

NAMBALAE DIOCESE EXAMINATIONS 2019

121/1

MATHEMATICS

PAPER 1

1. Evaluate without using a calculator

(2 Marks)

$$\frac{23.4 - 2(5.2 + 5.3)}{3.2 \times 1.2}$$

2. In Blessed Church choir, the ratio of males to females is 2:3. On one Sunday service, ten male members were absent and six new female members joined the choir as guests for the day. If on this day the ratio of males to females was 1:3, how many regular members does the choir have? (3 Marks)

3. A Kenyan bank buys and sells foreign currency as shown below.

	Buying Kenya shillings	Selling Kenya shillings
1 Euro	84.15	84.26
1 US Dollar	80.12	80.43

A tourist travelling from Britain arrives in Kenya with 5000 Euros. He converts all the Euros to Kenya shillings at the bank. While in Kenya he spends a total of KSh. 289,850 and then converts the remaining Kenya shillings to US dollars at the bank. Calculate (to nearest dollar) the amount he receives? (3 Marks)

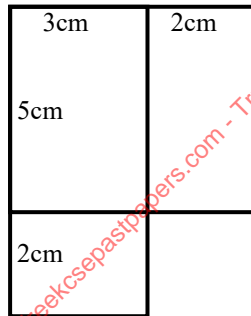
4. Simplify the expression.

(3 Marks)

$$\frac{4x}{\quad}$$

5. Complete the figure below so as to make the net of a cuboid. Hence determine the surface area of the cuboid.

(4 Marks)



6. The sum of the interior angles of a regular polygon is 1080° . Calculate

(2 Marks)

- (a) The number of sides of the polygon

The sizes of the exterior and interior angles of the polygon.

(2 Marks)

7. If $\frac{1}{x} + \frac{1}{y} = \frac{1}{10}$. Find the possible values of x

(3 Marks)

8. Three similar pieces of timber of length 240cm, 320cm and 380cm are cut into equal pieces. Find the largest possible area of a square which can be made from any of the three pieces. (3 Marks)

9. The sum of digits formed in a two digit number is 16. When the number is subtracted from the number formed by reversing the digits, the difference is 18. Find the number (3 Marks)

10. Solve for x given that

(3 Marks)

$$(x - 1) + 1 = \frac{1}{10}(x - 4)$$

11. Three pens and four exercise books cost Sh. 87. Two pens and five exercise books cost Sh. 93. Find the cost of one pen and one exercise book. (4 Marks)

12. A farmer has enough feed to last 45 cows for 30 days. If he buys 5 more cows, how long will the feed last? (2 Marks)

(2 Marks)

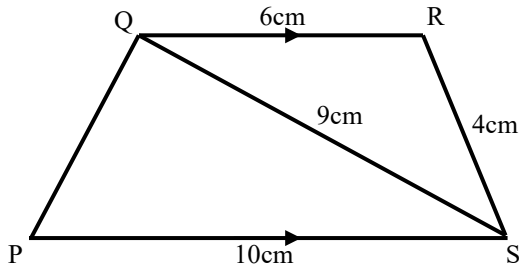
13. Find the equation of the line perpendicular to $3x - 7y - 20 = 0$, and passes through the point (5,2) (3 Marks)

(3 Marks)

14. Wanza sold a bag of potatoes for Sh. 420 and made a profit. If she sold it at Sh. 320, she could have made a loss. Given that the profit is thrice the loss, how much did she pay for the bag of potatoes? (3 Marks)

(3 Marks)

15. In the figure below PQRS is a trapezium with QR parallel to PS. QR = 6cm, RS = 4cm, QS = 9cm and PS = 10cm.



Calculate

- (a) The size of angle SQR (2 Marks)
- (b) The area of triangle PQS (2 Marks)

16. Given that $\cos(x - 20)^\circ = \sin(2x + 32)^\circ$ and x is an acute angle, Find $\tan(x - 4)^\circ$ (3 Marks)

SECTION II (50 MARKS)

Answer Only Five Questions In This Section

17. An expedition has 5 sections AB, BC, CD, DE and EA. B is 200m on a bearing of 050° from A. C is 500m from B. The bearing of B from C is 300° . D is 400m on a bearing 230° from C. E is 250m on a bearing 025° from D.

- (a) Sketch the route (1 Mark)
- (b) Use the scale of 1cm to 50m to draw the accurate diagram representing the route. (5 Marks)
- (c) Use your diagram to determine
 - (i) Distance in metres of A from E (2 Marks)
 - (ii) Bearing of E from A

18. A business lady bought 100 quails and 80 rabbits for Sh. 25,600. If she had bought twice as many rabbits and half as many quails she would have paid Sh. 7,400 less. She sold each quail at a profit of 10% and each rabbit at a profit of 20%.

- (a) Form two equations to show how much she bought the quails and the rabbits (2 Marks)
- (b) Find the cost of each (3 Marks)
- (c) Calculate the profit she made from the sale of the 100 quails and 80 rabbits (3 Marks)
- (d) What percentage profit did she make from the sale of the 100 quails and 80 rabbits (2 Marks)

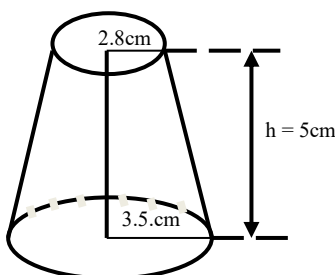
19. The table below shows the length of 40 seedlings.

Length in (mm)	Frequency
118-126	3
127 - 135	4
136 - 144	10
145 - 153	12
154 - 162	5
163 - 171	4
172-180	2

Determine

- (a) (i) The modal class (1 Mark)
- (ii) The median class (2 Marks)
- (b) (i) The mean of the seedlings (4 Marks)
- (ii) The median of the seedlings (3 Marks)

20. Find

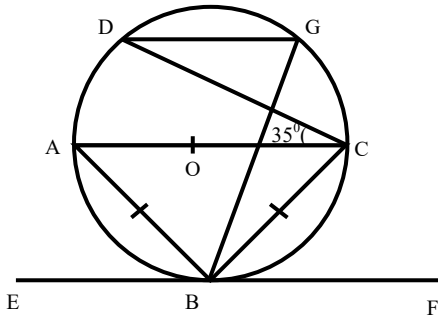


- (a) The surface area of the frustum (5 Marks)

(5 Marks)

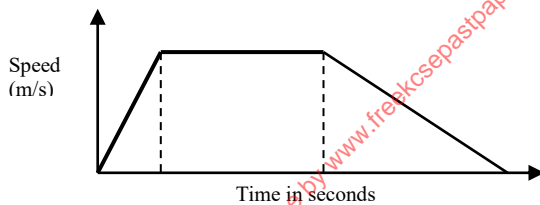
- (b) The volume of frustrum shown.
21. Triangle ABC vertices A (-2, 6), B (2, 3) and C (-2, 3) is reflected in the line $x = -3$ to give the image $A_1B_1C_1$. $A_1B_1C_1$ is translated by the vector $\begin{pmatrix} 10 \\ 2 \end{pmatrix}$ to give image $A_2B_2C_2$. $A_3B_3C_3$ with coordinates $A_3 (6,-6)$ $B_3 (2,-3)$ and $C_3 (6,-3)$ is the image of $A_2B_2C_2$ after transformation. Plot all the triangles in the grid provided and determine
- (i) The transformation that maps $A_2B_2C_2$ onto $A_3B_3C_3$ (2 Marks)
 - (ii) The simple transformation that maps ABC onto $A_3B_3C_3$ (2 Marks)

22. In the figure below AOC is a diameter of the circle centre O; $AB = BC$ and $\angle ACD = 35^\circ$. EBF is a tangent to the circle at B. G is a point on the minor arc CD.



Giving reason

- (a) Calculate the size of
 - (i) $\angle BAD$ (3 Marks)
 - (ii) The obtuse $\angle BOD$ (2 Marks)
 - (iii) $\angle BGD$ (2 Marks)
 - (b) Show that $\angle ABE = \angle CBF$ (3 Marks)
23. The diagram below shows the speed-time graph for a bus travelling between two stations. The bus begins from rest and accelerates uniformly for 30 seconds. It then travels at a constant speed for 60 seconds and finally decelerates uniformly for 40 seconds.



Given that the distance between the two stations is 2090m. Calculate

- (a) The maximum speed, in km/h the bus attained (3 Marks)
 - (b) The acceleration (2 Marks)
 - (c) The distance travelled during the last 20 seconds (2 Marks)
 - (d) The time the bus takes to travel the first half of the journey (3 Marks)
24. The members of a photograph club decided to buy a camera worth Shs. 4000 by each contributing the same amount of money. Fifteen member failed to pay their contribution due to various reasons. As a result each of the remaining members had to contribute Sh. 60 more.
- (a) Find the number of members in the club (7 Marks)
 - (b) What was the percentage increase in the contribution per month? (3 Marks)

NAMBALAE DIOCESE EXAMINATIONS 2019
121/2
MATHEMATICS
PAPER 2

SECTION I (50 MARKS)

Answer ALL the questions in this section.

1. Use logarithms to evaluate:

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$$
 (4 marks)
2. a) Expand $(1 - \frac{1}{2}x)^6$ to fourth term. (2 marks)
 b) Use the expansion above to evaluate $(0.98)^6$ (2 marks)
3. The price of a new car is shs. 800,000. If it depreciates at a constant rate to shs. 550,000 within 4 years, find the annual rate of depreciation. (3 marks)
4. Object A of the area 10cm^2 is mapped onto its image B of area 60cm^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)
5. Without using a calculator or mathematical tables, express $\frac{\sqrt{3}}{1 - \cos 30^\circ}$ in surd form and simplify. (3 marks)
6. The position vector of A and B are $a = 4\mathbf{i} + 4\mathbf{j} - 6\mathbf{k}$ and $b = 10\mathbf{i} + 4\mathbf{j} + 12\mathbf{k}$. D is a point on AB such that AD:DB is 2:1. Find the co-ordinates of D. (3 marks)
7. A variable Z varies directly as the square of X and inversely as the square root of Y. Find percentage change in Z if X is increased by 20% and Y decreased by 19%. (3 marks)
8. Pipe A can fill a tank in 2 hours, Pipe B and C can empty the tank in 5 hours and 6 hours respectively. How long would it take:
 a) To fill the tank if A and B are left open and C is closed. (2 marks)
 b) To fill the tank with all pipes open. (2 marks)
9. Given that $\sin(\frac{2}{3}x + 20^\circ) - \cos(\frac{5}{6}x + 10^\circ) = 0$. Without using a mathematical table or a calculator, determine $\tan(x + 20^\circ)$. (3 marks)
10. Make P the subject of the formula $XY^P = Q^{PX}$ (3 marks)
11. The coordinates of the end points of diameter are A(2,4) B(-2,6). Find the equation of a circle in the form $ax^2 + by^2 + cx + dy + e = 0$ (3 marks)
12. A bag contains 10 balls of which 3 are red, 5 are white and 2 green. Another bag contains 12 balls of which 4 are red, 3 are white and 5 are green. A bag is chosen at random and a ball picked at random. Find the probability the ball so chosen is red. (3 marks)
13. The first, the second and sixth terms of an increasing arithmetic progression are the three consecutive terms of a geometric progression. If the first term of the arithmetic progression is 2, find:
 a) Common difference of the arithmetic progression (2 marks)
 b) Common ratio of the geometric progression. (1 mark)
14. Solve for x in the equation

$$\frac{6x-4}{3} - \frac{2x-1}{2} = \frac{6-5x}{6}$$
 (2 marks)
15. The length and breadth of a rectangular floor garden were measured and found to be 4.1m and 2.2m respectively. Find the percentage error in its area. (3 marks)
16. Given that $4y = 3 \sin \frac{2}{5}x$ for $0 \leq x \leq 360$. Determine:
 a) Amplitude of the curve. (1 mark)
 b) Period of the curve. (2 marks)

SECTION II (50 MARKS)

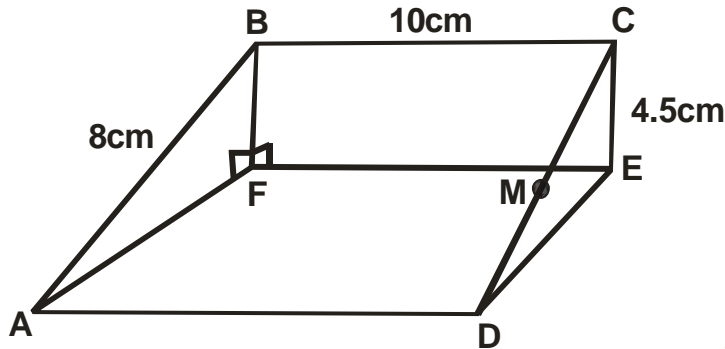
Answer any FIVE questions in this section.

