

GOLDLITE ONLINE EDUCATIONAL SERVICES
Kenya Certificate of Secondary Education
KCSE REPLICAS SERIES 2 TERM 2 2023
MAY-AUGUST 2023- 2 ½ hours

Name Admission number

Candidate's Signature.....Date.....

REPLICA 1

121/1
MATHEMATICS
PAPER 1



INSTRUCTIONS TO CANDIDATES

- a) Write your name and admission number in the space provided at the top of this page
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- f) Non-programmable silent electronic calculators and KNEC mathematical tables may be used.
- g) This paper consists of 15 printed pages

FOR EXAMINER'S USE ONLY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	TOTAL

SECTION I

17	18	19	20	21	22	23	24	TOTAL

Grand total

SECTION II

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FOR MORE PAPERS FOR ALL SUBJECTS AND MARKING SCHEMES

SECTION I (50 MARKS)

1. Solve for x.

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

(3 marks)

2. A man left $\frac{1}{5}$ of his estate to his wife and $\frac{2}{3}$ of the remainder to be divided equally to each of his two sons. The rest was to be shared in the same ratio among his six cousins. If each cousin got

sh 60,000, how much money did the son get.

(4 marks)

3. Solve for x in the equation:

$$5^{3y+3} + 5^{3y-1} = 125.2$$

(4 marks)

4. The average lap time for 3 athletes in a long distance race is 36 seconds, 40 seconds and 48 seconds respectively. If they all start the race at the same time, find the number of times the slowest runner will have been overlapped by the fastest runner at the time they all cross the starting point together again.

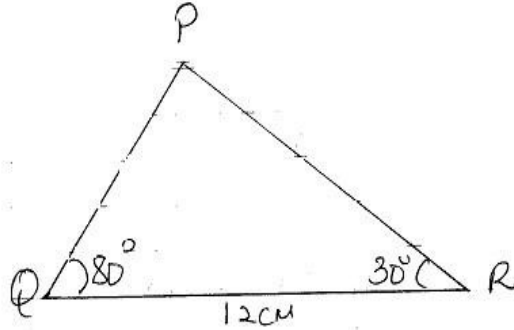
(3 marks)

5. Simplify the expression

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

(3 marks)

6. In a triangle PQR below, $QR = 12\text{cm}$, $\angle PQR = 80^\circ$ and $\angle PRQ = 30^\circ$



Calculate, correct to 4 significant figures, the area of triangle PQR.

(3 marks)

7. Mr. Wanyonyi travelled by train from Butere to Nairobi. The train left Butere on a Sunday 2350 hours and travelled for 7 hours 15 minutes to reach Nakuru. After 45 minutes stop in Nakuru, the train took 5 hours 40 minutes to reach Nairobi. Find the time, in the 12-hour system and the day Mr. Wanyonyi arrived in Nairobi. (3 marks)

8. Find the reciprocal of 0.005041 hence evaluate $\frac{3}{0.005041}$ (2 marks)

9. Line BC below is a side of triangle ABC and also a side of a Parallelogram BCDE



Using a ruler and a pair of compasses only, construct:

- (i) The triangle ABC given that $\angle ABC = 120^\circ$ and $AB = 6\text{cm}$ (1cm)
(ii) the parallelogram BCDE whose area is equal to that of the triangle ABC and point E is on line AB

(3 marks)

10. Given that $4\mathbf{p} - 3\mathbf{q} = \begin{pmatrix} 10 \\ 5 \end{pmatrix}$ and $\mathbf{p} + 2\mathbf{q} = \begin{pmatrix} -14 \\ 15 \end{pmatrix}$; find the value of \mathbf{p} and \mathbf{q} (4 marks)

11. 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 travelling 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 that he received.

(3 marks)

12. From a viewing tower 40 metres above the ground, the angle of depression of an object on the ground is 36° and the angle of elevation of an aircraft vertically above the object is 48° . Calculate the height of the aircraft above the object on the ground. (3 marks)

13. The interior angle of a regular polygon with $3x$ sides exceeds the interior angle of another regular polygon having x sides by 40° . Determine the value of x (3 marks)

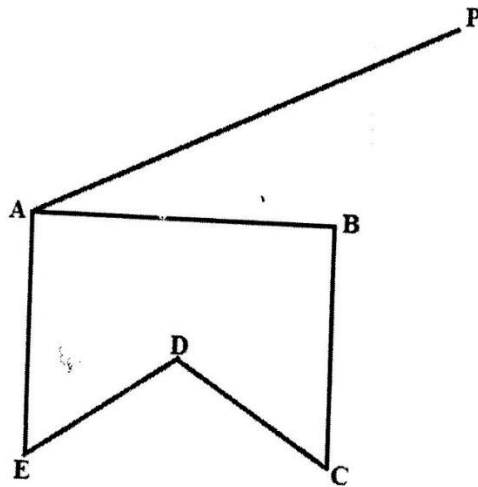
14. The mass of two similar cans is 960g and 15000g. If the total surface area of the smaller can is 144cm^2 , determine the surface area of the larger can. (3 marks)

15. The table below show the mean marks in a mathematics test of two classes

Class	Number of students	Mean mark
A	45	62
B	43	65

Calculate, correct to 2 decimal places, the mean mark of the classes. (2 marks)

16. The figure below ABCDE is a cross-section of a solid. The solid has a uniform cross-section. Given that AP is an edge of the solid, complete the sketch showing the hidden edges with a broken line. (3 marks)



SECTION II (50 MARKS)

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

17. Two lines $L_1: 2y - 3x = 6 = 0$ and $L_2 = 3y + x - 20 = 0$ intersect at a point A.

a) Find the coordinates of A

(3 marks)

b) A third line L_3 is perpendicular to L_2 at point A. Find the equation of L_3 in the form $y = mx + c$, where m and c are constants.

(3 marks)

c) Another line L_4 is parallel to L_1 and passes through $(-2, 3)$. Find the x and y intercepts of L_4

(4 marks)

18. One day Mr. Makori bought some oranges worth Ksh 45, on another day of the same week his wife Mrs. Makori spent the same amount of Money but bought the oranges at a discount of 75 cents per orange

a) If Mr. Makori bought an orange at Kshs x , write down and simplify an expression for the total number of oranges bought by the two in the week.

(3 marks)

b) If Mrs. Makori bought 2 oranges more than her husband, find how much each spent on an orange.

(5 marks)

d) Find the number of oranges bought by the two.

(2 marks)

19. Give points P, Q, R, V and T lie on the same plane, Point Q is 53km on the bearing of 055° of P, Point R lies 162° of Q at a distance of 58km. Given that point T is west of P and 114km from R and V is directly South of P and $S40^\circ E$ from T.

a) Using a scale of 1:1,000,000, show the above information in a scale drawing.

(3 marks)

b) From the scale drawing determine

i) The distance in km of point V from R

(2 marks)

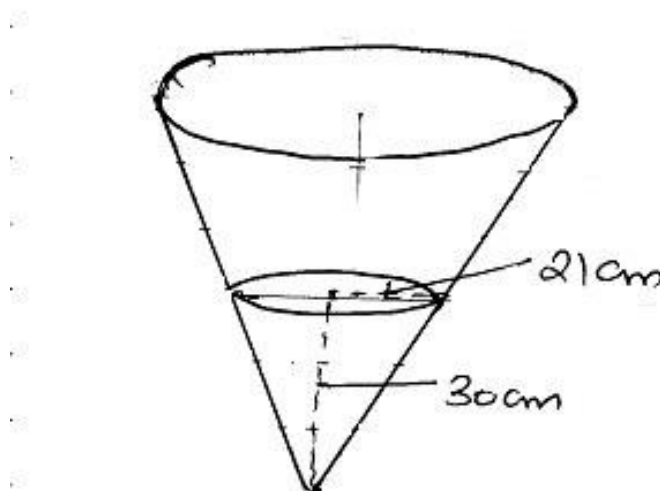
ii) The bearing of V from Q.

(2 marks)

iii) Calculate the area enclosed by the points PQRVT in squares kilometers.

(3 marks)

20. The figure below represents a conical vessel which stands vertically. The vessels contain water to a depth of 30cm. the radius of the water surface in the vessel is 21cm (Take $\pi = \frac{22}{7}$)



(a). Calculate the volume of the water in the vessel in cm^3 . (2 marks)

(b) When a metal sphere is completely submerged in the water, the level of the water in the vessel rises by 6cm. calculate:

(i) the radius of the new water surface in the vessel. (2 marks)

(ii) the volume of the metal sphere in cm^3 (3 marks)

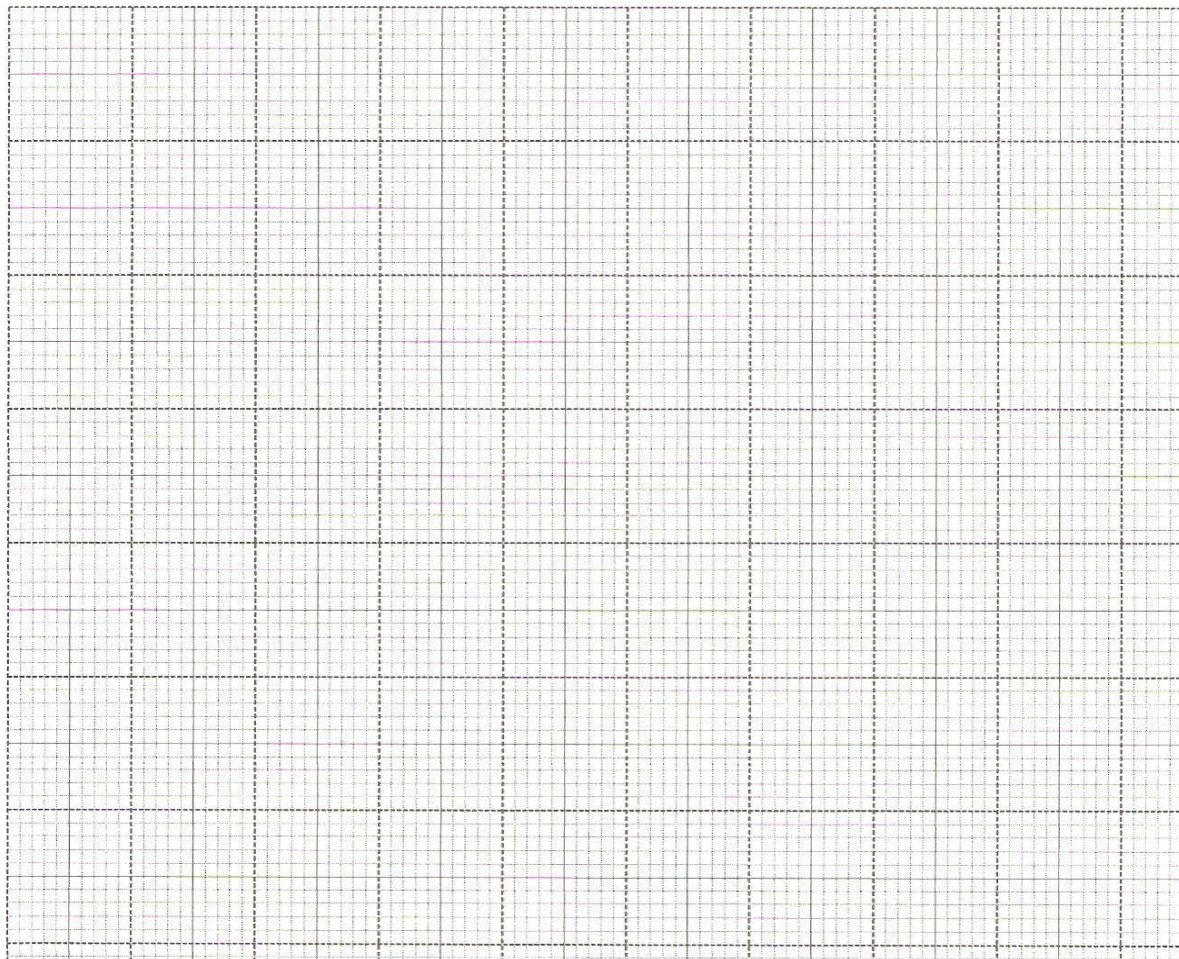
(iii). the radius of the sphere (3 marks)

21. The masses to the nearest kilogram of some student were recorded in table below

Mass (kg)	41-50	51-55	56-65	66-70	71-85
Frequency	8	12	16	10	6
Height of rectangle					0.2

a). Complete the table above to 1 decimal (2 marks)

b) on the grid provided below, draw a histogram to represent the above information (3 marks)



c) Use the histogram to

i) State the class in which the median mark lies. (1 mark)

ii) Estimate the median mark (2 marks)

iii) The percentage number of students with masses of at least 74kg. (2 marks)

22. a) Given that $A = \begin{pmatrix} 3 + 3x & 6 \\ x + 7 & 2x + 2 \end{pmatrix}$ is a singular matrix, find the values of x (3 marks)

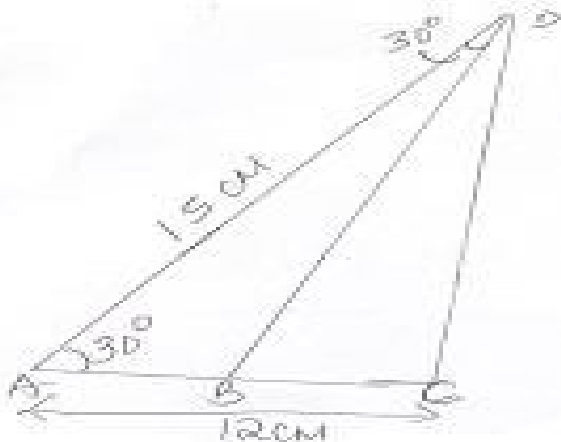
(b) John bought 3 exercise books and 5 pens for a total of Ksh 200. If John had bought 2 exercise books and 4 pens, he would have spent Ksh 60 less. Taking e to represent the price of an exercise.

i) Form two expressions to represent the above information. (2 marks)

ii) Use matrix method to find the price of an exercise book and that of a pen. (3 marks)

iii) A teacher of a class of 45 students bought 3 exercise books and 2 pens for each student. Calculate the total amount of money the teacher paid for the books and the pens. (2 marks)

23. In the figure below, $AC = 12\text{cm}$, $AD = 15\text{cm}$ and B is a point on AC $\angle BAD = \angle ADB = 30^\circ$

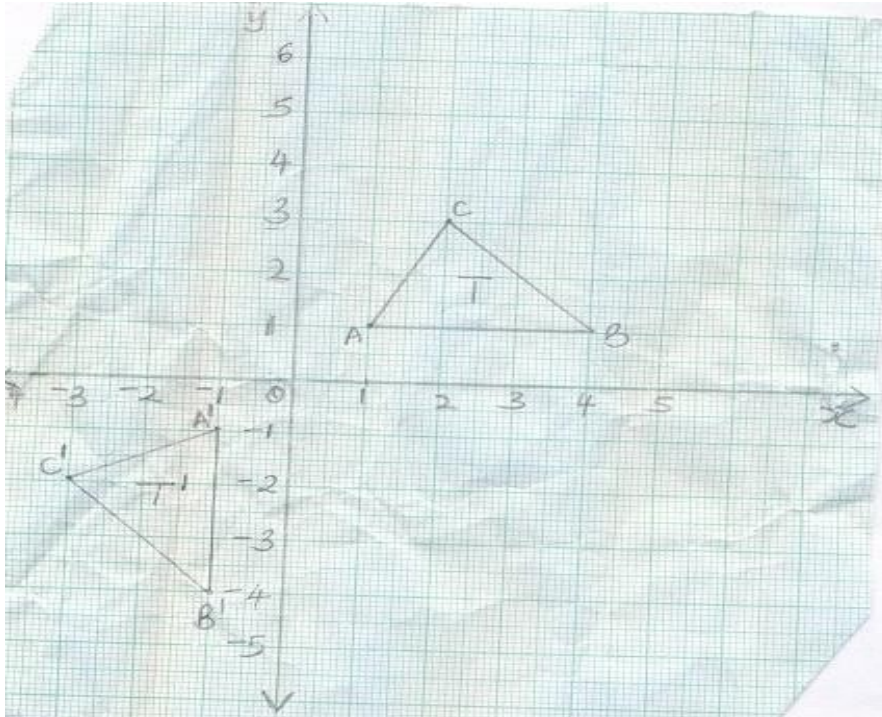


Calculate, correct to one decimal place: -

a) the length of CD (3 marks)

- b) the length of AB; (3 marks)
- c) the area of triangle BCD (2 marks)
- d) the size of $\angle BDC$ (2 marks)

24. On the grid below, an object T and its image T' are drawn.



- a) Find the equation of the mirror line that maps T onto T' (1 mark)
- b) (i) T' is mapped onto T'' by positive quarter turn about (0,0). Draw T'' (2 marks)
- ii) Describe a single transformation that maps T onto T''. (2 marks)
- c) T'' is mapped onto T''' by an enlargement, centre (2,0), scale factor -2. Draw T''' (2 marks)
- d) Given that the area of T''' is 12cm^2 , calculate the area of T. (3 marks)

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REPLICA 2

121/1

MATHEMATICS

PAPER 1

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SECTION I

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Grand total

SECTION II@2023CONTACT US ON 0724351706/0726960003

FOR MORE PAPERS FOR ALL SUBJECTS AND MARKING SCHEMES

SECTION I(50marks)

Answer all the questions in this section

- 1) The sum of four consecutive odd integers is less than 64. Determine the first four such integers. (3 marks)

- 2) Solve the equation (3marks)

$$\frac{2}{t-1} - \frac{1}{t+2} = \frac{1}{t}$$

- 3) Moses has twenty shillings more than Jane. After he spends a quarter of his money and Jane $\frac{1}{5}$ of hers, they find that Jane has 10 shillings more than Moses. How much money did both have? (4 marks)

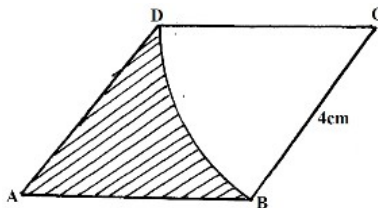
- 4) The sum of interior angles of two regular polygons of side $n-1$ and n are in the ratio 4:5. Calculate;

(i) The size of interior angle of the polygon with side $(n-1)$ (2 marks)

(ii) The size of exterior angle of the polygon with side $(n-1)$ (1 mark)

- 5) The figure below is a rhombus ABCD of sides 4cm. BD is an arc of circle center C. Given that $\angle ABC = 138^\circ$. Find the area of shaded region correct to 3 significant figures.

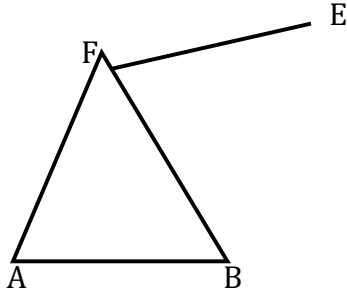
(Take $\pi = \frac{22}{7}$)



(3 marks)

- 6) Find the greatest common factor of x^3y^2 and $4xy^4$. Hence factorise completely the expression $x^3y^2 - 4xy^4$. (3 Marks)

- 7) The figure below is a part of the sketch of a triangular prism ABCDEF.



