GOLDLITE ONLINE EDUCATIONAL SERVICES
Kenya Certificate of Secondary Education
KCSE REPLICA SERIES EXAMS

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*
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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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

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

SECTION II

Grand total

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FOR MORE PAPERS FOR ALL SUBJECTS AND MARKING SCHEMES

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 got. (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.
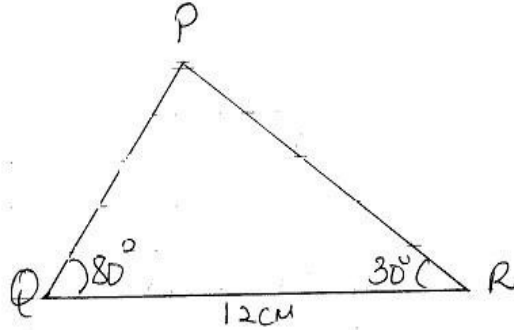
(3 marks)

5. Simplify the expression

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

(3 marks)

6. In a triangle PQR below, QR = 12cm, $\angle PQR = 80°$ and $\angle PRQ = 30°$

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 $\dfrac{3}{0.005041}$ (2 marks)

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

B   C

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

(i)   The triangle ABC given that $\angle ABC = 120°$ and AB = 6cm   (1cm)
(ii)   (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 $4\mathbf{p} - 3\mathbf{q} = \binom{10}{5}$ and $\mathbf{p} + 2\mathbf{q} = \binom{-14}{15}$; 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 objet 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)

6
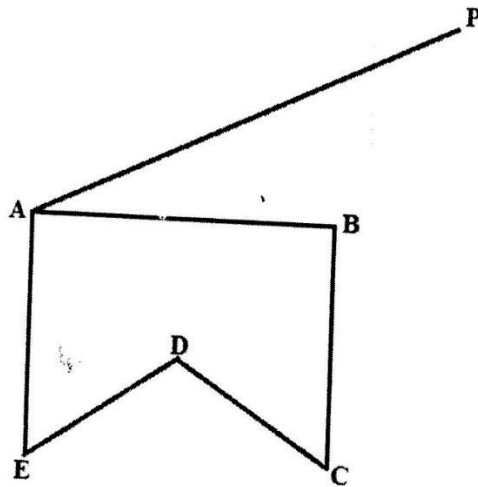
SECTION II (50 MARKS)

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_4 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 L4 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 if 58km. Given that point T is west of P and 114km from R and V is directly South of P and S40ºE 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 dept of 30cm. the radius of the water surface in the vessel is 21cm (Take $\pi = {}^{22}/_7$)
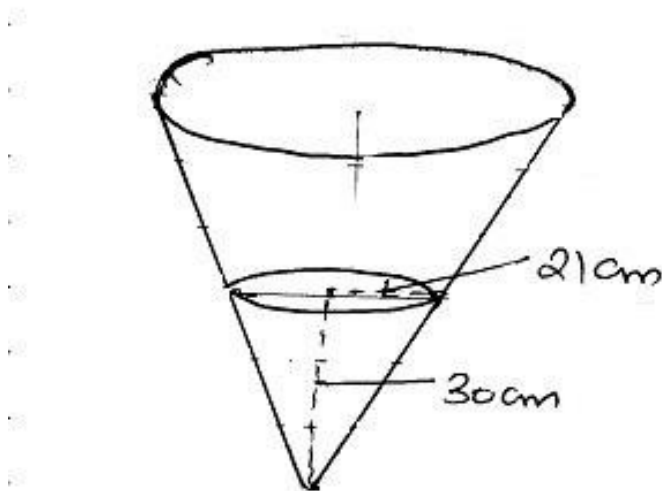
(a). Calculate the volume of the water in the vessel in cm^3. (2 marks)

(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 mases 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)
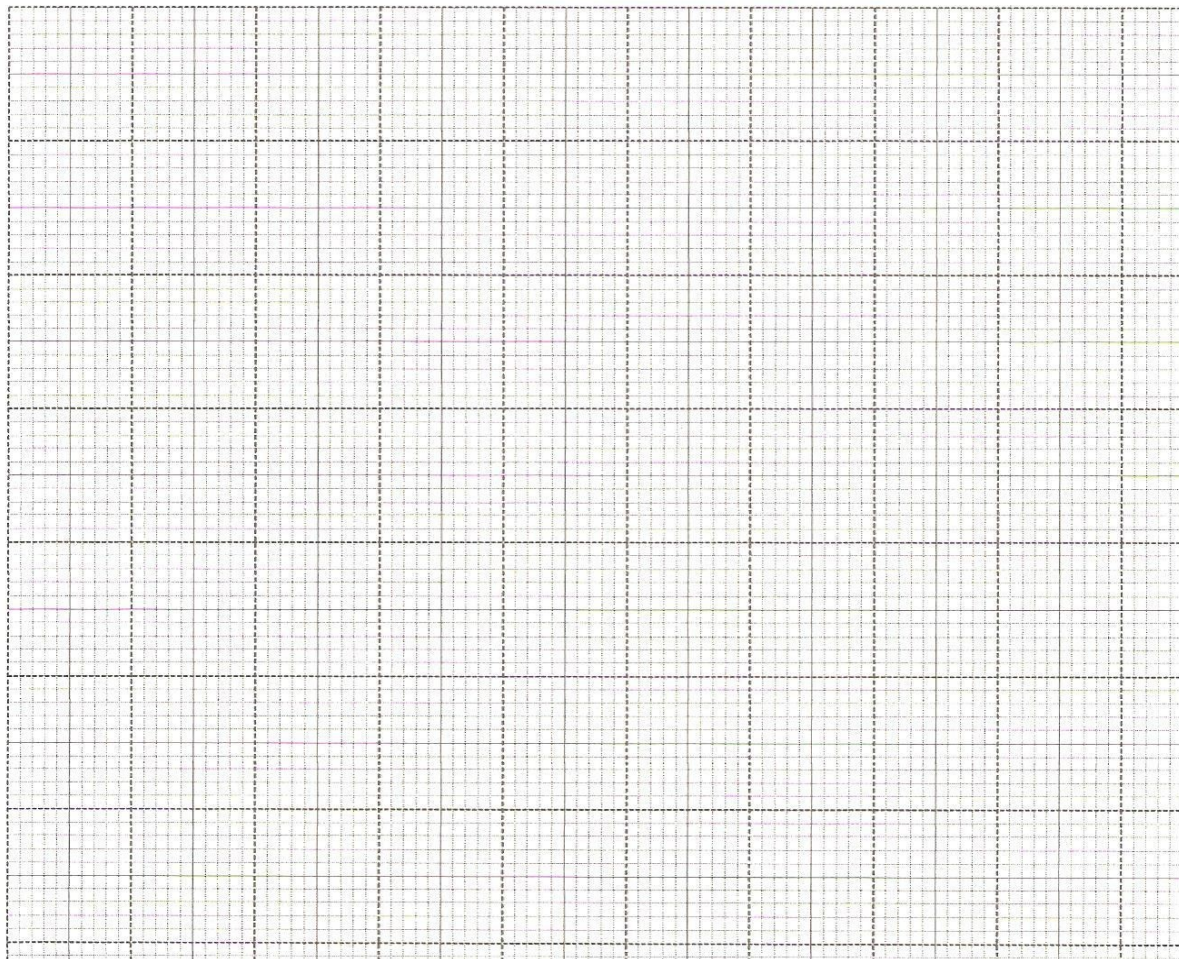
c) Use the histogram to

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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 = 12cm, AD = 15cm and B is a point on AC ∠BAD = ∠ADB= 30º
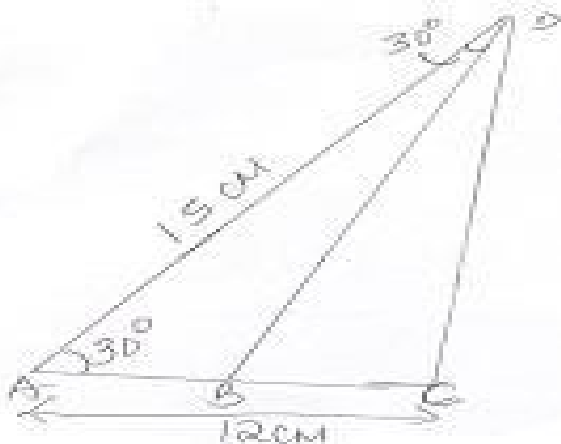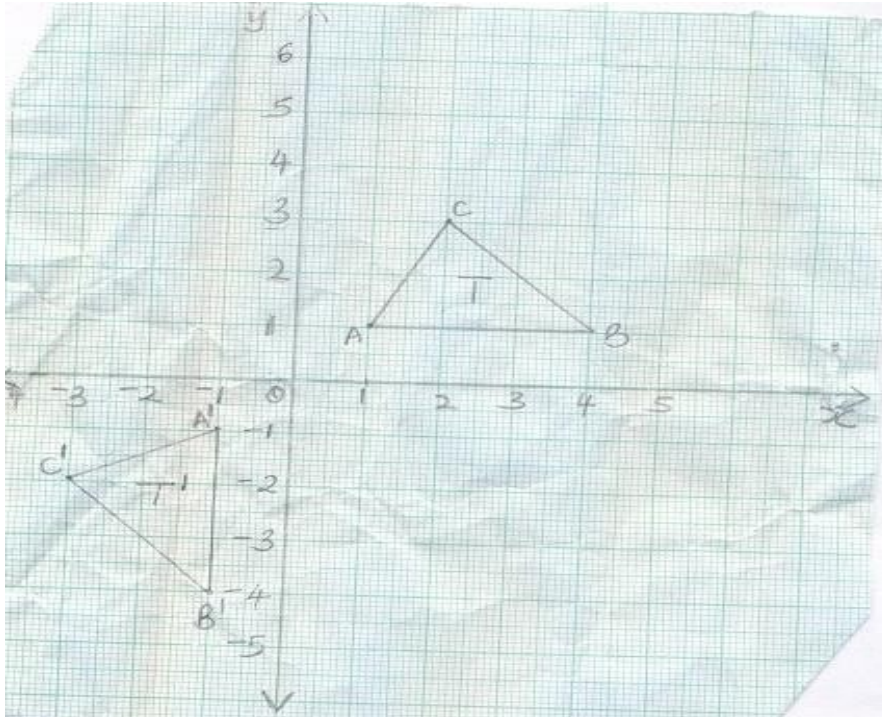

