

KCSE SMARTFOCUS HOMESTRETCH CLUSTER EXAMS



(POST MOCKS)

FEATURING KENYA CERTIFICATE OF SECONDARY EDUCATION 2024

MATHEMATICS ALT. A

POST MOCK 1-10

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Presented To

KCSE 2024 CANDIDATES



Presented By

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KCSE SMARTFOCU HOMESTRECH CLUSTER EXAMS (POST MOCKS)

Featuring Kenya Certificate of Secondary Education 2024

MATHEMATICS ALT. A

PAPER 1

SEPT/OCT. 2024

Name: Index No:

School: Signature:

POST MOCK 1

Featuring Kenya Certificate of Secondary Education, 2024

INSTRUCTIONS TO CANDIDATES.

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of the examination in spaces provided above.
- (c) This paper consists of two sections: Section I and II.
- (d) Answer all the questions in section I and only five questions from section II.
- (e) Show all the steps in your calculations, giving your answer at each stage in the space provided.
- (f) Marks may be given for correct working even if the answer is wrong.
- (g) Non-programmable silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.
- (h) Candidates should check the question paper to ascertain that no questions are missing.
- (i) Candidates should answer the questions in English.

FOR EXAMINER'S USE ONLY

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL	GRAND TOTAL	

SECTION I (50MARKS)

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

1. Evaluate without using tables or calculators (3marks)

$$\frac{6/7 \text{ of } 14/3 \div 80 x^{-20/3}}{-2 x 5 \div (14 \div 7) x 3}$$

2. Solve the following inequalities and represent the solution on a number line.

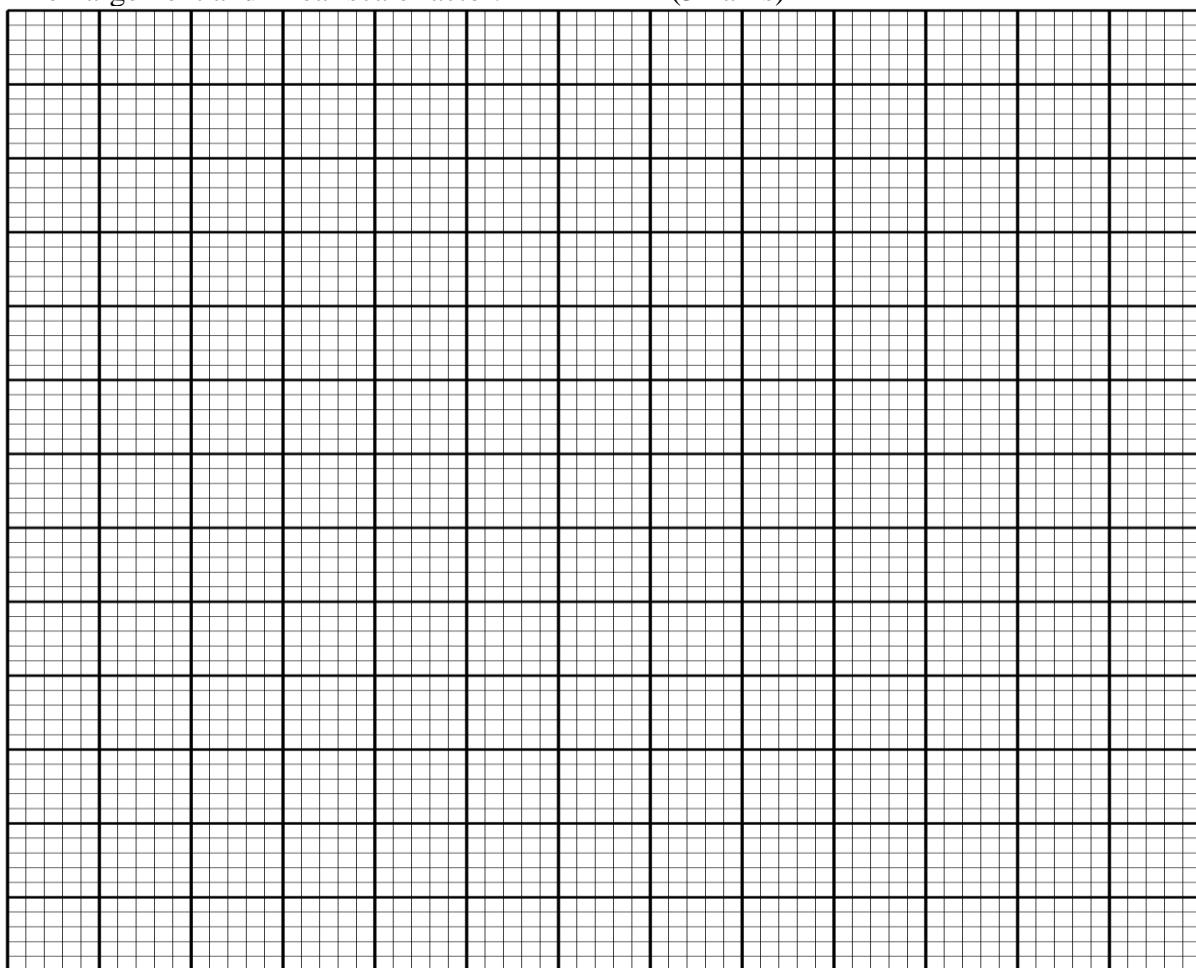
$$4 - 3 \leq 6x - 1 < 3x + 8$$

(3marks)

3. Use tables of squares, cubes roots and reciprocals to evaluate; (4marks)

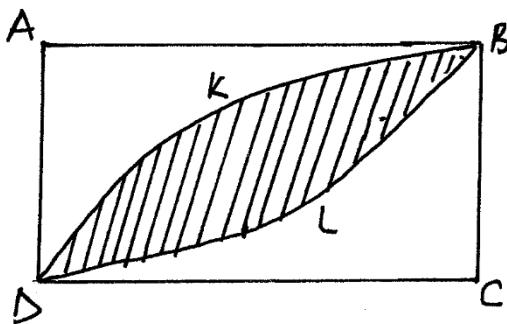
$$23.5^3 - \sqrt[3]{(4411)} + \frac{1}{0.0071}$$

4. Triangle ABC has its vertices at A(3, 0), B(2,3) and C(5,1) if A'(5, 0), B'(3,6) and C'(9,2) is the image of ABC under enlargement. On the same axes and grid provided below, determine the Centre of enlargement and linear scale factor. (3marks)

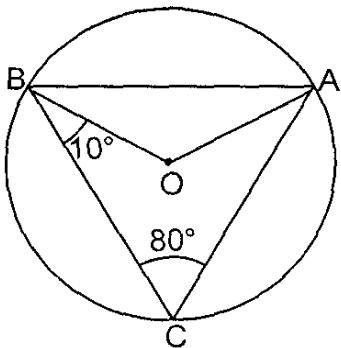


5. Phenny is a saleslady. She is paid Ksh 15,375 per month. She is also paid a commission of $4\frac{1}{2}\%$ on the amount of money she makes from her sales. In a certain month, she earned a total of Ksh. 28,875. Calculate the value of her sales that month. (3marks)

6. The figure drawn below is a square ABCD of sides 36.75cm. The shaded area is formed out of two segments DCB and DKB. Find the area of the shaded region. (3marks)



7. Solve for x in the equation: $3^{2x+1} + 4 \times 3^{2x+1} - 45 = 0$ (3 marks)
8. Simplify the expression to its simplest form $\frac{24x^2 + 2ax - 12a^2}{18x^2 - 8a^2}$ (3marks)
9. In the figure below, O is the centre of circle. Angle BCA=80° and angle CBO = 10°. Determine the size of angle CAB. (3marks)



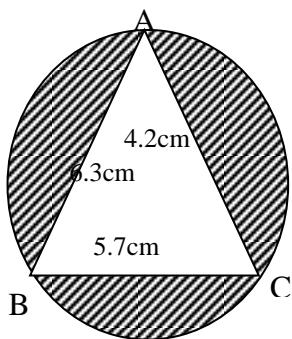
10. A foreign exchange bureau in Mombasa buys and sells selected foreign currencies at the rates shown in the table below.

Currency	Buying (Ksh)	Selling (Ksh)
1 South African Rand	7.48	7.95
1 Chinese Yuan	20.03	20.20

A tourist arrived in Kenya from South Africa with 7,435,000 South African Rands. She converted the whole amount to Kenya shillings through an agent at a commission of 2%. While in Kenya, she spent 25% of this money and converted the balance to Chinese Yuan. Calculate the amount of Chinese Yuan that she received. (3 marks)

11. Two matrices A and B are such that $A = \begin{pmatrix} k & 4 \\ 3 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, given that the determinant of $AB = 4$, find the value of K. (3mks)

- 12.** The circle below whose area is 18.05cm^2 circumscribes triangle ABC where $AB = 6.3\text{cm}$, $BC = 5.7\text{cm}$ and $AC = 4.2\text{cm}$. Find the area of the shaded part. (4Marks)



- 13.** A boat is at point P, a distance of 100km from the bottom of a hill. The angle of elevation of the top of the hill is 30° from P. The boat sails straight towards the hill to a point Q from where the angle of elevation to the top of the hill is now 60° . Calculate the distance PQ (3 marks)
- 14.** The interior angle of a regular polygon is 108° larger than the exterior angle. Determine the number of sides of the polygon. (3 Marks)
- 15.** A piece of wire 18 cm long is to be bent to form a rectangle. If its length is x cm, obtain an expression for its area. Hence calculate the dimensions of the rectangle with maximum area from the expression (3marks)
- 16.** A solid comprises of a cube ABCDEFGH of each side **2cm** and a square based pyramid EFGHV. The slant edges of the pyramid **EV=FV=GV=HV=2cm**. Draw the net of the solid. (3marks)

SECTION II(50 Marks)

Answer only five questions from this section in the spaces provided

- 17.** A bus left Kisumu at 6.00a.m and travelled towards Usenge Boys at an average speed of 100km/hr. At 6.30 am, a van left Usenge Boys and travelled towards Kisumu to receive the bus with a number of students moving at an average speed of 125km/h. Given that the distance between Kisumu and Usenge Boys is 500km Calculate:

- The time the two vehicles met. (4marks)
- On meeting, the bus proceeded with its journey but the van had a break of 30 minutes before proceeding for Usenge Boys. Calculate:
 - The time the bus arrived at Usenge Boys. (3marks)
 - The time the van arrived at Usenge Boys (3marks)

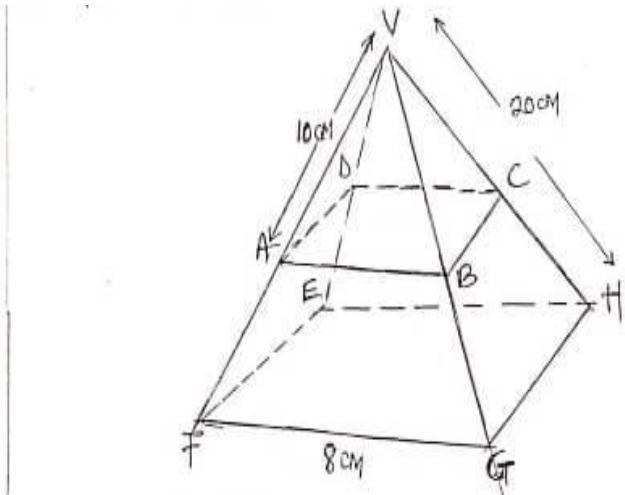
- 18.** Complete the table below for the function $y = x^2 - 3x + 6$ in the range $-2 \leq x \leq 8$. (2mks)

X	-2	-1	0	1	2	3	4	5	6	7	8
Y											

- Use the trapezium rule with 10 strips to estimate the area bounded by the curve, $y = x^2 - 3x + 6$, the lines $x = -2$, $x = 8$ and the x – axis. (3mks)
- Use the mid – ordinate rule with 5 strips to estimate the area bounded by the curve, $y = x^2 - 3x + 6$, the lines $x = -2$, $x = 8$ and the x- axis. (3mks)

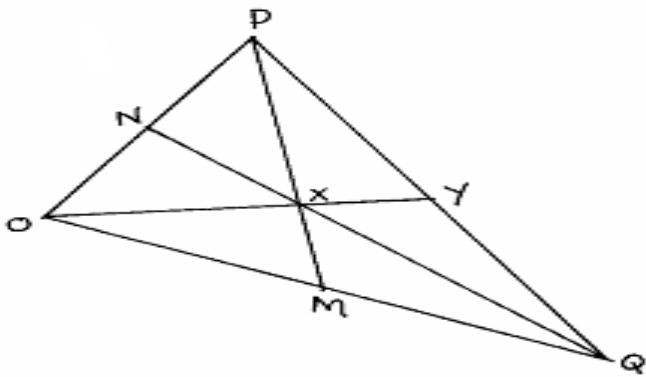
- c. By integration, determine the actual area bounded by the curve $y = x^2 - 3x + 6$, the lines $x = -2$, $x = 8$, and the x -axis. (2mks)

19. The figure below is a right pyramid VEFGH with a square base of 8cm and a slant edge of 20cm. points A,B,C and D lie and plane ABCD is parallel to the base EFGH.



- a. Find the length of AB. (2marks)
- b. Calculate to 2 decimal places.
- The length of AC. (2marks)
 - The perpendicular height of the pyramid VABCD. (2marks)
- c. The pyramid VABCD was cut off. Find the volume of the frustum ABCDEFGH correct to 2 decimal places. (4marks)

20. The figure below is triangle OPQ in which $\mathbf{OP} = \mathbf{p}$ and $\mathbf{OQ} = \mathbf{q}$. M and N are points on \mathbf{OQ} and \mathbf{OP} respectively such that $\mathbf{ON} = \mathbf{NP} = 1:2$ and $\mathbf{OM}: \mathbf{MQ} = 3: 2$.



- (a) Express the following vectors in terms of \mathbf{p} and \mathbf{q} .
- \mathbf{PM} . (2marks)
 - \mathbf{QN} . (1marks)
 - \mathbf{PQ} . (1marks)
- (b) Lines PN and QN intersect at X such that $\mathbf{PX} = r\mathbf{PM}$ and $\mathbf{QX} = t\mathbf{QN}$. Express \mathbf{OX} in two different ways and find the value of r and t . (4 marks)

- (c) **OX** produced meets **PQ** at **Y** such that **PY: YQ = 5: 3**. Using the ratio theorem or otherwise, find **OY** in terms of **p** and **q**. (2 mark)

- 21.** Complete the table below for the equation $y = 2x^2 + 3x - 11$ (2 Marks)

x	-4	-3	-2	-1	0	1	2	3
$2x^2$	32							
$3x$	-12							
-11	-11	-11	-11	-11	-11	-11	-11	-11
y			-9					16

(a) On the grid paper provided draw the graph of $y = 2x^2 + 3x - 11$ (3 Marks)

(b) On the same axes draw the graph of $y = 2x + 1$ (2 Marks)

(c) Use your graph to solve the quadratic

(i) $2x^2 + 3x - 11 = 0$ (1 Mark)

(ii) $2x^2 + x - 12 = 0$ (2 Marks)

- 22.** A straight line **L1** passes through the points (8, -2) and (4, -4).

(a) Write its equation in the form $ax + by + c = 0$, where a , b and c are integers. (3Marks)

(b) If the line **L1** above cuts the x-axis at point **P**, determine the coordinates of **P**. (2Marks)

(c) Another line **L2**, which is a perpendicular bisector to the line in (a) above cuts the y axis at the point **Q**. Determine the coordinates of point **Q**. (3 Marks)

(d) Find the length of **QP** (2 Marks)

- 23.** A rectangular field measures 20 metres by 16 metres. A path of uniform width x - metres is made all round it. This make the area of the field to reduce in the ratio 7 : 16.

a) Find an expression in x for the new length and the width (1mark)

b) Find the expression in x for the new area. (1mark)

c) Find the possible value of x (4 marks)

d) The remaining area of the field is divided among three siblings Abdi, Bor and Celine such that the ratio of Abdi to Bor's is 3 : 4 while that of Bor's to Celine's is 6 : 5. Find the difference between the area of Celine's share and Abdi's share. (4marks)

- 24.** Using a pair of compass and ruler only construct.

(a) Triangle **PQR** in which $PQ = 5\text{cm}$ $\angle QPR = 30^\circ$ and $\angle PQR = 105^\circ$. (3marks)

(b) A circle that passes through the vertices of the triangle **PQR**. Measure its radius. (3marks)

(c) The height of triangles **PQR** with **PQ** as the base. Measure the height. (2marks)

(d) Determine the area of the circle that lies outside the triangle correct to 2 decimal places (2marks)

KCSE SMARTFOCUS HOMESTRECH CLUSTER EXAMS (POST MOCKS)

Featuring Kenya Certificate of Secondary Education 2024

121/2

Mathematics Alt A

Paper 2

SEPT/OCT 2024

Time: 2½ Hours

Name:Adm No:.....

Class:Candidate's Signature:Date:

School.....Index number.....

POST MOCK 1

INSTRUCTIONS TO CANDIDATES

- (a) Write your name and index number in the spaces provided above
 - (b) Sign and write the date of examination in the spaces provided above
 - (c) This paper consists of TWO sections: Section I and only five questions form Section II
 - (d) Answer ALL the questions in Section I and only five questions from Section II
 - (e) All answers and workings must be written on the question paper in the spaces provided below each question.
- Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- (f) Marks may be given for correct working even if the answer is wrong
 - (g) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.
 - (h) This paper consists of 18 printed pages
 - (i) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

For Examiner's use only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

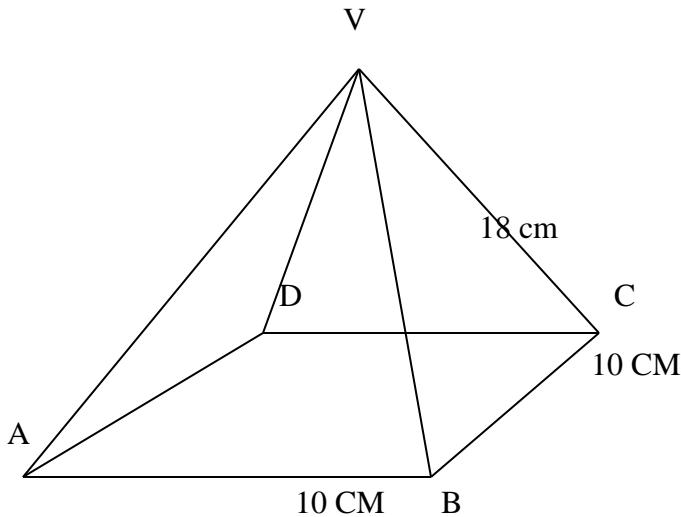
Section II

17	19	19	20	21	22	23	24	Total

Grand
Total

SECTION I (50 marks)

1. Use logarithms to evaluate (4marks)
- $$\sqrt{\left(\frac{\log 9 \times 0.954}{0.301 \times 4.3}\right)^{-2}}$$
2. AB is the diameter of the circle. Given that A(2, -3) and B(4, -7). Find the equation of the circle in the form $x^2 + y^2 - 2ax + 2by + c = 0$ (3 marks)
3. A quantity P varies partly as the cube of Q and partly varies inversely as the square of Q. When Q = 2, P = 108 and when Q = 3, P = 259. find the value of P when Q = 6 (4 rmarks)
4. (a) expand $(a - b)^5$ (2 marks)
- (b) Use the first three terms of the expansion in (a) the above to find the value of 1.97^5 to two decimal place (2 marks)
- 5 . Simplify without using tables or calculator
- $\log_7 49 \times \log_3 27$ (2 marks)
6. Water flows from a tap. At the rate 27cm^3 per second, into a rectangular container of length 60cm, breath 30 cm and height 40 cm. If at 6.00 p.m. the container was half full, what will be the height of water at 6.04 pm? (3 marks)
- 7.) Figure below shows a square based pyramid ABCD .AV=BV=CV=DV=18 cm.
- AB= 10 cm. Calculate the angle between the plane BVC and AVD. (3 marks)



8. The roots of a quadratic equation are -3 and $\frac{1}{2}$. Form the quadratic equation in the form

$$ax^2 + bx + c = 0 \text{ Where } a, b, \text{ and } c \text{ are constants} \quad (3 \text{ marks})$$

9. Triangle ABC is mapped onto triangle A'B'C' by a transformation given by the matrix $N = \begin{pmatrix} 3 & 1 \\ -1 & 1 \end{pmatrix}$. If $A'B' = 4 \text{ cm}$, find AB (3 marks)

10. Using $\log 2 = 0.3010$ and $\log 3 = 0.4771$. Evaluate $\log 45$ (3 marks)

11. The position of two towns A and B on the earth's surface are $(36^\circ\text{N}, 49^\circ\text{E})$ and $(36^\circ\text{N}, 131^\circ\text{W})$ respectively.

(a) Find the local time at A if the time at B is 12.35pm on Sunday. (1mk)

(b) Using 6370km as the radius of the earth, calculate the shortest distance between town A and B (2mks)

12. The first, the third and the seventh terms of an increasing arithmetic progression are three consecutive terms of a geometric progression. In the first term of the arithmetic progression is 10, find the common difference of the arithmetic progression. (3Mrks)

13. A two digit number is made by combining any of two digits 1,2,3,4, and 5 at random. Find the probability that the number formed is even (2marks)

14. The deviation d from the mean X of the set of data x are given below;

X	15	18	M	23	M+6	28	30
d	-8	-5	Y	0	-y	5	7

a) Find the value of m and y (2 marks)

b) Calculate the mean absolute deviation of the data (2 marks)

15. Make y the subject of the formula (3 marks)

$$q = m \sqrt{\frac{r^2 - y^2}{y^2 - 3}}$$

16. Solve the equation: $3 \cos X = 2 \sin^2 X$ where $0 \leq X \leq 360$ (3marks)

Section II (50 marks) . Answer only five questions in this section in the spaces provided

17. The table below shows the analysis of examination marks scored by 160 candidates

Marks (%)	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
No of candidates	2	6	15	22	36	34	20	15	6	4

a) Using an assumed mean of 45.5. calculate

I. The mean (3 marks)

II. The standard deviation (4 marks)

b) Calculate the minimum mark for grade A if 40 student got grade A (3 marks)

18. A and B are two points on latitude 40° . The two points lie on the longitude 80°W and 100°E

respectively.(taking $\pi = \frac{22}{7}$ and $R = 6370 \text{ KM}$) .

(a) Calculate;

(i) The distance from A to B along the parallel of latitude (3mks)

(ii) The distance from A to B along the great circle (4mks)

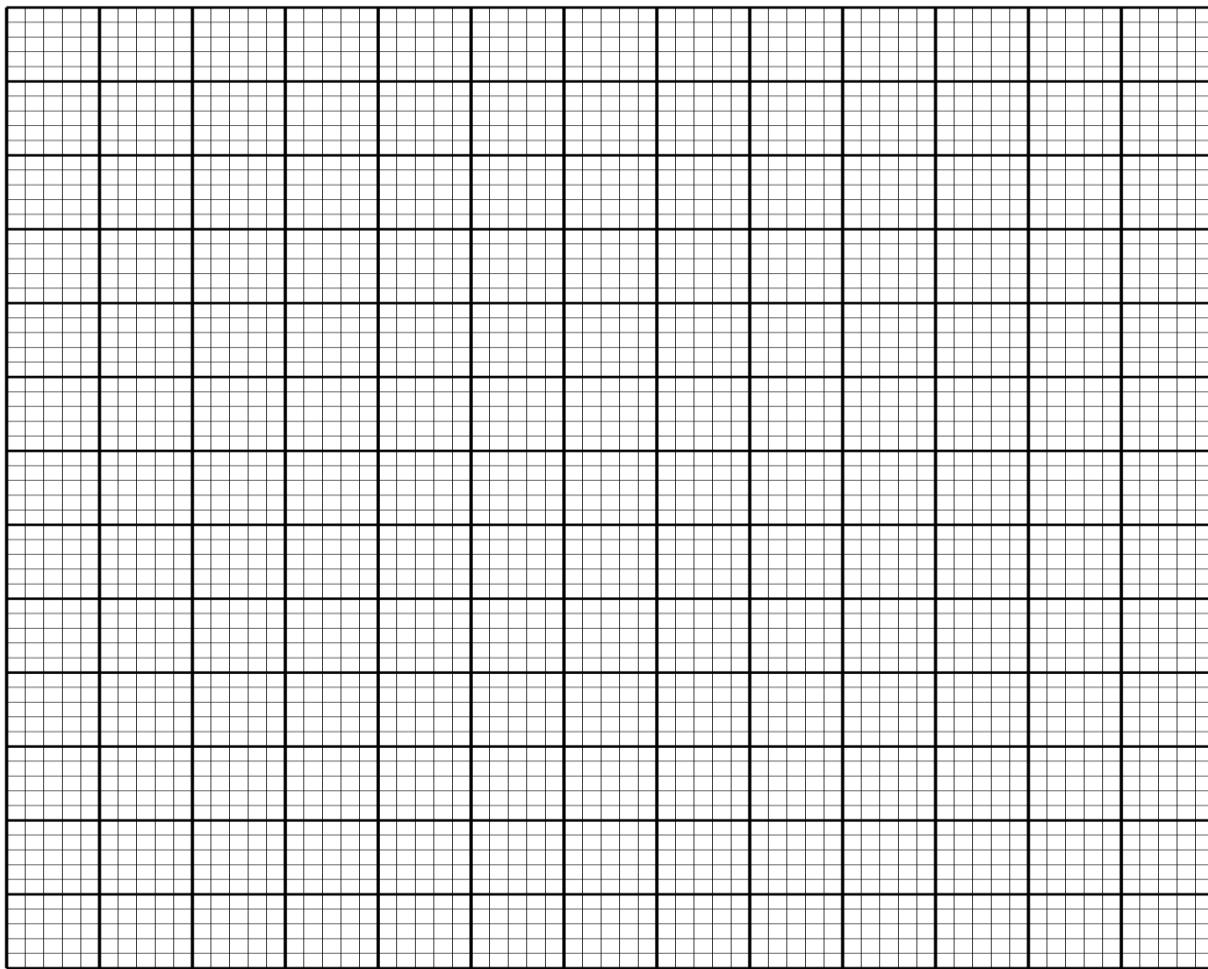
(b) Two planes P and Q left A for B at 400 knots and 600 knots respectively. If P flew along the great circle and Q along the parallel of latitude , which one arrived earlier and by how much? Give your answer to the nearest minute. (3mks)

19. a). Complete the table below by filling in the blank spaces for the functions

$$y = \sin(x + 30) \text{ and } y = \cos \frac{1}{2}x \quad (2 \text{ marks})$$

X	0	30	60	90	120	150	180	210
Y = sin(x + 30°)	0.5		1		0.5			-0.87
Y = cos $\frac{1}{2}x$	1.00			0.71			0.00	

b.) Using the scale,x-axis 1cm =30 ,y-axis 1cm=0.5 units, draw their graphs of the functions on the same axes
(5marks)



c) Use your graph to solve

i. $\sin(x + 30) - \cos\frac{1}{2}x = 0$ (1 mark)

ii. $\sin(x + 30) = 0$ (1 mark)

iii) $\cos\frac{1}{2}x = -0.25$ (1mark)

20. The equation of a curve is $y=3x^2-4x+1$

a) Find the gradient function of the curve when $x=2$ (2 marks)

b) Determine

i) The equation of the tangent of the curve at the point $(2, 5)$ (2marks)

ii) The angle which the tangent to the curves at the point $(2,5)$ makes with the horizontal line (2mks)

iii) The equation of the line through the point (2, 5) which is perpendicular to the tangent in (b) i above (3marks)

21. The table shows income tax rates for the year 2023

Monthly income in Kenya shillings	Tax Rate in each shilling
0 – 10164	10%
10165 – 19740	15%
19741 – 29316	20%
29317 – 38892	25%
38893 and above	30%

In a certain month of that year an employee's taxable income in the fourth band was K£ 334.2

Tax relief of Ksh 1162 pm. Was allowed.

a) Calculate

i) The employees total taxable income in that month (3 marks)

ii) The P.A.Y.E. in that month (5 marks)

b) The employees income included taxable allowances amounting to Kshs. 14000. The employees contributed 6% of the basic salary to a co-operative society. Calculate the employee net income for that month . (3 marks)

22. The probability that Zora goes to school by boda boda is $\frac{2}{5}$ and by a matatu is $\frac{1}{4}$. If she uses a boda boda , the probability that she will be late is $\frac{2}{5}$ and $\frac{3}{10}$ if she uses a matatu . If she uses other means of transport the probability of being late is $\frac{3}{20}$

a) Draw a tree diagram to represent this information (3 marks)

b) Find the probability that she will be late for school (2 marks)

c) Find the probability that she will be late for school if she does not use a matatu (3 marks)

d) Find the probability that she will be late for school (2 marks)

23. The acceleration of a particle after passing a fixed point P is given by $a = 3t - 3$. Given that the velocity of the particle when $t = 2$ seconds is 5m/s, find:

a). Its velocity:

i). In terms of t (3 marks)

ii). When $t = 4$ (2 marks)

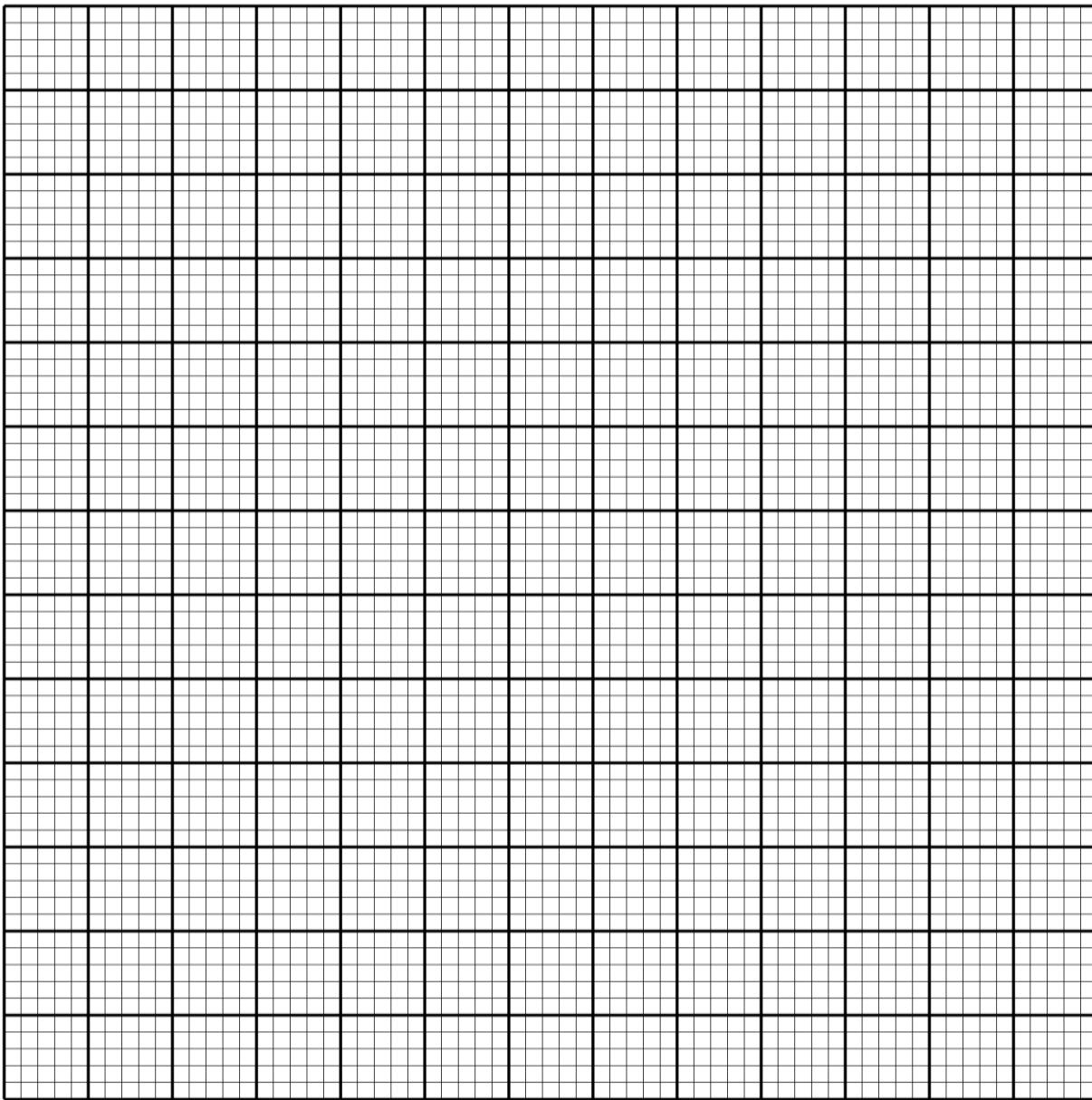
b). The maximum velocity attained by the particle. (2 marks)

c). Its displacement during the third second. (3 marks)

24.A triangle ABC with vertices A(2,0), B(4,-2) and C(4,4) is mapped onto its image A¹B¹C¹under a transformation represented by the matrix $\begin{pmatrix} 1 & 1/2 \\ 0 & 1 \end{pmatrix}$

a)i) State the coordinates of A¹B¹C¹ (2 Marks)

ii) On the grid provided plot triangle ABC and triangle A¹ B¹ C¹ (2 marks)



iii)Describe fully the transformation represented by the matrix $\begin{pmatrix} 1 & 1/2 \\ 0 & 1 \end{pmatrix}$ (1 mark)

b)A¹¹B¹¹C¹¹ is the image of triangle A¹B¹C¹ under reflection on the line X= 0

Plot triangle A¹¹B¹¹C¹¹ on the same grid and state the co-ordinates (2marks)

c)Find a single matrix that can map triangle ABC onto triangle A¹¹B¹¹C¹¹ (3 mks)

KCSE SMARTFOCUS HOMESTRECH CLUSTER EXAMS (POST MOCKS)

Featuring Kenya Certificate of Secondary Education 2024

121/1

Mathematics Alt A

Paper 1

SEPT/OCT 2024 Time: 2½ Hours

Name:

Adm No:.....

Class:Candidate's Signature:

Date:

School.....Index number.....

POST MOCK 2

Instructions

Instructions to candidates

- (a) Write your name, admission number and stream in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of **two** sections: **Section I** and **Section II**.
- (d) Answer **all** the questions in **Section I** and only **five** questions from **Section II**.
- (e) **Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.**
- (f) Marks may be given for correct working even if the answer is wrong.
- (g) **Non-programmable** silent electronic calculators **and** KNEC Mathematical tables may be used, except where stated otherwise.
- (h) **This paper consists of 16 printed pages.**
- (i) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (j) Candidates should answer the questions in **English**

For Examiner's Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

Grand Total

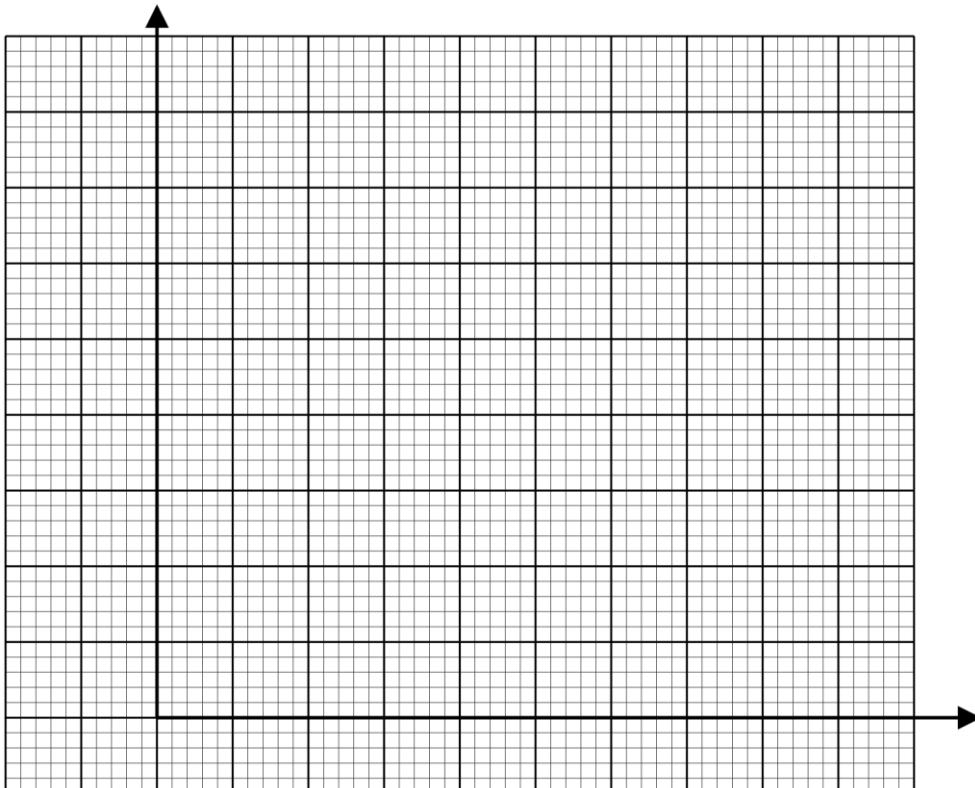
17	18	19	20	21	22	23	24	Total

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SECTION I (50 marks)

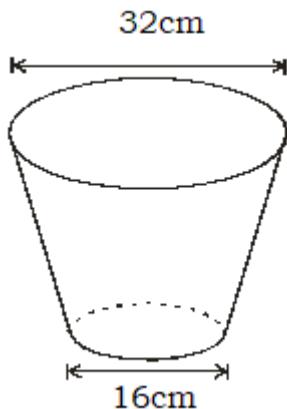
Answer **all** the questions in this section in the spaces provided:

1. Solve for a in the equation $3\frac{a}{5} - 4\frac{a}{20} = 2$. (3 marks)
2. At Kona-Samaki Secondary School $\frac{3}{10}$ of the students are boys. On a certain day $\frac{5}{6}$ of the boys were present and $\frac{2}{5}$ of the girls were absent, if the total number of students absent on that day were 99 calculate the population of students in the school. (3 marks)
3. Calculate $m = \sqrt[3]{9a}$ without using Calculators or Mathematical Tables given that $\sqrt{a} = 8\sqrt{3}$. (3 marks)
4. From a viewing tower, 30 metres above the ground, the angle of depression of an object on the ground is 30° and the angle of elevation of an aircraft vertically above the object is 42° . Calculate the height of the aircraft above the tower to the nearest millimeter. (3 marks)
5. On the grid provided draw the region bounded by: $y - 2x \leq 1$, $x + y < 7$ and $y \geq 1$ using a scale of 1cm to represent 1 unit on both axes. (3 marks)



6. The ratio of the current ages of John and Kelly is 4:5. Five years ago, the ratio of their ages was 7:9. Calculate their current ages in years. (3 marks)

7. The figure below shows a frustum container with base diameter 16cm and top diameter 32cm. The slant height of the frustum is 36cm as shown below. The container 80 percent full of water.



Calculate the volume of the water in the container to the nearest decilitre. **(4 marks)**

8. Solve for k in the equation $\left(\frac{20}{12}\right)^{(7k-5)} = \left(\frac{36}{100}\right)^{(k-1)}$. **(3 marks)**

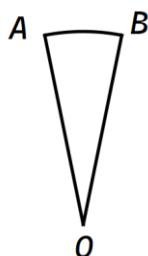
9. Given that x is an acute angle and $\sin(x - 20)^\circ = \cos(3x - 50)^\circ$ find the value of x in degrees. **(2 marks)**

10. A straight line whose equation is $4y + 3x = 12$ is perpendicular to line QR. Determine the obtuse angle α° , to one decimal place, which line QR makes with x-axis. **(3 marks)**

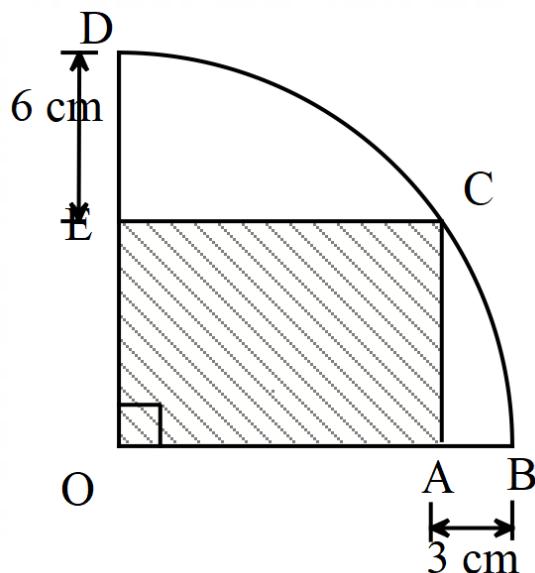
11. Determine the value of t given that points P(-6, -3), Q(-2, -1) and R(6, -t) are collinear. **(4 marks)**

12. Calculate the square of the length of the side of an equilateral triangular card whose area is 81 cm^2 leaving your answer in the form $b\sqrt{c}$. **(3 marks)**

13. In the figure below triangle ABO represents part of a county government badge. The badge has a symmetry of order 3 about O. Complete the figure to show the badge. **(3 marks)**



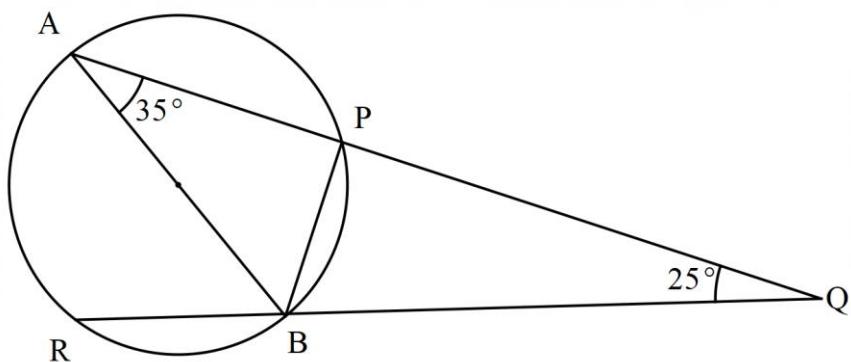
14. The figure below shows rectangle OACE inscribed in a quarter circle centre O.



