

**STRATEGIC ALLIANCE JOINT EXAMINATION
MATHEMATICS
PAPER 1**

SECTION 1: (50 MARKS)

Attempt ALL Questions in this section

1. Evaluate: (3mks)

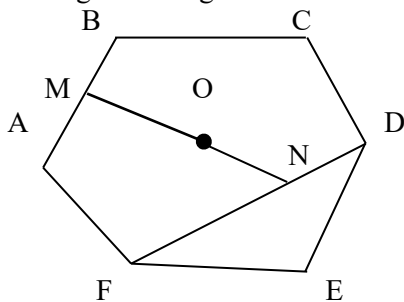
$$\frac{8 \times \frac{1}{3} \text{ of } 9 \div 2}{(12+2 \times 3) - \frac{2}{3} \text{ of } 144 \div 12}$$

2. Use the tables of reciprocals to evaluate to 3d.p (3 mks)

$$\frac{2}{3.53} + \frac{1}{1.758}$$

3. A rhombus A B C D with its side 15cm and diagonal AC = 24cm. Find the other diagonal BD. (2mks)

4. The figure below is a regular hexagon. O is the centre and M is the mid point of AB. (2mks)



Find angle:

- (i) EFD (2mks)
 (ii) MNF (2mks)

5. Simplify the expression: (3mks)

$$\frac{4x^2 - xy - 3y^2}{32x^2 - 18y^2}$$

6. A pool of water with surface area of 0.8ha has a uniform depth of 4m. A pipe drains the pool at the rate of 400 litres per second. How many hours does it take to empty the pool? (2mks)

7. Evaluate, giving your answer to 2 s.f figure: (3mks)

$$\frac{0.0065 \times 6.48}{0.27}$$

8. If $2^{x+y} = 16$ and $4^{2x-y} = \frac{1}{4}$, find $(y - x) : 2y$ (4 mks)

9. Solve the simultaneous inequality given below and represent the solutions on a number line. (3mks)

$$2x + 3 \geq x - 4 > 3(x - 2)$$

10. The travel timetable below shows the departure and arrival time for a bus plying between two towns M and R, 300 kilometres apart. (3mks)

TOWN	ARRIVAL	DEPARTURE
M		0830h
N	1000h	1020h
P	1310h	1340h
Q	1510h	1520h
R	1600h	

Calculate the average speed for the whole journey. (3mks)

11. Simplify the following expression without using tables or calculator: (3mks)

$$\frac{4 \cos 60^\circ + 16 \cos^2 45^\circ + 2 \sin 30^\circ}{\sin^2 45^\circ}$$

12. Given that $PQ = \begin{pmatrix} 9 \\ 2 \end{pmatrix}$ and $OQ = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$ determine:

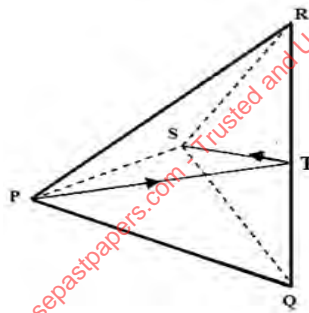
OP and find the magnitude of OP giving your answer in surd form. (3mks)

13. A tourist arrived from USA and changed his US \$1500 TO Ksh. He spent Ksh. 3000 per night in a hotel for 20 nights and a further Ksh. 9000 daily for the entire period. He left for South Africa having changed the balance to South African Rand.

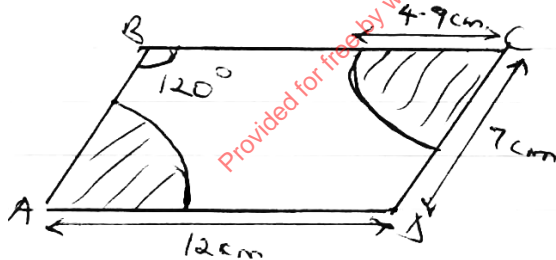
Calculate the amount of South African Rands he was left with, if the bank buys and sells currencies using the table below. (3 mks)

Currency	Buying	Selling
1 US Dollar (\$)	78.4133	78.4744
1 Sterling Pound (£)	114.1616	114.3043
1 South African Rand	7.8842	7.9141

14. The figure below shows a regular tetrahedron PQRS of edges 4cm. Draw its net and measure the length of the straight path of PS through the midpoint T over the edge QR. (3mks)



15. The diagram below represents a parallelogram. Calculate the area of the shaded region. (2mks)



16. The sum of interior angles of a regular polygon is 24 times the size of the exterior angle.
 a. Find the number of sides in the polygon. (3 mks)
 b. Name the polygon. (1 mk)

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

17. A group of choir members decided to raise 3600/= to buy a guitar. Each member was to contribute equal amount. In the preparation process five members transferred to another church, that meant the remaining contributors had to pay more to achieve the target.
 a. Show that the increase in the contribution per member was:

$$\text{Sh. } \frac{18,000}{n(n-5)}$$
 if n is the initial number of members. (4 mks)