Calculate, correct to one decimal place: -

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 ∠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 12cm², calculate the area of T.   (3 marks)

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REPLICA 2

121/1
MATHEMATICS
PAPER 1
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SECTION I

17	18	19	20	21	22	23	24	TOTAL

Grand total

SECTION II@*2023CONTACT US ON 0724351706/0726960003*

FOR MORE PAPERS FOR ALL SUBJECTS AND MARKING SCHEMES

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 ⅕ 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 ∠ABC = 138^0. Find the area of shaded region correct to 3 significant figures. (Take π=$\frac{22}{7}$)
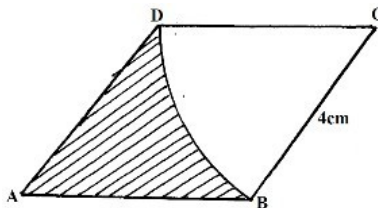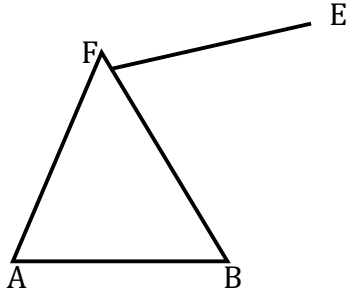
   (3 marks)

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^{0}E. He then
changed direction and travelled a distance of 4km in the direction of 135^0 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)
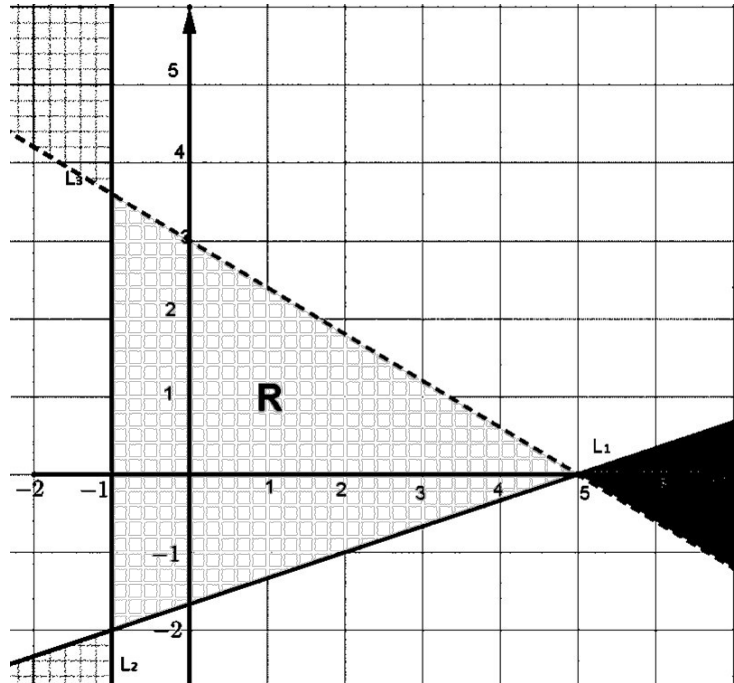
14) A dealer sells a certain spare part for Kshs 650, making a profit of 30%. The manufacturer reduces the price to the dealer by Kshs 50 and the dealer reduces his selling price by the same amount. Find the dealer's new percentage profit.

(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 agents 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 64^0 and 62^0 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 22^0 and 32^0 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
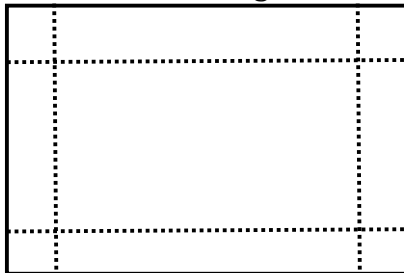 $\frac{x}{a} + \frac{y}{b} = 1$

    (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 m² 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 0f 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.
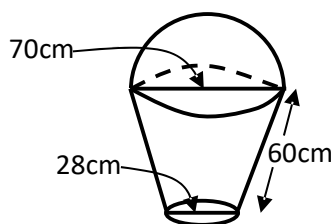
The diameter of the hemispherical top is 70cm and is equal to the diameter of the top of the frustum. The frustum has a base diameter of 28cm and a slant height of 60cm.
(a) Calculate the area of the hemispherical surface.   (1mark)

(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
PAPER 1
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SECTION II

17	18	19	20	21	22	23	24	TOTAL

Grand total

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 $\dfrac{9a^2y - 16b^2y^3}{4by^2 - 3ay}$ (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 $\sqrt{\dfrac{12x^4 y^{-1} Z^5}{3x^{-2}y^{-3} Z^3}}$ (2 mks)

5) One interior angle of a certain polygon is 84^0. If each of the other angles is 147^0, 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=25cm, BC = 15cm, AC = 14cm, BD = 28cm and $CBD = 32$ (4mks)
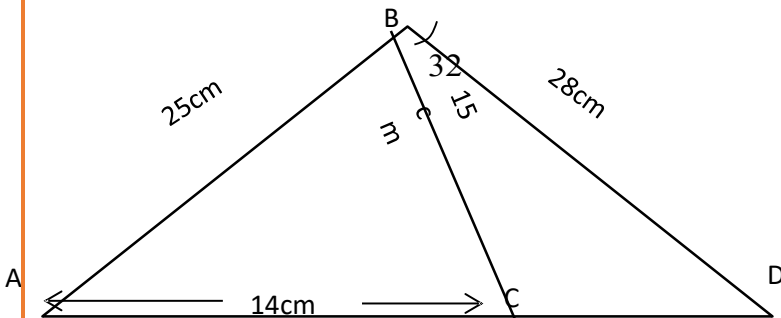
8) A shear parallel to the x-axis maps point (1,2) onto a point (7, 2). Determine the shear factors and hence state the shear matrix (invariant line is y = 0) (3mks)

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,
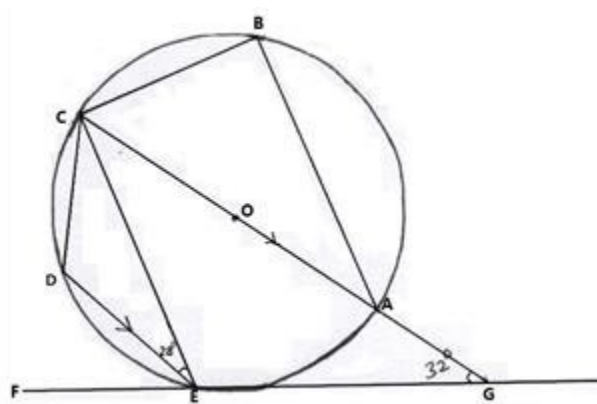
Calculate
(a) AEG   (2mks)

(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 $\text{Cos } A = \dfrac{5}{13}$ and angle A is acute, without using tables or calculator, find the value of   (3 mks)

        $2 \tan A + 3 \sin A$.

