm and CN is a bisector of <ACB
Calculate the length of CN to 1 decimal place (3 marks)



6. Simplify $\frac{3-\sqrt{7}}{3+\sqrt{7}} - \frac{\sqrt{7}}{3-\sqrt{7}}$ leaving your answer in the form $a+b\sqrt{7}$ where a and b are constants (3 marks)
7. Solve for x in the equation
Sin $(4x - 10)^o$ – Cos $(x + 60^o)^o = 0$ (3 marks)
8. A farmer has 1200m of wire to fence three sides of a rectangular field. The fourth side is a wall. Find the dimensions that will give the maximum possible area. (4 marks)
9. A quantity y varies partly as x^2 and partly as x. When y = 6, x = 1 when y = 30, x = 3. Find y when x = - 3. (3 marks)
10. In the figure below, AB and AC are tangents from A to the circle center O. D is any Point on the major arc BC such that BD = DC. If angle ABC = 77°, find angle DCO (3 marks)



11. Evaluate:
$\int_2^5 \frac{x^2-3x+2}{x-2}\,dx$ (3 marks)
12. John bought 3 brands of tea A, B and C. The cost price of the three brands was sh.25, sh.30 and sh.45 per kilogram respectively. He mixed the three brands in the ratio 5:2:1 respectively. After selling the mixture he made a profit of 20%. How much profit did he make per kilogram of the mixture? (3 marks)

13. Find the constant term in the expansion $\left(3x-\frac{1}{2x}\right)^8$. Hence state it's value (3 marks)

14. The dimensions of a rectangle are width 40 cm and length 45 cm. If there is an error of 5 % in the length and 8% in the width find the percentage error in calculating the area of the rectangle. (4 marks)

15. A football tube in the form of a sphere is inflated so that its radius increases in the ratio of 32:18. Find the ratio in which the volume is increased (2 marks)

16. A computer whose marked price is sh. 40,000 is sold at sh. 56,000 on hire purchase terms. Mary bought the computer on hire purchase terms. She paid a deposit of 25% of the hire purchase and cleared the balance by 18 equal Monthly installments of sh. 2625. Calculate the rate of interest charged per Month. (3 marks)

SECTION II (50 MARKS)

ANSWER ANY FIVE QUESTIONS IN THIS SECTION

17. The table below shows the distribution of ages in years of 50 adults who attended a clinic:-

Age	21-30	31-40	41-50	51-60	61-70	71-80
Frequency	15	11	17	4	2	1

(a) State the medium class (1mark)

(b) Using a working mean of 45.5, calculate:-

(i) The mean age (3 marks)

(ii) The standard deviation (3 marks)

(iii) Calculate the 6th decile. (3 marks)

18. (a) Complete the table below for the equation $y=x^3-2x^2-4x+7$ (1 mark)

X	-3	-2	-1		1	2	3	4
Y	-26		8	7	2		8	

(b) using the scale 1cm to represent 1 unit on x- axis and 1cm to represent 5units on the y –axis, draw the graph of $y = x^3-2x^2-4x+7$ (3 marks)

(c) use your graph to estimate the roots of the equation $x^3-2x^2-4x+2=0$ (1mark)

(d) By drawing straight lines, use your graph to solve the equation (2 marks)

(i) $x^3-2x^2-4x-3=0$

(ii) $x^3-2x^2-3x+3=0$ (3 marks)

19. (a) Using trapezium rule, estimate the area under the curve $y=\frac{1}{2}x^2-2$, using six trapezia between x=2 and x=8 and x-axis (5 marks)

(b) (i) Use integration to determine the exact area under the curve (3 marks)

(ii) Find the percentage error in calculating the area using the trapezium rule (2 marks)

20. The positions of two towns on the earth's surface are A (40°S, 45°W) and B (40°S, 135°E)

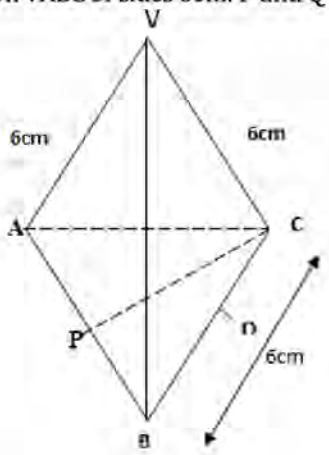
Calculate:

(a) The difference in distance between towns A and B along the parallel of latitude and along the great Circle (in nm) (4 marks)

(b) Two planes X and Y left town A at 8:00 a.m. flying at 758 knots each towards town B. If plane X flies along the parallel of latitude and plane Y along the great circle; then determine the position of Plane X when plane Y lands at town B (4 marks)

(c) What is the local time at town B when the second plane lands (2 marks)

21. The figure below shows a regular tetrahedron VABC of sides 6cm. P and Q are the midpoints of AB and BC respectively



Calculate

(a) The length VP (2 marks)

(b) The angle between the planes VAB and ABC (4 marks)

(c) The perpendicular height of the tetrahedron (2 marks)

(d) The angle between the line VP and the plane VAQ (2 marks

22. A farmer has at least 50 acres of land on which he plans to plant potatoes and cabbages. Each acre of potatoes requires 6 men and each acre of cabbages requires 2 men. The farmer has 240 men available and he must plant at least 10 acres of potatoes and at most 30 acres of cabbages. The profit on potatoes is ksh. 1000 per acre and on cabbages is ksh.1200 per acre. If he plants x acres of potatoes and y acres of cabbages:

(a) Write down the inequalities in x and y to describe this information. (3 marks)

(b) Represent these inequalities graphically. (4 marks)

(c) Use your graph to determine the number of acres for each crop which will give maximum profit and hence find the maximum profit. (3 marks)

23. (a) Using a ruler and pair of compasses only, construct triangle ABC in which AB = 9cm, AC = 8cm and angle BAC = 60^0. (2 marks)

(b) On the same side of AB as C, draw the locus of a point such that angle APB = 60^0 (3mark

(c) A region T is within the triangle ABC such that AT > 4cm and angle ACT ≥ angle BCT. Show the region T by shading it. (5 marks)

24. In driving to work, Buma has to pass through three sets of traffic lights. The probability that he will have to stop at any of the lights is ¾

(a) Draw a tree diagram to represent the above information. (2 marks

(b) Using the diagram, determine the probability that on any one journey, he will have to stop at:

(i) All the three sets. (2 marks)

(ii) Only one of the sets (2 marks)

(iii) Only two of the sets (2 marks)

(iv) None of the sets. (2 marks)

NANDI EAST/TINDERET SECONDARY SCHOOLS EXAMINATIONS 2016
Kenya Certificate of Secondary Education
MATHEMATICS
Paper 1
2 ½ hours

SECTION 1: (50 MARKS)
Answer All questions in this Section

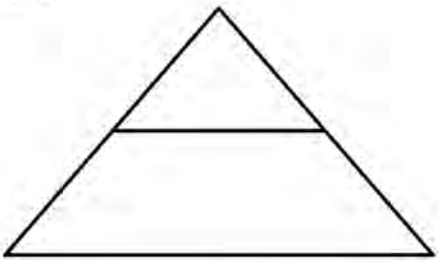
1. Simplify without using tables or calculators and express your answer as a mixed number. (3 Marks)

$$\frac{\frac{3}{5} \div \frac{1}{6} \text{ of } 1\frac{2}{25} - \frac{1}{2}}{\left(1\frac{1}{4} + \frac{2}{5}\right) \div 5\frac{1}{9} - \frac{1}{7}}$$

2. Given that P = 0.0432, G = 2943, a = 0.00436 and b = 324,000, using prime factorization method evaluate without using tables and calculators the exact value of:

$\sqrt{\frac{PG}{ab}}$ Giving your answer in the form $A \times 10^n$ (3Marks)

3. In the diagram below PQ is parallel to SR and TR:RQ = 2:5. If the diagram TSR has an area of 24cm², find the area of the trapezium. (3 Marks)

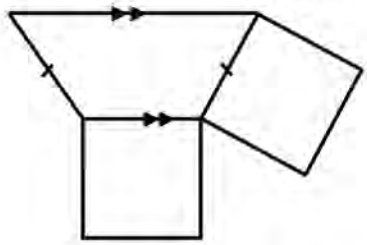


4. Solve for x and y in the questions given by:
$5^x \times 5^{2y} = 25$ and $3^{2x} \times 3^y = \sqrt[3]{81}$ (3 Marks)
5. If the sum of the roots of $x^2 - (c + 1)x + 2(C-1) = 0$ is three quarters of their product find the value of C. (3 Marks)
6. A hollow sphere whose external diameter is 15cm weighs 12.4kg and is made of steel, density 7800 kg/m³. Calculate the thickness of the metal, assuming it to be uniform. (3 Marks)
7. At a show, three cars A,B and C are being continuously driven on a circular track. Car A completes a circuit every 60 seconds, car B every 75 seconds and car C every 100 seconds. All the three cars start together at the same instant. Calculate the number of time cars A, B and C will be together at the starting point in a duration of 2 hours 30 minutes. (3 Marks)
8. The graph shows the straight line obtained by plotting log T against log S. Obtain T in terms of S. (3 Marks)

9. Find the values of r and s if $(r + s - 5) : (2r - 5) : (r-s-2) = 3:21:15$ (4 Marks)
10. Find the value of x and y from the matrix equation. (4 Marks)

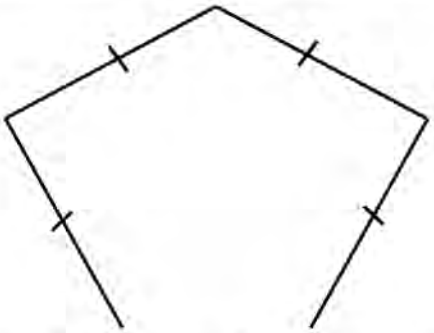
$$\begin{pmatrix} x & 4 & 2 \\ 3 & y & x \end{pmatrix} \begin{pmatrix} 3 \\ 4 \\ x \end{pmatrix} = \begin{pmatrix} 4 \\ x+2 \end{pmatrix}$$

11. The figure below shows a trapezium ABCD, BCHK and CDMN are squares outside ABCD. Given that BK = 5cm, MN = 8cm, AD = BC and $\sqrt{125^0}$, calculate the area of the figure ABKHNMD. (3 Marks)



12. The line ax + 2y – b = 0 passes through the point (-3,5) and is perpendicular to the line 2x – 3y – 4 = 0. Determine the values of a and b. (3 Marks)
13. Calculate the possible integral solutions of x in $\frac{2}{3}(x + 5) \geq 4x + \frac{3}{5}(3x + 5)$ (3 Marks)
14. The figure below shows an incomplete figure (All sides are equal) with a rotational symmetry of order 5. Complete it in the shape below. (1Mark)

    In the diagram indicate (with dotted lines) all the lines of symmetry. (2 Marks)



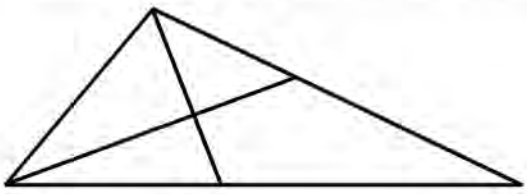
15. Two cars start from the same place at the same time. One accelerates uniformly at $2ms^{-2}$ for 10 seconds while the other accelerates at $1.2ms^{-2}$ for 20 seconds. Both cars continue with the same speed they reached. Calculate.
(a) How long after the start the second car will take to overtake the first car. (2 Marks)
(b) How far from the start they have travelled at this point. (1Mark)

16. A scout preparing to raise the flag watches the top of the flag mast at an angle of elevation of 42^0. A bird at the top of the flag mast observes another student 8.6m behind the scout at an angle of depression of 33^0 18'. The foot of the flag mast and the two students stand on a level ground and are collinear. The two students are 175cm tall each. Calculate the height of the flag mast. (3 Marks)

SECTION II (50 MARKS)

<u>Answer any five questions in this section</u>

17. Toti started walking East from the dormitory which is 100m South of the borehole. She walked to a point L from which the bearing of the borehole is 315^0. She then walked on a bearing of 030^0 to a tank. From the tank, she went straight to the borehole which is 160m from the tank.
(a) Using a scale of 1:2000, draw a diagram showing the position of the borehole, tank, dormitory and point L. (4 Marks)
(b) Find the bearing of the borehole from the tank. (2 Marks)
(c) Find the total distance covered by Toti. (2 Marks)
(d) Find the distance and bearing of the dormitory from the tank. (2 Marks)
18. In the figure below, AB = $\underset{\sim}{a}$ + 2$\underset{\sim}{b}$, X is a point on BC and AE such that $\overrightarrow{BX}:\overrightarrow{XC}$ = 2:1 and $\overrightarrow{AX}:\overrightarrow{XE}$ = -1:1 $\overrightarrow{AX}$ = 4$\underset{\sim}{a}$



(a) Express $\overrightarrow{BX}$, $\overrightarrow{BC}$, $\overrightarrow{BE}$ and $\overrightarrow{AC}$ in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$. (4 Marks)
(b) If $\overrightarrow{AF}$ = K $\overrightarrow{AC}$ and $\overrightarrow{BF}$ = hBE express $\overrightarrow{AF}$ in two different ways and hence by solving, determine the ratio of BE:BF (6 Marks)

19. A factory employs 348 workers which include 1 apprentice to every 6 skilled workers and 1 foreman to every 24 skilled workers.