Calculate the area of the shaded region.

(4 marks)

15. The figure below shows a circle with diameter AB. AP and RB are its chords which intersect externally at point Q.



Calculate the size of angle PBR.

(3 marks)

16. Use the trapezium rule to estimate the area under the curve $y = x^2 + x - 6$ over the interval $0 \leq x \leq 8$ using 4 trapezia.

(3 marks)

SECTION II (50 marks)

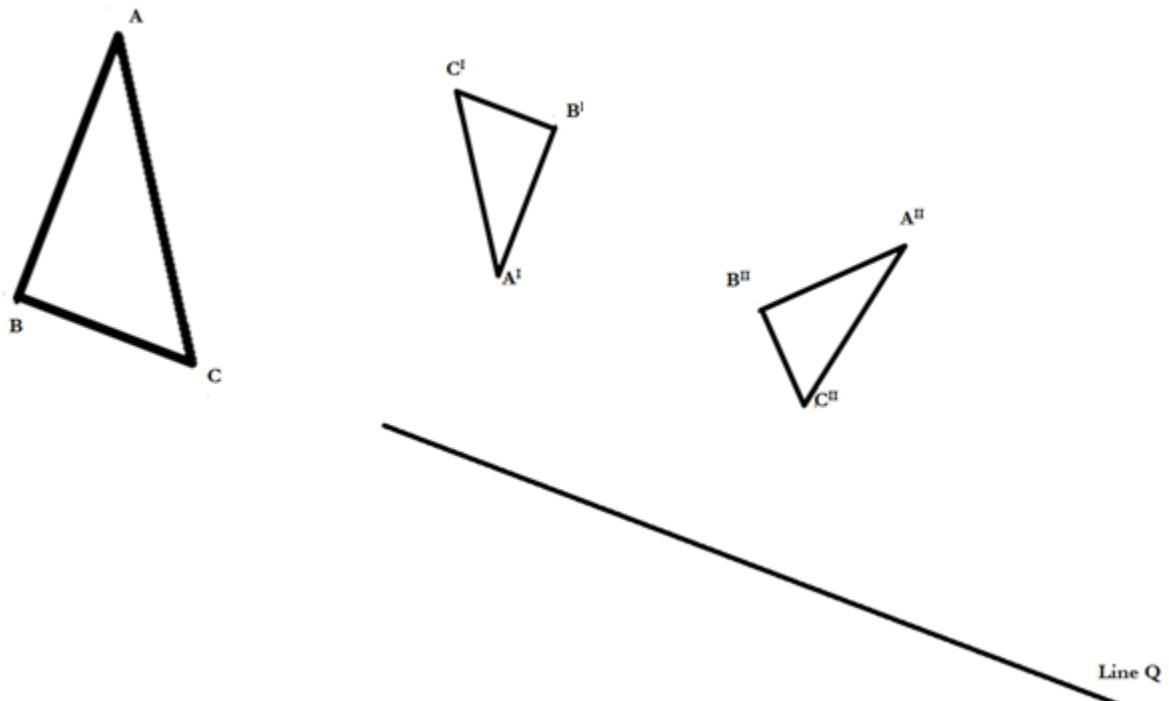
Answer any five questions from this section in the spaces provided:

17. The marked price of a piece of metal rod is Kshs. 1250 from Mali-Bora Metal Suppliers Limited. The supplier however have put a condition that discounts can only be allowed to customers who purchase more than 50 pieces of the metal rod. Customers enjoyed a 5% discount on the over purchase of the first 10 rods and thereafter 8%.

Calculate the:

- percentage profit the Supplier received from the sale of 62 metal rods given that the Factory supplied them at Kshs. 1078 per rod. (5 marks)
- number of rods received by a customer who paid Kshs. 168,675 under the same terms. (5 marks)

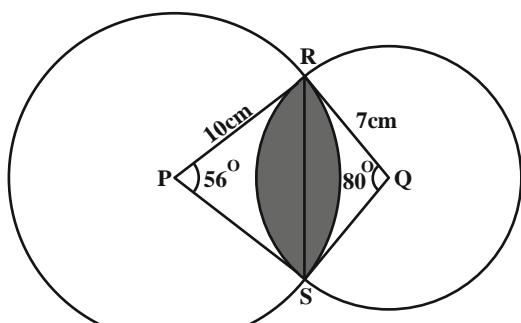
18. The triangle $A^I B^I C^I$ is the image of triangle ABC under a transformation enlargement of centre X and scale factor P. On the other hand $A^{II} B^{II} C^{II}$ is the image of $A^I B^I C^I$ under rotation whose centre of rotation is Y and angle of rotation is α° . $A^{II} B^{II} C^{II}$ is further reflected on line Q to give triangle $A^{III} B^{III} C^{III}$.



By construction:

- locate centre X hence calculate, to one decimal place, the scale factor of enlargement P. **(4 marks)**
- locate centre Y hence measure the angle of rotation α° . **(3 marks)**
- draw $A^{III} B^{III} C^{III}$ the image of $A^{II} B^{II} C^{II}$ under reflection on line Q. **(3 marks)**

19. The figure below shows two circles centres P and Q of radii 10cm and 7cm respectively. The two circles intersect at R and S so that they have a common chord RS. Given that angle $RPS = 56^\circ$ and angle $RQS = 80^\circ$.



Taking $\pi = \frac{22}{7}$ calculate to 2 decimal places the area of the:

- a) sectors RSP and RSQ (4 marks)
- b) triangles RPS and RQS (4 marks)
- c) shaded region. (2 marks)

20. Madam Pamela used to buy a certain number of bottles of soda for her class during bashes for Ksh. 3000. However when the prices of each bottle of soda went up by Ksh.10 she had to add money for ten more bottles on top of their usual budget.

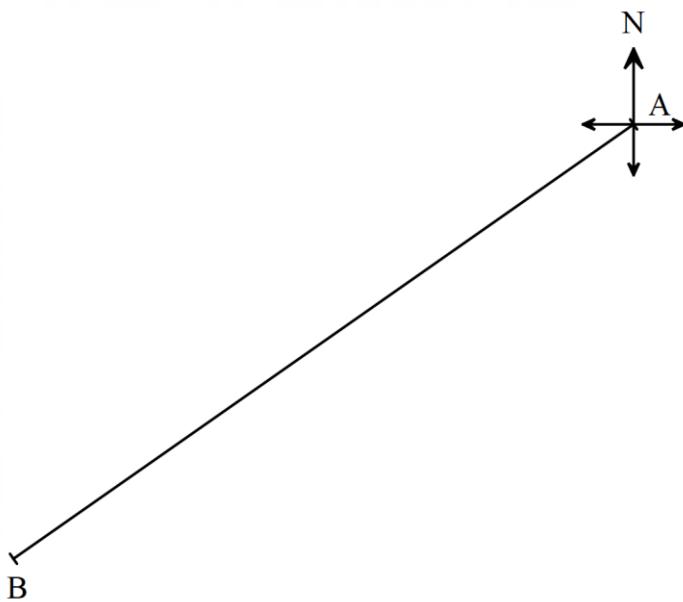
- a) Taking x as the original number of bottles of soda bought from the original budget, write an expression for the:
- i) price of a bottle of soda before the increase in price. (1 mark)
 - ii) price of a bottle of soda after the increase in price. (1 mark)
- b) Calculate:
- i) number of bottles of soda purchased by Madam Pamela. (4 marks)
 - ii) the percentage increase in the price of a bottle of soda. (3 marks)
 - iii) the number of learners in the class if each took two bottles of soda. (1 mark)

21. The equation of a curve is given by $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 12x + \frac{2}{3}$.

- a) Determine the :
- i) equation of the normal to the curve $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 12x + \frac{2}{3}$ at $x = -1$. (3 marks)
 - ii) coordinates of the stationary points of the curve $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 12x + \frac{2}{3}$. (3 marks)
 - iii) nature of each stationary point in (ii) above. (2 marks)
- b) Hence sketch the curve $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 12x + \frac{2}{3}$ showing clearly the y -intercept and the stationary points. (2 marks)

- 22.** Rafiki bus left Nairobi at 8:00am and traveled towards Mombasa at an average speed of 80km/hr. At 8:30am Upendo Bus left Mombasa towards Nairobi at an average speed of 120km/hr. Given that the distance between Nairobi and Mombasa is 400km; determine:
- time Upendo Bus arrived in Nairobi. **(2 marks)**
 - time the two buses met. **(3 marks)**
 - distance from Nairobi to the point where the two buses met. **(2 marks)**
 - speed in km/hr at which the taxi driver must drive from the airport 10km away ferrying an Investigating Officer who boarded a plane travelling at 300km/hr from Mombasa at 10:10am to intercept a suspect at the terminus of Upendo Bus Service just as the bus arrive given that the taxi driver also require 10 minutes for changeover and braking. **(3 marks)**

- 23.** The scale diagram below shows the relative positions of towns A and B which are 80 kilometres apart.

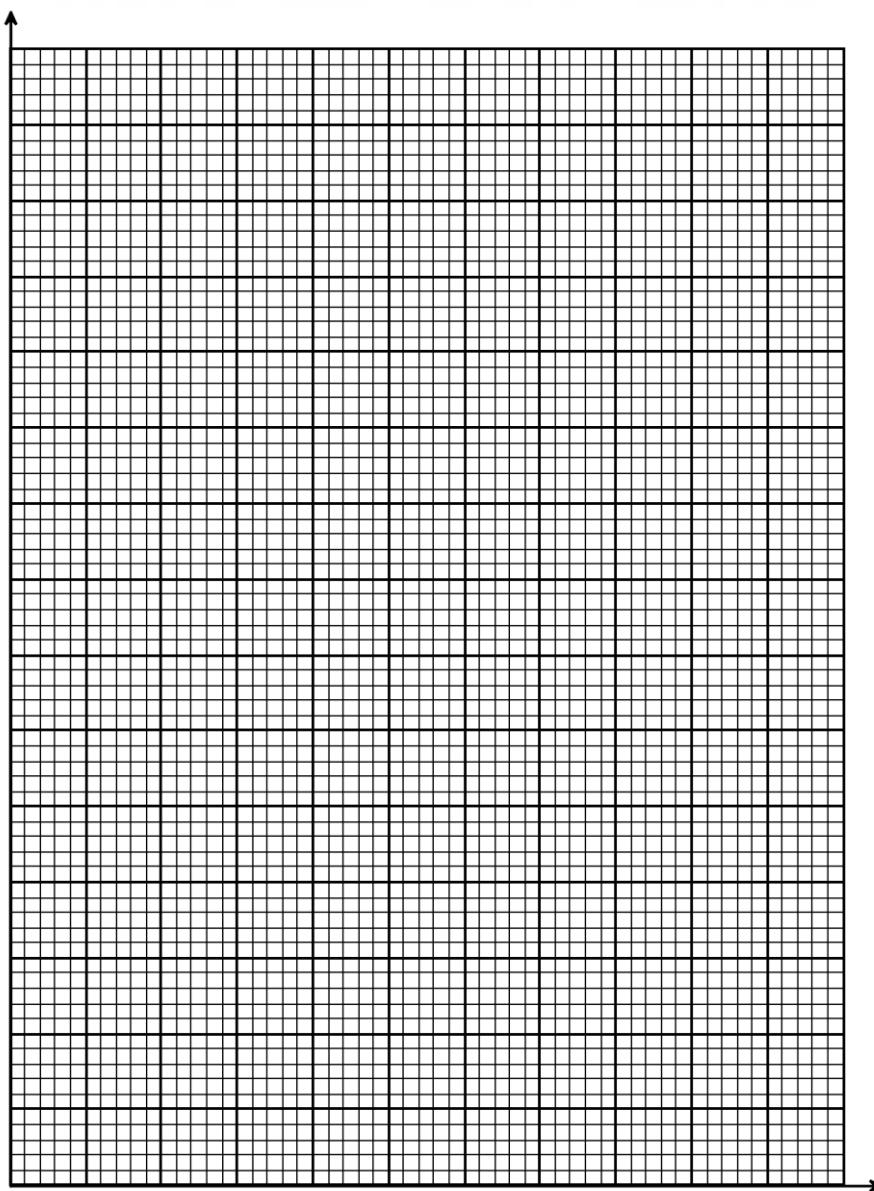


- Determine the scale used in drawing the diagram in the form $1:x$ hence state the compass bearing of point A from B. **(2 marks)**
- Locate another town C on the bearing 150° from A and 085° from B hence state the distance between town B and C. **(3 marks)**
- Locate and label a Surveillance Post K which is equidistant from the three towns and hence use it to construct a ring road that passes through the three towns such that the road is always equidistant from the Post K. **(3 marks)**
- Calculate the length of the ring road. **(2 marks)**

Marks	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
Number of learners	3	9	q	14	10	6	r	2

24. The Table below shows marks obtained by 60 students in a Mathematics Exams.

- a) Calculate the values of q and r given that the median mark is 45.5. (4 marks)
- b) Determine the mean mark for the test to two decimal places. (3 marks)
- c) On the grid provided draw a frequency polygon representing the data using a scale 1cm to represent 10 marks in x-axis and 1cm to represent 1 student in the y-axis. (3 marks)



KCSE SMARTFOCUS HOMESTRECH EXAMS (POST MOCKS)

Featuring Kenya Certificate of Secondary Education 2024

121/2

Mathematics Alt A

Paper 2

SEPT/OCT 2024

Time: 2½ Hours

Name:

Adm No:.....

Class: Candidate's Signature: Date:

School.....Index number.....

POST MOCK 2 EXAMINATIONS 2024

Instructions to candidates

- (a) Write your name, stream, Adm No. and sign in the spaces provided above.
- (b) This paper consists of **TWO** sections: **Section I** and **Section II**.
- (c) Answer **ALL** the questions in **Section I** and only five from **Section II**.
- (d) All answers and working must be written on the question paper in the spaces provided **below each question**.
- (e) **Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.**
- (f) Marks may be given for correct working even if the answer is wrong.
- (g) KNEC Mathematical tables may be used except where stated otherwise.
- (h) **This paper consists of 15 printed pages.**
- (i) **Students should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

For Examiner's Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

--

SECTION 1 (50 marks)

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

1. In what ratio should grade **P** of tea costing sh. 900 per kg be mixed with grade **Q** of tea costing sh. 700 per kg so that a profit of 10% is made by selling the mixture at sh. 902 per kg?

(3 marks)

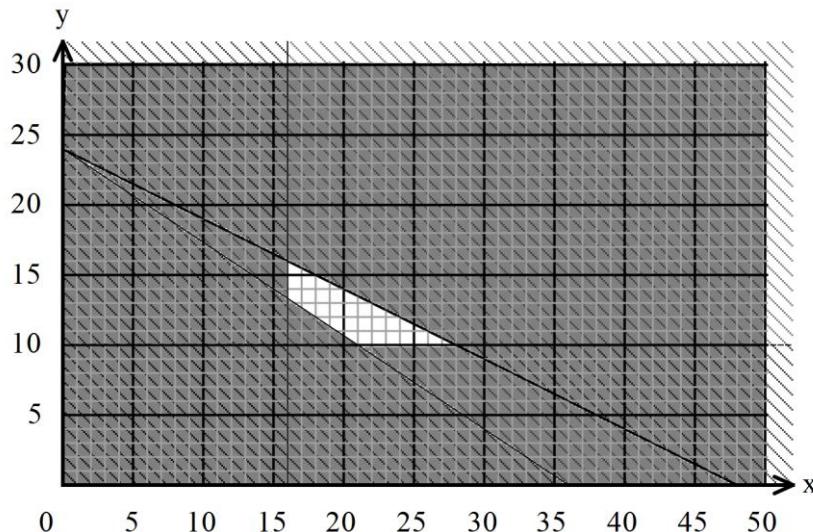
2. Use binomial to expand and simplify the expression (4 marks)

$$\left(2 - \frac{1}{\sqrt{7}}\right)^4 + \left(2 + \frac{1}{\sqrt{7}}\right)^4$$

3. Mrs. Chebukaka bought a television set on hire purchase by paying a down payment of Ksh. 5000 and Monthly installments of Ksh. 1250 for 2 years. If the interest rate charged was 12% p.a compound interest, evaluate the carrying charge to the nearest hundreds. (4 marks)

4. Calculate the mean absolute deviation of 3, 5, 7, 9 and 11 correct to 2 decimal places. (3 marks)

5. Use the graph below to answer the question that follows:



Tarus makes a profit of Ksh. 40 on a ream paper and Ksh. 100 on calculator. Use the graph to determine the maximum profit Tarus can make by using a search line and use number of ream papers be x and calculator be y. (3 marks)

6. Make x the subject of the formula.

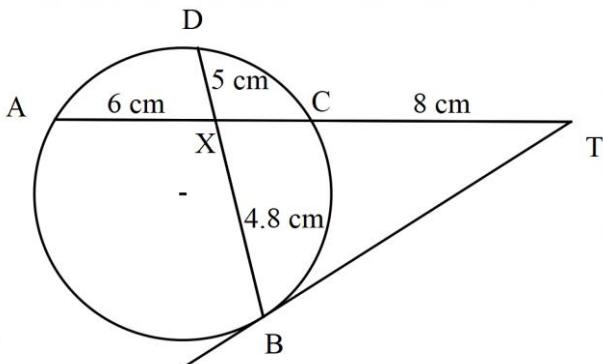
$$A - x = \sqrt{Bx + x^2} \quad (3 \text{ marks})$$

7. A ball is dropped from the top of a building and its height h , metres above the ground at any time t , seconds is given by $h = 350 + 65t - t^2$.

a) Find the velocity of the ball when $t = 2$ seconds (2 marks)

b) State the time when the velocity is zero. (1 mark)

8. In the figure below, \mathbf{BT} is a tangent to the circle at \mathbf{B} . \mathbf{AXCT} and \mathbf{BXD} are straight lines. $\mathbf{AX} = 6\text{cm}$ $\mathbf{CT} = 8\text{cm}$, $\mathbf{BX} = 4.8\text{cm}$ and $\mathbf{XD} = 5\text{cm}$.

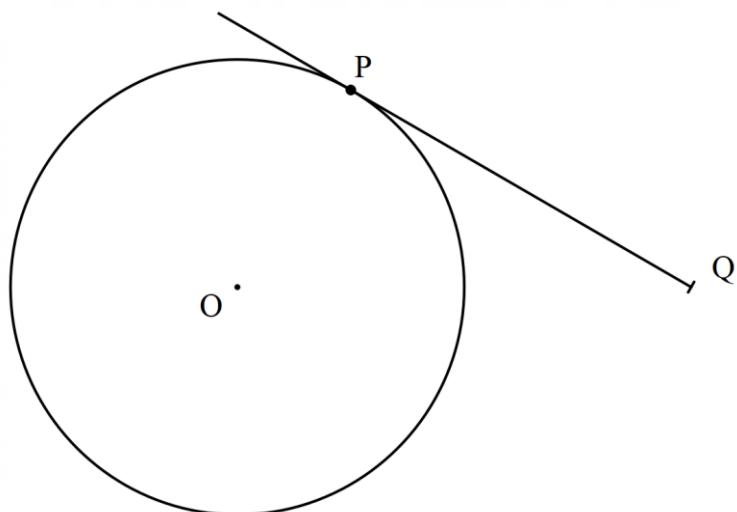


Calculate the length of \mathbf{BT} (3 marks)

9. Under a transformation whose matrix is $A = \begin{pmatrix} 5x & 2 \\ -3 & x \end{pmatrix}$ a square whose area is 10 cm^2 is mapped onto a square whose area is 110 cm^2 . Find the two possible values of x . (3 marks)

10. Solve for y in the equation $\log_2 \sqrt{81} + \log_2 (y^2 - 3^{-1}y) = 1$ (3 marks)

11. In this question, use a ruler and a pair of compasses. The following figure shows a circle, centre O. A tangent to the circle at P is drawn.

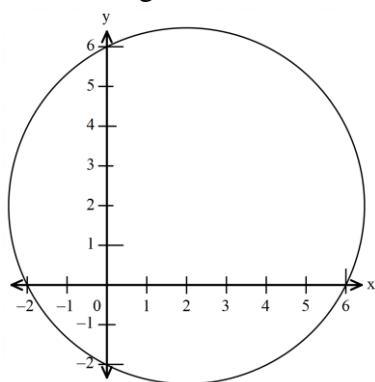


Construct another tangent to the circle to intersect the drawn tangent at an angle of 60° . (2 marks)

12. A school's environmental club consists of 7 boys and 5 girls. Three members are to be randomly chosen to be officials of the club. Calculate the probability that more boys were chosen to be official. (3 marks)

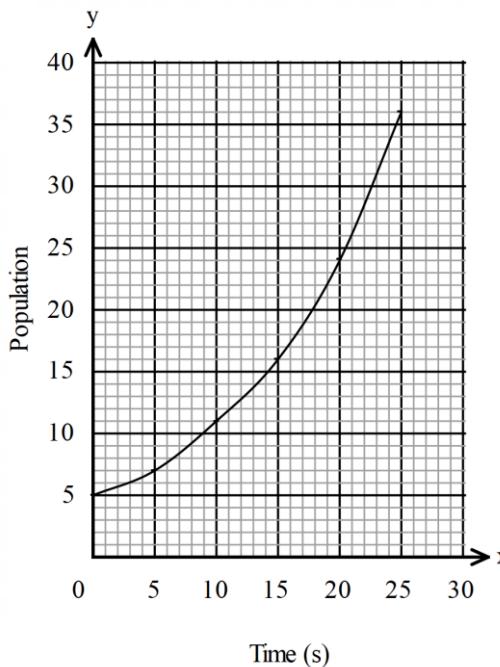
13. Solve the equation $4\sin^2 \alpha = 1 - \frac{1}{2}\sin \alpha$ for $0^\circ \leq \alpha \leq 180^\circ$. (4 marks)

14. In the figure below, the circle passes through the points $(-2, 0)$, $(6, 0)$, $(0, -2)$ and $(0, 6)$. Find the centre and radius of the circle and hence the equation of the circle in the form $x^2 + y^2 + ax + by + c = 0$ where a, b and c are integers. (3 marks)



15. The second and fifth terms of a geometric progression are 16 and 2 respectively. Determine the common ratio and the first term. (3 marks)

16. The population growth of a colony of insects was recorded at an interval of 5 second(s) as shown in the graph below.

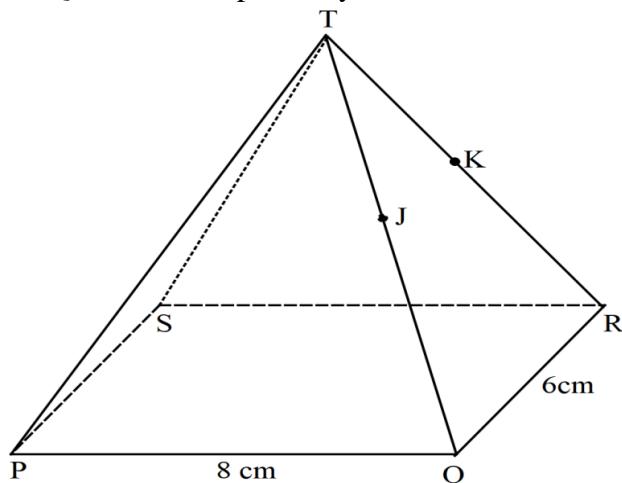


Use the graph to determine, correct to 4 significant figures, the average rate of change of the population of insect at $t = 20$. (3 marks)

SECTION II (50 marks)

Answer only **five** questions from this section in the spaces provided:

17. The figure below PQRST is a right pyramid with base $PQ = 8\text{cm}$, $QR = 6\text{cm}$ and $PT = QT = RT = ST = 13\text{cm}$. J and K are mid points of QT and RT respectively,



Determine;

- (a) The height of the pyramid (2 marks)

- (b) The angle the length TS makes with SJ (3 marks)

- (c) The angle PTS makes with the base PQRS. (2 marks)

- (d) The angle between the plane PTS and the plane PJKS. (3 marks)

18. Two variables P and Q are such that P varies partly as the square of Q and partly as the inverse of Q.

Given that $P=10.5$ when $Q=2.5$ and $P=30.75$ when $Q=4$.

- a) Find the equation connecting P and Q (4 marks)

- b) Find P when $Q=1.5$ (2 marks)

- c) Q is directly proportional to the square root of R, and $Q=3.04$ when $R=3.61$, find

i) The relationship between Q and R (2 marks)

ii) The relationship between P and R. (2 marks)

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

- a) Construct triangle ABC such that $AB = 9\text{ cm}$, $BC = 10\text{ cm}$ and angle $BAC = 75^\circ$. (3 marks)

- b) On the same side as C, construct the locus of P such that area of triangle APB = 13.5 cm^2 (2 marks)

c) On the same side as C construct the locus of Q such that angle AQB = 60°.

(2 marks)

d) Locate R within the triangle, such that AR < 5cm , $\angle ACR \geq \angle BCR$ and $AR \leq BR$, by shading the wanted parts. (3 marks)

20. The weight of loads by 100 trucks at the Naivasha weighbridge was as shown in the table below.

Weight (tonnes)	1 – 10	11 - 20	21 - 30	31 - 40	41 - 50	51-60	61-70	71-80	81-90	91-100
No. of Trucks	2	10	13	17	18	14	10	6	6	4

a) Assuming an average load of each truck as 42 tonnes, calculate the actual average load of each truck. (3 marks)

b) Determine the range of weight of the trucks in the 3rd quarter. (5 marks)

c) 20% of the trucks were found to be overload, determine the maximum recommended weight for a truck. (2 marks)

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

Monthly taxable income(Ksh)	Rate of tax (%) in each Ksh
1-10165	10
10166-19740	15
19741-29316	20
29317-38892	25
Over 38892	30

Mr Obambla is an employee who earns a basic salary of Ksh y and he is entitled to a house allowance of Ksh. 5,480 per month. He is also entitled to a monthly personal relief of Ksh. 1162. Given that his employer deducts Ksh. 6075.75 as income tax each month.

a) Calculate;

i) The monthly gross tax (2 marks)

ii) His gross monthly income (6 marks)

b) Calculate Mr. Obambla's basic monthly salary (2 marks)

22. A jet on a mission left town P (60°N , 15°E) to another town Q (60°N , 165°W) on the earth surface at a speed of **300 knots** using the shortest route possible. Take $\pi = \frac{22}{7}$ and $R = 6370 \text{ km}$.

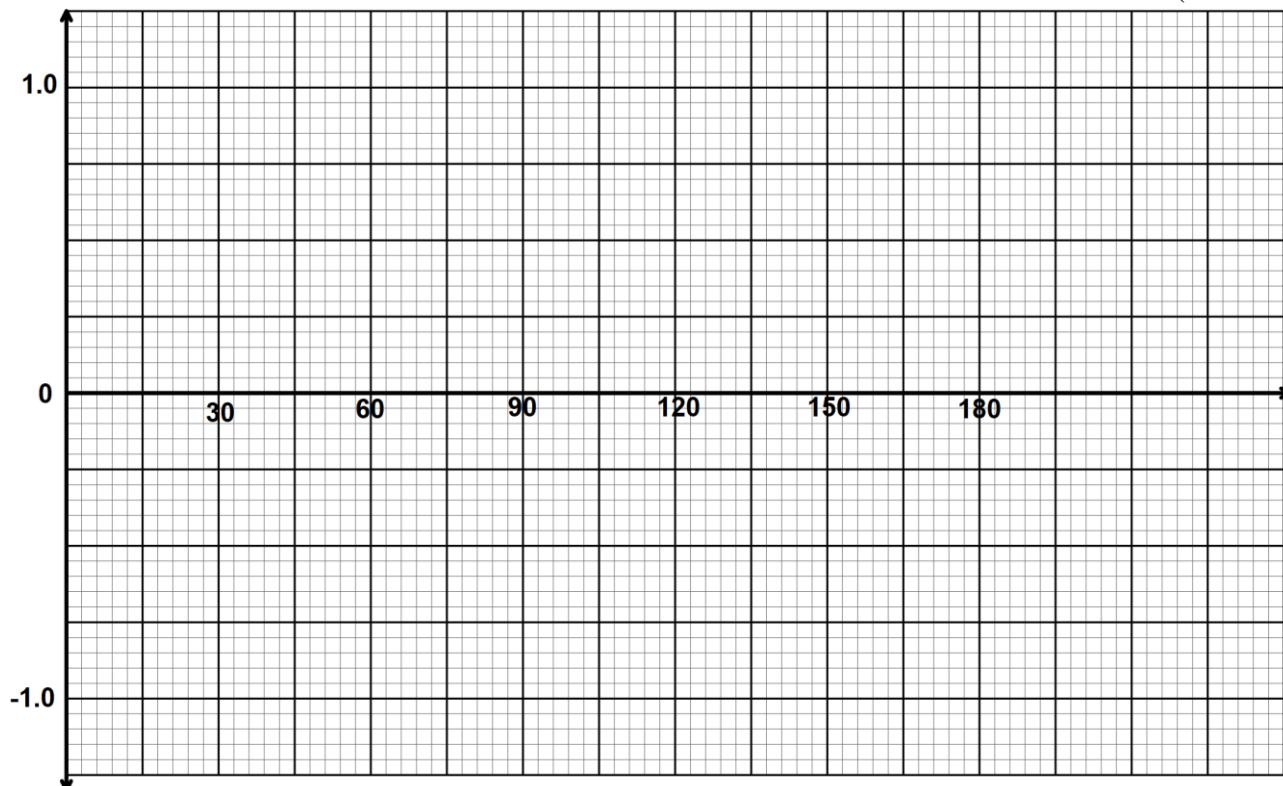
a) Calculate the distance travelled in nautical miles. (2 marks)

- b) After some communication, the jet turns round immediately and heads due east of town **Q** with the same speed .However, it runs into a bad weather after covering **2700 nm** and it is forced to land at town **X**. Find the position of town **X**. (3 marks)
- c) If the local time at **P** is **1.30 pm** by the time the jet flew off, what is the local time of its arrival at town **X** (3 marks)
- d) Calculate the radius of the latitude in which the jet followed from **Q** to **X** in nm. (2 marks)

23. a) Complete the table below giving your values correct to two decimal places. (2 marks)

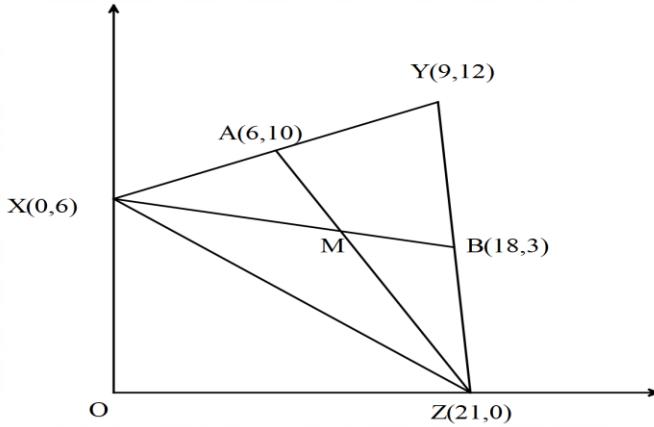
x°	0	15	30	45	60	75	90	105	120	135	150	165	180
$\sin 2x^{\circ}$	0.00	0.50		1.00		0.50	0.00		-0.87			-0.50	0.00
$\cos(x-30)^{\circ}$	0.87		1.00		0.87		0.26		-0.26	-0.50			

- b) Draw on the same axes the graph $y = \sin 2x^{\circ}$ and $y = \cos(x-30)^{\circ}$ for the range $0^{\circ} \leq x \leq 180^{\circ}$ (4 marks)



- c) Use the graph to solve the equation $2\sin 2x - 2\cos(x-30)^{\circ} = 0$ (2 marks)
- d) Use the graph to find the range of values of x for which $\sin 2x > \cos(x-30)^{\circ}$ (2 marks)

24. In the diagram below, the vertices XYZ are X (0, 6), Y (9, 12) and Z (21, 0). Points A (6, 10) and B (18, 3) lie on lines XY and YZ respectively.



a) Find:

i) \mathbf{XB} (1 mark)

ii) \mathbf{ZA} (1 mark)

b) Lines XB and ZA intersect at M such that $\mathbf{ZM} = k\mathbf{ZA}$ and $\mathbf{XM} = m\mathbf{XB}$ where k and m are scalars.

i) By expressing \mathbf{OM} in two different ways, determine the values of k and m. (5 marks)

ii) Determine the exact coordinates of point M. (2 marks)

iii) Find the ratio in which A divides line ZM. (1 mark)

**KCSE SMARTFOCU HOMESTRECH CLUSTER EXAMS
(POST MOCKS)**

Featuring Kenya Certificate of Secondary Education 2024

POST MOCK 3 EXAMINATIONS 2024

121/1

Mathematics Alt A

Paper 1

SEPT/OCT 2024

Time: 2½ Hours

Name: Adm No:

Class: Candidate's Signature: Date:

School.....Index number.....

INSTRUCTIONS TO CANDIDATES

- a) Write your name and index number in the spaces provided at the top of this page.
- b) This paper consists of two sections: Section I and Section II.
- c) Answer ALL questions in section I and ONLY FIVE questions from section II
- d) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- e) Marks may be given for correct working even if the answers are wrong.
- f) Non – Programmable silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.

FOR EXAMINERS USE ONLY

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Section II

17	18	19	20	21	22	23	24	TOTAL	GRAND TOTAL

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SECTION 1: ANSWER ALL QUESTIONS IN THIS SECTION

1. Evaluate $5\frac{1}{2} - 1\frac{1}{7} (1\frac{1}{5} + \frac{9}{10}) + \frac{1}{3}$ of $(\frac{2}{3} \div \frac{5}{6})$ (3mks)

2. Simplify

$$\frac{6a^2 + 7ab + 2b^2}{4a^2 - b^2} \quad (3\text{mks})$$

3. A positive two digit number is such that the product of the digits is 20. When the digits are reversed, the number so formed is greater than the original number by 9. Find the number.

4. Three years ago, Juma was three times old as Ali. In two years time, the sum of their ages will be 62. Determine their current ages (2 mks)

5. A number n is such that when its divided by 3, 7, 11 or 13, the remainder is always one. Find the number n. (2 mks)

6. The size of each Interior angle of a regular polygon is seven times the size of the exterior angle.

Find the number of sides of the polygon. (2 mks)

7. Use reciprocal, square and square root tables to evaluate, to 4 significant figures, the expression. (4 marks)

$$\frac{2}{(0.5245)^2} - \frac{5}{\sqrt{363.4}}$$

8. The surface area of two similar bottles are 12cm^2 and 108cm^2 respectively. If larger one has a volume of 810cm^3 . Find the volume of the smaller one. (3mks)

9. A solid block in the shape of a cylinder has a height of 14cm and weighs 22kg. If it is made of material of density 5g/cm^3 , find the radius of the cylinder. Take $\pi = \frac{22}{7}$ (3mks)

10. Find the value of x in the following equations: (3mks)

$$(4)^{-2x} = \left(\frac{1}{32}\right)^{3x-4}$$

11. A line $Ax + 3y - 6 = 0$ is perpendicular to the line $5x + 7y - k = 0$. If $5x + 7y - k = 0$ passes through the point (4,3). Determine the values of A and K (4mks)

12. Agnes paid rent which was $\frac{1}{10}$ of her net salary. She used $\frac{1}{2}$ of the remaining amount to make a down payment for a plot. She gave her mother Kshs. 2,500 and did shopping worth Kshs. 7,500 for herself. She saved the remainder which was Ksh. 12,500. How much was the down payment that she made. (4mks)

13. A watch which loses a half-minute every hour was set to read the correct time at 0545h on Monday. Determine the time, in the 12 hour system, the watch will show on the following Friday at 1945h. (3 marks)

14. Use the exchange rates below to answer this question.

	Buying	Selling
1 US dollar	63.00	63.20
1 UK £	125.30	125.95

A tourist arriving in Kenya from Britain had 9600 UK Sterling pounds (£). He converted the pounds to Kenya shillings at a commission of 5%. While in Kenya, he spent $\frac{3}{4}$ of this money. He changed the balance to US dollars after his stay. If he was not charged any commission for this last transaction, calculate to the nearest US dollars, the amount he received. (3 marks)

15. Solve the following inequality and show your solution on a number line. (3mks)

$$4x - 3 \leq \frac{1}{2}(x + 8) < x + 5$$

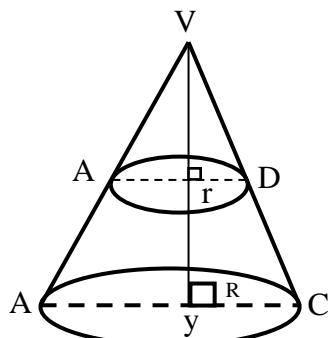
16. The table below shows marks obtained by a form four class in a certain school.

Marks (x)	$8 \leq X < 9$	$9 \leq X < 11$	$11 \leq X < 13$	$13 \leq X < 16$	$16 \leq X < 20$	$20 \leq X < 21$
No. of contents y	2	6	8	3	2	1

Use the table to represent the information on a histogram. (3 Marks)

SECTION B: ATTEMPT ANY FIVE QUESTIONS

17. The figure below shows a cone from which a frustum is made. A plane parallel to the base cuts the cone two thirds way up the vertical height of the cone to form frustum ABCD. The top surface radius of the frustum is labelled r and the bottom radius R .



(a) Find the ratio $r:R$. (1 Mark)

(b) Given that $r = 7\text{cm}$, find R . (2 Marks)

(c) If the height VY of the original cone is 45cm . Calculate to the nearest whole number the volume of the frustum. (Take $\pi = \frac{22}{7}$) (4 Marks)

(d) The frustum represents a bucket which is used to fill a rectangular tank measuring 1.5m long, 1.2m wide and 80cm high with water. How many full buckets of water are required to fill the tank. (3 Marks)

18. The displacement h metres of a particle moving along a straight line after t seconds

is given by $h = -2t^3 + \frac{3}{2}t^2 + 3t$

(a) Find the initial acceleration.

(3 marks)

(b) Calculate

(i) The time when the particle was momentarily at rest.

(3 marks)

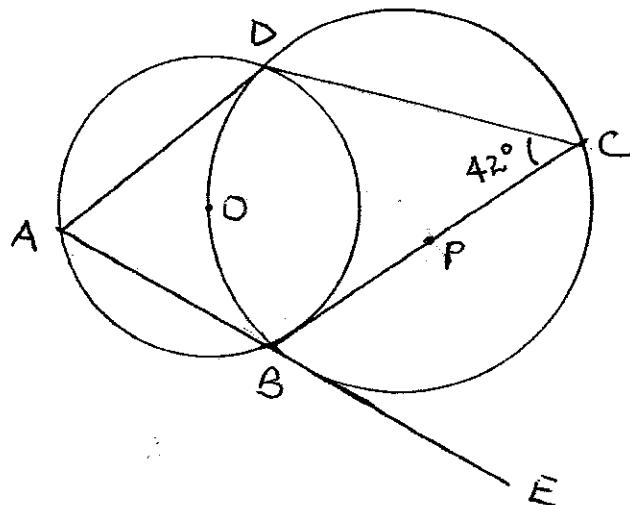
(ii) Its displacement by the time it comes to rest momentarily.

(2 marks)

(c) Calculate the maximum speed attained.

(2 marks)

19. (a) The figure below shows two intersecting circles. Circle DCB has its centre P while DAB centre O.



Giving reasons, determine the size of:

a) Angle CBD (2 marks)

b) Angle ODB (2 marks)

c) Angle BAD (2 marks)

d) Angle ABC (2 marks)

e) Angle ODA (2 marks)

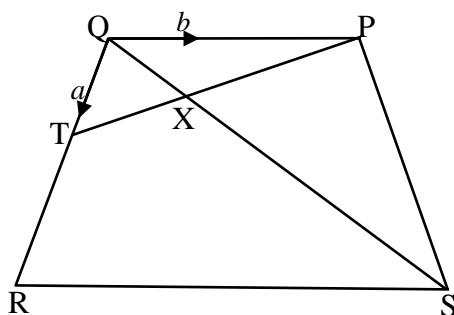
20. A car leaves town X for town Y 120 km away at an average speed of 80 km/hr at 8.30 a.m. At the same time a bus leaves town Y for town X at an average speed of 60 km/hr. At 8.45 a.m., a cyclist leaves town Y for town X at an average speed of 30 km/hr.

i. Calculate the time when the bus meets the car to the nearest minute. (3 marks)

ii. Calculate the distance between the car and the bus by the time the cyclist meets the car. (4 marks)

iii. If the bus upon reaching town X stops for 10 minutes then starts its journey back to Y, Calculate how far from X the bus meets the cyclist. (3 marks)

21. In the figure below, PQRS is a trapezium. Line PT and QS intersect at X and line QP is parallel to RS. $QT = a$, $QP = b$, $QR = 3QT$, $RS = 2QP$, $QX = tQS$, and $PX = kPT$ where k and t are constants.



a) Find in terms of a and b :

(i) \mathbf{PT} (1 mark)

(ii) \mathbf{PX} (2 marks)

(iii) **QS**

(1 mark)

b) Express **QX** in terms of:

(i) **a**, **b**, and *t*.