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

14)   The figure below (**not drawn to scale**) is a right pyramid with slant height of 5cm and square base of 3cm.
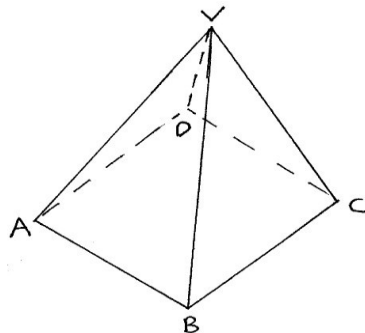
(a)   Draw its net and label it.   (2mks)

(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)**
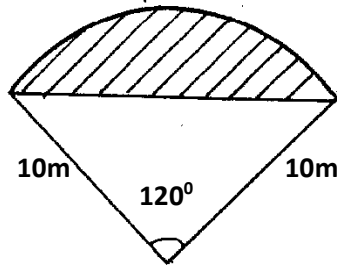
Mass(kg)	frequency
41-50	20
51-55	
56-65	40
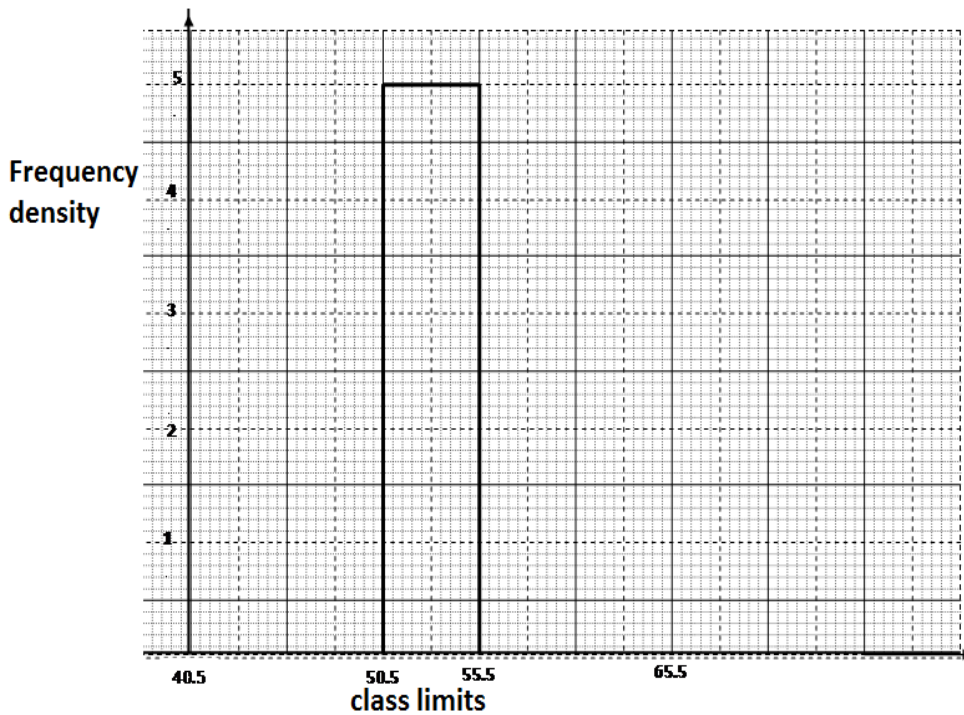
17) The ends of the roof of a workshop are segment of a circle of radius 10m. The roof is 20m long .The angle at the centre is 120^0 as shown in the figure below.

(a) Calculate:
(i) The area of one end of the ı   (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 16cn. 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)
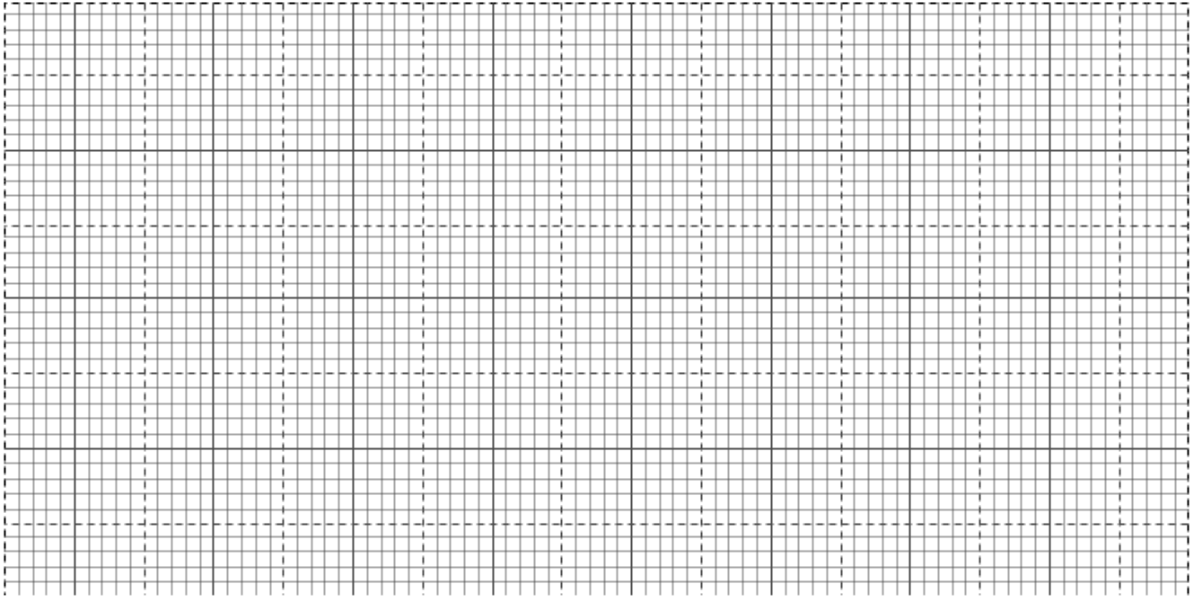
20) A straight line passes through the points (8, -2) and (4,-4).

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.ne OA is produced to L such that OL = 3 OA
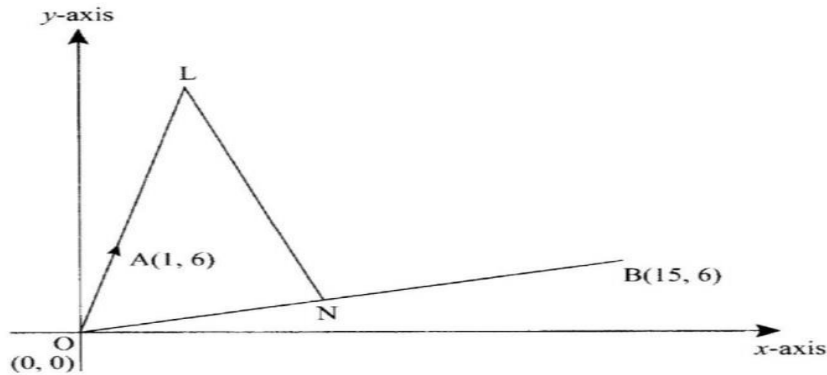
(a) Vector LN.   (3 marks)

(b) Given that a point M is on LN such that LM:MN = 3:4, find the coordinate of M.   (2 marks)
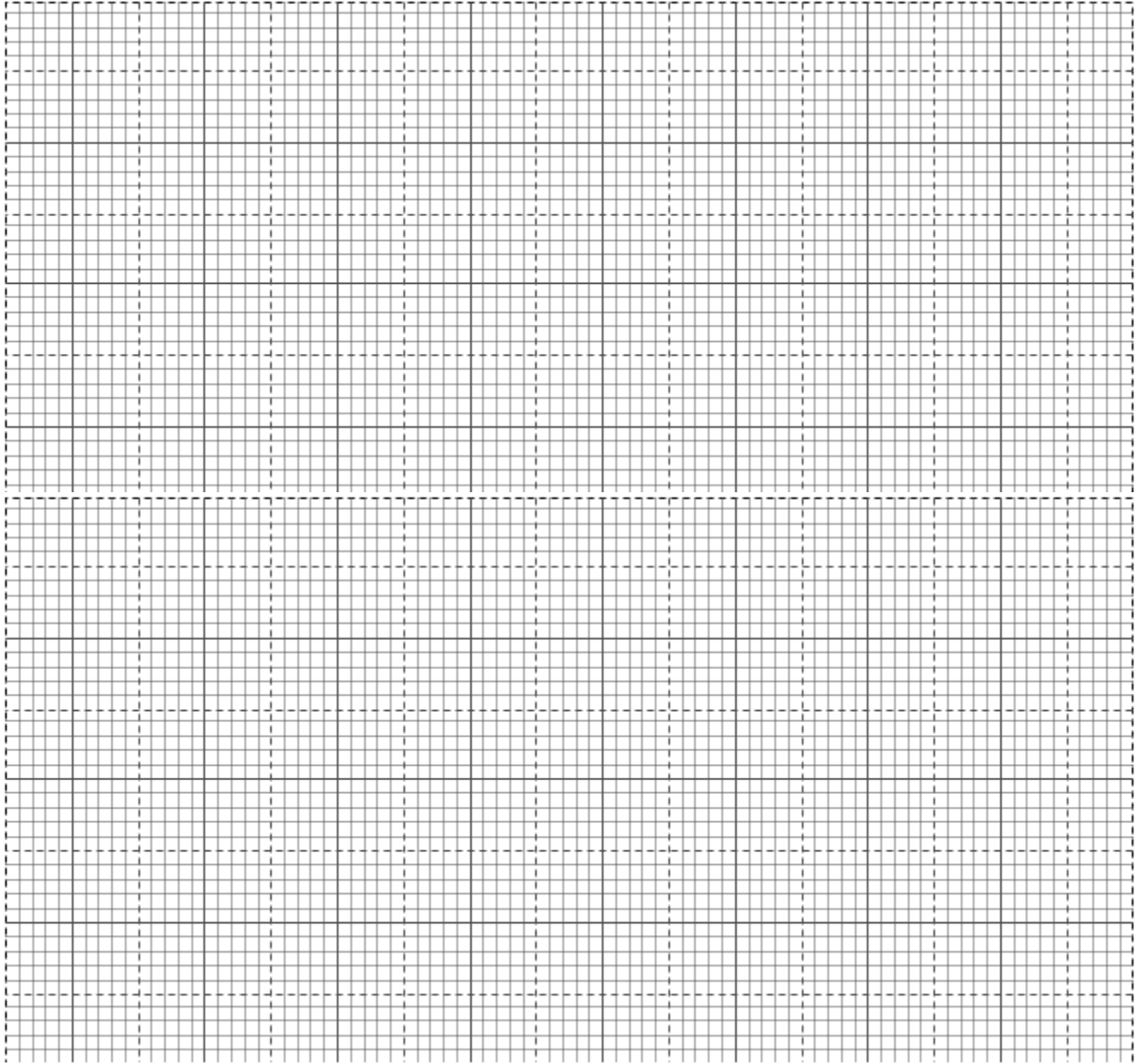
(c) If line OM is produced to T such that OM:MT = 6:1
(i) Find the position vector of T.   (1 mark)