17. A steel manufacturing factory had a sample of 5 iron rods of various lengths. The lengths of the rods were measured and recorded in the table below:

Length (cm)	8-10	11-13	14-16	17-19	20-22	23-25	26-28
No. of rods	4	7	11	15	8	5	3

- a) State the frequency of the modal class. (1 mark)
 b) Using 18 as an assumed mean, calculate:
 i) Actual mean (5 marks)
 ii) Variance (3 marks)
 iii) Standard deviation (1 mark)

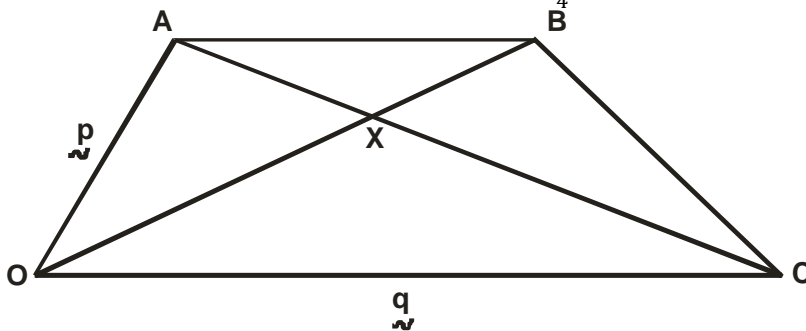
18.



The above diagram represents a wooden prism. ABCD is a rectangle. Points E and F are directly below C and B respectively. M is the midpoint of CD. AB = 8cm, BC = 10cm and CE = 4.5cm.

- a) The size of angle CDE. (2 marks)
 b) Calculate:
 i) Length of AC. (2 marks)
 ii) The angle CAE makes with the plane ADEF. (2 marks)
 (c) Find the:
 i) Length of MB. (2 marks)
 ii) Angle CBM. (2 marks)
19. An aeroplane flies from a point P(60°N, 45°W) to a point Q(60°N, 135°E). Given that the radius of the earth is 6370km,
 a) Calculate the shortest distance between P and Q:
 i) in kilometres (km) (3 marks)
 ii) in nautical miles (nm) (1 mark)
 b) If the plane flew at a speed of 600 knots, how long did it take to move from P to Q? (2 marks)
 c) The plane left P at 10.00a.m on Monday. At what time did it arrive at Q if it travelled along a parallel latitude at the same speed. (4 marks)

20. In the figure below $\vec{OA} = \mathbf{p}$ and $\vec{OC} = \mathbf{q}$. Vector $\vec{AB} = \frac{3}{4}\vec{OC}$. Express in terms of unit vectors \mathbf{p} and \mathbf{q} the vectors.



- a)
 i) AC (1 mark)
 ii) OB (1 mark)
 iii) BC (1 mark)

- b) Vector AC intersects with vector OB at X such that $AX = tAC$ and $OX = hOB$. By expressing OX in two ways in terms of t and h,
Find:
i) Scalars t and h (5marks)
ii) the ratio OB: BX (2 marks)
21. Two fair dice one a regular tetrahedron (4 faces) and the other a cube are thrown. The scores are added together. Complete the table below to show all possible outcomes. (2 marks)

TETRAHEDRON		1	2	3	CUBE 4	5	6
	1						
	2						
	3						
	4						

- a) Find the probability that:
i) The sum is 6. (1 mark)
ii) The sum is an odd number. (1 mark)
iii) The sum is 6 or 9. (2 marks)
- b) If a player wins a game by throwing a sum of 6 or 9, draw a tree diagram and use it to find probability that he wins at least once when the dice are thrown twice. (4 marks)

22. The table below shows the income tax rates for a certain year.

Taxable pay per month Ksh	Tax rate
1 -9680	10%
9681 – 18800	15%
18801 – 27920	20%
27921 – 37040	25%
37040 – and above	30%

That year Mary paid net tax of Ksh.5,512 p.m. Her total monthly taxable allowances amounted to Ksh.15220 and he was entitled to a monthly relief of Ksh. 162. Every month the following deductions were made.

- NHIF – Ksh.320
- Union dues – Ksh.200
- Co-operative shares – Ksh.7500

- a) Calculate Mary’s monthly basic salary in Ksh. (7 marks)
b) Calculate her monthly net salary. (3 marks)
23. A number of people working at a factory decided to raise 72000 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 did not contribute. The same target of 72000 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 shs. $\frac{360000}{n(n-5)}$ (3 marks)
b) If the increase in contribution per person was 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)
24. a) Complete the table below for the functions $y = 3\sin x$ and $y = 4\cos (2x - 10)$ (2 marks)

x	0	15	30	45	60	75	90	105	120	135	150	165
3Sin x	0	0.78						2.90			1.50	
4Cos (2x-10)	3.94		2.57			3.06				-0.69		3.06

**NYANDARUA WEST CLUSTERS EXAMINATION
MATHEMATICS 121/1
PAPER 1
SECTION I (50 Marks)**

INSTRUCTIONS: Answer all questions in this section in the spaces provided

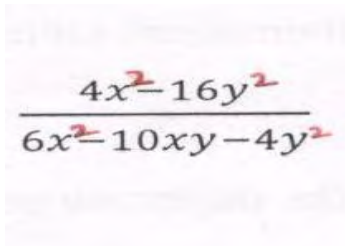
1. Without using calculator, simplify (3 mks)

$$\frac{\left(\frac{1}{4} \text{ of } 15 - \frac{1}{3} \left(\frac{5}{9} - \frac{1}{6} + \frac{2}{5}\right)\right)}{\frac{5}{9} \div \frac{2}{5} \text{ of } 10 \left(10\frac{1}{2} - 6 + 4\frac{1}{2}\right)}$$

2. Use table of reciprocals to evaluate (3 mks)

$$\frac{3}{0.159} - \frac{2}{1.297}$$

3. Simplify (3 mks)



4. Ouma had pigs, hens and ducks in his farm. The number of pigs was 32 and number of hens was twelve times the number of pigs. The number of ducks was 1344 more than the number of hens. If he sold $\frac{3}{4}$ of the ducks, find the number of ducks that remained (4 mks)

5. The mass of a solid sphere of radius 0.14m is 7.89kg, find its density in g/cm³. (3 mks)

Take $\pi = \frac{22}{7}$

6. Simplify $\frac{243^{-2/5} \times 125^{2/3}}{9^{-3/2}}$ (3 mks)

7. A Kenyan bank buys and sells foreign currencies as shown below.

	Buying (ksh)	Selling (ksh)
1 Sterling pound (£)	129.24	130.57
1 South African Rand	9.15	9.38

A businessman on a trip to Kenya had £ 50,000 which he converted to Kenya shillings. While in Kenya, he spent 75% of the money and changed the balance to South African Rand. Calculate to the nearest a Rand the amount he obtained. (3 mks)

8. Two students Paul and Omondi standing 10m apart on the same side of a tall building on a horizontal ground. Paul who is closer to the building sees the roof top at an angle of 70° while Omondi at an angle of 46.8°, If the building, Paul and Omondi lies on a straight line, Calculate the height of the building correct to 3 s.f. (4 mks)

9. On the line AB, given below, divide it into 3 equal proportions. (2 mks)



10. The volume of two similar cans are 96cm³ and 1500cm³. If the surface area of a small can is 40cm², find the surface area of a larger can. (4 mks)

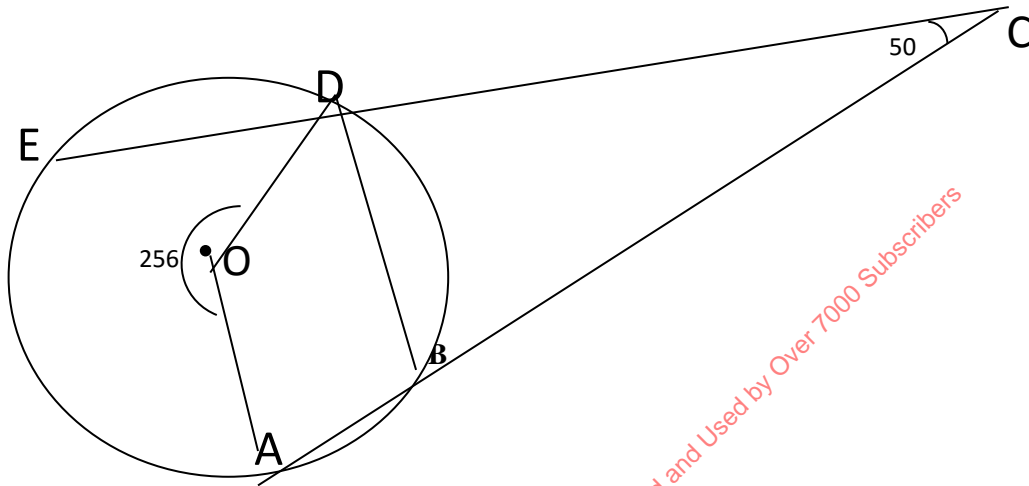
11. The interior angles of a heptagon are x , $2x - 30$, $\frac{1}{3}x + 40$, $2\frac{1}{2}x - 60$, $3x$, $\frac{2}{5}x + 75$ and 44° . Find the size of the largest angle. (3 mks)
12. The marks scored by a group of students in a test were recorded as shown below.

Marks	30-34	35-44	45-49	50-64	65-74
No. of students	10	28	5	27	4

Draw a histogram.

(4 mks)

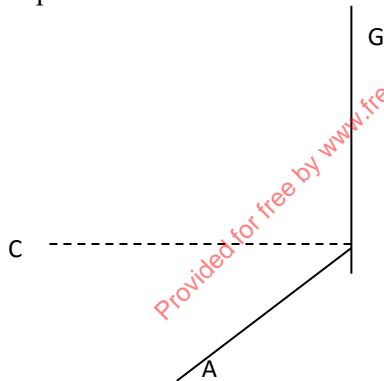
13. A truck left Nakuru at 8.00am for Nairobi at an average speed of 60km/h. At 9.00am, a bus left Nairobi for Nakuru at a speed of 120km/h Find far from Nakuru did the vehicles meet if Nakuru is 160km for Nairobi. (4 mks)
14. In the figure below, O is the center of the circle, The reflex angle AOD = 256 and ACE = 50°



Calculate angle BDC

(3 mks)

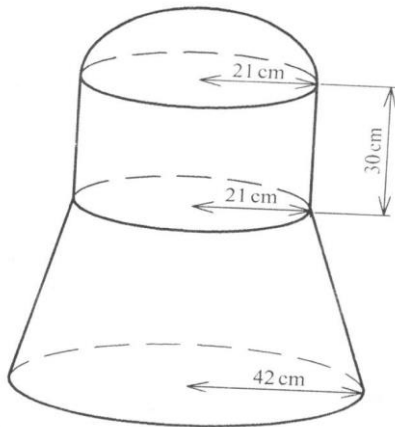
15. Given that line $3x - 2y = 2$ is drawn in a Cartesian plane, determine the acute angle the line makes with line $y=1$. (2 mks)
16. Below is a part of a solid cuboid ABCDEFGH. Complete the sketch.



SECTION 2 (50 MARKS)

INSTRUCTIONS: Answer any FIVE questions

17. The figure below is a solid which consists of a frustrum of a cone, a cylinder and a hemispherical top. The internal radii of a frustrum are 42cm and 21cm. The vertical height of an original cone was 40cm and the height of a cylinder is 30cm. Take $\pi=3.142$



Calculate:

- (a) the volume of the frustrum part: (5 mks)
- (b) the volume of the cylindrical part: (2 mks)
- (c) the total volume of the solid. (3 mks)

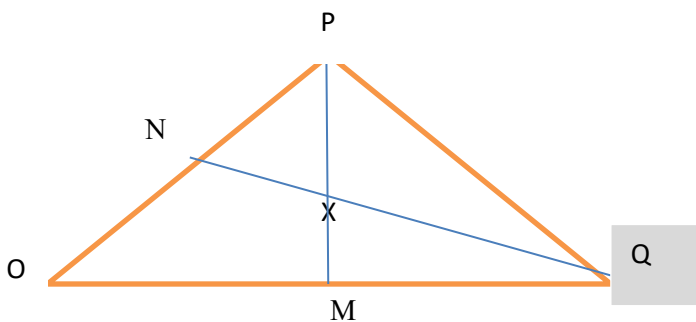
18. Four posts A,B,C and D stand on a level horizontal ground. Post B is 240m on a bearing of 060° from A, C is 210m to the south of B and D is 150m on a bearing of 140° from A.