(2 marks)

(ii) **a**, **b** and *k*

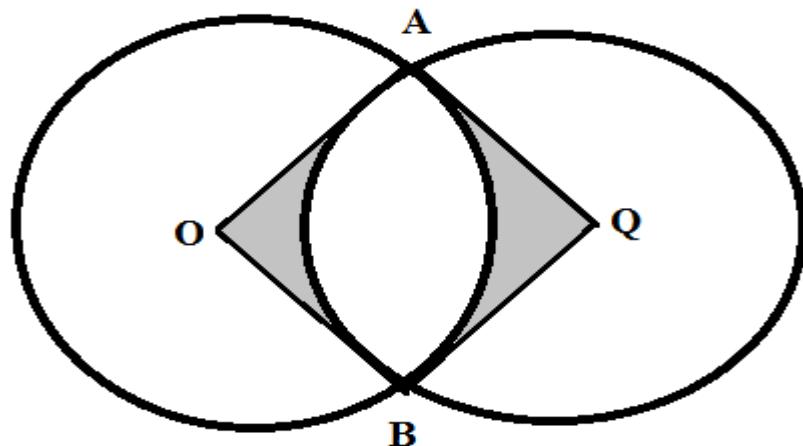
(c) Determine the value of *k* and *t*.

(3 marks)

(d) Find the ratio PT:TX

(1 mark)

22. Two circles with centres O and Q and radii 8cm intersect at points A and B as shown below.



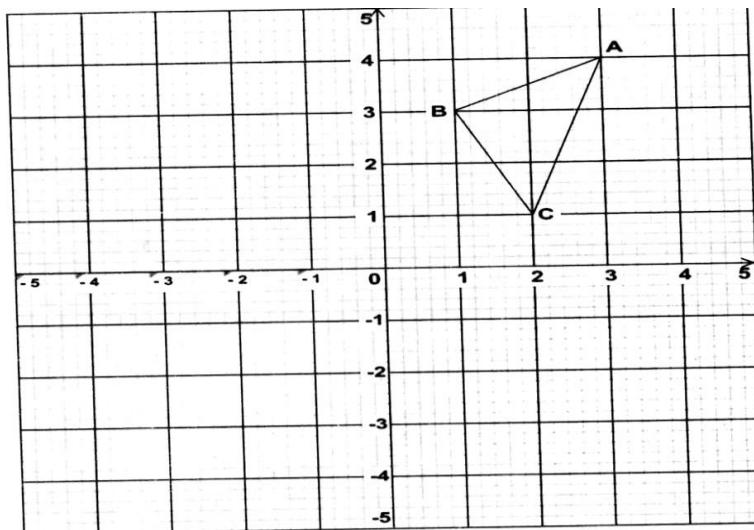
Given that the distance between O and Q is 12cm and that the line AB meets OQ at X, find:

(a) the length of the chord AB. (3marks)

(b) the reflex angle AOB. (3marks)

(c) the area of the shaded region. $\pi = 3.142$ (4marks)

23. The diagram below shows a triangle ABC with A (3, 4), B (1, 3) and C (2, 1).



- a) Draw $\triangle A'B'C'$ the image of $\triangle ABC$ under a rotation of $+90^\circ$ about $(0, 0)$. 2mks
- b) Draw $\triangle A''B''C''$ the image of $\triangle A'B'C'$ under a reflection in the line $y=x$. 2mks
- c) Draw $\triangle A'''B'''C'''$ the image of $\triangle A''B''C''$ under a rotation of -90° about $(0, 0)$. 2mks
- d) Describe a single transformation that maps $\triangle ABC$ onto $\triangle A'''B'''C'''$. 2mks
- e) Write down the equations of the lines of symmetry of the quadrilateral $BB''A'''A'$. 2mks

24. Complete the table below for $y = 14 - 5x - 2x^2$ for the domain $-5 \leq x \leq 3$ (2 marks)

x	-5	-4	-3	-2	-1	0	1	2	3
14	14	14	14	14	14	14	14	14	14
$-5x$	25	20			5	0	-5		-15
$-2x^2$	-50		-18		-2	0	-2	-8	
y	-11				17	14	7		

(b) Draw the graph of $y = 14 - 5x - 2x^2$ for the domain $-5 \leq x \leq 3$ (3marks)

(c) Use your graph to solve the equations:

(i) $2x^2 + 5x - 14 = 0$ (2mark)

(ii) $4 - 5x - 2x^2 = 0$ (2marks)

d) Write down and simplify the equation in x which would be solved by drawing the line $y=3x+2$ on the same axes as (b) above. (1mark)

**KCSE SMARTFOCU HOMESTRECH CLUSTER EXAMS
(POST MOCKS)**

Featuring Kenya Certificate of Secondary Education 2024

POST MOCK 3 EXAMINATIONS 2024

121/2

Mathematics Alt A

Paper 2

SEPT/OCT 2024

Time: 2½ Hours

Name:

Adm No:.....

Class: Candidate's Signature:

Date:

School.....Index number.....

INSTRUCTION TO CANDIDATE'S:

- a) Write your name, index number Adm. Number and school in the spaces provided at the top of this page.
- b) Sign and write the date of examination in spaces provided above.
- c) This paper consists of two Sections; Section I and Section II.
- d) Answer all the questions in Section I and any FIVE questions from Section II.
- e) All answers and working must be written on the question paper in the spaces provided below each question.
- f) Show all the steps in your calculation, giving your answer at each stage in the spaces provided below each question.
- g) Marks may be given for correct working even if the answer is wrong.
- h) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.
- i) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

FOR EXAMINER'S USE ONLY:

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

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SECTION I: (50 MARKS)

Answer all the question in this section in the spaces provided:

1. Using logarithm tables only, evaluate

$$\sqrt[3]{\frac{849.6 \times 2.41}{3941}}$$

(4 marks)

2. The transformation represented by the matrix

$M = \begin{pmatrix} 0 & 1 \\ 3 & 1 \end{pmatrix}$ maps a triangle \mathbf{ABC} onto another triangle $\mathbf{A}^1 \mathbf{B}^1 \mathbf{C}^1$ of area 36cm^2 .

Find the area of triangle \mathbf{ABC} (3mks)

3. Simplify $(1 + \sqrt{3})(1 - \sqrt{3})$ and hence evaluate $\frac{1}{1 + \sqrt{3}}$ to 3 significant figures given

$$\sqrt{3} = 1.7321 . \quad (3 \text{ marks})$$

4. If $(M + n) : (M - n) = 8: 3$. Find the ratio $M: n$. (3 marks)

5. Find the values of x if; (3 mks)

$$\log_{16}(7x - 14) - \log_{16}(6 - 3x) = \frac{3}{2}$$

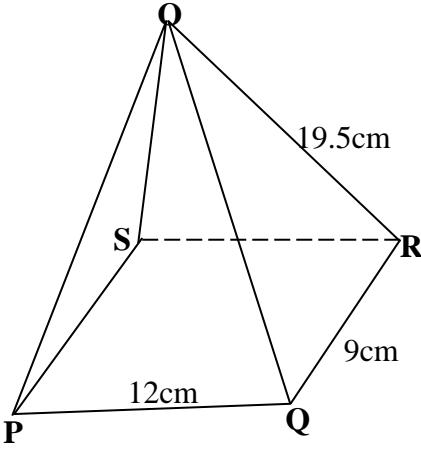
6. Make q the subject of the formula:

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

7. The 3rd term of a geometric sequence is 20 and the 16th term is -160 Calculate the 8th term the sequence (3mks)

8. If $A = 2.3$, $B = 8.7$ and $C = 2.0$ find the % error in $\frac{A + B}{C}$. (3 marks)

9. Simplify:

$$\frac{2\chi^2 + \chi - 6}{\chi^2 - 4} + \frac{1}{\chi - 2}$$
(3 marks)
10. Obtain the binomial expansion of $(1 - 2\chi)^5$ and use your expansion to evaluate $[0.98]^5$ correct to 5d.p.
(3 marks)
11. After being given a discount of sh.5 on every book James bought, he was able to buy 2 more books than before he was given the discount, with sh.200. What was the price of one book before the discount?
(4 marks)
12. Find the centre and radius of a circle with equation:
 $\chi^2 + y^2 - 6\chi + 8y - 11 = 0$
(3 marks)
13. A car was valued at Ksh.3000000 in January 2000. Each year its value decreased by 12% of its value at the beginning of the year. Find the value of the car in January 2004 giving your answer correct to 4s.f.
(3 marks)
14. The figure below is a pyramid of a rectangular base PQRS of length 12cm and width 9cm. The slanting edge has a length of 19.5cm. Determine the angle PO makes with base PQRS
- 
15. A point $(-5, 4)$ is mapped onto $(-1, -1)$ by a translation T. Find the image of $(-4, 5)$ under the same translation.
(3 marks)
16. The gradient of the curve $y = a\chi^2 + b\chi$ at the origin is equal to 8. Find the value of a and b if the curve has a maximum turning point at $\chi = 4$.
(3 marks)

SECTION II: (50 MARKS)

Attempt **ONLY FIVE** questions from this section.

17. Mr. Karambu is a civil servant in a ministry. He earns a monthly salary of sh.N and allowance of sh.1271.all taxable. He is entitled to a monthly relief of sh.1056. The table below shows the rates of taxation.

K£ P.a	Rates %
1 - 5808	10
5.809 – 11280	15
11281 - 16752	20
16753 – 22224	15
22225 and above	30

When his salary was increased by 50% the net tax increased by 66.25 % to sh.9036 per month.

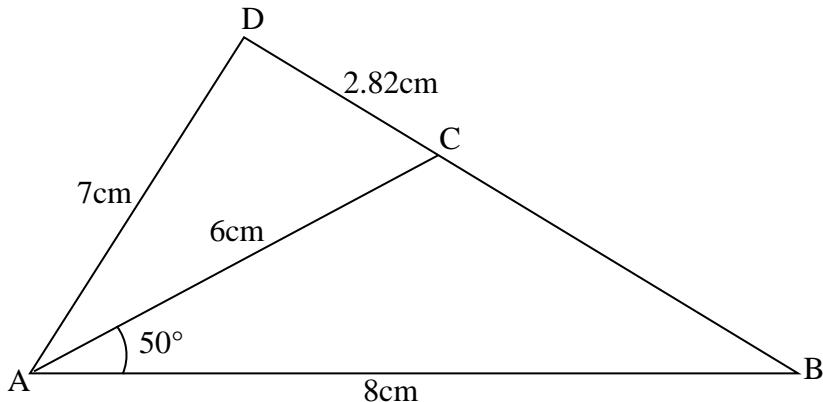
- (a) What was his net tax in K£ p.a before the salary increase (2mks)
- (b) Calculate his salary before the increase (5mks)
- (c) Calculate the percentage increase in his net pay after the salary increase (3mks)
18. A transporter wishes to transfer 1000 bags of sugar to a go down. He has two types of lorries to use. FTR with a capacity of 80 bags and a canter with the capacity of 20 bags. The canter has to make at most twice as many trips as the FTR makes. The total number of trips made by both lorries must be less than 30, and the canter has to make more than 10 trips.
- (a) Write down all the possible inequalities to represent this information (take trips made by FTR be x and trips made by canter be y) (4mks)
- (b) Represent the information above on the grid provided (3mks)
- (c) The transporter makes a profit of sh 1800 per trip on FTR and sh 1000 per trip on canter. Determine his maximum profit. (3 mks)
19. A plane S flies from a point P(40° N, 45° W) to a point Q(35° N, 45° W) and then onto a point T(35° N, 135° E).
- (a) Given that the radius of the earth is 6370km, find the distance from P to Q in km. (2 marks)
- (b) Find in nm;
- (i) the shortest distance between Q and T. (2 marks)

- (ii) the longest distance between Q and T (to the nearest tens). (2 marks)
- (c) Find the difference in time taken when S flies along the shortest and longest routes if its speed is 420 knots. (4 marks)
20. 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 |
- (a) On the grid provided draw a cumulative frequency curve for the data.(4 marks)
- (b) Use the graph in (a) above to determine:
- (i) The 60th percentile mass. (2 marks)
- (ii) Percentage of potatoes whose masses lie in the range 53g to 68g. (3 marks)
- (iii) Median mass. (1 mark)
21. Matrix P is given by $\begin{pmatrix} 4 & 7 \\ 5 & 8 \end{pmatrix}$
- (a) Find the inverse of P. (2 marks)
- (b) Two Schools Theri and Kimathi purchased beans at sh.B per bag and maize at sh.M per bag. Theri purchased 8 bags of beans and 14 bags of maize for sh.47,600. Kimathi purchased 10 bags of beans and 16 bags of maize for sh.57,400.
- (i) Form a matrix equation to represent the information above. (2 marks)
- (ii) Use the inverse matrix of P to find the prices of one bag of each item. (4 marks)
- (c) The price of beans later went up by 5% and that of maize remained constant. Theri bought the same quantity of beans but spent the same total amount of money as before on the two items. State the new ratio of beans to maize. (2 marks)
22. Mr. Karanja owns a bicycle which he sometimes rides to go to work. Out of the 21 working days in a month he only rides to work for 18 days. If he rides to work the probability that he is bitten by a rabid dog is $\frac{4}{15}$ otherwise it is only $\frac{1}{13}$. When he is bitten by the dog the probability that he will get treatment is $\frac{4}{5}$ and if he does not get treatment the probability that he will get rabies is $\frac{5}{7}$.
- (a) Draw a tree diagram to show the events. (3 marks)
- (b) Using the tree diagram in (a) above determine the probability that
- (i) Karanja will not be bitten by a rabid dog. (2 marks)

(ii) He will get rabies. (2 marks)

(iii) He will not get rabies. (3 marks)

23. In the figure **below** (not drawn to scale) $AB = 8\text{cm}$, $AC = 6\text{cm}$, $AD = 7\text{cm}$, $CD = 2.82\text{cm}$ and angle $CAB = 50^\circ$.



Calculate (to 2d.p.)

(a) the length BC. (3 marks)

(b) the size of angle ABC. (2 marks)

(c) size of angle CAD. (3 marks)

(d) Calculate the area of triangle ACD. (2 marks)

24. Complete the table below for the functions $y = \sin 3\theta$ and $y = 2 \cos(\theta + 40^\circ)$ (2 Marks)

θ^0	0^0	10^0	20^0	30^0	40^0	50^0	60^0	70^0	80^0	90^0
$3 \sin 3\theta$	0	1.50		3.00			0.00			-3.0
$2 \cos(\theta + 40^\circ)$	1.53	1.29			0.35			-0.69		-1.29

(a) On the grid provided, draw the graphs of $Y = 3 \sin 3\theta$ and $y = 2 \cos(\theta + 40^\circ)$ on the same axis. Take 1 cm to represent 10° on the x-axis and 4 cm to represent 2 unit on the y – axis. (5 marks)

(b) From the graph find the roots of the equation.

(i) $\frac{3}{4} \sin 3\theta = \frac{1}{2} \cos(\theta + 40^\circ)$ (2 Marks)

(ii) $2 \cos(\theta + 40^\circ) = 0$ in the range $0 \leq \theta \leq 90^\circ$ (1 Mark)

**KCSE SMARTFOCU HOMESTRECH CLUSTER EXAMS
(POST MOCKS)**

Featuring Kenya Certificate of Secondary Education 2024

POST MOCK 4 EXAMINATIONS 2024

121/1

Mathematics Alt A

Paper 1

SEPT/OCT 2024

Time: 2½ Hours

Name:

Adm No:.....

Class: Candidate's Signature:

Date:

School.....Index number.....

Instructions to Candidates

- (a) Write your name, admission number class and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of two sections; **Section I** and **Section II**.
- (d) Answer all the questions in **Section I** and any five questions from **Section II**
- (e) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question
- (f) Marks may be given for correct working even if the answer is wrong.
- (g) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.

FOR EXAMINER'S USE ONLY

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

Section II

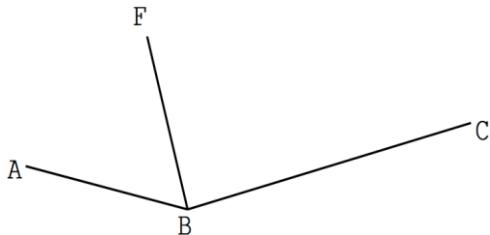
17	18	19	20	21	22	23	24	TOTAL

Grand Total

SECTION I (50 MARKS)

Answer all questions in this section

1. Evaluate without using tables or calculator: $\frac{-2(-3^2 + 5) - 12 \div 3 \text{ of } 4 \times (-2)^2}{5^{-1} - 12 \div 10 + 6}$ correct to 3 decimal places (3 marks)
2. Two of the exterior angles of a polygon are each 63° . The remaining exterior angles are each 26° . Determine the number of sides of the polygon and hence the name. (3 marks)
3. Koech and Kigen began a 10000 m race together at the starting line. Koech and Kigen took 36 seconds and 48 seconds respectively to run a 400 m lap. The two athletes were together again at the starting line after some time. Determine the number of laps that Kigen had to run to complete the race after they were together. (3 marks)
4. In the figure below ABF is a uniform cross section of a solid. AB, BC and BF are some of the visible edges of the solid. Complete the sketch showing the hidden edges with broken lines. (3 marks)



5. A Kenyan bank bought and sold Japanese Yen when the rate are as shown below.

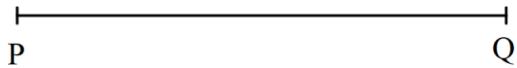
Buying (Ksh)	Selling
(Ksh) 100 Japanese Yen 84.00	85.50

A Kenyan businessman travelled to Japan and converted Ksh. 1 613 760 to Japanese Yen. He spends 75% of the amount and then converted the balance into Kenyan shillings at the bank when buying rate FOR MARKING SCHEMES CALL OR TEXT MRCHEPKWONY ON 0724351706 OR VISIT www.goldlitekcserevision.co.ke

increased by 1.4% and selling rate increased by 1.3%. Calculate the amount of money in Kenyan shilling that he received.

(3 marks)

6. (a) Line PQ given below is one of side of a parallelogram PQRS. Using a ruler and a pair of compass only, construct the parallelogram given that $\angle SPQ = 75^\circ$ (2 marks)



- (b) Drop a perpendicular from R to PQ produced at T. Measure RT. (2 marks)

7. Six tractors each working 8 hours a day can plough a field in 5 days. Calculate the number of days that four tractors working 10 hours a day would take to plough the field. (3 marks)

8. Rina has several buses, each with a driver and a conductor. All her drivers earn the same wage and all conductors earning are also equal. Any three drivers and four conductors earn a total of Ksh. 7 500 per day and the difference in driver's earning and conductor's earning per day is Kshs. 400. Calculate the daily wage of a driver. (3 marks)

9. From a point Mary notices that the angle of elevation of the top of a tree is 28° , she then walks 10m towards the tree and finds that the angle of elevation of the top of the tree is now 34° . Calculate the height of the tree to 1 decimal place given that Mary is 1.5m tall. (3marks)

10. Under an enlargement with scale factor -1.5, the point R (2, -8) is mapped onto R' (10, 5). By calculation, determine the coordinates of the center of enlargement.

(3marks)

11. Use tables of squares, square roots and reciprocal to find the value of x if its given that

$$x = \frac{2}{\sqrt{0.4278}} + \frac{1}{6.04^2} \quad (4\text{marks})$$

12. The number line below represents the solution for some given inequalities



Form the two inequalities represented above and write them as a compound statement

(3 marks)

13. The coordinate of A (-2,5) and B(x, 0), calculate the value of x if the magnitude of AB is 13 units

(3 marks)

14. Simplify completely $\left[\frac{(m+5n)^2 + (m-5n)^2}{3m^2 + 75n^2} \right]^{-1}$

(3 marks)

15. Calculate the values of x and a in the equation $\frac{4^{2x} - 2^{2x}}{2^{2x} - 2^x} = 20$

(3 marks)

16. Find the equation of the normal to the curve $y = x^3 + 2x^2 - 4x$ when $x = -1$

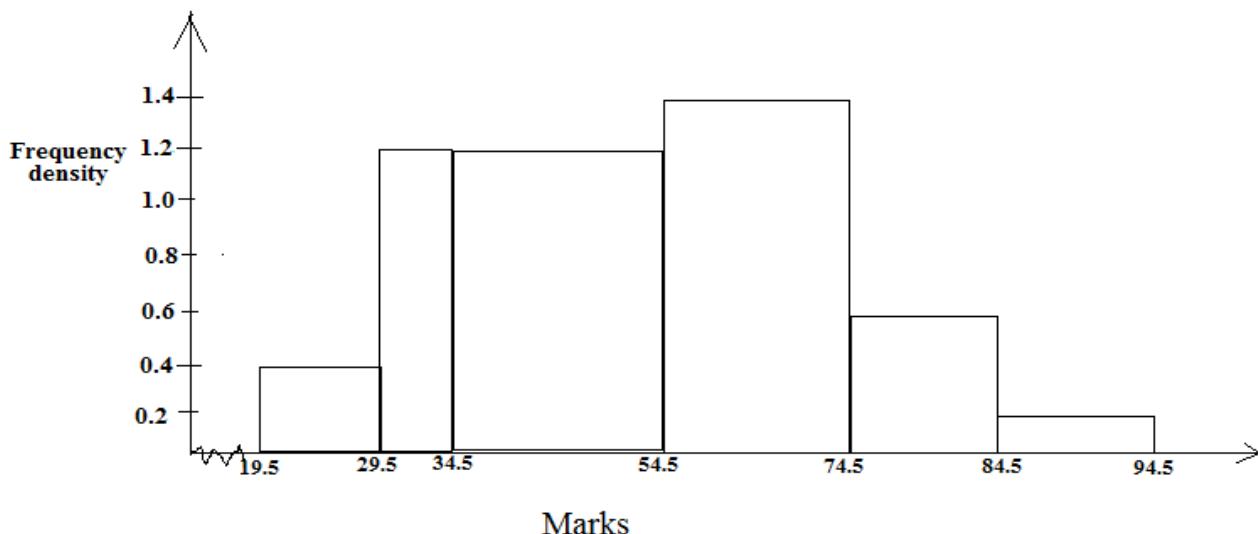
(3 marks)

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

17. During a surveying exercise to establish a housing of affordable houses units, a surveyor marked out four points P, Q, R and S to represent an area to be left out for other social amenities. Point Q is 480m on a bearing of N75°E from P. Point R lie on a bearing of 150° at a distance 600m from Q. S is directly south of P a distance of 640m.

- a) Draw a scale drawing to represent the relative position of the area under survey (Scale: 1cm represents 80 m). (4 marks)
- b) Using the scale in (a) above, determine
(i) the compass bearing of point R from S (1 mark)
(ii) the distance of point S from point Q (2 marks)
- c) An emergency water point is located within the area marked such that it is equal in distance from line QR and RS. Locate the water point and measure its distance from point P. (3 marks)

18. The histogram below is drawn from marks obtained by students



- (a) Use it to fill the table below

(4 marks)

Classes	Midpoint	Frequency

- (b) Calculate the mean mark.

(3 marks)

- (c) Calculate the median mark

(3 marks)

19. (a) A Nissan travelling at a speed of 90 km/h left Nairobi for Nakuru at 9.00 a.m. Half an hour later, a bus left Nakuru for Nairobi at a speed of x km/h. The two vehicles met at a point 180 km from from Nakuru at 11.00 am. Find the value of x

(4 marks)

- (b) Given that the bus had a puncture that lasted 20 minutes to repair, determine which vehicle arrived at its destination first and by how long

(4 marks)

- (c) Find the distance between town A and B

(2 marks)

20. (a) Given that $\mathbf{A}^{-1} = \begin{pmatrix} 2 & \frac{-5}{2} \\ -3 & 4 \end{pmatrix}$, find matrix A

(2 marks)

(b) A student bought 16 exercise books and 10 pens at a total cost of Kshs. 1018. If she had bought 12 exercise books and 8 pens, she would have spent Kshs. 242 less.
(i) Form a matrix equation to represent the information above (2 marks)

(ii) Using the inverse of A in (a) above, determine the price of each item (4 marks)

(c) Find the total cost of 4 books and 5 pens by using matrices of orders 1×2 and 2×1 respectively (2 marks)

21. ABCD is a parallelogram with A(1,1) and C(8,10). The equation of AB is $4x - 5y = -1$ and the equation of BC is $5x - 2y = 20$. Determine

(a) The coordinates of M, where M is the point of intersection of the diagonals

(2 marks)

(b) The coordinates of the vertices of B and D

(6 marks)

(c) The length of AB correct to 3 significant figures

(2 marks)

22. $A^1(-1,0)$ $B^1(-1,2)$ and $C^1(-4,0)$ is the image of A(2,1), B(4,1) and C(2,4) respectively under a rotation

(a) Plot the two triangles on the grid provided (2 marks)

(b) By construction find the center and angle of rotation (3 marks)

(c) $A''B''C''$ is the image of $A^1B^1C^1$ under enlargement, center (-2,-1) and scale factor -2. Plot $A''B''C''$ and state its coordinates (3 marks)

(d) $A^{111}B^{111}C^{111}$ is the image of $A''B''C''$ under reflection in the line $y + 2 = 0$. Plot $A^{111}B^{111}C^{111}$ on the same grid and state its coordinates (2 marks)

23. A bucket is in the shape of a frustum of a cone. The base radius of the bucket is 30 cm and it is filled with water to a height of 60 cm. The radius of the water level in the bucket is 40 cm. Taking π to be 3.142;

a) Calculate:

(i) The quantity of water in the bucket in litres. (3 marks)

(ii) The surface area of the bucket in contact with water. (4 marks)

b) Find the volume of water that if added into the bucket, would give a 20 cm rise in the water level. (3 marks)

24. The displacement of a particle is given as $S = t^3 - 6t^2 + 9t + 50$ metres. Determine;

a) the displacement of the particle when $t = 2$ seconds.

(2 marks)

b) the velocity of the particle when $t = 4$

(2 marks)

c) the acceleration of the particle when $t = 5$.

(2 marks)

d) the time when the particle is at rest.

(2 marks)

e) the minimum velocity

(2 marks)

**KCSE SMARTFOCU HOMESTRECH CLUSTER EXAMS
(POST MOCKS)**

Featuring Kenya Certificate of Secondary Education 2024

POST MOCK 4 EXAMINATIONS 2024

121/2

Mathematics Alt A

Paper 2

SEPT/OCT 2024

Time: 2½ Hours

Name:

Adm No:.....

Class:Candidate's Signature:

Date:

School.....Index number.....**INSTRUCTIONS TO
CANDIDATES**

- a) Write your Name and Index Number in the spaces provided at the top of this page.
- b) Sign and write the date of examination in the spaces provided above.
- c) This paper contains TWO sections: section I and section II
- d) Answer all the questions in section I and any FIVE questions from section II.
- e) All answers and working must be written on the question paper in the spaces provided below each question.
- f) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.
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- h) Non-programmable silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.

FOR EXAMINER'S USE ONLY:

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

Section II

TOTAL

17	18	19	20	21	22	23	24	TOTAL

GRAND

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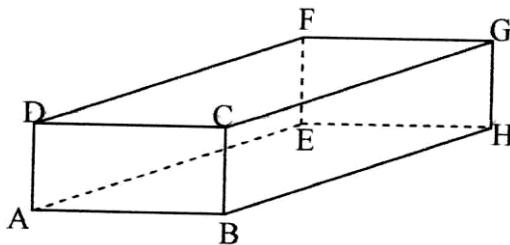
SECTION I: (50 MARKS)

Answer ALL Questions in this section

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

$$\sqrt{\frac{0.7493 \cos^2 16.335^\circ}{\log 559.3 + 10 \tan 3^\circ}}$$

2. What must be added to $\frac{1}{4}x^2 + \frac{1}{9}$ in order to make it a perfect square? (2mks)
3. Expand $(x - a/x^2)^6$ in ascending powers of x, up to the term independent of x. If this independent term is 1215, find the value of a. (3mks)
4. An angle of 1.75 radians at the centre of a circle subtends an arc of length 24.8cm. Find the diameter of the circle. (2mks)
5. ABCDEFG is a rectangular box in which AB, AD, AE are 3cm, 4cm and 5cm long respectively. M is the midpoint of FG.



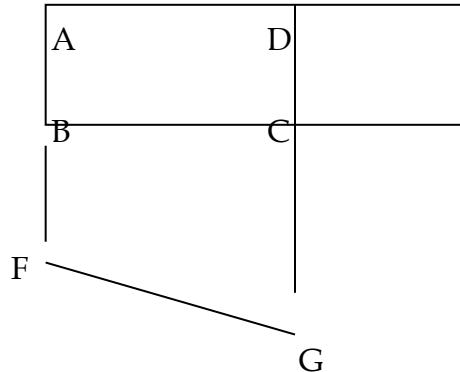
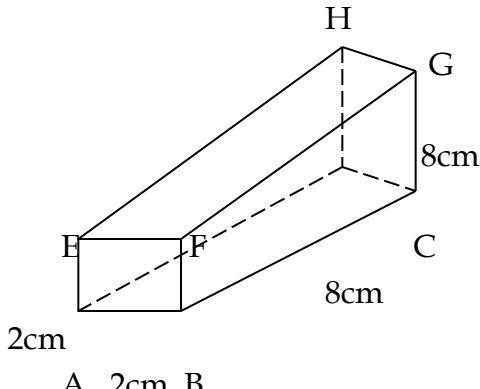
Find the length AM and determine the inclination of AM to EFGH. (3mks)

6. Use square roots, reciprocals and square tables to evaluate the expression: (3mks)
- $$(0.00546667)^{1/2} + \left(\frac{3}{0.043279} \right)^2$$
7. A member of a county assembly sold his car for shs. 1,250,000 and deposited this money in a savings account in one of the banks in Kaiboi town. The banks paid 18% p.a compounded quarterly. After two years, the member of the county assembly withdrew a half of the amount from the account. He left the rest for a further two and a half years. Calculate the total interest he earned in the 4½ year period. (4mks)
8. Given that x° is an angle in the third quadrant such that $16\sin^2 x^\circ + 4\cos x^\circ = 10$. Find $\tan x$. (3mks)
9. Two variables P and L are such that P varies partly as L and partly varies inversely as the square root of L.
- Determine the relationship between P and L given that $L = 16$ when $P = 500$ and $L = 25$ when $P = 800$. (3mks)
 - Hence find P when $L = 81$. (1mk)
10. The angle of elevation from the base of a wall to the top of the flag post 70 metres away is 62°. The angle of depression from the top of the flag post to the wall is 25°. Calculate:-
- The height of the flag post. (1mk)
 - The height of the wall. (2mks)
11. Given that $\log 3 = 1.583$ and $\log 5 = 2.322$, evaluate without using table or calculator:

12. Two values of a and b are such that $7.1 \leq a \leq 7.3$ and $12.5 \leq b \leq 12.7$. Calculate the percentage error in b , giving your answer correct to 2 decimal places. (3mks)

13. The following figure is a solid and its incomplete net.

- (a) Complete and label the net.



- (b) Hence or otherwise, find the surface area of the solid. (2mks)

14. Solve for x in the equation: (3mks)

$$9^{x+1} - 54 = 3^{2x+1}$$

15. The points P (-6, 5) and Q (2, -1) are the ends of a diameter of a circle centre M.

Determine:-

- (a) The coordinates of M. (1mk)

- (b) The equation of the circle in the form $x^2 + y^2 + ax + by + c = 0$. (2mks)

16. Solve the simultaneous equations: (3mks)

$$y + 2x + 1 = 0$$

$$x^2 + xy = -6$$

SECTION II (50 MARKS)

Answer ONLY FIVE questions in this section in the spaces provided

17. Mr. Maiyo, who works in a sugarcane plantation, owns a bicycle which he sometimes rides to work. Out of the 21 working days in a month, he rides to work for 18 days. If he rides to work, the probability that he is bitten by a rabid dog is $\frac{4}{15}$ otherwise it is only $\frac{1}{13}$. When he is bitten by the dog, the probability that he will get treated is $\frac{4}{5}$ and if he does not get treated, the probability that he will get rabies is $\frac{5}{7}$.

- (a) Draw a tree diagram using the given information. (3mks)

- (b) Using the tree diagram in (a) above, determine the probability that;

- (i) Maiyo will not be bitten by a rabid dog. (2mks)

- (ii) He will get rabies. (3mks)
 (iii) He will not get rabies. (2mks)

18. Tax rates in operation in a certain year in Kenya are as given in the table below.

Income (kf p.a.)	Tax Rates (sh. Per £)
1 – 4,512	2
4,513 – 9,024	3
9,025 – 13,536	4
13,537 – 18,048	5
18,049 – 22,560	6
Over 22,560	6.5

- (a) Mr. Koech pays Ksh. 2,172 P.A.Y.E. monthly. He was entitled to a house allowance of Ksh. 5,000 and a medical allowance of Ksh. 2,000 and gets a monthly tax relief of Ksh. 1,093. Calculate his monthly basic salary. (8mks)

- (b) Mr. Koech's other deduction per month were as follows:-

NHIF – Kshs. 320

Co-op Loan – Kshs. 4,000

Calculate Koech's net pay per month. (2mks)

19. Using a ruler and a pair of compasses only:

- (a) Three points A, B and C are vertices of a triangle ABC such that AB = 8cm, BC = 5cm and AC = 6.4cm. Draw triangle ABC with AB as the base. (2mks)

- (b) Construct the locus of P such that it is equidistance from the sides AB, BC and AC. (3mks)

- (c) On the opposite side of point C on AB, construct the locus L such $\angle ALB = 60^\circ$. (3mks)

- (d) Hence determine the area of the major sector bounded by the locus L. (2mks)

20. (a) Complete the table below for the functions $y = 4 \cos 2x$ and $y = 3 \sin(2x + 30^\circ)$ giving the values to 1 decimal place. (2mks)

	-30°	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°
$4 \cos 2x$	2.0	4.0	2.0		-4.0	-2.0		4.0	2.0		-4.0
$3 \sin(x + 30^\circ)$	0.0	1.5	2.6	3.6		1.5	0		-2.6		-2.6

- (b) Draw the graphs of $y = 4 \cos 2x^\circ$ and $y = 3 \sin(x + 30^\circ)$ for $-30^\circ \leq x \leq 270^\circ$ on the same axes. Use a scale of 1cm for 30° on x-axis and 1cm for 1 unit on the y-axis. (4mk)

- (c) Use your graphs in (b) above to solve the equation:

(i) $3 \sin(x + 30^\circ) - 4 \cos 2x = 0$. (2mks)

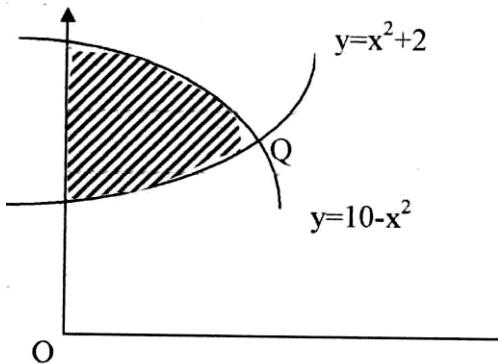
(ii) $3 \sin(2x + 30^\circ) + 1 = 0$ (1mk)

- (d) Determine the period of the function $y = 4 \cos 2x$. (1mk)

21. An aircraft takes off from the airport X(65°N , 36°E) and flies by the most direct route to another airport Y (10°N , 144°W) covering a distance of 4800nm.

- (a) Find R^0 (1mk)
 (b) If instead, the aircraft had flown along the meridian 144^0W to point Y, find how much further it would have flown. (5mks)
 (c) Two aircrafts takes off from X to Y at the same time. Given that both fly at the same speed and one flies on the direct route and the other takes the route described in (b) above, state the position of the second aircraft when the first is landing at Y. (2mks)

22. The diagram shown below represents the area between the curves $y = x^2 + 2$ and $y = 10 - x^2$ and y-axis.



Find:-

- (a) The coordinates of Q (a point of intersection) (1mk)
 (b) The area of the shaded region, by use of mid-ordinate rule with 8 ordinates (6mks)
 (c) Use integration method to calculate the same area as in (b) above. (3mks)

23. Two quantities of p and r are given below.

P	1.2	1.5	2.0	2.5	3.5	4.5
r	1.58	2.25	3.39	4.74	7.86	11.5

- (a) State the linear equation connecting p and r. (1mk)
 (b) Using the scale 2cm to represent 0.1 units on both axes, draw a suitable straight line graph on the grid provided;
 Hence estimate the value of k and n. (8mks)
 (c) Write an equation connecting p and n. (1mk)

24. An aircraft leaves point A and flies on a bearing of 020^0 to a second point B, which is 600km from A. From B, the aircraft then flies on a bearing of 320^0 to a third point C which is 1000km from B. The aircraft then flies directly back to A from C at a speed of 200km/hr. By scale drawing, find:-

- (a) Time taken to fly directly from C to A. (6mks)
 (b) The bearing in which it would fly from C to A. (1mk)
 (c) Locate point D on a bearing 170^0 from C and 280^0 from A. Calculate BD in kilometers. (2mks)
 (d) What is the bearing of D from B? (1mk)

**KCSE SMARTFOCU HOMESTRECH CLUSTER EXAMS
(POST MOCKS)**

Kenya Certificate of Secondary Education

MATHEMATICS ALT. A

PAPER 1

SEPT/OCT. 2024

Name: Index No:

School: Signature:

POST MOCK 5

Featuring Kenya Certificate of Secondary Education, 2024

INSTRUCTIONS TO CANDIDATES

1. Write your name and index number in the spaces provided at the top of this page.
2. This paper consists of two sections: **Section I** and **Section II**.
3. Answer all questions in **Section I** and five questions from **Section II**.
4. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
5. Marks may be given for correct working even if the answer is wrong.
6. Non-programmable silent electronic calculators and **KNEC Mathematical tables** may be used.

FOR EXAMINER'S USE ONLY

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

GRAND TOTAL

17	18	19	20	21	22	23	24	TOTAL

This paper consists of 15 printed pages. Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION I (50 MARKS)

Answer all the questions in this section.

1. Without using a calculator, evaluate, $\frac{2\frac{1}{4} + \frac{3}{5} \div \frac{5}{6} \text{ of } 2\frac{2}{5}}{1\frac{7}{10}}$, leaving your answer as a fraction in its simplest form. (3mks)

2. Find the equation of a perpendicular bisector of a line AB if the coordinates of A and B are (-4,-2) and (6,2) respectively. (3mks)

3. Use squares, squares roots and reciprocal tables only to evaluate the following giving your answer correct to 2 decimal places. (4mks)
$$\frac{1}{\sqrt{31.47}} + \frac{3}{8.54^2}$$

4. Find the integral values of x for which: (3mks)
$$-6 \leq 3x + 3$$

$$14 - 3x > 2$$

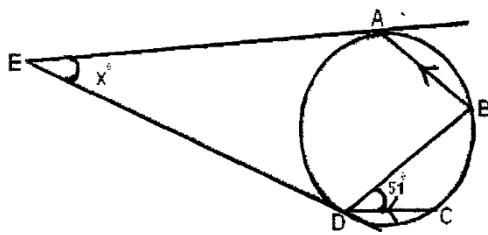
5. Pipe A empties a full tank in 8 hours, pipe B empties in 6 hours and pipe C empties in 3 hours. If all the three pipes are open for 30 minutes and then pipe A closed , How long will it take to empty a full tank. (3mks)

6. Without using a calculator or mathematical table, evaluate. (3mks)
$$\frac{8^{\frac{2}{3}} + 4^{\frac{3}{2}}}{16^{-\frac{3}{4}}}$$

7. A man on top of a tower 300m sees two cars P and Q on a straight level road. The angle of depression of P was 48° and that of Q was 28° . Calculate the distance between the two cars. (Give your answer to 2d.p.). (3 marks)

8. Two trains T_1 and T_2 , traveling in opposite directions on parallel tracks are just beginning to pass one another. Train T_1 is 72metres long and is traveling at 108km/hr. T_2 is 78 metres Long and traveling at 72km/hr. Find the time in seconds the two take to completely pass one another. (4mks)

9. In the figure bellowed and EA are tangents to the circle at D and A. DC is parallel to AB and $\angle BDC = 51^\circ$. Calculate the value of x. (3mks)



10. Two similar containers have base areas 25cm^2 and 324cm^2 respectively. Calculate the Capacity of the larger container correct to one decimal place if the capacity of the smaller one is 8cm^3 (3mks)

11. Solve for x and y in the simultaneous equation. (4 marks)

$$3^{2x} \times 3^y = 27$$

$$2^{x-y} \times 2^x = 32$$

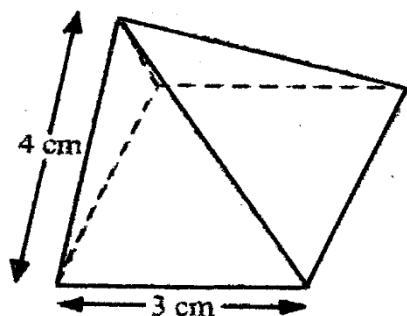
12. Given that $1.\overline{05} = 1\frac{a}{b}$, Find the values of a and b. (3mks)

13. A Kenyan bank buys and sells foreign currencies using the rates shown below.

Buying (Ksh)	Selling (Ksh)
1 Euro 86.25	86.97
100 Japanese Yen 66.51	67.26

A Japanese traveling from France arrives in Kenya with 5000 Euros, which he converts to Kenya shillings at the bank. While in Kenya he spent a total of Ksh.289,850 and then converted the remaining Kenya shillings to Japanese Yen at the bank. Calculate the amount of Japanese Yen that he received. (3 mks)

14. All prime numbers between ten and twenty are arranged in descending order to form a number.
- a) Write down the number (1mk)
- b) State the total value of the third digit in the number formed in (a) above. (1 mark)
15. If $\log 2=0.30103$ and $\log 3=0.47712$ find the logarithm of 36 without using tables or calculators. (3mks)
16. The diagram below represents a right pyramid on a square base of side 3 cm. The slant Height of the pyramid is 4 cm.