Complete the sketch by drawing the hidden edges using broken lines. (3 marks)

- 8) Without using calculator, solve for n in the equation $1 - \left(\frac{1}{3}\right)^n = \frac{242}{243}$ (3marks)

- 9) Given that $OA = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$ and $OB = \begin{pmatrix} x \\ -2 \end{pmatrix}$ and that the magnitude of AB is 13 units, find the possible values of x. (3marks)

- 10) Ali travelled a distance of 5km from village A to village B in direction of $N60^\circ E$. He then changed direction and travelled a distance of 4km in the direction of 135° to village C.

a) Using a scale of 1cm to represent 1.0 km represent the information on an accurate diagram.

(2marks)

b) Using scale drawing in (a) above determine

(i) The distance between A and C

(1mk)

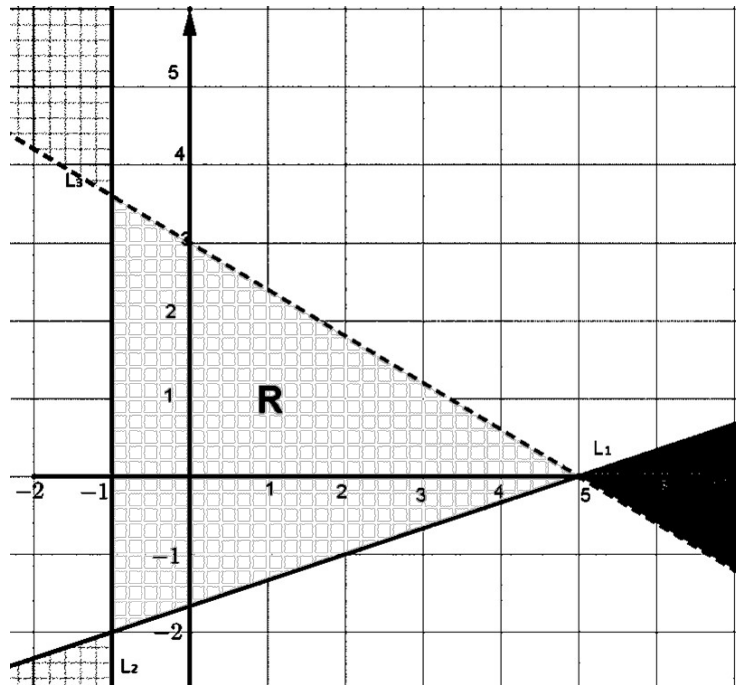
(ii) The bearing of A from C

(1mk)

11) Three numbers p, q and r are such that $p^3 \times q^2 \times r = 2250$. Find p, q and r .
(3 marks)

12) A bus starts off from Kitale at 9.00 a.m and travels towards Kakamega at a speed of 60km/hr. At 9.50 a.m, a matatu leaves Kakamega and travels towards Kitale at a speed of 60Km/h. If the distance between the two towns is 150km, how far from Kitale will the two vehicles meet?
(3marks)

13) Find the inequalities that satisfy the region R shown in the figure below. (3 marks)



- 14) A dealer sells a certain spare part for Kshs 650, making a profit of 30%. The manufacturer reduces the price to the dealer by Kshs 50 and the dealer reduces his selling price by the same amount. Find the dealer's new percentage profit. (3marks)

- 15) A taxi travelling at 20m/s accelerates uniformly and in 4 seconds, its velocity is 30m/s. it maintains this velocity for another 5 seconds before decelerating uniformly to rest after 3 seconds. Calculate the total distance travelled by the taxi during the journey. (3marks)

- 16) The length of a rectangle is $(x + 3)$ cm. If the width of the rectangle is two thirds its length and the perimeter is 40 cm, find its width. (3 marks)

SECTION II

Answer only five questions in this section

17. A sales agent earns a basic salary of Kshs. 20,000 per month. In addition, he is entitled for a commission for sales in excess of Kshs. 200,000 as follows:

Sales	Commission
0-200,000	0%
200,001-300,000	1.5%
300,001-400,000	3.0%
400,001-500,000	4.5%
Above 500,000	6.0%

- (a) On the month of April 2019, her total sales were Kshs. 558,200. Determine his total earnings that month. (4marks)
- (b) On the month of May 2020, his sales increase in the ratio 6:5, Calculate his total earnings on May 2020 to the nearest shilling. (3marks)
- (c) On the month of June 2020 his total earnings were Kshs. 39,800. Calculate the difference in his total sales in months of May and June. (3marks)

18. (a) A man standing 20m away from a building notices that the angles of elevation of the top and bottom of a flagpole mounted at the top of the building are 64° and 62° respectively. Calculate to 1d.p. the height of the flagpole.

(4marks)

b) The angles of elevation of the top of a tree from P and Q which are 30m apart are 22° and 32° respectively. Given that the two points are on the same side of the tree and on a straight line, determine the height of the tree.

(6marks)

19. Two security personnel were together at a road junction. Each had a walkie talkie. The maximum distance at which one could communicate with the other was 2.5km. One of the personnel walked due East at 3.2km/h while the other walked due North at 2.4km/h. The personnel who headed east travelled for x km while the one who headed North travelled for y km before they were unable to communicate.

(a) Draw a sketch to represent the relative positions of the policemen. (1 mark)

(b) (i) From the information above form two simultaneous equations in form of x and y. (2 marks)

(ii) Find the value of x and y. (5 marks)

(iii) Calculate the time in minutes taken before the security personnel were unable to communicate. (2 mark)

20. ABCD is a rectangle with A as the point (-3,1).

(a) If AB is parallel to the line $3y - x = 4$, find the equation of line AB.

(2 marks)

(b) Find the equation of line AD.

(2marks)

(d) If C has coordinates (2,6), find the equations of the line BC and CD in the form

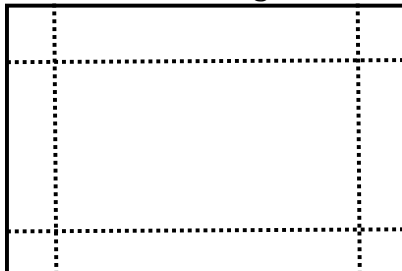
$$\frac{x}{a} + \frac{y}{b} = 1$$

(4marks)

(e) Find the coordinates of B

(2marks)

21. The figure below shows a rectangular sheet of metal whose length is twice its width.



An open rectangular tank is made by cutting equal squares of length 60 cm from each of its four corners and folding along the dotted lines shown in the figure above. Given that the

capacity of the tank so formed is 1920 litres and the width of the metal sheet used was x cm;

a) (i) Express the volume of the tank formed in terms of x cm. (3 marks)

(ii) Hence or otherwise obtain the length and width of the sheet of metal that was used. (3 marks)

b) If the cost of the metal sheet per m^2 is Kshs 1000 and labour cost for making the tank is 300 per hour. Find the selling price of the tank in order to make a 30% profit if it took 6 hours to make the tank. (4 marks)

22. a) The ratio of Juma's and Akinyi's earnings was 5: 3. Juma's earnings rose to Ksh 8 400 after an increase of 12%. Calculate the percentage increase in Akinyi's earnings given that the sum of their earnings was Ksh. 14 100 (6 marks)

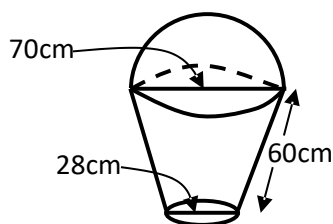
(b) Juma and Akinyi contributed all the new earnings to buy maize at Ksh 1 175 per bag. The maize was then sold at ksh 1 762.50 per bag. The two shared all the money from the sales of the maize in the ratio of their contributions. Calculate the amount that Akinyi got. (4 marks)

23. a) Given that $A = \begin{pmatrix} 3 & 4 \\ 2 & 3 \end{pmatrix}$ find inverse of A (1mark)

- b) Two colleges, Utalii and Huduma purchased beans and rice. Utalii bought 90 bags of beans and 120 bags of rice for a total of sh 360 000. Huduma bought 200 bags of beans and 300 bags of rice for a total of sh 850 000. Use the inverse of **A** obtained in (a) above to find the price of one bag of each item. (6marks)

- c) The price of beans later decreased in the ratio 4: 5 while that of rice increased by 20%. A businessman bought 20 bags of beans and 30 bags of rice. How much did he pay? (3marks)

24. The figure below shows a model of a solid in the shape of a frustum of a cone with a hemispherical top.



The diameter of the hemispherical top is 70cm and is equal to the diameter of the top of the frustum. The frustum has a base diameter of 28cm and a slant height of 60cm.

- (a) Calculate the area of the hemispherical surface. (1mark)

- (b) Calculate the slant height of the cone from which the frustum was cut. (4marks)

- (c) Calculate the total surface area of the model. (5 marks)

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REPLICA 3

121/1

MATHEMATICS

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SECTION II

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FOR MORE PAPERS FOR ALL SUBJECTS AND MARKING SCHEMES

SECTION I (50 MARKS)

Answer ALL questions in this section in the spaces provided

- 1) Without using mathematical tables or calculator evaluate; (3mks)

$$\sqrt{\frac{1.90 \times 0.032 \times 1.08}{2.00 \times 0.0038}}$$

- 2) Simplify completely $\frac{9a^2y - 16b^2y^3}{4by^2 - 3ay}$ (3mks)

- 3) A water tank has a capacity of 50 litres. A similar model tank has a capacity of 0.25litres. if the larger tank has a height of 100cm. calculate the height of the model tank. (3mks)

- 4) Simplify $\sqrt{\frac{12x^4 y^{-1} Z^5}{3x^{-2}y^{-3} Z^3}}$ (2 mks)

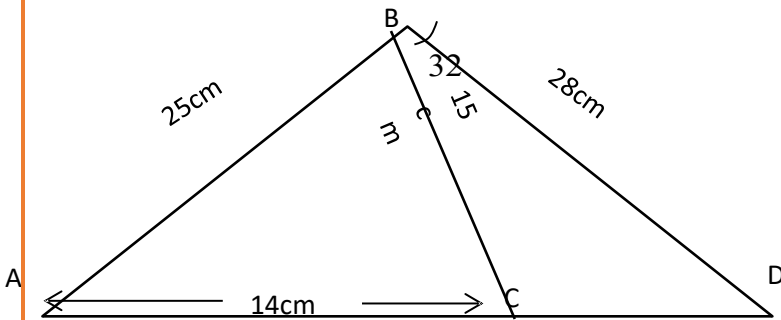
- 5) One interior angle of a certain polygon is 84° . If each of the other angles is 147° , how many sides does this polygon have? (3 mks)

- 6) During a certain period the exchange rates at a Pesa point were;

	Buying shs	Selling shs
Riyal	19.68	19.78

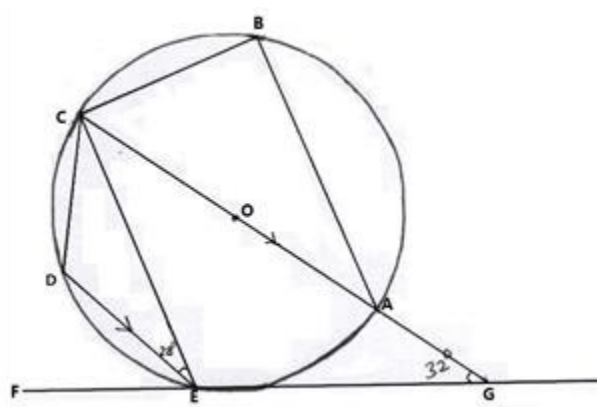
A tourist arrived with 5480 Riyal which he changed to Kshs. He spend $\frac{2}{3}$ of the total in visiting various sites. As he was leaving he changed all he had to Riyal. How much did he leave with? Answer to 1 d.p.
(3 mks)

- 7) Find the area of the triangle below given that lines $AB=25\text{cm}$, $BC = 15\text{cm}$, $AC = 14\text{cm}$, $BD = 28\text{cm}$ and $\angle CBD = 32^\circ$
(4mks)



- 8) A shear parallel to the x-axis maps point (1,2) onto a point (7, 2). Determine the shear factors and hence state the shear matrix (invariant line is $y = 0$)
(3mks)

- 9) The diagram below shows a circle ABCDE. The line FEG is a tangent to the circle at point E. Line DE is parallel to CG,
(3mks)



Calculate

(a) AEG

(2mks)

(b) ABC

(2mks)

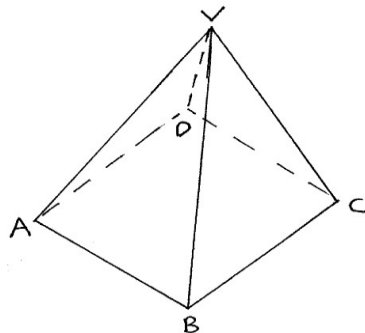
- 10) Wasike and Wanjala live 40km apart. Wasike starts cycling from his home at 8.00a.m toward's Wanjala's house at 16km/h. Wanjala stars cycling towards Wasike's house 30 minutes later at 8km/h. **what** time did they meet. (3mks)

- 11) The line which joins the point A (3, K) and B (-2, 5) is parallel to the line whose equation is $5y+2x-7=0$. Find the value of K. (3mks)

- 12) Given that $\cos A = \frac{5}{13}$ and angle A is acute, without using tables or calculator, find the value of $2 \tan A + 3 \sin A$. (3 mks)

- 13) Find the greatest integral value of x which satisfies. $\frac{2x+3}{2} < \frac{8-3x}{5} < \frac{5x+6}{3}$ (3mks)

- 14) The figure below (**not drawn to scale**) is a right pyramid with slant height of 5cm and square base of 3cm.



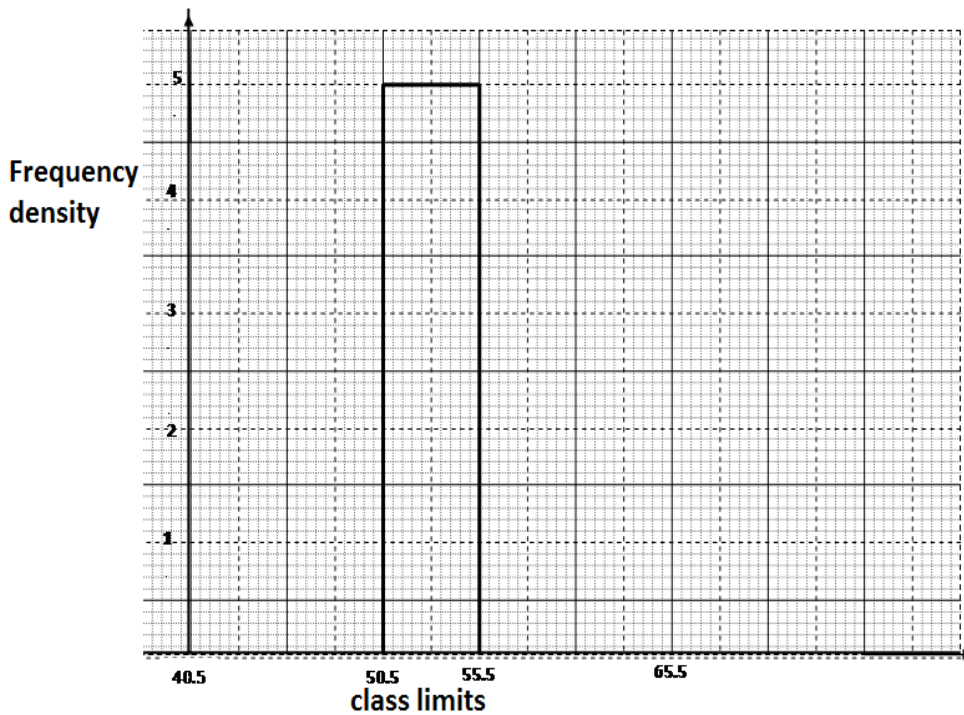
(a) Draw its net and label it. (2mks)

(b) Calculate the total surface area. (2mks)

15) A plane leaves town P to town Q on a bearing of 130° and a distance of 350km. It then flies 500km on a bearing of 060° to town R. Find, by scale drawing the distance between town R and town P. (3 mks)

16) The following data was obtained from the mass of a certain animal. Complete the table and the histogram below. (3 marks)

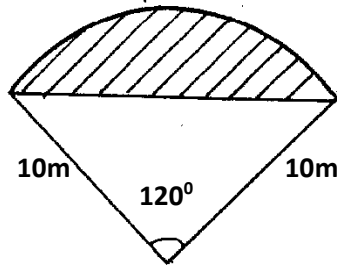
Mass(kg)	frequency
41-50	20
51-55	
56-65	40



SECTION II: (50 MARKS)

Answer only FIVE question from this section.

17) The ends of the roof of a workshop are segment of a circle of radius 10m. The roof is 20m long .The angle at the centre is 120° as shown in the figure below.



(a) Calculate:

(i) The area of one end of the roof

(4mks)

(ii) The area of the curve surface of the roof.

(2mks)

(b) What would be cost to the nearest shilling of covering the two ends and the curved surface with galvanized iron sheet costing sh.80 per square meter. (4mks)

18) A rectangular tank whose internal dimensions are 1.7m by 1.4m by 2.2m is three quarters full of milk.
a) Calculate the volume of milk in litres. (3 marks)

b) The milk is packed in small packets in a shape of a right pyramid with an equilateral base triangle of side 16cm. The height of each packet is 13.6cm. Full packets obtained are sold at ksh.25 per packet.

i) The volume in cm^3 of each packet to the nearest whole number. (3 marks)

ii) The number of full packets of milk.

(2 marks)

iii) The amount of money realized from the sell of milk.