- (a) Using a scale of 1 cm to represent 30m, show the relative positions of the posts. (4 mks)
- (b) Use the scale drawing to:
 - (i) find the distance and the bearing of C from D. (2 mks)
 - (ii) determine how far A is to the west of B. (2 mks)
- (c) The height of post D is 18m. Calculate, correct to 2 decimal places, the angle of elevation of the top of post D from the foot of post A. (2 mks)

19. The vertices of a triangle are A(-2,2), B(2,2) and C(2,8).

- (a) On the grid provided, draw triangle ABC and its image A'B'C' under a rotation of -90° about R (1,1).
- (b) The vertices of triangle A''B''C'' are A''(-1,-5), B''(-1,-3) and C''(-4,-3)
 - (i) Draw triangle A''B''C'''. (1 mk)
 - (ii) Describe fully the transformation X that maps $\Delta A'B'C'$ and $\Delta A''B''C''$. (1 mk)
- (c) Triangle A'''B'''C''' is the image of triangle A''B''C'' under a reflection in the line X=0. On the same grid draw triangle A'''B'''C'''.
- (d) State the type of congruence between:
 - i) ΔABC and $\Delta A'B'C'$.
 - ii) $\Delta A''B''C''$ and $\Delta A'''B'''C'''$

20. The figure below shows triangle OPQ in which $OP=\mathbf{p}$ and $OQ=\mathbf{q}$. M and N are points on \overline{OQ} and \overline{OP} respectively such that $3\overline{ON} = \overline{NP}$ and $OM:OQ=2:3$

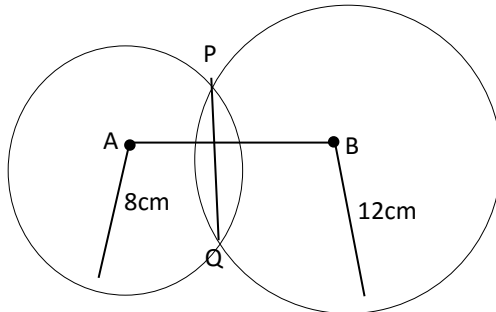


- (a) Express the following vectors in terms of P and q

- (i) \overline{PM} (1 mk)
- (ii) \overline{QN} (1 mk)
- (iii) \overline{PQ} (1 mk)

- (b) If lines pm and QN intersect at x such that $\overline{PX} = h\overline{PM}$ and $QX = kQN$. Find the values of h and k (6 mks)
- (c) Line OX produced meets PQ at Y such that $5PY=3PQ$. Find \overline{OY} in terms of p and q. (1 mk)

21. The figure below shows two circles centers A and B and radii 8cm and 12cm respectively. The circles intersect at P and Q. If the centers re 15cm apart and taking $\pi = 3.142$



Calculate

- (a) the length of chord PQ (4 mk)
 - (b) the angle PAQ. (1 mk)
 - (c) the angle PBQ (1 mk)
 - (d) the area of the shaded region. (4 mks)
22. A line segment PQ is passing through P(-2,3) and Q (4,7).
- i. Find the equation of
 - (a) line PQ (3 mks)
 - (b) Perpendicular bisector of line PQ. (4mks)
 - (ii) If the perpendicular bisector meets the x axis at R, determine the co-ordinates of R. (2 mks)
 - (iii) What would the y intercept of the perpendicular bisector in (ii) above. (1 mk)
23. Three quantities R,S and T are such that R varies directly as S and inversely as the square of T.
- (a) Given that R=480 when S= 150 and T=5 write an equation connecting R,S and T. (3mks)
 - (b) i. Find the value of R when S = 360 and T=1.5. (3mks)
 - ii. Find the percentage change in R if S increases by 5% and T decreases by 20%. (4mks)
24. Draw a graph of $y=8-2x-x^2$ for $-5 \leq x \leq 3$ (5mks)

X	-5	-4	-3	-2	-1	0	1	2	3	
y						8				

From the graph

- (i) Determine the roots of $8-2x-x^2=0$ (1 mk)
- (ii) Solve $x^2 + 4x =0$ (4 mks)

NYANDARUA CLUSTERS EXAMINATIONS
121/2
MATHEMATICS
PAPER 2

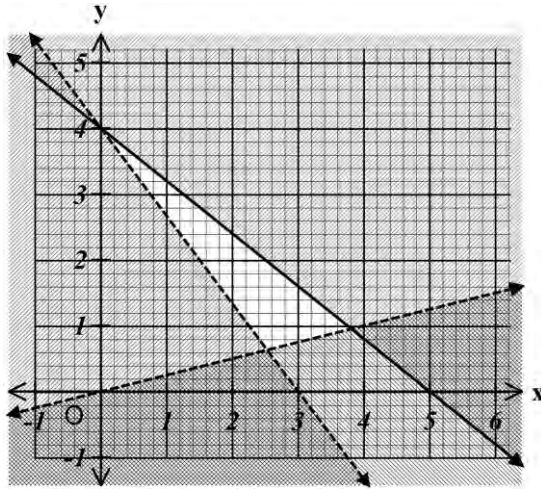
SECTION I (50 MARKS)

Answer ALL Questions in this section in the spaces provided.

1. Use the table of logarithms to evaluate. (4 marks)

$$\left(\frac{6.79 \times 0.391}{\log 5} \right)^{\frac{3}{4}}$$

2. Form the three inequalities that satisfy the unshaded region in the diagram below. (3 marks)



3. Form the quadratic equation whose roots are $x = -\frac{5}{3}$ and $x = 2$. Give your answer in the form $ax^2 + bx + c = 0$ (2 marks)
4. Given that $\frac{5}{\sqrt{11}-\sqrt{7}} + \frac{3}{\sqrt{11}+\sqrt{7}} = a\sqrt{11} + b\sqrt{7}$ Where a and b are rational numbers, find the values of a and b. (3 marks)
5. Mwangi truncated $\frac{7}{9}$ to 3 decimal places. Calculate the percentage error resulting from the truncating. (3 marks)
6. Expand $(1 + 2x)^8$ in ascending powers of x up to and including the term in x^3 . Hence evaluate $(1.02)^8$ (3 marks)
7. $\log_{27}(x + 5) - \log_{27}(x - 3) = \frac{2}{3}$ (3 marks)
8. (a) Find the inverse of the matrix. (1 mark)

$$\begin{pmatrix} 1 & 1 \\ 3 & 1 \end{pmatrix}$$

- (b) Hence determine the point of intersection of the lines. (2 marks)

$$\begin{aligned} y + x &= 7 \\ 3x + y &= 15 \end{aligned}$$

9. The first term of an arithmetic sequence is $(2x+1)$ and the common difference is $(x+1)$ if the product of the first and the second terms is zero, find the first three terms of the two possible sequences. (4 marks)
10. Machine A can complete a piece of work in 6 hours while machine B can complete the same work in 10 hours. If both machines start working together and machine B breaks down after two hours, how long will it take machine A to complete the rest of the work. (3 marks)
11. An item that costs sh 24000 cash can be bought on hire purchase. A customer pays sh 6000 as deposit and then makes 6 monthly instalments of sh 3500 each. Calculate the monthly rate of compound interest, giving your answer to 1 d.p. (3 marks)

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SHIBALE ACK SECONDARY SCHOOL
121/1
MATHEMATICS

SECTION I (50 MARKS)

Answer all questions in this section

1. Evaluate without using a calculator or mathematical table. (3 marks)

$$\left(2\frac{2}{7} - 1\frac{5}{6}\right) \div \frac{5}{6}$$

$$\frac{2}{3} \text{ of } 2\frac{1}{4} - 1\frac{1}{7}$$

2. A perpendicular line is drawn from a point (4, 6) to the line $5y+4x = 20$. Find its equation in the form $ay+bx = c$ where a, b, c are integers. (3 marks)

3. Simplify completely by factorization $\frac{20-45x^2}{6x^2-x-2}$ (3 marks)

4. Solve for x in the equation $8^{(2x-1)} \times 32^x = 16^{x+1}$ (3 marks)

5. A bank in Kenya buys and sells foreign currencies as follows.

	buying (Ksh)	Selling (kshs.)
1 Us dollar	85.86	86.06
1 sterling pound	142.41	142.73

A tourist from united States of America converted 43521 US dollars into Kenya shillings.

- i) Calculate the amount in Kenya shillings that she received (1 mark)
 ii) While in Kenya, the tourist spent sh. 2437821 and converted the balance into sterling pounds. How much in Sterling pound did the tourist receive? (3 marks)
6. Wasike bought 3 bags of DAP fertilizer and 4 bags of CAN fertilizer at sh. 21500. Had he bought 2 bags of DAP and 5 bags of CAN, he would have spent sh. 400 less. Find the cost of one bag of each type of fertilizer. (3 marks)
7. Use square roots and reciprocals tables to evaluate to 4 significant figures the expression.

$$(0.06458)^{\frac{1}{2}} + \frac{2}{0.4327}$$

(3 marks)

8. Express 128 and 200 as a product of their prime factors in power form hence evaluate $\sqrt{\frac{128}{200}}$ (3 marks)

9. Given that $\sin \theta = \frac{2}{3}$ and θ is acute angle, find $\tan(90 - \theta)$. Give the answer to 4 significant figures. (3 marks)

10. Given the column vector $p = \begin{pmatrix} -5 \\ 3 \end{pmatrix}$, $q = \begin{pmatrix} 4 \\ -8 \end{pmatrix}$ and $r = \begin{pmatrix} 6 \\ -9 \end{pmatrix}$, $t = 2p - \frac{1}{2}q + \frac{1}{3}r$
- i) Express t as a column vector (2 marks)
 ii) Calculate the magnitude of vector t in (i) above correct to 2 d.p. (1 mark)

11. Four machines give out signals at intervals of 24 seconds, 27 seconds, 30 seconds and 50 seconds. At 5.00 p.m. all the four machines give out a signal simultaneously. Find the time this will happen again. (3 marks)

12. A wire in form of an arc with radius 12 cm and centre angle 150° is formed into a circle. Find the radius of the circle. (3 marks)

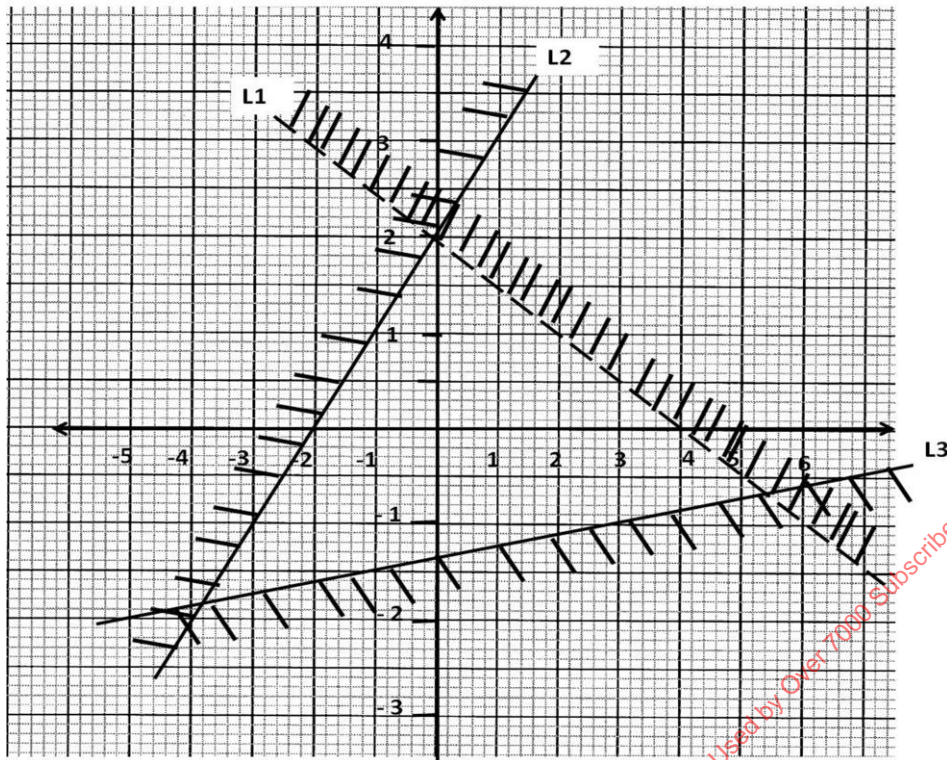
13. The exterior angle of a regular polygon is equal to one – third of interior angle. Calculate the number of sides of the polygon and give its name. (3 marks)

14. Make x the subject of the formula. (3 marks)

$$A = \sqrt{\frac{3+2x}{5-4x}}$$

15. Use logarithms table to evaluate $\sqrt[3]{\frac{0.006549}{81.06 \tan 43^\circ}}$ (4 marks)

16. a) Form the three inequalities that satisfy the given region R. (3 marks)



SECTION II (50 MARKS)

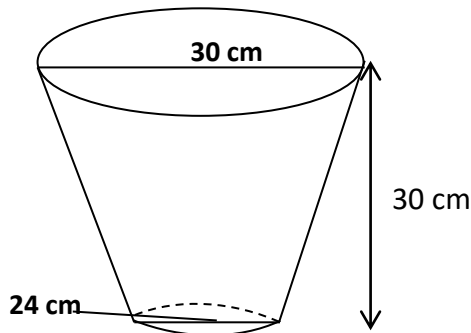
Answer any five questions from this section in the spaces provided below in each question.