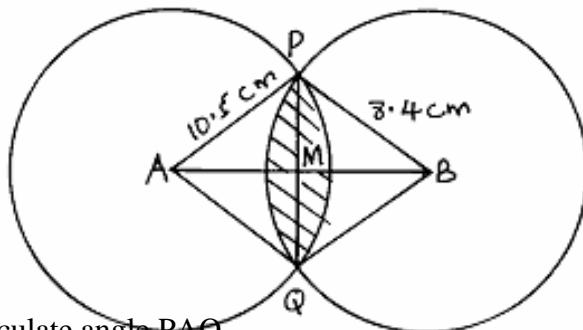


- a) Draw a net of the pyramid (2 marks)
- b) On the net drawn, measure the height of a triangular face from the top of the Pyramid (1 mark)

SECTION 11(50 MARKS)

Answer only FIVE questions from this section.

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



- (a) Calculate angle PAQ. (2 marks)

- (b) Calculate angle PBQ. (2 marks)
- (c) Calculate the area of the shaded part. (6 marks)
18. B is 102km on the bearing of 112° from A. C is 94km on the bearing of 062° from B D is 073° from A and 336° from C.
- (a) Using a scale of 1cm to represent 20km, draw a diagram to show the positions of A,B,C and D. (6mks)
- b) Using your diagram, determine;
- i) The bearing of B from D and A from C. (2mks)
- ii) The distance AC and BD (2mks)
19. A group of people planned to contribute equally towards a water project which needed kshs. 2,000,000 to complete. However, 40 members of the group withdrew from the project. As a result, each of the remaining members were to contribute ksh 2500 more.
- (a) Find the original number of members in the group. (5mks)
- (b) Forty five percent of the value of the project was funded by Constituency Development Fund (CDF). Calculate the amount that would be made by each of the remaining members of the group. (3mks)
- (c) Members contribution were in terms of labour provided and money contributed. The ratio of the value of labour to the money contributed was 6:19, calculate the total amount of money contributed by the members (2mks)
20. A bus left Kisumu at 9:30 a.m towards Nairobi at an average speed of 81 km/hr. A matatu left Nairobi at 10.10 a.m at an average speed of 72km/hr. The distance between Kisumu and Nairobi is 360km.
- (a) Determine

- (i) The time taken before the two vehicles met. (3mks)
- (ii) The distance between the two vehicles 40 minutes after meeting. (2mks)
- b) A car left Kisumu towards Nairobi at 9.50 a.m at an average speed of 90 km/hr. Determine
 i) The time when the car caught up with the bus. (3mks)
- ii) The distance of Nairobi from the place where the car caught up with the bus. (2mks)
21. Using a ruler and a pair of compasses only.
- Construct line $AB = 6\text{cm}$. (1 mark)
 - Construct triangle DAB where angle $DAB = 75^\circ$ and $AB = BD$. (2 marks)
 - Complete the parallelogram $ABCD$. (1 mark)
 - Drop a perpendicular from A to BD and hence find the area of the parallelogram. (3 marks)
 - Construct a circle to touch line BC , AB produced and DC produced.
 Measure its radius. (3 marks)
22. A surveyor recorded the measurements of a field in a field book using lines $AB = 260\text{m}$ as shown below.
- | | | |
|-----|-----|------|
| | B | |
| | 130 | R 40 |
| | 70 | Q10 |
| | 50 | P20 |
| S50 | 10 | |
| | A | |
- Sketch the map of the field. (4mks)
 - Find the area of the field in hectares. (6mks)

23. A trader sold an article at sh.4800 after allowing his customer a 12% discount on the marked price of the article. In so doing he made a profit of 45%.
- a) Calculate
- (i) The marked price of the article. (3 marks)
- (ii) the price at which the trader had bought the article (2marks)
- b) If the trader had sold the same article without giving a discount. Calculate the percentage profit he would have made. (3 marks)
- c) To clear his stock, the trader decided to sell the remaining articles at a loss of 12.5% calculate the price at which he sold each article. (2mks)
24. The distances S metres from a fixed point , covered by a particle after t seconds is given by the equation, $S = t^3 - 6t^2 + 9t + 5$
- a) Calculate the gradient to the curve at $t = 0.5$ seconds. (3mks)
- b) Determine the values of S at the maximum and minimum turning points of the curve. (4mks)
- c) On the space provided, Stretch the curves of $S = t^3 - 6t + 9t + 5$ (3mks)

**KCSE SMARTFOCU HOMESTRECH CLUSTER EXAMS
(POST MOCKS)**

Kenya Certificate of Secondary Education

MATHEMATICS ALT. A

PAPER 2

SEPT/OCT. 2024

Name: Index No:

School: Signature:

POST MOCK 5

Featuring Kenya Certificate of Secondary Education, 2024

INSTRUCTIONS TO CANDIDATES:

- (a) Write your name and index number in the spaces provided above
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of **TWO** sections: **Section I** and **Section II**.
- (d) Answer **ALL** the questions in **section I** and only five from **Section II**
- (e) All answers and working must be written on the question paper in the spaces provided below each question.
- (f) **Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.**
- (g) Marks may be given for correct working even if the answer is wrong.
- (h) **Non-programmable** silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.

FOR EXAMINER'S USE ONLY

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

--

SECTION I:5MARKS- Answer all questions from this section

1. Rationalise the denominator and simplify leaving your answer in the form $\sqrt{a} + b$. (3 marks)

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

2. a) expand $(1 - \frac{1}{2}x)^5$ (1 mark)

- b) Use the expansion upto x^3 in (a) above to evaluate $(0.98)^5$ correct to 4 d.p (2 marks)

3. Agotho has a rectangular plot that was measured to the nearest meter and found to be 80m in length and 60m in width. Determine the percentage error in its perimeter. (3 marks)

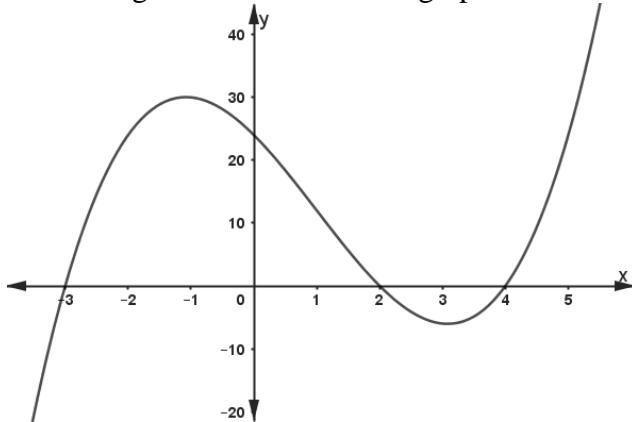
4. Simplify $\frac{9x^2 - 1}{3x^2 + 2x - 1}$ (3 marks)

5. A circle of radius 3cm has its centre at $(3, -2)$. Express the equation of the circle in the form $x^2 + y^2 + mx + ny + c = 0$. Where m, n and c are constants. (3 marks)

6. Find the value of x that satisfies the equation $\log(2x - 11) - \log 2 = \log 3 - \log x$ (4 marks)

7. Five men working 8 hours a day take 2 days to cultivate an acre of land. How many days would four men working 10 hours a day at double rate take to cultivate 3 acres of land? (3 marks)

8. The figure below shows the graph of a cubic function.

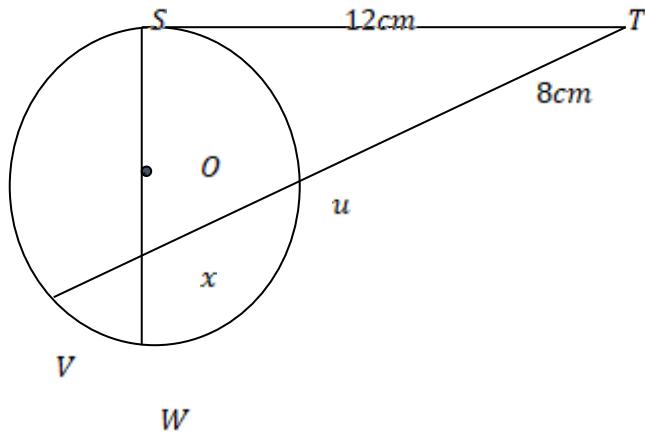


Write the equation of the function in the form $y = x^3 + ax^2 + bx + c$, where a , b and c are constants.
(3 marks)

9. Given that $\mathbf{A} = \begin{pmatrix} 1 & k \\ 3 & 3 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} -3 & 5 \\ 1 & -2 \end{pmatrix}$, find k if the determinant of \mathbf{AB} is 9
(3 marks)

10. A variable P varies directly as t^3 and inversely as the square root of S . When $t = 2$ and $S = 9 P = 16$.
Determine the equation connecting P , t and S hence find P when $S = 36$ and $t = 3$.
(3mks)

11. In the figure below the tangent ST meets chord Vu . Produced at T. chord SW passes through the centre O of the circle and intersect chord Vu at x . Line $ST = 12\text{cm}$ and $uT = 8\text{cm}$



- a) Calculate the length of chord Vu .
(1mk)
- b) If $wx = 3\text{cm}$ and $Vx:xu = 2:3$. find Sx
(2mks)

12. Make n the subject of the formula.

$$\frac{r}{p} = \frac{M}{\sqrt{n-1}} \quad (2 \text{mks})$$

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

Monthly income in Kshs	Tax rate in each kshs
$1 \leq x < 9681$	10%
$9681 \leq x < 18801$	15%
$18801 \leq x < 27921$	20%
$27921 \leq x < 37040$	25%
Over 37040	30%

In that year Mr. Mogaka gets a total deduction of ksh5,000 he gets a personal tax relief of kshs.1056 and pays kshs.3944 for NHIF, WCPS and sacco loan repayment. Calculate

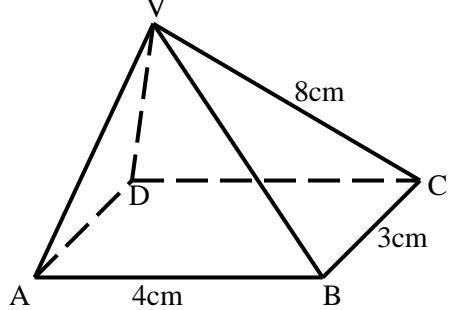
(i) P.A.Y.E. (1 mark)

(ii) Monthly income/salary (3 marks)

14. Use logarithms tables to evaluate. (4mks)

$$\sqrt[3]{\frac{36.72 \times (0.46)^2}{185.4}}$$

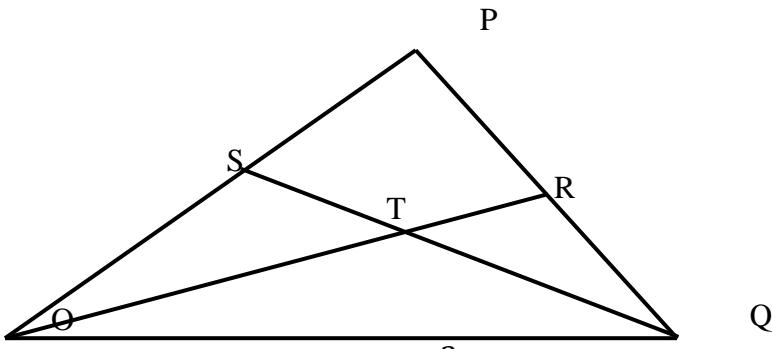
15. The figure below shows a rectangular based right pyramid. Find the angle between the planes ABCD and ABV. (2marks)



16. Find the shortest distance between points A(50° S, 25° E) and B(50° S, 140° E in KM (Take R=6370 Km)
(3mks)

SECTION II – 50 MARKS; Answer any FIVE questions from this section

17.



In the figure above, OPQ is a triangle in which $OS \sim \frac{3}{4}PQ$ and $PR \sim : RQ \sim = 2:1$

Line OR and SQ meet at T .

h) Given that $OP = p \sim$ and $OQ = q \sim$, express the following vectors in terms of $p \sim$ and $q \sim$.

(i) $PQ \sim$ **(1 Mark)**

(ii) $OR \sim$ **(2 Marks)**

(iii) $SQ \sim$ **(1 Mark)**

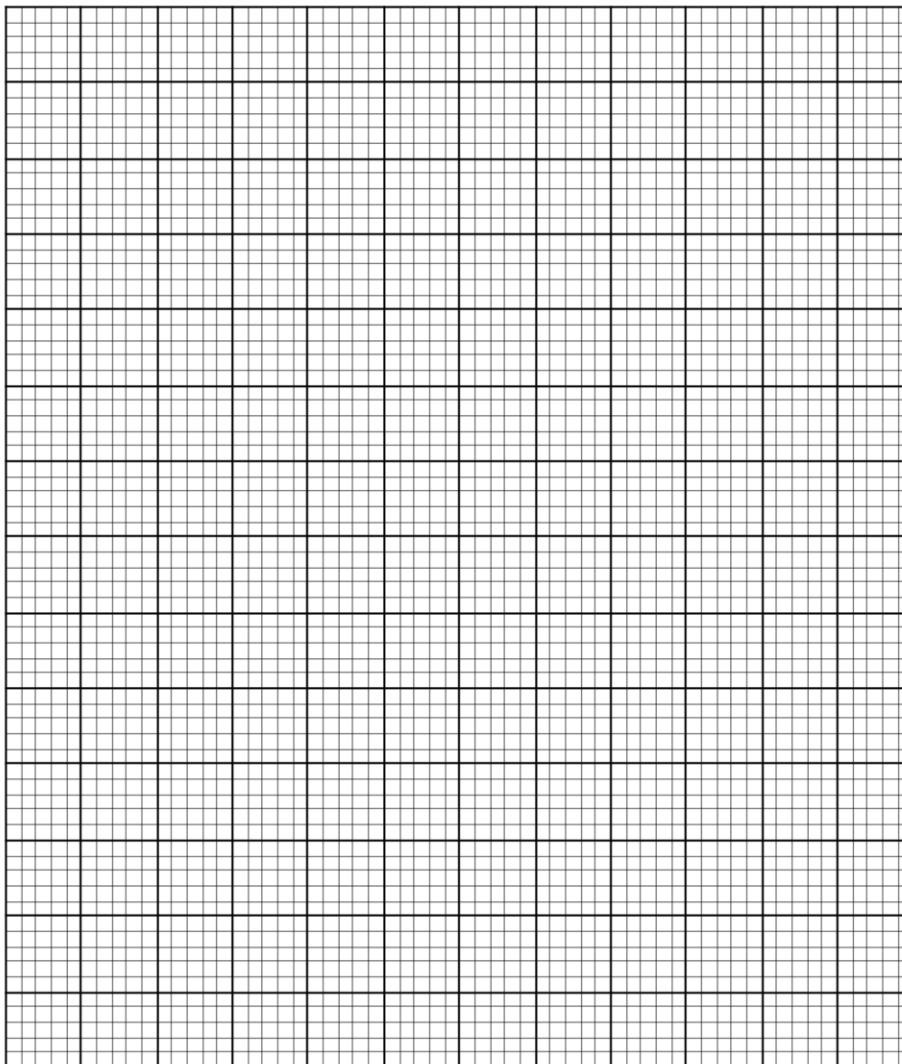
i) You are further given that $ST = mSQ$ and $OT = nOR$. Determine the values of m and n . (6 marks)

18. (a) Complete the table given below for the functions $y = -3 \cos 2x$ and

$$y = 2 \sin\left(\frac{3}{2}x + 30\right)^0 \text{ for } 0^0 \leq x \leq 180^0 \quad (2 \text{ marks})$$

x^0	0	20	40	60	80	100	120	140	160	180
$-3 \cos 2x$	-3.00			1.50	2.82	2.82		-0.52	-2.30	
$2 \sin\left(\frac{3}{2}x + 30\right)^0$	1.00		2.00	1.73		0.00	-1.00			-1.73

(b) Using the grid provided, draw the graphs of $y = -3 \cos 2x$ and $y = 2 \sin\left(\frac{3}{2}x + 30\right)^0$ for $0^0 \leq x \leq 180^0$ on the same pair of axes. Take 1cm to represent 20^0 on the x – axis and 2cm to represent 1 unit on the y – axis. (5 marks)



(c) From the graphs in (b) above, find;

(i) the period of $y = 2 \sin\left(\frac{3}{2}x + 30\right)^0$ (1 mark)

(ii) the values of x given that $2 \sin\left(\frac{3}{2}x + 30\right)^0 + 3 \cos 2x = 0$ (2 marks)

19. Awuor was paid an initial salary of Kshs. 180000 per annum with a fixed annual increment. Wasonga was paid an initial salary of Kshs. 150000 per annum with a 10% increment compounded annually.

(a) Given that Awuor's annual salary in the 11th year was Kshs. 288,000, determine:

(i) Her annual increment. (2 marks)

(ii) The total amount of money Awuor earned during the 11 years. (2 marks)

(b) Determine Wasonga's monthly earning, correct to the nearest 10 shillings during the 11th year (3 marks)

(c) Calculate the number of years it will take Awuor's total earnings to be Ksh. 1022400.(3 marks)

20. In a mixed school there are 420 boys and 350 girls. The probability that a girl passes her exams in the school is $\frac{4}{7}$ while that of a boy passing is $\frac{5}{8}$. The probability of a girl being made a prefect is $\frac{2}{11}$ while that of a boy is $\frac{1}{8}$.

Find the probability that a student picked at random.

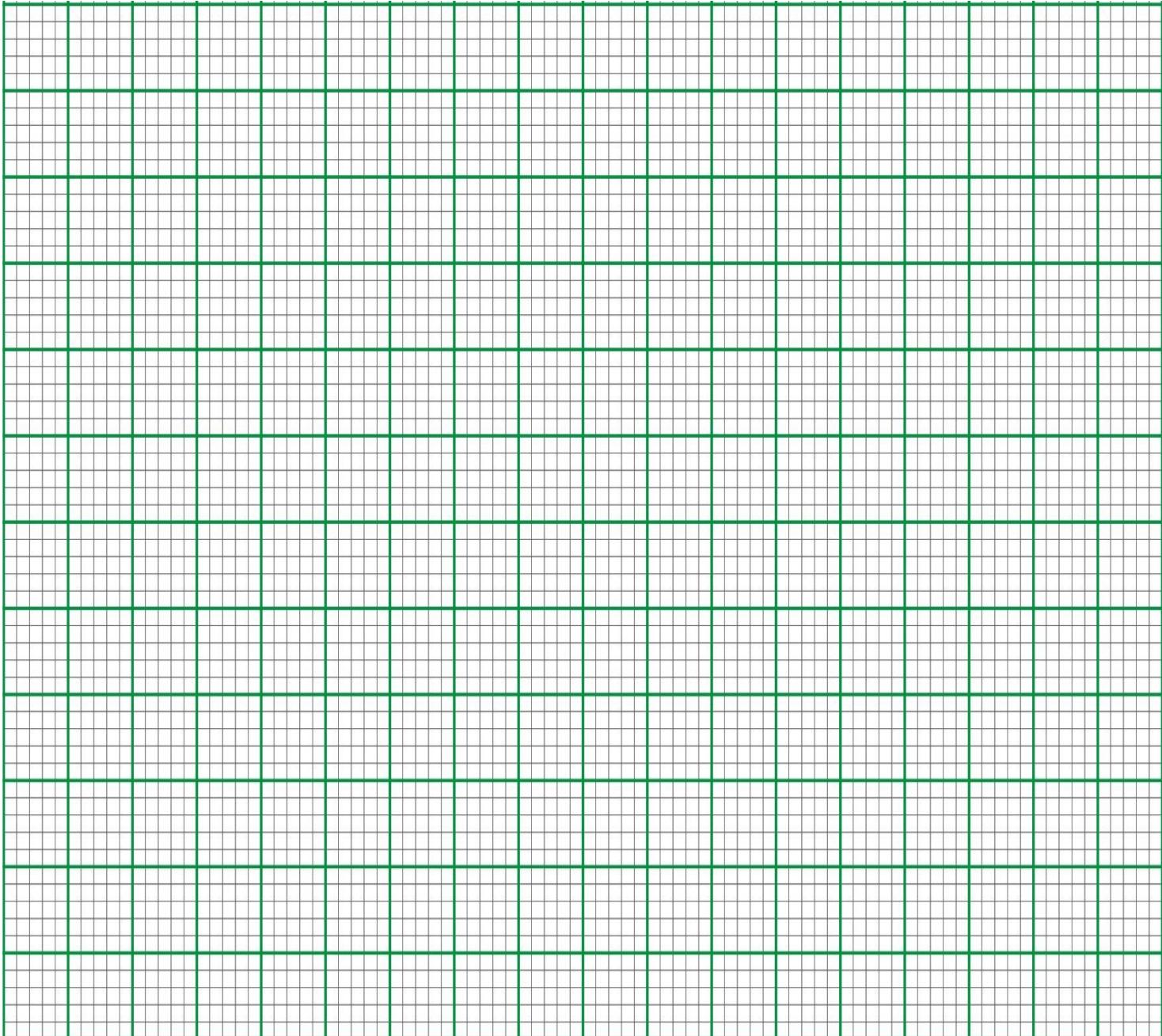
a) Is a boy and passes the exam and is not a prefect. (3mks)

b) Is a girl, a prefect and passes the exam. (3mks)

c) Is not a prefect and passes the exam. (4mks)

21. OABC is a parallelogram with vertices O (0, 0) A (2, 0) B (3, 2) and C (1, 2).

$O^1 A^1 B^1 C^1$ is the image of OABC under transformation matrix $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$



- a) Find the co-ordinates of $O^1 A^1 B^1 C^1$. (2mks)
- b) On the grid provided draw OABC and $O^1 A^1 B^1 C^1$ (2mks)
- c) Find $O^{11} A^{11} B^{11} C^{11}$ the image of $O^1 A^1 B^1 C^1$ under the transformation matrix $\begin{pmatrix} 1 & 0 \\ 0 & -2 \end{pmatrix}$ (2mks)
 - (i) On the same grid draw $O^{11} A^{11} B^{11} C^{11}$. (1mk)
 - (ii) Find the single matrix that map $O^{11} A^{11} B^{11} C^{11}$ onto OABC. (3mks)

22. A particle moves in such a way that the velocity V at any given time is
 $v=10t - \frac{1}{2} t^2 - \frac{15}{2}$ mls.
- (a) Calculate the initial velocity (1 mark)
- (b) Calculate the velocity when the time $t=3$ (2 marks)
- (c) Find the displacement during the 5th second (4 marks)
- (d) Calculate the maximum velocity attained (3 marks)

23. The 2nd and 5th terms of an arithmetic progression are 8 and 17 respectively. The 2nd, 10th and 42nd terms of the A.P. form the first three terms of a geometric progression.

Find

- (a) The 1st term and the common difference. (3mks)

- (b) The first three terms of the G.P and the 10th term of the G.P. (4mks)

- (c) The sum of the first 10 terms of the G.P. (3mks)

24. Matrix P is given by $\begin{pmatrix} 4 & 7 \\ 5 & 8 \end{pmatrix}$

- (a) Find P^{-1} (2 Marks)

- (b) Two institutions, Kamunyaka secondary School and Njabini mixed secondary School purchased beans at Sh. b per bag and maize at Sh. m per bag. Kamunyaka secondary purchased 8 bags of beans and 14 bags of maize for KSh. 47,600. Njabini mixed purchased 10 bags of beans and 16 bags of maize for KSh. 57,400.

- (i) Form a matrix equation to represent the information above. (2 Marks)

- (ii) Use matrix P^{-1} to find the prices of one bag of each item. (3 Marks)

- (c) The price of beans later went up by 5% and that of maize remained constant. Kamunyaka secondary bought the same quality of beans but spent the same total of money as before on the two items. State the new ratio of beans to maize. (3 Marks)

POST MOCK JOINT EXAMINATIONS 2024

Kenya Certificate of Secondary Education

121/1 — MATHEMATICS — Paper 1

ALT A

POST MOCK 6

SEPT/OCT, 2024

$2\frac{1}{2}$ hours

Name Index Number /

Stream Adm. Number

School Candidate's Signature Date

Instructions to Candidates

- (a) Write your **name**, **index No.**, **Stream**, **Adm. No.** and **school** in the spaces provided above.
 - (b) **Sign** and write the **date** of the examination in the spaces provided above.
 - (c) This paper consists of two sections: **Section I** and **Section II**.
 - (d) Answer all the questions in section I and only five questions from section II.
 - (e) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.
 - (f) Marks may be given for correct working even if the answer is wrong.
 - (g) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.
 - (h) This paper consists of 15 printed pages.
 - (i) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
 - (j) Candidates should answer the questions in English.
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For Examiner's Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

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SECTION I (50 marks)

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

1. Simplify $\frac{b-2}{4} + \frac{b+3}{7}$ (3 marks)

2. Given that the number 987h19564 is divisible by 11, determine digit h. (2 marks)

3. A tourist changed half of her 24 000 Euros to US dollars in a bank. The currency exchange rates in the bank were:

$$1 \text{ Euro} = \text{Ksh } 155.7285$$

$$1 \text{ US dollar} = \text{Ksh } 144.1462$$

Calculate, to one decimal place, the amount of money, in dollars, she received. (3 marks)

4. Evaluate without using calculators or mathematical tables, leaving the answer as a mixed number.

$$\frac{1.23 \times 35 \times 0.0084}{0.056 \times 2.87} \quad (2 \text{ marks})$$

5. Three people X, Y and Z share Ksh 25 300 in such a way that Y gets one and a half times as much as X and Z gets twice as much as Y. Find the amount that Z gets. (3 marks)

6. On his cycling practice, Peter cycled for 6 km on a bearing of 120° . He then cycled for 8 km on a bearing of N 80° E. Finally, he turned north and cycled 10 km. Using, scale drawing, find the distance of his final position from the starting point. (4 marks)

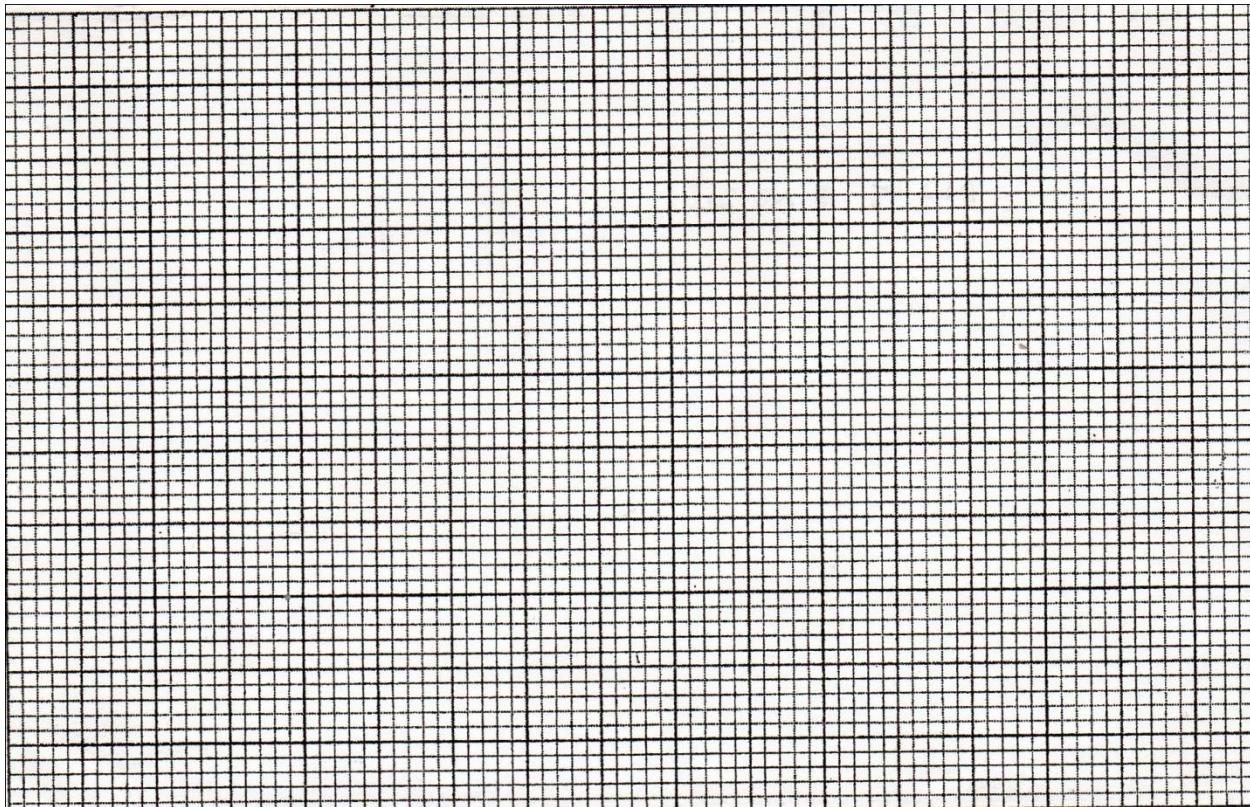
7. Solve the equation; $64^x - 121 = 7 - 4^{3x}$ (3 marks)

8. Use tables of cubes, squares and reciprocals to evaluate: $12.86^3 - \frac{10}{(0.17)^2}$ (3 marks)

9. A circle whose radius is 15 cm is divided into ten equal sectors. Calculate the total area of the minor segments formed in the sectors. (3 marks)

10. On the grid provided, solve the simultaneous equations:

$$2y - 6 = 3x \text{ and } 3x + 5y = 15 \quad (4 \text{ marks})$$

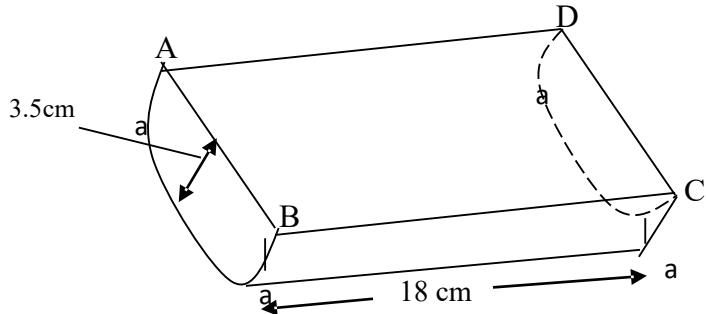


11. If $\begin{pmatrix} 4 & 1 \\ 1 & 3 \end{pmatrix} \begin{pmatrix} x \\ x^2 \end{pmatrix} = \begin{pmatrix} 5 \\ k \end{pmatrix}$, find the values of k. (4 marks)

12. A straight line through the points P(2, 1) and Q(4, b) is perpendicular to the line whose equation is $3y + 2x = 5$. Determine the value of b. (3 marks)
13. Towns P and Q are 360 km apart. A bus leaves town Q for town P at 6.20 a.m. driving at an average speed of 60 km/h. At 7.05 a.m., a van leaves town Q for town P driving at 120 km/h. Determine the distance from town P to the point where the van catches up with the bus. (4 marks)
14. Solve the inequalities and hence represent the solutions on a single number line.

$$\begin{aligned}4x - 9 &\leq 6 + x \\8 - 3x &< x + 4\end{aligned}\quad \text{(3 marks)}$$

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



Find the surface area of the solid.

(3 marks)

16. Under an enlargement, the images of the points $E(1,3)$ and $F(2, -2)$ are $E^I(4, 5)$ and $F^I(6, -5)$. Calculate:

(a) the scale factor of the enlargement; (2 marks)

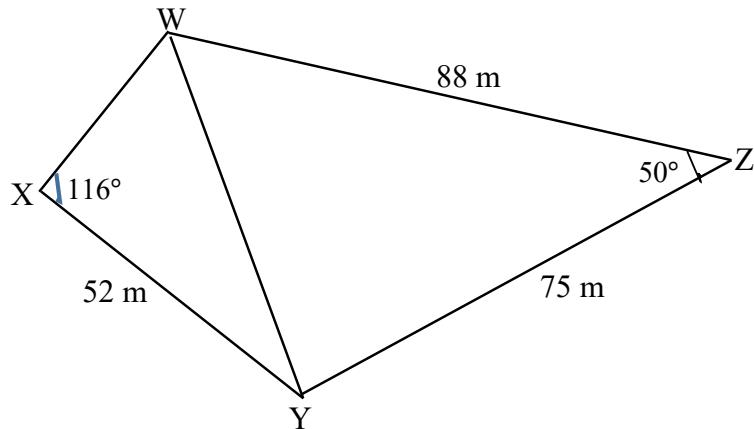
(b) the centre of the enlargement. (2 marks)

SECTION II (50 marks)

Answer only **five** questions in this section in the spaces provided.

17. The outfitter for the school was asked to stock three different types of school jumpers. He decided to purchase 40 V-neck jumpers, 30 polo-neck jumpers and 30 crew-neck jumpers.
- (a) He bought the V-neck jumpers at Ksh 1 200 each and sold them at a profit of 40 % on the cost price. Calculate the selling price of each V-neck jumper. (2 marks)
- (b) He bought the polo-neck jumpers at Ksh 1 500 each and sold them at a profit of Ksh 800 each. Express the profit as a percentage of the cost price. (2 marks)
- (c) He sold each crew-neck jumper at Ksh 1 620, thereby losing 10 % on the cost price. Determine the cost price of each crew-neck jumper. (2 marks)
- (d) Calculate the total profit he made on the sale of all the jumpers and express this profit as a percentage of his initial outlay. (4 marks)

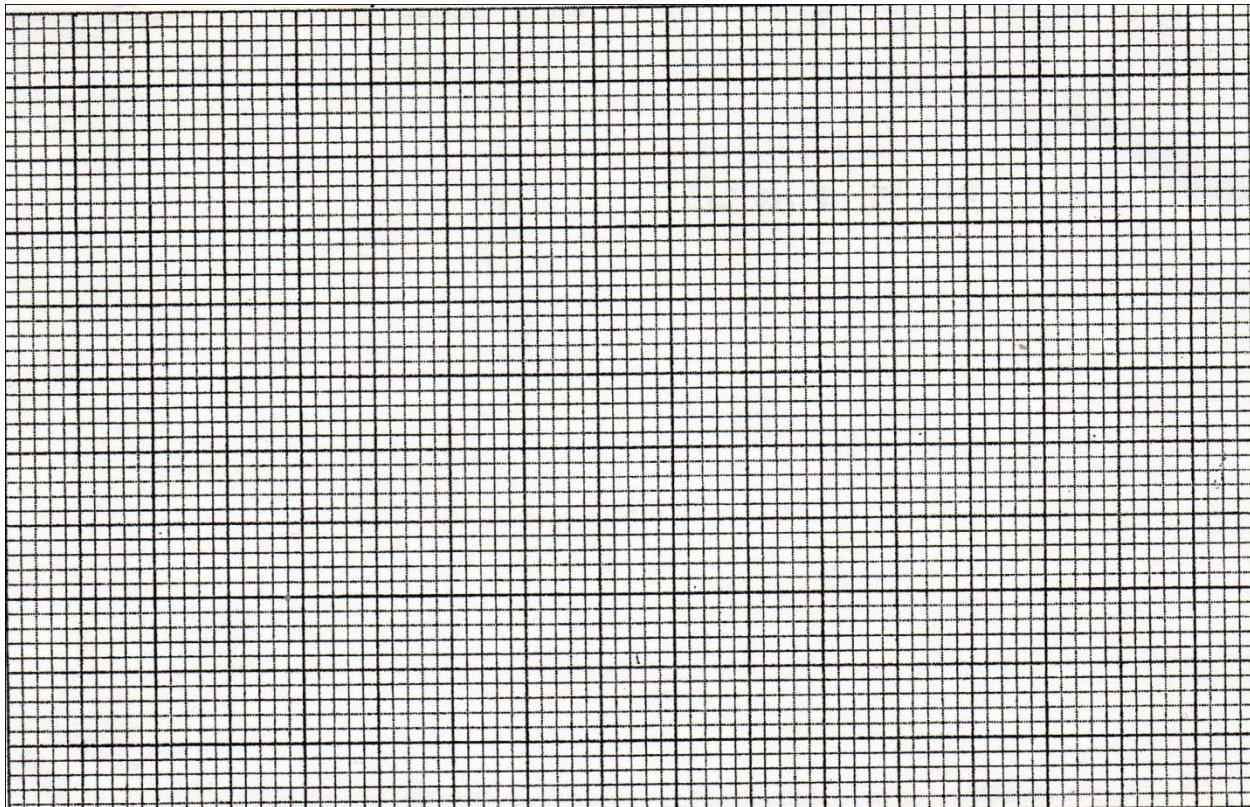
18. The figure below represents a plot of land WXYZ divided into two pieces. Given that $XY = 52$ m, $YZ = 75$ m, $WZ = 88$ m, angle $WXY = 116^\circ$ and angle $WZY = 50^\circ$.



Calculate to 2 decimal places:

- (a) the length of WY ; (2 marks)
- (b) the size of angle XYW ; (3 marks)
- (c) the length of WX ; (2 marks)
- (d) the area of the quadrilateral $WXYZ$ in hectares. (3 marks)

19. The vertices of a triangle T are A(1, 1), B(3, 0) and C(1, 3).
- (a) On a grid draw triangle T. (1 mark)
- (b) T_1 is the image of T under a reflection in the line $y + x = 0$. Draw T_1 . (3 marks)
- (c) T_2 is the image of T_1 under a rotation of clockwise quarter turn about the origin. Draw T_2 . (2 marks)
- (d) T_3 is the image of T_2 under an enlargement scale factor -2 and centre $(0, 0)$. Draw T_3 . (2 marks)



- (e) Describe a transformation that maps T onto T_2 . (2 marks)

20. The times, in seconds, taken by some athletes who took part in the 400 metres race during an inter-school competition were recorded as below.

64	67	56	60	61	51	52	68	66	59
57	60	46	58	63	52	63	50	64	52
58	53	62	63	47	63	62	68	49	66
55	46	58	45	48	52	55	45	61	65

- (a) Using the data provided above, complete the table below. (1 mark)

Time (sec.)	45 – 49	50 – 54	55 – 59	60 – 64	65 – 69
No. of athletes					

- (b) State the median class. (1 mark)

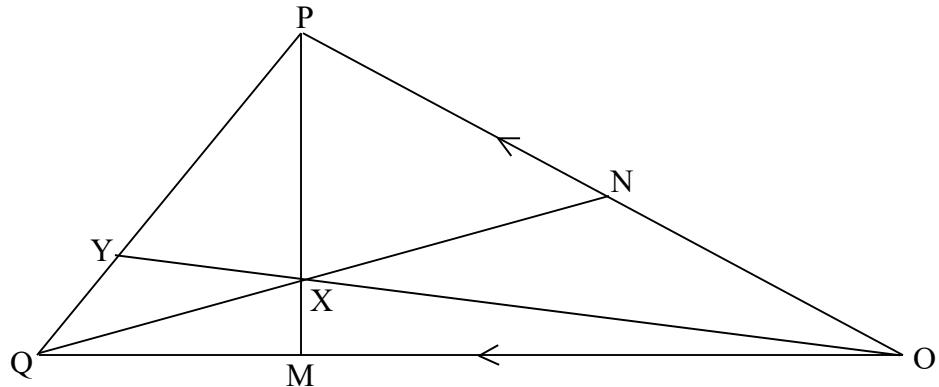
- (c) Calculate the:

- (i) mean time; (3 marks)

- (ii) median time. (3 marks)

- (d) Determine the percentage of athletes whose time was more than 54 seconds but less than 65 seconds. (2 marks)

21. The figure below shows a triangle OPQ in which $\mathbf{OP} = \mathbf{p}$ and $\mathbf{OQ} = \mathbf{q}$. M and N are points on OQ and OP respectively such that $ON : NP = 2 : 3$ and $OM : MQ = 2 : 1$.



(a) Express the following vectors in terms of \mathbf{p} and \mathbf{q} .

(i) \mathbf{PM} (1 mark)

(ii) \mathbf{QN} (1 mark)

(iii) \mathbf{PQ} (1 mark)

(b) Lines PM and QN intersect at X such that $\mathbf{PX} = h\mathbf{PM}$ and $\mathbf{QX} = k\mathbf{QN}$. Express \mathbf{OX} in two different ways and hence find the values of h and k . (5 marks)

(c) Show that Q, X and N are collinear. (2 marks)

22. A radio dealer planned to buy some radios from a wholesaler for Ksh 340 000. Before he could buy them the price of each radio was increased by Ksh 300. He then discovers that he can only afford to buy 30 radios less than he had planned to buy with the same amount of money.