(a) Calculate the number of workers in each group. (2 Marks)

(b) Each of the workers work 5 days in a week. The total wage bill for one particular month was KSh. 9,590,400. Each foreman receives KSh. 960 per day, each apprentice KSh. 1,350 per day and skilled worker KSh. 175 per hour. Calculate the number of hours per day worked by each skilled worker. (3 Marks)

(c) In the following month, 2 foremen and skilled workers were dismissed and as a result the rest had to work overtime. Each foreman is to receive extra of KSh. 150 per day and each skilled worker to work 2 extra hours for 3 selected days in a week and receive 20% more per hour for the extra hours. There are no changes in the apprentices. Calculate the monthly wage bill for this month. (5 Marks)

20. The table below shows the income tax rates for the year 2015.

Taxable income (p.a) in K £	Tax rates in KSh/K £
1-5808	2
5809-11280	3
11281-16752	4
16753-22224	5
Over 22225	6

In the year 2015 Walace's monthly earning were as follows:
Basic salary – KSh. 23,600
House allowance – KSh. 12,500
Medical allowance – KSh. 2850
Transport allowance – KSh. 350
Walace was entitled to a monthly personal relief of KSh. 1162 and an insurance relief of KSh. 450. Every month the following deductions were made:

NIHIF	KSh. 320
Insurance premium	KSh. 3000
Sacco loan repayment	KSh. 6000
Sacco share contributions	KSh. 1500
Workers union dues	KSh. 200
WCPS (Allowance deductions)	KSh. 2300

Calculate:

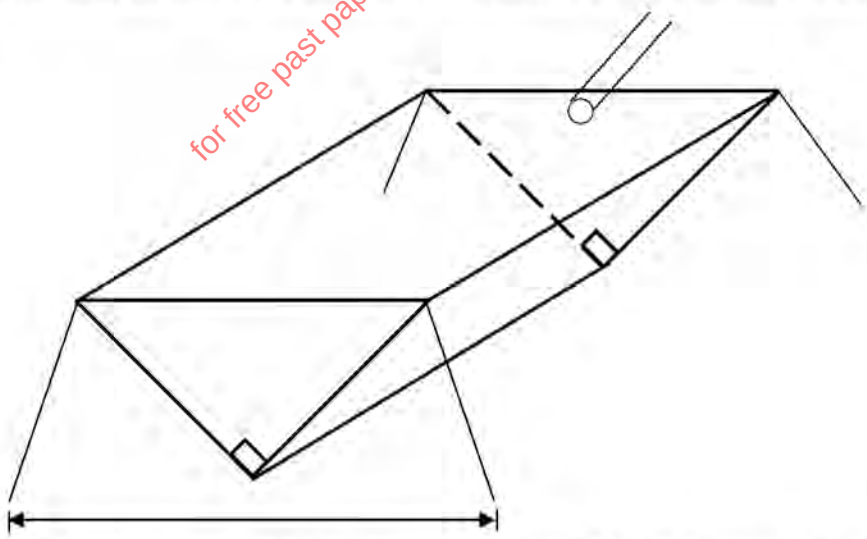
(a) Walace's taxable income in K£ p.a (1 Mark)

(b) Walace's monthly tax paid in KSh. (4 Marks)

(c) Walace's monthly net income from his employment in KSh. (2 Marks)

(d) If Walace received 10% increase in his basic salary calculate (PAYE) per month (to 4 S.F.) (3 Marks)

21. In this question use $\pi = \frac{22}{7}$. The figure below shows a trough ABCHGI which is triangular prism, 67.9m long and right angled at C. It is supported by 4 equal straight rolls AE, BD, GF and IJ of negligible thickness. AC = 2x metres, BC = x metres. A cylindrical pipe with a diameter of 7cm delivers water at the rate of 3.6m³/s into the empty trough.



(a) Given that the trough is empty at 6.00 am and completely full at 8.40 am, calculate the values of AC and BC. Give the final answer to 2 significant figures. (4 Marks)

(b) If AB// to the horizontal ED = 10cm calculate to 2 s.f.

(i) The height of point A above the horizontal (2 Marks)

(ii) The angle AE makes with the horizontal (2 Marks)

(iii) The length of the rod AE (2 Marks)

22. It has been established that the probabilities of Exater High School (EHS) and Kabiyet Day School (KDS) soccer teams scoring 0, 1,2, 3 goals against each other are as shown below.

No. of goals	Probabilities of scoring	
0	3.0×10^{-1}	2.0×10^{-1}
1	3.0×10^{-1}	4.0×10^{-1}
2	3.0×10^{-1}	3.0×10^{-1}
3	1.0×10^{-1}	1.0×10^{-1}

(a) Using a tree diagram or otherwise, show all the possible outcomes. (3 Marks)
(b) Calculate the probability of
(i) EHS winning (3 Marks)
(ii) A draw (2 Marks)
(iii) KDS winning (2 Marks)

23. (a) By taking integral values of x from -4 to 3 make a table of values for the function $y + 3x = 2x^2 - 5$ (2 Marks)

x	-4	-3	-2	-1	0	1	2	3	4
y									

(b) On the same axes and using the same scale, draw the graph $y + 3x = 2x2 - 5$ and a straight line of the equation $y - 3 = 2x$ on the grid provided. (4 Marks)
(c) Use the graph in (b) to solve
(i) The equation $2x^2 - 3x - 5 = 0$ (2 Marks)
(ii) The simultaneous equations (2 Marks)
$y = 2x^2 - 3x - 5$
$y = 2x + 3$

24. A line L1 passes through the points (-2,3) and (-1,6) and perpendicular to line L2 at (-1,6)
(a) Find the equation of L1 (2 Marks)
(b) Find the equation of L2 in the form $ax + by - c = 0$ where a, b and c are constants. (2 Marks)
(c) Given that another L3 is parallel to L1 and passes through point (1,2) find the x and y intercepts of L3. (3 Marks)
(d) Find the point of intersection of line L2 and L3 (3 Marks)

NANDI EAST/TINDERET SECONDARY SCHOOLS EXAMINATIONS 2016

Kenya Certificate of Secondary Education

MATHEMATICS

Paper 2

2 ½ hours

SECTION 1: (50 MARKS)

Answer ALL Questions in this section

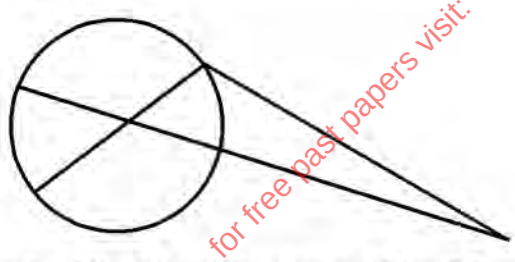
1. In this section show all your calculations giving the answer at each stage. Use logarithms correct to 4 decimal places to evaluate: (3 marks)

$$\frac{6.373 \log - 4.948}{\sqrt{0.004636}}$$

2. Make C the subject of the formula. (3 marks)

$$\frac{C^{\frac{2}{3}}}{A\sqrt[3]{(c-b)(c+b)}}$$

3. Expand and simplify the binomial expression $(2 - x)^7$ in ascending powers of x. Use your expansion up to the fourth term to evaluate $(1.97)^7$ correct to 4 decimal places. (4 marks)
4. Two grades of tea costing Sh. 100 and Sh. 150 per kg respectively are mixed in the ratio 3:5 by weight. The mixture is then sold at Sh. 160 per kg. Find the percentage profit on the cost price. (4 marks)
5. The position vectors of points A and B are $\begin{pmatrix} 3 \\ -1 \\ -4 \end{pmatrix}$ and $\begin{pmatrix} 8 \\ -6 \\ -4 \end{pmatrix}$ respectively. A point P divides AB in the ratio 2:3. Find the position of point P. (3 marks)
6. Solve $4 - 4\cos^2\theta = 4\sin\theta - 1$ for $0^0 \leq \theta \leq 360^0$ (3 marks)
7. A circle whose equation is $(x - 1)^2 + (y-k)^2 = 10$ passes through the point (2,5). Find the coordinates of two possible centres of the circle. (3 marks)
8. Simplify $\frac{3}{\sqrt{5}-2} + \frac{1}{\sqrt{5}}$ leaving your answer in the form $a + \sqrt{c}$ where a, b and c are rotational numbers. (3 marks)
9. Solve for x in $(\log x)2 = \frac{\log x^5 + 3}{2}$ (3 marks)
10. The area of a triangle FGH is 21cm². The triangle FGH is transformed using the matrix $\begin{pmatrix} 4 & 5 \\ 1 & 2 \end{pmatrix}$ calculates the area of the image of triangle FGH. (2 marks)
11. In the figure below AB is a diameter of the circle. Chord PQ intersects AB at N. A tangent to the circle at B and meets PQ produced at R.



Given that PN = 14cm, NB = 4cm and BR = 7.5cm, calculate the length of: (4 marks)

(a) NR

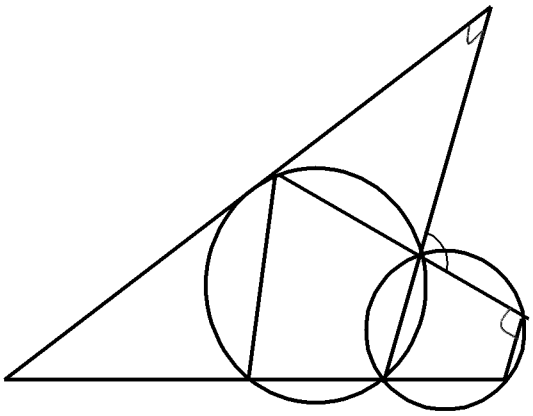
(b) AN

12. The top of a table is a regular hexagon. Each side of the hexagon measures 50.0cm. Find the maximum percentage error in calculating the perimeter of the top of the table. (3 marks)
13. Determine the interquartile range for the following set of numbers 4,9,5,4,7,6,2,1,6,,7,9. (3 marks)
14. Simplify $\frac{3x^2-1}{x^2-1} - \frac{2x+1}{x+1}$ (3 marks)
15. The interior angles of a hexagon are $2x^0$, $\frac{1}{2}x^0$, x^0+140^0, 110^0, 130^0 and 160^0. Find the value of the smallest angle. (3 marks)
16. A biscuits factory has a machine which produces 18,000 biscuits per hour. The rate of production decreases by 20% every hour. If the machine is shut down after running for 4 hours, how many biscuits will it have produced? (3 marks)

SECTION II

Answer any FIVE questions in this section.