17. a) Using a ruler and a pair of compasses only, construct triangle ABC in which $BC = 6\text{cm}$, $AB = 8.8\text{ cm}$ and $\angle ABC = 22\frac{1}{2}^\circ$, (4 marks)
 b. Measure AC and $\angle ACB$ (2 marks)
 c. Construct a circle that passes through A, B and C. (3 marks)
 d. What is the radius of this circle (1 mark)
18. Forty students in a form 2 class were weighed and their masses recorded to the nearest kilogram as shown below.

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

- a) Using class intervals of 5kg tabulate this data in a frequency table (4 marks)
 b) Find the modal frequency (1 mark)
 c) Modify the table and use it to calculate the mean mass of the students (5 marks)
19. A bus left town A at 11.45 a.m. and travelled towards town B at an average speed of 60km/h. A matatu left town B at 1.15 p.m. and travelled towards town A along the same road at an average speed of 90km/hr. The distance between the two towns is 540km. Determine;

- a) The time of day when the two vehicle met. (4 marks)
 b) How far from town A they met? (2 mark)
 c) How far outside town B the bus was when the matatu reached town A. (4 marks)
20. The diagram below shows a frustrum which represents a bucket with an open end diameter of 30 cm and a bottom diameter of 24 cm. The bucket is 30 cm deep as shown and it is used to fill an empty cylindrical tank of diameter 1.4m and height 1.2 m.



- a. Leaving π in your answer, calculate
 i) The capacity of the bucket in litres (6 marks)
 ii) The capacity of the tank in litres (2 marks)
- b. Determine the number of buckets that must be drawn in order to fill the tank. (2 marks)
21. Four matatu operators Adhiambo, Babu, Chirchir and Asai decided to buy a minibus. They agreed to pay for the cost of the minibus in the ratio 3:4:5:6. Basing their contributions on the marked price of the minibus, they found that chirchir would pay sh. 240000 more than Adhiambo. The sales agent however allowed them a 10% discount on cash payment.
- a) Calculate
 i) the marked price of the minibus (2 marks)
 ii) How much more Adhiambo and Babu paid than Asai (5 marks)
- b) The four partners agreed to share monthly profits from the minibus in the ratio of their contributions after setting a side 25% of the profit for emergencies. If the minibus realized sh. 64000 in profits during one month, calculate Asai's share of the profits for that month. (3 marks)
22. a) The points A(2, 6), B(1, 1) C(3, 4) and D(5, 3) are vertices of a quadrilateral ABCD. Plot ABCD on the grid below to form quadrilateral ABCD. (2 mark)
- b) ABCD undergoes a rotation of positive 90° , about the origin. on the same grid, draw the image A'B'C'D' and state the coordinates of A'B'C'D'. (3 marks)
- c) A'B'C'D' undergoes a reflection in the X – axis to give A''B''C''D''. On same grid, draw A''B''C''D'' and state the coordinates of A''B''C''D''. (3 marks)
- d) A''B''C''D'' is the image of ABCD under a reflection. On the grid, mark the mirror line and state its equation. (2 marks)
23. Copy and complete the table i) and ii) below for the functions.

i) $y = 7 - 3x$ (2 marks)

x	-2	-1	0	1	2	3	4	5
Y	13		7					-8

ii) $y = 2x - 8$ (2 marks)

x	-4	-2	0	2	4	6	8	10
Y	-16		-8			4		

- b) On the same grid, draw $y = 7 - 3x$ and $y = 2x - 8$ (4 marks)
 c) Use your graphs to solve the simultaneous equations (2 marks)

24. Four points A, B, C, and D are situated on a horizontal plane such that B is 200 m on a bearing of 065° from A. C is 300m on a bearing of 120° from B and D is 150m due west of C.
- Draw a rough sketch showing the positions of the four points. (1 mark)
 - Using a suitable scale, draw an accurate scale drawing representing the positions of A, B, C, and D. (5 marks)
 - By measuring use your scale drawing to find the distance and bearing of:-
 - D from A (2 marks)
 - B from D (2 marks)

SHIBALE ACK SECONDARY SCHOOL
121/2

MATHEMATICS (ALT A)
PAPER 2 SECTION I (50 MARKS)

Answer all questions in this section

- Using logarithm table only, evaluate:- (3 marks)

$$\sqrt[3]{\frac{849.6 \times 2.41}{3941}}$$
- On average, the rate of depression of a water pump is 9% per annum. After three complete years it was K.shs. 150,700. Find its value at the start of the three years period. (3 marks)
- Make n the subject of the formula (3 marks)

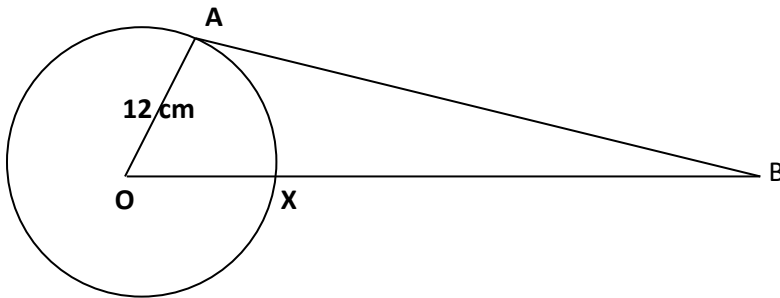
$$W = \frac{x^2}{(m-n)(m+n)}$$

- A variable P varies joint with the square of R and inversely with the square root of Q. If R is increased by 10% and Q decreased by 20%, what is the percentage change in the value of P. (3 marks)
- Without using a calculator evaluate $\frac{\sqrt{252} + \sqrt{72}}{\sqrt{32} + \sqrt{28}}$, leaving the answer in the form of $a\sqrt{b} + c$ where a, b and c are integers. (3 marks)
- Grade A sugar costs sh. 75 per kg and grade B sugar costs sh. 50 per kg. Muli mixed the two grades and sold the mixture at sh. 72 per kg. In so doing, he made a profit of 20%. In what ratio did he mix them? (3 marks)
- Expand $(1-2x)^6$ upto the term in x^3 . (1 mark)
 - Use the expansion to evaluate $(1.02)^6$ to 4 decimal places. (2 marks)
- Solve the equation $2 \cos^2 x - \sin x = 1$ for $-180^{\circ} \leq x \leq 180^{\circ}$. (4 marks)
- The angle of elevation of the top of a building from a point P is 45° . From a point Q, which is 10 meters from P towards the base of the building, the angle of elevation is 48° . Calculate the height of the building. (3 marks)
- Evaluate without using mathematical tables or calculator: (3 marks)

$$\frac{0.008 \times 1.23 \times 3.5}{2.87 \times 0.056}$$
 - Express the answer as a fraction in its simplest form. (3 marks)

- A group of young men decided to raise shs. 480000 to start a business. Before the actual payment was made, four of the members pulled out and each of those remaining had to pay an additional sh. 20000. Determine the original number of members. (4 marks)
- Solve for y in the following $\log_4 y - \log_4 4 = \frac{1}{2}$ (3 marks)

13. The velocity v meters per second of a particle in motion is given by the equation:
 $V = 2t^2 - 4t + 10$, where t is time in seconds. Determine the total distance moved by the particle in the first 3 seconds of motion. (3 marks)
14. Find the percentage error in estimating the volume of a cone whose radius is 3.4 cm and height is 8 cm. (3 marks)
15. In the figure below, AB is a tangent to the circle centre O and radius 12 cm. The area of the triangle AOB is 120cm^2 . OXB is a straight line.



- Calculate XB. (3 marks)
16. The table below shows the number of defective bolts from 40 samples.

No. of defective bolts (x)	0	1	2	3	4	5
Frequency (y)	20	8	6	4	1	1

- Calculate the standard deviation. (3 marks)

SECTION II (50 MARKS):

ANSWER FIVE QUESTIONS IN THIS SECTION.

17. OAB is a triangle which $OA = a$ and $OB = b$. M is a point on OA such that $OM:MA = 2:3$ and N is another point on AB such that $AN:NB = 1:2$. Lines ON and MB intersect at X.
- Express the following vectors in terms of \underline{a} and \underline{b} .
 - \underline{AB} (1 mark)
 - \underline{ON} (1 mark)
 - \underline{BM} (1 mark)
 - If $\underline{OX} = k\underline{ON}$ and $\underline{BX} = h\underline{BM}$ express \underline{OX} in two different ways. Hence or otherwise find the value of h and k . (6 marks)
 - Determine the ratio $OX: XN$ (1 mark)
18. a) The Masinde Muliro University uses three buses A, B and C. On any day the probability of the buses operating are 0.75, 0.4 and 0.5 respectively. Use a tree diagram to find the probability that on a given day
- All the buses are not operating (3 marks)
 - Only one bus is operating (2 marks)
 - Atleast one bus is operating (2 marks)
- b) Basket A contains 5 oranges and 3 mangoes basket B contains 4 oranges and 3 mangoes. Two fruits are picked at random, one at a time without replacement, find the probability that the fruits picked are of the same type. (3 marks)
19. A and B are two points on the latitude 40°N . The two points lie on the longitudes 20°W and 100°E respectively.
- Calculate:
 - The distance from A to B along a parallel of latitude. (3 marks)
 - The shortest distance from A to B along a great circle. (3 marks)
 - Two planes P and Q left A for B at 400 knots and 600 knots respectively. If P flew along the great circle and B along parallel latitude, which one arrived earlier and by how long? Give your answer to the nearest minutes. (Take $R = 6370 \text{ km}$ and $\pi = \frac{22}{7}$). (4 marks)
20. A metallic disc is in the shape of a regular polygon of side 16 cm and interior angle 150° . The disc is 10mm thick and is made of metal whose density is 8.5g/cm^3 .

- a) Determine the number of sides of the polygon (2 marks)
- b) Calculate to the nearest whole number:
- The area of the polygon. (4 marks)
 - The volume of the disc (2 marks)
 - The mass of the disc in kilograms (2 marks)
21. Use a ruler and a pair of compasses only in this question:
- Construct triangle ABC such that $AB = AC = 4.3$ cm and angle $ABC = 30^\circ$. (3 marks)
 - Measure BC. (1 mark)
 - A point P is always on the same side of BC as A. Draw the locus of P such that angle BAC is always twice angle BPC. (2 marks)
 - Drop a perpendicular from A to meet BC at D. Measure AD. (2 marks)
 - Calculate the area of triangle ABC. (2 marks)
22. The data below shows the masses in grams of 50 potatoes.