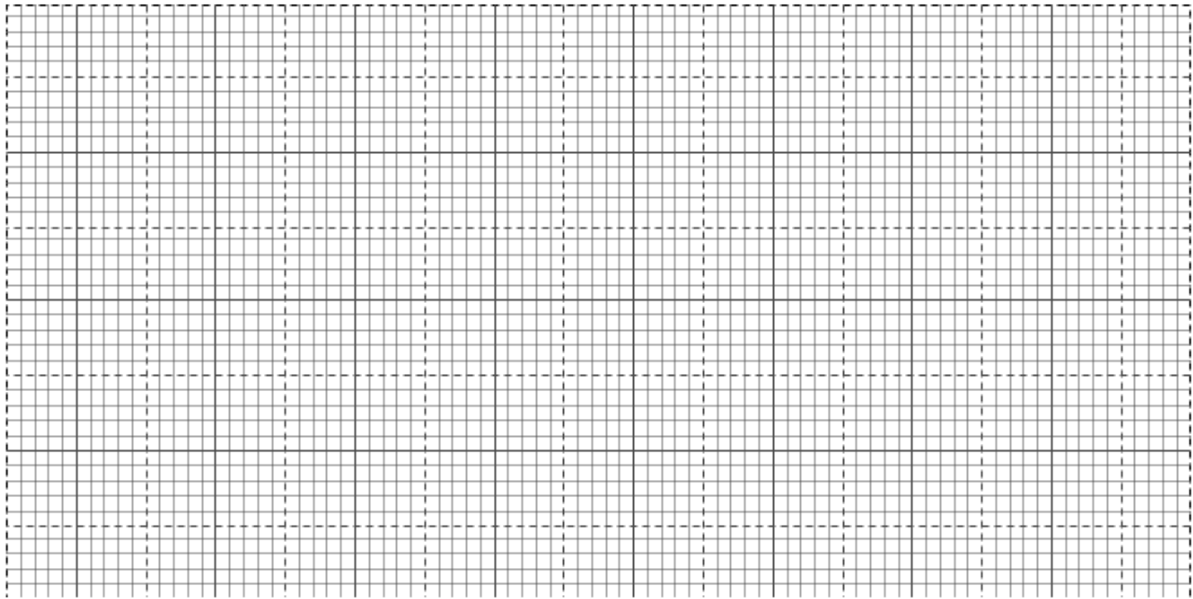
(2 marks)

19) (a) On the grid provided below, plot the polygon A(3, 7), B(5, 5), C(3, 1), D(1, 5) on a cartesian plane
(2mks)

(b) $A^1B^1C^1D^1$ is the image of ABCD under a translational $T\begin{pmatrix} -6 \\ -9 \end{pmatrix}$. Plot $A^1B^1C^1D^1$ and state its coordinates. (2mks)

(c) Plot $A^{11}B^{11}C^{11}D^{11}$, the image of $A^1B^1C^1D^1$ after a rotation about (-1, 0) through a positive quarter turn. State its coordinates. (3mks)

(d) $A^{111}B^{111}C^{111}D^{111}$ is the image of $A^{11}B^{11}C^{11}D^{11}$ after a reflection in the line $Y=x + 2$. Plot $A^{111}B^{111}C^{111}D^{111}$ and state its coordinates (3mks)



20) A straight line 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. (3 Marks)

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

c) Another line, which is perpendicular to the line in (a) above passes through point P and cuts the y axis at the point Q. Determine the coordinates of point Q. (3 Marks)

d) Find the length of QP (2 Marks)

21) Matrix P is given by

$$\begin{pmatrix} 4 & 7 \\ 5 & 8 \end{pmatrix}$$

(a) Find p^{-1} (3mks)

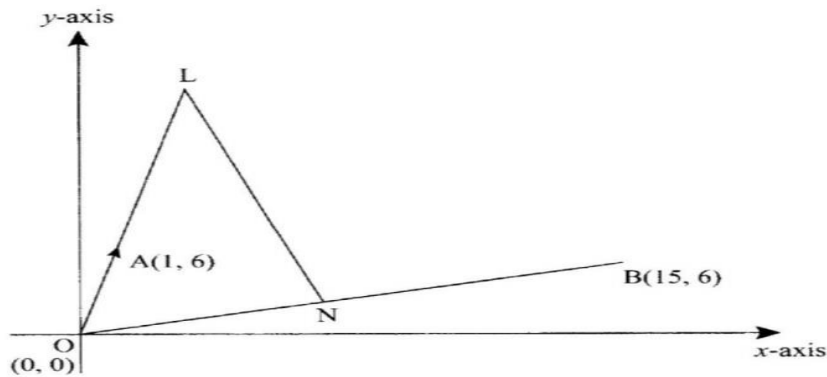
(b) Two institutes regions and Alphax purchased beans at sh.B per bag and maize at sh.M per bags. Regions purchased 8 bags of beans and 14 bags of maize for sh. 47,600. Alphax purchased 10 bags of beans and 16 bags of maize for sh. 57,400.

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

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

- (c) The price of bean later went up by 5% and that of maize remain constant. Regions bought the same quality of beans but spent the same total amount of money as before on the two items. State the new ratio of beans and maize. (2mks)

22. In the diagram below, the coordinates of points A and B are (1, 6) and (15, 6) respectively. Point N is on OB and that $3 ON = 2 OB$. OA is produced to L such that $OL = 3 OA$



- (a) Vector LN. (3 marks)

- (b) Given that a point M is on LN such that $LM:MN = 3:4$, find the coordinate of M. (2 marks)

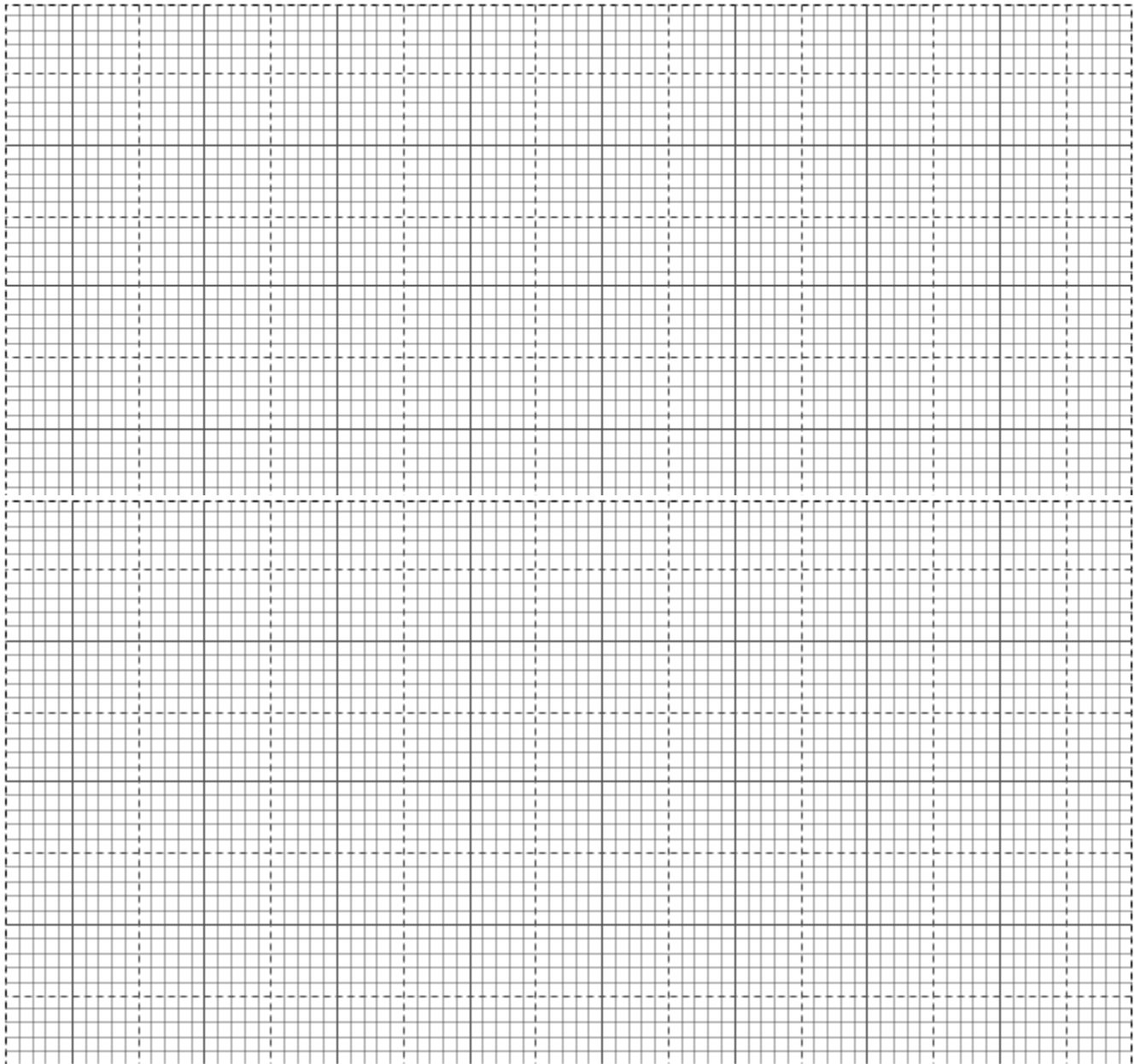
- (c) If line OM is produced to T such that $OM:MT = 6:1$
 (i) Find the position vector of T. (1 mark)

- (ii) Show that points L, T and B are collinear. (4 marks)

23. Complete the table below for the functions $y = 2x^2 - 3x - 5$ for $-2 \leq x \leq 3$ (2 mks)

x	-2	-1	0	1	2	3
y						

(b) Draw the graph of $y = 2x^2 - 3x - 5$ from the table above. (2 mks)



(c) Use your graph to solve the equation $y = 2x^2 - 3x - 5 = 0$ (1 mk)

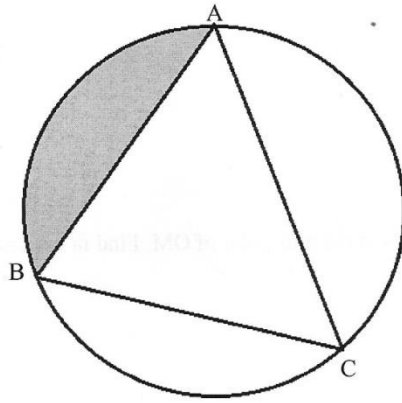
(e) From your graph, find the value of X which satisfy the simultaneous equations. (1 mk)

$$y = 2x^2 - 3x - 5$$

$$y = 2x - 2$$

(d) Write down the equation which is satisfied by the values of x in (e) above in the form $ax^2 + bx + c = 0$ (2 mks)

24. The diagram below shows a circle ABC with $AB=12\text{cm}$, $BC=15\text{cm}$, and $AC=14\text{cm}$



Calculate to 4 significance figures:

(a) The angle ACB

(3mks)

(b) The radius of the circle.

(3mks)

(c) The area of the shaded region

(4mks)

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KCSE REPLICA SERIES 2 TERM 2 2023
MAY-AUGUST 2023- 2 ½ hours

Name Admission number

Candidate's Signature.....Date.....

REPLICA 4

121/1

MATHEMATICS

PAPER 1

INSTRUCTIONS TO CANDIDATES

- a) Write your name and admission number in the space 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 in section II
- d) Show all the steps in your calculations; giving your answers at each stage in the spaces provided below each question.
- e) Marks may be given for correct working even if the answer is wrong.
- f) Non-programmable silent electronic calculators and KNEC mathematical tables may be used.
- g) This paper consists of 15 printed pages

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	TOTAL

SECTION I

17	18	19	20	21	22	23	24	TOTAL

Grand total

SECTION II

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SECTION I (50 Marks)

Answers all the questions in this section in the space provided.

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

$$\frac{\sqrt{45} \times (2.04)^2}{2.89 \times \sqrt{0.05}}$$

2. Momanyi spent one eighth of his February Salary on farming, half on school fees and two thirds of the remainder on food. Calculate his February salary and the amount he spend on school fees if he spent sh. 3200 on food. (3marks)

3. Makau, Wanjiru and Kemboi start a race at 9.03 a.m in the same direction to run round a circular course. Makau makes the circuit in 252 seconds, Wanjiru in 308 seconds and Kemboi in 198 seconds. If they start from the same point, at what time will they next be all at the starting point together? (3marks)

4. Use squares square roots and reciprocal tables to evaluate (3marks)

$$3.045^2 + \frac{1}{\sqrt{49.24}}$$

5. Simplify the expression

$$\frac{9t^2 - 25a^2}{6t^2 + 19at + 15a^2} \quad (3marks)$$

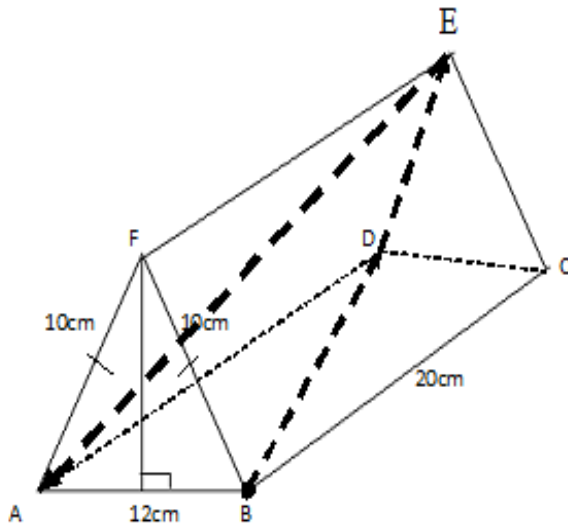
6. A square based brass plate is 2mm high and has a mass of 1.05kg. The density of the brass is 8.4g/cm^3 . Calculate the length of the plate in centimeters. (3 marks)

7. The currency exchange rates of a given bank in Kenya are as follows;

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

A tourist arrived in Kenya with 5,000 US dollars which he converted to Kenya shillings upon arrival. He spent ksh.214, 500 and converted the remaining to sterling pounds. How many pounds did he receive? (3marks)

8. The figure below shows a simple tent. $AF=FB=10\text{cm}$, $AB=12\text{cm}$ and $BC=FE=AD=20\text{cm}$. On the tent, a tight rope is tied as shown on the diagram from BD , DE and EA . Draw the net of the tent and show the path of the rope on the net using the scale $1\text{cm rep. } 5\text{cm}$ (3marks)

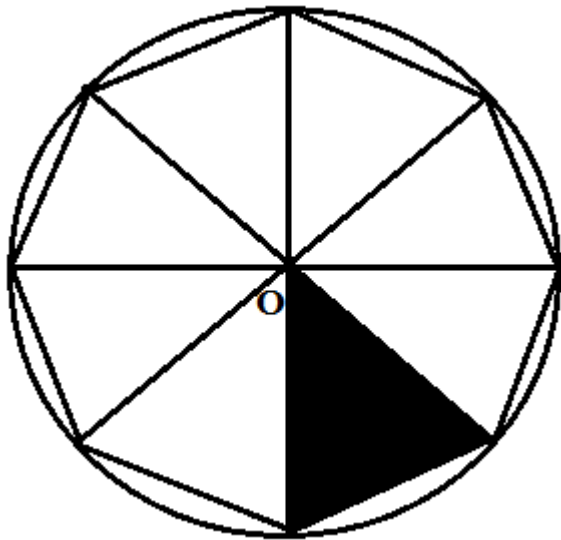


9. Mrs Wekesa paid shs 12500 for a wrist watch after the shopkeeper gave her a discount of 2%. If the shopkeeper made a profit of 20%. calculate the price the shopkeeper bought from the manufacturer. (3marks)

10. Solve for x in $\left(\frac{4}{9}\right)^x \times (8)^{1-x} = 486$ (4marks)

11. Find the equation of a perpendicular bisector of line PQ if the coordinates of P and Q are (-2,6) and (4,-2) respectively, in the form $y = mx + c$ (3marks)

12. Complete the figure below by adding the correct missing features if it has a rotational symmetry of order 4 about O. (3marks)



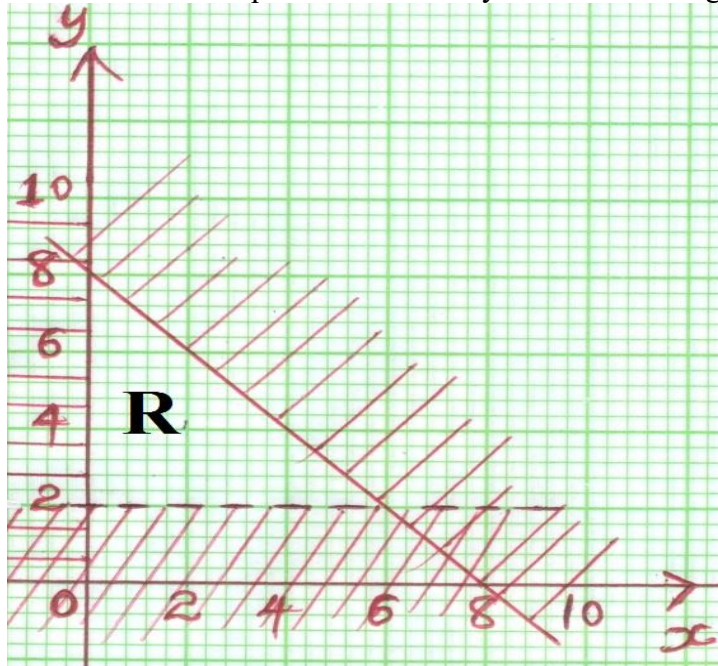
13. The volumes of two similar cylindrical containers are 27cm^3 and 125cm^3 respectively. Given that the height of the smaller container is 12cm, find the height of the larger container. (3marks)

14. Without using calculator or mathematical tables, simplify (4marks)

$$\frac{\cos 30 - \sin 45}{\sin^2 30 + \tan^2 45}$$

15. Form three inequalities that satisfy the unshaded region R.

(3marks)



16. A railway line and a road are parallel to each other on a flat and level section of land. A 5 metre long car moving at a speed of 110kmh^{-1} starts overtaking a train which is 495 metres and moving at 80kmh^{-1} . How long will it take the car to completely overtake the train?