17. The figure below shows two circles ABPQ and ABSR intersecting at A and B. QART, PBS and ABU ARE straight lines. The line TSU is a tangent to the circle ABSR at S.
$\angle BPQ = 80^0$, $\angle PBC = 115^0$ and $\angle BCS = 70^0$



(a) $\angle BRS$ (3 marks)
(b) $\angle BSC$ (3 marks)
(c) $\angle STR$ (3 marks)
(d) $\angle BAR$ (3marks

18. (a) Complete the table below, giving the values correct to 2 decimal places. (2 mks)

x0	0	30^0	60^0	90^0	120^0	150^0	180^0	210^0	240^0	270^0	300^0	330^0	360^0
Sin 2x	0		0.87		0.87		0	0.87	0.87				0
3 cos x – 2				-2	-3.5			-4.60					

(b) On the grid provided, draw the graph of $y = \sin 2x$ and $y = 3\cos x - 2$ for $0^0 \le x \le 360^0$, on the same axes, use a scale of 1 cm to represent 30^0 on the x axis and 2 cm to represent 1 unit on the y axis. (5 marks)
(c) Use your graph in (b) above to solve the equation $3\cos x - \sin 2x = 2$ (2 marks)
(d) State the amplitude of $y = 3\cos x - 2$ (1mark)

19. The table below shows a number of goals scored in a handball match during a tournament.

No. of goals	0-9	10-19	20-29	30-39	40-49
No. of matches	2	14	24	12	18

(a) Draw a cumulative frequency curve on the grid provided. (5 marks)
(b) Using the curve in (a) above determine:
(i) The median (1 mark)
(ii) The number of matches in which goals scored were not more than 37. (1 mark)
(ii) The interquartile range (3 marks)

20. (a) Complete the table below for the equation (3 marks)
$y = x^3 - 5x^2 + 2x + 9$

x	-2	-1.5	-1	0	1	2	3	4	5
x^3		-3.4	-1	0			27	64	125
$-5x^2$	-20	-11.3		0	-5	-20	-45		
2x	-4	-3		0	2	4	6	8	10
9		9	9	9	9	9	9	9	9
y		-8.7	9		7		-3		

(b) On the grid provided draw the graph of $y = x^3 - 5x^2 + 2x + 9$ for $-2 \le x \le 5$ (3 marks)
(c) Using the graph, estimate the roots of the equation. $x^3 - 5x^2 + 2x + 9 = 0$ between $x = 2$ and $x = 3$ (1 mark)
(d) Using the same axes draw the graph of $y = 4 - 4x$ and estimate the solution to the equation.
$x^3 - 5x^2 + 6x + 5 = 0$ (3 marks)

21. Two towns A and B line on the same parallel of latitude 61.5^0N.
(a) Find the shortest distance between the towns and the North pole. (3 marks)
(b) If the longitude of A and B are 42^0N and 29^0E respectively find the shortest distance between them in km. (2 marks)
(c) If C is another town due South of A and 960km away from A find the co-ordinates of C (5 marks)

22. ΔABC has vertices A (-2,6), B(2,3) and C(-2,3). ΔABC is the image of $\Delta A^{I}B^{I}C^{I}$ under a reflection in the line x = -3. Under a translation vector $\begin{pmatrix}10\\3\end{pmatrix}$ $\Delta A^{I}B^{I}C^{I}$ is mapped onto $\Delta A^{II}B^{II}C^{II}$ and $\Delta A^{II}B^{II}C^{II}$ is mapped onto $\Delta A^{III}B^{III}C^{III}$ under another transformation.

(a) Give that A^{III} (6,-6), B^{III} (2,-3)and C^{III} (6,-3) determine and describe fully the transformation that maps $\Delta A^{II}B^{II}C^{II}$ onto $\Delta A^{III}B^{III}C^{III}$. (4 marks)

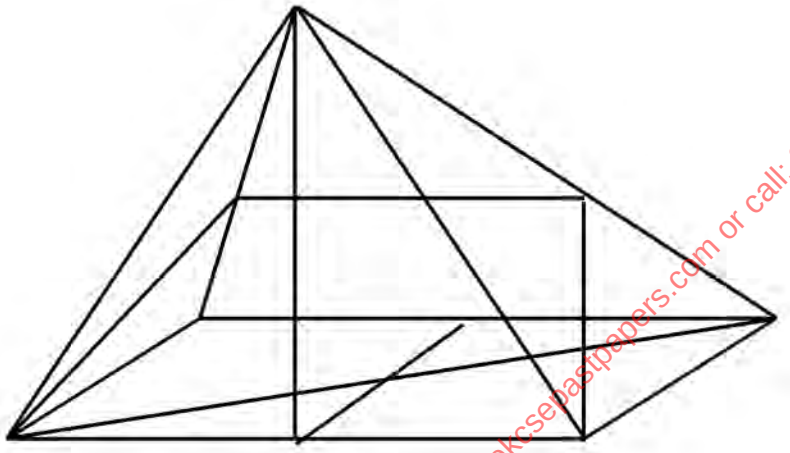
(b) Describe fully the transformation that would map ΔABC onto $\Delta A^{III}B^{III}C^{III}$ (3 marks)

(c) Given that also that $\Delta A^{IV}B^{IV}C^{IV}$ is a triangle whose vertices are A^{IV}(2,-6)B^{IV} (-2,-3) and C^{IV} (2,-3) describe the transformation that maps ΔABC onto $\Delta A^{IV}B^{IV}C^{IV}$ (3 marks)

23. (a) The sum of the first n terms of a certain series is $\frac{n}{2}$- $\frac{3n^2}{2}$, for all integral values of n find the first 3 terms of the series. (4 marks)

(b) The first term of an AP and GP is 4. The common ratio of the GP is 8 less than the common difference of the AP. The ratio of the third term of the AP to the third term of the GP is 7:16. Find the value of the common difference and the common ratio. (6 marks)

24. The diagram below shows a right pyramid VABCD with V as the vertex. The base of the pyramid is a rectangle ABCD with AB = 4cm and BC = 3cm. The height of the pyramid is 6cm.



(a) Calculate

(i) The length of the projection of VA on the base (3 marks)

(ii) The angle between the base VAB and the base (3 marks)

(b) P is the midpoint of VC and Q is the midpoint of VD. Find the angle between the place VAB and the plane ABPQ. (4 marks)

REVISION EXERCISES

BURETI SUB-COUNTY JOINT EVALUATION 2016

Kenya Certificate of Secondary Education

121/1

MATHEMATICS

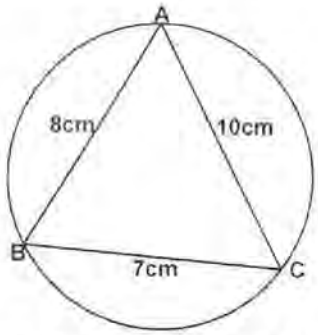
Paper 1

Time : 2 ½ Hours

SECTION 1 (50 MARKS)

Answer all the questions in this section in the spaces provided

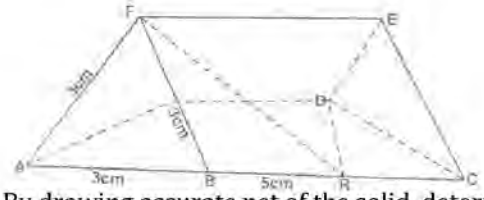
1. Without using a calculator or tables, find the value of y given that: (2 marks)
$y = \frac{(a+b)(x-c)^2}{(a-x)(a-c)}$ a =5, b = 6, x = 3, c = 2
2. Three toilets are designed to flush automatically at intervals of 6, 3 and 12 minutes. They all flush at 6.30 am. What time will they next together? (2 marks)
3. Mwambala hired a lorry and a pick up to transport bags of maize. The pick-up 1 ½ times as many trips as the lorry. For one trip, its costs him Sh. 2500 to hire a pick-up and Sh. 4500 to hire a lorry. If he paid a total of Sh. 16,500 for transport. Determine the number trips each vehicle made. (3 marks)
4. The perimeter of a right-angled is 30cm and the hypotenuse is 13cm, find the length of the other two sides. Hence calculate the area of the triangle. (4 marks)
5. Use logarithm to evaluate. (4 marks)
$\sqrt{\frac{2.52^2 \times 82.45}{434^2}}$
6. Solve $4 \leq 3x - 2 < 9 + x$ hence list the integral values that satisfies the inequality. (3 marks)
7. Simplify the expression. (3 marks)
$\frac{2x^2 - 3xy - 2y^2}{4x^2 - y^2} \div \frac{2x+y}{2x-y}$
8. The figure below shows a triangle ABC inscribed in a circle. AC = 10cm, BC = 7cm and AB = 8cm.



(a) Find the size of angle BAC. (2 marks)

(b) Calculate the radius of the circle correct to 1 decimal place. $\pi = 3.142$ (2 marks)

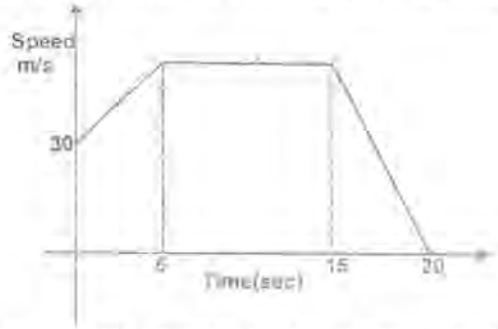
9. A plane leaves an airstrip L and flies on a bearing of 040° to airstrip M, 500km away. The bearing of N is 350°. By scale drawing, determine the distance between airstrips M and N. (4 marks)
10. A pentagon has angles $(2x + 20^0)$, $(x + 50^0)$, $(3x - 10^0)$, $(2x + 40^0)$ and $(x - 10^0)$. Calculate the sizes of all the external of this pentagon. (3 marks)
11. Below is a triangle prism ABCDEF. A find string stretch from F to D through R or BC.



By drawing accurate net of the solid, determine the short distance possible length of the string. (3 marks)

12. A Kenyan businessman bought goods from Japan worth Sh. 2,950, 000 Japanese Yen. On arrival in Kenya, custom duty of 20% was charged on the value of the goods. If the exchange rates were as follows; (3 marks)
1 US dollar = 118.0 Japanese Yen
1 US dollar = 76 Kenya shillings
Calculate the duty paid in Kenya shillings

13. The figure below shows the motion of a particle in 20 seconds. The particle starts off at a speed of 30m/s and accelerates at 4m/s² for 5 seconds. Calculate the total distance covered by the particle in 20 seconds. (4 marks)



14. Estimate the area bounded by the survey $y = \frac{1}{2}x^2 + 5$, the x-axis, the line $x = 1$ and $x = 5$ using trapezium rule with 4 trapezia.

(3 marks)

15. Determine the inverse, T^{-1} of the matrix

$T = \begin{pmatrix} 1 & 2 \\ 1 & -1 \end{pmatrix}$

Hence find the co-ordinates to the point at which the two lines $x + 2y = 7$ and $x - y =$ intersect. (3 marks)

16. Find the value of m in the following equation. (3 marks)

$\left(\frac{1}{27}\right)^{m} \times (81)^{-1} = 243$

SECTION II (50 MARKS)

Answer ANY 5 questions in this section in the spaces provided.