Mass (g)	25-34	35-44	45-54	55-64	65-74	75-84	85-94
No. of potatoes	3	6	16	12	8	4	1

- On the grid provided draw a cumulative frequency curve for the data. (4 marks)
 - Use the graph in (a) above to determine:
 - The 60th percentile mass (2 marks)
 - Percentage of potatoes whose masses lie in the range 53g to 68g. (3 marks)
 - Median mass. (1 mark)
23. Two variables A and B are connected by the equation:
 $A = KB^n$ where k and n are constants. The table below gives values of A and B.
- | | | | | | |
|---|------|------|------|------|------|
| A | 1.50 | 1.95 | 2.51 | 3.20 | 4.50 |
| B | 1.59 | 2.51 | 3.98 | 6.31 | 11.5 |
- Find a linear equation connecting A and B. (2 marks)
 - On the graph provided draw a suitable straight line graph to represent the relation in (a) above. (use the scale 1cm to represent 0.2 units on both axes). (5 marks)
 - Use your graph to estimate the values of k and n to one decimal place. (3 marks)
24.
 - Sketch the curve of $y = x^2 - 4$ (3 marks)
 - Calculate the area bounded by the curve $y = x^2 - 4$, the x – axis, the lines $x = 1$ and $x = 4$ by using the trapezoidal rule with 6 equal strips. (3 marks)
 - Calculate the exact area in (b) above using the method of integration. (3 marks)
 - Find the percentage error in the area in (b) above. (1 mark)

GATUNDU SUB-COUNTY EVALUATION EXAMINATION 2019

121/1

MATHEMATICS ALT A

Paper 1

SECTION 1 (50MARKS)

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

1. Without using tables, evaluate $\frac{0.51 \times 5700}{6.8 \times 0.0095}$ giving the answer in standard form. (3mks)
2. The sum of all the interior angles of a regular n-sided polygon is 2880° . Calculate the value of n and the size of the exterior angles of the polygon. (3mks)
3. Find the equation of the line which passes through the point of intersection of the lines $y + 2x = 8$ and $2y - x = 6$ and the point (4, 3). (4mks)
4. Express the inequalities $\frac{1}{3}x + 4 \leq 7 + 2x \leq 4 + \frac{1}{4}x$ in the form $p \leq x \leq q$, where p and q are real numbers. (3mks)
5. A translation maps the point Q (5, -3) onto Q¹ (2, -5)
 - (a) Determine the translation vector. (1 mk)
 - (b) A point R¹ is the image of R (-2, -3) under the same translation. Find the length of Q¹R¹. (2mks)
6. George received 10,000 Euros from his brother who stays in France .He sent to his sister who stays in Japan 10,000 Yen .In addition George bought a car worth sh.200,000. Exchange rates :

	Buying	Selling
1 Euro	73.4226	73.52953
100 Japanese yen	62.8011	62.8822

- How much was left in Kenya shillings. (3mks).
7. Simplify the expression (3mks)

$$\frac{x^2 - 9y^2}{2x^2 - 7xy + 3y^2}$$
 8. Kassim has a money box containing 100 mixed shs 5 and shs 10 coins with a total value of shs 600. How many of each type of coin does the box contain? (3mks)
 9. Use square roots, reciprocal and square tables to evaluate to 4 significant figures the expression; (4 mks)

$$(0.06458)^{\frac{1}{2}} + \left(\frac{2}{0.4327}\right)^2$$
 10. A boy walk directly from point Q towards the foot of a vertical flag post 200m away. After covering a distance of 140m, he observes the angle of elevation of the top of the flag post as 75° . Calculate the angle of depression of point Q from the top of the flag post. (3mks)
 11. Two similar blocks have masses of 729g and 216g respectively. If the surface area of the smaller block is 300cm^2 , calculate the surface area of the larger block. (3mks)
 12. Evaluate $\int_{-1}^2 (x^2 + 1)dx$ (3 mks)
 13. A two digit number is such that 4 times the units digit exceeds the tens digit by 1. If the digits are reversed, the number formed is decreased by 45. Find the number. (3mks)
 14. Given that the column vectors

$$p = \begin{pmatrix} -3 \\ 4 \end{pmatrix}, q = \begin{pmatrix} 16 \\ -4 \end{pmatrix}, r = \begin{pmatrix} 9 \\ 6 \end{pmatrix}$$
 and that $a = 2p - \frac{3}{4}q + \frac{2}{3}r$
 Express as a column vector and hence calculate its magnitude (3mks)
 15. 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 mks)
 16. (a) Find the inverse of the matrix $\begin{pmatrix} 4 & 3 \\ 3 & 5 \end{pmatrix}$ (1 mk)

(b) Hence solve the simultaneous equation using the matrix method

(2mks)

$$4x + 3y = 6$$

$$3x + 5y = 5$$

SECTION II

Answer any Five Questions in this Section in the spaces provided

17. Three businessladies Wanjiku, Muthoni and Njoki decided to buy a lorry. The marked price of the lorry was 2.8million shillings. The dealer agreed that the ladies could pay a deposit of 60% of the marked price and the rest to be paid within a year. The ladies raised the deposit in the ratio of 3:2:5 respectively. At the end of the year the lorry had realized 2.08million shillings which the three shared in the ratio of their contribution. However, they were required to contribute for the balance of the lorry from these earnings again in the ratio of their original contributions.

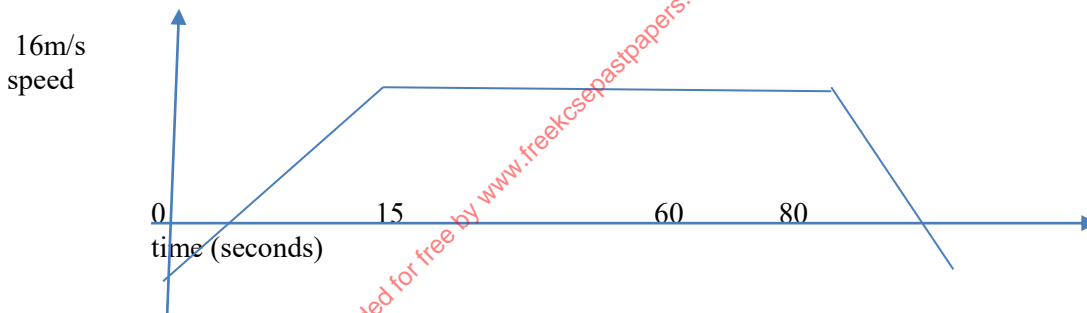
- a) calculate amount to be paid as deposit (1mk)
- b) How much did each contribute to pay for the deposit? (3mk)
- c) How much did Njoki receive at the end of the year? (1mk)
- d) Calculate the total amount Muthoni and Njoki contributed to pay for the balance. (3mk)
- e) How much money did Wanjiku remain with after paying her share of the balance? (2mk)

18. a) A bus left Kisumu at 9.30 am towards Nairobi at an average speed of 81km/hr. A matatu left Nairobi for Kisumu at 10.10 a.m at an average speed of 72km/hr. The distance between Kisumu and Nairobi is 360km.

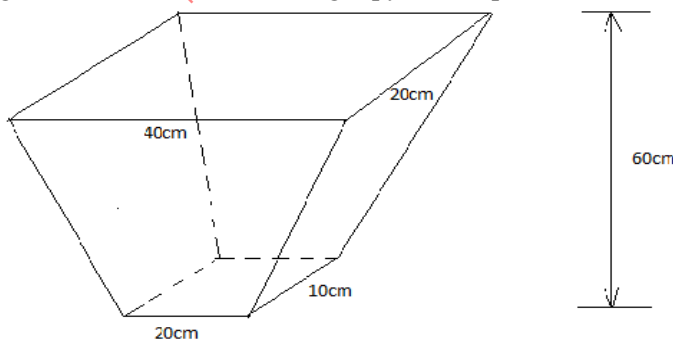
Determine:

- i) The time taken before the two vehicles met. (3mks)
- ii) The distance between two vehicles 40 minutes after meeting. (2mks)
- iii) A car left Kisumu towards Nairobi at 9.50am at an average speed of 90km/hr. Determine the time the car caught up with the bus. (3mks)

(b) The figure below shows speed time graph of a journey. If total distance travelled in 80 seconds is 1000m. Find the distance travelled in the final 40 seconds. (3 mks)



19. The Figure shows a frustum of a right pyramid open container for storing water.



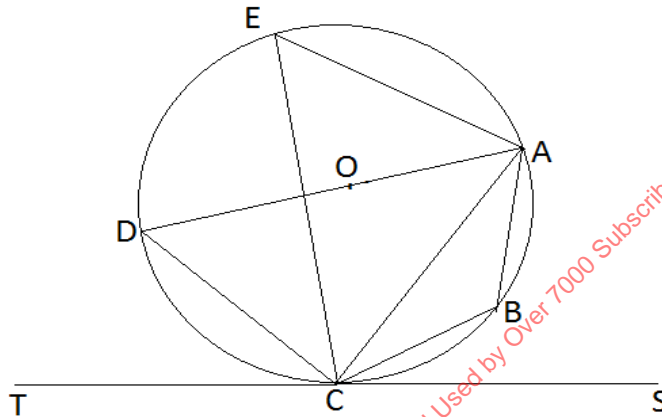
Calculate:

- a) The height of the pyramid from which the frustum was cut from. (2mks)
- b) The capacity of the frustum in litres (4mks)
- c) The surface area of the frustum (4mks)

20. The table below represent marks in percentage scored by 50 students in a class

Marks	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Frequency	6	4	7	6	12	4	5	3	3

- a) State the modal class (1mk)
 b) Estimate:
 i. The mean mark (4 mks)
 ii. the median. (3mks)
 c) Calculate the percentage of students who scored between 50-64 marks (2 mks)
21. In the figure below DA is a diameter of the circle ABCDE centre O. TCS is a tangent to the circle at C, AB = BC



and angle $\text{DAC} = 38^\circ$

Giving reasons, determine the following angles:

- (a) $\angle \text{DCT}$ (2 mks)
 (b) $\angle \text{DEA}$ (2 mks)
 (c) $\angle \text{ACB}$ (2 mks)
 (d) $\angle \text{BDC}$ (2 mks)
 (e) $\angle \text{BOA}$ (2 mks)

22. (a) Complete the table below for the function $y = -2x^2 - 7x + 4$. (2 mks)

X	-5	-4	-3	-2	-1	0	1
$Y = -2x^2 - 7x + 4$							

- (b) Draw the graph of $y = -2x^2 - 7x + 4$ for $-5 \leq x \leq 1$ (3mks)
 (c) Use your graph to solve
 (i) $-2x^2 - 7x + 4 = 0$ (1 mk)
 (ii) $-2x^2 - 4x - 2 = 0$ (2mks)
 (iii) $x^2 + \frac{7}{2}x - 1 = 0$ (2mks)

23. (a) Complete the table below for the function $y = x^2 + 3$ (2mks)

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, the line $x = 1$ and the line $x = 6$. (2mks)
 (c) Use integration to find the exact area in (b) above. (3mks)
 (d) Calculate the percentage error arising from the use of mid-ordinate rule. (3mks)

24. Mwikali planned to spend sh. 16,800 to buy a number of bags of maize. When she went to the market, she discovered that the price of maize had increased by sh. 200 per bag. She could now afford to buy two bags less than she had planned to buy with the same amount of money taking the original number of bags she intended to buy to be y:

- (a) write an expression in terms of y for:
- i) original price per bag (1 mk)
 - ii) Price per bag after the increase in price. (1 mk)
- b) Determine the number of bags that she originally intended to buy. (4 mks)
- c) She later sold the maize at sh. 1750 per bag. Find the percent profit she made. (4 mks)

**GATUNDU SOUTH SUB-COUNTY EVALUATION EXAMINATION
MATHEMATICS ALT A**

Paper 2

2 ½ Hours

SECTION I (50 marks)

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

1. Without using mathematical tables, evaluate the expression below.

$$3 \log_{10} 5 - \frac{1}{2} \log_{10} 64 + 6 \log_{10} 2.$$
 (3mks)
2. Nanjala invested Sh.560,000 in Pesa Bank for 5 years and earned a compound interest of Sh.189,406. Omedo invested some money in a different bank at the same rate p.a for 3 ½ years and earned a compound interest of sh.142,522. If Nanjala's interest was compounded semi-annually, find the principal amount that Omedo invested, to the nearest Sh.10. (3mks)
3. Find the value of x for which

$$\begin{pmatrix} 4+x & 2 \\ 10 & x-4 \end{pmatrix}$$
 is a singular matrix. (3mks)
4. Make n the subject of the equation. (3mks)

$$\frac{p}{q} = \sqrt[3]{\frac{m^2}{1-n^2}}$$
5. The effort (E) applied on a lever to lift a load (L) is partly constant and partly varies as L. When L=3, E=4 and when L=15, E=10. Find the equation connecting E and L. (3mks)
6. Simplify leaving your answer in form of $a + b\sqrt{c}$. State the value of a, b and c. (3mks)

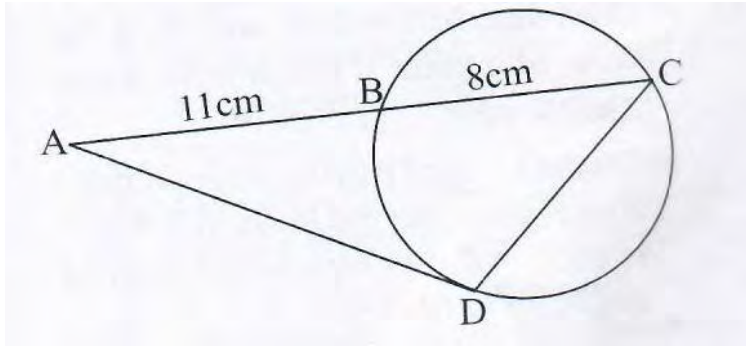
$$\frac{\sqrt{7}}{\sqrt{3}-\sqrt{2}} - \frac{\sqrt{7}}{\sqrt{3}+\sqrt{2}}$$
7. Find the centre and radius of a circle whose equation is (3mks)

$$3x^2 + 3y^2 - 24x + 6y + 3 = 0$$
8. Expand $(1 - \frac{1}{2}x)^5$ and use the first four terms of your expansion to evaluate $(0.95)^5$. Give your answer to 4 s.f. (4mks)