(3marks)

SECTION II (50 Marks)

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

17. The vertices of a parallelogram are O (0,0), A(5,0),B(8,3) and C(3,3)

Plot on the same axes

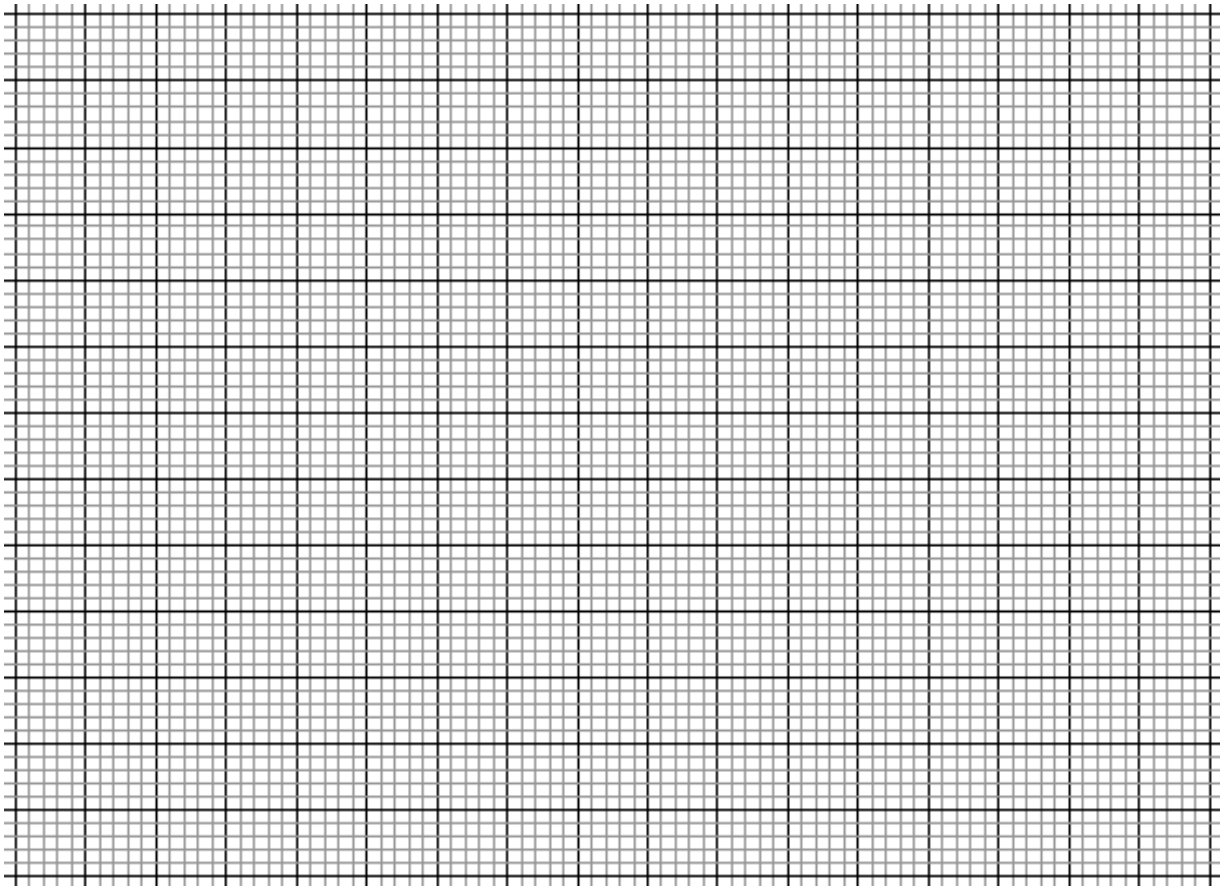
i) Parallelogram O'A'B'C', the image of OABC under reflection in the line $x=4$ (4marks)

ii) Parallelogram O''A''B''C'' the image of O'A'B'C' under a transformation described by the

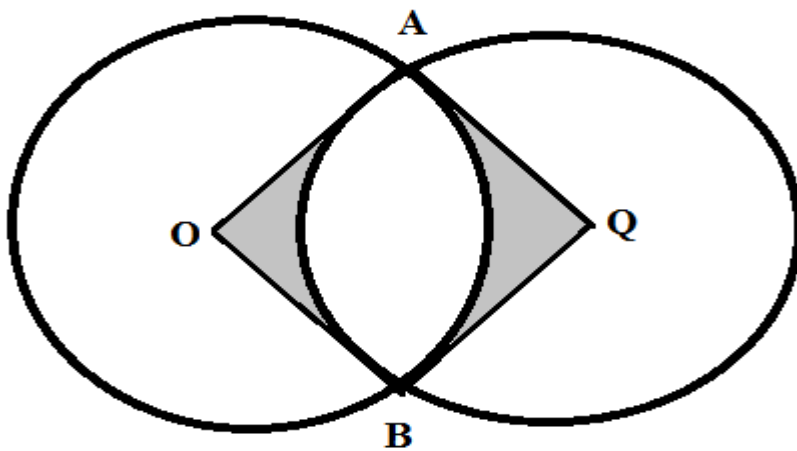
matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$. Describe the transformation. (4marks)

iii) Parallelogram O'''A'''B'''C''', the image of O''A''B''C'' under the enlargement, centre

(0,0) and scale factor $\frac{1}{2}$ (2marks)



18. 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)

19. In the figure below, EG is the diameter of the circle centre O. Points B, G, D, E and F are on the circumference of the circle. $\angle BFD = 50^\circ$, $\angle BEO = 25^\circ$ and line ABC is a tangent to the circle at B

Giving reasons,

(a) $\angle CBD$ (2marks)

(b) $\angle BED$ (2marks)

(c) The reflex angle BOD (2marks)

(d) $\angle EBA$ (2marks)

(e) $\angle BGD$ (2marks)

20. OAB is a triangle in which $\mathbf{OA} = \mathbf{a}$, $\mathbf{OB} = \mathbf{b}$, M is a point on OA such that $OM:MA=2:3$ and N is another point on AB such that $AN:NB = 1:2$. Lines ON and MB intersect at X.

- a) Express the following vectors in terms of \mathbf{a} and \mathbf{b}
- i) \mathbf{AB} (1mark)
- ii) \mathbf{ON} (1mark)
- iii) \mathbf{BM} (1mark)

b) If $\mathbf{OX} = k \mathbf{ON}$ and $\mathbf{BX} = h \mathbf{BM}$, express \mathbf{ON} in two different ways. Hence or otherwise find the value of h and k (6marks)

c) Determine the ratio OX: XN (1 mark)

21. Every Sunday Alex drives a distance of 80km on a bearing of 074° to pick up his brother John to go to church. The church is 75km from John's house on a bearing of $S50^{\circ}E$. After church they drive a distance of 100km on a bearing of 260° to check on their father before Alex drives to John's home to drop him off then proceeds to his house.

(a) Using a scale of 1 cm to represent 10km, show the relative positions of these places. (4 marks)

(b) Use your diagram to determine:

(i) the true bearing of Alex's home from their father's house. (1 mark)

(ii) the compass bearing of the father's home from John's home. (1 mark)

(iii) the distance between John's home and the father's home. (2 marks)

(iv) the total distance Alex travels every Sunday. (2 marks)

22. The data below shows the sample of age distribution of some of the people who reside in a Yoruba village in years.

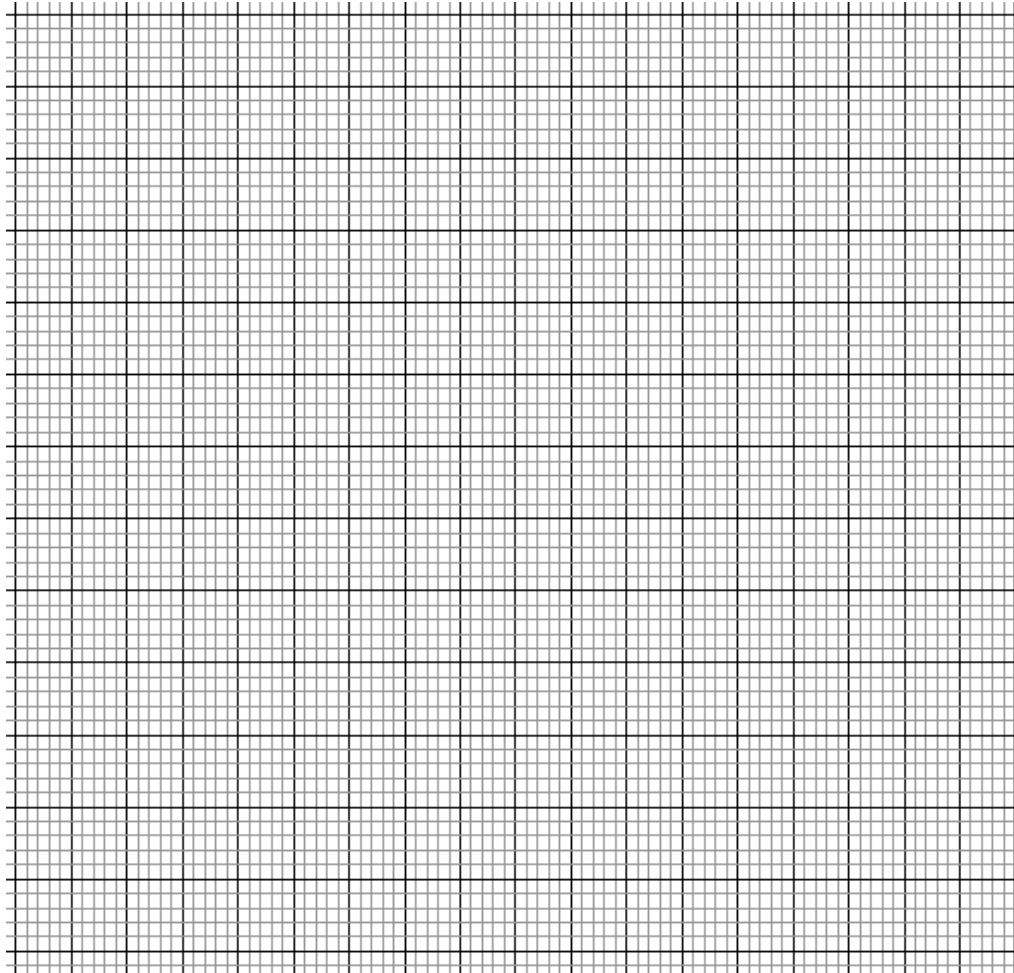
Age group	Number of persons in age group
1 - 5	4
6 - 10	12
11 - 20	9
21 - 30	6
31 - 50	18
51 - 55	4
56 - 65	2

(a) Complete the frequency distribution table above and hence

(i) Calculate the mean. (3marks)

(ii) Calculate the median. (2marks)

(b) Draw a frequency polygon from the given data on the grid below (5marks)

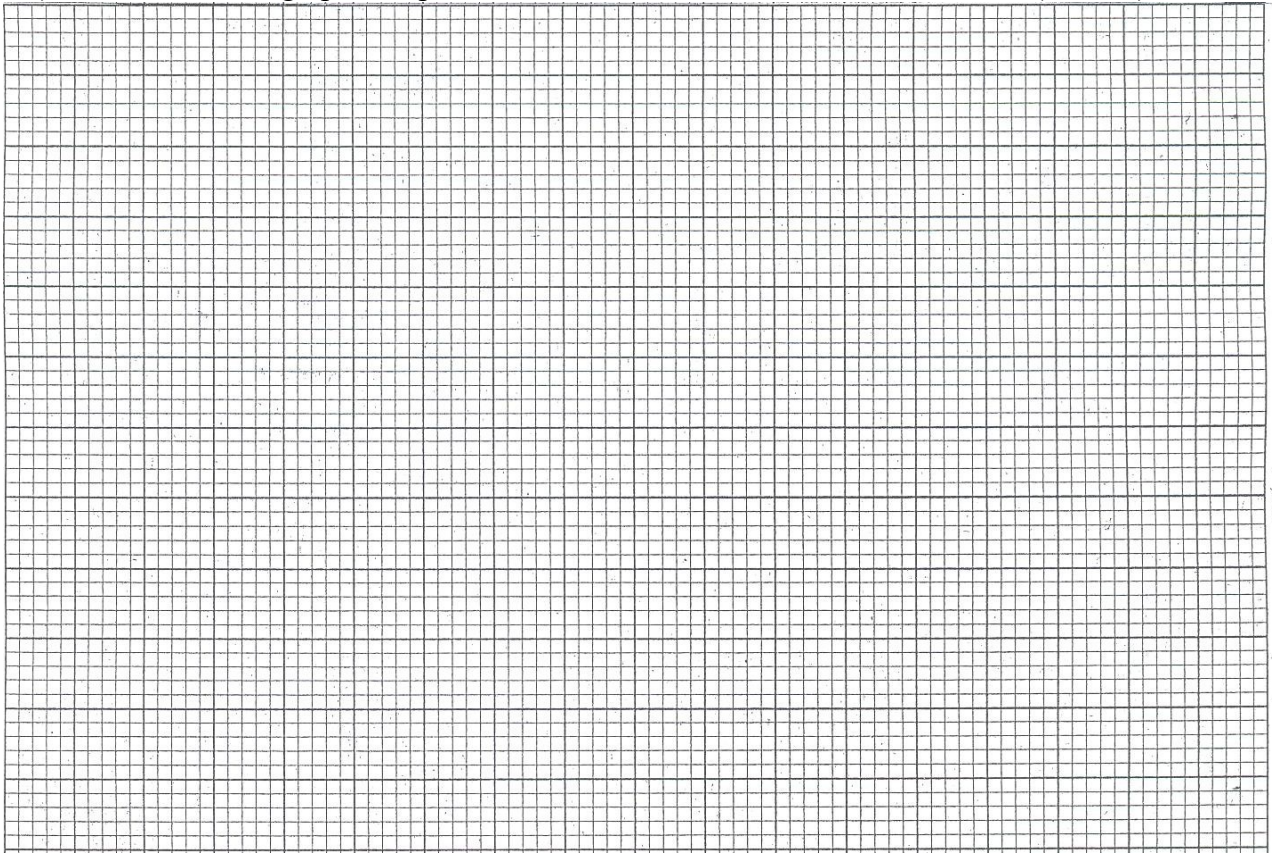


23. Two variables x and V are known to satisfy the relation $V = Kx^n$ where k and n are constants. The table below shows data collected from an experiment.

x	3.01	3.98	5.01	6.02	7.08	8.94
V	10.5	101	989	9600	95000	854000

a) Write down the function $V = Kx^n$ in linear form and make a suitable table of values correct to one decimal place. (3marks)

b) Draw a suitable graph to represent the relation $V = Kx^n$ (3marks)



24. A particle moves in a straight line. It passes through point O at $t = 0$ with velocity $V = -4m/s$. The acceleration $a m/s^2$ of the particle at time t seconds after passing through O is given by $a = 10t + 1$

(a) Express the velocity V of the particle at time t seconds in terms of t . (3marks)

b) Find V when $t = 3$ (1mark)

c) Determine the value of t when the particle is momentarily at rest (3marks)

d) Calculate the distance covered by the particle between $t = 2$ and $t = 4$ (3marks)

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MAY-AUGUST 2023- 2 ½ hours

Name Admission number

Candidate's Signature..... Date.....

REPLICA 5

121/1

MATHEMATICS

PAPER 1

INSTRUCTIONS TO CANDIDATES

- a) Write your name and admission number in the space 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 in section II
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	TOTAL	

SECTION I

17	18	19	20	21	22	23	24	TOTAL

Grand total

SECTION II

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SECTION I (50 Marks)

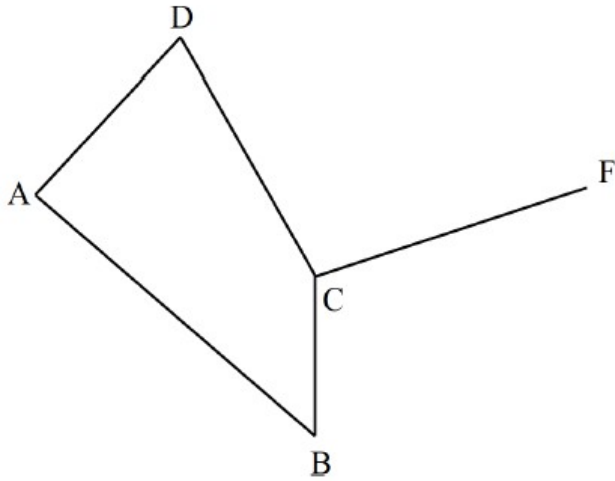
Answer all the questions in this section

1. A man withdrew some money from a bank. He spent $\frac{3}{10}$ of the money on his daughter's school fees and $\frac{3}{5}$ of the remainder on his son's school fees. If he remained with Ksh 10 500, calculate the amount of money he spent on son's school fees. (3 marks)

2. Solve for x (3 marks)
- $$9^{(x+1)} + 3^{(2x+1)} = 108$$

3. The volume of two similar solid spheres are 4752 cm^3 and 1408 cm^3 . If the surface area of the smaller sphere is 352 cm^2 , find the surface area of the larger sphere. (3 marks)

4. The figure below represents a sketch of the cross – section of a solid ABCDEFGH and its edge CF. Complete the sketch of the solid showing the hidden edges using dotted lines. (3 marks)



5. When a given length of a piece of wire is divided into pieces measuring 20 cm or 24 cm or 26 cm or 28 cm, a piece of wire 7cm always remained. Find the length of wire. (4 marks)
6. Solve the equation $6x^2 - 13x + 6 = 0$ using the completing the square method. (3 marks)
7. Using a ruler and a pair of compasses only, construct a trapezium ABCD in which $AB = 5\text{ cm}$, $AD = 6\text{ cm}$, $DC = 10\text{ cm}$, $\angle BAD = 105^\circ$ and AB is parallel to DC. Draw a perpendicular from B to DC hence measure the height of the trapezium. (4 marks)

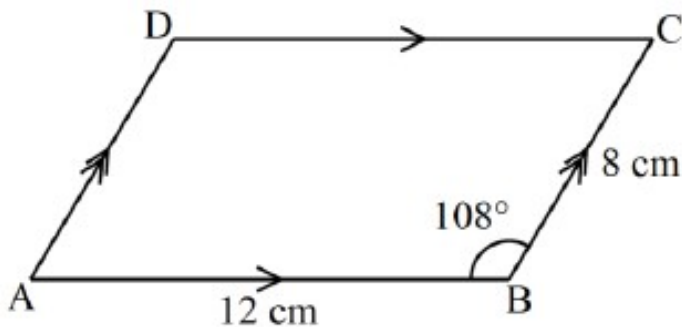
8. Given that $\vec{a} = 2p - \frac{3}{4}q$ where $p = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$ and $q = \begin{pmatrix} 16 \\ 4 \end{pmatrix}$ Find column vector \vec{a} . (2 marks)

9. Two friends Ojwang and David live 40 km apart. One day Ojwang left his house at 9.00 a.m. and cycled towards David's house at an average speed of 15 km/h. David left his house at 10.30 a.m. on the same day and cycled towards Ojwang's house at an average speed of 25 km/h. Determine;

i. The time taken before the two friends met. (3 marks)

ii. The time they met. (1 mark)

10. In the figure below, ABCD is a parallelogram in which AB = 12 cm, BC = 8 cm and angle ABC = 108° .



Calculate the area of the parallelogram correct to 3 significant figures. (3 marks)

11. Without using mathematical tables or a calculator evaluate. (3 marks)

$$\frac{\tan 30^\circ \tan 60^\circ}{\sin 60^\circ \cos 30^\circ}$$

12. Given that $M = \begin{pmatrix} 4 & 5 \\ 2 & 3 \end{pmatrix}$ and $N = \begin{pmatrix} -2 & 3 \\ 1 & -1 \end{pmatrix}$, find $M^{-1}N$ (3 marks)

13. Simplify completely; $\frac{(m+5n)^2+(m-5n)^2}{3m^2+75n^2}$ (3 marks)

14. Use logarithms to evaluate. (3 marks)

$$\frac{39.51 \times 614}{0.758}$$

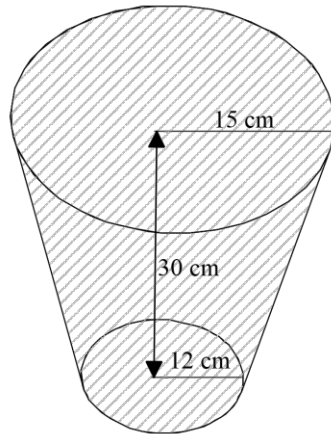
15. Dr. June needs to import a car from Japan that costs US dollars (USD) 5 000 outside Kenya. He intends to buy the car through an agent who deals in Japanese Yen (JPY). The agent charges a 20% commission on the price of the car and a further 80 325 JPY for shipping the car to Kenya. Find the amount in Kenya shillings that Dr. June will need to send to the agent to get the car given that 1 USD = Ksh. 120 and 1USD = 135 JPY (3 marks)

16. In a right angled triangle, the two sides enclosing the right angle measure $(3x - 2)$ cm and $(x + 2)$ cm. If the area of the triangle is 17.5 cm^2 , find the length of these two sides. (3 marks)

SECTION II (50 Marks)

Answer any Five questions only in this section

- 17.** The diagram below shows a frustum which represents a bucket with an open end diameter of 30 cm and bottom diameter 24 cm.