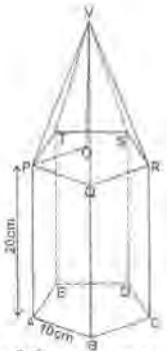
17. The co-ordinates of the points P and Q are (1,-2) and (4, 10) respectively. A point T divides the line. PQ in the ratio 2:1
    (a) Determine the co-ordinates of T. (2 marks)
    (b) (i) Find the gradient of a line perpendicular to PQ. (3 marks)
    (ii) Hence determine the equation of the line perpendicular to PQ and passing through T. In the form $ax + by + c = 0$ (3 marks)
    (iii) If the line meets the y-axis at R, calculate the length TR, correct to 3 significant figures. (2 marks)

18. The following are masses of 25 students in form 4 class.
    49, 51, 50, 60, 55, 45, 56, 51, 58, 59, 40, 54, 44, 44, 42, 59, 62, 46, 43, 57, 56, 52, 43, 41
    (a) Prepare a frequency distribution table with a uniform class size starting with the class 40 – 43. (4 marks)
    (b) Estimate the median mass. (3 marks)
    (c) Draw a histogram for the data. (3 marks)

19. Line AB drawn below is a side of a triangle ABC.

    (a) Using a pair of compasses and ruler only construct;
    (i) triangle ABC in which BC = 10cm and ∠CAB = 90⁰. (2 marks)
    (ii) a rhombus BCDE such that ∠CBE = 120⁰. (2 marks)
    (iii) a perpendicular from F, the point of intersection of diagonals of the rhombus, to meet BE at G. Measure FG; (2 marks)
    (iv) a circle to touch all the sides of the rhombus. (1 mark)

20. The figure below shows a solid consisting of a right pyramid and a pentagonal prism.

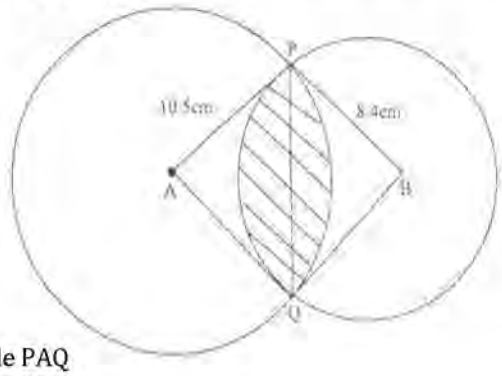


Given that the height of the pentagon prism is 20cm while the height of the right pyramid $V_0 = 36$cm. If PO = 15cm. Calculate

(a) the area the base correct to 2 decimal places. (2 marks)

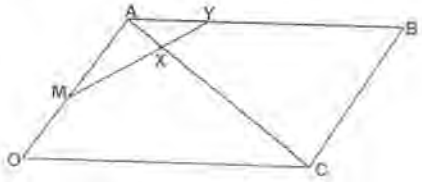
(b) the length of AV (1 mark)
(c) the surface area of the solid correct to 2 decimal places. (4 marks)
(d) the volume of the solid correct to 4 significant figures (3 marks)

21. The figure below shows two circles of radii 10.5cm and 8.4cm with centres A and B respectively. The common chord PQ = 9cm. (Take $\pi = 3.142$)



(a) Calculate angle PAQ (2 marks)
(b) Calculate angle PBQ. (2 marks)
(c) Calculate the area of the shaded part. (6 marks)

22. OABCD is a parallelogram. M is the mid-point of OA and $Ax = \frac{2}{3}AC$, OA = a and OC = c



(a) Express the following in terms of vectors a and c
(i) AC (1 mark)
(ii) AX (1 mark)
(iii) MX (2 marks)
(b) If AY = hAB and MY = kMX. Express MY into two different ways hence find the scalars h and k (4 marks)
(c) Find the ratio AY : YB (2 marks)

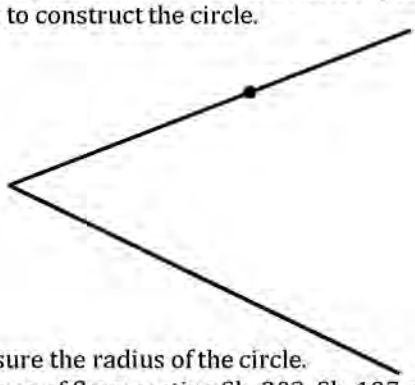
23. A group of youth planned to open a computer business. They planned to buy some computers for a total of KSh. 1,800,000. Before they could buy the computers the price per unit was reduced by Sh. 4000. This reduction in price enabled the retailer to buy five more computers using the same amount of money as originally planned. Let x represent the number of computers purchased.
(a) Write down an expression in terms of x for the price of each computer.
(i) before the price was reduced. (1 mark)
(ii) after the price was reduced. (1 mark)
(b) Use the expressions in (a) above to determine the number of computers that youth group purchased. (4 marks)
(c) Two computers purchased got damaged while in store, the rest were sold and the youth group made 20% profit. Calculate the profit made by the youth group on each computer sold. (4 marks)

24. The equation of a curve is given by $y = x^3 + 4x^2 - 3x$
(a) Find the value of y when x = 1. (1 mark)
(b) Determine the stationary points of the curve. (5 marks)
(c) Find the equation of the normal to the curve at x = 1. (4 marks)

BURETI SUB-COUNTY JOINT EVALUATION 2016
Kenya Certificate of Secondary Education
121/2
MATHEMATICS
Paper 2
Time : 2 ½ Hours

SECTION 1 (50 MARKS)
Answer all the questions in this section in the spaces provided

1. Five people can build 3 huts in 21 days. Find the number of people, working at the same rate that will build 6 similar huts in 15 days. (2 marks)
2. In a Geometric Progression (G.P) the 4^{th} term is 24 and 6^{th} term is 96.
   Determine
   (a) the common ratio of the G.P (2 marks)
   (b) the first term of the G.P (2 marks)
3. Solve for x in the equation. (3 marks)
   $9^{(22x+2)} - 41(2^x) + 8 = 0$
4. (a) In the figure below, lines AB and AC represent tangents to a circle at B and C. Use a pair of compasses and a ruler only to construct the circle. (2 marks)



   (b) Measure the radius of the circle. (1 mark)
5. Three types of flour costing Sh. 203, Sh. 197 per kg are mixed in the ratio 2:5:k respectively. Find the value of k, if the mixture was sold at KSh 221 per kg giving of 30% profit. (3 marks)
6. Make b the subject of the formula in; (3 marks)

   $t = \sqrt{\frac{a-b}{a-ab}}$
7. (i) Expand and simplify $(2 - x)^5$ (2 marks)
   (ii) Use the first three terms to approximate the value of $(1.6)^5$ as a mixed fraction. (2 marks)
8. Solve the equation $2\cos 2x - \sin x - 1 = 0$, for $-180^0 \leq x \leq 180^0$. (3 marks)
9. Evaluate $\frac{\sqrt{2}+1}{\sqrt{2}-\sqrt{5}}$ leaving your answer in its simplest form. (3 marks)
10. A bus left Kisumu for Nairobi and travelled at a speed of 80km/h. After 30 minutes, a car travelling a speed of 100km/h left Kisumu for Nairobi and followed the same route of the bus. Determine the distance from Kisumu covered by the car time it caught up with the bus. (3 marks)
11. The probability that a certain student passes her examination is $\frac{4}{5}$ If she passes the probability that she does not get a job is $\frac{2}{9}$. If she does not pass the probability that she gets a job is $\frac{1}{4}$. Find the probability that she does not get a job. (3 marks)
12. Use the mid-ordinate rule, with strips of 1 unit width to estimate the area bonded by the curve $y = \frac{1}{x+2}$, the lines $x = 0$ and $x = 5$. (3 marks)
13. The value of a machine depreciates every year by 10% of its value at the beginning of the year. Its value when new is Sh. 65,000. Find its value to the nearest shillings after 8 years. (3 marks)
14. Given that $x = 2i + j - k$, $y = 3i + 4j - k$ and $z = -5i + 5j + 2k$ that $p = 3x - y + z$. Find the magnitude of vector p to 3 significant figures. (3 marks)
15. Find the value of y given that the matrix $\begin{pmatrix} y+7 & 4 \\ -2 & y \end{pmatrix}$ is singular. (3 marks)
16. Find the equation of the normal to the curve $y = 2x3 + 5x2 - x - 6$ at the point where $x = 1$. (4 marks)

SECTION II (50 MARKS)

Answer ANY 5 questions in this section in the spaces provided.

17. Mr. Mitei, a civil servant earns a basic salary of KSh. 40,300, house allowance of KSh. 12,000 and medical allowance of KSh 3,800 every month. He claims a personal relief of Sh. 1056 per month and life insurance relief of 5% of the premium paid per month.

Monthly taxable income	Rate in KSh/pound
1 – 8800	2
8801 – 16800	3
16801 – 24800	5
24801 – 36800	7
36801 – 48800	9
Over 48800	10

(a) Calculate Mr. Mitei's annual income in K£ per annum. (2 marks)

(b) The tax paid by Mr. Mitei every month. (4 marks)

(c) If further deductions are made every month from his salary.
WCPS of 2% of basic salary
Life insurance premium of Sh. 4600
Sacco loan repayment of Sh. 14200
Calculate
(i) Total deductions (2 marks)
(ii) His net pay for every month. (2 marks)

18. Two variables A and B are related by the equations $A = KB^n$. The table below shows the corresponding values of A and B from the relation.

A	1.2	1.5	2.0	2.5	3.5	4.5
B	1.57	2.26	3.39			

(a) Determine a linear equation connecting A and B. (1 mark)

(b) Draw a suitable straight line graph to represent the relationship above. (5 marks)

(c) Determine the values of k and n. (3 marks)

(d) The value of B when A = 4.32 (1 mark)

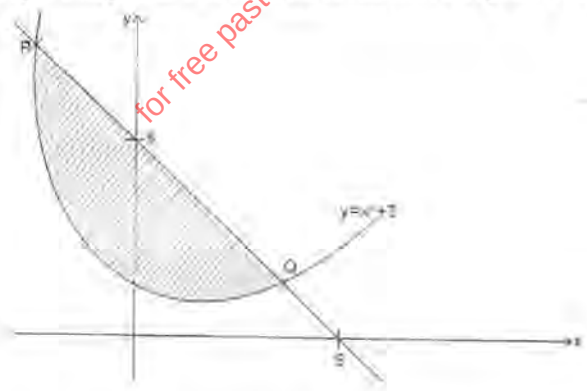
19. A trader makes two types of chairs, ordinary and special chairs. The cost of each ordinary chair is Sh. 300, while each special chair is Sh 700. He is prepared to spend not more than Sh. 21,000. It is not viable for him to make less than 20 chairs. Ordinary chairs must be less than twice the special chairs but more than 15. By taking the number of ordinary chairs as x and special chairs as y.

(a) Write down all inequalities in x and y. (4 marks)

(b) Represent the inequalities on the grid provided. (4 marks)

(c) He sells a special chair at a profit of Sh. 140 and ordinary chair at a profit of Sh. 120; Determine the maximum possible profit. (2 marks)

20. The sketch below represents the curve $y = x^2 + 3$ and a straight line PQ which cuts the x-axis and the y – axis at (5 , 0) and (5,0) respectively. The line intersects the curve at point P and Q as shown.



(a) Find the equation of the line in the form $y = mx + c$ (2 marks)

(b) Determine the co-ordinates of P and Q. (3 marks)

(c) Calculate the area of the shaded region. (5 marks)

21. (a) Complete the table given below by filling the blank spaces.

x^0	0^0	15^0	30^0	45^0	60^0	75^0	90^0	105^0	120^0	135^0	150^0	165^0	180^0
4 Cos 2x	4.00		2.00	0	-2.00	-3.46	-4.00	-3.46	-2.00	0	2.00		4.00
2 Sin (2 x + 30^0)	1.00	1.73	2.00	1.73		0	-1.00	-1.73	-2.00			0	1.00

(b) On the grid provided below draw on the same axes, the graph of $y = 4 \text{ Cos } 2x$ and $y = 2 \text{ Sin } (2x + 30^0)$ for $0^0 \leq x \leq 180^0$.