Determine the quartile deviation for the following set of number

$$4,9,5,4,7,6,2,1,6,7,8$$
 (3mks)
9. A machine A can do a piece of work in 5 hrs while machine B can do the same amount of work in 8 hours, machine A was set to do the piece of work but after 3 hours. It broke down and machine B did the rest of work. Calculate the time machine B took to do the rest of work. (3mks)
10. The sides of a triangle were measured and recorded as 8cm, 10cm and 15cm. Calculate the percentage error in the calculation of its perimeter correct to 2 decimal places. (3mks)
11. Point T divides line MN externally in the ratio 5:2. Taking the position vectors of M and N to be $M = \begin{pmatrix} 8 \\ 5 \end{pmatrix}$ and $N = \begin{pmatrix} -12 \\ 15 \end{pmatrix}$ and $N = \begin{pmatrix} -6 \\ 0 \end{pmatrix}$ respectively, find the position vector of T. (3mks)
12. Kimtai has 2400m of wire with which he wants to fence three sides of a rectangular piece of land in his farm then grow fruits in it. The fourth side is already fenced. Determine the dimensions that will give the maximum possible area. (4mks)
13. A trader mixed grades A, B and C of coffee in the ratio 2:3:5 respectively. Grade A cost sh. 650 per kg, grade B cost sh. 500 per kg and grade c cost sh. 420 per kg.
 - (a) Find the cost of 1kg of the mixture (2 marks)
 - (b) If the trader sold the mixture at a profit of 20%, calculate the selling price of 3kg of the mixture (2 marks)

14. In the figure below, AD is a tangent to the circle at D. AB=11cm and BC=8cm. Find the length of AD in 4s.f. (2mks)

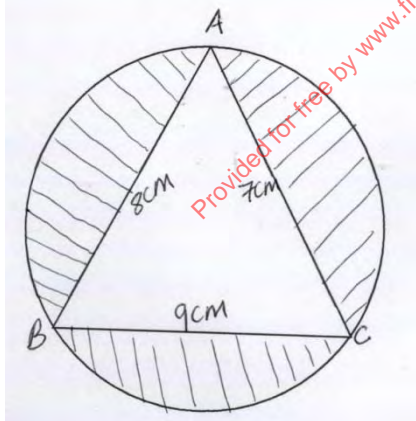


15. (a) Draw line MN= 7cm and show the locus of a point P which is such that $\angle MPN = 90^\circ$. (1mk)
 (b) On the locus of P in the diagram in (a) above, construct the locus of T which is such that is equidistant from M and N. (2mks)

SECTION II: (50 Marks)

Answer any five questions from this section in the spaces provided

16. The cost of Jane’s car at the beginning of the year 2000 was sh.750,000. It depreciated in value by 7% per year for the first three years, by 8% for the next two years and by 11% per year for the subsequent years.
 a) Find the value of the car at:
 (i) The start of the year 2003. (2mks)
 (ii) The end of the year 2007. (3mks)
 b) At the beginning of 2008, Jane sold the car through Mary, a dealer, at 22% more than its actual depreciated value to Lucy. Taking Mary’s sale price as the car’s value after depreciation, find the average monthly rate of depreciation for the 8 years. (5mks)
17. The diagram below shows a circle and a triangle that touches its circumference.



- (a) Find the radius of the circle. (6mks)
 (b) Find the area of the shaded region. (4mks)

18. 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 Kazembe 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.

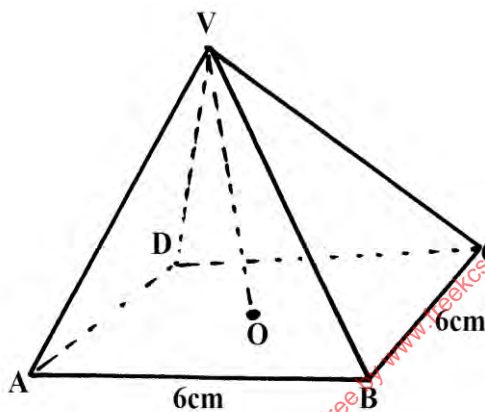
Every month the following deductions were made:

- NHIF – Ksh. 320
- Union dues – Ksh.200
- Co-operative shares – Ksh.7,500

(a) Calculate Kazembe’s monthly basic salary in Ksh. (7mks)

(b) Calculate his monthly net salary. (3mks)

19. 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 VDC and ABCD (2mks)

(iv) Volume of the pyramid. (2mks)

20. (a) Complete the table below, giving the values correct to 2 d.p.

X°	0	30	60	90	120	150	180	210	240	270	300	330	360
$\sin 2x$	0		0.87		-0.87		0	0.87					0
$3\cos x - 2$	0	0.60		-2	-3.5			-4.60			-0.5		1

(b) On the grid provided draw the graphs of $y = \sin 2x$ and $y = 3 \cos x - 2$ for $0^{\circ} \leq x \leq 360^{\circ}$ on the same axes. Use a scale of 1 cm to represent 30° on the x-axis and 2 cm to represent 1 unit on the y-axis. (5mks)

(c) Use the graph in (b) above to solve the equation $3\cos x - \sin 2x = 2$ (2mks)

(d) State the amplitude of $y = 3\cos x - 2$ (1mk)

21. Three variables P, Q and R are such that P varies directly as Q and inversely as the square of R, when $P = 18$, $Q = 24$ and $R = 4$
- Find the relationship connecting P, Q and R hence find the value of P when $Q = 30$ and $R = 10$.
 - If P is increased by 20% and R decreased by 10%. Find the percentage change in Q. (5mks)
22. A geometric progression (G.P) is such that the product of its first three terms is 8,000.
- Taking the first term as 'a' and the common ratio as 'r', express 'r' in terms of 'a'. (3mks)
 - 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)
 - Find the product of the 8th terms of the two sequences. (2mks)
23. (a) The gradient function of a curve is given by $\frac{dy}{dx} = 3x^2 - 2$
- Determine the equation of the curve given that $y = 1$ when $x = -2$. (4mks)
- (b) The velocity, V m/s of a moving particle after t seconds is given by $v = 12t^2 - 5$.
- Find the total distance covered by the particle in the third second. (3mks)
 - If the distance covered by the particle at $t = 1$ second was 2m, what distance had been covered at $t = 5$? (3mks)

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KANDARA
121/1
Mathematics Paper 1
July/ August

SECTION I

(Answer all the questions in the spaces provided)

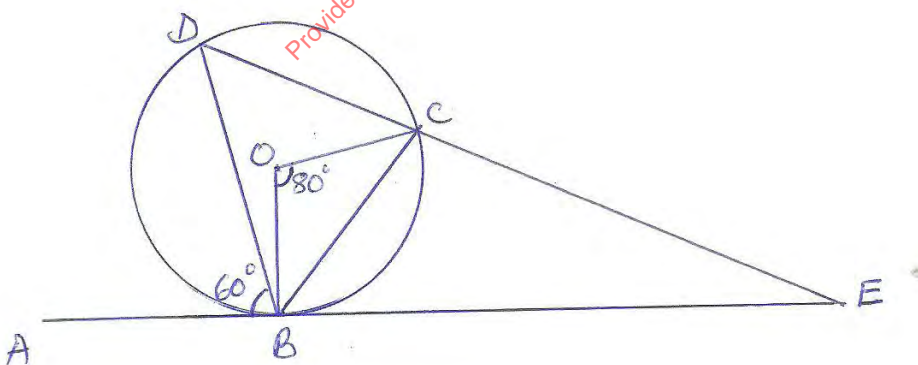
- Evaluate $\frac{8^{\frac{1}{8}} - 2^{\frac{1}{2}}}{5^{\frac{3}{20}} - 1^{\frac{1}{6}} \text{ of } 1^{\frac{1}{5}}}$ (3mks)
- A bus service number 4 leaves a terminus every 15 minutes. Services 8 and 3 leaves after every 20 and 30 minutes respectively. If all the three services leave together at 6.00 am, what is the earliest time the three buses will leave together again? (3mks)
- Use tables of reciprocals and square roots to evaluate. (3mks)

$$\sqrt{\frac{2}{0.5893} + \frac{1.06}{846.3}}$$

- A Line passes through A (1, 1) and B(x, y). The mid-point of AB is (3, 5). If line BC is perpendicular to AB, find the equation of line BC. (3mks)
- Solve for the equation $\left(\frac{27}{8}\right)^{x+7} - \left(\frac{4}{9}\right)^{-3x} = 0$ (3mks)
- Elvis exchanged Ksh.600,000 to Sterling pounds. After settling the bills worth £1200, he changed the balance to Euros. He then purchased goods worthy 200 Euros. Using the exchange rates below, calculate his balance in Kenyan shillings. (3mks)

	<u>Buying (Ksh)</u>	<u>Selling (Ksh)</u>
1 Sterling pound	114.20	114.50
1 Euro	101.20	101.30

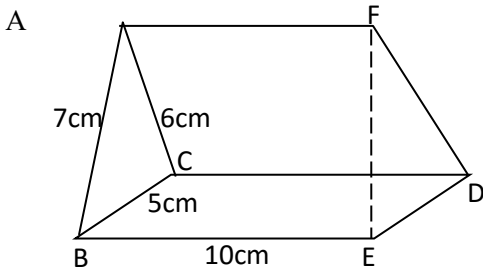
- Find the mass of a wooden beam 4m long, 25cm wide and 18cm deep if the density of the wood is 625kg/m³. (3mks)
- Solve the inequality below hence represent the solution in a number line (3mks)
 $3 + 2x < 3x - 1 \leq 2x + 7$
- In the diagram below ABE is a tangent to a circle at B and DCE is a straight line. If $\angle ABD = 60^\circ$, $\angle BOC = 80^\circ$ and O is the centre of the circle.



Find the value of $\angle BEC$ and give reasons.

(3mks)

10. The marks obtained by 10 pupils were 15, 14, 12, 13, 9, 16, 11, 12, 13 and 17. Calculate the standard deviation correct to 4 s.f. (4mks)
11. Each exterior angle of a regular polygon is a fifth of the interior angle.
 a) Find the size of the exterior angle (2mks)
 b) Find the number of sides of the polygon (2mk)
12. The figure below shows a solid prism:-



- Sketch the net of the prism above and show with arrows the path ACDB and F via E (3mks)
13. Solve the equation $2\sin x = 1$ for $0^\circ \leq x \leq 360^\circ$ (3mks)
14. Solve for y in the equation.
 $\log_{10}(3y + 2) - 1 = \log_{10}(y - 4)$ (3mks)
15. The angle of elevation of the top of a flag post from a point x on level ground is 13° . The angle of elevation of the top of the flag post from another point y nearer the flag post and 120 metres from x is 30° . Y is between A and the bottom of the flag post and the three points are collinear. Find the height of the flag post. (3mks)
16. Simplify the expression $\frac{x-1}{x} - \frac{2x-1}{3x}$. Hence solve the equation $\frac{x-1}{x} - \frac{2x-1}{3x} = \frac{2}{5}$ (3mks)

SECTION II

(Answer ANY FIVE questions in the spaces provided)

17. Town B is 20km N60°W from village A. Town C is 25km 040° from town B. Village D is due East of town C and due South of village A
 (a) Using a scale 1:500,000 draw a diagram showing a relative position of town B, town C, village A and village D (3mks)
 (b) Determine;
 (i) Distance between village A and town C (1mk)
 (ii) Distance between town C and village D (1mk)
 (iii) Compass bearing of town C from village A (1mk)
 (iv) Compass bearing of village D from town B (1mk)
 (c) Determine the area enclosed by the diagram in (a) above in hectares (3mks)
18. John bought 3 brands of tea A, B and C. The cost price of the three brands were sh.25, sh.30 and sh.45 per kilogram respectively. He mixed the three brands in the ration 5:2:1 respectively. After selling the mixture he made a profit of 20%.
 a) How much profit did he make per kilogram of the mixture? (3mks)
 b) After one year the cost price of each brand was increased by 12%.
 i) How much did he sell one kilogram of the mixture to make 20% profit? Give your answer to the nearest 5cents. (4mks)
 ii) What would have been the percentage profit if he sold one kilogram of the mixture at Ksh.40.25. (3mks)
19. The distance S meters from a fixed point O, covered by a particle after t seconds B given by the equation $S = t^3 - 6t^2 + 9t + 5$
 a. Calculate the gradient of the curve at $t = 0.5$ seconds (3mks)
 b. Determine the values of S at the turning points of the curve (3mks)
 c. Sketch the curve in the space provided. (4mks)

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- c) From your graphs:
- (i) State the amplitude of $y = 3\sin x$. (1mk)
 - (ii) Find the values of x for which $3\sin x - 2\cos x = 0$. (1mk)
 - (iii) Find the range of values of x for which $3\sin x \geq 2\cos x$ (1mk)