(a) If the original price of each radio was Ksh p , write down an expression for:

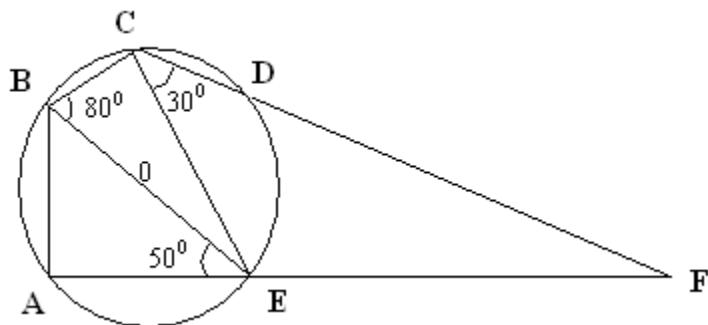
(i) the original number of radios he could buy; (1 mark)

(ii) the new number of radios he could buy after price increase. (1 mark)

(b) Form an equation in P and determine the original price of each radio. (5 marks)

(c) Find the number of radios he finally bought after price increase. (3 marks)

23. In the figure below, O is the centre of the circle. Angle AEB = 50° , angle EBC = 80° and angle ECD = 30° .



Giving reasons, determine:

(a) angle CDE; (2 marks)

(b) angle DFE; (2 marks)

(c) obtuse angle COE; (2 marks)

(d) angle ADE; (2 marks)

(e) angle FDE; (2 marks)

24. Three solids, a cylinder, a sphere and a cone, are such that their radii are equal. It is also given that their surface areas are equal. If the volume of the sphere is 904.9 cm^3 , calculate, using $\pi = 3.142$ the:

(a) common radius of the solids; (2 marks)

(b) volume of the cylinder; (4 marks)

(c) volume of the cone. (4 marks)

POST MOCK MATHEMATICS JOINT EXAMINATIONS

Kenya Certificate of Secondary Education

SEPT/OCT - 2024

121/2

Mathematics

Paper 2

**Alternative A.
POST MOCK 6**

Name: Adm No:

School: Class:

Date: Signature:

INSTRUCTIONS TO CANDIDATES

- (a) Write your name, admission number and class in the spaces provided at the top of this page.
- (b) Sign and write the date of the examination in the spaces provided above.
- (c) This paper consists of **two** sections: **Section I** and **Section II**.
- (d) Answer **ALL** questions in **Section I** and all the questions from **Section II**.
- (e) **Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.**
- (f) Marks may be given for correct working even if the answer is wrong.
- (g) **Non-programmable** silent electronic calculators and KNEC Mathematical Tables may be used.
- (h) **This paper consists of 11 printed pages.**
- (i) Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

For Examiners' Use Only

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

SECTION II

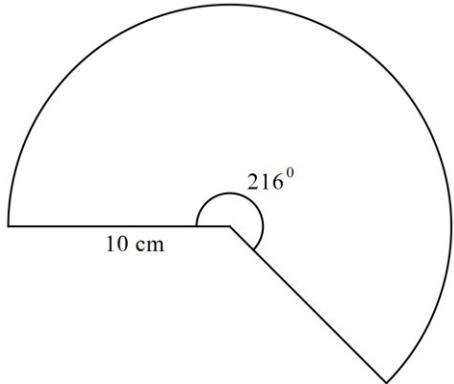
17	18	19	20	21	22	23	24	Total	Grand Total	

SECTION I (50 Marks)

Answer all the questions in this section

1. The radius of sphere is 4.9 cm. Find the maximum percentage error in the volume of the sphere if the error in the radius is 0.5%. Give the answer correct to four significant figures. (3 marks)
 2. A school wanted to buy some scientific calculators for members of its Mathematics department with a budget of Ksh. 142200. Before the purchase, the school was given a discount of Ksh. 175 per calculator by the bookshop. As a result, the department was able to buy seven more calculators with the same amount. Calculate the total number of calculators the department was able to buy. (4 marks)
 3. Given that $\log 2 = 0.3010$ and $\log 3 = 0.4771$, find $\log 7.2$ (3 marks)

4. The figure below shows a sector of a circle made from a wire model. The sector subtends an angle of 216^0 at the centre of the sector of radius 10 cm.



The model is cut at one point and bent to form a circle. Calculate the radius of the circle formed, correct to one decimal place. Use $\pi = 3.142$ (3 marks)

5. Simplify by rationalizing the denominator (3 marks)

$$\frac{\sin 30^0}{2 - \tan 60^0}$$

6. Two parallel chords of dimensions 15.6 cm and 13 cm are such that they are on either sides of the centre of a circle centre O and radius 12 cm. find the perpendicular distance between the two chords, correct to 2 decimal places. (3 marks)

7. Rose bought a branding machine on hire purchase terms. The cash price of the branding machine was Kshs. 750000. She paid 15 equal monthly installments of Kshs. 62500 each. Calculate the monthly rate at which compound interest was charged. (4 marks)

8. Make m the subject of the formula (3 marks)

$$P = \frac{m}{\sqrt[3]{Q^2 - m^3}}$$

9. A bag has 3 red balls, 6 blue ball and some green balls of the same shape and size. The probability of picking a green ball is 0.5. Find the probability of picking either a green or a blue ball. (3 marks)

10. The roots to a cubic equation are $x = 2$, $x = 4$ and $x = -3$. Write the equation in the form $x^3 + ax^2 + bx + c = 0$, where a , b and c are constants. (3 marks)

11. (a) Find \mathbf{A}^{-1} given that (1 mark)

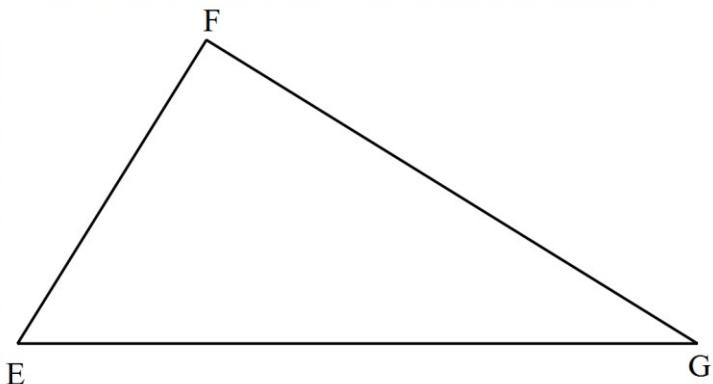
$$\mathbf{A} = \begin{pmatrix} 3 & 5 \\ 2 & 4 \end{pmatrix}$$

(b) Mr. Mutua bought 3 mathematical tables and 5 geometrical sets and paid a total of Ksh. 3050 while Fayao bought 2 mathematical tables and 4 geometrical sets and paid a total of Ksh. 2230. Use \mathbf{A}^{-1} to find the cost of each item. (3 marks)

12. Determine the independent term in the expansion of (2 marks)

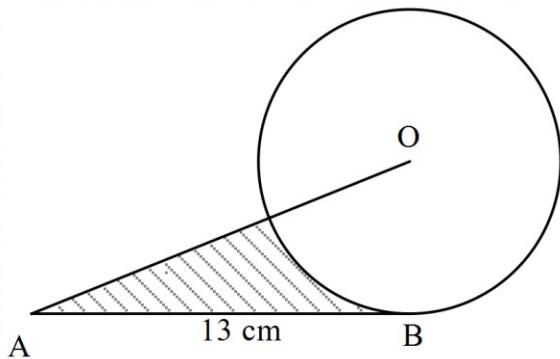
$$(2x - \frac{1}{3x^2})^6$$

13. The figure below represents a triangular field ABC



- (a) Draw the locus of points 2 cm from E
- (b) Draw the locus of points equidistant from the sides EF and EG
- (c) Draw the locus of all points equidistant from E and G
- (d) A coin is lost within a region which is nearer to point E than to the point G and closer to the side EG than to the side EF. Shade the region where the coin can be located. (4 marks)

14. In the figure below, AB is a tangent to the circle centre O at B. The radius of the circle is 5 cm and $AB = 13 \text{ cm}$.



Calculate the shaded area. Use $\pi = 3.142$. (3 marks)

15. A coffee trader buys two grades of coffee at Kshs. 80 and Kshs. 100 per packet. The trader blends the two grades in the ratio $1:n$. By selling the blend at Ksh. 120 per packet, a 25% profit realized. Determine the value of n . (3 marks)

16. The area of a triangle PQR is 14 square units. It is transformed using the matrix $\begin{pmatrix} \frac{1}{3}x & 2 \\ 2x & 4 \end{pmatrix}$ and mapped onto triangle P'Q'R' of area 84 square units. Find the value of x . (2 marks)

SECTION II – 50 Marks
Answer any *five* questions in this section.

17. The table below shows income tax rates for the year 2020

Taxable income (Ksh. per month)	Tax Rate (% per Ksh)
1 – 15000	0
15001 – 27000	10
27001 – 37000	15
37001 – 45000	20
45001 – 50000	25
Above 50000	30

In June 2020, Juma earned a basic salary of Ksh. 34320. In addition, he was entitled to a house allowance of Ksh. 12000 per month and medical allowance of Ksh. 6450. He also has a non-taxable risk allowance of Ksh. 6000 per month. He contributes to a provident fund of Ksh. 7500. He also has tax relief of Ksh. 1180 monthly.

- (a) Calculate Juma's taxable income in that month. (2 marks)
- (b) Calculate Juma's Pay As You Earn for June 2020. (5 marks)
- (c) In the month of July 2020, Juma's tax in the last band was Ksh. 2556. Calculate his net salary in July. (3 marks)

18. The table below shows the frequency distribution of the heights of 100 seedlings in a tree nursery.

Height (cm)	Number of seedlings (f)	Midpoint (x)	$d = \frac{x - 55.5}{10}$	fd	fd^2
1 – 10	3				
11 – 20	5				
21 – 30	8				
31 – 40	11				
41 – 50	12				
51 – 60	18				
61 – 70	20				
71 – 80	10				
81 – 90	7				
91 – 100	6				
	$\Sigma f = 100$			$\Sigma fd =$	$\Sigma fd^2 =$

(a) Complete the table (4 marks)

(b) State the modal class (1 mark)

(c) Calculate the mean and standard deviation (5 marks)

19. A farm is quadrilateral in shape with vertices at A, B, C and D such that B is 160 metres from A on a bearing of 090° . C is 140 metres from A on a bearing of 130° , and D is 260 metres to the west of C and on a bearing of 240° from A

(a) Sketch the relative positions of A, B, C and D. (1 mark)

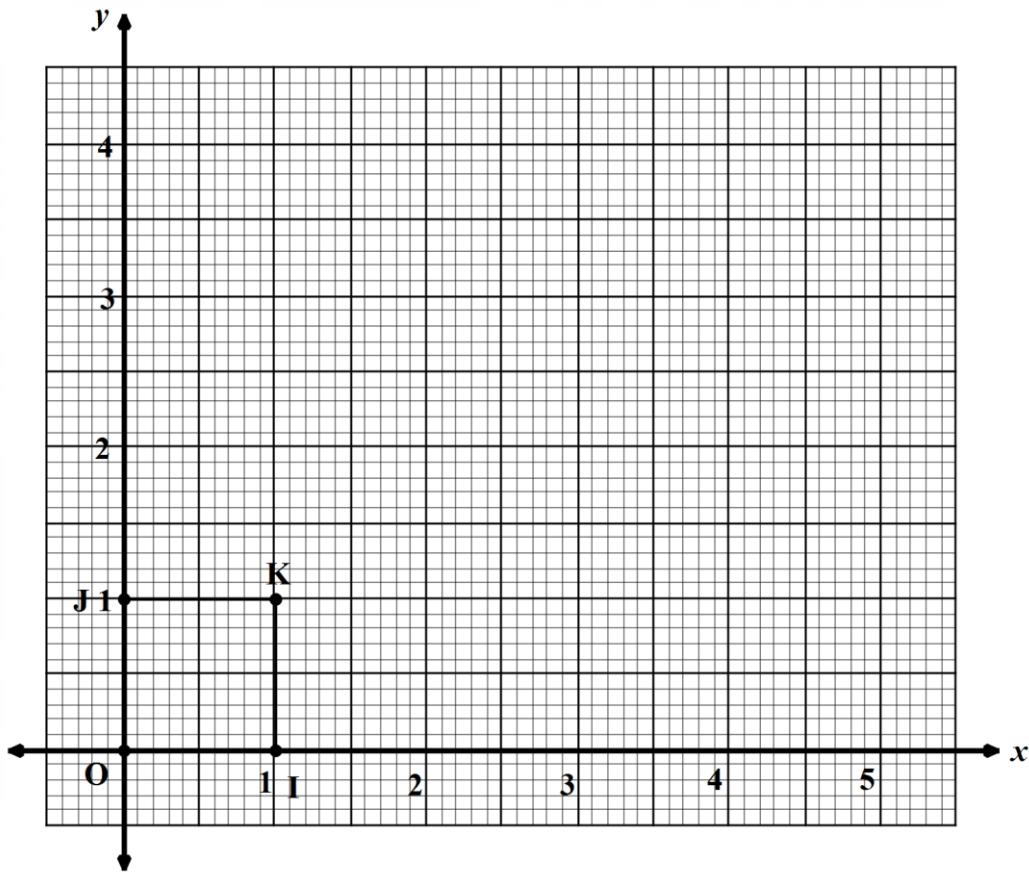
(b) Calculate:

(i) The distance BC, correct to 1 decimal place. (3 marks)

(ii) The bearing of C from D to the nearest degree. (3 marks)

(c) Find the area of the farm in hectares, correct to 3 significant figures. (3 marks)

20. The grid below shows the unit square OIKJ such that $O(0, 0)$, $I(1, 0)$, $K(1, 1)$ and $J(0, 1)$



(b) $O'I'K'J'$ is the image $OIKJ$ after a transformation M such that $O'(0, 0)$, $I'(4, 0)$, $K'(4, 1)$ and $J'(0, 1)$

- (i) On the same grid, draw $O'I'K'J'$ (1 mark)
(ii) Describe fully the transformation M. (3 marks)

- (iii) Find the matrix of M. (1 mark)

(c) $O''I''K''J''$ is the image of $O'I'K'J'$ under a transformation described by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & 4 \end{pmatrix}$

(i) Find the coordinates of $O''I''K''J''$

(2 marks)

(ii) On the same grid, draw $O''I''K''J''$

(1 mark)

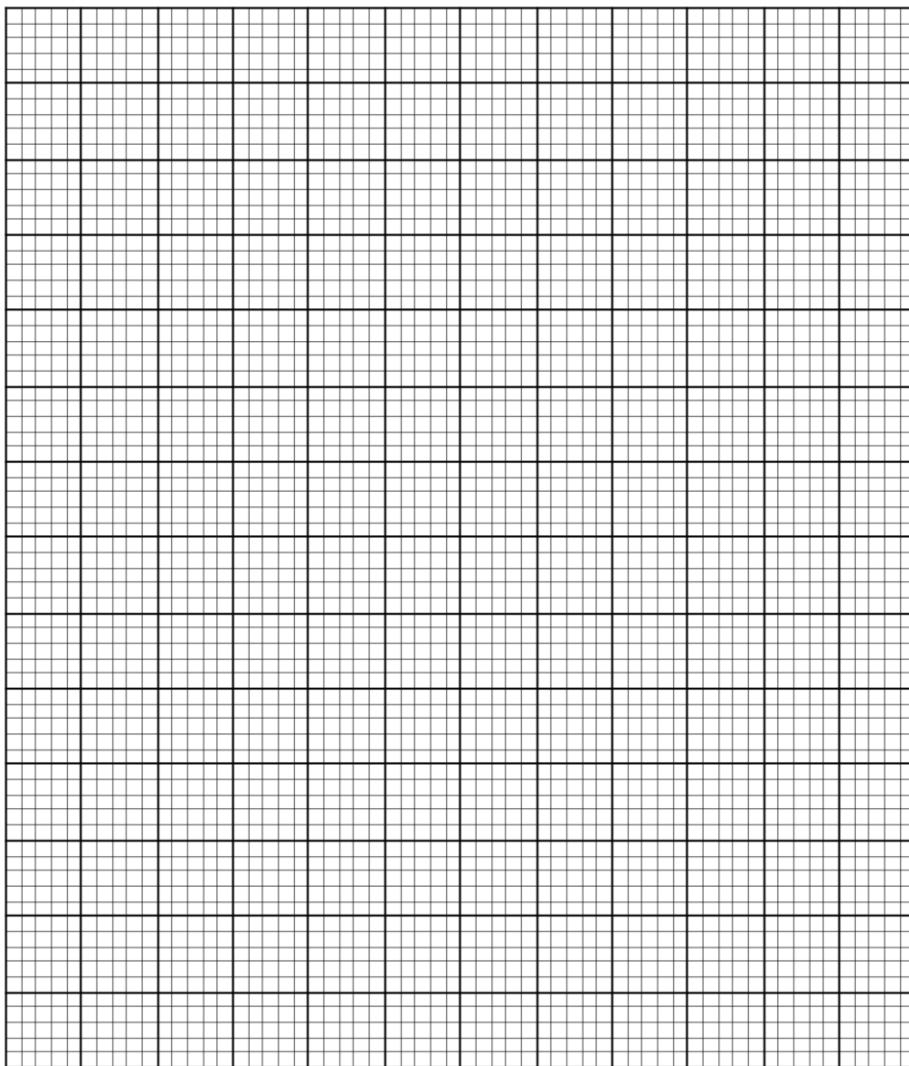
(d) Describe a single transformation that maps $OIKJ$ onto $O''I''K''J''$.

(2 marks)

21. (a) Complete the table given below for the functions $y = -3 \cos 2x$ and $y = 2 \sin (\frac{3}{2}x + 30)$ for $0^\circ \leq x \leq 180^\circ$ (2 marks)

x°	0	20	40	60	80	100	120	140	160	180
$-3 \cos 2x$	-3.00			1.50	2.82	2.82		-0.52	-2.30	
$2 \sin (\frac{3}{2}x + 30)^\circ$	1.00		2.00	1.73		0.00	-1.00			-1.73

- (b) Using the grid provided, draw the graphs of $y = -3 \cos 2x$ and $y = 2 \sin (\frac{3}{2}x + 30)$ for $0^\circ \leq x \leq 180^\circ$ on the same pair of axes. Take 1cm to represent 20° on the x – axis and 2cm to represent 1 unit on the y – axis. (5 marks)



- (c) From the graphs in (b) above, find;

(i) the period of $y = 2 \sin (\frac{3}{2}x + 30)^\circ$ (1 mark)

(ii) the values of x given that $2 \sin (\frac{3}{2}x + 30)^\circ + 3 \cos 2x = 0$ (2 marks)

22. Awuor was paid an initial salary of Kshs. 180000 per annum with a fixed annual increment. Wasonga was paid an initial salary of Kshs. 150000 per annum with a 10% increment compounded annually.

(a) Given that Awuor's annual salary in the 11th year was Kshs. 288,000, determine:

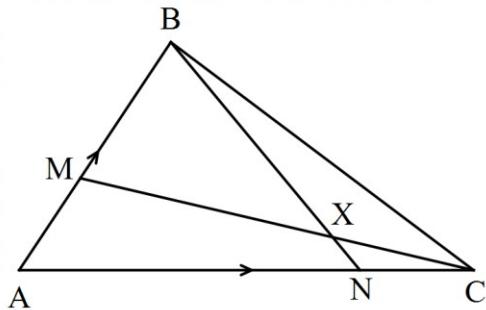
(i) Her annual increment. (2 marks)

(ii) The total amount of money Awuor earned during the 11 years. (2 marks)

(b) Determine Wasonga's monthly earning, correct to the nearest 10 shillings during the 11th year (3 marks)

(c) Calculate the number of years it will take Awuor's total earnings to be Ksh. 1022400. (3 marks)

23. In the triangle ABC shown below, $\mathbf{AB} = \mathbf{a}$ and $\mathbf{AC} = \mathbf{c}$. Point M lies on AB such that $AM: MB = 2: 3$ and point N lies on AC such that $AN: NC = 5: 1$. Lines BN and MC at X



(a) Express the following in terms of \mathbf{a} and \mathbf{c} :

(i) \mathbf{BN} ;

(1 mark)

(ii) \mathbf{CM} .

(1 mark)

(b) Given further that $\mathbf{BX} = h\mathbf{BN}$ and $\mathbf{CX} = k\mathbf{CM}$ where h and k are constants

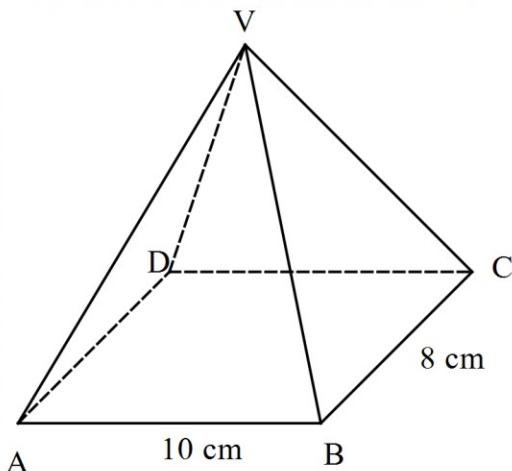
(i) Write two different expressions for \mathbf{AX} in terms of \mathbf{a} , \mathbf{c} , h and k .

(4 marks)

(ii) Hence find the values of h and k .

(4 marks)

24. The figure below shows a right pyramid VABCD standing on a rectangular base of length 10 cm and width 8 cm. The diagonals of the base intersect at O and M is the midpoint of BC. The vertical height OP of the pyramid is 12 cm and that all the slant edges are equal.



Calculate correct to 2 decimal places:

- (a) The length of VM, (2 marks)
- (b) (i) State the projection of VB on the plane ABCD. (1 mark)
- (ii) Calculate the angle VB makes with the plane ABCD. (3 marks)
- (c) The angle between planes VAD and ABCD. (2 marks)
- (d) The volume of the pyramid. (2 marks)

NAME ADM NO CLASS

121/1

MATHEMATICS ALT A
Paper 1
SEPTEMBER 2024

Candidate's signature

Date

TIME: 2 ½ HRS

POST MOCK JOINT EXAMINATIONS

POST MOCK 7

Kenya Certificate of Secondary Education

Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of the examination in the spaces provided above.
- (c) The paper contains **TWO** Sections: **Section I** and **Section II**.
- (d) Answer **ALL** the questions in Section I and **only five** questions from Section II.
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FOR EXAMINER'S USE ONLY

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

SECTION II

17	18	19	20	21	22	23	24	Total

Grand

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Total

Section 1 (50 marks)*Answer all the questions from this section*

- 1 Without using mathematical tables or a calculator, evaluate (3marks)

$$\frac{\frac{5}{6} \text{ of } \left(\frac{1}{3} - \frac{5}{6}\right)}{\frac{7}{12} \times \frac{3}{21} + 1\frac{5}{9} \div 2\frac{1}{3}}$$

2. A business woman bought two bags of maize at the same price per bag. She discovered that one bag was of high quality and the other of low quality. On the high quality bag she made a profit by selling at sh. 1040, whereas on the low quality bag, she made a loss by selling at sh. 880. If the profit was three times the loss, calculate the buying price per bag. (3marks)

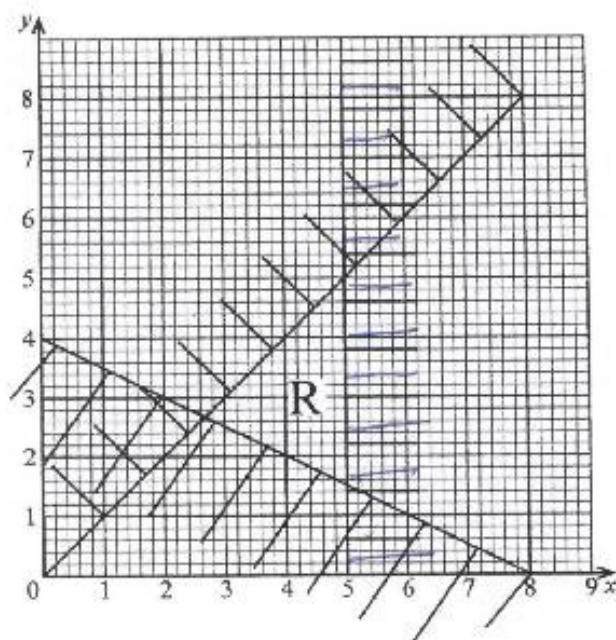
- 3 Given that $\mathbf{Q} = \begin{pmatrix} 3 & -1 \\ 1 & 2 \end{pmatrix}$ and $\mathbf{R} = \begin{pmatrix} 5 & 3 \\ 13 & 5 \end{pmatrix}$ and that $\mathbf{PQ} = \mathbf{R}$, find \mathbf{P}^{-1} (4marks)

- 4 An artisan has 81kg of a metal of density 9g/cm^3 . She intends to use it to make a cuboid with a square cross section whose side is 10cm. Calculate the length of the cuboid in centimeters. (3 marks)
- 5 Simplify $\frac{x - 4xy + x^2 - 4y}{4y^2 - x^2y - xy - 4xy^2}$ (3 marks)
- 6 The size of an interior angle of a regular polygon is 144° . Find the number of sides of the polygon and hence the sum of its interior angles. (3 marks)
- 7 The surface areas of two similar solid are 528cm^2 and 1188cm^2 . If the volume of the larger solid is 1350cm^3 , find the volume of the smaller sphere. (3 marks)

- 8 The quadratic curve $y = ax^2 + bx - 10$ intersects with the straight line $y = 2x - 5$ at the points A(-1, -7) and B(2.5, 0). Determine the values of a and b . (3 marks)

9 Evaluate $\frac{3^{n+3} - 3 \times 3^{n-1}}{4 \times 3^{n+2}}$ (3 marks)

- 10 In the diagram below, the region R is defined by three inequalities.



Write down the three inequalities. (3marks)

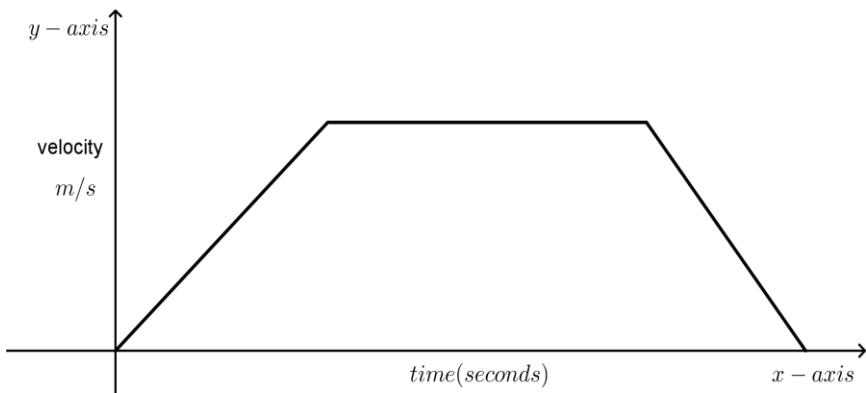
11 The coordinates of points P and Q are $(2, -1)$ and $(14, 7)$ respectively. Point T is the midpoint of line PQ. Determine the

- (a) The coordinates of T. (1 mark)

- (b) Equation of the perpendicular bisector of PQ. Leave your answer in the form

$$y = mx + c \quad (3 \text{ marks})$$

12 The diagram below shows the velocity – time graph for a particle moving in a straight line from point P to point Q, a distance of 168 metres. It starts from rest and accelerate uniformly for 5 seconds. It then travels at a constant speed for 10 seconds and finally decelerates uniformly for 3 seconds.



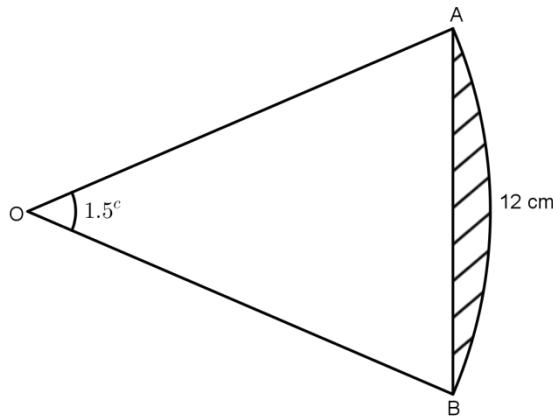
Calculate the maximum speed in km/h attained.

(3 marks)

13 In a commercial bank, customers may withdraw cash through one of the two tellers at the counter. On average, one teller takes 3 minutes while the other takes 5 minutes to serve a customer. If the two tellers start to serve the customers at the same time, find the shortest time it takes to serve 200 customers. (3 marks)

14 The area of the curved surface of a cone is 308cm^2 . The slant height of the cone is equal to its diameter. Determine the diameter of the cone. (3 marks)

- 15 The diagram below shows a sector AOB of a circle, centre O. $\angle AOB = 1.5^\circ$ radians and arc AB is of length 12cm.



- (a) Determine the radius OA of the circle. (1 mark)
- (b) Calculate the area of the shaded segment. Give your answer to 3 significant figures (2 marks)
- 16 A ship sails 22km from P on a bearing of 045° to R. From R, it sails a further 30km on a bearing of 095° to arrive at Q. Calculate the area bounded by P, R and Q in km^2 . (3 marks)

SECTION 2 (50 marks)
*Answer **only five** questions from this section*

17 Two friends Jane and Tom live 40km apart. One day Jane left her house at 9.00 a.m. and cycled towards Tom's house at an average speed of 15km/h. Tom left his house at 10.30a.m. on the same day and cycled towards Jane's at an average speed of 25km/h.

a) Determine:

(i) The distance from Jane's house to where the two friends met. (4 marks)

(ii) The time they met (2marks)

(iii) How far Jane was from Tom's house when they met. (2marks)

b) The two friends took 10 minutes at the meeting point and then cycled to Tom's house at an average speed of 12km/h. Find the time they arrived at Tom's house. (2marks)

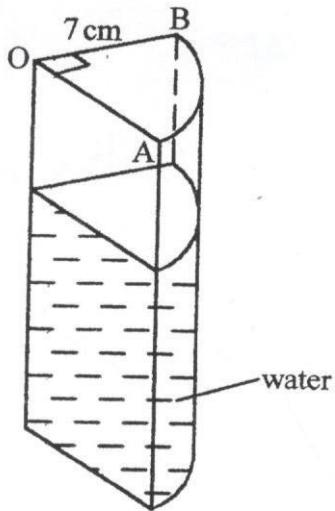
18 Betty and Joan entered into a business partnership in which they contributed sh 320 000 and sh 400 000 every year respectively. After one year, Kevin joined the business and contributed sh 240 000.

(a) Calculate the ratio of their investment after 3 years of business. (3marks)

(b) It was agreed that 30% of the profits after 3 years be used to cater for the costs of running the business, while the remaining would be shared proportionally. Calculate each persons share, if the profit made after 3 years was sh 561 000. (4 marks)

(c) If each of them re-invested their shares back in the business, find their new individual investments at the beginning of the fourth year. (3 marks)

- 19 The figure below shows a vessel in the shape of a prism. The cross section OAB, is a sector of a circle of radius 7cm and angle $\text{AOB} = 90^\circ$. The vessel contains 600cm^3 of water.



- (a) Calculate the:
- (i) The perimeter of the sector OAB (3 marks)
 - (ii) The height of the water in the vessel, correct to 1 decimal place. (3 marks)
- (b) Given that the vessel is $\frac{4}{5}$ full of water, calculate.
- (i) the height of the vessel, correct to one decimal place. (2marks)
 - (ii) The capacity of the vessel in litres (2marks)

20 A class of 50 pupils sat for a test. The following table shows the distribution of the scores.

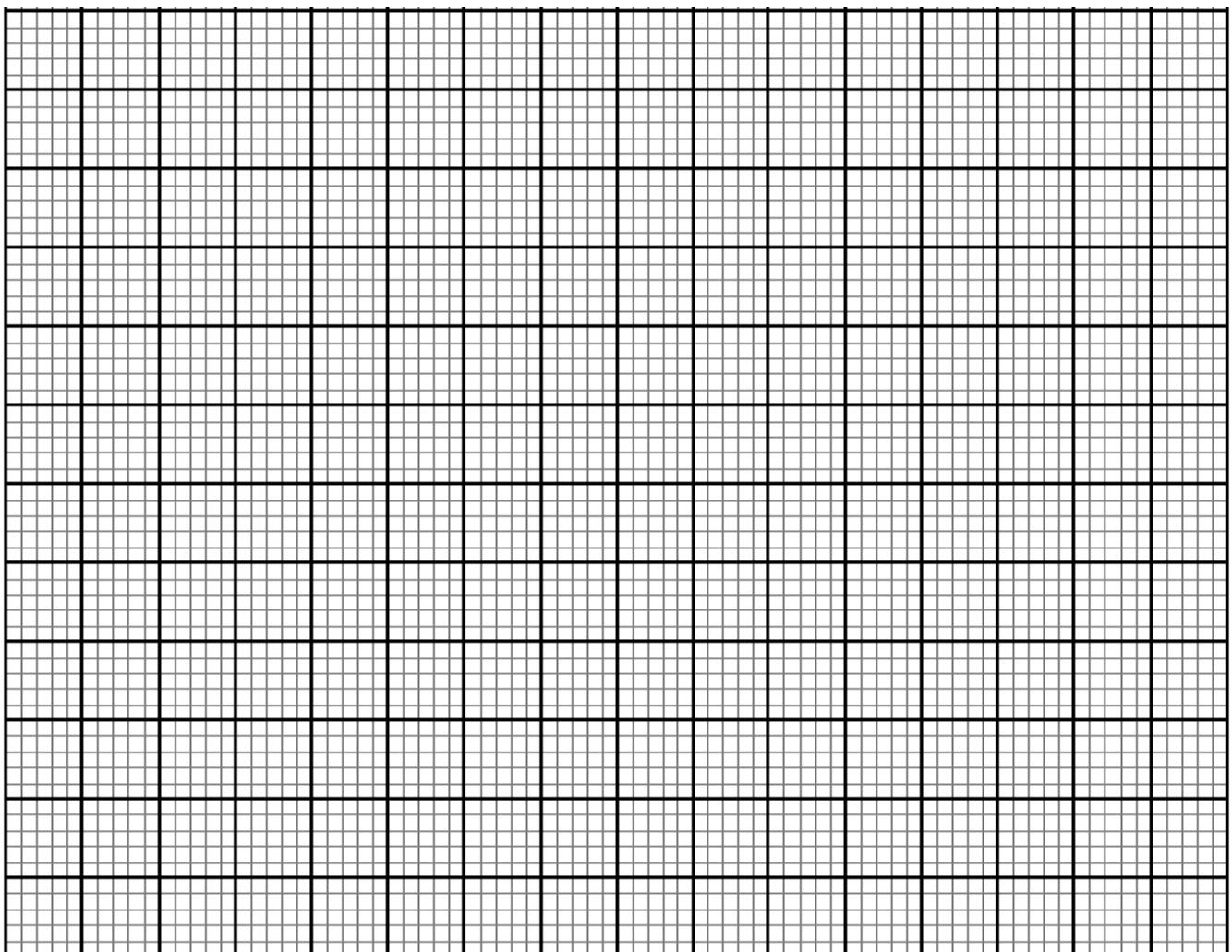
Score	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No. of pupils	6	7	8	10	9	6	3	1

(a) State the modal class. (1mark)

(b) Estimate the
i) Mean score (3marks)

ii) Median score (3marks)

(c) Draw a frequency polygon to represent the information above. (3marks)



21 A square floor is fitted with identical rectangular tiles. The length of the floor is 9.6 m.

The perimeter of each of the tiles is 220 cm. Each row (tile lengthwise) carries 20 less tiles than each column (tiles breadthwise). Taking x to represent the width of the tile,

(a) Write the expression in x the number of tiles on both row and column. (2 marks)

(b) Calculate the dimensions of the tiles. (4 marks)

(c) Find the number of tiles needed to cover the whole floor of the room. (1 mark)

(d) Find the cost of fitting, if the tiles are sold in dozen at sh 1500 per dozen and the labour cost is sh 300. (2 marks)

22 Town X is 1620m from a school A on a bearing 056° . Town Y is 1250m from the school A on a bearing of 185°. Town Z is 1620m from town X on a bearing of 152°.

(a) Make the drawing of a sketch of the positions of school A and towns X, Y, Z.

(2 marks)

(b) Find by calculation the distance of town X from Y to 1 decimal place. (3 marks)

(c) Calculate the bearing of

(i) X from town Y to 1 decimal place.

(3 marks)

(ii) Town Z from school A

(2 marks)

23 (a) Using a ruler and a pair of compasses only;

(i) Construct triangle ABC in which BC = 7cm, $\angle ABC = 105^\circ$ and $\angle ACB = 30^\circ$.

(3marks)

(ii) Drop a perpendicular from A to meet CB produced at T. (1mark)

(iii) Measure angle TAB (1mark)

(iv) Measure TA (1mark)

(b) The triangle ABC represents a farm drawn to scale of 1:500000. Find the area of the farm in ares. (5marks)

24 The velocity Vm/s of a vehicle at any time t seconds is given by the equation
 $V = t^2 - 4t + 5$.

a) Complete the table below: (2marks)

t	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8
v	2				2	3.25			10			21.25			37

b) Use mid-ordinate rule with seven strips to estimate the area enclosed by the curve $V = t^2 - 4t + 5$, the time – axis and the lines $t = 1$ and $t = 8$. (2marks)

c) Find the exact area of the region in (b) above (3marks)

d) Calculate the percentage error introduced by the use of mid-ordinate rule...in (b) above. (3marks)

**KCSE SMARTFOCUS HOMESTRECH CLUSTER EXAMS
(POST MOCKS).**

Featuring Kenya Certificate of Secondary Education (K.C.S.E.) 2024.

121/2

MATHEMATICS

Paper 2

ALT A

POST MOCK 7

Sept/Oct. 2024— $2\frac{1}{2}$ hours

NAME..... INDEX NUMBER.....

CLASS..... CANDIDATE'S SIGNATURE..... DATE.....

Instructions to candidates

- (a) Write your name and admission number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided.
- (c) This paper consists of two sections: **Section I** and **Section II**.
- (d) Answer all questions in **section I** and only five questions from **section II**.
- (e) Show all the steps in your calculations, giving the answers at each stage in the spaces provided below each question.
- (f) Marks may be given for correct working even if the answer is wrong.
- (g) Non-programmable silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.
- (h) This paper consists of 16 printed pages.
- (i) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- (j) Candidates should answer the questions in English.

For Examiner's Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

--

SECTION I (50 marks)

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

1. The expression $\mathbf{ax}^2 - 60x + 18$ is a perfect square, where \mathbf{a} is a constant. Find the value of \mathbf{a} .
(2 marks)

2. A rectangular plot of land has length of 125.8 m and an exact width of 84 m. Find the percentage error in calculating area of the plot *correct to 3 decimal place*. (3 marks)

3. Find the area of a sector of radius 10.5cm subtended by an angle of $\frac{1}{3}\pi^c$ at the center.(3 marks)

4. Without using a calculator or mathematical tables, evaluate;

$$\frac{\sin 45^\circ + \cos 30^\circ}{\tan 30^\circ}$$

(3 marks)

5. Simplify the logarithmic expression;

$$\frac{\frac{1}{2}\log 625 + \frac{1}{3}\log 125}{\log 100 - \frac{1}{2}\log 16}$$

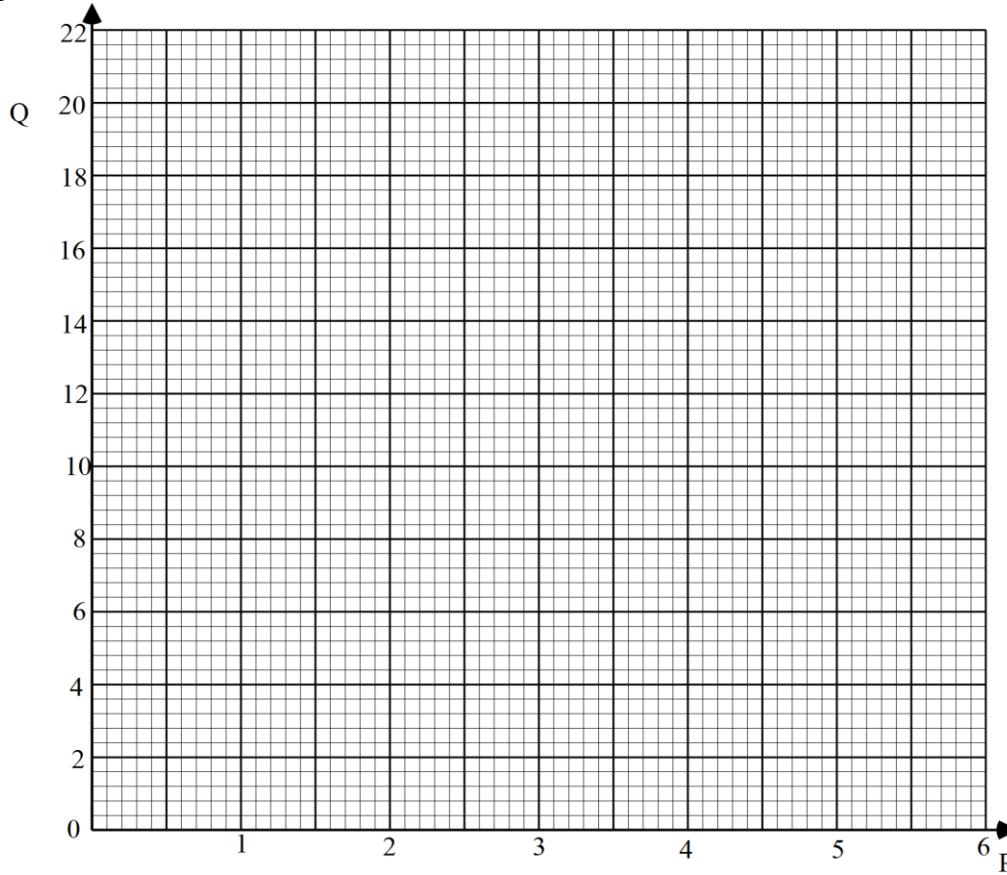
(3 marks)

6. A man who deposited Sh.50,000 in an investment account compounded semi-annually had at a total amount of Sh.70,925 after three years. Calculate the rate of interest per annum to the nearest whole number.
(3 marks)

7. A quantity P is partly constant and partly varies as the square of Q . If $Q = 2$ when $P = 9$ and $Q = 4$ when $P = 33$, find the value of P when $Q = 1.5$. (4 marks)
8. Expand $(3x - y)^4$ and simplify hence evaluate $(1.5 - 0.2)^4$. (4 marks)
9. A committee of 3 people is to be chosen randomly from 5 men and 3 women. If every gender must be represented in the committee, find the probability of choosing more women than men. (3 marks)
10. An inlet tap can fill an empty tank in 8 hours. It takes 12 hours to fill the tank when the inlet tap and an outlet tap are both opened at the same time. Calculate the time the outlet tap takes to empty the full tank when the inlet tap is closed. (3 marks)
11. The table below shows the relationship between the quantities P and Q .