Take the scale, 1cm for 15^0 on x-axis and 2cm for 1 unit on the y – axis. (5 marks)

(c) From your graph;

(i) state the amplitude of $y = 4 \text{ Cos } 2x$. (1 mark)

(ii) find the period of $y = 2 \text{ Sin } (2x + 30^0)$

(iii) Use your graph to solve, $4 \text{ Cos } 2x - 2\text{Sin } (2x + 30^0) = 0$

22. Given that $y = (1 + x)(5 - 2x)$

(a) Copy and complete the table below.

x	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3	3.5
y	-9	-4		3					3			-9

(b) Draw the graph of $y = (1 + x)(5 - 2x)$ on the grid provided. (3 marks)

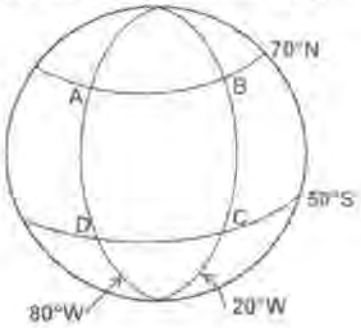
(c) Find the line of symmetry of the curve $y = (1 + x)(5 - 2x)$ (1 mark)

(d) By drawing suitable straight lines use your graph to solve

(i) $y = (1 + x)(5 - 2x) = -2$

(ii) $(1 + x)(5 - 2x) = (1 - 2x)$

23. The diagram below shows the positions of A, B, C and D on the earth's surface.



(a) State the position of A. (1 mark)

(b) Calculate in kilometres 9 the distance between A and C via B to 2dp. (Take $\pi = \frac{22}{7}$ and radius of earth to be 6370km)

(c) A plane travels due North from A for a distance of 4200nm. Give the coordinates of its new position after covering this distance. (3 marks)

(d) State the local time at D if the time at C is 8.00 am on Monday. (2 marks)

24. (a) PQRS is a quadrilateral with vertices P (1,4), Q(2,1), R(2,3) and S(6,4). On the grid provided, plot the quadrilateral. (1mark)

(b) Draw $P^IQ^IR^IS^I$ the image of PQRS under a positive quarter turn about the origin and write down the co-ordinates. (3 marks)

(c) Draw $P^{II}Q^{II}R^{II}S^{II}$ the image of $P^IQ^IR^IS^I$ under transformation whose matrix is $\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$ and write down its co-ordinator. (1marks)

(d) Determine the single matrix of transformation that maps PQRS onto $P^{II}Q^{II}R^{II}S^{II}$. (3 marks)

KEIYO SOUTH JOINT EVALUATION
Kenya Certificate of Secondary Education
MATHEMATICS
PAPER 1
Time: 2 ½ hours

SECTION 1 (50 marks)
Answer all questions in this section in the spaces provided.

1. Without using a calculator evaluate (3 marks)

$$\frac{-2(5+3)-9\div 3+5}{-3\times -5+-2\times 4}$$

2. A line which passes through points P(4,a) and Q(2a,2) is parallel to the line whose equation is 2y-3x=6. Find the value of *a*. (3marks)

3. Evaluate $5\frac{1}{2}-1\frac{1}{7}\left(1\frac{1}{5}+\frac{9}{10}\right)+\frac{1}{3}\text{ of}\left(\frac{2}{3}\div\frac{5}{6}\right)$ (3marks)

4. Find the value of x and y in the equation (4marks)
$3^{2x}\div 3^{3y}=2187$ and $2^{3x}\times 2^{6y}=1$

5. Winnie bought maize and millet flour from a vendor. She then mixed them in the ratio 4:3. She bought the maize flour at kshs.41 per kg and the millet flour at kshs.61 per kg. If she was to sell and make a profit of 20%. What should be the selling price of 1kg of the mixture? Give you answer correct to the nearest10cent. (3marks)

6. A Kenyan tourist left Germany for Kenya through Switzerland. While in Switzerland he bought a watch worth 52 Deutche marks. Find the value of the watch in Kenya shillings using the exchange rates below, **1 swiss Franc = 1.28 DM and 1 Swiss Franc = 45.21 Kenya shillings.** (3 marks)

7. Use table of reciprocals only to work out

$$\frac{3}{0.6735}+\frac{13}{0.156}$$

(3 marks)

8. (a) Find the LCM of (x-1), (x^2-1) and x^2+2x+1. (1 mark)
(b) Hence or otherwise simplify (2 marks)

$$\frac{1}{x-1}+\frac{x-1}{(x^2+2x+1)}$$

9. Given the matrix $M=\begin{pmatrix}3 & -5\\ 5 & 2\end{pmatrix}$ find the inverse of M and hence

Solve the simultaneous equations (4 marks)
$3x-5y=-9$
$5x+2y=16$

10. Find the integral values of x for which, (3 marks)
$\frac{3(4-2x)}{2}<9\geq 4x-3$

11. A piece of land was valued at kshs.680,000 at the beginning of January 2009. Due to increase in demand, the land appreciated at a rate of 25% annually. Calculate the value of the land at the end of December, 2012 to the nearest whole number. (3 marks)

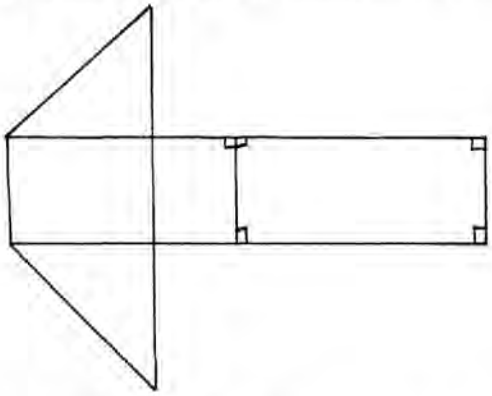
12. Solve for x in the equation.
$\log_3(2a+8)-\log_3 a=1+\log_3 2$ (3 marks)

13. Make x the subject of the formula: $y=\frac{ax^2}{b-x^2}$ (3marks)

14. A point P (-2, 5) is mapped onto P'(1, 9) by a translation T_1. If P' is mapped onto P" by a translation T_2 given by $\begin{pmatrix}-4\\ -1\end{pmatrix}$.
Find the coordinates of P" and hence a single transformation which maps P' to P". (3 marks)

15. The net of a solid is shown below.
(a) Sketch the solid if ABCD is the base. (1 marks)

(b) Calculate the angle that the plant height makes with the base. (2 marks)



16 The table below shows marks scored by students in a mathematics exam.

marks	≤10	≤20	≤30	≤40	≤50	≤60	≤70	≤80	≤90	≤100
No. of students	2	5	10	18	27	33	38	41	43	44

(a) Prepare a frequency distribution table from the above table beginning with 1-10, 11-20, etc (2marks)

(b) State the modal class (1mark)

Answer only five questions in this section in the spaces provided (50mks)

17 Jane deposited money in Equity Bank at the end of every week. Her first deposit was shs.500 and the subsequent weekly deposits were shs.800. The account is interest free

(a) If she wanted to raise the amount to shs.20,000, determine the number of weeks she will take. (3marks)

(b) At the beginning of the 20th week, Jane withdrew the amount and invested it in a pyramid scheme. This scheme collapsed and the amount refunded was 10% less. Determine how much she received (3marks)

(c) She used the amount in (b) above to buy shares at the beginning of a certain year. If at the end of each year she increases her investment by shs.6,000, calculate how long it will take for her total investment to be shs.80,000. (4marks)

(leave your answer to the nearest year)

18 A certain number of students agreed to contribute money to buy novels worth shs.1200. Five of them pulled out and the others agreed to contribute an extra shs.10 each. Their contribution bought novels worth shs.200 more than they originally expected

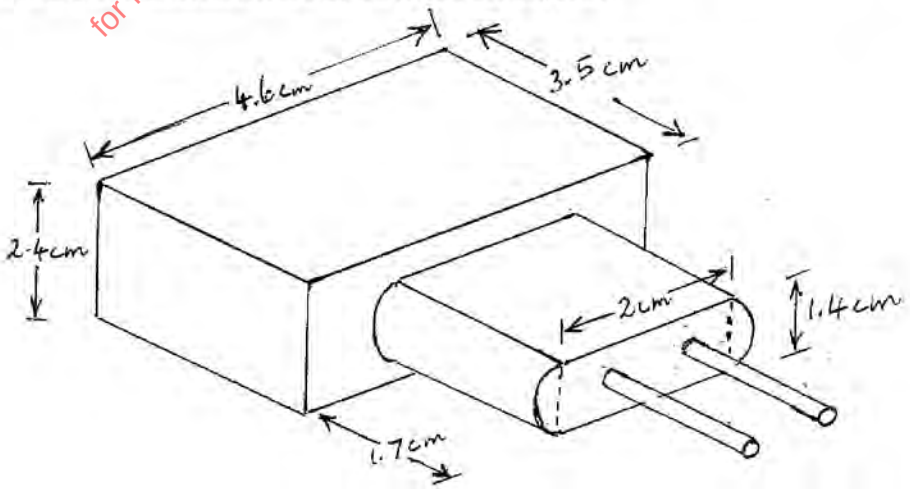
(a) If the original number of students was x, write an expression of how much each was to contribute (1mark)

(b) Write down two expressions on how much each contributed after five pulled out (2marks)

(c) Calculate number of students that made the contribution (5marks)

(d) Determine the amount that each student contributed (2marks)

19. The diagram below represents a mobile phone charger which consists of a cuboid fixed on a prism whose cross section is a rectangle bounded on its two sides by semi circles. Two cylindrical plugs each 1.8cm long and of diameter 4mm are fixed onto the prism. Other dimensions are as shown on the diagram



a) Calculate the volume, in cm^3 of

(i) The twin plugs. (1mark)

(ii) The prism connected to the twin plugs (take$\pi = \frac{22}{7}$) (3marks)

(iii) The volume of the mobile charger (2marks)

(b) The above mobile charger breaks down and is replaced by a similar mobile charger. If the surface area of the new and the old chargers are 128 cm^2 and 98 cm^2 respectively determine the volume of the new mobile charger. (4mark)

20. (a) Complete the table below, giving the values correct to 2 decimal places. (2marks)

x^0	0	20	40	60	80	100	120	140	160	180
Cos x	1.00	0.94	0.77	0.50		-0.17		-0.77		-1.00
Sin x + cos x	1.00	1.28		1.37	1.15		0.37		-0.60	-1.00

(b) On the grid provided and using the same axes draw the graph of y=cos x and y=sin x + cos x for $0^0 \leq x \leq 180^0$. Use scale 1cm to represent 20^0 on the x -axis and 4cm to represent 1 unit on the y axis. (4 marks)

(c) Use the graph to solve the equation.

(i) Sin x + cos x = 1.2 (2 marks)

(ii) Cos x = sin x + cos x (1 marks)

(iii) State the amplitude of the graph y= Sin x + cos x (1 marks)

21. A school bus left Nairobi at 9:00am and traveled towards Eldoret at an average speed of 80km/hr. At 9.30a.m a car left Eldoret towards Nairobi at an average speed of 120km/h. Given that the distance between Nairobi and Eldoret is 400km. Calculate

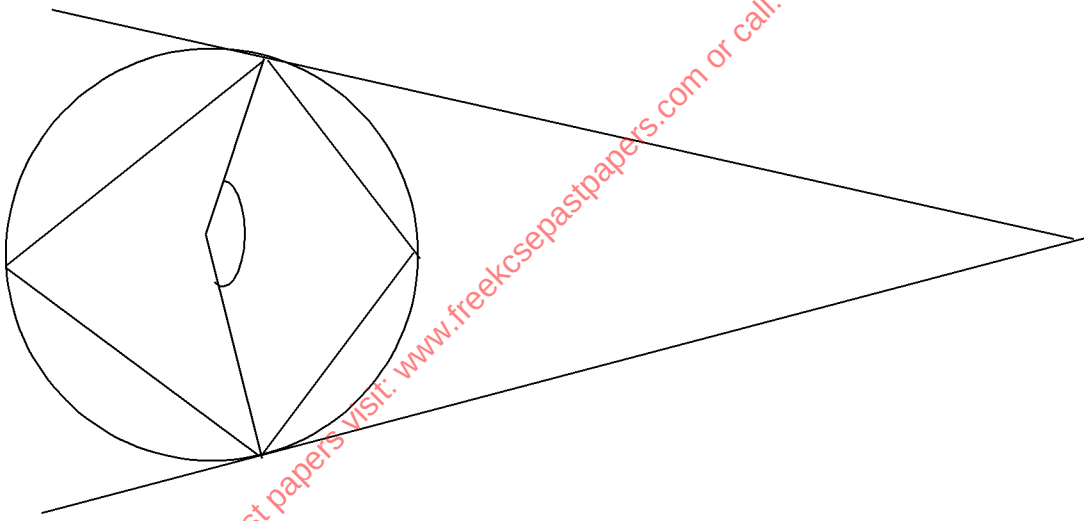
(a) the time the car arrived in Nairobi (2 marks)

(b) the time the two vehicles met (4 marks)

(c) the distance from Nairobi to the meeting point (2 marks)

(d) the distance of the bus from Eldoret when the car arrived in Nairobi (2 marks)

22. In the circle below, O is the centre; AB and AD are tangents to the circle.
Angle ABC = 30^0, angle ADC = 40^0 and Angle DOB = 140^0



Find: Giving reasons:

(a) Angle DEB (2 marks)

(b) Angle DAB (2 marks)

(c) Angle ODB (2 marks)

(d) Reflex Angle DOB (2 marks)

(e) Angle DBC (2 marks)

23 In a certain school the flagpost (F), Gate(G), Principals office (P) and staffroom(S) are on a level ground. S is 50M from F on a bearing of 200^0. G is 20M from S on a bearing of 160^o and P is 40M from G on a bearing of 290^o.