(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)
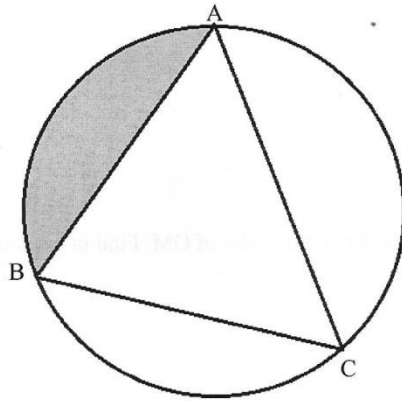
(e) From your graph, find the value of X which satisfy the simultaneous equations. (1 mk)
$$y = 2x^2 - 3x - 5$$
$$y = 2x - 2$$

(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=12cm, BC=15cm, and AC=14cm

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)

KCSE REPLICA SERIES EXAMS

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*

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

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 eight 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

$$\frac{9t^2 - 25a^2}{6t^2 + 19at + 15a^2}$$

(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/cm³. 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=10cm, AB=12cm and BC=FE=AD=20cm. 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 $1cm$ rep. $5cm$ (3marks)
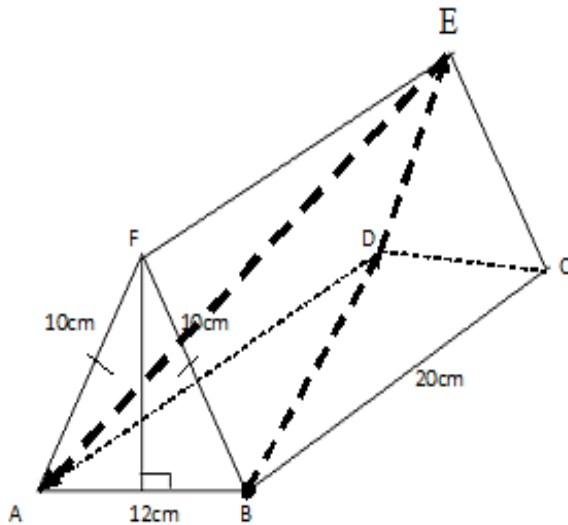

9. Mrs Wekesa paid shs 12500 for a wrist watch after the shopkeeper gave her a discount of 2%. If the shopkeeper made a profit of 20%.calculate the price the shopkeeper bought from the manufacturer. (3marks)

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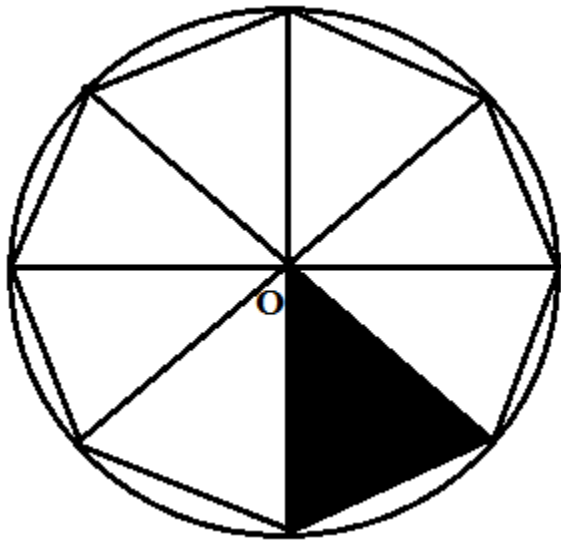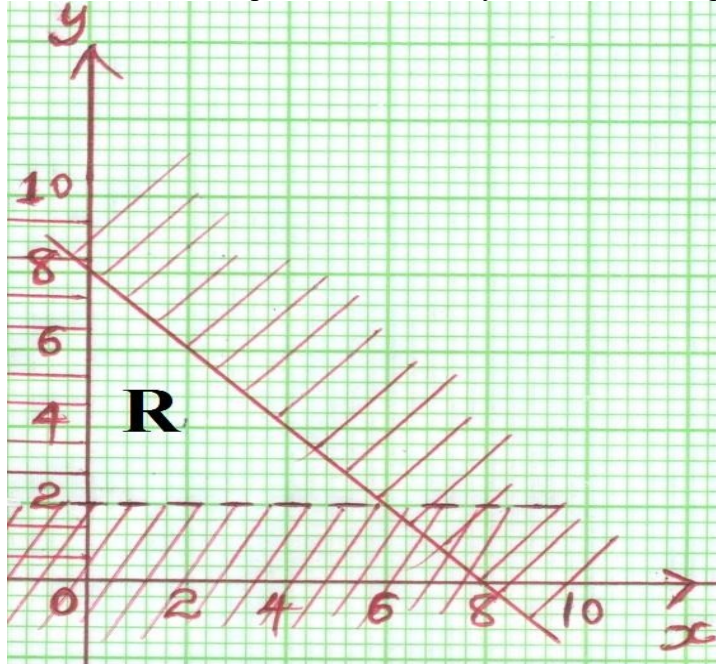

13. The volumes of two similar cylindrical containers are $27cm^{3}$ and $125 \ cm^{3}$ respectively. Given that the height of the smaller container is 12cm, find the height of the larger container. (3marks)

14. Without using calculator or mathematical tables, simplify (4marks)
$$\dfrac{\cos 30 - \sin 45}{\sin^{2} 30 + \tan^{2} 45}$$

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 $\dfrac{1}{2}$ (2marks)
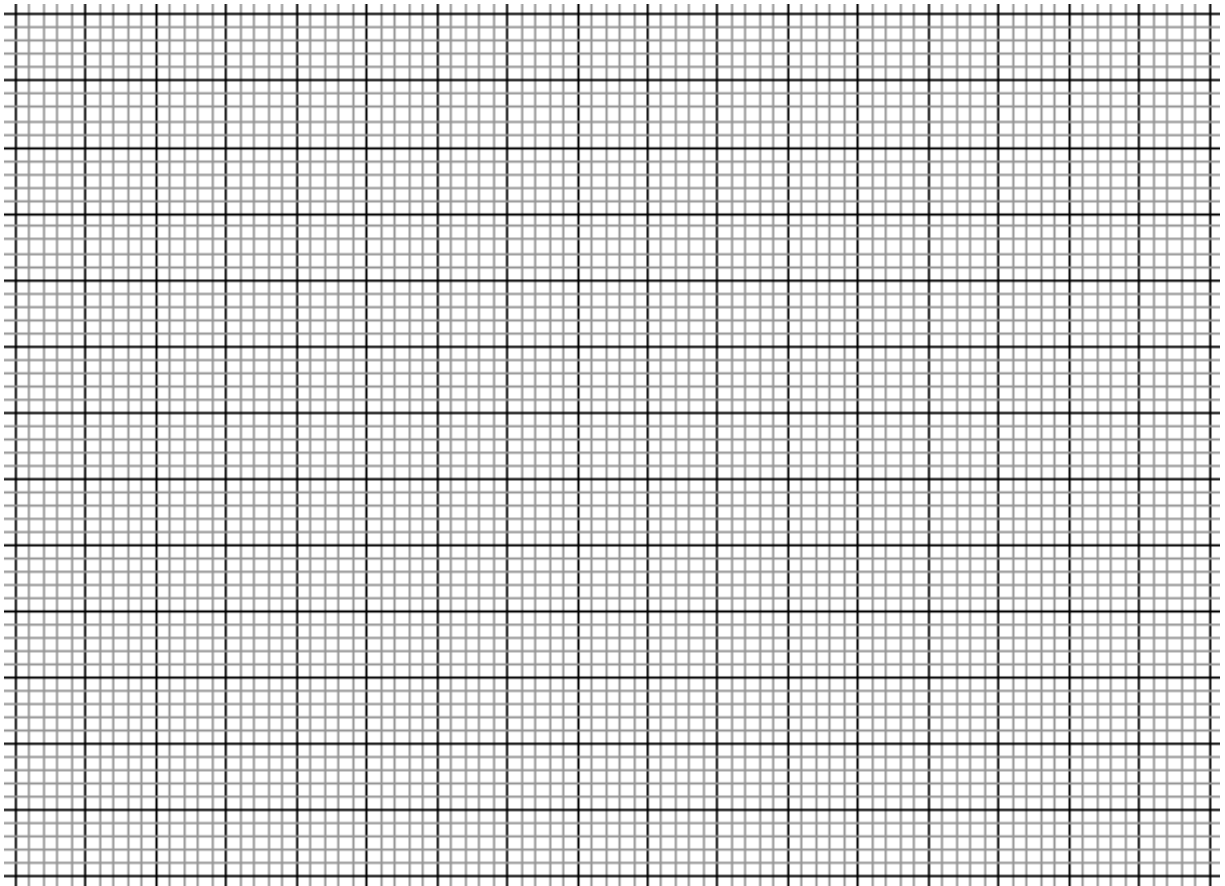
18. Two circles with centres O and Q and radii 8cm intersect at points A and B as shown below.
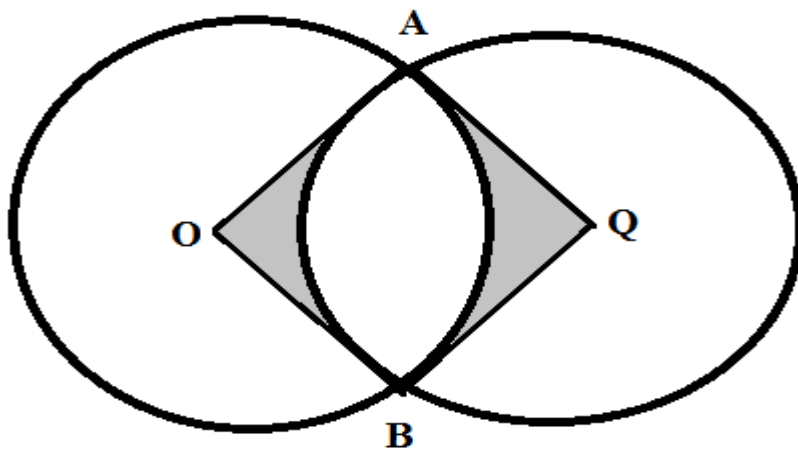
Given that the distance between O and Q is 12cm and that the line AB meets OQ at X, find:
   (a)   the length of the chord AB.   (3marks)