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23.(a) Fill the table below to 2 d.p for the curves given by $y = 3 \sin (2\chi + 30^\circ)$ and $y = \cos 2\chi$ for χ values in the range $0 \leq \chi \leq 180^\circ$. (2mks)

χ	0°	15°	30°	45°	60°	75°	90°	120°	150°	180°
$y = 3 \sin (2\chi + 30^\circ)$		2.6		2.6		0.0		-3.0		1.5
$y = \cos 2\chi$		0.87		0.00		-0.87		-0.5		1.0

- b) Draw the graphs of $y = 3 \sin (2\chi + 30^\circ)$ and $y = \cos 2\chi$ on same axes. (4mks)
 c) Use your graph to solve the equation $3 \sin (2\chi + 30^\circ) = \cos 2\chi$. (2mks)
 d) Determine the following from your graph:
 (i) Amplitude of $y = 3 \sin (2\chi + 30^\circ)$. (1mk)
 (ii) Period of $y = 3 \sin (2\chi + 30^\circ)$. (1mk)
24. A trader bought 8 cows and 12 goats for a total of Ksh.294,000. If he had bought 1 more cows and 3 more goats he would have spend Ksh.337,500.
 (a) Form two equations to represent the above information. (2 mks)
 (b) Use matrix method to determine the cost of a cow and that of a goat. (4 mks)
 (c) The trader sold the animals he had bought making a profit of 40% per cow and 45% per goat.
 (i) Calculate the total amount of money he received. (2 mks)
 (ii) Determine his profit in Kenya shillings. (2 mks)

STRATEGIC JOINT EXAMS-2019
MATHEMATICS
PAPER 2

SECTION 1: (50 MARKS)

Answer ALL the Questions in this section in the spaces provided.

1. Use logarithm table to evaluate: (4mks)

$$\sqrt[3]{\frac{(0.0246)^2 \times 142}{0.002 \times 1.14}}$$

2. Expand the expression: $(3\sqrt{2} + 5)(3\sqrt{2} - 5)$. Hence work out the following: (3mks)

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

3. Expand $(2 + \frac{1}{5}x)^8$ up to the term in x^3 . Use your expansion to evaluate $(2.04)^8$ correct to 4 decimal places. (4mks)
 4. Evaluate without using mathematical tables or calculators: (2mks)

$$2 \log_{10} 5 - \frac{1}{2} \log_{10} 16 + 2 \log_{10} 40$$

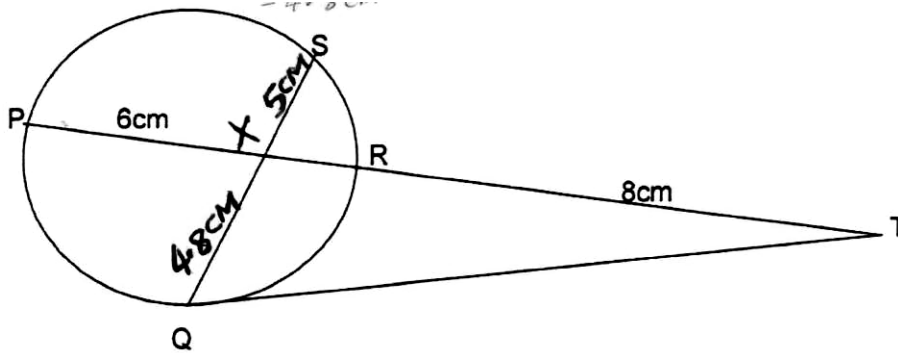
5. Make r the subject in the formula: (3mks)

$$s = \frac{\sqrt{rt}}{\sqrt{(r^2 - t)}}$$

6. It would take 18 men 12 days to dig a piece of land, if they work for 8 hours a day. How long will it take 24 men if they work 12 hours a day to cultivate three quarters of the same land. (3mks)

7. Under a transformation whose matrix $y = \begin{pmatrix} x - 2 & -2 \\ x & x \end{pmatrix}$, a triangle whose area is 13.5cm^2 is mapped on the a triangle whose area is 54cm^2 . Find two possible values of x. (3 mks)

8. In the figure below QT is a tangent to a circle at Q. PXRT and QXS are straight lines. PX = 6cm, RT = 8cm, QX = 4.8cm and XS = 5cm.