The bucket is 30cm deep. (Use $\pi = 3.142$)

- (a) Calculate the capacity of the tank in litres.

(5 marks)

- (b) The bucket is used to fill an empty cylindrical tank of diameter 1.4m and height 1.2m.

- i. Calculate the capacity of the tank in litres.

(3 marks)

- ii. Determine the number of buckets that must be drawn in order to fill the tank.

(2 marks)

- 18.** Three islands P, Q, R and S are on an ocean such that island Q is 400Km on a bearing of 030° from island P. Island R is 520 km and a bearing of 120° from island Q. A port S is sighted 750 km due South of island Q.

- a) Taking a scale of 1cm to represent 100Km, give a scale drawing showing the relative positions of P, Q, R and S.

(4 marks)

- b) Use the scale drawing to find the bearing of:

- i. Island R from island P

(1 mark)

- ii. Port S from island R

(1 mark)

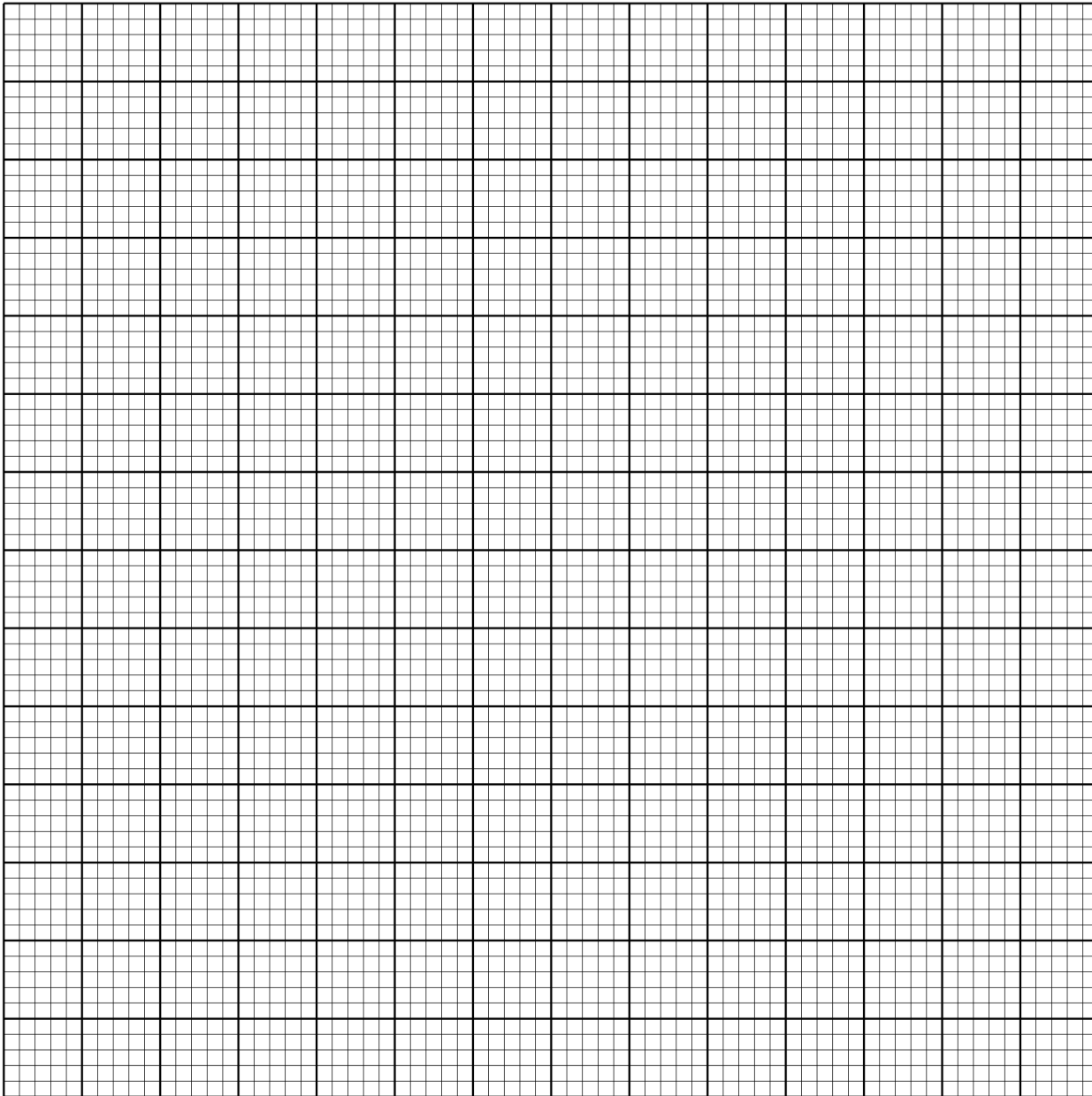
c) Find the distance between island P and R

(2 marks)

d) A warship T is such that it is equidistant from the islands P, S and R. by construction locate the position of T.
(2 marks)

19. The vertices of a triangle ABC are A(1,1), B(4,1) and C(6,4)

a) On the grid below, draw the triangles.



i. ABC.

(1 mark)

ii. $A'B'C'$, the image of triangle ABC under a negative quarter turn about the origin.

iii. $A''B''C''$, the image of triangle $A'B'C'$, under reflection in the line $y = x$. (2 marks)

b) Triangle $A'''B'''C'''$, with vertices $A'''(-1, -5)$, $B'''(-4, -5)$ and $C'''(-6, -2)$, is the image of, triangle $A''B''C''$, under a transformation **T**.

i. Draw the triangle $A''B''C''$, (1 mark)

ii. Describe fully the transformation **T**. (2 marks)

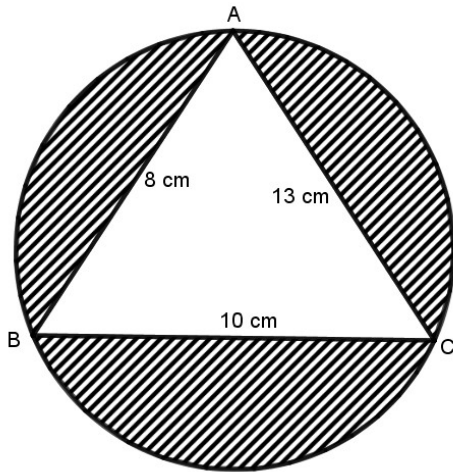
c) State **any** pair of triangles which are:

i. Directly congruent. (1 mark)

ii. Oppositely congruent. (1 mark)

20. The figure below shows a triangle inside a circle. $AB = 8\text{ cm}$, $BC = 10\text{ cm}$ and $AC = 13\text{ cm}$

$AC =$



Calculate

(a) The area of triangle ABC. (3 marks)

(b) Angle BAC (2 marks)

(c) The radius of the circle. (2 marks)

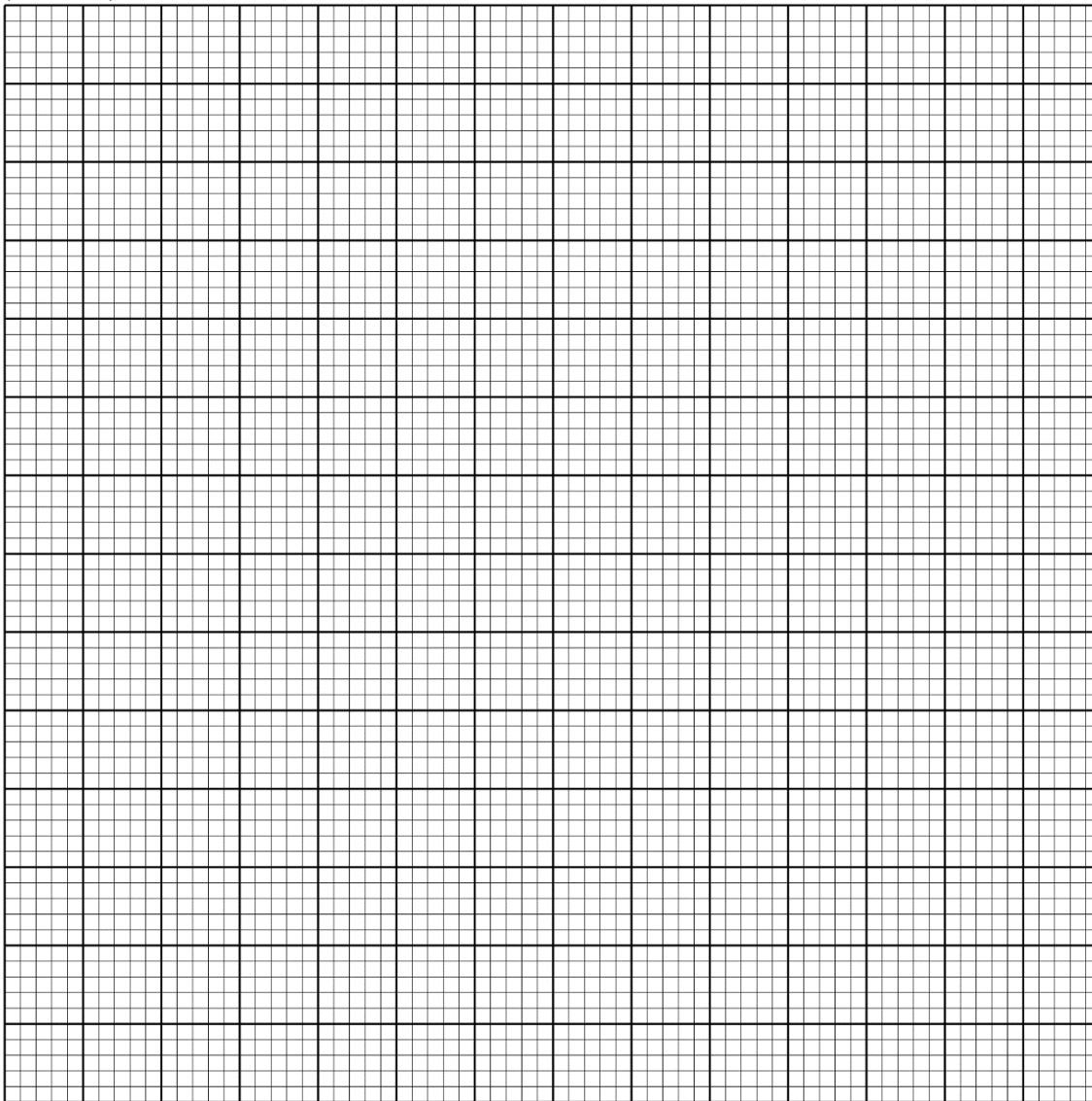
(d) Area of the shaded region.

(3 marks)

21. (a) Complete the table below for the function $y = x^3 - 5x^2 + 2x + 9$ for $-2 \leq x \leq 5$
(2 marks)

x	-2	-1	0	1	2	3	4	5
y			9					

(b) On the grid provided, draw the graph of $y = x^3 - 5x^2 + 2x + 9$ for $-2 \leq x \leq 5$
(3 marks)



(c) Use the graph in (b) above to find the roots of the following equations:

i. $x^3 - 5x^2 + 2x + 9 = 0$

(2 marks)

ii. $x^3 - 5x^2 + 6x = -5$ (3 marks)

22. A construction company makes concrete by mixing cement, sand and ballast such that the ratio of cement to sand is 1:2 and that of sand to ballast is 3:4.

a) Determine:

i. The ratio of cement to ballast in the concrete. (2 marks)

ii. The number of bags of ballast required to make a concrete with 27 bags of sand. (2 marks)

b) The cost of a bag of cement, sand and ballast is Ksh 680, Ksh 136 and Ksh 102 respectively. Calculate the cost of one bag of concrete. (2 marks)

c) The construction company requires to transport 30 tonnes of sand to a site using a tractor. The tractor carries a maximum of 3 600 kg of sand and costs Ksh 8 000 per trip. Calculate the least amount of money required to transport the sand to the site. (4 marks)

23. A trader bought 8 cows and 12 goats for a total of Ksh 294,000. If he had bought 1 more cow and 3 more goats he would have spent Ksh 337,500

a) Form two equations to represent the above information. (2 marks)

b) Use matrix method to determine the cost of a cow and that of a goat. (4 marks)

c) The trader sold the animals he had bought making a profit of 40% per cow and 45% per goat. Calculate the total amount of money he received. (2 marks)

d) Determine his profit in Kenya shillings. (2 marks)

24. A straight line l_1 has a gradient $-\frac{1}{2}$ and passes through the point $(-1, 3)$. Another line l_2 passes through the points $Q(1, -3)$ and $R(4, 5)$. Find:

a) (i) The equation of l_1 in the form $y = mx + c$, where m and c are constants. (2 marks)

(ii) Hence find the y intercept of line l_1 (1 mark)

b) (i) The gradient of l_2 (1 mark)

(ii) The equation of l_2 in the form $ax + by = c$, where a , b and c are integral values. (2 marks)

c) The equation of a line passing through a point $(0, 5)$ and perpendicular to l_2 . (3 marks)

d) Calculate the acute angle that l_3 makes with the x -axis. (1 mark)

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REPLICA 6

121/1
MATHEMATICS
PAPER 1
INSTRUCTIONS TO CANDIDATES

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- f) Non-programmable silent electronic calculators and KNEC mathematical tables may be used.
- g) This paper consists of 15 printed pages

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	TOTAL

SECTION I

17	18	19	20	21	22	23	24	TOTAL

Grand total

SECTION II

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FOR MORE PAPERS FOR ALL SUBJECTS AND MARKING SCHEMES

SECTION I (50 Marks)

Answer *all* the questions in this section

1. Find the value of $1.5\bar{7} - 0.4\bar{2}$ leaving the answer as a mixed fraction in simplified form. (3 marks)

2. Oscar refuels his car every two days; Morris refuels his car after every four days while Millicent refuels her car after every ten days. If the all refueled their cars on 20th March, on which date will they refuel their cars together again? (3 marks)

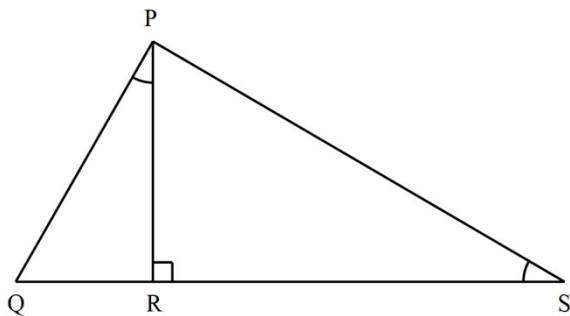
3. Use logarithms only to evaluate, correct to 4 decimal places: (4 marks)

$$\left(\frac{12.78 \sin 33.45^\circ}{(9.063)^2} \right)^{\frac{1}{3}}$$

4. Without using a calculator, evaluate leaving the answer as a fraction in the simplest form. (3 marks)

$$\frac{2\frac{1}{4} + \frac{3}{5} \div \frac{5}{6} \text{ of } 2\frac{2}{5}}{1\frac{7}{10}}$$

5. In the figure below angles QPR and PSR are equal. Angle PRS is a right angle. The ratio of the PR:QR=4:3

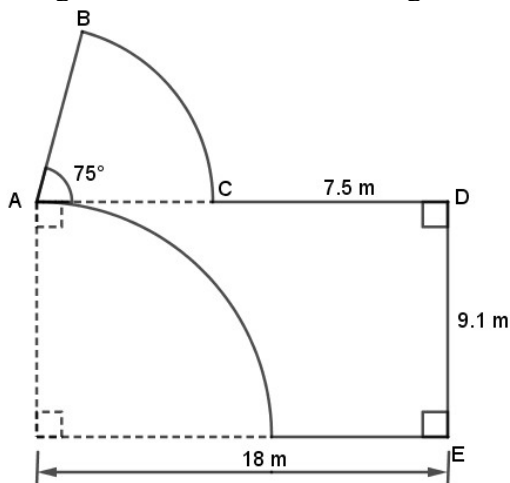


Given that the area of triangle PQR is 24 cm^2 , find the area of triangle PRS. (3 marks)

6. A suit whose marked price is sh. 8,000 is sold to customer after allowing him a discount of 13%. If the trader makes a profit of 20%, find how much the trader paid for the suit. (3 marks)

7. Evans is a salesperson with Ajab Millers. He is paid on monthly basis as the agreement; basic pay of Ksh. 20,000, a commission of 2% for goods sold up to a maximum of Ksh. 200,000 and a commission of 4% for goods sold over Ksh. 200,000 in that month. In January 2023, he sold goods worth Ksh. 600,000. Calculate his total pay that month. (3 marks)

8. The figure below shows a flower garden with the dimensions shown.



Calculate the perimeter of the garden (3 marks)

9. The GCD of three numbers is 30 and their LCM is 900. Two of the numbers are 60 and 150. By expressing the GCD, LCM and the two numbers as products of their prime factors, determine the least possible value of the third number. (3 marks)

10. Solve for x in the equation (3 marks)

$$\frac{27^x \times 9^{2x}}{\left(\frac{1}{3}\right)^x} = 81$$

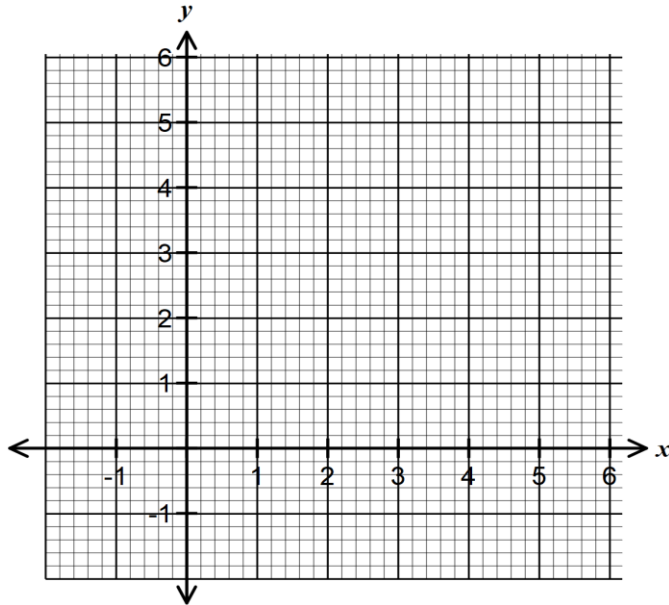
11. The sum of interior angles of two regular polygons of sides; n and $n + 2$ are in the ratio 3:4. Calculate the value of n hence find the size of each exterior angle of the polygon with n sides. (4 marks)

12. Simplify the expression: (3 marks)

$$\frac{(x + 1)(4a^2 - ax)}{x^2 - 4ax - 4a + x}$$

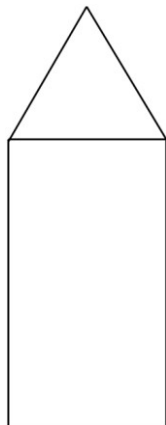
13. The sum of two consecutive even numbers is 270. Find the numbers. (2 marks)