   (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. $\angle BFD = 50^0$, $\angle BEO = 25^0$ 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 **OA= a, OB= b**, M is a point on OA such that OM:MA=2:3 and N is another point on AB such that AN:NB = 1:2. Lines ON and MB intersect at X.
a) Express the following vectors in terms of **a** and **b**
      i) **AB**   (1mark)

      ii) **ON**   (1mark)

      iii) **BM**   (1mark)

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

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

21.   Every Sunday Alex drives a distance of 80km on a bearing of 074^0 to pick up his brother John to go to church. The church is 75km from John's house on a bearing of $S50^0E$. After church they drive a distance of 100km on a bearing of 260^0 to check on their father before Alex drives to John's home to drop him off then proceeds to his house.

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

(4 marks)

    (b)   Use your diagram to determine:

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

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

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

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

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

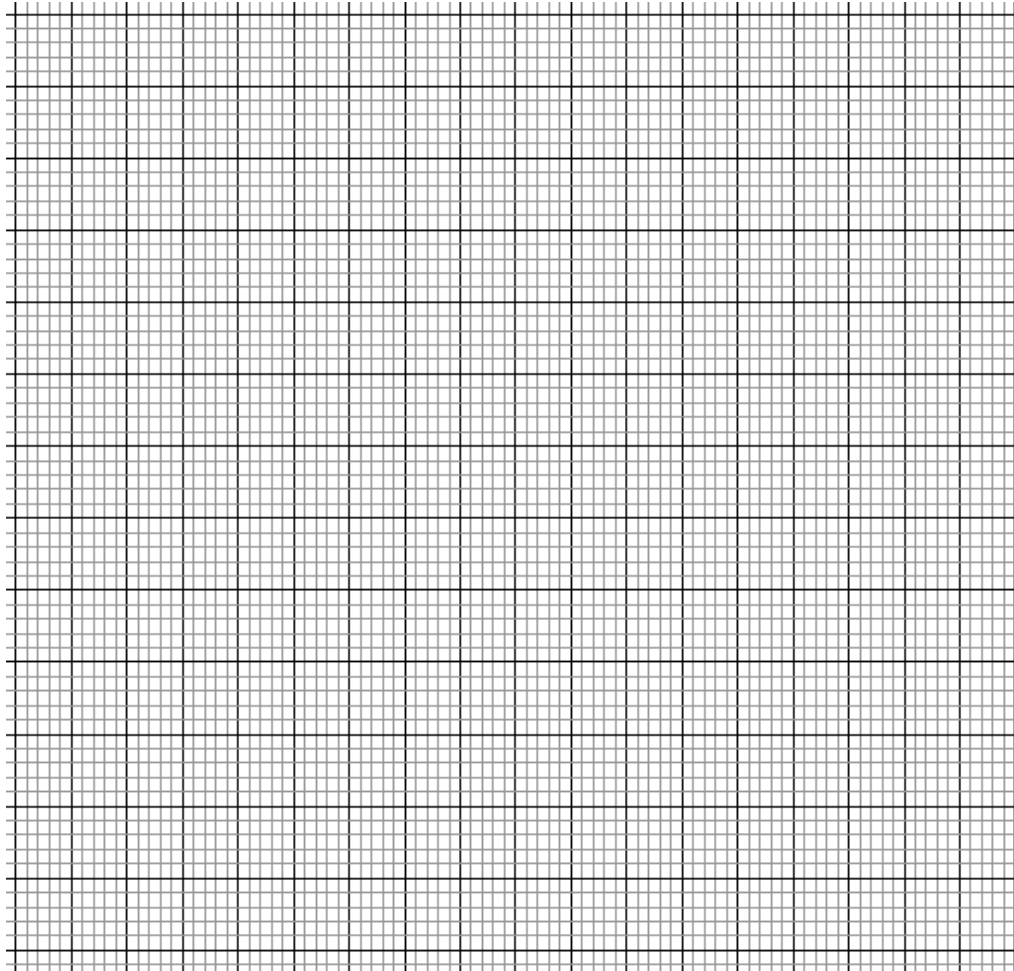   (i)   Calculate the mean.   (3marks)

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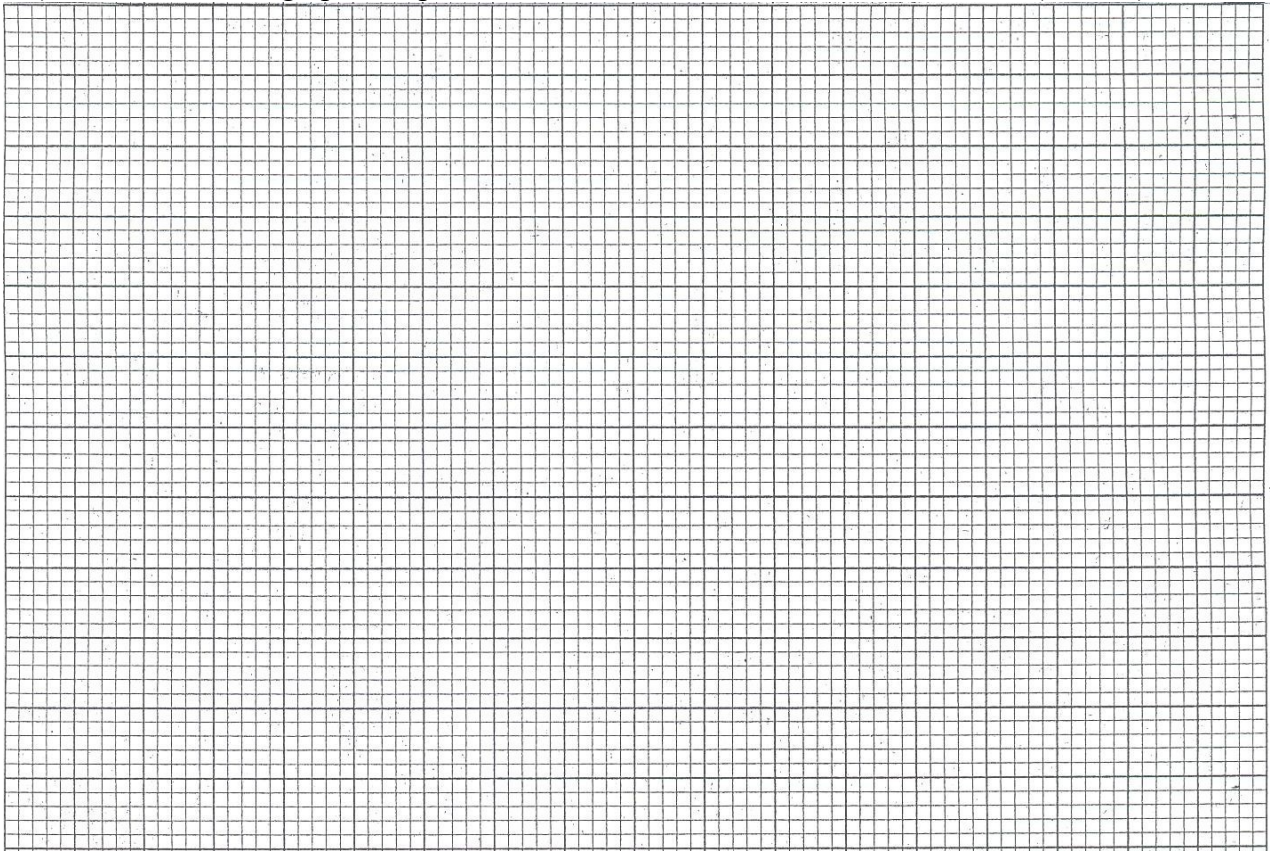
24. A particle moves in a straight line. It passes through point O at $t = 0$ with velocity $V = -4m/s$. The acceleration $a \ m/s^2$ of the particle at time t seconds after passing through O is given by $a = 10t + 1$