(a) Use scale drawing to show the relative position of F,G ,P and S. (Use the scale 1cm to represent 10 M (3marks)

(b) Measure

(i) the bearing of S from P (1mark)

(ii) the bearing of G from F (1mark)

(iii) the distance of G from F (2marks)

(c) The flagpost and the Gate are 10M and 2M high respectively. Calculate the angle of elevation from the top of the gate to the top of the flagpost (3marks)

24. The two variable P and Q are connected by $Q=Ka^p$ and the table of values of P and Q is given below.

P	0	1	2	3	4	5	6	7	8
Q	600	606	612	618	624	631	637	643	650

(a) Write the equation $Q=Ka^p$ in the form y = mx + c. (1 mark)

(b) Draw a suitable linear graph and use it to estimate the values of K and a. (8 marks)

(c) Write the equation connecting P and Q. (1 mark)

KEIYO SOUTH JOINT EVALUATION
Kenya Certificate of Secondary Education
MATHEMATICS
Paper 2
2 ½ hours

SECTION 1 (50 marks)
Answer all the questions in this section in the spaces provided.

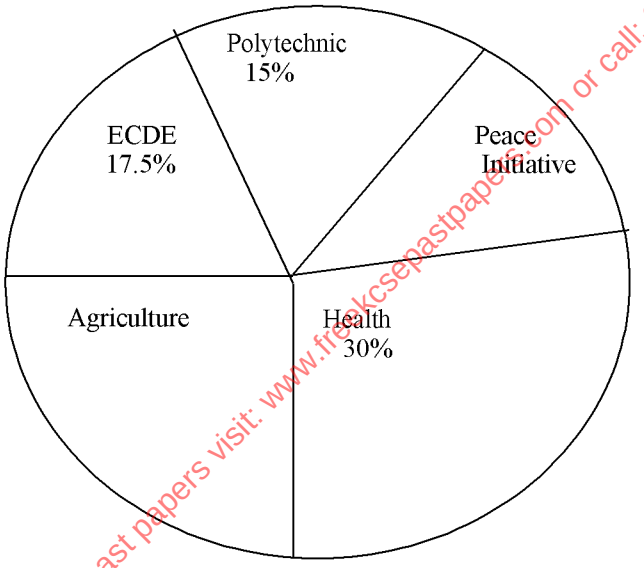
1. Use a calculator to evaluate $\frac{(3.84)^2 - \sqrt[3]{110.592}}{0.03885}$ (2 marks)

2. In a certain year, Ondege's annual salary was Ksh.120,600. For the next seven years, his annual increment was Ksh.2280.
   Determine
   a) Ondege's annual salary in the 7th year; (2 marks)
   b) The total salary that ondege earned during the first six years. (2 marks)

3. A curve crosses the x-axis at $x = 1\frac{1}{3}$ and $x = -\frac{1}{2}$. Determine the equation of the curve in the form $ax^2 + bx + c = y$ where a, b and c are integers. (2 marks)

4. Sifa invested an amount of money in a financial institution which paid a simple interest rate of 5% per annum. After 3 ½ years, the total amount of money in Sifa's account was Ksh.37, 600. Calculate the amount of money that Sifa invested (3 marks)

5. A county allocated funds for various projects as shown in the pie-chart below.



The allocation for agriculture was twice that of Peace Initiative. Calculate the size of the angle of the sector that represents the Peace Initiative. (3 marks)

6. Given that matrix A= $\begin{pmatrix} 2 & 1 & 3 \\ 3 & 2 & 1 \end{pmatrix}$ and B= $\begin{pmatrix} 1 & 0 \\ 2 & 1 \\ 1 & 2 \end{pmatrix}$, determine 2(AB) (3 marks)

7. The table below shows the amount of milk, in litres, delivered to a milk processing plant, on a certain day, by 80 farmers.

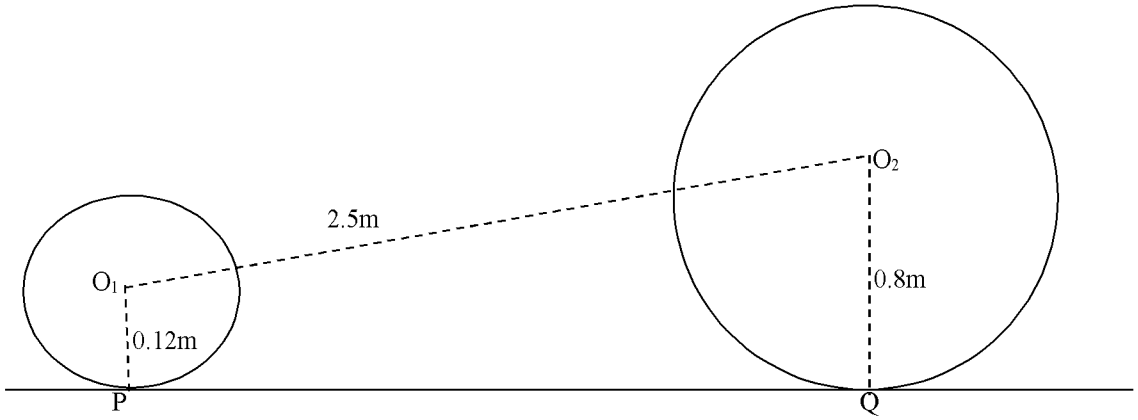
Milk in litres	10-14	15-19	20-24	25-29	30-34	35-39	40-44	44-49
No. of farmers	2	6	14	24	13	10	8	3

   Estimate by calculation, the median (3 marks)

8. A point A (4, 2) is mapped onto A′ (4, -6) by a shear y-axis invariant. Determine the matrix of the shear. Hence determine the co-ordinates of B (2, 3) under the same shear. (4 marks)

9. In a children's home, the amount of water in litres (L) used per month is partly constant and partly varies with the number n, of the children. In a certain month, there were 50 children and the amount of water used was 78,000 L. In another month, there were 70 children and 85,200L of water was used.
   a) Form an equation connecting L and n (1 mark)
   b) Determine the amount of water used in a month when the number of children was 100. (3 marks)

10. The figure below shows two circles, centres O_1 and O_2. PQ is a common tangent to the circles. The radius of the smaller circle is 0.12m while the radius of the larger circle is 0.8m. The distance between O_1 and O_2 is 2.5m.



Calculate the length PQ, correct to 2 decimal places. (3 marks)

11. Determine the centre and radius of a circle whose equations is $4x^2 + 4y^2 - 8x + 12y - 24 = 0$ (3 marks)
12. a) Find the first five terms of the expansion $(2 - {}^1/_x)^8$. (1 marks)
    b) Hence evaluate $(1.75)^8$. (2 mark)
13. A box contains 13 balls which are identical except for the colour. Three of the balls are red while the rest are white. Two balls are picked at random from the box, one at a time, without replacement.
    a) Using a tree diagram, show all the possible outcomes. (2 marks)
    b) Find the probability that a red and a white ball are picked. (2 marks)
14. Given that $10.5 \leq x \leq 20$ and $1.5 \leq y \leq 3$. Find the relative error in finding x/y (3 marks)
15. Points P,Q and R lie on a straight line, such that PQ = ¾ PR. Given P(2,5) and R(6,1), express in terms of i and j
    a) the position vector of P (1 mark)
    b) PQ (2 marks)
16. In an experiment, water was heated and its temperature changes recorded at intervals of 2 minutes as shown in the table below.

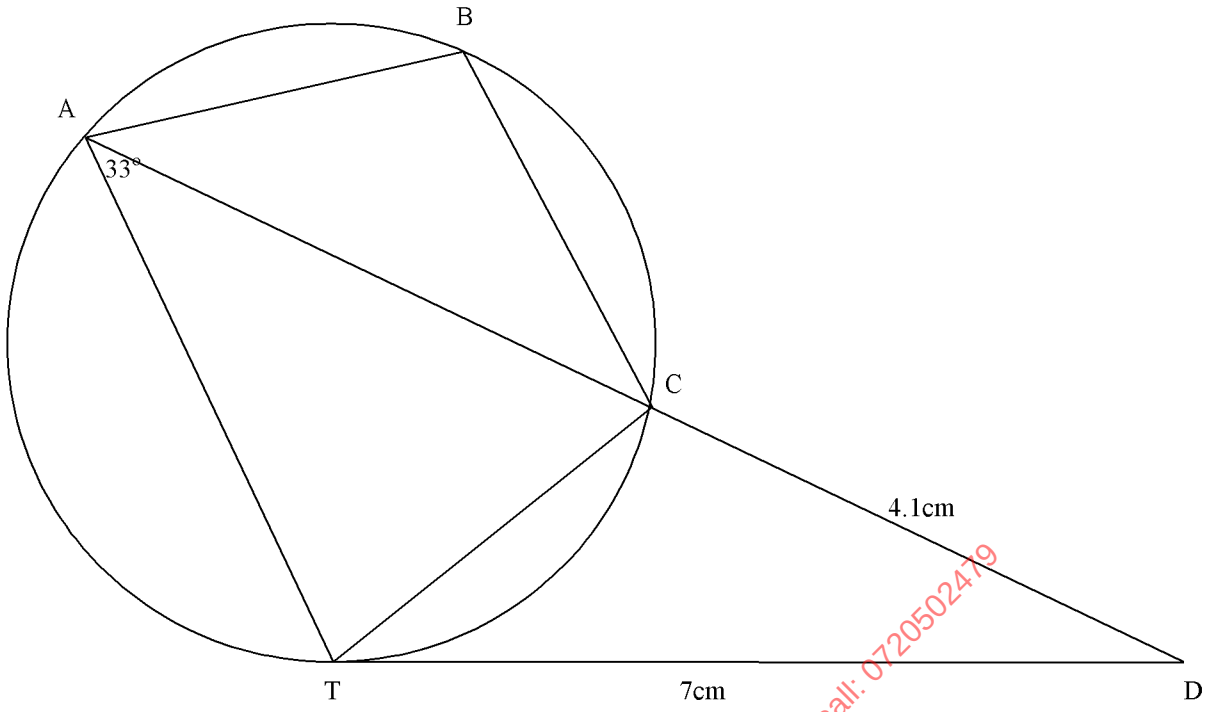
Time (min)	0	2	4	6	8	10	12	14	16
Temperature ^oC)	25	35	42.5	50	60	67.5	77.5	85	92.5

    a) On the grid provided, plot the points and draw the line of best fit. (2 marks)
    b) Use the line of best fit to estimate the time taken for the temperature of the water to reach 75^{o}C. (1 mark)

SECTION II (50 Marks)
Answer any <u>five</u> questions from this section in the spaces provided.