Find the length of:

- (a) XR (2mks)
 (b) QT (2mks)
9. A circle whose equation is $(x - 1)^2 + (y - k)^2 = 10$ passes through point (2,5). Find the coordinates of the two possible centres of the circle. (3mks)

10. A 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 work but after $3\frac{1}{2}$ 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. (3 mks)

11. The marks of 80 students in a Mathematics test are shown in the table below.

Marks	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-100
No. of students	8	10	15	14	11	8	7	5	2	0

Find the quartile deviation of the marks. (4mks)

(Give your answer to the nearest whole number)

12. Solve for x in the equation:

$$3\cos^2x + \sin x + 1 = 0$$

For $0 \leq x \leq 360$

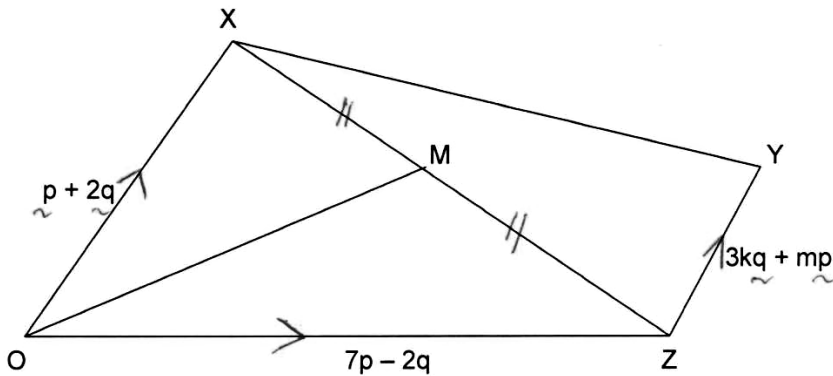
(4mks)

13. Mrs. Beth wants to buy a flat screen television set on hire purchase. The cash price is Kshs. 28,000. She can pay the cash price or make a down payment of Kshs. 8,000 and 15 monthly installments of Kshs. 2,000 each. Calculate the rate of compound interest charged per month. (3 mks)
14. 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 Ksh. 168 per 1 litre bottle and brand B at Ksh. 153 per 1 litre bottle, calculate the ratio in which the brands A and B are mixed. (2mks)
15. A quantity y varies partly as the square of X and partly as X. When $y = 20$, $x = 2$ and when $y = 36$, $x = 3$. Determine the equation relating y and x. (3mks)
16. The image of a point Q(1,2) after a translation is Q¹(-1,2). What is the co-ordinate of the point R whose image is R¹(-3, -3) after undergoing the same translation? (2 mks)

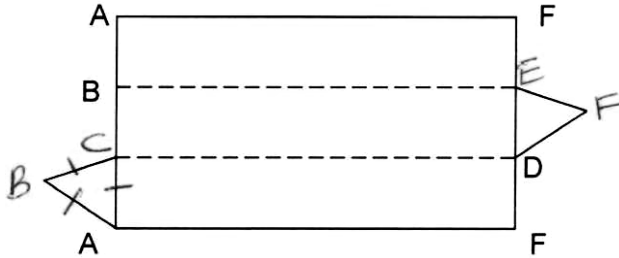
SECTION II (50 MARKS)

Answer any five questions in this section

17. In the diagram M is the midpoint of XZ. $OX = p + 2q$. $Oz = 7p - 2q$ and $ZY = 3Kq + mp$ where k, and m are constants.



- (a) Express the following in terms of p and q .
- (i) XZ (2mks)
 - (ii) XM (1mk)
 - (iii) OM (1mk)
- (b) Express OY in terms of p , q , k and m . (2mks)
- (c) If Y lies on OM produced with $OY:OM = 3:2$. Find the values of k and m . (4mks)
18. The figure below shows a net of solid. The dimensions $AC = CB = BA = 5\text{cm}$, $AF = 10\text{cm}$ and the triangles ABC and DEF are equilateral and equal.



- a. Taking $BCDE$ as the base of the solid, draw a proportionately well labelled solid that can be made from the net. (2mks)
 - b. Name the solid formed. (1mk)
 - c. Using the figure, calculate:-
 - i. The angle between line CF and the plane $BCDE$. (3mks)
 - ii. The angle between lines BD and DE . (3mks)
 - iii. The angle between the planes $BCDE$ and $CDFA$. (1mk)
19. The position of two towns P and Q are given to the nearest degree as $P(45^{\circ}\text{N}, 20^{\circ}\text{W})$ and $Q(45^{\circ}\text{N}, 160^{\circ}\text{E})$. Find:
- a. Shortest distance between the two towns in:-
 - i. Kilometres (take radius of the earth as 6370km) (3mks)
 - ii. Nautical miles. (Take $\pi = \frac{22}{7}$) and the earth's radius = 6370km . (2mks)
 - b. A ship leaves town P and sails due east for 120 hours to another town R at an average speed of 27 knots.
 - i. Calculate the distance between the two towns in nautical miles. (2mks)
 - ii. Find the position of town R . (3mks)
20. 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. 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 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)

21. (a) Complete the table below for the function:

$y = x^2 - 3x + 5$							
x	2	3	4	5	6	7	8
y			9		23		45

(2mks)