(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)

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**.
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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

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)
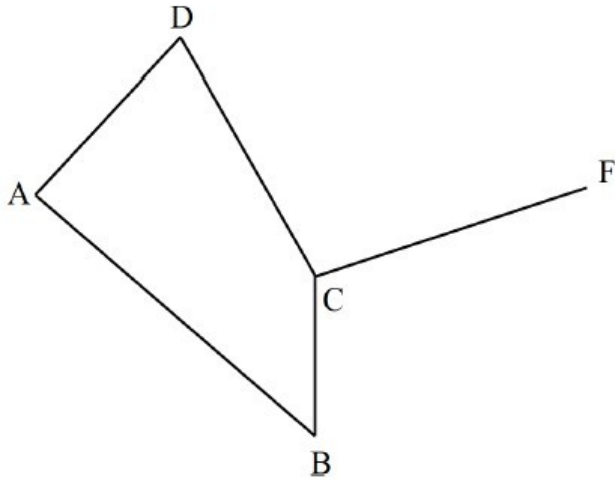
5. When a given length of a piece of wire is divided into pieces measuring 20 cm or 24 cm or 26 cm or 28 cm, a piece of wire 7cm always remained. Find the length of wire. (4 marks)

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 $AB = 5\ cm$, $AD = 6\ cm, DC = 10\ cm, \angle BAD = 105°$ 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 $\tilde{a}f = 2p - \frac{3}{4}q$ where $p = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$ and $q = \begin{pmatrix} 16 \\ 4 \end{pmatrix}$ Find column vector af (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°.
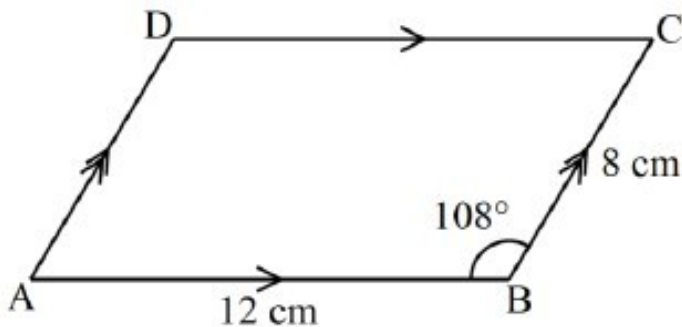
   Calculate the area of the parallelogram correct to 3 significant figures.   (3 marks)

11. Without using mathematical tables or a calculator evaluate.   (3 marks)
   $$\frac{\tan 30^o \ \tan 60^o}{\sin 60^o \ \cos 30^\circ}$$

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; $\dfrac{(m+5n)^2 + (m-5n)^2}{3m^2 + 75n^2}$ (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)

5

17. The diagram below shows a frustum which represents a bucket with an open end diameter of 30 cm and bottom diameter 24 cm.
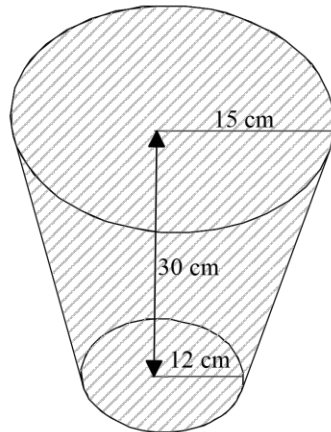
The bucket is 30cm deep. (Use π = 3.142)

(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.
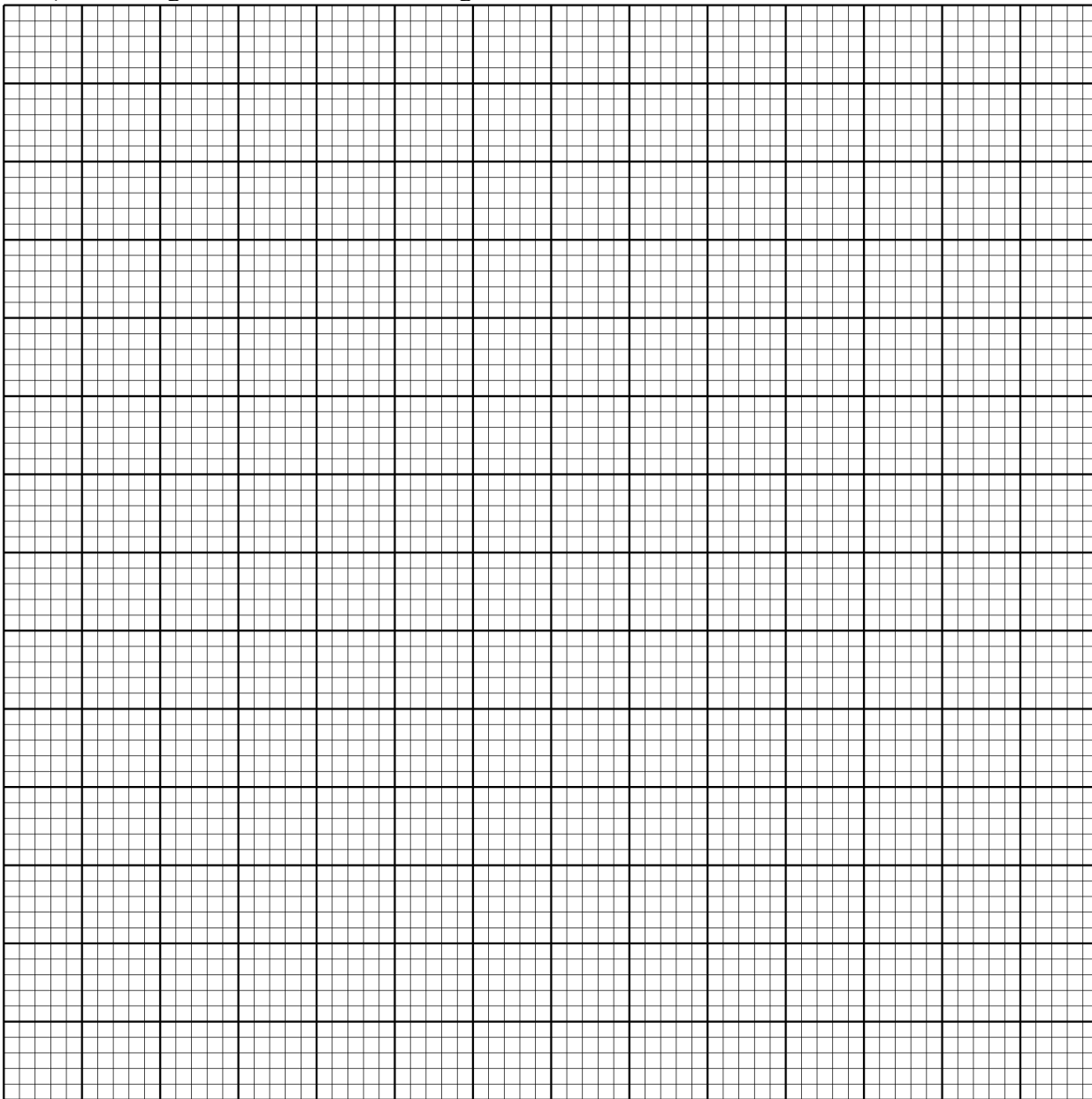
i.   ABC.   (1 mark)
ii. $A'B'C'$, the image of triangle ABC under a negative quarter turn about the origin.