P	0	1	2	3	4	5	6
Q	2.4	5.2	8.4	11.6	14.0	17.6	20.4

- (a) On the grid provided, draw a line of best fit. (2 marks)



- (b) Using the graph, find the law connecting P and Q . (1 marks)

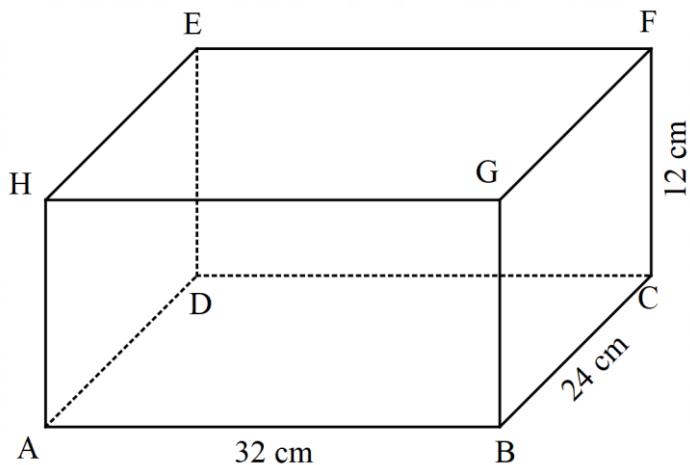
12. Solve the equation $8\sin^2x = 12\cos x$ for $0 \leq x \leq 360^\circ$. (4 marks)

13. In a transformation. An object with an area of 6 cm^2 is mapped onto an image whose area is 36 cm^2 . Given that the matrix of the transformation is $\begin{pmatrix} 4 & x-1 \\ 2 & x \end{pmatrix}$, find the value of x. (3 marks)

14. The gradient of curve at any given point is given by $2x^2 - 4$, given that the curve passes through $(1, 2)$, find the equation of the curve. (3 marks)

15. AB is a fixed line segment 6cm long. Point P moves on one side of the plane of AB such that $\angle APB$ is always 60° . Construct the locus of P. (3 marks)

16. The figure below represents a cuboid ABCDEFGH. AB = 32 cm, BC = 24 cm and CF = 12 cm.



Given that M is the mid-point of EF, calculate the angle between AM and plane ABCD, correct to 2 decimal places. (3 marks)

SECTION II (50 marks)

Answer only five questions from this section in the spaces provided.

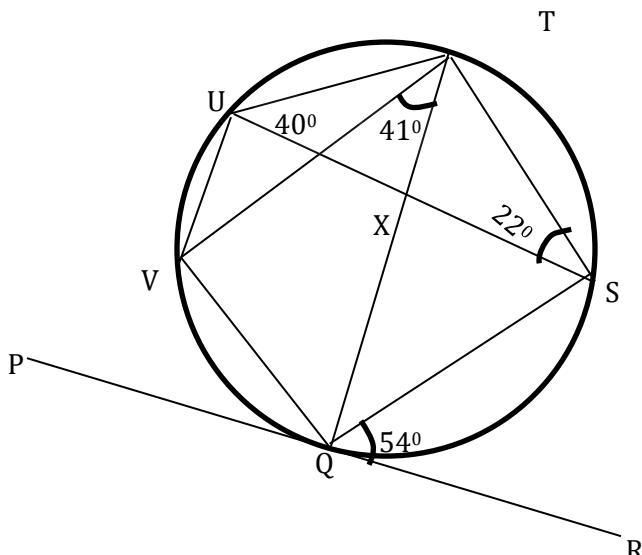
17. The table below shows income tax rates for the year 2023

Taxable Income in Kshs per month	Tax Rate (%) per month
1–15000	0
15001–27000	10
27001–37000	15
37001–45000	20
45001–50000	25
<i>Above 50000</i>	30

In November 2023, Silas earned a basic salary of Sh. 38 320. In addition, he was entitled to a house allowance of Sh. 12 800 per month and medical allowance of Sh. 6 850. He also has a non – taxable risk allowance of Sh. 5 000 per month. He contributes to a provident fund of Sh. 3 500. He also has tax relief of Sh. 1 480 monthly.

- (a) Calculate Silas' taxable income in that month. (2 marks)
- (b) Calculate Silas' Pay As You Earn (P.A.Y.E) for November 2023. (5 marks)
- (c) In the month of December 2023, Silas' tax in the last band was Sh. 2 556. Calculate his net salary in December. (3 marks)

18. In the figure below PQR is a tangent to the circle at point Q $\angle SQR = 54^\circ$, $\angle VTQ = 41^\circ$, $\angle UST = 22^\circ$ and $\angle SUT = 40^\circ$.



Giving reasons, find the value of

(i) $\angle PQV$

(ii) $\angle UVT$

(iii) $\angle PQT$

(iv) $\angle SUV$

(v) $\angle QXS$

19. (a) The first term of an Arithmetic Progression (AP) is 3. The sum of the first 6 terms of the AP is 78.

(i) Find the common difference of the AP. (2 marks)

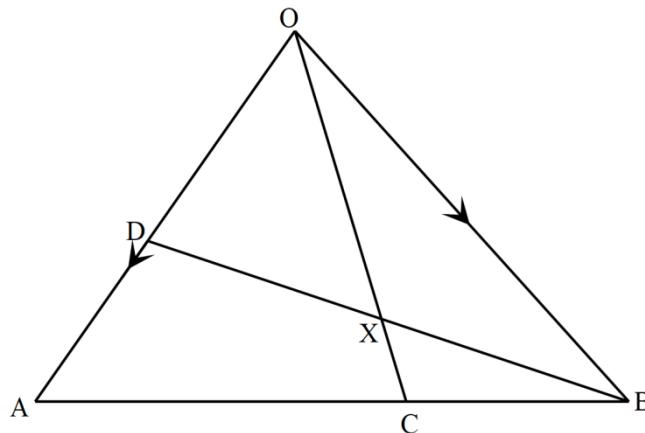
(ii) Given that the sum of the first n terms of the AP is 406, find n. (2 marks)

(b) The 2nd, 4th and 7th terms of another AP form the first three terms of a Geometric Progression (GP). If the common difference of the AP is 2, find;

(i) The first term of the GP; (4 marks)

(ii) The sum of the first 7 terms of the GP, to 4 significant figures. (2marks)

20. In the figure below C is a point on AB such that $\mathbf{BA} = 3\mathbf{BC}$ and D is the mid – point of OA. OC and BD intersect at X. Given that $\mathbf{OA} = \mathbf{a}$ and $\mathbf{OB} = \mathbf{b}$.



(a) Write down in terms of \mathbf{a} and \mathbf{b} the vectors;

(i) \mathbf{AB} (1 mark)

(ii) \mathbf{OC} (2 marks)

(iii) \mathbf{BD} (1 mark)

(b) If $\mathbf{BX} = h\mathbf{BD}$, express \mathbf{OX} in terms of \mathbf{a} , \mathbf{b} and h . (1 mark)

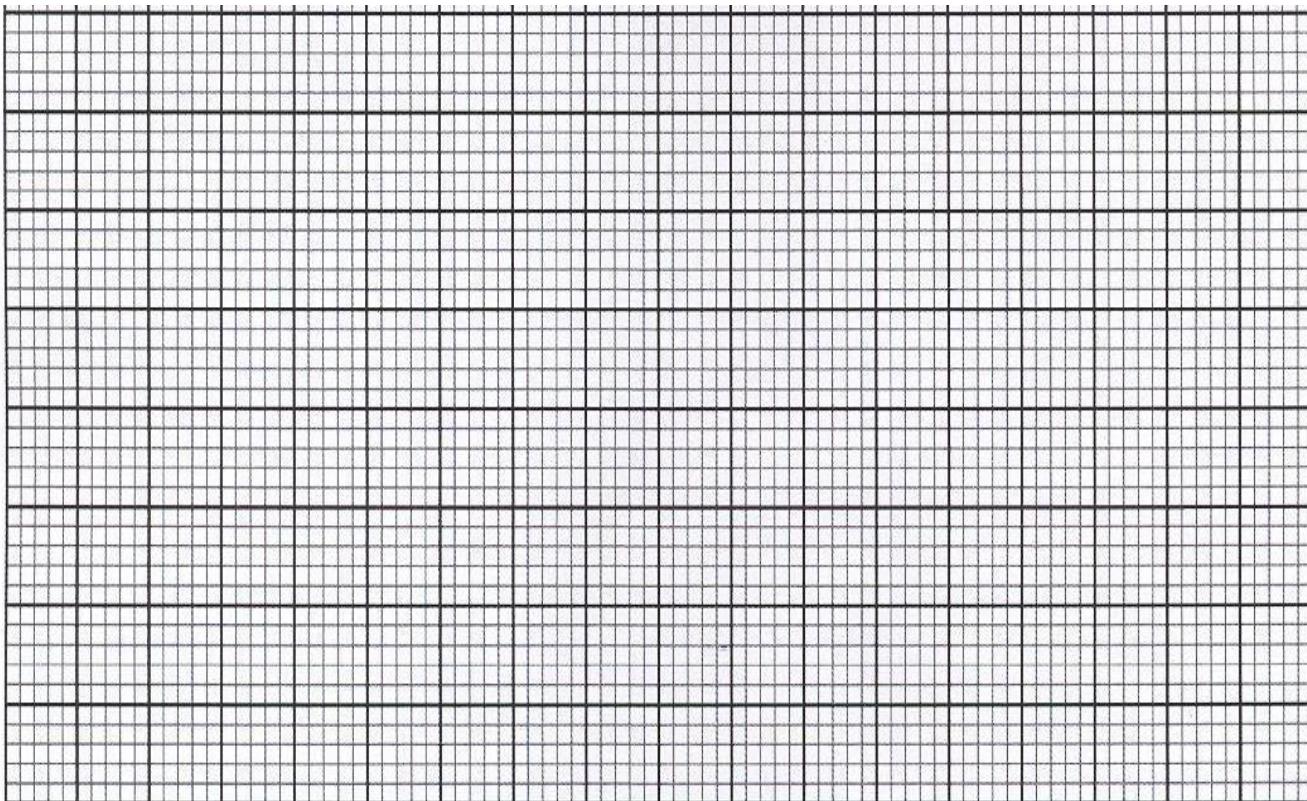
(c) If $\mathbf{OX} = k\mathbf{OC}$, find h and k . (3 marks)

(d) Show that B, X and D are collinear. (2 mark)

21. Triangle A'B'C' is the image of triangle ABC with vertices A(3,-1), B(1,3) and C(4,2) transformation represented by matrix $M = \begin{pmatrix} -0.6 & -0.8 \\ -0.8 & 0.6 \end{pmatrix}$

(a) Find the coordinates of triangle A'B'C'. (2 marks)

(b) (i) on the grid below draw Triangles ABC and A'B'C'. (2 marks)



(ii) describe fully the transformation M. (2 Marks)

(c) Triangle A''B''C'' is the image of triangle A'B'C' and a transformation represented by the matrix $N = \begin{pmatrix} 2 & -1 \\ -4 & 3 \end{pmatrix}$

(i) Find the coordinates of Triangle A''B''C'' and draw on the same axis.
(2 marks)

(ii) Determine a single matrix that maps triangle ABC onto triangle A''B''C''.
(2 marks)

22. The position of two towns P and Q are given as P(40°N, 10°W) and Q(40°N, 170°E). (use $\pi = \frac{22}{7}$, Radius of the Earth = 6371km).

(a) Find the difference in longitude between the two towns. (1 mark)

(b) Find the shortest distance from P to Q in Kilometres correct to two decimal places.
(2 marks)

- (c) (i) A ship sailed from town P towards town R which is directly east of P covering a distance of 2000km.
Determine the position of R. (3 marks)

- (ii) If the ship departed P at 2.00pm, sailing at an average speed of 150 knots, find the local time at R when the ship arrived. (4 marks)

23. The masses of 64 hybrid goats in a ranch in Laikipia were recorded as follows:

Mass in kg	15–19	20–24	25–29	30–34	35–39	40–44
No. of goats	9	12	21	15	5	2

- (a) On the grid provided, draw a cumulative frequency curve to represent the above information. (4 marks)

- (b) Use your graph to estimate:

- i) The median (1 mark)

- ii) The number of goats that were overweight if 36 kg is the recommended healthy weight. (2 marks)

- iii) The range of weight of the middle 40% of the goats. (3 marks)

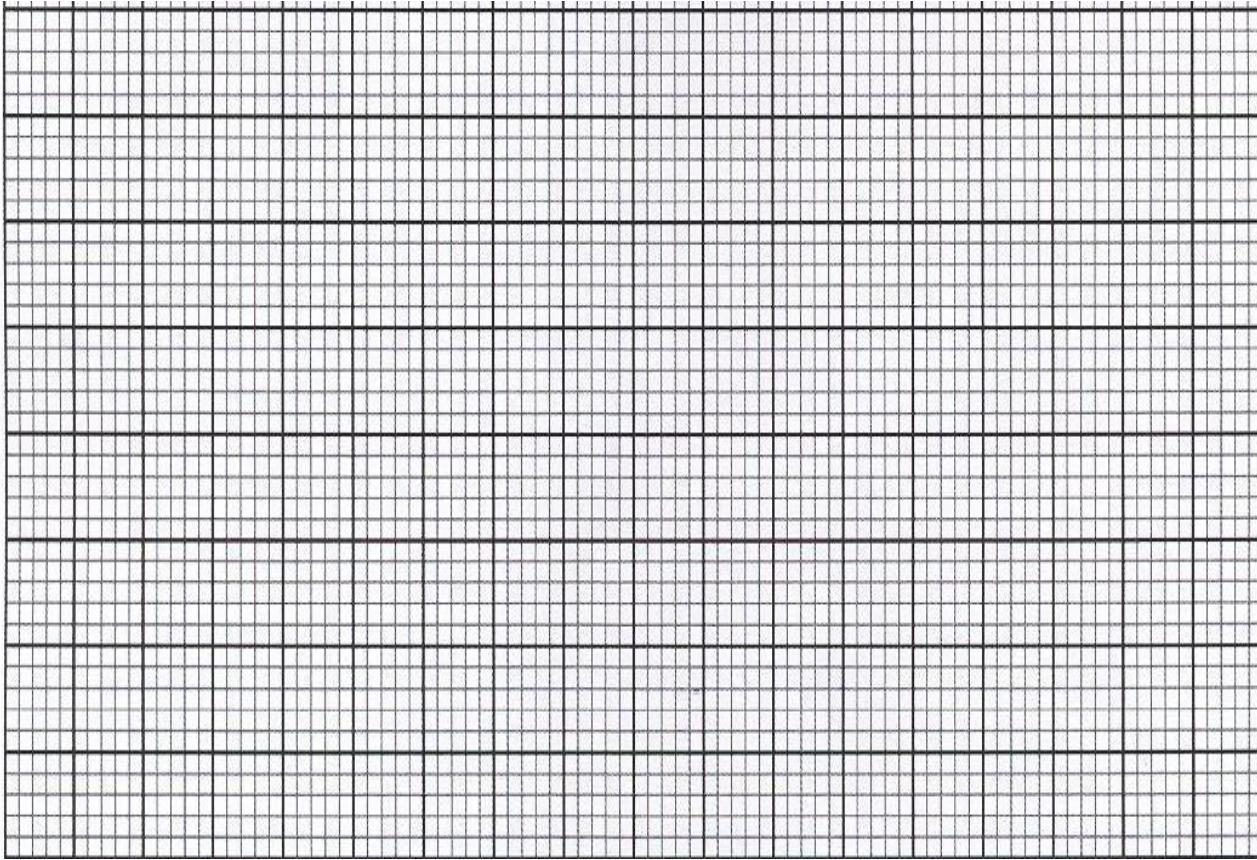
24. The dimensions of a rectangular flow of a proposed room are such that

- The length is greater than the width but at most twice the width
- The sum of the width and length is more than 4 meters but less than 10 meters

If x represents the width and y the length.

- (a) Write inequalities to represent the above information. (4 marks)

- (b) Represent the inequalities in (a) above on a linear programming diagram. (4 marks)



- (c) Using the integral values of x and y , list all the possible dimensions of the floor
hence find the maximum possible area of the floor. (2 marks)

SMARTFOCUS HOMESTRETCH CLUSTER EXAMS

POST MOCKS

Kenya Certificate of Secondary Education

121/1 MATHEMATICS (Alt. A)

Paper 1

POST MOCK 8

Name Adm. No..... Class

School Signature.....

Instructions to candidates

- a) Write your name, admission number and class in the spaces provided above.
- b) Write the name of your school and sign in the spaces provided above.
- c) This paper consists of two sections; **Section I** and **Section II**.
- d) Answer all the questions in **Section I** and only five questions from **Section II**.
- e) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.
- f) Marks may be given for correct working even if the answer is wrong.
- g) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.
- h) This paper consists of 15 printed pages.
- i) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

--

SECTION I (50 marks)

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

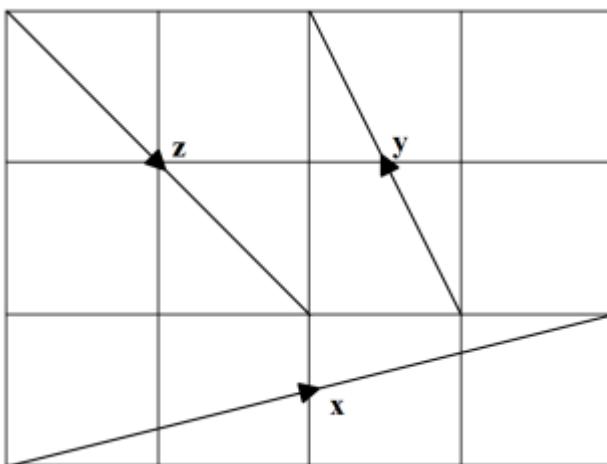
- 1 Given that $x = 403217 + 321860 \div 11$, find the total value of the second digit of x . (2 marks)
- 2 Mary sells goods worth Ksh 950 000. Her total commission was Ksh 45 000. If the commission on the first Ksh 50 000 was half that earned on the rest, find the two rates of commission. (3 marks)
- 3 A restaurant serves tea from an urn that can fill cups of capacities 300 ml, 360 ml or 450 ml exact number of times. Each cup of tea is sold at Ksh 100 for the 300 ml, Ksh 120 for the 360 ml and Ksh 150 for the 450 ml. Calculate the maximum revenue that can be collected if the urn is to have the least capacity. (3 marks)

- 4 An alloy of density 7 g/cm^3 is made from two metals A and B by mixing them in the ratio 3:2 by volume. Another alloy of density 5.5 g/cm^3 is formed by mixing the same metals in the ratio 3:7 by volume. Find the densities of A and B. (3 marks)

- 5 Solve the equation $\sin(5x - 15) - \cos(3x + 33) = 0$ hence find the exact value of $\tan(7x - 3)$.

(3 marks)

- 6 The vectors \mathbf{x} , \mathbf{y} and \mathbf{z} are represented on the grid below.



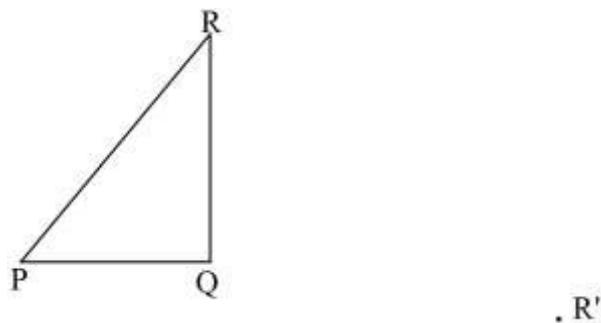
On the same grid, draw the vectors:

- (a) $\mathbf{x} + \mathbf{y}$ (2 marks)
 (b) $\mathbf{x} - \mathbf{z}$ (2 marks)

- 7 The interior angles of a hexagon are $4x$, $(5x-10)$, $6x$, $(7x-40)$, $8x$ and $(9x-10)$. Find the value of x hence determine the size of the largest interior angle. (3 marks)
- 8 Ali's rectangular plot is represented by an area of 252 cm^2 on map A and 700 cm^2 on map B. If the scale of map B is 1:30 000, find the scale of map A. (3 marks)
- 9 Solve the equation $3^{2x-1} + 9^x = 36$. (3 marks)

- 10** Kamau spends $\frac{1}{4}$ of his salary on school fees, $\frac{2}{3}$ of the remainder on food and $\frac{1}{5}$ of what is left on transport. He saves the balance. In a certain month, he saved Ksh 8 500. Calculate his salary. (3 marks)
- 11** A translation T maps a point $A(-2,1)$ onto $A'(-1, -3)$. Given that a point $B'(-4, 9)$ is the image of B under the translation T , find:
- The coordinates of B . (2 marks)
 - The distance between A and B . (2 marks)
- 12** Solve the inequality $x-3 \leq 3x+1 < x+13$ giving your answer as a combined inequality hence list all the integral values of x . (3 marks)

13 The figure below shows triangle PQR and a point R' , the image of R, under reflection in the line MM.



(a) Draw the line of reflection MM. (1 mark)

(b) Construct triangle $P'Q'R'$, the image of triangle PQR under reflection in the line MM. (2 marks)

14 A right – angled triangle has sides of lengths x cm, $(x - 2)$ cm and $(x + 2)$ cm . Calculate the value of x hence determine the perimeter of the triangle. (4 marks)

- 15 A solid comprises a cube ABCDEFGH of each side 2 cm and a square based pyramid EFGHV. The slant edges of the pyramid $EV = FV = GV = HV = 2$ cm. Draw the net of the solid. (3 marks)

- 16 The length of a minor arc of a circle of radius 7 cm is 8.8 cm. Calculate the area of the minor sector.

Take π to be $\frac{22}{7}$. (3 marks)

SECTION II (50 marks)

*Answer only **five** questions from this section in the spaces provided.*

- 17 ABC is an isosceles triangle in which AB = BC. The coordinates of A and B are $(-2,1)$ and $(6,-3)$ respectively and M is the mid-point of AB.

Given that the equation of AC is $x - 3y + 5 = 0$, find:

(a) The equation of CM in the form $y = mx + c$ where m and c are constants. (4 marks)

(b) The coordinates of C. (3 marks)

(c) The x and y intercepts of BC. (3 marks)

- 18 A conical flask comprises of a bottom in the shape of a frustum of a cone and a top in the shape of a cylinder. The base and top diameters of the frustum are 8.4 cm and 3.5 cm and the height of the frustum is 8.4 cm. The height of the cylindrical part is 5 cm.

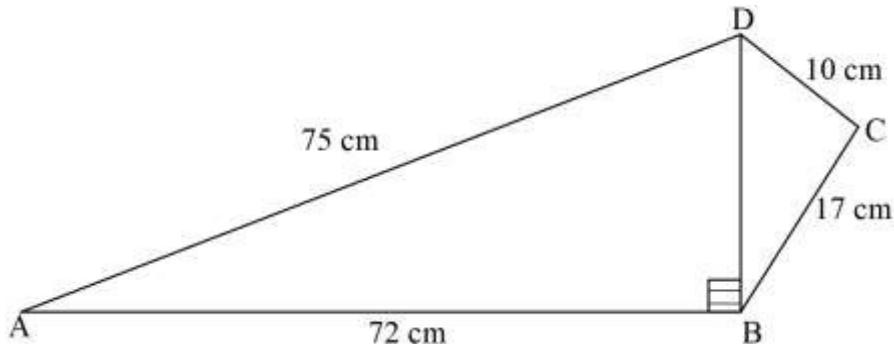
Taking π to be $\frac{22}{7}$,

(a) Calculate volume of water in the flask when filled to a height of 12.4 cm. (5 marks)

(b) Calculate surface of the flask in contact with water when the flask is filled to a height of 7.2 cm. (5 marks)

19 In the figure below ABCD is a quadrilateral. $AB = 72 \text{ cm}$, $BC = 17 \text{ cm}$, $CD = 10 \text{ cm}$ and $AD = 75 \text{ cm}$.

The size of angle $ABD = 90^\circ$.



(a) Calculate correct to 1 decimal place:

(i) The size of angle BCD.

(4 marks)

(ii) The size of angle ABC.

(3 marks)

(b) Calculate the area of the quadrilateral ABCD.

(3 marks)

20 ABCD is a trapezium in which $AB = 10 \text{ cm}$, $AD = 5 \text{ cm}$, $\angle DAB = 60^\circ$, $\angle ABC = 75^\circ$ and AB is parallel to DC.

(a) Using a ruler and a pair of compasses only;

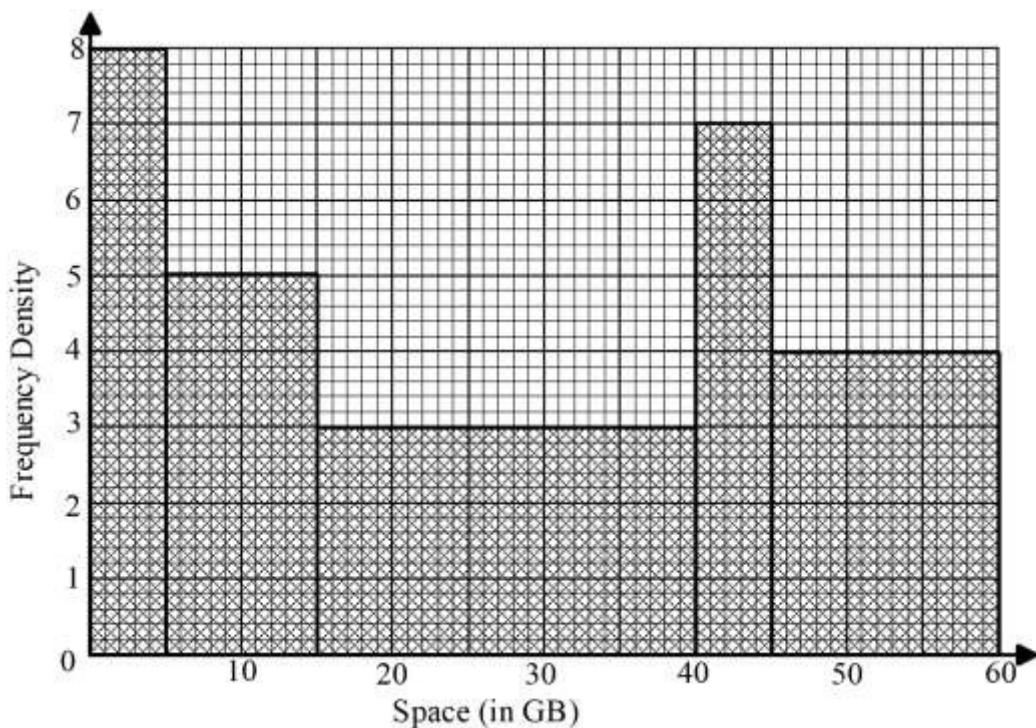
(i) Construct the trapezium. (4 marks)

(ii) Construct a circle centre O such that AB, AD and DC are its tangents. Measure the radius of the circle. (3 marks)

(b) Calculate to 1 decimal place, the area of the trapezium that lies outside the circle. Take π to be

3.142. (3 marks)

- 21 A school investigated how much space on its computers' hard drives is used for data storage. The results are shown below. It is given that 16 hard drives use less than 5GB for data storage.



- (a) Find the total number of hard drives represented. (3 marks)
- (b) Calculate the average space on its computers' hard drives. (4 marks)
- (c) Use the histogram above to estimate the median. (3 marks)

22 The distance between Nairobi and Mombasa is 500 km. A bus left Nairobi at 10.45 a.m. and travelled towards Mombasa at an average speed of 60 km/h. A matatu left Nairobi for Mombasa at 1.15 p.m. using the same route and on the same day at an average speed of 100 km/h.

(a) Calculate:

(i) The time of the day when the matatu overtook the bus. (3 marks)

(ii) The distance of the matatu from Mombasa when it overtook the bus. (2 marks)

(b) Both vehicles continue towards Mombasa at their original speeds.

(i) How far was the bus from Mombasa when the matatu arrived? (2 marks)

(ii) For how long did the matatu wait in Mombasa before the bus arrived? (3 marks)

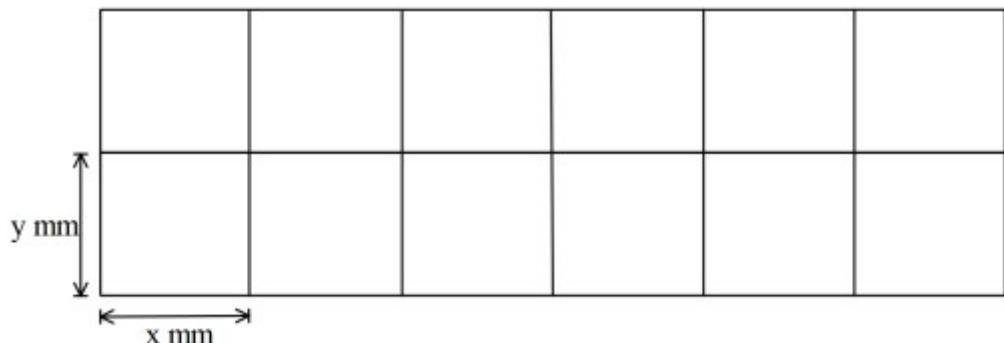
23 (a) Given that $\mathbf{A} = \begin{pmatrix} 2 & -5 \\ -1 & 3 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 4 & 6 \\ 1 & -1 \end{pmatrix}$, find the determinant of $\mathbf{A}^{-1}\mathbf{B}$. (4 marks)

(b) The cost of a Mathematics book in shop A is Ksh x and that of a Chemistry book is Ksh y . In shop B, the cost of a Mathematics book is 6% less of that in shop A while the cost of a Chemistry book is 5% more than that in shop A. Jane bought 5 Mathematics books and 4 Chemistry books from shop A and paid a total of Ksh 6 630. Dan bought 5 Mathematics books and 4 Chemistry books from shop B and paid a total of Ksh 6 549.

(i) Form a matrix equation to represent the above information. (2 marks)

(ii) Use matrix method to find the cost of a Mathematics book and that of a Chemistry book in shop A. (4 marks)

- 24 The shape shown below is a wire frame in the form of a large rectangle split by parallel lengths of wire into 12 smaller equal – sized rectangles.



- (a) Given that the total length of wire used to complete the whole frame is 1512 mm, find an expression in x for the area of the whole shape, $A \text{ mm}^2$. (4 marks)
- (b) Hence find:
- The values of x and y for which the area of the whole shape is a maximum. (4 marks)
 - The maximum area of the whole shape. (2 marks)

**KCSE SMARTFOCU HOMESTRECH CLUSTER EXAMS
(POST MOCKS)**

Kenya Certificate of Secondary Education

MATHEMATICS ALT. A

PAPER 2

SEPT/OCT. 2024

POST MOCK 8

Name Adm. No..... Class

School Signature.....

Instructions to candidates

- a) Write your name, admission number and class in the spaces provided above.
- b) Write the name of your school and sign in the spaces provided above.
- c) This paper consists of two sections; **Section I** and **Section II**.
- d) Answer all the questions in **Section I** and only five questions from **Section II**.
- e) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.
- f) Marks may be given for correct working even if the answer is wrong.
- g) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.
- h) This paper consists of 15 printed pages.
- i) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

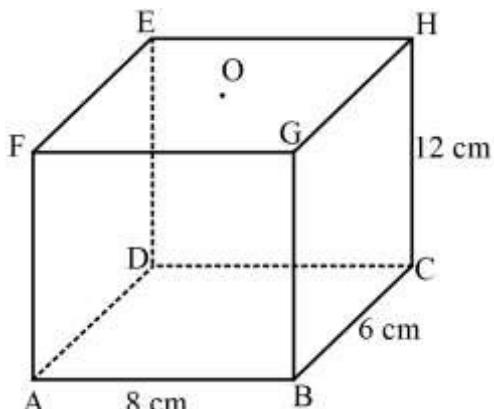
17	18	19	20	21	22	23	24	Total	Grand Total	

SECTION I (50 marks)

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

- 1 Nandi obtains an approximate value of 3.80×7.4 by rounding off the given values to the nearest whole numbers. Determine the percentage error in the calculation arising from the approximation. (3 marks)
- 2 Without using tables or calculators, express $\frac{\sqrt{3} + 4 \sin 30}{2 - \tan 60}$ in the form $a + b\sqrt{c}$. (3 marks)
- 3 Ayub bought Ugandan tea at Ksh 160 per kilogram, Kenyan tea at Ksh 200 per kilogram and Tanzanian tea at Ksh 140 per kilogram. He then mixed them in the ratio 2 : 5 : a respectively by mass. Find the value of a if the mixture was sold at a profit of 20% for Ksh 208.80. (3 marks)

- 4 ABCDEFGH is a cuboid in which $AB = 8 \text{ cm}$, $BC = 6 \text{ cm}$ and $CH = 12 \text{ cm}$. O is the centre of the plane FGHE.



Calculate:

- (a) The length of AO. (2 marks)

- (b) The size of angle AOC correct to 1 decimal place. (2 marks)

- 5 A circle centre O and diameter 16 cm has two parallel chords of length 11 cm and 12.6 cm such that the two chords are on opposite sides of the centre. Calculate the perpendicular distance between the two chords correct to 2 decimal places. (3 marks)

6 Solve for x in the equation $(\log_2 x)^2 + \log_2 4 = \log_2 x^3$. (3 marks)

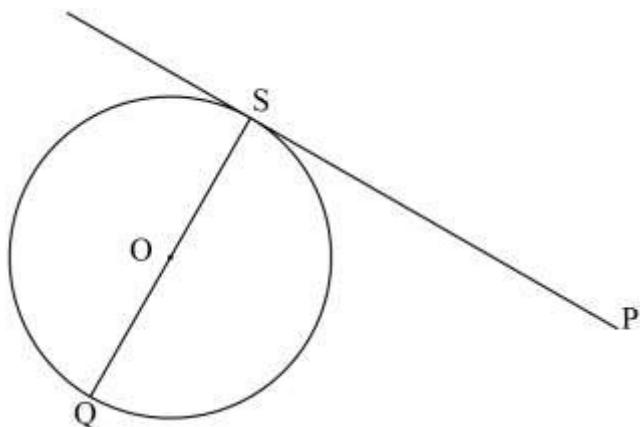
7 The x -intercepts of a cubic function are -2 , 1 and 2 . Given that the y -intercept of the function is -4 , find the equation of the function in the form $y = x^3 + ax^2 + bx + c$ where a , b and c are integers.

(3 marks)

8 Make q the subject of the formula $c = \frac{a}{p} - \frac{b}{q}$. (3 marks)

- 9 An aircraft flew due north from Nairobi (4 S, 37 E) at an average speed of 440 km/h for 4 hours 33 minutes to point Q. Find the location of Q. Take $\pi = \frac{22}{7}$ and the radius of the earth as 6 370 km.
- (3 marks)

- 10 In the figure below, PS is a tangent to the circle at S. O is the centre of the circle and QS is its diameter. Given that the equation of the circle is $x^2 + y^2 + 6x - 6y - 16 = 0$, and the gradient of PS is $-\frac{3}{5}$, find the equation of the diameter of the circle. (4 marks)



11 Find the independent term in the binomial expansion $\left(2x - \frac{1}{x}\right)^6$. (2 marks)

12 A farmer borrowed Ksh 180 000 from a bank which charged interest at a rate of 16% per annum compounded half yearly for 30 months. How much interest did he pay at the end of the period?

(3 marks)

13 A line segment AB is 6 cm long. Using a ruler and a pair of compasses only, shade a region Q on the upper side of AB that is bounded by the following loci: (3 marks)

- (a) The locus of R such that $AR > 4$ cm .
- (b) The locus of P such that $\angle APB \neq 20^\circ$.

- 14 Given that $\mathbf{Q} = \begin{pmatrix} 3 & 5 \\ 3 & 1 \end{pmatrix}$ and $\mathbf{I} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, find two possible values of k for which the determinant of $\mathbf{Q} - k\mathbf{I}$ is zero. (3 marks)

- 15 A hot water tap can fill a bath in 4 minutes while a cold water tap can fill it in 5 minutes. A drainage pipe can empty the full bath in 3 minutes. Find how long it would take to fill the bath if all three are left open. (3 marks)

- 16 Solve the equation $2 \cos^2 x + \sin x = 1$ for $0^\circ \leq x \leq 360^\circ$. (3 marks)

SECTION II (50 marks)

Answer only five questions from this section in the spaces provided.

- 17** The table below shows income tax rates for a particular year.

Taxable income (Ksh per month)	Percentage tax rate per Ksh
1–15 000	0
15 001–27 000	10
27 001–37 000	15
37 001–45 000	20
45 001–50 000	25
Above 50 000	30

Mr Njoroge earns a basic salary of Ksh 43 500, a house allowance of Ksh 12 000 and a commuter allowance of Ksh 4 500. Every month, he pays a premium of Ksh 5 000 towards a life assurance policy for which he receives tax relief of 15% of the premium paid. He also receives a personal relief of Ksh 2 400 every month.

(a) Calculate:

(i) The amount of taxable income in Ksh per month. (2 marks)

(ii) The amount of net tax paid by Mr Njoroge every month. (5 marks)

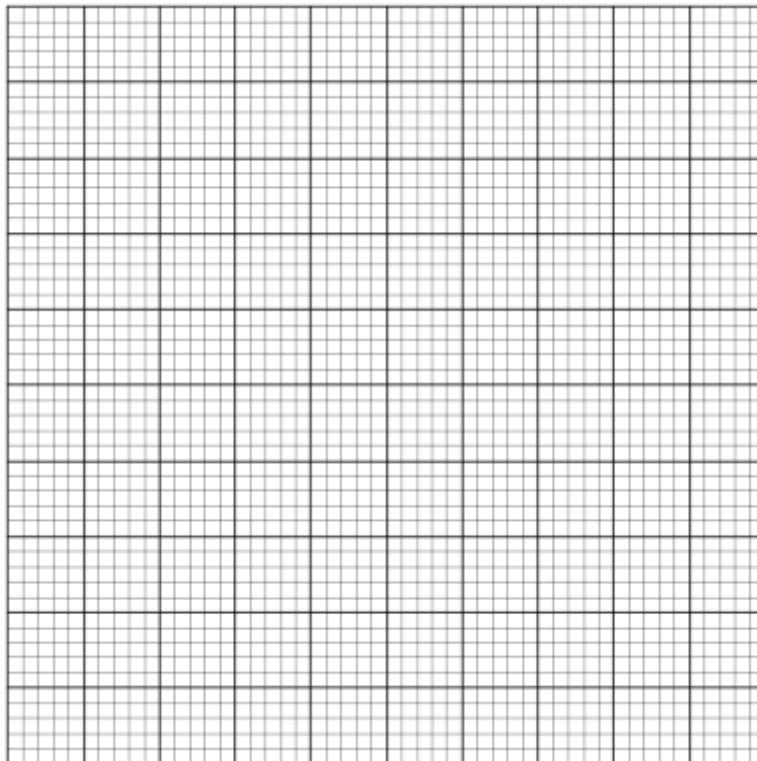
(b) If the tax rate in the first band is increased to 5% while the remaining rates for the subsequent bands remain unchanged, calculate the amount of tax that Mr Njoroge would pay. (3 marks)

18 The following distribution shows the masses to the nearest kilogram of 40 patients in a certain hospital.

Mass (Kg)	21–25	26–30	31–35	36–40	41–45	46–50	51–60
Frequency	1	4	9	12	8	5	1

(a) On the grid provided below, draw a cumulative frequency curve for the given information.