14. On the grid provided below, draw and label the region R satisfied by the following inequalities:
 $L_1; x \geq -1$, $L_2; 3y - x \geq -5$ and $L_3; 3x + 5y < 15$ (3 marks)



15. In a theatre group, the ratio of males to females is 2:3. On one Tuesday training, ten males members were absent and six new female members joined the group as guests for the day. If on this day the ratio of males to females was 1:3, how many regular members does the group have? (3 marks)

16. The figure below shows part of the net of a triangular prism whose cross-section is an equilateral triangle.



Complete the net of the solid. (4 marks)

SECTION II (50 Marks)

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

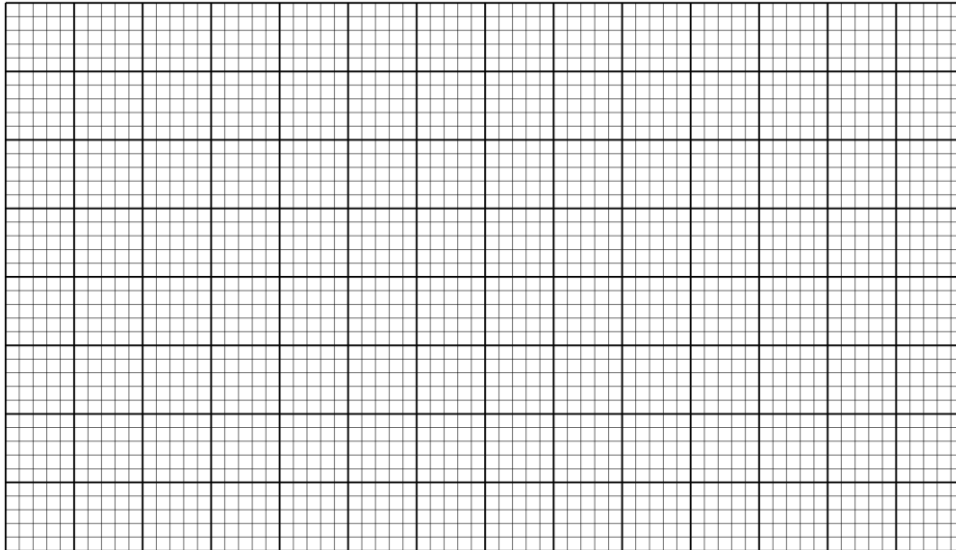
17. The table below shows the wages in US dollars earned by technical developers in an ICT firm

Amount (USD)	10 – 14	15 – 24	25 – 29	30 – 44	45 – 64
Number of workers	6	16	a	9	5

(a) Given that the mean wage is $27\frac{11}{16}$ USD, find the value of a . (4 marks)

(b) Find the median class and its frequency. (2 marks)

(c) On the grid provided, draw a histogram to represent the information. (4 marks)



18. A composite solid comprises of a frustum of a cone mounted on a hemisphere such that the diameters of the hemisphere and the bottom of the frustum both measure 30 cm. The entire solid has a vertical height of 60 cm. The radius of the top of the frustum is 10 cm.

(a) Calculate the volume of the solid correct to two decimal places. Use $\pi = \frac{22}{7}$. (7 marks)

(b) The solid is melted and recast into cubes of side 16 cm. How many such cubes are realized? (3 marks)

19. Two lines $L_1: 2y - 3x - 6 = 0$ and $L_2 = 3y + x = 20$ intersect at a point M
(a) Find the coordinates of M. (3 marks)

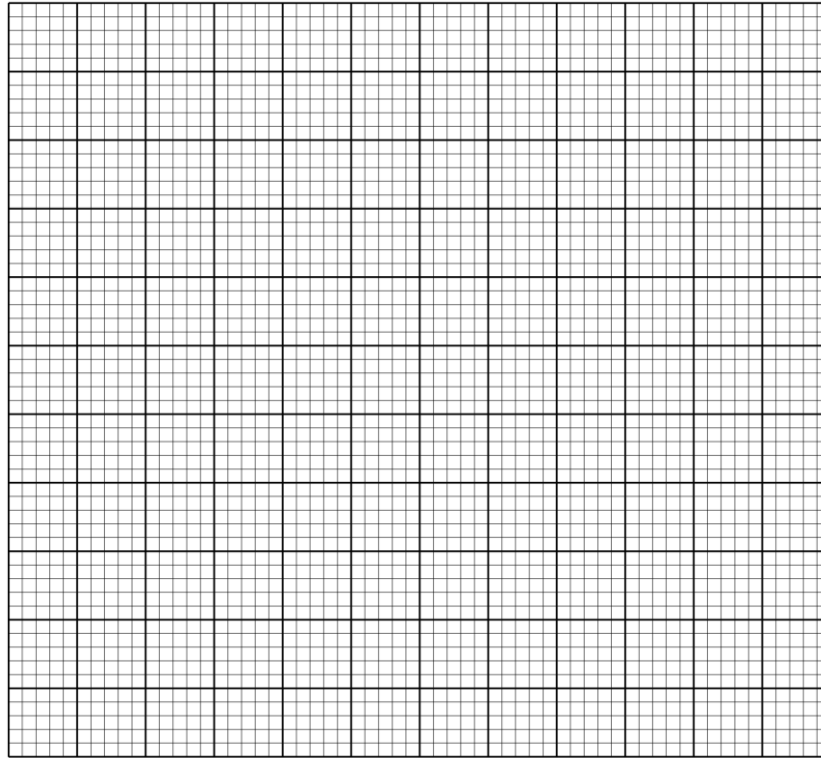
(b) A third line L_3 is perpendicular to L_2 at M. Find the equation of L_3 in the form $y = mx + c$ where m and c are constants (3 marks)

(c) Another line L_4 is parallel to L_1 and passes through $(-1, 3)$. Determine the x and y intercepts of L_4 (4 marks)

20. (a) Complete the table below for the function $y = 2x^2 + 5x - 12$ for $-6 \leq x \leq 3$. (2 marks)

x	-6	-5	-4	-3	-2	-1	0	1	2	3
y				-9			-12			

(b) On the grid provided, draw the graph of $y = 2x^2 + 5x - 12$ for $-6 \leq x \leq 3$ (3 marks)

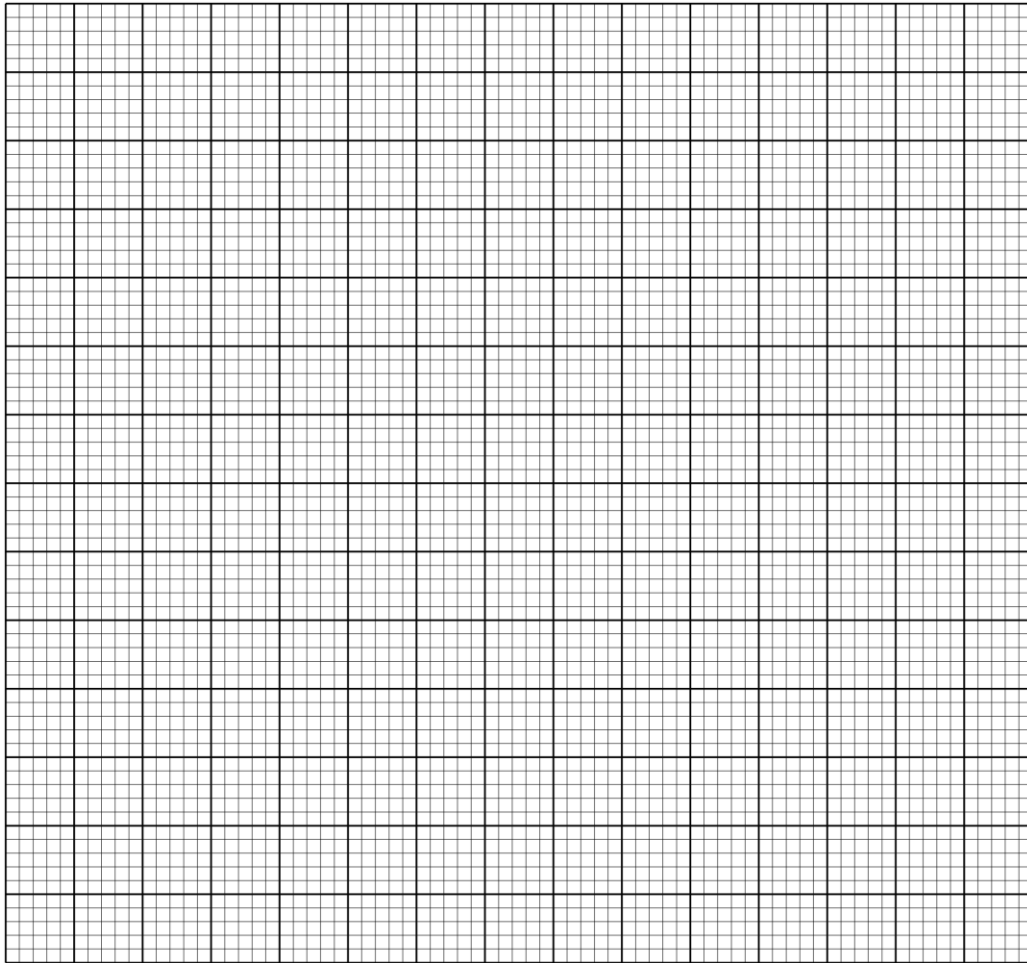


(c) Use the graph in (b) above to find the roots to the equation $2x^2 + 5x - 12 = 0$ (2 marks)

(d) By drawing a suitable line on the same axes as the graph in (b), solve the equation $x^2 + x - 6 = 0$ (3 marks)

21. On the grid provided,

(a) Draw ΔPQR in which $P(2, 3)$, $Q(1, 2)$ and $R(4, 1)$. On the same axes, draw $\Delta P''Q''R''$ such that $P''(-2, 3)$, $Q''(-1, 2)$ and $R''(-4, 1)$. (2 marks)



- (b) On the same axes, draw $\Delta P'Q'R'$, the image of ΔPQR under a reflection in the line $y + x = 0$. (2 marks)
- (c) Describe fully, a single transformation that maps $\Delta P'Q'R'$ onto $\Delta P''Q''R''$. (2 marks)
- (d) Draw $\Delta P'''Q'''R'''$ such that it can be mapped onto ΔPQR by a rotation of -90° about $(0, 0)$ and state its coordinates. (3 marks)
- (e) State the type of congruency between $P'Q'R'$ and $\Delta P'''Q'''R'''$. (1 mark)

22. In the figure below, O is the centre of the circle, $\angle ADO=39^\circ$, $\angle OBC=33^\circ$ and $\angle ECD=45^\circ$. EC is a tangent to the circle at C.

(ii) the distance from A to the meeting point.

(3 marks)

- (b) A motorist started at her home at 1030 hours on the same day and traveled at an average speed of 120 km/h. She arrived in B at the same time as the bus. Calculate the distance from her home to B. (3 marks)

- 24.** Mama Moraa, a cereals trader deals in two types of beans, Wairimu and Yellow Green. Wairimu costs Ksh. 4,000 per bag while Yellow Green costs Ksh. 3,500 per bag.
- (a) She mixes 30 bags of Wairimu with 50 bags of Yellow Green. If she sells the mixture at a profit of 20%, calculate the selling price of one bag of the mixture. (4 marks)

- (b) She now mixes Wairimu with Yellow Green in the ratio $a: b$ respectively. If the cost of the mixture is Ksh. 3,835 per bag, find the ratio $a: b$ (4 marks)

- (c) Mama Moraa then mixes one bag of the mixture in part (a) with one bag of the mixture in part (b) above. Calculate the ratio of Yellow Green to Wairimu in this mixture. (2 marks)

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REPLICA 7

121/1

MATHEMATICS

PAPER 1

INSTRUCTIONS TO CANDIDATES

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SECTION I

17	18	19	20	21	22	23	24	TOTAL

Grand total

SECTION II

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FOR MORE PAPERS FOR ALL SUBJECTS AND MARKING SCHEMES

SECTION 1(50 MARKS)

1. Evaluate without using a calculator.

(3 marks)

$$\frac{-2(+5 + 3) - 9 \div 3 + 5}{-3x - 5 \pm 2 \times 4}$$

2. Three consecutive odd numbers add up to 369. Determine the three numbers. (2 marks)

3. The position vectors of A and B are $3i + 2j - 5k$ and $5i + 3j + 2k$ respectively. If C divide AB in the ratio 3:-2, express OC in term of I, j and k. (3 marks)

4. Line L passes through P(8,6) and perpendicular to the line $3y + 2x + 6 = 0$. Find the equation of line L and write it in the form $y = mx + c$. (3 marks)

5. The distance between points P and Q on a section of a straight road is 12km. Mukai and Mutua left points P and Q respectively at the same time and moved towards each other at 1m/sec and 1.5 m/s respectively. Calculate

a) Their relative speed

(1 mark)

b) The time in hours that they took before meeting

(2 marks)

6. Use tables of logarithms to evaluate $\frac{0.3}{0.0351} + \sqrt{0.4983}$ (4 marks)
7. Find the equation of the tangent which has a positive gradient too the curve $y = 3x^2 - 2x + 5$ at the point where $y = 13$ (4 marks)
8. Juma, Ali and Hassan share the profit of their business in the ratio 3: 7: 9 respectively. If Juma receives kshs 60, 000. How much profit did the hassan get. (3 marks)
9. Simplify as far possible the following $\frac{4}{4-x^2} - x + 2$ (3 marks)
10. Taps A and B can fill a water tank in 30 minutes and 25 minutes respectively while C can empty in 20 minutes. If the three taps are turned on for 18 minutes then A and C closed. How long would it take before the tank is filled? (3 marks)
11. In the triangle ABC below, show the locus P such that P is nearer to C than A, nearer to AC than to BC and less than 6 cm from A. (3 marks)

12. Solve for θ in the equation.

(3

marks)

$$\sin (2\theta - 10) = -0.5 \text{ for the range } -180^\circ \leq \theta \leq 180^\circ$$

13. Solve the equation $\log_2(x^2 - 9) = \log_2 8 + 1$

(3 marks)

14. The diameter and slant height of a cone are stated as 9.6 cm and 5.2 cm respectively. Both measurements are given to the nearest 0.1 cm

Calculate the percentage error in the area.

(4 marks)

15. Find the range of values of x which satisfy the following inequalities simultaneously

$$4x - 9 < 6 + x$$

$$8 - 3x \leq x + 4 \text{ and represent them on a number line.}$$

(3 marks)

16. The G.C.D of three numbers is 30 and their L.C.M IS 900. If two of the numbers are 150 and 60, what are other three possible third numbers? (3 marks)

SECTION II (50 MARKS)
Answer five questions only

17. .

- a) In a certain week, a business bought 18 bicycles and 16 radios for a total of kshs. 113,640. In the following week, he bought 14 bicycles and 12 radios for a total of kshs. 87,480. Using matrix method, find the price of each bicycle and each radio that he bought.
- b) A trader sold an item at sh. 10,625 after allowing his customers 15% discount on the marked price of the item. In so doing he made a profit of 25%
- i) Calculate the marked price of the item. (2 marks)
- ii) Calculate the price at which the trader had bought the item (1 mark)
- iii) If the trader had sold the item without giving a discount, calculate the percentage profit he would have made. (2 marks)

- a) To clear his stock the trader decides to sell the remaining items at a loss of 10%. Calculate the price at which he sold each item. (1 marks)

18. .

- a) The angle of elevation of the top of a tree from a point P on the horizontal ground is 24.5° . From another point Q, five meters from P towards the base of the tree, the angle of elevation of the top of the tree is 33.2° . Calculate to one decimal place the height of the tree. (4 marks)

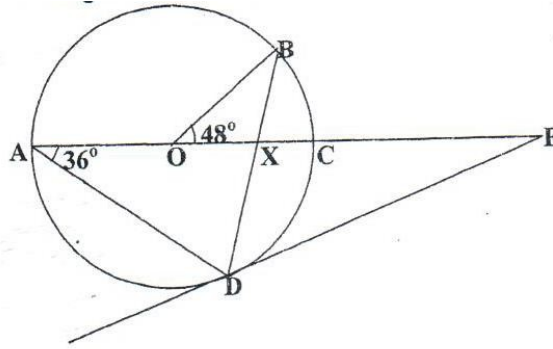
- b) Four points B, C, Q and D lie on the same plane. Point B is due southwest of point Q. Point C is 70 Km on a bearing of $S 60^\circ E$ from Q. Point D is equidistant from B, Q and C.