(2 marks)

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. $AB = 8\ cm, BC = 10\ cm$ and $AC = 13cm$
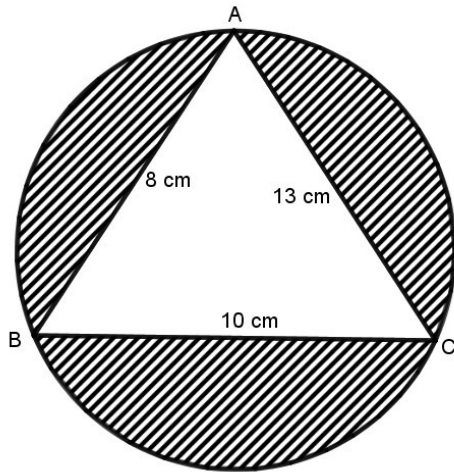
Calculate
(a) The area of triangle ABC.   (3 marks)

(b) Angle BAC   (2 marks)

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

8

(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)
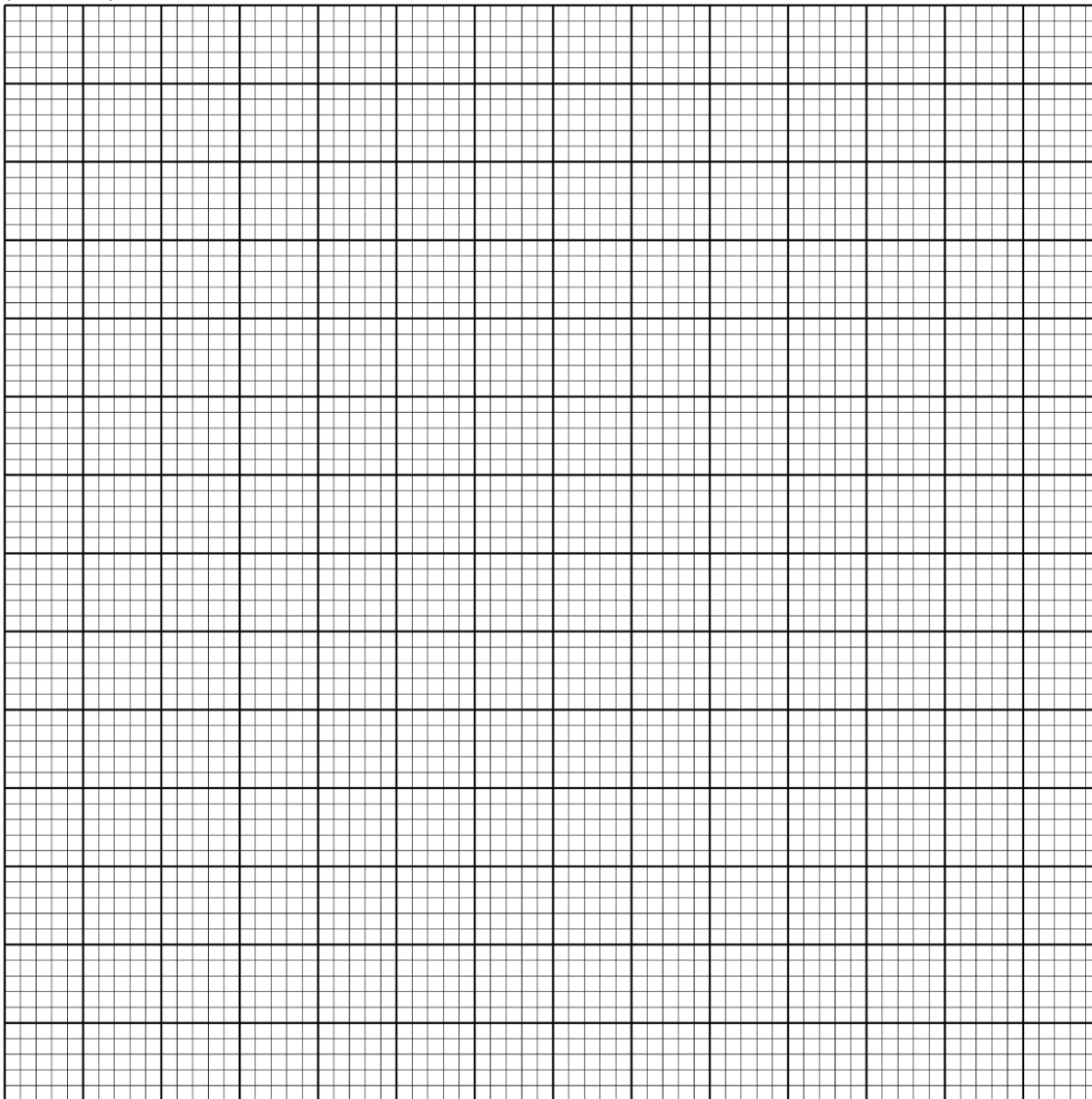
(c) Use the graph in (b) above to find the roots of the following equations:
   i. $x^3 - 5x^2 + 2x + 9 = 0$ (2 marks)

    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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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

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

SECTION II

Grand total

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FOR MORE PAPERS FOR ALL SUBJECTS AND MARKING SCHEMES

1

1. Find the value of $1.5\dot{7}\dot{5} - 0.4\dot{2}\dot{5}$ 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)

$$\left(\frac{12.78 \sin 33.45^0}{(9.063)^2}\right)^{\frac{1}{3}}$$

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

2
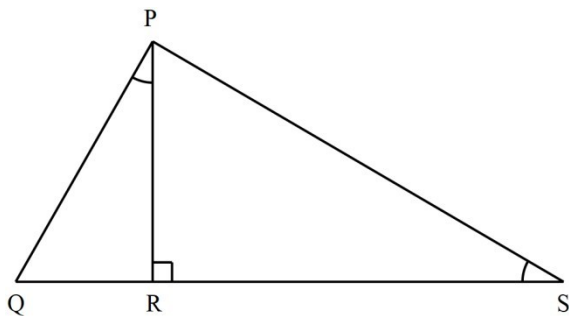
Given that the area of triangle PQR is 24 cm², find the area of triangle PRS. (3 marks)

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.
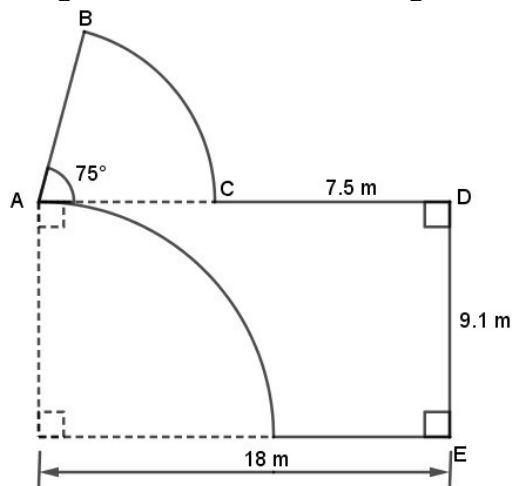
Calculate the perimeter of the garden (3 marks)

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)

4

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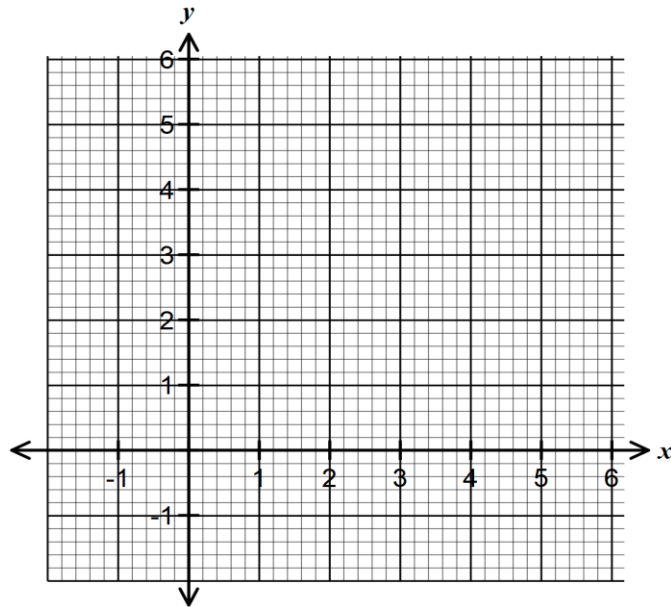
15. In a theatre group, the ratio of males to females is 2:3. On one Tuesday training, ten males members were absent and six new female members joined the group as guests for the day. If on this day the ratio of males to females was 1:3, how many regular members does the group have? (3 marks)

16. The figure below shows part of the net of a triangular prism whose cross-section is an equilateral triangle.
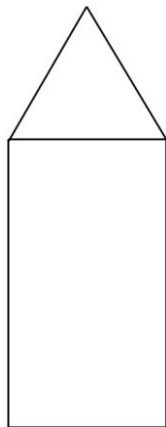
Complete the net of the solid. (4 marks)

5

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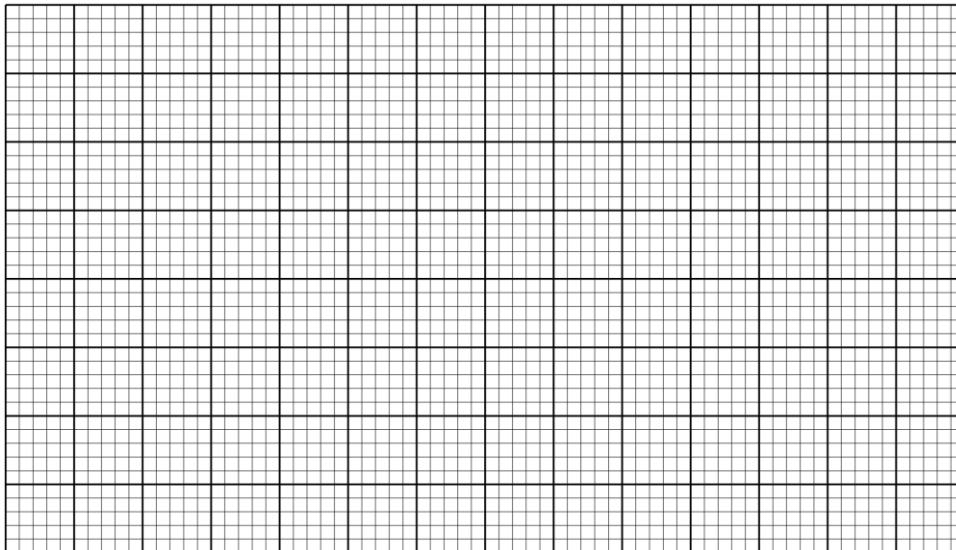
18. A composite solid comprises of a frustum of a cone mounted on a hemisphere such that the diameters of the hemisphere and the bottom of the frustum both measure 30 cm. The entire solid has a vertical height of 60 cm. The radius of the top of the frustum if 10 cm.