- (b) Use the mid-ordinate rule with six ordinates to estimate the area enclosed by the curve of the functions $y = x^2 - 3x + 5$, x – axis and the lines $x = 2$ and $x = 8$. (3mks)
- (c) Find the exact area of the region described in (b) above. (3mks)
- (d) If the mid-ordinates rule is used to estimate the area under the curve between $x = 2$ and $x = 8$, what will be the percentage error in the estimation? (2mks)
22. a) The first term of an Arithmetic Progression (AP) is 2. The sum of the first 8 terms of the AP is 156.
- Find the common difference of the AP (2mks)
 - Given that the sum of the first n terms of the AP is 416, find n.
- b) The 3^{rd} , 5^{th} and 8^{th} terms of another AP from the first three terms of a Geometric progression (GP). If the common difference of the AP is 3, Find:
- The first term of the GP (4mks)
 - The sum of the first 9 terms of the GP, to 4 s.f. (2mks)
23. Two baskets X and Y contain identical balls except for the colors. Basket X contains 6 red balls and 3 black balls. Basket Y contains 2 red balls and 3 black balls.
- (a) If a ball is drawn at random from each basket, find the probability that both balls are of the same color. (4 mks)
- (b) If two balls are drawn at random from each basket, one ball at a time without replacement, find the probability that:-
- The two balls drawn from basket X or basket Y are red. (4 mks)
 - All the four balls drawn are red. (2 mks)
24. (a) Using a ruler and a pair of compasses only. Construct triangle ABC in which $AB = 5\text{cm}$, $BC = 4.5\text{cm}$ and $\angle BAC = 60^\circ$ (3 mks)
- (b) On the same side of AB as C:
- determine the locus of a point P such that $\angle APB = 60^\circ$ (3 mks)
 - construct the locus R such that $AR > 2\text{cm}$ (2 mks)
 - Determine the region T such that $\angle ACT \geq \angle BCT$ (2 mks)

STRATEGIC JOINT EXAMS-2019
MATHEMATICS
PAPER 1

SECTION 1: (50 MARKS)

Attempt ALL Questions in this section

Question 1

N) $\frac{1}{3} \times 9 = 3$

$8 \times 3 \div 2$ M1

$8 \times \frac{3}{2} = 12$

D) $(12 + 2 \times 3) - \frac{2}{3}$ of $144 \div 12$

$12 + 6 - \frac{2}{3}$ of $144 \div 12$

$18 - \frac{96}{12}$

$18 - 8 = 10$ M1

Sum = $\frac{12}{10}$

= $\frac{6}{5}$

= $1\frac{1}{5}$ A1

Question 2

rec 3.53 \Rightarrow 0.2833

$1.758 \Rightarrow 0.5688$ M1

Sum $2(0.2833) + 1(0.5688)$ M1

= 1.1354 A1

Question 3

$5^2 - 12^2 = 81$ M1

$\sqrt{81} = 9$

other diagonal = 18 cm A1

Question 4

(i) = $\frac{180 - 120}{2}$ B1

= 30°

(ii) $360^\circ - (120 + 90 + 90)$ B1

= 60° A1

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121/1
MATHEMATICS
Paper 1
July /August 2019

SECTION I (50 Marks)

Answer all questions in the spaces provided

1. Without using a calculator, evaluate (2 marks)

$$\frac{-9 + (-7) \times (-8) - (-5)}{-2 + (-6) \div 3 \times 6}$$

2. Use logarithms to evaluate

$$\frac{34.33}{\sqrt{5.25 \times 0.04}}$$

3. Solve the equation below. (3 marks)

$$\frac{2x + 5}{3} - \frac{6 - 2x}{2} = 2$$

4. Given $\sin(90 - a) = \frac{1}{2}$, find without using tables or calculators the value of $\cos a$. (2 marks)

5. Find all the integers satisfying the inequalities. (3 marks)

$$3 - 2x < x - 3 \leq 4$$

6. A number n is such that when it is divided by 27, 30 or 45, the remainder is always 3. Find the smallest value of n . (3 marks)