17. A factory blends three types of juice in the ratios A: B = 3:4 and B: C = 1:2.
    a) Determine
        i) the ration A:B:C; (1 mark)
        ii) the amount of type A juice in a 20 litre mixture. (2 marks)
    b) The cost of producing one litre of A is Ksh.80, one litre of B is Ksh.84 and one litre of C is Ksh.90.
        i) Find the cost of producing one litre of the mixture. (2 marks)
        ii) Calculate the selling price of one litre of the mixture if the factory makes a profit of 25% (2 marks)
    c) The factory uses two types of machines P and Q to blend the juices. Machine P takes 7 hours to blend 14 000 litres and
    Q takes 5 hours to blend 12 000 litres. Determine the time it would take the factory to blend 550 000 litres. (3 marks)
18. a) Construct triangle ABC such that ABC = 30^o, AC = 8cm and BA = 12cm. (3 marks)
    b) Construct a perpendicular from C to meet BA produced at D. Measure AD. Using AD determine the area of triangle ABC. (3 marks)
    c) Show T the locus of all points equidistant from A and B. (1mark)
    d) On the diagram show the locus of X, on the same side as C, such that angle AXB = 60^o. (3 mark)

19. In the figure below, TD is a tangent to the circle at T. chord AC produced intersects TD and D. CD = 4.1cm, TD =7cm and angle TAC = 33°C



a) Giving a reason, find the size of angle CTD. (2 marks)
b) Calculate the length of AC correct to one decimal place. (3 marks)
c) Calculate to the nearest degree the value of;
i) the obtuse angle TCD (3 marks)
ii) angle ABC (2 marks)

20. a) Complete the table below for values of $y = x^3 + 3x^2 + 5$ for $-4 \leq x \leq 2$, correct to 1 decimal place. (2 marks)

x	-4	$-3/5$	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2
y		-1.1	5		9			5.6		5.9		15.1	

b) On the grid provided, draw the graph of $y = x^3 + 3x^2 + 5$ for $-4 \leq x \leq 2$. Use the scale: 2 cm for 1 unit on the x-axis and 2cm for 5 units on the y axis.
c) Using the graph, determine:
i) the average rate of change between x = 0.5 and x = 1.8; (2marks)
ii) the instantaneous rate of change of the curve at x = -3. Correct to one decimal place. (3 marks)

21. A pavement is of length (x – 1)m and width (x – 8)m. the area of the pavement is $4.56m^2$
a) i) Write a quadratic equation for the area of the pavement in the form $ax^2 + bx + c = 0$ where a, b and c are constants. (2 marks)
ii) Using the method of completing the square, find the actual length and width of the pavement. (6 marks)
b) The pavement is covered with rectangular tiles measuring 0.4m by 0.3m. Determine the number of tiles used to cover the pavement completely. (2 marks)

22. Omari bought a house valued for Ksh.4 000 000. The value of the house appreciated at 20% per annum for the first three years and then at 15% per annum for the next two years.
a) Calculate the value of the house after:
i) three years, (2 marks)
iii) five years, (2 marks
b) After the five years, the value of the house depreciated for the next two years. At the end of the two years, Omari sold the house through an agent. Omari received Ksh.7,125,000 after paying a 5% commission to the agent.
Calculate
i) the value of the house after two years; (2 marks)
ii) the annual rate of depreciation in the two years (4 marks)

23. A quadrilateral ABCD has vertices A(-3,1), B(-2,3), C(-3,4) and D(-4,3).
a) i) Find the co-ordinates of A′B′C′D′, the image of ABCD, under a transformation whose matrix is $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ (2 marks)

ii) On the grid provided, draw the quadrilateral ABCD and its image ABCD (2 marks)

b) A″B″CD″is the image of A′B′C′D′under a transformation whose matrixis $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$

followed by an enlargement scale factor 2, centre (0,0)

i) Determine the co-ordinates of A″B″C″D″ (2 marks)

ii) On the same grid as in (a)(ii) above, draw A"B"C"D" (1 mark)

iii) Find a single transformation matrix that maps A"B"C"D" onto ABCD (3 marks)

24. The masses to the nearest kg of 65 patients who attended a medical clinic are as shown in the table below.

Mass (kg)	26-30	31-35	36-40	41-45	46-50	51-55
Frequency (f)	9	13	20	15	6	2

Calculate;

a) the mean mass of the patients (4 marks)

b) i) the variance mass (5 marks)

ii) the standard deviation (1 mark)

RAISMARADE JOINT EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education
MATHEMATICS
Paper 2
$2\frac{1}{2}$ hours

SECTION I (50MKS)
Answer ALL the questions in this section in the spaces provided below

1. Evaluate: $\dfrac{-8+5\times 6\div 2-10}{+22\div(+4\times 18\div 6-1)-27\div 9}$ (3 marks)

2. The sum of interior angles of a regular polygon is 1080°.
a) Find the size of each exterior angle. (2 marks)

b) Give the name of the polygon. (1 mark)

3. Solve for x in the following equation: $\frac{7x+1}{9}-\frac{3x-1}{7}=2$ (3 marks)

4. If $\sin x=\frac{1}{\sqrt{3}}$ where x is an acute angle, evaluate without using mathematical tables and calculators.
a) tan x (1 mark)
b) Sin (90 – x) (1 mark)

5. Solve the following pair of simultaneous inequalities and list the integral values. (3maks)

$7-2x\leq 16+x$ and $\frac{4x+1}{3}<3$

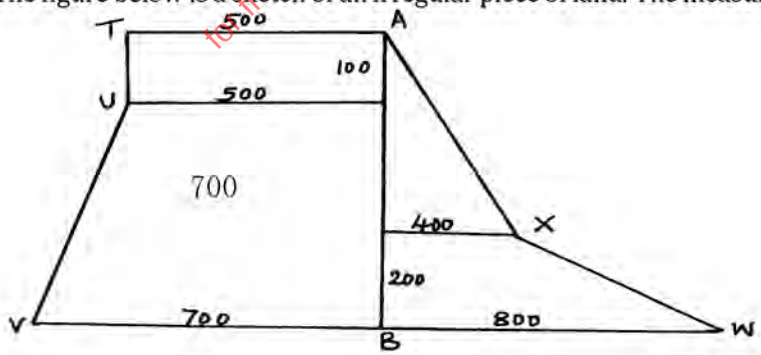
6. Two straight roads intersect at an angle of 30°. A hut is built so that it is equidistant from the two roads and 30m from the point of intersection. Using a scale of 1cm to 5m, show all possible positions of the hut. (3marks)

7. The following table shows marks for 40 students in mathematics examination.

Marks	50 - 53	54 - 61	62 - 73	74 - 77
No of students	12	16	6	6

a) Draw a histogram from the above information. (3 marks)
b) State the median class. (1 mark)

8. The figure below is a sketch of an irregular piece of land. The measurements are in metres.

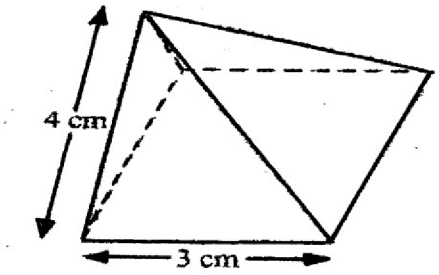


Represent the information above in a field book. (2mks)

9. (a) Find the inverse of the matrix $\begin{pmatrix}4 & 3\\ 3 & 5\end{pmatrix}$ (1 mark)

(b) Hence solve the simultaneous equation using the matrix method (3 marks)
$4x+3y=6$
$3x+5y=5$

10. The diagram below represents a right pyramid on a square base of side 3 cm. The slant edge of the pyramid is 4 cm.



a) Draw a net of the pyramid (2 marks)

b) On the net drawn, measure the perpendicular height of a triangular face from the top of the Pyramid (2 marks)

11. Three men each working for 5 hours a day can cultivate an acre piece of land in 4 days. How long would 6 men, each working 2 hours a day take to cultivate 3 acres? (3 marks)

12. Find the equation of a straight line which is perpendicular to the line $8x + 2y - 2 = 0$ given that they intersect at $y = 0$ leaving your answer in a double intercept form. (3 marks)

13. A refrigerator is sold at a cash discount of 15% of the marked price. Paul bought a refrigerator on hire purchase by paying monthly installment of Ksh. 2000 per month for 40 months and a deposit of Ksh. 12,000. If this amounted to an increase of 25% of the marked price of the refrigerator, what was the cash price of the refrigerator? (3 marks)

14. The points A, B and C lie on a straight line. The position vectors of A and C are $2i + 3j + 9k$ and $5i - 3j + 4k$ respectively; B divides AC internally in the ration 2:1. Find the

a) Position vector of B. (2 marks)

b) Distance of B from the origin. (2 marks)

15. Find the equation of the circle whose centre lies on the line $y - 2x + 2 = 0$ and which touches the positive axe. (3 marks)

16. A liquid spray of mass 384g is packed in a cylindrical container of internal radius 3.2 cm. Given that the density of the liquid is $0.6g/cm^3$, calculate to 2dp the height of the liquid in the container. (3 marks)

SECTION II (50MKS)

Answer only five questions from this section

17. The table **below** shows the income tax rates for a certain year.

Taxable pay per month (Ksh)	Tax rates
1 – 9,680	10%
9,681 – 18,800	15%
18,801 – 27,920	20%
27,921 – 37.040	25%
37,040 and above	30%

That year Asembo paid net tax of Ksh.5, 512 per month. His total monthly taxable allowances amounted to Ksh.15, 220 and he was entitled to a monthly personal relief of Ksh.1, 162. Every month the following deductions were made:

- NHIF – Ksh. 320
- Union dues – Ksh.200
- Co-operative shares – Ksh.7,500

a) Gross tax payable in Ksh. (2 marks)

b) Monthly taxable income in Ksh. (4 marks)

c) Monthly basic salary in Ksh. (2 marks)

d) Monthly net salary. (2 marks)

18. The distance from town A to town B is 360km. A bus left town A and traveled towards town B at an average speed of 60km/h. After 1½ hours, a car left town A and traveled along the same road at an average speed of 100km/h.

a) Determine

i) The distance of the bus from town A when the car took off. (2marks)

ii) The distance the car traveled to catch up with the bus. (3marks)

b) The distance from P to Q is 160km. If an express train was 16km/h slower it would take 20 minutes longer on the journey. Find the average speed of the express train. (5 marks)

19. A bag contains 5 red, 4 white and 3 blue beads. Two beads are selected at random one after another without replacement.

a) Draw a tree diagram and show the probability space. (2marks)

b) From the tree diagram, find the probability that:

i) The last bead selected is red. (3marks)

ii) The beads selected were of the same colour. (2marks)

iii) At least one of selected beads is blue. (3marks

20. Four schools P. Q, R and S are situated in such a way that Q is 240km due east of school P. School R is 100km due south of school Q and on a bearing of 112° from P. The fourth school S is 225km on a bearing of 202° from P.

a) Use a scale of 1cm to represent 50km to show the relative position of the four schools (3marks)

b) Using the scale drawing above, determine

i) The distance of school R from school P (2marks)

ii) The bearing of P from R (1mark)

iii) The distance of S from R (2marks)

c) Calculate the actual area of the triangle formed by the schools PQR in hectares. (2 marks)

21. An arithmetic progression has the first term as a and the common difference d.

a) Write down third, the ninth and the twenty-fifth terms of the progression. (1mark)

b) The progression is increasing and the 3rd, 9th, and 25th terms form the first three consecutive terms of a geometric progression. If the sum of the 7th term and twice the sixth term of the arithmetic progression is 78, calculate;

i) The first term and common difference of the A.P (4 marks)

ii) The common ration of the G.P (2marks)

iii) The sum of the first nine terms of the A.P (3marks)