- I. Using the Scale: 1 cm represents 10km, construct a diagram showing the position of B, C, Q and D. (4 marks)

II. Determine the distance between B and C (1 mark)

III. Determine the bearing of D from B. (1 mark)

19. The figure below shows a circle centre O PQRS is a cycle quadrilateral and QOS is a straight line



Giving reasons for your answers find the size of

a) Angle PRS (2 marks)

b) Angle POQ (2 marks)

c) Angle RPS (2 marks)

d) Angle PSR (2 marks)

e) Reflex angle POS (2 marks)

20. A room is constructed such that its length and breadth are 7.5 m and 5.3 m respectively. The thickness of the wall is 15cm and its height 3.3 metres. A total space of 5m^2 is left for doors and windows on the walls.

a) Calculate the volume of:

i) The materials needed to construct the walls without the doors and windows
(4 marks)

b) The blocks used in constructing the walls are 450mm by 200mm by 150mm. calculate the number of blocks needed to construct the room. (ignore the material used to join the blocks) (4 marks)

c) If each block costs sh 52.50, calculate the cost of buying the blocks. (2 marks)

21.

a) A racing cyclist completes the uphill section of a mountain course of 75km at an average of V km/hr. he then returns downhill along the same route at an average of $(v + 20)$ km/h. given that the difference between the times is one hour, find and solve an equation in V . hence

i) Find the total time taken to complete the uphill and the downhill sections of the course.
(4 marks)

ii) Calculate the cyclist's average speed over the 150km. (1 mark)

b) A train moving at an average speed of 72km/hr takes 15 seconds to completely cross a bridge that is 80m long.

i) Express 72km/hr in metres per second. (2 marks)

ii) Find the length of the train in meters. (3 marks)

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REPLICA 8

121/1

MATHEMATICS

PAPER 1

INSTRUCTIONS TO CANDIDATES

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SECTION I

17	18	19	20	21	22	23	24	TOTAL

Grand total

SECTION II

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FOR MORE PAPERS FOR ALL SUBJECTS AND MARKING SCHEMES

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

1. Simplify (3mks)

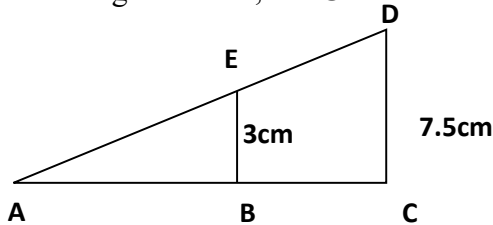
$$\left(3\frac{1}{5} - \frac{2\frac{1}{2}}{3\frac{1}{3}}\right) \div 6\frac{1}{2}$$

2. Factorise completely $10x^2 + 11xy - 6y^2$ (3mks)

3. Use logarithms to evaluate the following $\sqrt[3]{\frac{0.07893}{37.8 \times 43.81}}$ (4mks)

4. Awinja is 100m from the foot of a tower and the angle of elevation of the tower from her position is 49° . Find the height of the tower (2mks)

5. In the figure below, $\angle ACD = \angle ABE = 90^\circ$. Find the area of the triangle **ABE** (3mks)



6. A square **ABCD** is such that **A**(-3,4) **C**(2,3). Equation of line **AB** is $3y - 2x = 18$ and equation of line **CD** is $3y - 2x = 5$. Determine
- (a) Equation of line **BC** in the form $y = mx + c$ (2mks)
- (b) Equation of line **AD** in the form $y = mx + c$ (2mks)

7. Make **v** the subject of the formula $T = \frac{1}{2}m(u^2 - v^2)$ (3mks)

8. A squared brass plate is 2mm thick and has a mass of 1.05kg. The density of brass is 8.4g/cm^3 . Calculate the length of the plate in centimeters. (3mks)

9. Solve the inequality $-3x + 2 < x + 6 \leq 17 - 2x$ and write down the integral values satisfying the inequality (3mks)

10. An arc subtends an angle of 0.9 radians at the centre of a circle whose radius is 13cm. Find the length of the arc (2mks)

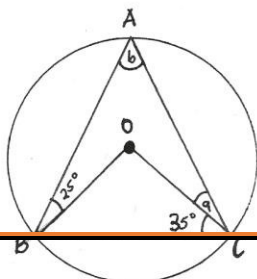
11. Simplify $\left(\frac{2x^{-3}}{5y^{-2}}\right)$ (4mks)

12. At 8.50am, a matatu is traveling at 80km/h and it is 40km behind a lorry travelling at 60km/hr
(a) After how long will the matatu overtake the lorry? (2mks)

(b) At what time will the matatu overtake the lorry? (2mks)

13. John who runs a clothing shop bought a shirt at Ksh. 500 and marked it at Ksh. 600. A customer bought it at Ksh. 550 after engaging John in a lengthy negotiations process. What was the customer's percentage discount. (3mks)

14. In the following figure, **O** is the centre. Find **a** and **b** (2mks)



a _____

b _____

15. Using a pair of compasses and a ruler only construct triangle **ABC** with $\angle C = 120^\circ$ and measure **BC** (3mks)

16. A stool is made by shaping a tree stump into a conical frustrum of vertical height 60cm. If the top radius is 12cm and the bottom is 24cm. calculate the surface area of the stool. $\pi=3.142$ (4mks)

SECTION II (50 MARKS)

Answer any five questions in this section in the spaces provided

17. The table below shows marks obtained by 100 candidates at Mwhila Secondary in a mathematics examination.

Marks	15-24	25-34	35-44	45-54	55-64	65-74	75-84
Frequency	6	14	24	14	x	10	10

- (i) Determine the value of x (2mks)

- (ii) State the modal class (1mk)

- (iii) Calculate the mean (3mks)

(iv) Determine the median mark. (4mks)

18. (a) In a stadium, the cost per seat during a match is Ksh. 200. The stadium is built in a such a way that the first row has five seats more than the previous one and there are thirty one rows. If during the match between AFC Leopards and Gor Mahia the stadium is 75% full, how much money is collected if every fan pays. (4mks)

(b) The 3rd term of a geometric sequence is 20 and 6th term is -160.

Calculate:

(i) The common ratio (2mks)

(ii) The first term (2mks)

(iii) The 8th term (2mks)

19. The table below shows measurements of a farm in a fields book. $XY=2000m$

	Y	
	1800	G 100
F 200	1600	
	1200	E 300
	900	D 100
C 150	600	
	300	B 200
A 200	100	
	X	

(a) Using a scale 1cm rep 100m. Sketch the map of the farm (2mks)

(b) Calculate the area of the farm in hectares (8mks)

20. Four towns **R,T,K** and **G** are such that **T** is 84km directly to the north of **R** and **K** is on bearing of 295° from **R** at a distance of 60km. **G** is on a bearing of 340° from **K** and at a distance of 30km.

(a) Using the scale of 1cm to represent 10km make an accurate scale drawing to show the relative positions of the towns. (3mks)

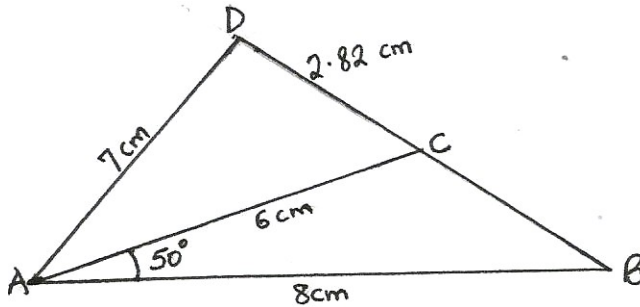
(b)Find:-

(i) The distance and the bearing of **T** from **K** (3mks)

(ii) The distance and the bearing of **G** from **T**. (3mks)

(iii) The bearing of **R** from **G** (1mk)

21. 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 two decimal places)

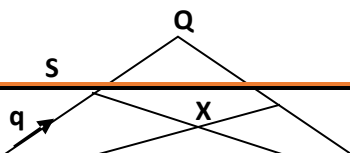
- (a) The length BC (2mks)

- (b) The size of angle ABC (3mks)

- (c) The size of the angle CAD (3mks)

- (d) The area of triangle ACD (2mks)

22. In the figure below, $PQ=a$ and $PR=r$. $QM:MR=1:2$. The point S is the mid point of PQ . X is the intersection of PM and SR . $SX=hSR$, $PX = kPM$ where h and k are constants.



Find:

(a) **QR** in terms of **q** and **r**

(1mk)

(b) **PM** in terms of **q** and **r**

(2mks)

(c) **SR** in terms of **q** and **r**

(2mks)

(d) Express vector **SX** in two way: in terms of **h,r** and **q** and in terms of **k,r** and **q**. Hence determine the ratio in which **x** divides **SR**.

23. A particle moves a long a straight line so that after **t** seconds its distance from **O**, a fixed point on the line is **S** metres where

$$S = t^3 - 3t^2 + 2t$$

(a) When is the particle at **O**?

(4mks)

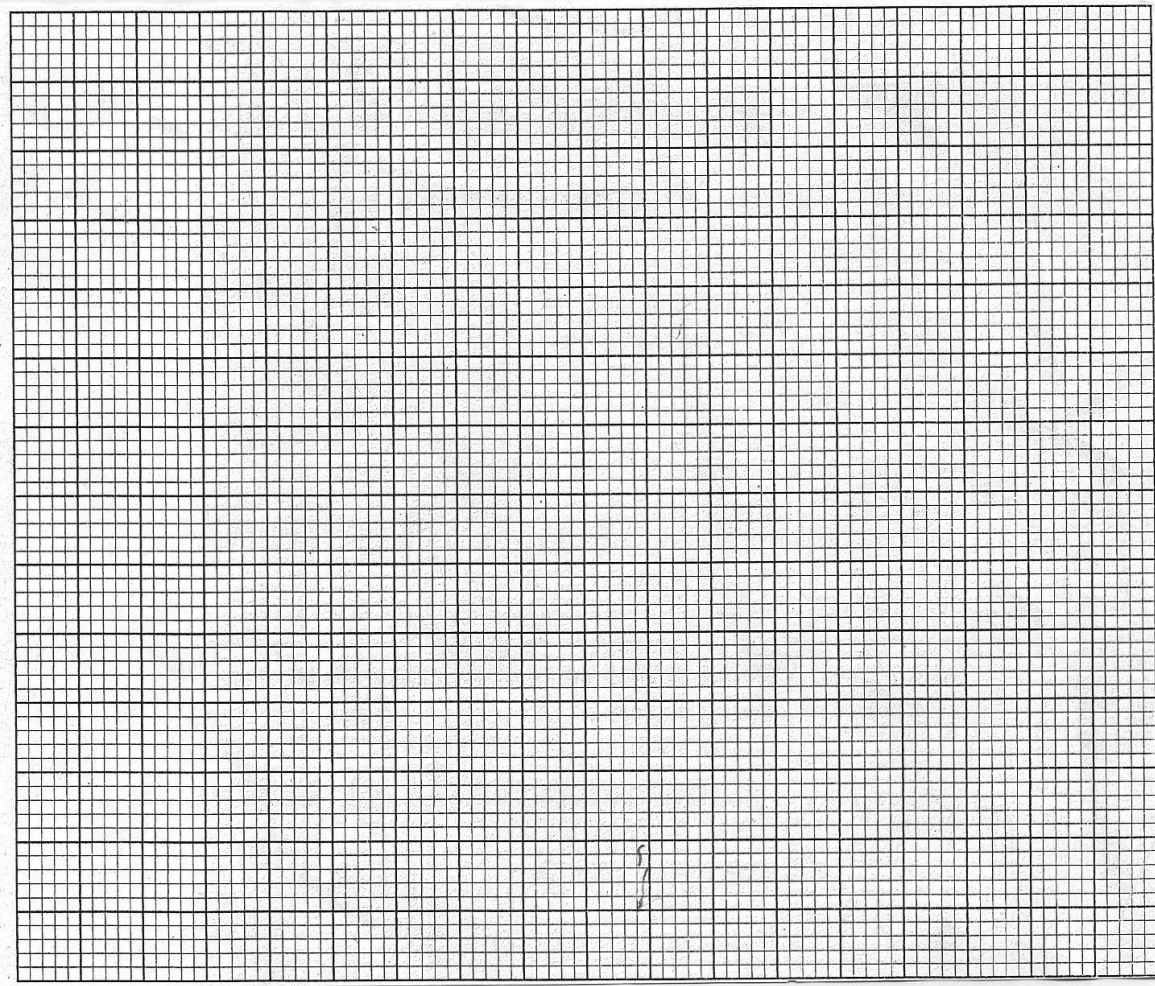
(b) What is its velocity at these times?

(6mks)

24. The points **A**(2,6) **B**(1,1) **C**(3,4) and **D** (5,3) are the vertices of a quadrilateral **ABCD**.

(a) Plot points **A,B,C** and **D** on the graph provided and join them to form quadrilateral **ABCD**

(2mks)



(b)
Locate

and write down the coordinates of **A'**, **B'**, **C'** and **D'** and to the image of **ABCD** under a rotation of positive 90° centre (0,0) on the same grid

(3mks)

(c) Reflect **A'B'C'D'** on the x-axis and draw the image of quadrilateral **A'' B'' C'' D''**

(3mks)

(d) Draw the mirror line **MM** for the reflection of **ABCD** whose image is **A'' B'' C'' D''**

(2mks)

GOLDLITE ONLINE EDUCATIONAL SERVICES
Kenya Certificate of Secondary Education
KCSE REPLICA SERIES 2 TERM 2 2023
MAY-AUGUST 2023- 2 ½ hours

Name Admission number

Candidate's Signature.....Date.....

REPLICA 9

121/1

MATHEMATICS

PAPER 1

INSTRUCTIONS TO CANDIDATES

- a) Write your name and admission number in the space 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 in section II
- d) Show all the steps in your calculations; giving your answers at each stage in the spaces provided below each question.
- e) Marks may be given for correct working even if the answer is wrong.
- f) Non-programmable silent electronic calculators and KNEC mathematical tables may be used.
- g) This paper consists of 15 printed pages

FOR EXAMINER'S USE ONLY

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SECTION I

17	18	19	20	21	22	23	24	TOTAL

SECTION II

Grand total

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FOR MORE PAPERS FOR ALL SUBJECTS AND MARKING SCHEMES

SECTION A (50 Marks)

Answer all the questions from this section in the spaces provided

1. Use logarithm tables to evaluate

(4 marks)

$$5\sqrt{\frac{3.172 \times (0.008367)^2}{\log 9}}$$

2. Solve for x and y

(3 marks)

$$3^{2x-y} = 27$$

$$4^x \div 16^y = 1$$

3. Evaluate without using mathematical tables or calculator

(3 marks)

$$\frac{3/4 + 2/5 \div 3/5 \text{ of } 1^{2/3}}{(1^{3/4} - 5/8) \times 2/9}$$

4. A line $y = mx + 8$ makes an angle of 75.97° with the x -axis, find the co-ordinates of the point where the line cuts the x -axis.

(3 marks)

5. Find the integral values of x which satisfy the inequalities.

(3 marks)

$$3x - 2 < 10 + x < 2 + 5x$$

6. A camera which is marked at Ksh 2400 is sold to a consumer after allowing him a 10% discount. By so doing the trader still makes a profit of 20% on the cost of the camera. Determine the cost price of the camera.

(3 marks)

7. Solve for θ given that θ is acute and $\sin (3\theta - 50^\circ) - \cos (2\theta + 10^\circ) = 0$.

(2 marks)

8. The cost of the car outside Kenya is US \$ 4,800. You intend to buy one such car through an agent who deals in Japanese yen. The agent will charge 15% commission on the price of the car and further 72,220 Japanese yens for shipment of the car. How many Kenya shillings will you need to send to the agent to obtain the car, given that;

$$\begin{aligned} 1 \text{ US \$} &= 117.20 \text{ Japanese yen} \\ 1 \text{ US \$} &= \text{Ksh. } 72.34 \end{aligned}$$

(3 marks)

9. A container of height 90cm has a capacity of 4.5litres. What is the height of a similar container of volume 9m^3 ?

(3 marks)

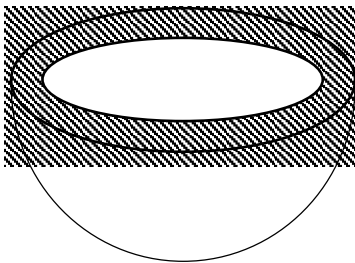
10. Junior paid shs.320 for a video tape after getting a discount of 13.5%. How much should a shopkeeper have sold the tape to enable him make a profit of 5%. **(3 marks)**

11. Three towns J, K and L are such that K is 40km on a bearing 290° from J. Town L is directly to the south of J. The distance between K and L is 60km. By scale drawing, find the distance of L from J. Using scale of 1:1000 000. **(4 marks)**

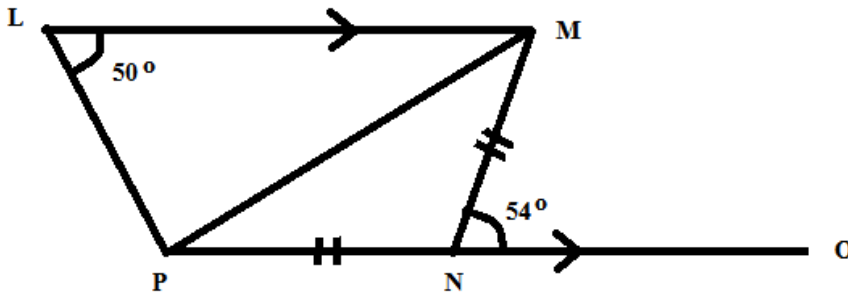
12. Express 0.73 as fraction.

(3 marks)

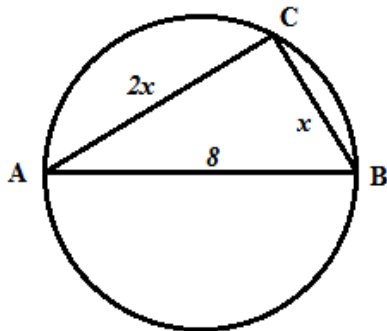
13. The figure below shows a hemispherical bowl of thickness 1.5cm. Given that the external surface area is 509cm^2 . Find the volume of the bowl. (Take $\pi = 3.142$) **(3 marks)**



14. In the figure below $\angle MNO = 54^\circ$, and $\angle PLM = 50^\circ$, $PN = NM$ and PO is parallel to LM . Find the value of $\angle LPM$. **(3 marks)**



15. In the figure below, AB is a diameter of the circle and $AB = 8\text{cm}$, $BC = x\text{cm}$ and $AC = 2x\text{cm}$. Calculate the length of AC to 2 significant figures. **(3 marks)**



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

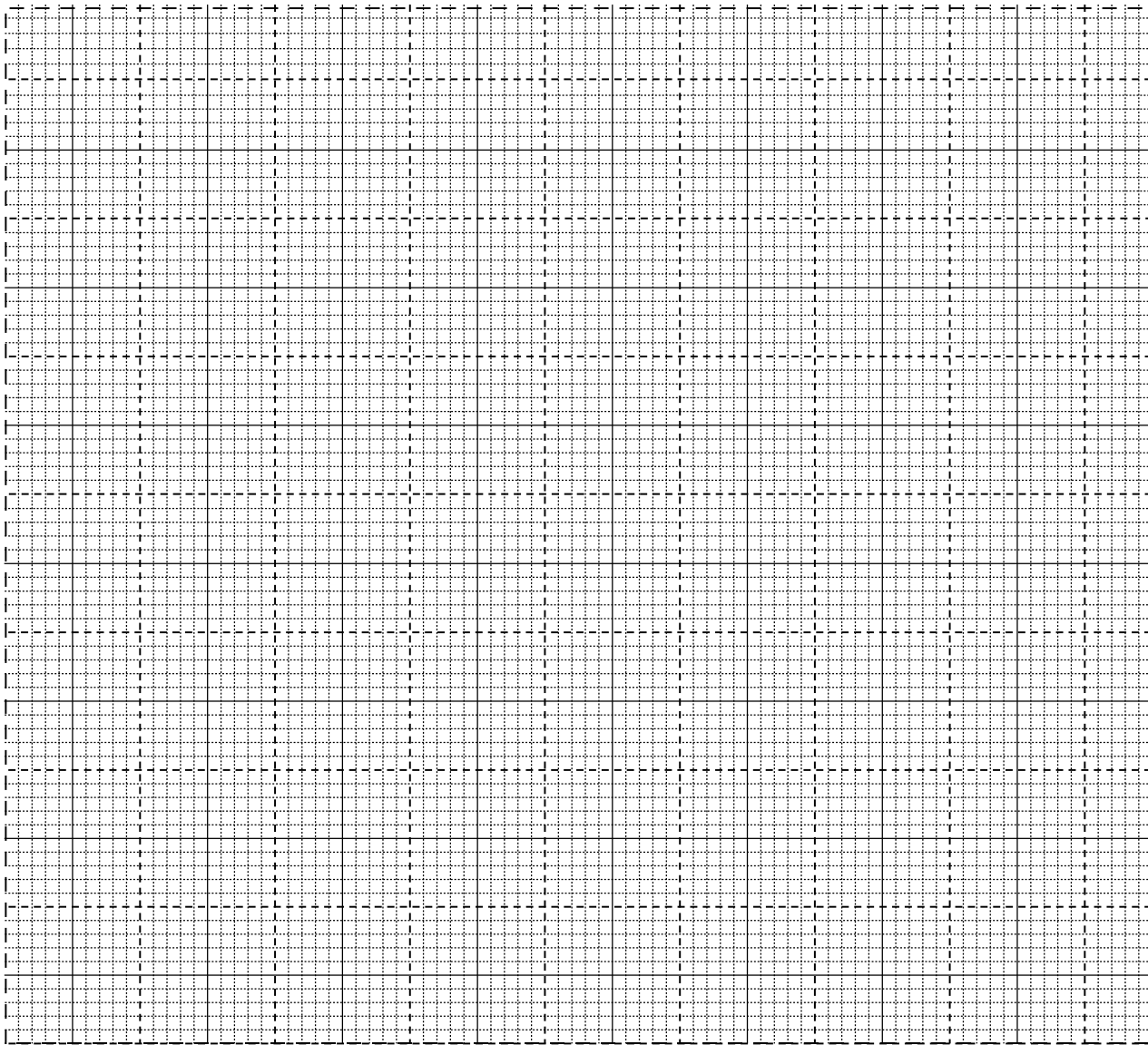
SECTION II (50 MARKS)

Answer ONLY FIVE questions in this section

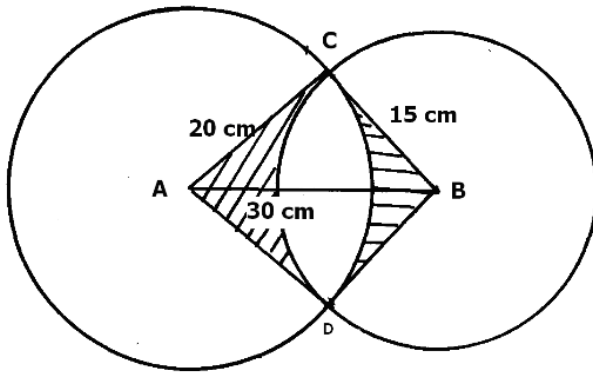
17. The table below shows the number of letters collected from the post office by a school messenger during a school year.