7. The interior angle of a n -sided regular polygon exceeds its exterior angle by 135° . Find the value of n . (3 marks)

8. Simplify the expression

$$\frac{9x^2 - 25y^2}{6x^2 + 19xy + 15y^2}$$

9. Find the value of (3 marks)

$$\sqrt[4]{2} \times \sqrt{32} \times \sqrt{2}$$

10. A line L is perpendicular to the line $\frac{5}{7}x + \frac{2}{3}y = 1$. Given that L passes through $(3, 10)$.

Find the

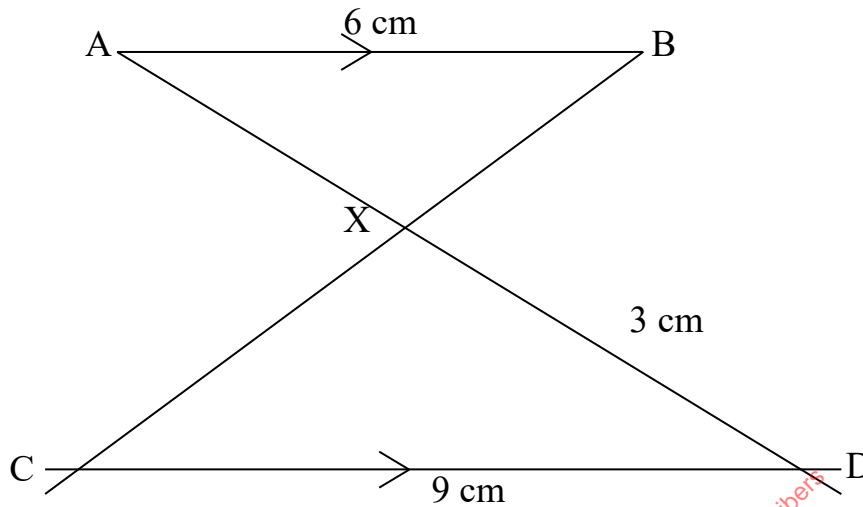
- a) Gradient of L (2 marks)

- b) Equation of L in form of $y = mx + c$ where m and c are constants. (2 marks)

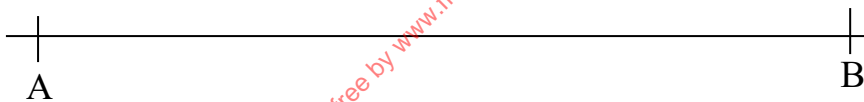
11. Without using a calculator evaluate (3 marks)

$$\frac{\frac{3}{4} + 1\frac{5}{7} \div \frac{4}{7} \text{ of } 2\frac{1}{3}}{\left(1\frac{3}{7} - \frac{5}{8}\right) \times \frac{2}{3}}$$

12. In the figure below the lines AB and CD are parallel. AD and CB intersect at X. AB = 6cm, CD = 9cm and DX = 3 cm.



- a) Calculate the length of AX. (2 marks)
- b) The area of $\triangle ABX$ is 6cm^2 . Calculate the area of $\triangle CXD$. (2 marks)
13. The area of a rhombus is 60cm^2 . Given that one of its diagonals is 15cm long. Calculate the perimeter of the rhombus. (3 marks)
14. Use the matrix method to find the co-ordinates of the points of intersection of the lines $3x - 4y = 1$ and $y + 7x = 23$ (4 marks)
15. Two grades of tea premium and Gold costing Ksh 200 and Ksh 250 per kg respectively are mixed in the ratio 3 : 5 by weight. The mixture is then sold at Ksh 260 per kg. Find the percentage profit on the cost price. (3 marks)
16. Divide line AB such that $AP = \frac{2}{5} AB$. (3 marks)



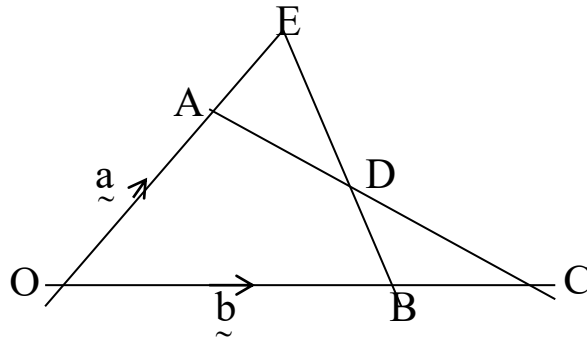
SECTION II (50 Marks)

Answer any five questions from this section.

17. A cylindrical water tank is of diameter 7 metres and height 2.8 metres.
- a) Find the capacity of the water tank in litres. (4 marks)
- b) Six members of a family use 15 litres each per day. Each day 80 litres are used for cooking and washing and a further 60 litres are wasted. Find the number of complete days a full tank of water would last the family. (2 marks)
- c) Two members of the family were absent for 90 days. During the 90 days, wastage was reduced by 20% but cooking and washing remained the same. Calculate the number of days a full tank would now last the family. (4 marks)
18. A house is to be sold either on a cash basis or through a loan. The cash price is Kshs. 750,000. The loan conditions are as follows: there is to be a down payment of 10% of the cash price and the rest of the money to be paid through a loan of 10% per annum compound interest. A customer decided to buy the house through a loan.