KANDARA
121/2
MATHEMATICS ALT A.
PAPER 2

SECTION I (50MARKS)

Answer all questions in this section in the spaces provided

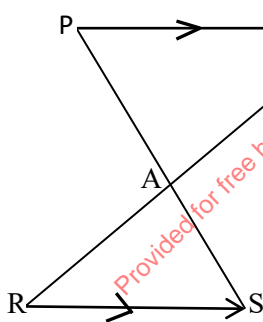
1. Use logarithm, correct to 4 decimal places to evaluate

$$\sqrt[3]{\frac{7.071}{456.3\sin 45^\circ}} \quad (4\text{marks})$$

2. Make V the subject of the formula

$$Mgh - \frac{1}{2}mV^2 = 1 \quad (3\text{marks})$$

3. In the figure below PQ is parallel to RS . PS and QR intersect at A . Given that $PQ=9\text{cm}$, $RS=3\text{cm}$ and $AS=4\text{cm}$, calculate the length of PS (3marks)



4. During the 1998 Safari rally, our local driver Patrick Njiru covered 550km in 2hours. Find the percentage error in his speed. (3marks)
5. Without using tables or calculator evaluate

$$\frac{\text{Log}729 - \text{log}81}{\text{Log}3} \quad (3\text{marks})$$

6. The area of a sector of a circle of radius 15cm is 270cm^2 . If the area of the sector subtends an angle θ at the centre of the circle, calculate: Use $\pi = \frac{22}{7}$
- a) The size of angle θ in radians (2marks)
 - b) The length of the arc subtended by the angle θ (1mark)

7. Two taps **P** and **Q** can fill a cistern in 6 minutes and 4 minutes respectively. Another tap **R** can drain the same cistern in 8 minutes. Tap **Q** and **R** are opened for 2 minutes and then tap **P** is opened. Find the time taken to fill the cistern. (3marks)
8. If $\frac{\sqrt{3}}{2-\sqrt{5}} = a\sqrt{b} + c\sqrt{d}$, find the values of **a**, **b**, **c** and **d** where they are rational numbers. (3marks)
9. Given that $\mathbf{OA} = 3\mathbf{i} + 2\mathbf{j} - 4\mathbf{k}$ and $\mathbf{OB} = 4\mathbf{i} + 5\mathbf{j} - 2\mathbf{k}$. P divides AB externally in the ratio 3: -2. Determine the position vector of P in terms of **i**, **j** and **k**. (3 marks)
10. A two digit number is such that the product of its tens and ones is 56. When the digits are reversed the number formed exceeds the original number by 9. Find the number. (3marks)
11. 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)
12. Solve for θ in the equation. $6 \cos^2\theta - \sin\theta - 4 = 0$ in the range $0^\circ \leq \theta \leq 180^\circ$ (3 Marks)
13. a) Expand and simplify the expression $(1+2x)^6$ (2 marks)
b) Use the first four terms of the expression in (a) above to find the approximate value of $(1.02)^6$ (2marks)
14. The mass of a cylinder varies jointly as the square of the radius and its height. If the radius is increased by 20% and the height is decreased by 10%, find the percentage change in mass. (3marks)
15. Evaluate $\int_{-2}^3 (x^3 - 2x^2 + 5)dx$ (3marks)
- Find y given that $\begin{pmatrix} 3 & 4 \\ y & 6 \end{pmatrix}$ is a singular matrix (3marks)

SECTION II (50marks)

Answer only five question from this section in the spaces provided

17. The table below shows the income tax rates in a certain year.

Total income in k£per annum	Rate in shs per pound
1-3900	2
3901-7800	3
7801-11,700	4
11701-15600	5
15601-19500	7
Over 19500	7.5

Mrs. Masau earned a basic salary of ksh18600 per month and allowances amounting to ksh 7800 per month. She claimed a personal relief of ksh 1080 per month.

Calculate:

- a) Total taxable income in k£ p.a (2 marks)
- b) i) the tax payable in ksh per month without relief (4marks)
ii) the tax payable in ksh per month after relief (2marks)
- c) Mrs. Musau's net monthly income (2marks)
18. a) Complete the table below for $y = x^3 + 2x^2 - 5x - 4$ (2marks)

X	-4	-3	-2	-1	0	1	2	3
$y = x^3 + 2x^2 - 5x - 4$	-16		6		-4			26

- b) On the grid provided, draw the graph of $y = x^3 + 2x^2 - 5x - 4$ for $-4 \leq x \leq 3$. Use 2cm to represent 1 unit on the x axis and 1cm to represent 5 units on the y axis (3marks)
- c) i) Use the equation to solve the equation $x^3 + 2x^2 - 5x - 4 = 0$ (2marks)
ii) By drawing a suitable straight line on the graph, solve the equation

$x^3 + 2x^2 - 2x - 10 = 0$ (3marks)

19. In a second year class of a certain college, $\frac{2}{3}$ are boys and the rest are girls. $\frac{4}{5}$ of the boys and $\frac{9}{10}$ of the girls are right handed, the rest are left handed. The probability that a right handed student will answer a question correctly is $\frac{1}{10}$ and the corresponding probability for a left handed student is $\frac{3}{10}$ irrespective of the sex.

- (a) Draw a tree diagram to represent the above information (2marks)
- (b) Determine:
 - i) The probability that a student chosen at random from the class is left hand (2 marks)
 - ii) The student is a girl and answers the questions incorrectly (2mark)
 - iii) The probability that a question is answered correctly (4marks)

20. The table below shows marks obtained by 60 form four students in an English test.

Marks	No. of students
40-44	5
45-49	10
50-54	20
55-59	15
60-64	5
65-69	3
70-74	2

- (a) State the modal class (1mark)
- (b) Using an assumed mean of 52,

Calculate:

- (i) The actual mean (3marks)
- (ii) The standard deviation (3marks)
- (c) Estimate the median mark (3marks)

The table below shows data collected from an experiment involving two variables **P** and **T**

P	6.0	5.3	4.5	3.9	3.1	2.4	1.4
T	1.33	0.48	0.40	0.28	0.23	0.18	0.14
$\frac{1}{T}$							

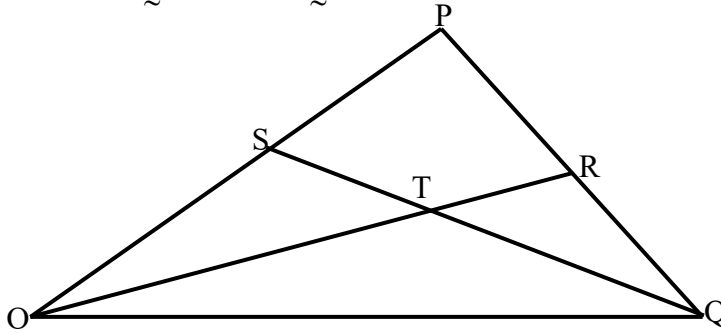
The variables are believed to satisfy an equation of the form $p = \frac{k}{T} + m$ where **k** and **m** are constants.

- a) For each of the value of **T** in the table above, write down the value of $\frac{1}{T}$ (2mark)
- b) (i) Using the scale 2cm to represent 1 unit on both axes draw a suitable straight line graph on the grid provided. (3marks)
- ii) Use the graph to estimate the value of **k** and **m** (3marks)
- iii) Write down the equation connecting **P** and **T** (2mark)
- 22. a) A plane flew due East to a town **Q** from a town **P**(60°N,16°W). The plane covered a distance of 5400nm. **Find;**
 - i) Find the position of **Q** (4marks)
 - ii) The time at **P** when the time at **Q** is 0140hrs on a Wednesday. (3marks)
- b) Another plane flew **P** to **Q** through the North Pole at a speed of $667\frac{1}{3}$ km, determine the time taken by the plane (take $\pi = \frac{22}{7}$, R=6370 km) (3marks)

23. In the figure below, OPQ is a triangle in which $OS = \frac{3}{4}OP$ and $PR:RQ = 2:1$

Line OR and SQ meet at T.

(a) Given that $\vec{OP} = \mathbf{p}$ and $\vec{OQ} = \mathbf{q}$, express the following vectors in terms of \mathbf{p} and \mathbf{q} .



(i) \vec{PQ} (1Mark)

(ii) \vec{OR} (2Marks)

(iii) \vec{SQ} (1Mark)

(b) You are further given that $ST = mSQ$ and $OT = nOR$. Determine the values of m and n . (6 marks)

24. a) The first term of a geometric Progression is 4. If the common ratio is 2, find the greatest number of Terms that will give a sum less than 40. (4marks)

b) the 2nd, 4th and 7th terms of an Arithmetic progression are the first 3 consecutive terms of a Geometric progression, if the common difference of the Arithmetic progression is 2, find
 i) the common ratio (3marks)
 ii) the sum of the first eight terms of the Geometric progression.

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KAPSABET BOYS
121/1 MATHEMATICS
PAPER ONE

SECTION I (50Mrks)

Answer ALL the Questions in the section

1. Evaluate: 3mks

$$\frac{2\frac{1}{2} \text{ of } 1\frac{3}{4} - 5\frac{1}{4}}{1\frac{2}{5} + 2(1\frac{1}{4} - 2\frac{3}{4})}$$

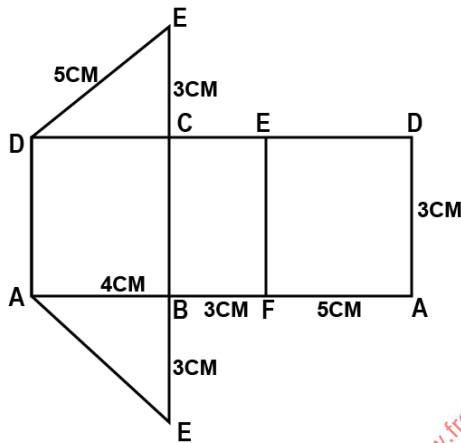
2. An electrician made a loss of 30% by selling a multi plug at Sh. 1400. What profit would he have made if he sold the multi plug at sh 2300. 3mks

3. Simplify $\sqrt{\frac{12x^4y^{-1}z^5}{3x^{-2}y^{-3}z^3}}$ 2mks

4. Solve the following inequalities and represent the solutions on a number line

$$X + 1 \leq 4x - 5 < 3x + 2$$

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



- a. Sketch the solid of the net showing the hidden edges with broken lines. 2mks
 b. Find the surface area of the solid. 2mks

6. Determine the quartile deviation for the following distribution. 3mks

3,4,9,5,4,7,6,2,1,6,7,8,9

7. Given that $2^{3/2x} = 4096$, find the value of x 2mks

8. It would take 15men 8days to dig a trench of 240m long. Find how many days it would take 18men to dig a trench 360meters long working at the same rate 3mks

9. Use logarithms to evaluate. 4mks

$$\sqrt[3]{\frac{0.921 \times 0.00739}{0.023}}$$

10. 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. 3mks

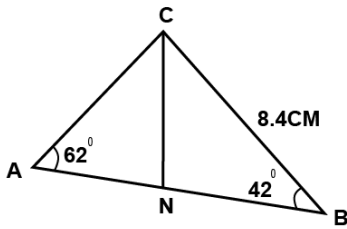
11. A translation vector $\begin{pmatrix} x-1 \\ 2-y \end{pmatrix}$ maps a point A(4,6) onto A'(9,12). Find the value of x and y. 3mks

12. A Canadian tourist arrived in Nairobi with Canadian dollars 6200. She converted all his money into Kenya Shillings and then spent a total of Kshs. 100,000. She paid her Kenyan tour guide a commission equivalent to 20% of the remainder. Given that 1 canadian dollar = Ksh. 48.12. calculate

A. How much she got in kenya shillings after converting all her money. 1mk

B. The amount of kenya shillings she was left with at the end. 2mks

13. In the figure below $\angle A = 62^\circ$, $\angle B = 42^\circ$, $BC = 8.4\text{cm}$ and CN is a bisector of angle ACB . Calculate to 1dp the length of CN . 3mks



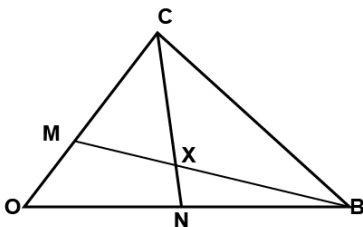
14. A father is now four times as old as his son. Five years ago, he was exactly one year and half times as old as his son will be in ten years from now. Determine the sum of their present ages. 4mks
15. An arc length of 11cm subtends an angle of 140° at the circle. Find the area of the enclosed sector. 4mks
16. Factorize and simplify the expression. 3mks

$$\frac{x^2 + 6x + 9}{x^2 - 9}$$

SECTION II (50 marks)