(3 marks)



(b) Using the curve in (a) above, determine:

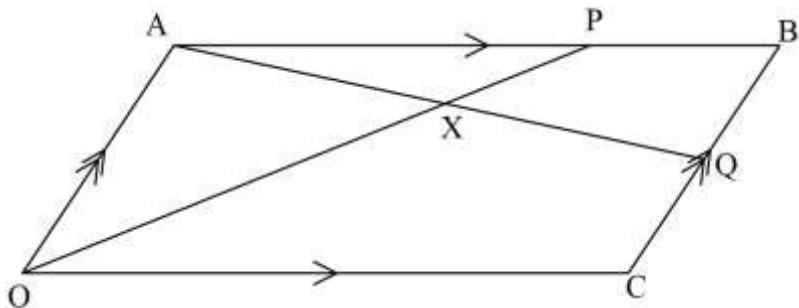
(i) The median. (1 mark)

(ii) Quartile deviation. (3 marks)

(iii) The percentage of patients whose masses are 38 kg and above. (3 marks)

- 19 In an arithmetic progression (A.P), the 4th term and the 9th term are 30 and 45 respectively.
- (a) Find the first term and the common difference of the A.P. (3 marks)
- (b) The second, sixth and twelfth terms of the above A.P are the first three consecutive terms of a geometric progression (G.P). Find:
- (i) The common ratio. (3 marks)
- (ii) The fourth term of the G.P. (2 marks)
- (iii) The sum of the first 5 terms of the G.P. (2 marks)

- 20 In the figure below, OABC is a parallelogram in which $\mathbf{OA} = \mathbf{a}$ and $\mathbf{OC} = \mathbf{c}$. $\mathbf{AP : PB} = 3 : 1$ and Q is the mid point of CB. \mathbf{AQ} and \mathbf{OP} intersect at X.



(a) Express the following vectors in terms of \mathbf{a} and \mathbf{c} .

(i) \mathbf{OP} (1 mark)

(ii) \mathbf{AQ} (2 marks)

(b) Given that $\mathbf{OX} = h\mathbf{OP}$ and $\mathbf{AX} = k\mathbf{AQ}$;

(i) Express \mathbf{OX} in two different ways. (2 marks)

(ii) Hence find the scalars h and k. (4 marks)

(c) State the ratio in which Q divides AX. (1 mark)

21 (a) Three quantities X, Y and Z are such that X varies directly as Y and inversely as the square root of Z. X = 120 when Y = 24 and Z = 36.

(i) Find the value of Y when X = 100 and Z = 225. (3 marks)

(ii) Find the percentage change in X if Y is increased by 20% and Z is increased by 21%.

(3 marks)

(c) The cost C of feeding n students in a school is partly constant and partly varies as the number of students. Feeding 80 students during a certain period costs Ksh 9 000 and feeding 130 students during the same period costs Ksh 11 500. Find the cost of feeding 200 students over the same period of time. (4 marks)

22 A bag contains 5 red balls, 3 blue balls and some green balls, all balls being similar in shape and size. The probability of picking a green ball is 0.5. Two balls are picked randomly from the bag, one at a time and with no replacement.

(a) Find the number of green balls in the bag. (2 marks)

(b) Draw a tree diagram to represent the information above. (2 marks)

(c) Using the tree diagram above, determine the probability that:

(i) Only one of the two balls picked is green. (3 marks)

(ii) Balls of the same type are picked. (3 marks)

23 Given that $y = 2\sin x$ and $y = \cos(x+10)$.

(a) Complete the table below correct to 2 decimal places.

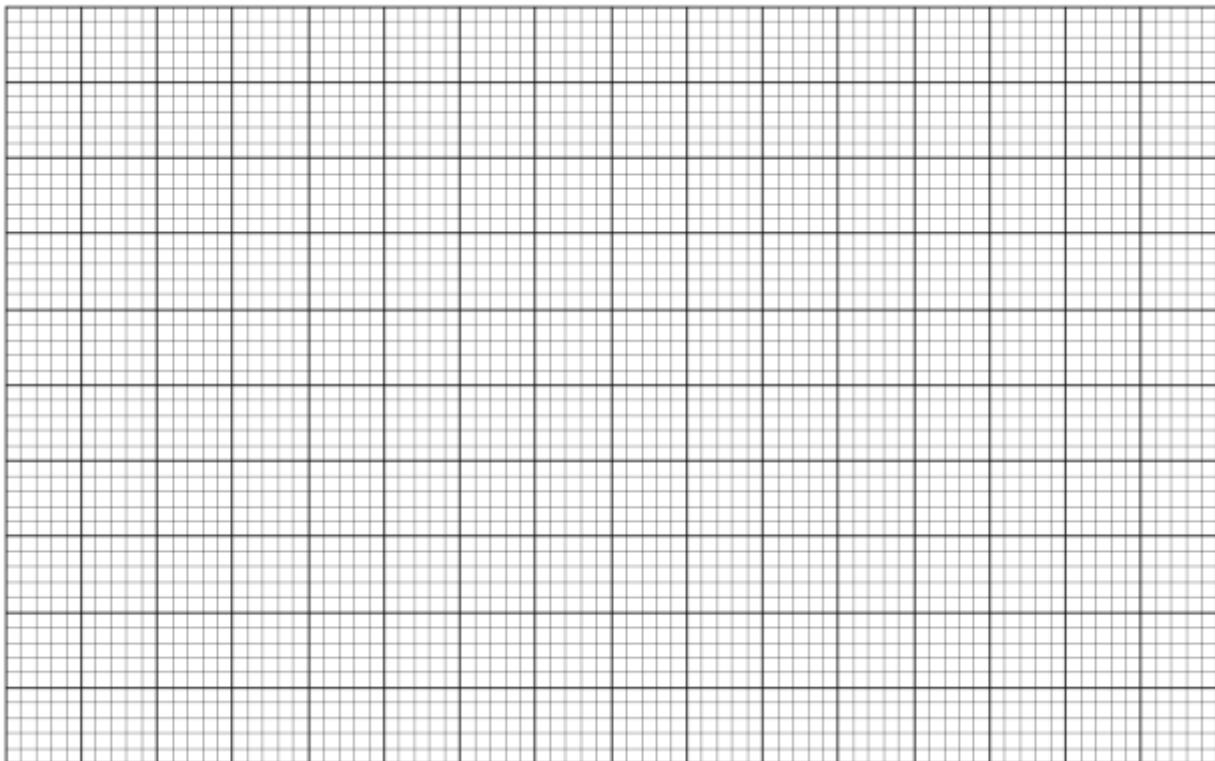
(2 marks)

x	0	30	60	90	120	150	180	210	240	270	300	330	360
$2 \sin x$	0		1.73			1	0		-1.73		-1.73		
$\cos(x+10)$	0.98			-0.17			0.98	-0.77			0.64		0.98

(b) On the same axes, draw the graphs of $y = 2\sin x$ and $y = \cos(x+10)$ for $0 \leq x \leq 360$. Use the

scale: 1 cm to represent 30 on the horizontal axis and 2 cm to represent 1 unit on the vertical axis.

(5 marks)



(c) Use the graphs in (b) above to find:

(i) The range of values of x for which $2\sin x \geq \cos(x+10)$.

(2 marks)

(ii) The period of $y = 2\sin x$.

(1 mark)

- 24 The points A' , B' and C are the images of $A(1,2)$, $B(4,2)$ and $C(4,6)$ respectively under transformation represented by a matrix $\mathbf{M} = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$.
- (a) Write down the coordinates of A' , B' and C . (3 marks)
- (b) A'' , B'' and C'' are the images of A' , B' and C respectively under another transformation whose matrix is $\mathbf{N} = \begin{pmatrix} 2 & -1 \\ 1 & 2 \end{pmatrix}$. Write down a single matrix that maps the points:
- (i) A , B and C onto A'' , B'' and C'' respectively. (3 marks)
- (ii) A'' , B'' and C'' onto points A , B and C respectively. (1 mark)
- (c) Calculate the area of a triangle whose vertices are points A'' , B'' and C'' . (3 marks)

Name Adm No Class

School Date Candidate's Signature.....

**KCSE SMARTFOCUS HOMESTRETCH CLUSTER EXAMS
(POST MOCKS)**
Kenya Certificate of Secondary Education
MATHEMATICS (Alt. A) – 121/1
SEPT/OCT 2024

POST MOCK 9

Instructions to candidates

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For Examiner's Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

--

SECTION I (50 marks)

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

1. A translation \mathbf{T} maps a point $P(-1,5)$ onto $P'(2,-3)$. Find the coordinates of another point Q whose image is $Q'(4,4)$ under \mathbf{T} . (3 marks)

2. AB and BC are two sides of a regular polygon. The size of angle CAB is 15° . Calculate the sum of the interior angles of the polygon. (3 marks)

3. A forex bureau in Nairobi buys and sells selected foreign currencies at the rates given in the table below.

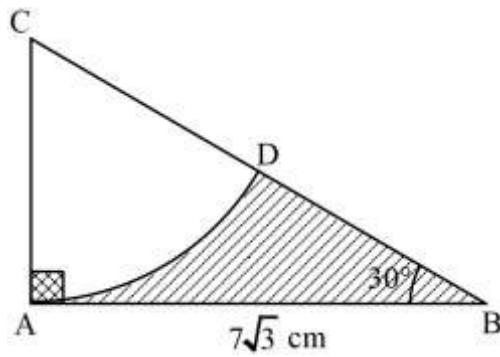
Currency	Buying (Ksh)	Selling (Ksh)
1 South African Rand	7.25	7.75
1 UAE Dirham	36.80	38.00

A tourist arrived in Kenya from South Africa with x South African Rand. He converted the whole amount into Kenya shillings through an agent that charged 2% commission. While in Kenya, he spent Ksh 1 192 890 and converted the balance into UAE Dirham. If he ended up with 62 095 UAE Dirham, find x . (3 marks)

4. A supermarket has 18 apples, 30 oranges and 54 mangoes. The fruits are to be arranged in rows such that each row contains the same number of fruits of each kind. Calculate the total number of fruits in each row for which the number of rows used is maximum. (3 marks)
5. Without using a calculator, solve for x in the equation $\left(\frac{1}{49}\right)^x \div (343)^{x-1} = \sqrt[3]{2401}$. (3 marks)
6. Three straight lines $L_1 : 2x + 3y + 5 = 0$, $L_2 : x - 2y - 8 = 0$ and L_3 intersect at point P. The line L_3 is perpendicular to L_2 . Determine the equation of line L_3 giving your answer in the form $y = mx + c$ where m and c are constants. (4 marks)

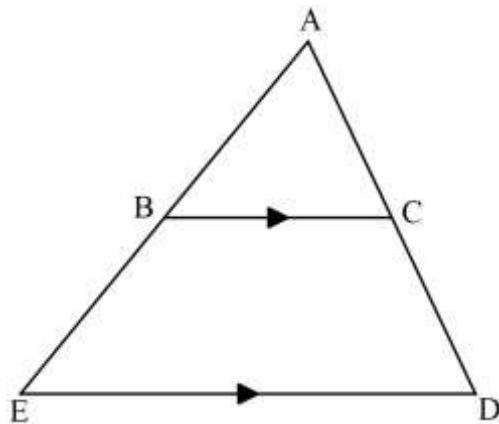
7. Solve $x - 3 \leq 3x + k < 2x + 9$ expressing your solution as a combined inequality, hence determine the sum of all the integral values of x in the solution. (3 marks)

8. In the figure below, ABC is a right triangle at A. $AB = 7\sqrt{3}$ cm and $\angle ABC = 30^\circ$. AD is an arc centre C.



Taking π to be $\frac{22}{7}$, calculate the area of the shaded region. Give your answer correct to 1 decimal place. (3 marks)

9. In the figure below, AED is a triangle and BC is parallel to DE.



Given that $AC:CD = 2:3$ and that the area of triangle ABC is 64 cm^2 , calculate the area of the quadrilateral BCDE. (3 marks)

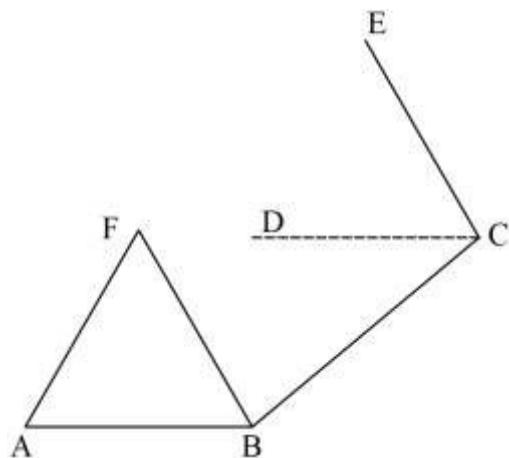
10. Given that $\frac{\sin(6x+10)}{\cos(3x+35)} = 1$, find the x hence determine the exact value of $\tan(12x)$. (3 marks)

11. A mother is eight times as old as son. In six years' time, the sum of their ages will be 48 years. How old was the mother when the son was born? (3 marks)

12. In a farm, the ratio of cows to goats is 1:3 and the ratio of cows to sheep is 3:5. The number of sheep is eight more than the number of cows. Find the number of goats in the farm. (3 marks)
13. Using a ruler and a pair of compasses only, construct a trapezium PQRS in which PQ is parallel to SR, $PQ = 10 \text{ cm}$, $PS = 6 \text{ cm}$, $SR = 5 \text{ cm}$ and $\angle QPS = 75^\circ$. Drop a perpendicular from R to meet PQ at X. Measure RX. (4 marks)
14. The position vector of A is $\mathbf{a} = 3\mathbf{i} + 9\mathbf{j}$. M(5, -1) is the midpoint of line AB. Find the magnitude of \mathbf{AB} correct to 2 decimal places. (3 marks)

15. After planning to buy a certain number of chairs for a total of Ksh 30 000, the price of each chair was lowered by Ksh 100. This enabled an hotelier to purchase 10 more chairs. Determine the number of chairs the hotelier bought. (3 marks)

16. The figure below part of the sketch of a triangular prism.



- (a) Complete the sketch by showing the hidden edges using broken lines. (1 mark)
(b) Draw the net of the prism. (2 marks)

SECTION II (50 marks)

*Answer **only five** questions from this section in the spaces provided.*

17. The distance between Busia and Kericho is 196 km. A matatu left Busia at 7.00 a.m. for Kericho at an average speed of 54 km/h. After 40 minutes, a van left Kericho for Busia using the same route at an average speed of 66 km/h. The two vehicles met in Kisumu.

(a) Calculate:

- (i) The time when the two vehicles met. (3 marks)

- (ii) The distance between Busia and Kisumu. (3 marks)

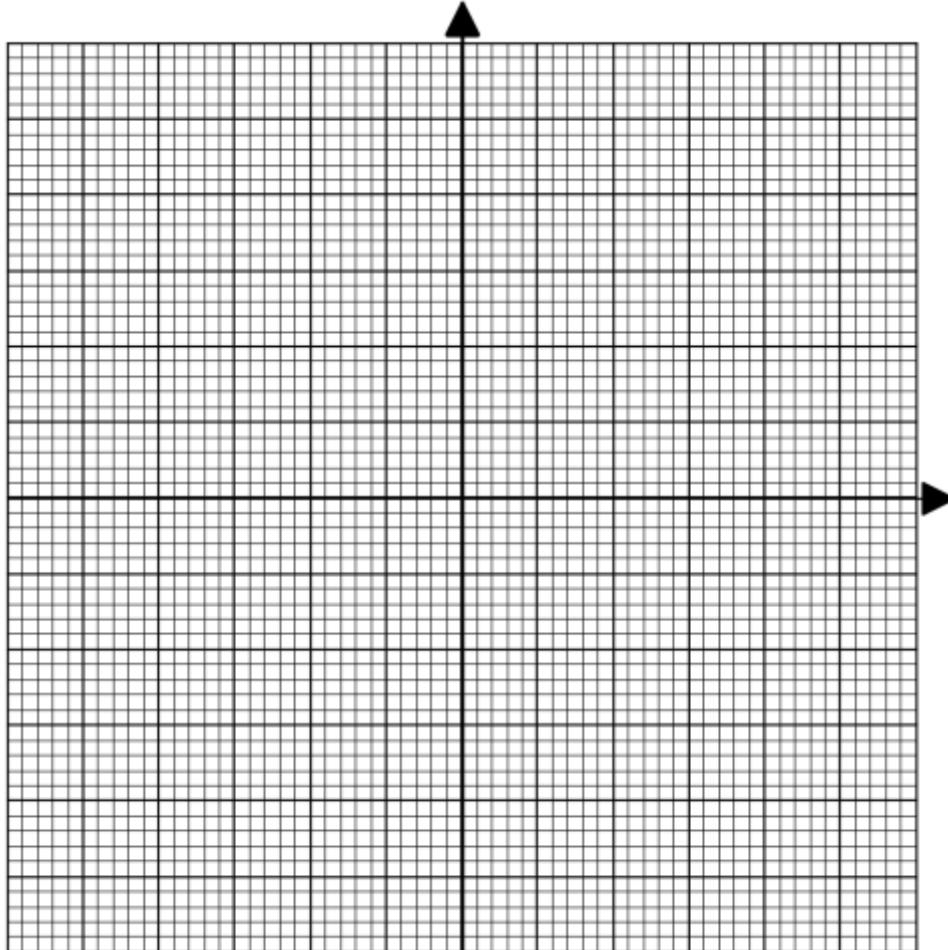
- (b) On the same day, a car left Busia for Kericho using the same route at an average speed of 90 km/h and caught up with the matatu at the same time as the van. Find:

- (i) The time when the car left Busia. (2 marks)

- (ii) The distance of the car from Kericho at 9.54 a.m. (2 marks)

18. The coordinates of the vertices of a triangle ABC are A (-5, -4), B (-3, -4) and C (-3, -2).

- (a) Triangle A'B'C' is the image of triangle ABC under an enlargement centre (-5, -6) and scale factor 2. On the grid provided below, draw triangles ABC and A'B'C'. (3 marks)



- (b) Triangle A'B'C' is rotated onto triangle A'B'C'' with vertices at A'(-6, 1), B'(-4, 1) and C'(-2, 2). ()

Triangle A'B'C'' is further mapped onto triangle A'B'C''' by a reflection in the line $y=1$.

- (i) Draw triangle A'B'C'' on the same grid hence describe the rotation that maps triangle A'B'C' onto triangle A'B'C''. (3 marks)

- (ii) Draw triangle A'B'C''' on the same axes. (2 marks)

- (c) Identify the type of congruency between the triangles:

- (i) A'B'C' and A'B'C''. (1 mark)

- (ii) A'B'C'' and A'B'C''' (1 mark)

19. (a) Find the value of P if the matrix $A = \begin{pmatrix} P & 2 \\ -3 & P+5 \end{pmatrix}$ is singular. (3 marks)

(b) A trader placed on display 8 shirts and 5 pairs of trousers valued at Ksh 49 600. If she reduced the number of shirts by 2 and increased the number of pairs of trousers on display by 2, the value of the items increases to Ksh 52 800.

(i) Taking x and y to be the prices of a shirt and a pair of trousers respectively, form a matrix equation to represent this information. (1 mark)

(ii) Determine the price of each item using matrix method. (4 marks)

(c) The trader sold each shirt at 20% profit and each pair of trousers at 25% profit. Calculate the percentage profit she made by selling a shirt and a pair of trousers. (2 marks)

20. A flower vase comprises of a cylindrical base and a frustum of a cone. The cylindrical base has a diameter of 21 cm and a height of 40 cm, while the upper part is a frustum of a cone with top diameter of 42 cm, bottom diameter of 21 cm and a slant height of 37.5 cm.

(a) Calculate the height of the vase. (3 marks)

(b) Taking $\pi = \frac{22}{7}$, calculate:

(i) The volume of the vase. (4 marks)

(ii) The area of water surface in the vase when filled to a height of 64 cm. (3 marks)

21. Four watchtowers A, B, C and D are such that A is 18 km from B on a bearing of S20 E , C is to the west of B and 20 km away, while D is south of C on a bearing of S60 E from A.

- (a) Using a scale of 1:400 000, draw a scale diagram showing the relative positions of A, B, C and D. (4 marks)

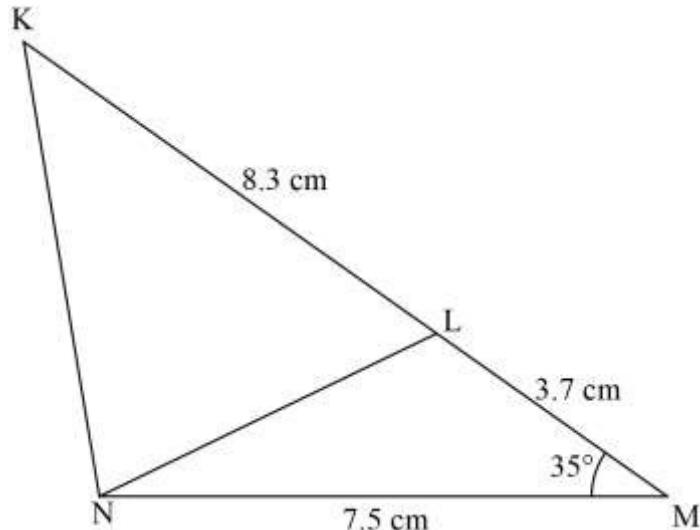
- (b) Using the scale drawing, determine:

(i) The distance between B and D. (2 marks)

(ii) The compass bearing of B from D. (1 mark)

- (c) A mast M is to be erected so that it is equidistant from B and C, and 20 km from D. On the same scale drawing, show the position of M and find its distance from A. (3 marks)

22. In the figure below, $KL = 8.3 \text{ cm}$, $NM = 7.5 \text{ cm}$, $LM = 3.7 \text{ cm}$ and $\angle KMN = 35^\circ$.



- (a) Calculate the area of triangle KLN correct to 1 decimal place. (2 marks)
- (b) Calculate correct to 1 decimal place:
- (i) The length of LN. (3 marks)
 - (ii) The size of the obtuse angle NLM. (3 marks)
 - (iii) The radius of a circle that passes through the points L, N and M. (2 marks)

23. The marks scored by 40 students in a test were recorded in the table below.

19	14	16	19	5	15	15	13	23	21	18	11	22	25	17	9	15	12	16	22
15	3	7	12	21	11	8	17	11	18	13	17	7	20	12	18	24	10	14	29

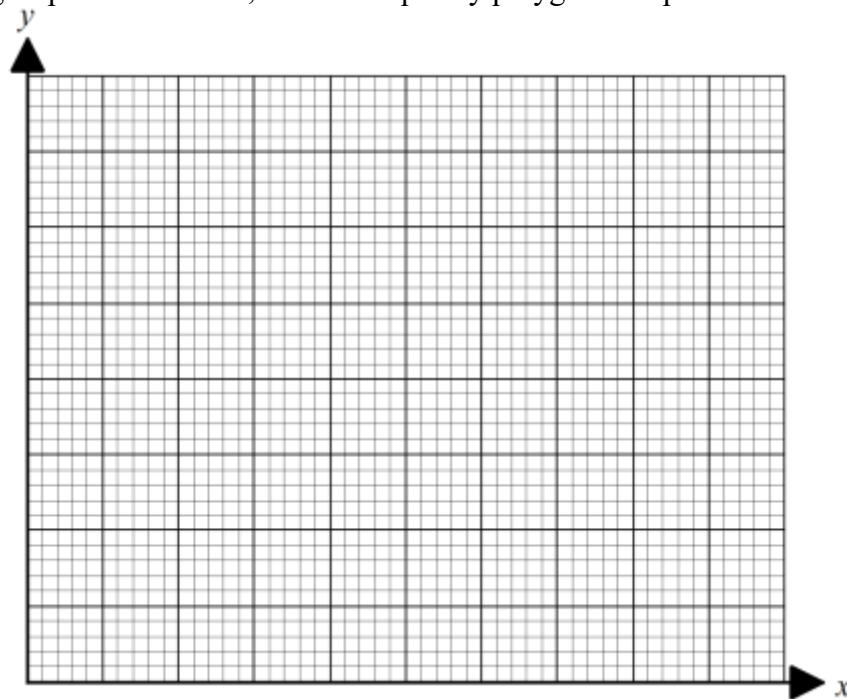
(a) Starting with 3 and using a class interval of 4, develop a frequency distribution table. (2 marks)

(b) Using the frequency distribution table in (a) above, calculate:

(i) The mean mark. (3 marks)

(ii) The median mark. (3 marks)

(c) On the grid provided below, draw a frequency polygon to represent the information. (2 marks)



24. A curve $y = x^3 + 4x^2 - 3x + k$ passes through a point A(-2, 9).

(a) Find the value of k. (2 marks)

(b) Find the equation of a tangent to the curve at point A. (3 marks)

(c) Determine:

(i) The stationary points of the curve. (3 marks)

(ii) The nature of each stationary point in (c) (i) above. (2 marks)

Name Adm No Class

School Date Candidate's Signature.....

KCSE SMARTFOCUS HOMESTRECH CLUSTER EXAMS (POST MOCK)

Kenya Certificate of Secondary Education

MATHEMATICS (Alt. A) – 121/2

Sept /Oct. 2024

POST MOCK 9

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

SECTION I (50 marks)

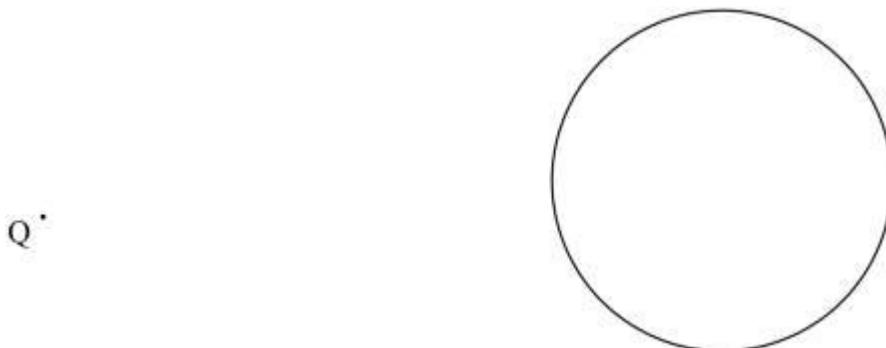
Answer all the questions in this section in the spaces provided.

1. Determine the percentage error when $2\frac{2}{13}$ is written as decimal and truncated to 4 significant figures. (3 marks)
 2. Given that $\sin 15^\circ = \frac{\sqrt{6} - \sqrt{2}}{4}$, simplify $\frac{1}{\cos 75^\circ}$. (3 marks)
 3. Make P the subject of the formula $\left(P + \frac{a}{b^2} \right)(b - c) = c$ and simplify your answer. (3 marks)

4. The expression $dx^2 - 56x + 16$ is a perfect square where d is a constant. Find the value of d.

(2 marks)

5. The figure below shows a circle and a point Q outside the circle.



Using a ruler and a pair of compasses only, locate the centre of the circle hence construct a tangent to the circle from Q. (4 marks)

6. Solve the equation $\log(x+3) - \log 160x = -2$.

(3 marks)

7. (a) Expand $\left(1 - \frac{1}{3}x\right)^6$ in ascending powers of x up to the 4th term leaving the coefficients as fractions in their simplest form. (2 marks)
- (b) Use your expansion in (a) above to estimate the value of $\left(\frac{9}{10}\right)^6$. (2 marks)
8. Given that $\mathbf{OA} = 3\mathbf{i} + 4\mathbf{j} - 7\mathbf{k}$ and $\mathbf{OB} = 9\mathbf{i} - 5\mathbf{j} - \mathbf{k}$ and that R divides AB externally in the ratio 5:2, determine the coordinates of R. (3 marks)
9. Triangle A'B'C' with vertices at A'(1, 1), B(8, 1) and C(10, 7) is the image of triangle ABC under transformation matrix $\begin{pmatrix} 2 & 3 \\ 5 & 4 \end{pmatrix}$. Find the area of triangle ABC. (3 marks)

- 10.** Tom calls Mary once each evening before he goes to bed. He calls Mary's mobile phone with probability 0.7 or her landline. The probability that Mary answers her mobile phone is 0.8, and the probability that she answers her landline is y . Given that Mary answers 74% of Tom's calls, find the value of y hence determine the probability that if Tom's call is not answered, then it is made to Mary's landline. (3 marks)

- 11.** The wave $2y = a \cos(bx - 20^\circ)$ has an amplitude of 2.5 and period of 1080 .

(a) Find the values of a and b . (2 marks)

(b) State the phase angle of the wave. (1 mark)

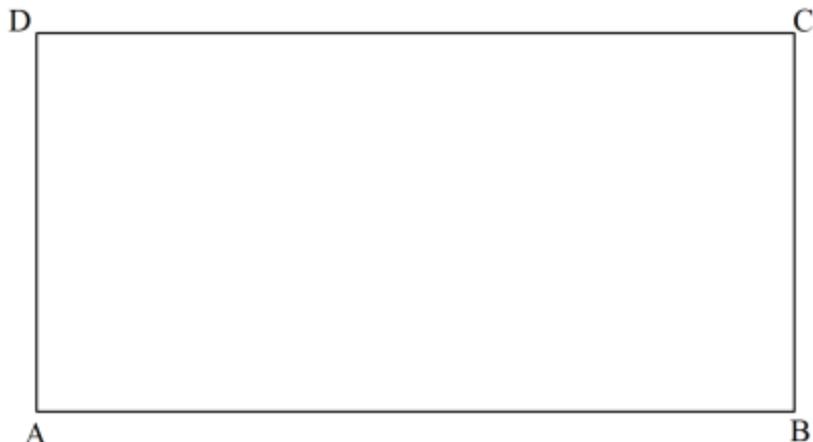
- 12.** The deviations d from the mean \bar{x} of the set of data x are given below:

x	15	18	m	23	24	m 6	28	30
d	-8	-5	y	0	1	-y	5	7

(a) Find the value of m and y . (2 marks)

(b) Calculate the mean absolute deviation of the data. (2 marks)

13. The figure below represents a rectangular garden ABCD.



The owner wants to plant flowers inside the garden. Each flower, F, must be closer to the edge DC than to the edge AB and angle AFB must be obtuse. Shade the region F within which the flower may be planted. (3 marks)

14. The cash price of a freezer is Ksh 87 600. A customer opts to buy the freezer on hire purchase terms by paying a deposit of Ksh 27 600. Determine the monthly rate of compound interest charged on the balance if the customer is required to repay by 9 equal monthly instalments of Ksh 9 500 each.

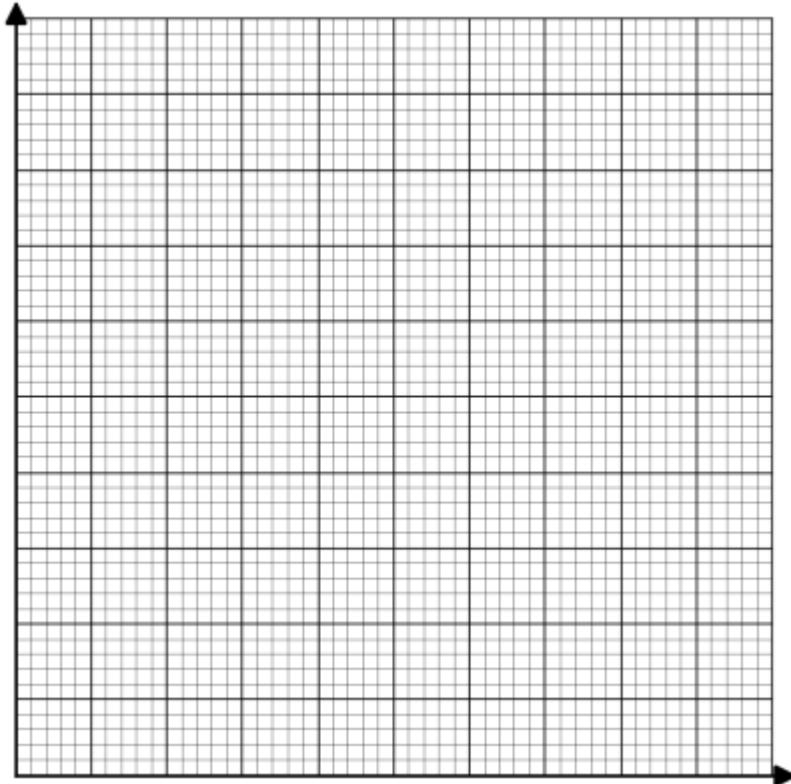
(3 marks)

15. The diameter of a circle centre O has its ends at A(-6, -2) and B(2, 4). Find the equation of the circle in the form $x^2 + y^2 + ax + by + c = 0$ where a, b and c are integers. (3 marks)

16. In an experiment involving two variables, time (t) hours and height (h) cm, the following results were obtained.

Time (t) hours	0	0.7	1.5	2.2	2.9	3.4	3.9
Height (h) cm	80	65	50	38	22	12	2

- (a) On the grid provided below, plot (t, h) where t is time and h is the height. (1 mark)



- (b) Use the plotted points to draw a line of best fit for the data and hence determine the rate of change of height with respect to time. (2 marks)

SECTION II (50 marks)

Answer only five questions from this section in the spaces provided.

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

Monthly taxable income in Kenya shillings	Tax rate percentage (%) in each shilling
Under Ksh 13 165	10%
From Ksh 13 165 but under Ksh 22 741	15%
From Ksh 22 741 but under Ksh 32 317	20%
From Ksh 32 317 but under Ksh 41 893	25%
Ksh 41 893 and above	30%

- (a) During the year, Oundo's monthly income was:

Basic Salary Ksh 53 840, House Allowance Ksh 13 200 and Commuter Allowance Ksh 8 000.

Calculate;

- (i) Oundo's monthly taxable income. (1 mark)

- (ii) Total income tax charged on Oundo's monthly income. (4 marks)

- (b) Oundo's net monthly tax was Ksh 15 486.40. Determine the monthly tax relief allowed.

(1 mark)

- (c) A proposal to expand the size of the first income tax band by 25% while retaining the size of the next three bands was made. The tax rates would remain as before in each band. Using the proposal, calculate:

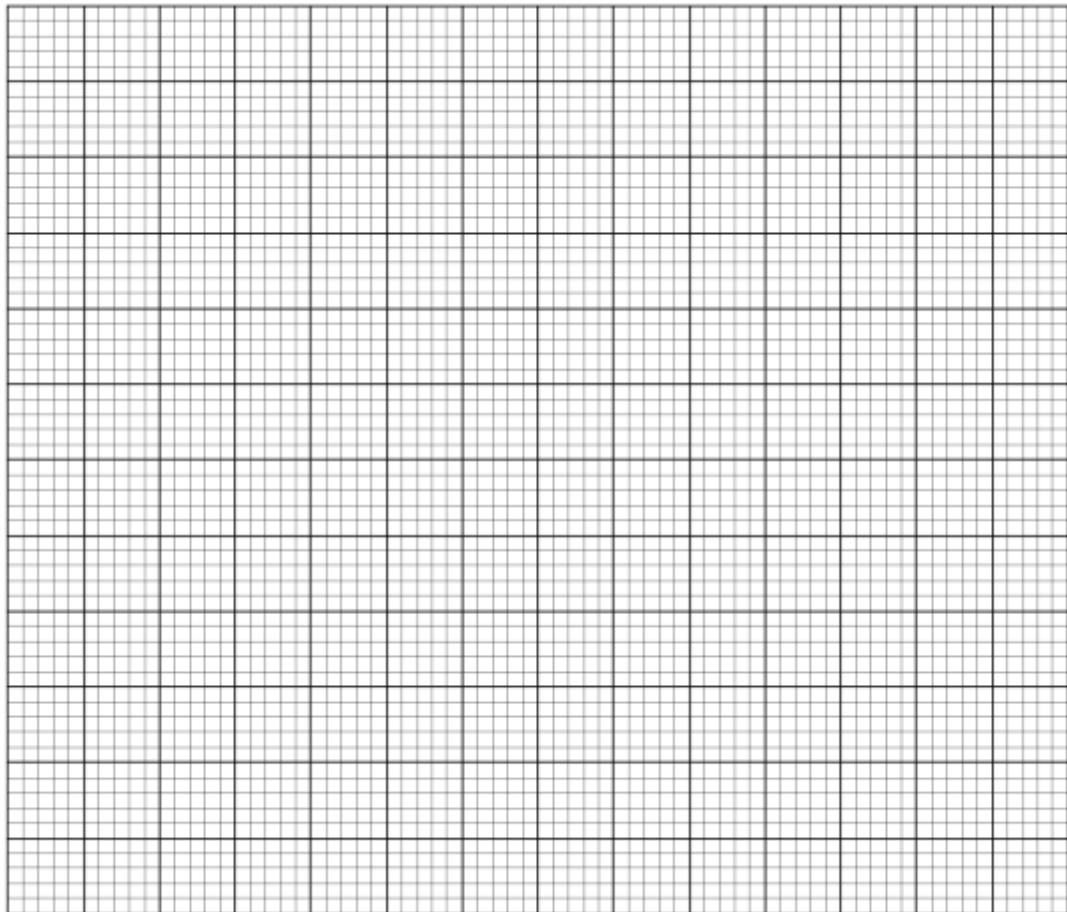
- (i) The tax Oundo would pay in the first band. (1 mark)

- (ii) The tax Oundo would pay in the last tax band. (3 marks)

18. The table below shows scores by sixty candidates in a Mathematics test.

Marks	0–9	10–19	20–29	30–39	40–49	50–59	60–69
No. of candidates	3	5	9	12	15	10	6

- (a) On the grid provided, draw an ogive to represent the above information. (4 marks)



- (b) Use the graph to:

- (i) Estimate the semi – interquartile range. (3 marks)

- (ii) Determine the percentage of students that passed the test if the pass mark was set at 34 marks. (3 marks)

19. An aircraft took off from point D(30° S, 5° W) at 0218 hours local time. It flew a distance of 2002 km due east to another point F(30° S, 31° E). After a stopover of 15 minutes at point F, the aircraft took off and flew for 5 hours 30 minutes due north to point H. The aircraft maintained an average speed of 455 km/h for the journey from D to F and also from F to H.

(a) Taking $\pi = \frac{22}{7}$ and the radius of the earth to be 6370 km, calculate the:

(i) Position of point F (3 marks)

(ii) Position of point H (3 marks)

(b) Determine the local time at point H when the aircraft arrived. (4 marks)

20. The first, fourth and nineteenth terms of an increasing arithmetic progression (A.P) corresponds to the first three consecutive terms of an increasing geometric progression (G.P). If the first term of each progression is 3, the common difference of the A.P is d and the common ratio of the G.P is r ;

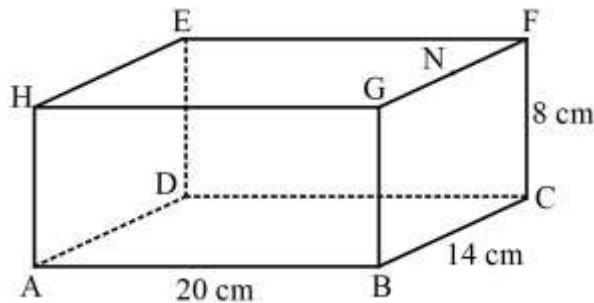
(a) (i) Give two equations involving d and r . (2 marks)

(ii) Find the values of d and r . (3 marks)

(b) Determine the sum of the first 20 terms of the A.P. (2 marks)

(c) Determine the greatest number of terms for G.P that would give a sum less than 292 968. (3 marks)

21. The figure below represents a cuboid ABCDEFGH in which $AB = 20 \text{ cm}$, $BC = 14 \text{ cm}$ and $CF = 8 \text{ cm}$. N is the midpoint of GF.



Calculate correct to 1 decimal place:

- (a) The angle between BC and HD. (2 marks)
- (b) The angle between line AF and plane ABCD. (3 marks)
- (c) The angle between AND and ABCD. (2 marks)
- (d) The obtuse angle between the planes ABFE and CGHD. (3 marks)

22. An organic animal feed dealer mixes maize silage with millet silage in the ratio 3:2. A bale of 10 kg of maize silage costs Ksh 600 and a bale of 10 kg millet silage costs Ksh 900.

(a) Determine the cost of 1 kg of the mixture. (3 marks)

(b) The dealer sells the mixture at a profit of 20% after allowing the customer a discount of 10% on the marked price. Calculate the marked price per kilogram. (3 marks)

(c) The feed dealer blended the mixture with another compound A in the ratio 5:4 in order to improve the quality of the mixture. The compound A cost him Ksh 1 500 per 5 kg tin.

Calculate:

(i) Price per kilogram of the resultant mixture. (2 marks)

(ii) New ratio of maize and millet silage in the resultant mixture. (2 marks)

23. (a) A quantity Q varies directly as the square of P and inversely as the cube root of R. Given that $Q = 15$ when $P = 6$ and $R = 27$, find P when $Q = 81$ and $R = 125$. (3 marks)

- (b) The square of a quantity m varies partly as the square of t and partly as cube of r. Given that $m = 27$ when $t = 3$ and $r = 5$, and $m = 78$ when $t = \sqrt{114}$ and $r = 10$;
- (i) Find the formula connecting m, t and r. Hence, find the positive value of m when $t = 8$ and $r = 15$. (4 marks)
- (ii) Find the percentage change in r when m and t are each decreased by 10%. (3 marks)

24. The vertices of a triangle PQR are $P(-3,2)$, $Q(4,3)$ and $R(x,y)$. A transformation matrix \mathbf{M} maps triangle PQR onto triangle $P'Q'R'$ whose vertices are $P'(-8,6)$, $Q(5,9)$ and $R(6,-12)$.

(a) Find the:

(i) Matrix \mathbf{M} . (3 marks)

(ii) Coordinates of R. (1 mark)

(b) Triangle $P'Q'R''$ is the image of triangle $P'Q'R'$ under a shear with y -axis invariant and $P'(-8, 6)$ is mapped onto $P''(-8, 30)$.