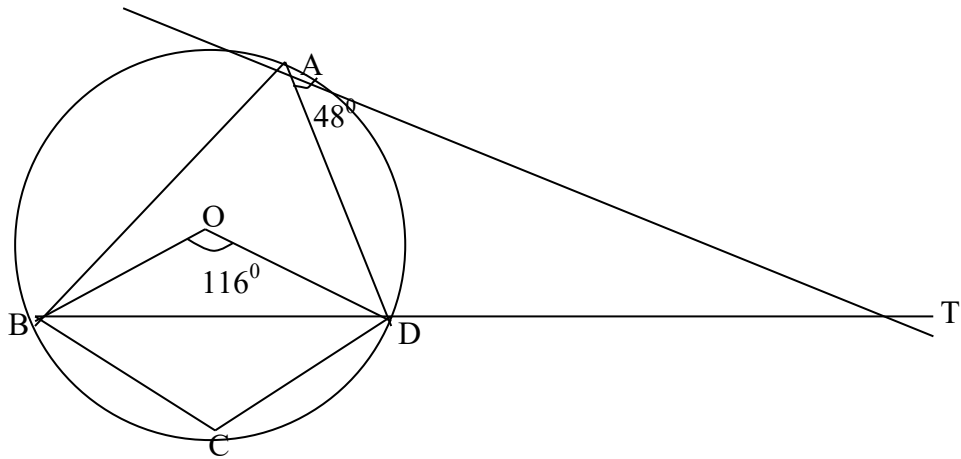
- a) i) Calculate the amount of money loaned to the customer. (3 marks)
 ii) The customer paid the loan in 3 years.
 Calculate the total amount paid for the house. (3 marks)
- b) Find how long the customer would have taken to fully pay for the house if she paid a total of Kshs 891,750. (4 marks)

19. In the figure below $\vec{OA} = \vec{a}$, $\vec{OB} = \vec{b}$, $OA : AE = 2 : 3$ and $OB : OC = 1 : 2$



- a) Express \vec{AC} and \vec{BE} in terms of \vec{a} and \vec{b}
- i) \vec{AC} (1 mark)
 ii) \vec{BE} (1 mark)
- b) If $\vec{DC} = k\vec{AC}$ and $\vec{BD} = m\vec{BE}$ where k and m are scalars.
 By expressing \vec{DC} in two ways, determine the values of k and m . (7 marks)
- c) Find the ratio of $BD : DE$ (1 mark)
20. A helicopter is stationed at an airport H on a bearing 060° and 800 km from another airport P. A third airport J is on a bearing of 140° and 1,200 km from H.
- a) Determine
- i) the distance between P and J. (4 marks)
 ii) the bearing of P from J. (3 marks)
- b) A jet flying at a speed of 1035 km/h left J towards P. The helicopter at H also took off towards P at the same time. Find the speed at which the helicopter will fly so as to arrive at P, 12 minutes later than the Jet. (3 marks)
21. a) Given that the matrix $A = \begin{pmatrix} 2 & 3 \\ 3 & 4 \end{pmatrix}$, find A^{-1} , the inverse of A. (2 marks)
- b) Kariuki bought 400 goats and 600 sheep for a total of Kshs 1.7m. Maina bought 180 goats and 240 sheep for a total of Kshs 720,000. If the price of a goat is sh. X and that of a sheep is shs y,
- i) Form two equations to represent the above information. (2 marks)
 ii) Use the matrix A^{-1} to find the price of one goat and one sheep. (3 marks)
- c) John bought 450 goats and 720 sheep. He was given a total discount of shs 66,600. If the discount on the price of a goat was 2%, calculate the percentage discount on the price of a goat. (3 marks)

22.



In the figure above, TA is a tangent to the circle ABCD with centre O. $\angle TAD = 48^\circ$ and $\angle BOD = 116^\circ$.
Giving reasons calculate?

- a) $\angle ACD$ (2 marks)
- b) $\angle ABD$ (2 marks)
- c) $\angle ADO$ (2 marks)
- d) $\angle ACB$ (2 marks)
- e) $\angle ATD$ (2 marks)

23. The table below gives some of the values of x and y for the function $y = \frac{1}{2}x^2 + 2x + 1$ in the interval $0 \leq x \leq 6$

x	0	1	2	3	4	5	6
Y	1	3.5	7	11.5	17	23.5	31

- a) Use the values in the table to draw the graph of the function on the grid provided. (3 marks)
- b) i) Using the graph and the mid-ordinate rule with six (6) strips, estimate the area bounded by the curve, the x – axis, the y- axis and the line $x = 6$. (4 marks)
- ii) If the exact area of the region described in (b) (i) is 78cm^2 ; calculate the percentage error made when the mid-ordinate rule is used. (3 marks)

24. The equation of a curve is given as $y = x^2 - 3x + 2$.

Determine

- a) the value of y when $x = 2$ (2 marks)
- b) the gradient of the curve at $x = 3$. (3 marks)
- c) the turning points of the curve and their nature. (5 marks)

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121/2

MATHEMATICS

Paper 2

July /August 2019

SECTION I (50 MARKS)