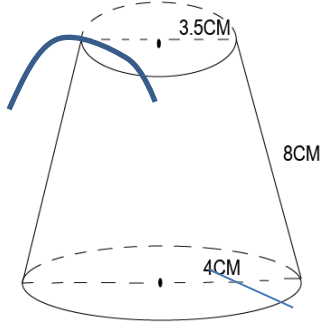
Answer any FIVE questions from this section

17. The triangle ABC with coordinates $A(2,3)$, $B(4,2)$ and $C(1,1)$ is mapped onto triangle $A^1B^1C^1$ by a reflection in the line $y + x = 0$.
- a. (i) Draw triangle ABC and its image $A^1B^1C^1$ on the same plane. 3mks
- (ii) Triangle $A^1B^1C^1$ is mapped onto $A^{11}B^{11}C^{11}$ by a transformation represented by the matrix $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$. Draw triangle $A^{11}B^{11}C^{11}$ and describe fully a single transformation that maps triangle ABC onto triangle $A^{11}B^{11}C^{11}$. 4mks
- b. Triangle ABC is mapped onto xyz with A being mapped onto x , B onto Y and C onto Z . given that the coordinates of x is $(-4,3)$, Y is $(0,2)$ and Z is $(-1,1)$, find the matrix representing the transformation. 3mks
18. A lorry left town A for B at 6.50pm at an average speed of 60km/h. at 8.35pm, a car left tow A for B at an average speed of 90km/h. if A is 317km from B . determine:
- a. The distance of the lorry from town A when the car took off. 3mks
- b. The distance the car travelled to catch up with the lorry. 4mks
- c. What time of the day did the car catch up with the lorry? Give your answer in 24hrs system. 3mks
19. Three ships X , Y and Z are approaching a harbour H . X is 150km from the harbour on a bearing of 090° . Y is 130km from the harbour on a bearing of $130^\circ E$ and Z is 180km to the west of Y .
- a) Taking a scale of 1cm to represent 20km, make a scale drawing of the routes of the three ships to the harbour 2mks
- b) What is the distance between ships X and Z ? 2mks
- c) Find the bearing of H from Z . 2mks
- d) If ship Y is travelling at a speed of 50km/h how long will it take to reach the harbor. 2mks
20. The figure below shows a triangle OAB with O as the origin. $OA = \underline{a}$ $OB = \underline{b}$, $OM = \frac{2}{5}\underline{a}$ and $ON = \frac{2}{3}\underline{b}$.



- a) Express in terms of \underline{a} and \underline{b} the vectors
- (i) \underline{BM} 1mk
- (ii) \underline{AN} 1mk
- b) Vector \underline{OX} can be expressed in two ways: $\underline{OB} + K\underline{BM}$ or $\underline{OA} + h\underline{AN}$, where K and h are constants. Express \underline{OX} in terms of:
- i. \underline{a} , \underline{b} and k . 2mks
- ii. \underline{a} , \underline{b} and h . 2mks
- c) Find the values of k and h . 4mks

21. In a certain meeting, there were 95 men in attendance. There were 50 more women than men and twice as many children as men.
- Determine the number of people in attendance. 2mks
 - Find the percentage of children in attendance, correct to 3 significant figures. 2mks
 - A hall for the meeting was fitted with benches that could accommodate either 10 children or 7 adults per bench.
Find the number of benches
 - Used by the children 2mks
 - Completely filled by the adults. 2mks
 - Adults who would fill the unoccupied space. 2mks
22. a) The point A(-2, 4) and B(3,-6) lies on a straight line AB, find
- the equation of the line perpendicular to AB and passing through A 3mks
 - The equation of the line parallel to AB and passing through the point. (3,-1). 3mks
- b) The points A and B are translated by a vector $M = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$. Find
- the images of A and B. 2mks
 - the equation of the line passing through A^1 and B^1 the images of A and B respectively. 2mks
23. the figure below represents a solid made up of a conical frustum and a hemispherical top. The slant height of the frustum is 8cm and its base radius is 4.2cm.



If the radius of the hemispherical top is 3.5cm

- Find the area of:
 - The circular base 2mks
 - The curved surface area of frustum. 4mks
 - The hemispherical surface 2mks
 - A similar solid has a total surface area of 81.5cm². determine the radius of the base. 2mks
24. Using a ruler and a pair of compasses, construct parallelogram ABCD such that AB = 8cm, diagonal AC = 12cm and angle BAC = 22.5° 4mks
- Measure
 - The diagonal BD 1mk
 - The angle ABC 1mk
 - Draw the circumference of triangle ABC 2mks
 - Calculate the area of the circle drawn 2mks

KAPSABET BOYS
121/2 MATHEMATICS
PAPER TWO

SECTION I (50Mks)

Attempt ALL Questions from this section

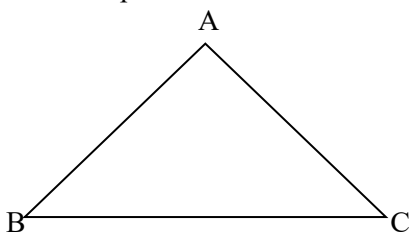
1. Make x the subject of the formula 3mks

$$P = \frac{\sqrt{x + 2w}}{\sqrt{4x + 3R}}$$

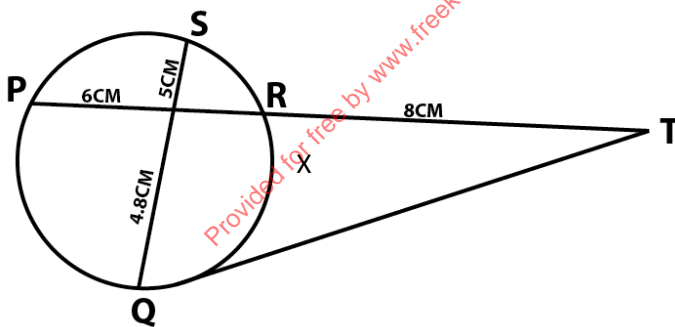
2. P varies partly as the square of v and partly as the cube of v. when $V=2, P = -20$ and when $v = -3, P=135$. Find the relationship between P and v. 3mks
3. Expand $(1 + 2x)^7$ up to x^3 , hence use the expansion to estimate the value of $(1.02)^7$ correct to four decimal places. 3mks
4. Simplify the following by rationalizing the denominator. 3mks

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

5. The diagram below represents a field ABC.



- (a) Draw the locus of points equidistant from sides AB and AC 2mks
- (b) Draw the locus of points equidistant from points A and C. 2mks
- (c) A coin is lost within a region which is nearer to point A than to point C and closer to side AC than to side AB. Shade the region where the coin can be located. 2mks
6. Given $x = 13.4\text{cm}$ and $y=4.3\text{cm}$. calculate the percentage error in x/y correct to 4 d.p 3mks
7. If matrix $A = \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$ Find B given that $A^2 = (A + B)$. 3mks
8. In the figure below QT is a tangent to a circle at Q. PXRT and QXS are straight lines. $PX = 6\text{cm}$, $RT = 8\text{cm}$, $QX= 4.8\text{CM}$



Find the length of

- a. XR 2mks
- b. QT 2mks
9. A circle whose equation is $(x - 1)^2 + (y - k)^2 = 10$ passed through point (2,5). Find the coordinates of the two possible centres of the circle. 3mks
10. A blender mixes two brands of juice A and B to obtain 70mls of the mixture worth Ksh. 165 per litre. If brand A is valued at Kshs. 168 per litre and brand B at Ksh. 153 per litre bottle, calculate the ration in which the brands A and B are mixed. (2mks)
11. Without using logarithm tables solve the equation $\log(5x - 4) = \log(x + 2) + \frac{1}{3} \log 27$. 3mks
12. a) Use reciprocal tables to find the value of $= 1 / 0.325$ 1mk

- b) Hence, evaluate $\frac{\sqrt[3]{0.000125}}{0.325}$ 1mk
13. The G.C.D of three numbers is 45 and the LCM is 18900. Two of the numbers are 675 and 540. Find the other possible numbers. 3mks
14. solve for θ given that θ is acute and $\sin(3\theta - 50^\circ) - \cos(20 + 10^\circ) = 0$ 3mks
15. A container of height 90cm has a capacity of 4.5L. What is the height of a similar container of volume 9cm^3 . 3mks
16. A point R divides a line PQ internally in the ration 3:4. Another point S, divides the line PR externally in the ratio 5:2. Given that PQ = 8cm, calculate the length of RS, correct to 2 decimal places. 3mks

SECTION II (50mrks)

Attempt any FIVE questions from this section

17. Complete the table below for the function

(a) $y = x^2 + \frac{12}{x} - 15$ for $0.5 \leq x \leq 4$

X	0.5	1	1.5	2	2.5	3	3.5	4
y	9.25			-5	-4			

- (b) Draw the graph of $y = x^2 + \frac{12}{x} - 15$ for $0.5 \leq x \leq 4$. using a scale of 2cm rep 1 unit on the x – axis and 2cm for 5 units on the y – axis. 3mks
- (c) (i) from your graph, state the range of values of x for which $y = x^2 + \frac{12}{x} \leq 18$ 3mks
 (ii) By adding a suitable straight line to your graph, solve the equation $y = x^2 + \frac{12}{x} - 5x + 20$ 3mks
18. 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 3mks
- (b) Given that the sum of the three terms is 14,
 (i) Calculate the values of a and r and hence write down two possible sequences each up to the 4th term. 5mks
 (ii) Find the product of the 50th terms of the two sequences 2mks
19. The table below shows income tax rates for certain year.

Monthly income in Kenya Shillings (Kshs)	Tax rate in each shillings
0 – 10164	10%
10165 – 19740	15%
19740 – 29316	20%
29317 – 38892	25%
Over 38892	30%

A tax relief of Kshs. 1162 per month was allowed. In a certain month of the year, an employee’s taxable income in the fifth band was Ksh. 2108.

- (a) Calculate
 i) Employees total income in that month 2mks
 ii) The tax payable by the employee in that month. 5mks
- (b) The employee’s income includes a house allowance of Ksh. 15,000 per month. The employees contributed 5% basic salary to a cooperative. Calculate the employee net pay for that month. 3mks
20. The following table shows the distribution of marks obtained by 50 students in a test.

Marks	45-49	50-54	55-59	60-64	65-69	70-74	75-79
No. of Students	3	9	13	15	5	4	1

By using an assumed mean of 62, calculate

- a) The mean 5mks
 b) The variance 3mks
 c) The standard deviation 2mks
21. A red and black dice are rolled and the events x, y and z are defined as follows.

X = the red die shows a 4
 Y = the sum of the scores of the two dice is 6
 Z = the black dice shows a 3

- a. Find the probability of event x 2mks
 - b. The probability of events x and y 3mks
 - c. Which event is mutually exclusive to x 1mk
 - d. Which event is independent of x 2mks
 - e. The probability of event Y 2mks
22. a) Complete the table below 2mks

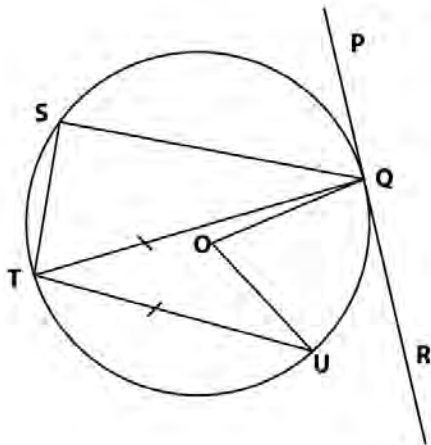
X	0	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
- Cos x	-1		-0.5		0.5	0.87		0.87			-0.5	0.87	
Sin(x-30°)		0.0	0.5			0.87	0.5		-0.5			-0.87	-0.5

b) Draw the graphs of $y=\sin(x-30)$ and $y=-\cos x$ on the same axes, for $0^{\circ}\leq x\leq 360^{\circ}$

(5mks
 (3mks)

c) Use your graph to solve the equation $\sin(x - 30^{\circ}) + \cos x = 0$

23. in the figure below, O is the centre of the circle, PQR is the tangent to the circle at Q, Angle PQS=28°, angle UTV = 54° and UT = TQ



Giving reasons, determine the size of

- a) Angle STR 2mks
 - b) Angle TQU 2mks
 - c) Reflex angle TQS 2mk
 - d) Reflex angle UOQ 2mks
 - e) Angle TQR 2mks
24. The cost c of producing n items varies directly 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. Calculate
- a) The constant of proportionality and hence write the equation connecting c and n. 5mks
 - b) The cost of producing 10 items 2mks
 - c) The number of items produced at a cost of Ksh. 756. 3mks