Determine the:

(i) Shear matrix. (2 marks)

(ii) Coordinates of Q'' and R'' . (2 marks)

(iii) The single matrix which maps triangle $P'Q'R''$ onto triangle PQR. (2 marks)

**KCSE SMARTFOCU HOMESTRECH CLUSTER EXAMS
(POST MOCKS)**

Kenya Certificate of Secondary Education

MATHEMATICS ALT. A

PAPER 1

SEPT/OCT. 2024

Name: Index No:

School: Signature:

POST MOCK 10

Instructions to candidates

- a) Write your name and Index number in the spaces provided above.
- b) Write your class, date of examination and sign in the spaces provided above.
- c) This paper consists of two sections; **Section I** and **Section II**.
- d) Answer all the questions in **Section I** and only five questions from **Section II**.
- e) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.
- f) Marks may be given for correct working even if the answer is wrong.
- g) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.
- h) This paper consists of 15 printed pages.
- i) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

--

SECTION I (50 marks)
*Answer **all** the questions in this section*

- 1 Without using a calculator, evaluate $(2.4 \times 10^{-5}) \div (9.6 \times 10^{-3})$ giving your answer in standard form.
(2 marks)
- 2 Solve the simultaneous equations $\begin{aligned} 2 \sin x + \cos y &= 2 \\ 2 \sin x - 2 \cos y &= -1 \end{aligned}$ for which $0^\circ \leq x \leq 90^\circ$ and $0^\circ \leq y \leq 90^\circ$.
(3 marks)
- 3 Some information about six numbers is provided as below:
- | | |
|----------------------------------|----|
| - Lowest number | 37 |
| - The range | 24 |
| - The mode | 43 |
| - The median | 46 |
| - One number is a multiple of 11 | |
- Find the mean of the six numbers. (3 marks)

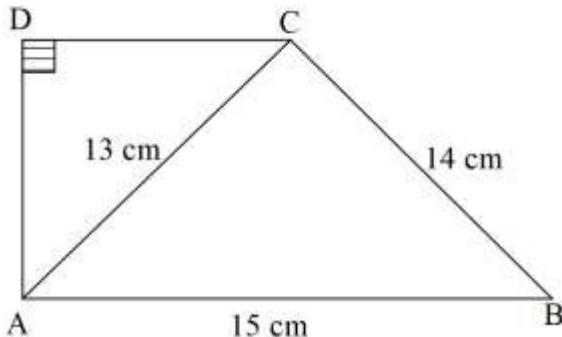
- 4 A train passes through a station at a speed of 108 km/h. The length of the station is 120 m. The train takes 7 seconds to completely pass through the station. Calculate the length of the train. (3 marks)
- 5 A point Q lies on the line PR below such that $PQ:QR = 4:1$. PT and PQ are two sides of a quadrilateral.



- (a) Using a ruler, a pair of compasses and a set square, locate the point Q. (1 mark)
- (b) Using a ruler and a pair of compasses only, construct a quadrilateral PQST such that angle $PQS = 75^\circ$ and angle QST is a right angle. Measure ST. (3 marks)

- 6 Find the value of x in the equation $81^{x-1} \times \frac{1}{9^{x+2}} = \sqrt{27}$. (3 marks)
- 7 A peg is 8 metres from the foot of a building. Two children Ali and Mary can spot the peg from the first floor and second floor at angles of depression 42° and 60° respectively. Calculate the height of the second floor from the first floor correct to 2 decimal places. (3 marks)
- 8 The dimensions of a rectangle are $(2x+1)\text{cm}$ by $(x-1)\text{cm}$. The area of the rectangle is 29 cm^2 greater than the area of a square of side $x\text{ cm}$. Find the perimeter of the rectangle. (4 marks)

- 9 In the trapezium ABCD, AB = 15 cm, AC = 13 cm and BC = 14 cm. The size of angle ADC = 90°.



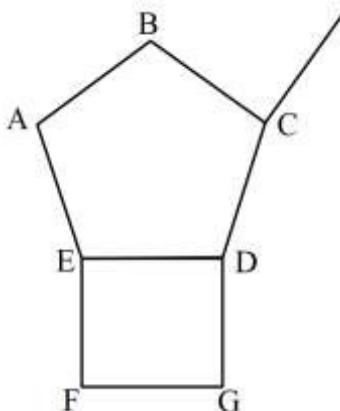
Calculate the area of the trapezium.

(4 marks)

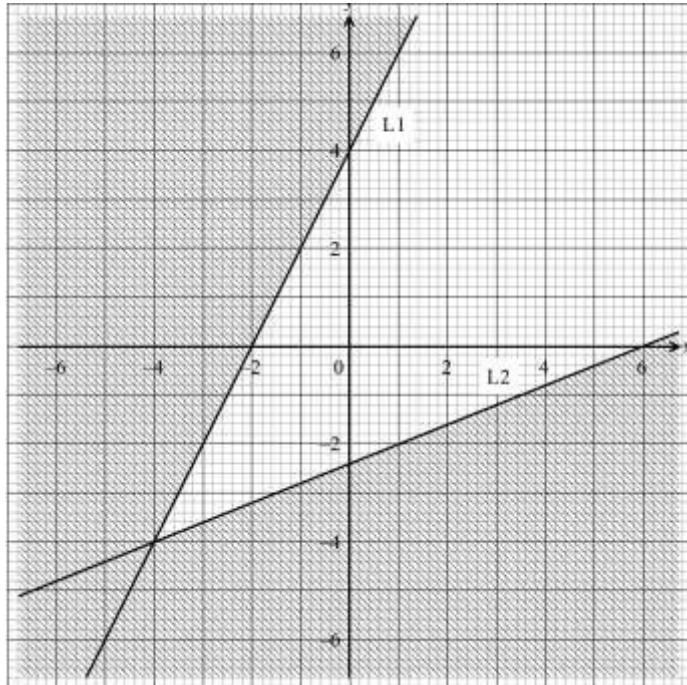
- 10 A water tank is in the shape of a frustum of a cone. The internal radii of the base and top of the vessel are 63 cm and 126 cm respectively and the internal height of the container is 280 cm. Calculate the radius of the water surface in the container when it is filled to a height of 140 cm. (3 marks)

- 11 Four bells ring simultaneously at starting and an interval of 6 seconds, 12 seconds, 15 seconds and 20 seconds respectively. How many times will they ring together between Monday 11.30 p.m. and Tuesday 2.30 a.m. (3 marks)

- 12 The figure below shows a regular pentagon, ABCDE, and a square, EDFG. The lines CD and DG are two sides of another regular polygon, P. Calculate the number of sides of polygon P. (3 marks)



- 13 A region **R** is bounded by the inequalities L_1 , L_2 and L_3 . L_1 and L_2 are drawn on the grid below while L_3 is $2x + 3y < 12$.



- (a) Find the inequalities L_1 and L_2 . (2 marks)
- (b) On the same axes, draw L_3 and shade the unwanted region. (1 mark)

- 14 Shapes are triangles or rectangles and are either red or blue. The ratio of triangles to rectangles is 3:4. Of the triangles, the ratio of red to blue is 2:3 while of the rectangles, the ratio of red to blue is 4:1. Find the ratio of red shapes to blue shapes. (3 marks)
- 15 A measuring cylinder is filled with 110 ml of water. The mass of the empty measuring cylinder is 238.6 grams. When an object is imersed in the cylinder, the mass of the cylinder increases to 642.3 grams and the volume of water rises to 165 ml. Calculate the density of the object in g/cm³. (3 marks)
- 16 Simplify $\frac{6ax - 3ay - 4bx + 2by}{8ay + 2by - 16ax - 4bx}$. (3 marks)

SECTION II (50 marks)

*Answer **only five** questions in this section in the spaces provided*

17 A salesman is paid a basic salary of Ksh 30000 and commissions for selling computers as follows:

5% for sales up to Ksh 100 000

6% for sales from Ksh 100 001 to Ksh 250 000

8% for sales in excess of Ksh 250 000

- (a) In one month, the salesman sold goods worth Ksh 370 000. Determine his total earnings that month. (3 marks)

- (b) In the month that followed, the salesman earned a total of Ksh 57 600 in salary and commissions.

How much sales did he make? (4 marks)

- (c) The marked price of each computer is Ksh 42 000. If the basic salary of the salesman is increased by 10%, and the computers are sold at 7% discount, the salesman would earn a total of Ksh 73 872 by selling x computers. Find x . (3 marks)

18 OAB is triangle in which $\mathbf{OB} = 3\mathbf{i} - 2\mathbf{j}$ and $\mathbf{AB} = 4\mathbf{i} - 10\mathbf{j}$. M is the mid – point of \mathbf{AB} .

(a) Find:

(i) The coordinates of A. (2 marks)

(ii) The distance of M from the origin. (3 marks)

(b) $A'(-3, -2)$ is the image of A under a translation T . Find the image of B under T . (3 marks)

(c) Given that the coordinates of C is $(-3, k)$, and that A, B and C are collinear, find k. (2 marks)

19 ABCD is a rhombus in which AC is a major diagonal. The coordinates of the vertices A and C are $(-3, -1)$ and $(5, 7)$ respectively.

(a) Find:

(i) The x intercept of the line AC. (3 marks)

(ii) The equation of the minor diagonal BD. (3 marks)

(b) Given that the equation of the side AB is $3y - x = 0$, find the coordinates of D. (4 marks)

20 A closed cylinder of radius r cm and height h cm has total surface area equal to $600\pi \text{ cm}^2$.

(a) Find:

(i) An expression in terms of π for the height, h of the cylinder. (2 marks)

(ii) An expression in terms of π and r for the volume, V of the cylinder. (2 marks)

(b) (i) Calculate the height, h and the radius, r of the cylinder for which the volume, V is a maximum. (4 marks)

(ii) Hence find the maximum volume of the cylinder. (2 marks)

21 (a) Given that $\mathbf{A} = \begin{pmatrix} 5 & 3 \\ 12 & 7 \end{pmatrix}$, show that $\mathbf{A}^2 - 12\mathbf{A} + \mathbf{I}$ is a null matrix. (3 marks)

(b) A teacher ordered for 12 calculators and 10 revision books costing Ksh 22 500. Due to financial constraint, he was advised to cut the budget to Ksh 20 100 by reducing the number of calculators by two.

(i) Form and simplify two linear equations to represent this information. (1 mark)

(ii) Use matrix method to find the cost of each item. (4 marks)

(c) If the teacher bought 5 calculators and 7 revision books, represent the number of items bought in a 1×2 matrix hence find the total cost of the items. (2 marks)

22 The table below shows marks scored by students in a class.

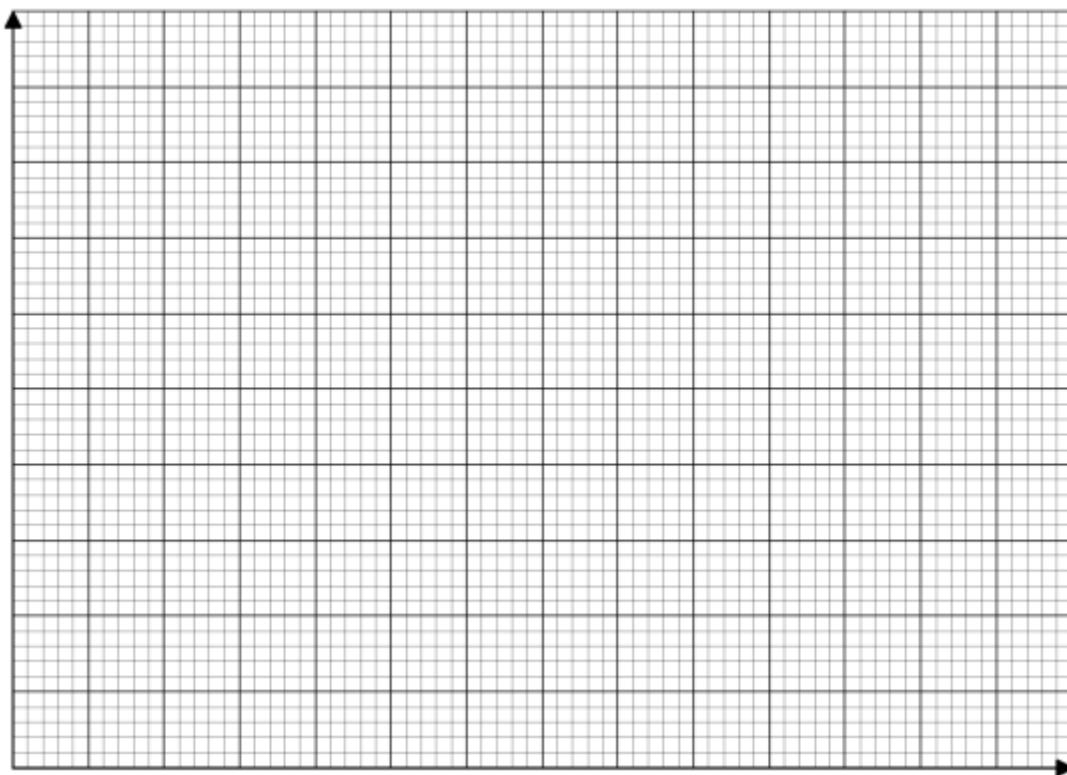
Marks	10–14	15–24	25–39	40–44	45–54	55–69
Frequency	11	8	9	4	6	t

(a) Given that the mean mark is 35.7, find:

- (i) The value of t. (3 marks)

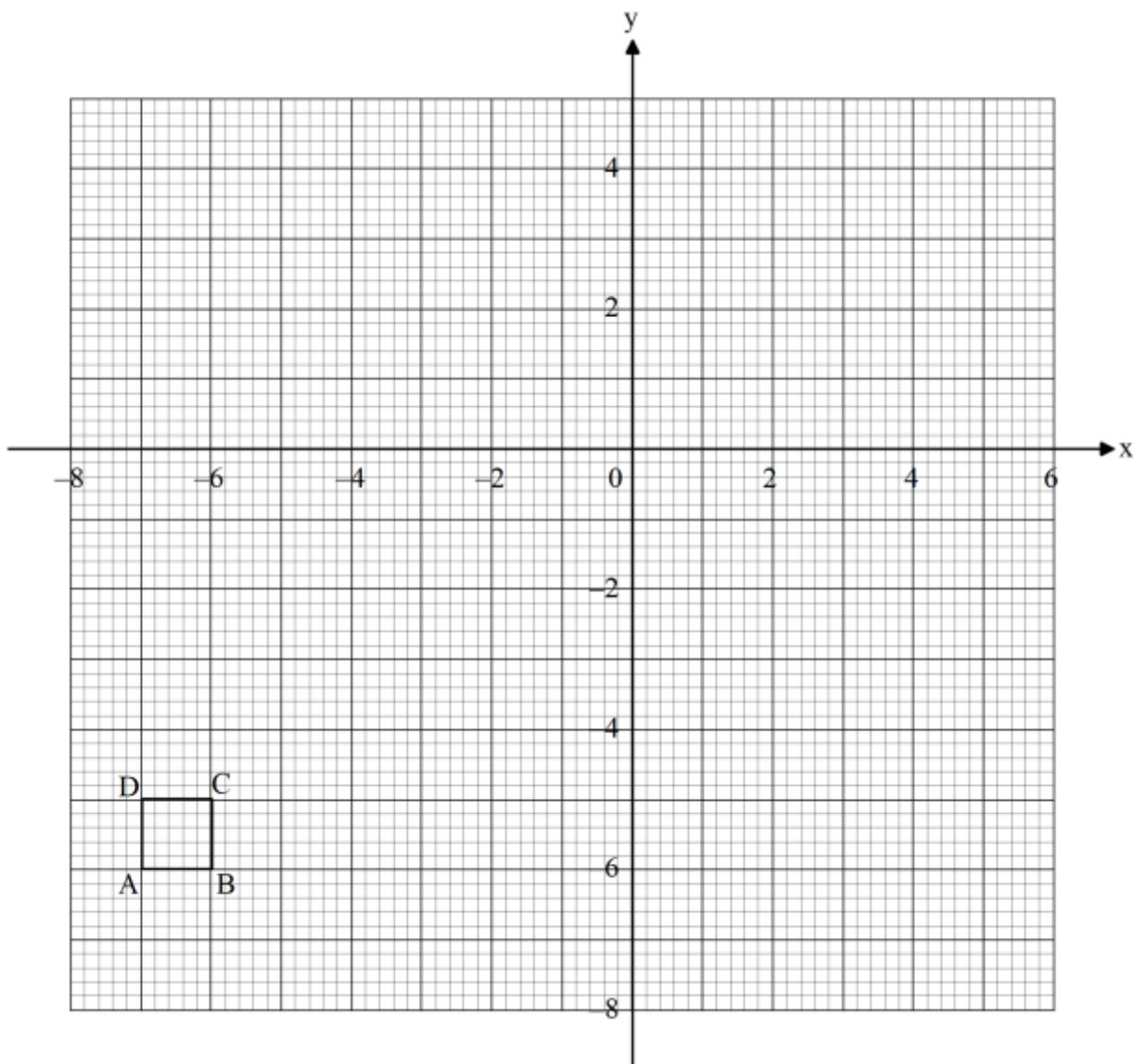
- (ii) The class interval for the modal class. (1 mark)

(b) On the grid provided below, draw a histogram to represent the information in the table. (3 marks)



(c) Using the histogram in (b) above, calculate the median mark. (3 marks)

- 23 A square ABCD with vertices at $A(-7, -6)$, $B(-6, -6)$, $C(-6, -5)$ and $D(-7, -5)$ is drawn on the grid below. $A'B'C'D'$ is the image of ABCD under enlargement centre $(-7, -7)$ and scale factor 3.



- (a) Draw $A'B'C'D'$ on the same axes. (3 marks)
- (b) $A'B'C'D''$ is the image of $A'B'C'D'$ under reflection in the line $y=0$. Draw $A'B'C'D''$ and state its vertices. (2 marks)
- (c) $A'B'C'D''$ is the image of $A'B'C'D'''$ under $+90^\circ$ turn about centre $(-1, -2)$.
- State the transformation that maps $A'B'C'D''$ onto $A'B'C'D'''$. (1 mark)
 - On the same axes, draw and label the vertices of the square $A'B'C'D'''$. (2 marks)
- (d) State any two pairs of the squares that are:
- Directly congruent. (1 mark)
 - Oppositely congruent. (1 mark)

24 The equation of a curve is given by $y = 8 - 2x - x^2$.

(a) Estimate the area of the region bounded by the curve and the lines $y = 0$, $x = -4$ and $x = 4$ using:

(i) Trapezium rule with 8 strips. (3 marks)

(ii) Mid – ordinate rule with 4 strips. (3 marks)

(b) Calculate the exact area of the region bounded by the curve and the lines $y = 0$, $x = -4$ and $x = 4$.

(4 marks)

KCSE SMARTFOCUS HOMESTRECH CLUSTER EXAMS

(POST MOCKS)

MATHEMATICS ALT. A

PAPER 1

SEPT/OCT. 2024

POST MOCK 10

Name Index Number.....

Class DateSignature.....

Instructions to candidates

- a) Write your name and Index number in the spaces provided above.
- b) Write your class, date of examination and sign in the spaces provided above.
- c) This paper consists of two sections; **Section I** and **Section II**.
- d) Answer all the questions in **Section I** and only five questions from **Section II**.
- e) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.
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For Examiner's Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

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SECTION I (50 marks)
Answer all the questions in this section

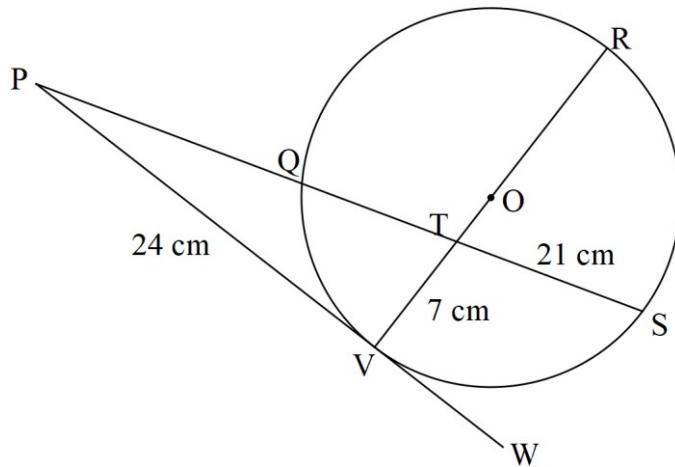
- 1 The cash price of a cooker is Ksh 40 000. Ryan bought it on hire purchase by paying a deposit of Ksh 4 000 and the rest in 36 equal monthly instalments. If he was charged simple interest at the rate of 20% per annum, calculate the amount of each instalment. (3 marks)

2 Two taps P and Q, when opened at the same time, can fill a tank 3 hours 36 minutes. Tap P working alone takes 3 hours longer than tap Q to fill the same tank. How many hours does it take tap P to fill the tank. (3 marks)

3 Without using a calculator, express $\frac{2}{2+\sqrt{3}} - \frac{\sqrt{3}}{2-\sqrt{3}}$ in the form $a + b\sqrt{c}$ where a, b and c are integers. (3 marks)

- 4 A variable P varies directly as the cube of Q and inversely as the square root of R. Calculate the percentage change in Q if P is increased in the ratio 8:5 and R is decreased by 19%. (3 marks)
- 5 (a) Expand $\left(2 - \frac{1}{4}x\right)^6$ in ascending powers of x up to the 4th term. (1 mark)
- (b) Use your expansion in (a) above to find the value of $(1.9)^6$ correct to three decimal places. (2 marks)
- 6 Three grades of tea A, B and C were mixed in the ratio 2:3:4 respectively. The cost per kilogram of grade A is Ksh 150, grade B is Ksh 140 and grade C is Ksh 90. Find the selling price of 12 kg of the mixture given that the mixture was sold at 15% profit. (3 marks)

- 7 In the figure below, O is the centre of the circle. VOR and PTS are straight lines. $ST = 21\text{ cm}$, $TV = 7\text{ cm}$, $PV = 24\text{ cm}$ and PVW is a tangent to the circle at V.



Calculate the:

- (a) Length PQ. (2 marks)

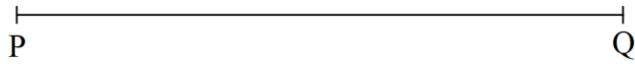
- (b) Length TR. (2 marks)

- 8 The probability that a bus will be late in getting to a stage in the morning is $\frac{1}{5}$. The probability that Rafiki will board the bus if it is in time is $\frac{9}{10}$ and that he will board it if it is late is $\frac{1}{3}$. Using a tree diagram, find the probability that Rafiki will not board the bus. (3 marks)

- 9 The coordinates of A and B are $(-2, 5, 4)$ and $(1, -1, 10)$ respectively. A point Q divides \mathbf{AB} externally in the ratio 5:2. Find the coordinates of Q. (3 marks)

- 10 Solve the equation $2\cos^2 x - \sin x = 1$ for $0^\circ \leq x \leq 360^\circ$. (3 marks)

- 11 A region R lies on the upper side of line PQ below such that $\angle PRQ \geq 60^\circ$ and the area of PRQ is greater than 15 cm^2 . Shade the region R. (3 marks)



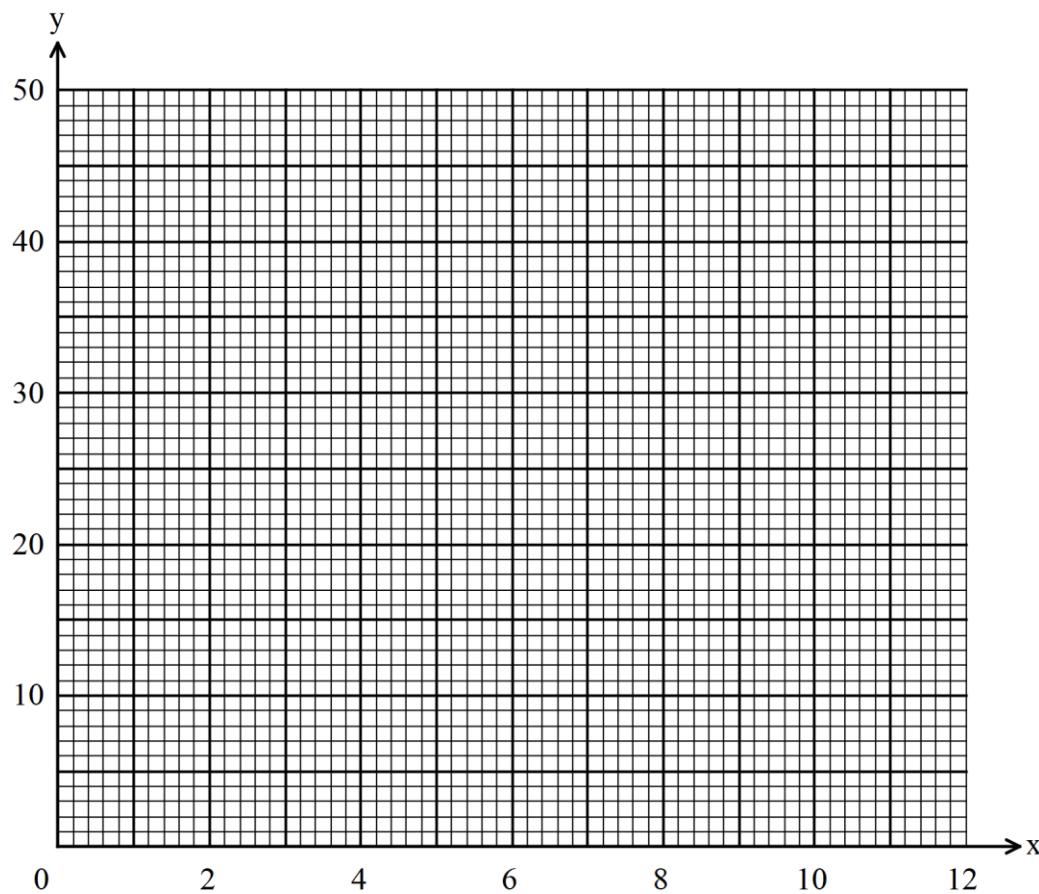
- 12 The internal and external diameters of a pipe are measured as 8 cm and 10 cm each to the nearest whole number. The length of the pipe is exactly 63 cm. Calculate the percentage error in the volume of the pipe. (3 marks)
- 13 Solve the equation $3\log_2 x - 8\log_2 2 = 10$ (3 marks)
- 14 In a mathematics test of 48 students, the mean mark is 55 while the standard deviation is 20. If the 49th and 50th student scored 60 and 64 respectively, calculate the:
(a) New mean (2 marks)
(b) New standard deviation (2 marks)

- 15** The vertices of a triangle ABC are A(2, 1) B(4, -1) and C(0, -1). The triangle ABC is sheared so that the vertex A maps onto A'(0, 1). Find the images of B and C under this shear. (3 marks)

- 16** Data was collected from an experiment involving two variables x and y and was recorded in the table below.

x	1	2	3	4	5	6	7	8	9	10
y	9	12	16	20	24	28	31	35	39	42

On the grid provided below, draw the line of best fit hence find the equation connecting the variables x and y . (3 marks)



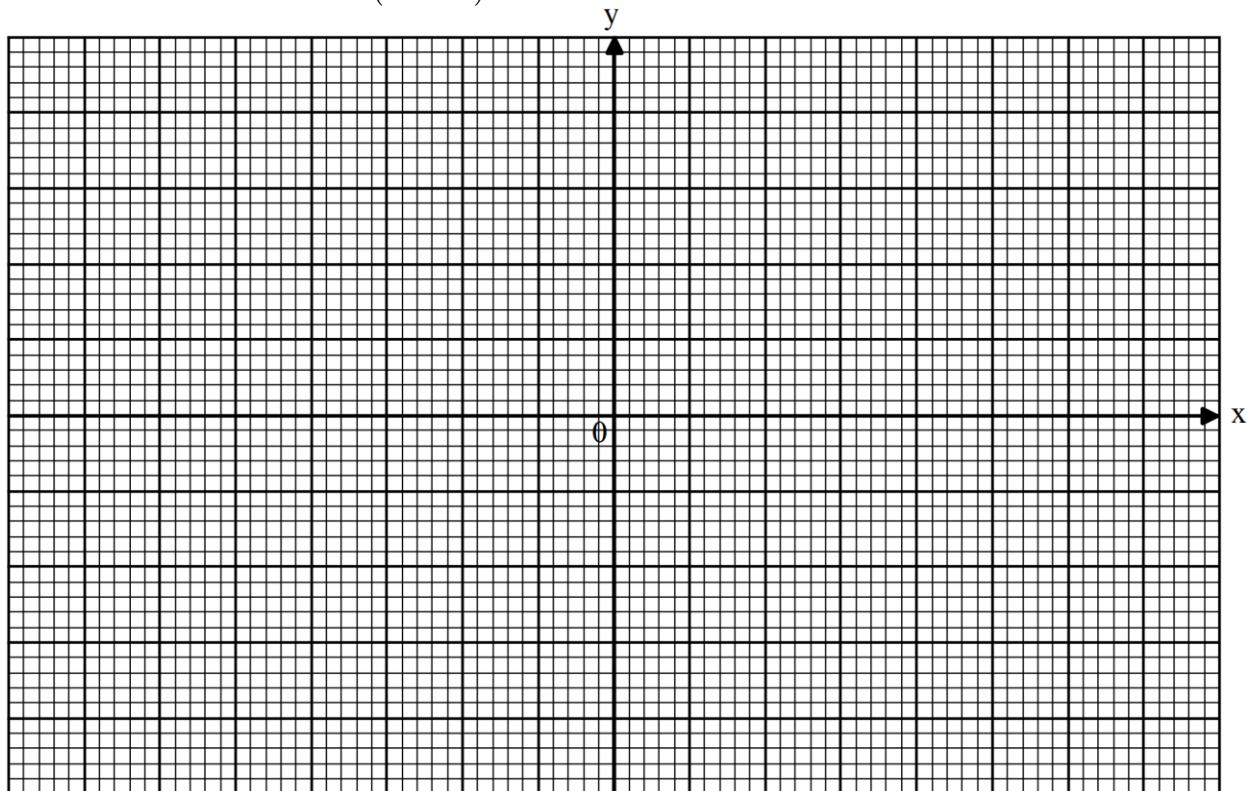
SECTION II (50 marks)

Answer only five questions in this section in the spaces provided

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

x	-180	-150	-120	-90	-60	-30	0	30	60	90	120	150	180
$1 - \cos x$	2			1	0.5	0		0.13		1			2
$2 \sin(x + 30^\circ)$	-1	-1.73			-1	0			2	1.73			-1

- (b) Using a scale of 1 cm for 30° on the x -axis and 2 cm for 1 unit on the y -axis, draw the graphs of $y = 1 - \cos x$ and $y = 2 \sin(x + 30^\circ)$ on the same axes for $0^\circ \leq x \leq 180^\circ$. (4 marks)



- (c) Use the graph above to:

(i) Find the amplitude of the curve $y = 1 - \cos x$. (1 mark)

(ii) Solve the equation $\cos x + 2 \sin(x + 30^\circ) = 1$ (2 marks)

(iii) Find the range of values of x for which $1 - \cos x \leq 2 \sin(x + 30^\circ)$. (1 mark)

18 A plane left point A on Monday 1000 hours local time and flew northwards to B(42 N,15 E) in 6 hours at an average speed of 450 knots. After a 45 minutes stop at B, the plane flew to C(42 N,165 W) at a the same speed using the shortest route.

Find:

(a) The location of point A. (3 marks)

(b) The time taken to travel from B to C. (3 marks)

(c) The local time at C;

(i) When the plane left A (2 marks)

(ii) When the plane arrived at C. (2 marks)

19 In an arithmetic progression (A.P), the 2nd, 5th and 11th terms form the first three terms of a geometric progression (G.P). Given that the common difference of the A.P. is 2, find:

(a) Find the tenth term of the A.P. (4 marks)

(b) Calculate:

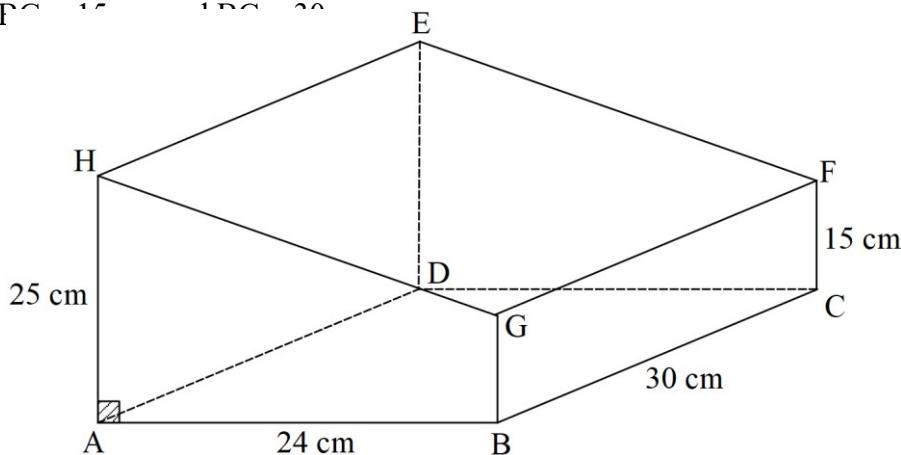
(i) The number of terms of the arithmetic progression for which the sum of the terms is 460.

(3 marks)

(ii) The least number of terms of the geometric progression for which the sum of the terms is greater than 6 138. (3 marks)

- 20 In the figure below, ABCDEFGH is a prism whose cross – section is a trapezium. $AB = 24 \text{ cm}$,

$$AH = 25 \text{ cm}, FG = 15 \text{ cm}, DC = 20 \text{ cm}$$



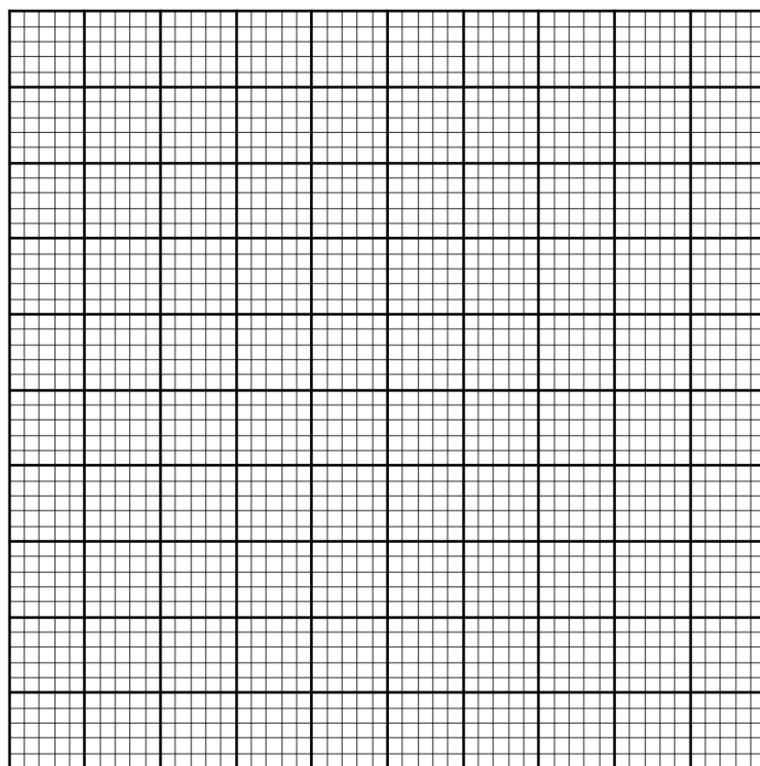
Calculate correct to 2 decimal place, the angle between:

- (a) Lines HG and AB. (2 marks)
- (b) Line CH and the plane ABCD. (2 marks)
- (c) Planes BCEH and EFGH. (3 marks)
- (d) Line AC and AE. (3 marks)

21 The following table shows the masses of students in a school.

Mass (kg)	25 – 29	30 – 34	35 – 39	40 – 44	45 – 49	50 – 54	55 – 59	60 – 64	65 – 69
Frequency	2	2	4	6	12	12	6	3	1

- (a) On the grid provided below, draw the cumulative frequency curve for the above data. (4 marks)



- (b) Use the graph to find the:

(i) Median mass. (1 mark)

(ii) Inter – quartile range. (2 marks)

(c) Find the percentage of students whose masses are at above 47 kg. (3 marks)

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

Monthly income in Kenya Shillings (Ksh)	Tax rate percentage (%) in each shilling
Up to 9 680	10
9 681–18 800	15
18 801–27 920	20
27 921–37 040	25
Over 37 041	30

In the month of February of that year, Jayden paid a net tax of Ksh 19 760. He was given a house allowance of Ksh 14 000 per month and commuter allowance of Ksh 8 000 per month. Jayden was also entitled to monthly personal relief of Ksh 1 350 and monthly insurance relief at the rate of 15% of the premium paid. Each month, he paid a monthly premium of Ksh 4 000 towards his life insurance policy.

(a) Calculate the:

(i) Gross tax per month. (2 marks)

(ii) Taxable income per month. (3 marks)

(iii) Basic salary per month. (2 marks)

(b) In the month of March the same year, Jayden received additional earnings. Given that he paid 25% more net tax that month, calculate the percentage increase in his earnings. (3 marks)

23 Anne and Ben are tailors. They make x jackets and y suits each week. Anne does all the cutting and Ben does all the sewing. To make a jacket takes 5 hours of cutting and 4 hours of sewing while to make a suit takes 6 hours of cutting and 10 hours of sewing. Neither tailor works for more than 60 hours a week.

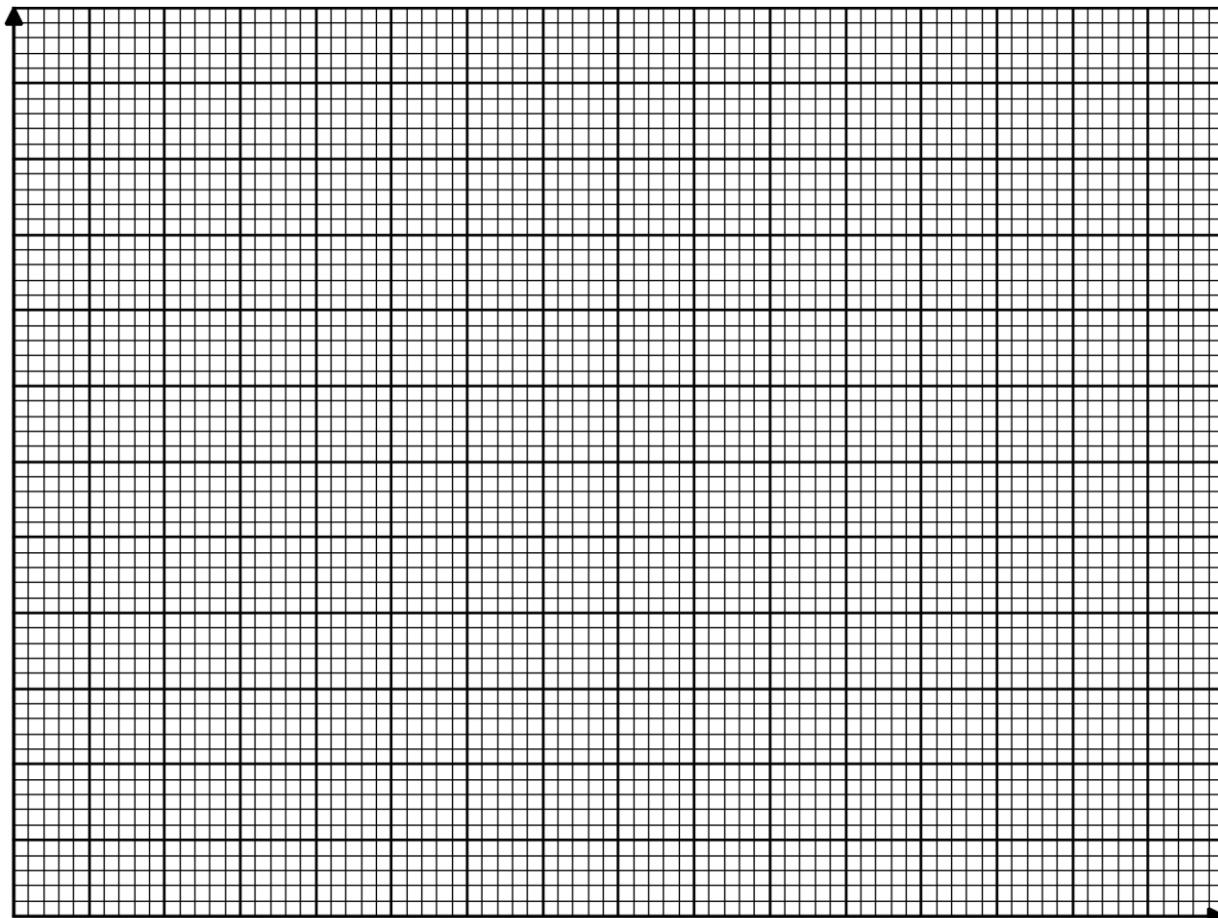
(a) Write down an equality in x and y for:

(i) Sewing (1 mark)

(ii) Cutting (1 mark)

(b) They make at least 8 jackets each week. Write down another inequality. (1 mark)

(c) Represent **all** the inequalities for the information above in a graph and shade the unwanted regions. (4 marks)



(d) The profit on a jacket is Ksh 3 000 and on a suit is Ksh 10 000. Find the maximum profit that Anne and Ben can make in a week. (3 marks)



- 24 The acceleration, a m/s² of a particle after t seconds is given by $a = 2t - 8$. The initial velocity of the particle is 12 m/s. Find:
- (a) An expression for the velocity of the particle at any given time t . (3 marks)
 - (b) The displacement of the particle during the third second. (2 marks)
 - (c) The minimum velocity of the particle. (2 marks)
 - (d) The acceleration when the particle is initially at rest. (3 marks)