Answer all the questions in this section

- The dimensions of a rectangle are measured and given as 6.9 cm by 3.06 cm, Calculate to 4 s.f. the percentage error in the area. (3 marks)
- Make q the subject of the formula.

$$P = 3\sqrt{\frac{nq - m}{q}} \quad (3 \text{ marks})$$

- Construct rectangle ABCD in which AB = 4cm and BC = 3cm. Inside the rectangle construct the locus of point L₁ which is 3 cm from A; Locus of L₂ which is equidistant from line AB and AD and locus of point L₃ which is 2cm from line AB. (4 marks)
- The distance s metres of an object varies partly with time t seconds and partly with square root of time. Given that s = 16 when t = 4 and s = 48 when t = 16. Write an equation connecting s and t. (4 marks)

- If $\frac{1}{3-\sqrt{5}} - \frac{2+2\sqrt{5}}{3+\sqrt{5}} = a + b\sqrt{c}$, find the value of a, b and c (3 marks)

- Expand $(1 - 2x)^4$ (1 mark)
 - Use the first four terms of your expansion to find the value of $(0.99)^4$ (2 marks)

- A DVD player whose cash price is sh. 15000 is bought on hire purchase by paying a deposit of sh 3000 and 12 monthly instalments of sh. 1250 each. Calculate the rate of interest per annum. (3 marks)

- State the amplitude and the phase angle of the curve $y = 2\sin\left(\frac{3}{2}x - 30^\circ\right)$ (2 Marks)

- Find the radius and centre of a circle whose equation is $x^2 + 4x + y^2 - 8y + 11 = 0$. (3 marks)

- Tap A takes 4 minutes to fill a tank and tap B takes 6 minutes to empty the tank. If the tank has a capacity of 3000 l, find the volume of the tank after 2 minutes when both taps are open. (3 Marks)

- The mass in kilograms of 9 sheep in a pen were 13, 8, 16, 17, 19, 20, 15, 14 and 11. Determine the quartile deviation of the data. (3 Marks)

- Solve for x in the equation. (3 Marks)

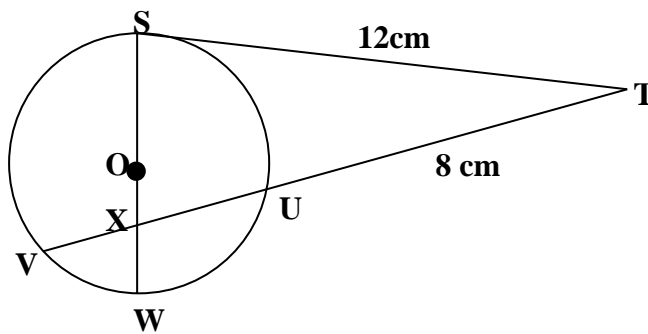
$$\frac{1}{2} \log_2 81 + \log_2 \left(x^2 - \frac{x}{3}\right) = 1$$

- The table below represents a relationship between two variables x and y.

x	1	2	3	4	5	6
y	3.5	4.5	8.0	8.5	11	13

- On the grid provided draw the line of best fit. (3 marks)
 - Use the graph to find the value of y when x = 0 (1 mark)
- The points A, B and C lies 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 ratio 2:1. Find the position vector of B. (2 marks)

15. In the figure below, the tangent ST meets chord VU produced at T. Chord SW passes through the centre of the circle and intersects chord VU at X. Line ST = 12cm and UT = 8cm.



16. Calculate the length of chord VT. (3 marks)
17. Find the number of terms that will give a sum of 800 in the series. (2 marks)
- $2 + 6 + 10 + \dots$

SECTION II (50 Marks)

Answer any five questions from this section

17. The table below shows income tax rates

Income in K£ p.a	Tax rate in sh per £
0 – 5808	2
5809 – 11280	3
11281 – 16752	5
16753 – 22224	7
Over 22224	11

- a) Mr. Juma claiming tax relief of Ksh 1056 per month discovered that a total of Ksh 18500 is deducted from his total earnings in form of income tax. Calculate Mr. Juma’s taxable income in Ksh per month.(6 marks)
- b) Mr. Juma other deductions include:
 5% of basic salary as cooperative shares
 2% of basic salary as WCPS
 Insurance policy Ksh 2800
 Co-operative shares Ksh 1500
 Given that his taxable allowances is Ksh 28400, calculate his net pay (4 marks)

18. a) Complete the table below for the equation $y = x^3 - 3x^2 - 9x + 2$.