Letters per day	6 – 10	11 – 15	16 – 20	21 – 25	26 – 30	31 – 35	36 – 40	41 – 45	46 – 50	51 – 55
Frequency	5	19	21	23	25	27	20	25	13	12

- (i)** State the modal class **(1 mark)**
- (ii)** Estimate the median of this data. **(4 marks)**
- (iii)** Estimate the mean of this data. **(3 marks)**
- (iv)** On the grid provided, draw a histogram to represent this data. **(2 marks)**



18. The diagram shows two intersecting circles of radii 20 cm and 15 cm such that their centres A and B are 30 cm apart.



Calculate to 2 decimal places.

a) The area of sector ACD (3marks)

b) The area of sector BCD (3marks)

c) The length of the common chord CD. (2marks)

d) The area of quadrilateral ACBD (1mark)

e) The shaded area. (1mark)

19. A certain number of people agreed to contribute equally to buy books worth sh.12000 for a school library. Five people pulled out so that others agreed to contribute an extra sh. 100 each. Their contribution enabled them to buy books worth sh 2000 more than they originally expected.

a) If the original number of people was x , write down.

i) An expression of how much each was originally to contribute. (1mark)

ii) Two distinct expressions of how much each contributed after the five pulled out.
(2 marks)

b) Calculate the value of x . (3 marks)

c) Calculate how much each person was expected to contribute originally. (2marks)

d) Calculate
i) The number of people who actually made the contribution and how much per person.
(2marks)

ii) The ratio of the supposed original contribution to new contribution. (1mark)

20. A bus left Nairobi at 7.00am and travelled towards Eldoret at an average speed of 80km/hr. At 7.45am a car left Eldoret towards Nairobi at an average speed of 120km/hr. The distance between Nairobi and Eldoret is 300km

Calculate

a) the time the bus arrived at Eldoret (2 marks)

b) the time of the day the two met. (4 marks)

c) the distance from Nairobi where the two met. **(2 marks)**

d) the distance of the bus from Eldoret when the car arrived at Nairobi. **(2 marks)**

21. 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 its initial acceleration if it accelerates uniformly. **(3 marks)**

b) Calculate:

(i) The time when the particle was momentarily at rest **(3 marks)**

(ii) It's displacement by the time it comes to rest momentarily **(2 marks)**

c) Calculate the maximum speed attained **(2 marks)**

22. In an n -sided polygon two angles are right angles and each of the remaining angles is 150°

a) Find the value of n hence the sum of interior angles of this polygon. **(4 marks)**

b) Name the polygon (1 mark)

c) Find the areas of a regular octagon of sides 4 cm o 5sf. (5 marks)

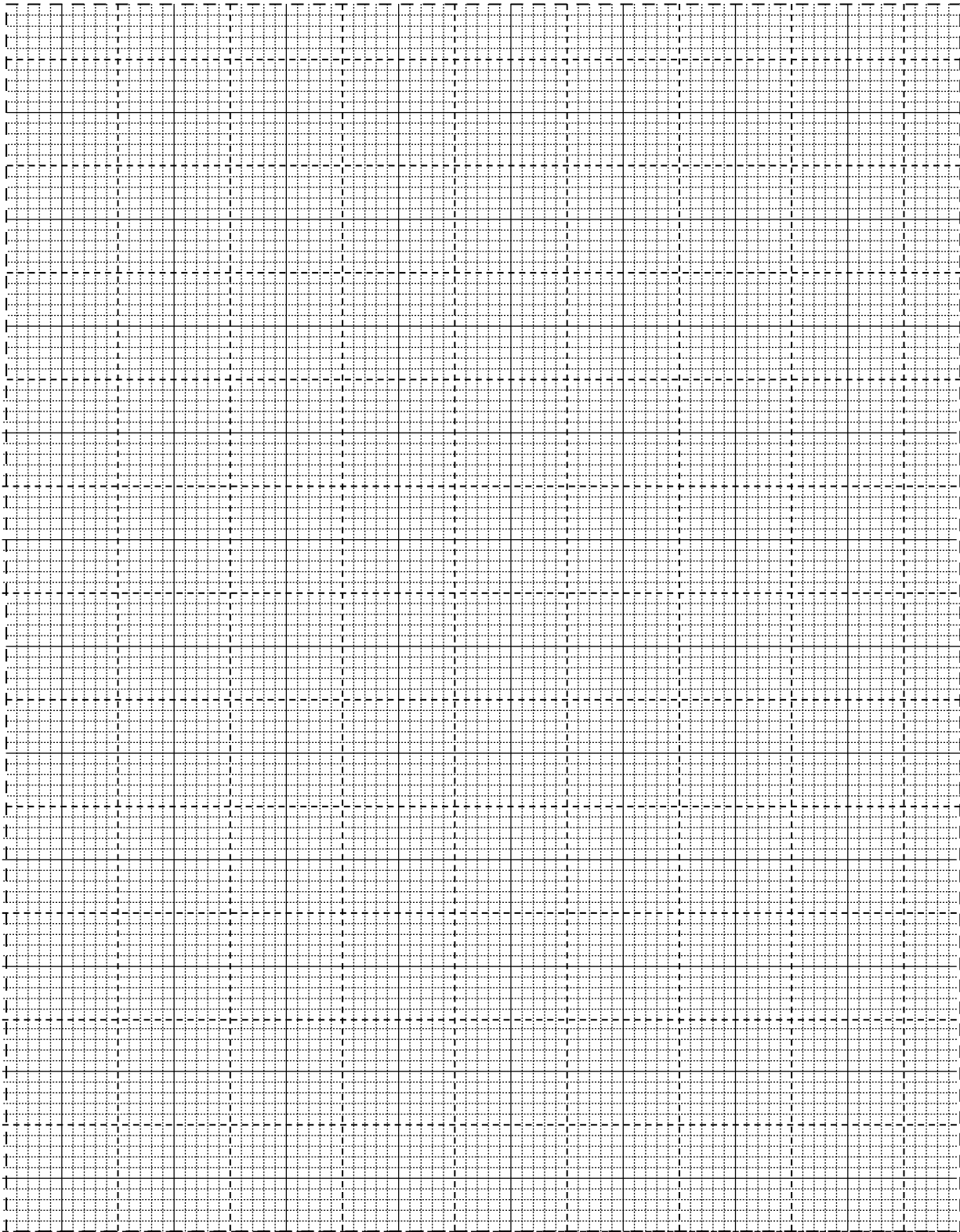
23. The cost C , of producing n items varies directly as n and partly as the inverse of n . to produce two items it costs Ksh. 135 and to produce three items it costs Ksh. 140

(a) The constant of proportionality and hence write the equation connecting C and n (5 marks)

(b) The cost of producing 10 items; (2 marks)

(c) The number of items of produced at a cost of Ksh. 756. (3 marks)

24. (a) On the grid provided draw triangle ABC such that A(6, -2), B(8, -2) and C(6, -1)(2 marks)



(b) Triangle $A^1B^1C^1$ is the image of triangle ABC under enlargement of scale factor 2 with the centre at (3, 0). Construct and label triangle $A^1B^1C^1$. State the coordinates of the triangle $A^1B^1C^1$.

(3 marks)

(c) $A^{11}B^{11}C^{11}$ is the image of $A^1B^1C^1$ under a certain rotation. If $A^{11}(-2, -1)$, $B^{11}(-2, -5)$ and $C^{11}(0, -1)$, by construction, find the coordinates of the centre of rotation. **(3 marks)**

(d) Triangle $A^{11}B^{11}C^{11}$, is reflected on the line $y = -3$. Draw the triangle $A^{111}B^{111}C^{111}$ the image of triangle $A^{11}B^{11}C^{11}$ under reflection in the line $y = -3$ **(2 marks)**

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REPLICA 10

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MATHEMATICS

PAPER 1

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Grand total

SECTION II

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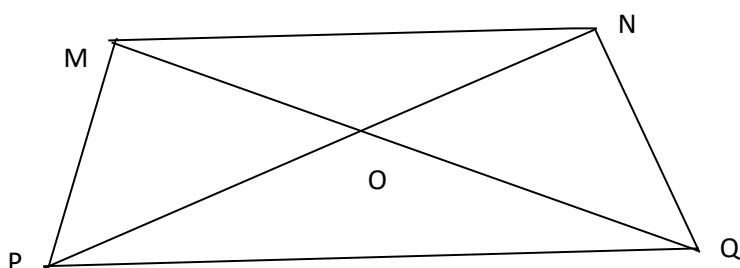
FOR MORE PAPERS FOR ALL SUBJECTS AND MARKING SCHEMES

Section I (50 marks)

Answer all the questions in this section

1. Use logarithms to evaluate $\frac{0.6845^2 \times 0.08416^{\frac{1}{2}}}{0.005937}$. (4 marks)

2. In the figure below PQ is parallel to MN. $PQ = (y + 3)$ cm, $MN = y$ cm, $PN = 7.5$ cm and $NO = 6$ cm. Find the value of y . (3 marks)



3. The straight line through the points D (6, 3) and E (3, -2) meets the y-axis at the point F. Determine the coordinates of F. (3 marks)

4. Solve for x and y in:
 $3^{2x-y} = 27$ and $4^x \div 16^y = 1$ (3 marks)

5. A sphere has surface area 18 cm^2 . Find its density if the sphere has a mass of 100 gm. (3 marks)

6. The length of an enlarged photograph is $(4x + 4)$ cm whilst that of the original is $(x + 1)$ cm. Find the width of the original photograph if the enlarged one is 32 cm wide.
(3 marks)

7. Simplify: $\frac{2 - 10x + 12x^2}{36x^2 + 3 - 21x}$. **(4 marks)**

8. Two upright poles AC and BD stand on a horizontal ground with C and D as their bases. E is a point equidistant from C and D such that CED is a straight line, angle AEB = 90° , ED = 5 m, BE = 6 m and AC = 3m. Calculate BD and AB.
(3 marks)

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

10. The sum of interior angles of two regular polygons of sides, $n-1$ and n are in the ratio 2:3. Calculate
i) The value of n. **(2 marks)**

- ii) The interior angle of each polygon. **(2 marks)**

11. If $\log_7 2 = 0.356$ and $\log_7 3 = 0.566$, find the value of $2\log_7\left(\frac{7}{15}\right) + \log_7\left(\frac{25}{12}\right) - 2\log_7\left(\frac{7}{3}\right)$.

(3 marks)

12. A 60 m by 80 m parking lot is torn up to install a sidewalk of uniform width around its perimeter. The new area of the parking lot is two thirds of the old area. How wide is the sidewalk?

(4 marks)

13. The cost of a camera outside Kenya is US\$ 1000. James intends to buy one such camera through an agent who deals in Japanese Yen. The agent charged him 5% commission on the price of the camera and further 1260 Japanese Yen as importation tax. How many Kenya Shillings will he need to send to the agent to obtain the camera at the following exchange rates?

$$1 \text{ US\$} = 105.00 \text{ Yen}$$

$$1 \text{ US\$} = \text{Kshs. } 93.33$$

(3 marks)

14. If 7, p, q, r and 9072 are the first five terms of a geometric progression, find the positive values of p, q and r.

(3 marks)

15. The formula $c = \frac{5}{9}(f - 32)$ can be used to convert Fahrenheit temperature, F, to Celsius temperatures C.

For what Fahrenheit temperatures is the Celsius temperature lower than 45°C ?

(2 marks)

16. The position vectors of A and B are $\begin{pmatrix} 2 \\ 5 \end{pmatrix}$ and $\begin{pmatrix} 4 \\ -5 \end{pmatrix}$ respectively. A point P, divides the line AB such that $-2AP=7PB$. Find the position vector of the point P. (3 marks)

SECTION II (50 MARKS)

Answer any five questions in this section

17. Patients who attended a clinic in one week were grouped by age as shown in the table below.

Age x years	$0 \leq x < 5$	$5 \leq x < 15$	$15 \leq x < 25$	$25 \leq x < 45$	$45 \leq x < 75$
No of patients	14	42	59	70	15

- a) Estimate
i) Mean age. (3 marks)
- ii) Median age. (3 marks)
- b) Calculate the semi-interquartile distribution range. (4 marks)
- 18.a) Using a ruler and pair of compasses only, construct triangle ABC in which $AB = 9\text{cm}$, $AC = 8\text{cm}$ and angle $BAC = 60^\circ$. (2 marks)

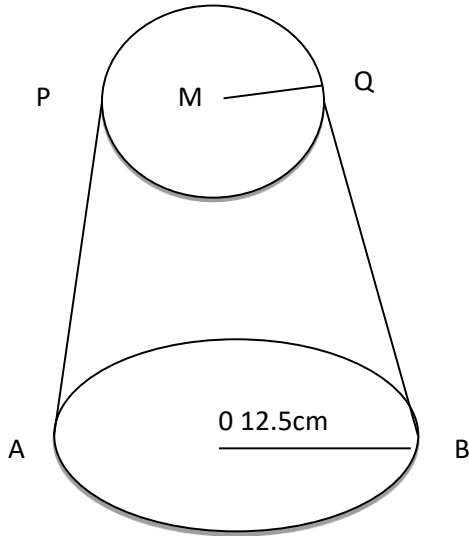
(b) On the same side of AB as C, draw the locus of a point such that angle $APB = 60^\circ$

(3 marks)

c) A region T is within the triangle ABC such that $AT > 4\text{cm}$ and angle $ACT \geq$ angle BCT . Show the region T by shading it.

(5 marks)

19.(a) PQCB shows a frustum of a cone. The radius of the top and bottom circular parts of the frustum are 7.5cm and 12.5cm respectively, centres M and O are 10cm apart.



a) Calculate the

i) Slant length QB of the frustum correct to 2 decimal places.

(1 mark)

ii) The volume of frustum

(3 marks)

iii) The vertex angle of the cone from which the frustum was made.

(2 marks)

b) If the frustum is of solid metal and is melted down and recast into a solid cylinder having a radius of 10.5cm, calculate.

i) The height of cylinder correct to 3 decimal places.

(2 marks)

ii) The surface area of the cylinder **(2 marks)**

20(a) Richard is a coffee farmer. In the year 2010 he produced 1200 bags of coffee. In the year 2011 his yield dropped by 28% due to drought. In the year 2012 his yield increased by 10% over that of 2011. Each bag of coffee has a mass of 65 kg. In the year 2010 he was paid sh. 14,600 per tonne. In the years after 2010 the price per tonne increased each year by 13%.

i) Calculate his earnings from coffee for each of these three years. **(5 marks)**

ii) Calculate his total income from coffee for the three years. **(1 marks)**

b) solve for n by factorization in $4p^{2n} - 5p^n + 1 = 0$. **(4 marks)**

21.(a) A train of length 100m travelling at 12 m/s passes a second train of length 140m travelling in the same direction at a speed of 9 m/s. Calculate the time taken for the train to pass completely.

(3 marks)

(b) X and Y cycle to school 10 km away. X cycles at 1.5 km/h faster than Y and arrives 10 minutes before Y. Determine the speeds at which the two cycle. **(4 marks)**

- c) A train leaves town A and travels towards B at 48 km/h. At the same time, another train leaves town B and travels towards A at a speed of 52 km/h. If the two towns are 500 km apart, find how far apart the trains are after traveling for 45 minutes. **(3 marks)**

- 22.a) A farmer has 120 metres of fencing with which to enclose a rectangular sheep-pen, using an existing wall for one side. Find the maximum area that he can enclose?
(5 marks)

- b) A particle moves along the x-axis in such a way that its distance, x cm from the origin after, t seconds is given by the formula: $x = 27t - 2t^2$.

Find

- i) Its velocity and acceleration after 6.75 seconds. **(2 marks)**
- ii) How long does it take for the velocity to be reduced from 15 cm/s to 9 cm/s? **(5 marks)**

23. At airport X, a building 20m high is 200m from the end of the main runway and in line with it. Assuming that a plane takes off at the end of the runway and climbs in a straight

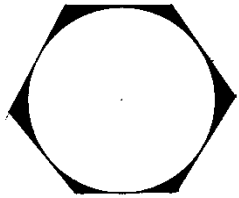
line

- a) Determine the minimum angle of ascent. **(2 marks)**
- b) If the angle of ascent is 10° and the plane leaves the ground 40m before the end of the runway, by how much will it clear the top of the building? **(3 marks)**

c) Determine the least possible distance from the end of the runway when the angle of ascent is 4° .
(3 marks)

d) Calculate the angle of ascent if the plane lifts off the ground 30 m before the end of the runway, makes a 15 m clear of the top of the building.
(2 marks)

24.a) In the figure below, a circle is inscribed in a regular hexagon. The circle is of radius 8 cm.



Calculate the area of the shaded region.

(5 marks)

b) An arithmetic progression has the first term a and common difference d .

i) Write down the third, ninth and twenty fifth terms of the progression. **(1 mark)**

ii) The arithmetic progression above is such that it is increasing and that the third, ninth and the twenty fifth terms form the first three consecutive terms of a geometric progression. The sum of the seventh and twice the sixth term of the arithmetic progression is 78. Calculate the first term and the common difference of the AP.

(4 marks)