22. (a) complete the table below for the function $y = 7 - 3x - 2x^2$ in the range $-3 \leq x \leq 3$ (2marks)

x	-4	-3	-2	-1	0	1	2	3
y	-13	-2			7			-20

On the grid provided, plot the graph of the above function (4 marks)

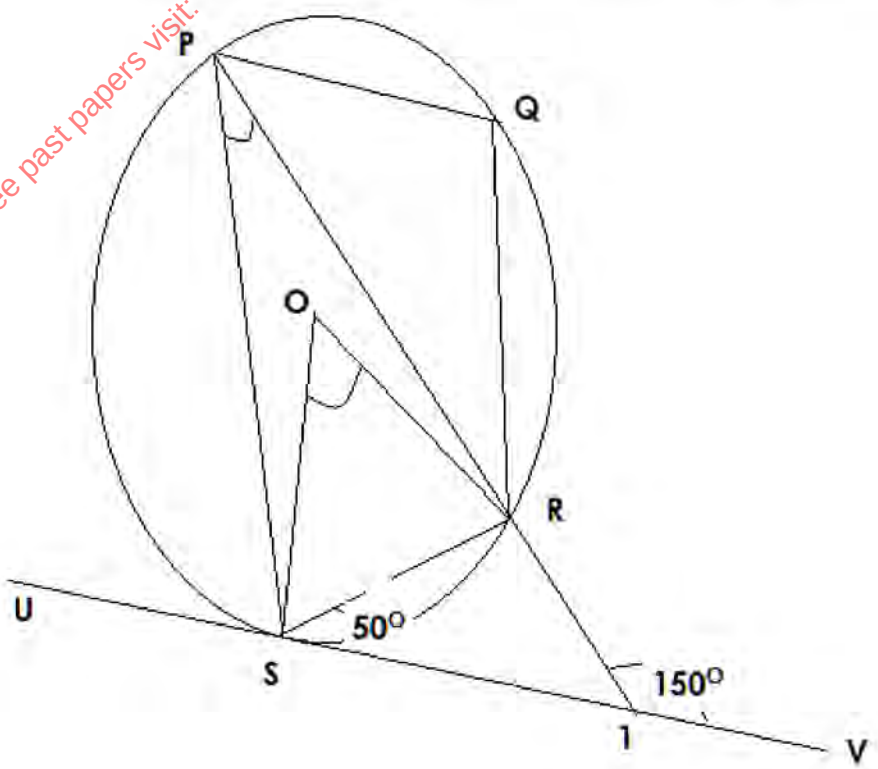
(c) Use the graph to solve the following equation

i) $-2x^2 - 3x + 7 = 0$ (2marks)

ii) $2x^2 + 4x - 9 = 0$ (3marks)

(c) Estimate the maximum value of y from your graph (1mark)

23. In the figure below P, Q, R and S are points on the circle centre O, PRT and USTV are straight lines. Line UV is a tangent to t circle at S, <RST = 50° and <RTV = 150°.



a. Calculate the size of:

i) < ORS (1 mark)

ii) < USP (2 marks)

iii) <PQR (2 marks)

b. Given that RT = 7cm and ST = 9cm, calculate to 3 significant figures.

i) length of line PR (2 marks)

ii) The radius of the circle. (3 marks)

24. A post stands directly across the street from a building. The angle of depression of the top of the building from the top of the post is 25.8° and the angle of elevation of the top of the post from the foot of the building is 43.5°. Given that the distance between the post and the building is 40m, calculate to (2.d.p);

a) The height of the post. (2 marks)

b) The difference in height between the post and the building. (3 marks)

c) The height of the building. (2 marks)

d) The angle of elevation of the top of the building from the foot of the post. (3 marks)

RAISMARADE JOINT EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education
MATHEMATICS
Paper 2
$2\frac{1}{2}$ hours

SECTION A (50 MARKS)
Answer all questions in this section.

1. Use logarithms to evaluate; (4 marks)

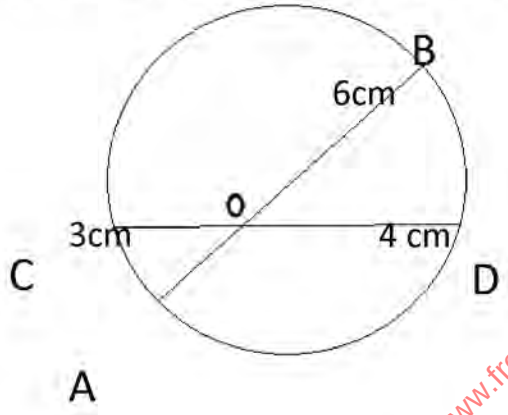
$$\left(\frac{0.03294 \log 28.73}{\tan 76^0}\right)^{\frac{1}{3}}$$

2. A circle has the equation $4x^2 - 24x + 99 = -4y^2 - 32y$. State the coordinates of the centre and the radius of the circle. (3 marks)

3. Make x the subject of the formula: (3 marks)

$$P=\frac{1}{2}\sqrt{\frac{x+2w}{4x+3R}}$$

4. In the diagram below, CO = 3cm, OD = 4cm and OB = 6cm. Find AO. (2 marks)



5. Two matrixes A and B are such that; $A=\begin{bmatrix} k & 4 \\ 3 & 2 \end{bmatrix}$ and $B\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

Given that the determinant of AB = 4, find the value of k. (3 marks)

6. A quantity Q is partly constant and partly varies as the square of E. When E = 2, Q = 560 and when E = 3, Q = 510. Find an equation connecting Q and E. (3 marks)

7. Simplify; $\frac{5}{2\sqrt{2}-\sqrt{5}} - \frac{2}{2\sqrt{2}+\sqrt{5}}$ leaving your answer in the for $\sqrt{2} + b\sqrt{5}$, where a and b are constants. (3 marks)

8. Expand $\left(1+\frac{1}{2}x\right)^8$ up to the term in x^4. Hence find the approximate value of $(1.05)^8$ correct to 3decimal places. (4 marks)

9. The seventh term of an arithmetic progression (AP) is 90. The sum of the first seven terms of the AP is 210. Calculate the first term and common difference. (3 marks)

10. A farmer weighed his goats and recorded the data as shown in the table below.

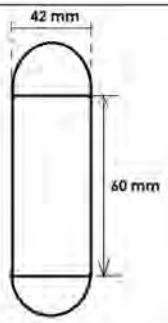
Weight (kg)	33	34	35	36	37	38	39
Frequency .	4	6	9	7	6	5	3

Calculate the interquartile range. (3 marks)

11. Kshs 120,000 kept in a certain bank amounted to Kshs. 133,700 after three years. If the interest was compounded quarterly, find the annual rate offered by the bank. (3 marks)

12. Five people can build 3 huts in 21 days. Find the number of people, working at the same rate that will build six 6 similar huts in 15 days. (2 marks)

13. The figure below shows a cross-section of a metal bar 800mm long. The ends are equal semi-circles of diameter 42mm each.



Determine its mass if the density of the metal is 17.6g/cm^3 (Take $=\frac{22}{7}$) (3 marks)

14. In a transformation, an object with an area of 10cm^2 is mapped onto an image whose area is 60cm^2. Given that the matrix of the transformation is; $\begin{bmatrix} x & x-1 \\ 2 & 4 \end{bmatrix}$, find the value of x. (3 marks)

15. A pond of diameter 15m is surrounded by a path 2m wide;
i. Determine the values of internal and external radii which will give a maximum area of the path. (2 marks)
ii. Calculate the maximum possible area of the path correct to 2 decimal places. (2 marks)

16. A bag contains 3 red balls and a number of black ones. If two balls are drawn one at a time without replacement and the probability of drawing a red ball is 0.2. Determine;
a) The number of black balls. (2 marks)
b) The probability of getting at least one black ball. (2 marks)

SECTION B (50MKS)
ANSWER ANY FIVE QUESTIONS IN THIS SECTION IN THE SPACES PROVIDED.

17. The table below shows the marks scored by students in a mathematics test.

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No. of students	3	5	6	21	12	6	4	2	1

(a) From the above table determine the 20th percentile. (2marks)
(b) Use the table above to draw the cumulative frequency curve (an Ogive) (4marks)
(c) From the graph in (b) above determine
i. the median mark. (1marks)
ii. The pass mark if 40% of the students passed. (1marks)
iii. The 6th decile. (1marks)
iv. The range of marks scored by the middle 40 students. (1marks)

18. A class eight in a primary School has 15 girls and 25 boys. The probability of a girl completing school is $^3/_5$ and that of a boy is $^4/_5$

(a) A pupil is picked at random from the class. Find the probability that :-
i. the pupil picked is a girl and will complete school. (2marks)
ii. The pupil will not complete school. (2marks)
b. If two pupils are picked at random without replacement from the class, find the probability that:-
i. both are girls
ii. both are of the same sex and will complete school. (3marks)

19. The relationship between the two variables E and F is believed to be of the form $F = a + bE^{-1}$, where a and b are constants.
(a). Complete the table below to two decimal places. (2marks)

E	1	2	3	4	5	6
F	7.0	6.0	5.7	5.5	5.4	5.3
$^1/_E$						

(b). Use the values on the table above to draw a suitable linear graph of F against $^1/_E$ on the grid provided. (3marks)
(c). Use the graph to estimate the values of a and b. (3marks)
(d). What is the relationship between F and E. (1marks)

(e). Find E correct to 4 significant figures when F= 6.4 (1marks)

20. The table shows annual income rates for the year 2001.

INCOME (K p.a)	Tax (shs per k£)

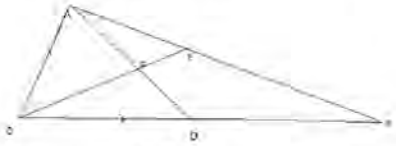
1 - 4800	2
4801 - 9600	3
9601 - 14400	5
14401 - 19200	7
19201 - 24000	9
24001 and above	10

Mr.Korir's monthly earnings were as follows:-
Basic Salary = ksh.24000
House allowance = Ksh.12000
Medical allowance = Ksh.1800

(a). Using the tax table above ,calculate Mr. Korir' s net Pay –As-You-Earn (P.A.Y.E) Per month if his monthly family reliefis Ksh.1,410. (6marks)

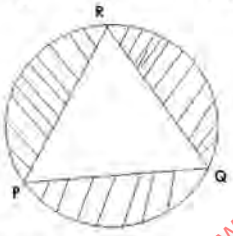
(b) If Mr. Korir pays Ksh.280 for NHIF, Ksh.3200 for hire purchase and Ksh.5250 for loan repayment, Calculate his net monthly salary. (4marks)

21. In the figure below E is the mid-point of AB.OD:DB=2:3 and F is the point of intersection of OE and AD.



(a) Given that OA = **a** and OB = **b** express in terms of **a** and **b**.
i. OE (1mark)
ii. AD (1mark)
(b) Given further that AF = tAD and OF = sOE , find the values of s and t. (5marks)
(c) Show that O, Fand E arecollinear. (3marks)

22. The figure below shows a triangle PQR.PR=4cm, QR=5.1 and angle QPR=64^0



(a).Find the radius of the circle to 2 decimal places that passes through the vertices P,Q and R. (2marks)
(b) Calculate the length of PQ. (5marks)
(c) Determine the area of the shaded region. (3marks)

23. The diagram below shows a wooded block made from a frustum of a cone.

The radii of its end are 30cm and 20 cm. It vertical height is 50cm.Determine:
(a). the volume of the frustum. (5marks)
(b). The surface area of the frustum. (5marks)

24. Without using a protractor, construct triangle ABC such that AB=10cm, angle ABC=60^0 and angle BCA =45^0.
(a). Find the length AC. (4marks)
(b). Construct the locus of a set of points which are equidistant from A and B (1mark)
(c). Mark a point P such that angle APB=45^0 and AP=PB. (2marks)
(d). Mark a point Q such that angle AQB=45^0 and AB =AQ. (2marks)
(e). Measure PQ. (1mark)