x	-3	-2	-1	0	1	2	3	4	5
$y = x^3 - 3x^2 - 9x + 2$				2			-25		

- (2 Marks)
- b) On the grid provided draw the graph of $y = x^3 - 3x^2 - 9x + 2$ for $-3 < x < 5$.
 Use the scale: 1cm rep 1 unit on x – axis
 1cm rep 5 units on y – axis (3 marks)
- c) i) Use your graph to solve the equation $x^3 - 3x^2 - 9x + 2 = 0$ (2 marks)
- ii) By drawing a suitable straight line on the graph solve the equation. $x^3 - 3x^2 - 9x + 2 = -2x - 4$ (3 marks)
19. The probability that our school will host soccer and rugby tournament this year is 0.8. If we host the probability of winning soccer is 0.7. If we do not host the probability of winning soccer is 0.4. If we win soccer the probability of winning rugby is 0.8, otherwise if we lose the probability of winning rugby is 0.3.
- a) Draw a tree diagram to represent this information. (2 marks)
- b) Use the tree diagram to find:-
- i) The probability that we will lose both games. (3 marks)
- ii) The probability that we will win only one game. (3 marks)

iii) The probability that we will host and lose both games. (2 marks)

20. The data below shows the masses of 50 potatoes in grams.

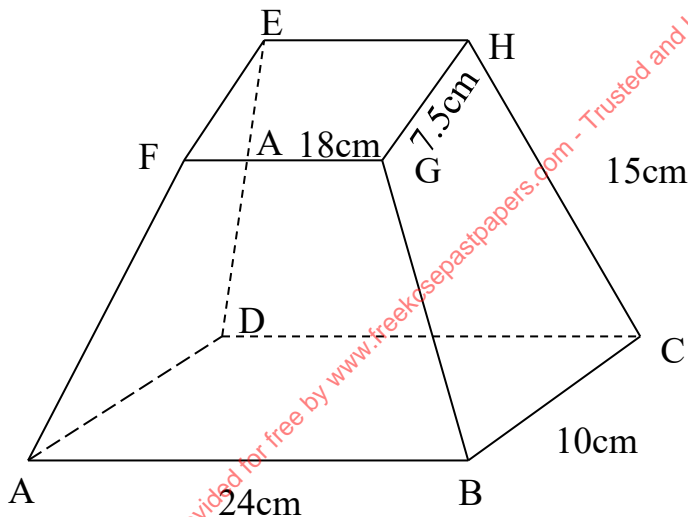
Mass (g)	25-34	35-44	45-54	55-64	65-74	75-84	85-94
No. of potatoes	3	6	16	12	8	4	1

- a) On the grid provided draw a cumulative frequency curve for the data. (4 marks)
- b) Using the curve drawn in (a) above determine:
 - i) The median (1 mark)
 - ii) The interquartile range (3 marks)
 - iii) The 60th percentile (1 mark)
 - iv) The 8th decile (1 mark)

21. The position of two towns P and Q are given as P(45°N, 10°W) and Q (45°N, 170°E). Find:

- a) The difference in longitude between the two towns. (1 mark)
- b) The distance along the parallel of latitude in
 - i) Km to 1 d.p (2 marks)
 - ii) Nm to 1 d.p (2 marks)
- c) The local time of P when the local time at Q is 2.00pm (2 marks)
- d) How long would a plane flying at 300 knots take to travel from P to Q along the shortest route. (3 marks)
(Take $\pi = \frac{22}{7}$) and R = 6370 km

22. The figure below shows a frustrum ABCDEFGH of a right pyramid. AB = 24 cm, BC = 10cm, FG = 18cm, GH = 7.5cm and AF = BG = CH = 15cm.



Determine:

- a) The altitude of a the pyramid. (2 marks)
- b) The angle between:
 - i) AF and the base ABCD (3 marks)
 - ii) The planes ABGF and ABCD (3 marks)
 - iii) Volume of the pyramid. (2 marks)

23. A rectangle OABC has vertices O(0, 0), A (2, 0), B (2, 3) and C (0,3). $O^1A^1B^1C^1$ is the image of OABC under a translation $T = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$. $O^{11}A^{11}B^{11}C^{11}$ is the image of $O^1A^1B^1C^1$ under a transformation given by the matrix

$$M = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$$

- a) Draw the rectangle OABC, $O^1A^1B^1C^1$ and $O^{11}A^{11}B^{11}C^{11}$ on the grid provided giving their co-ordinates. (6 marks)
- b) Use your diagram to find the centre of rotation which maps OABC onto $O^{11}A^{11}B^{11}C^{11}$ (2 marks)

c) Find the co-ordinates of $O^{111}A^{111}B^{111}C^{111}$ the image of $O^1A^1B^1C^1$ under a reflection in the line $y = -x$. (2 marks)

24. Particle P moves in a straight line such that, t seconds after passing through a fixed point O its velocity V m/s given by the equation $V = 3t^2 - 15t + 18$.

Find

- a) The values of t for which P is instantaneously at rest. (3 marks)
- b) An expression in terms of t for the distance P from O after t seconds. (2 marks)
- c) The total distance travelled by P in the first 4 seconds after passing point O. (2 marks)
- d) The distance P from O when the acceleration of P is zero. (3 marks)

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