(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_2 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)

7
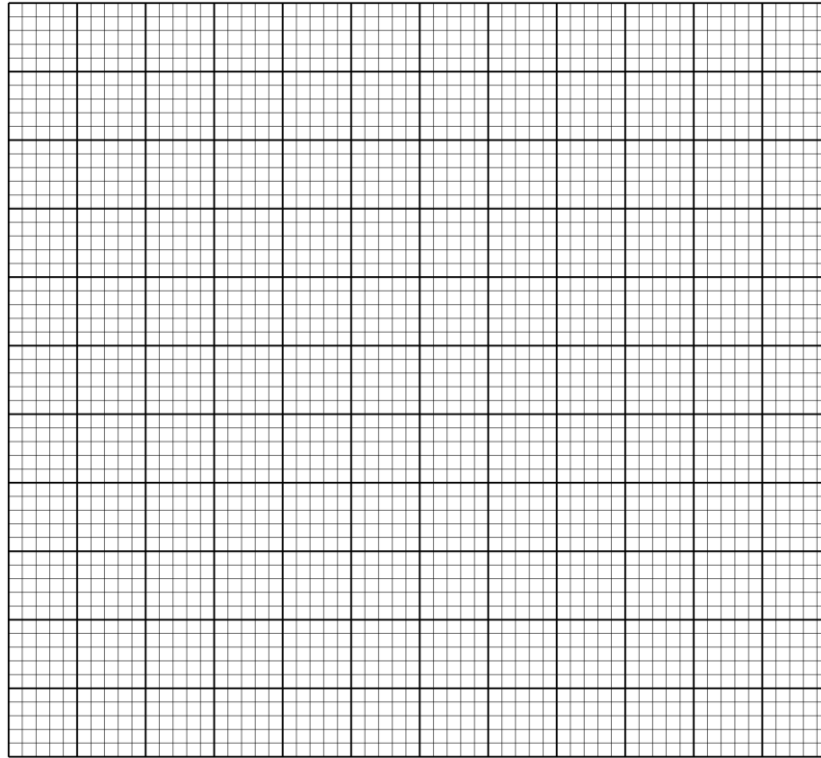
(c) Use the graph in (b) above to find the roots to the equation $2x^2 + 5x - 12 = 0$ (2 marks)

(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 ΔP''Q''R'' such that
    P''$(-2, 3)$, Q''$(-1, 2)$ and R''$(-4, 1)$.   (2 marks)
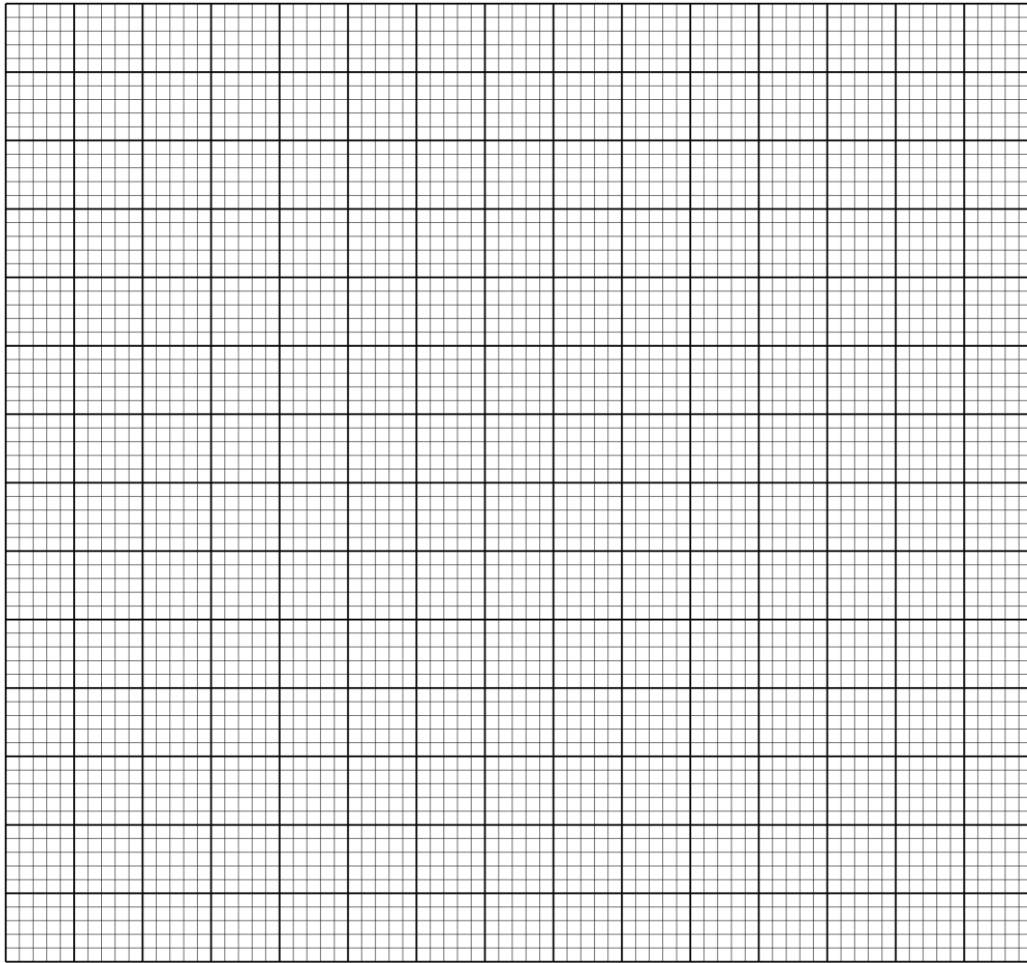
(b) On the same axes, draw $\Delta P'Q'R'$, the image of ΔPQR under a reflection in the line $y + x = 0$.

(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 -90^0 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, $\angle ADO=39^0$, $\angle OBC=33^0$ and $\angle ECD=45^0$. EC is a tangent to the circle at C.
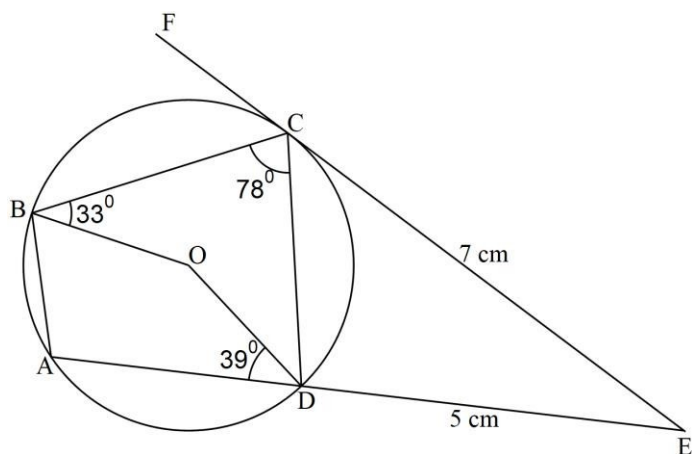
(a) Calculate, giving reasons
   (i)   ∠CDE   (2 marks)

   (ii)   ∠DEC   (2 marks)

   (iii) Reflex ∠BOD   (2 marks)

(b) Given that EC=7 cm and DE = 5 cm, calculate the length of AD correct to 4 significant figures.
                                                                                                     (4 marks)

23. The distance between two towns A and B is 760 km. A bus left A at 0815 hours and traveled towards B at
    an average speed of 90 km/h. At 1035 hours and on the same day, a car left B and traveled towards A at an
    average speed of 110 km/h
    (a) Calculate:
       (i) the time of the day the two vehicles met;   (4 marks)

(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)

GOLDLITE ONLINE EDUCATIONAL SERVICES
Kenya Certificate of Secondary Education
KCSE REPLICA SERIES EXAMS

Name ………………………………………………… Admission number ……………………

Candidate's Signature…………………………………Date……………………………………

REPLICA 7

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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FOR EXAMINER'S USE ONLY

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	TOTAL

Grand total

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 = 3x2 – 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 Ø in the equation.   (3   marks)

sin (2Ø- 10) = - 0.5 for the range $-180° \leq Ø° \leq 180°$

13. Solve the equation $log2(x^2 - 9) = log2^{8+1}$ (3 marks)

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

Calculate the percentage error in the area.   (4 marks)

15. Find the range of values of X which satisfy the following in equalities simultaneously

$4x - 9 < 6 + x$

$8 - 3x \leq x + 4$ 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) Ina 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)

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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 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 due southwest point Q. point C is 70 Km on a bearing of s 60°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
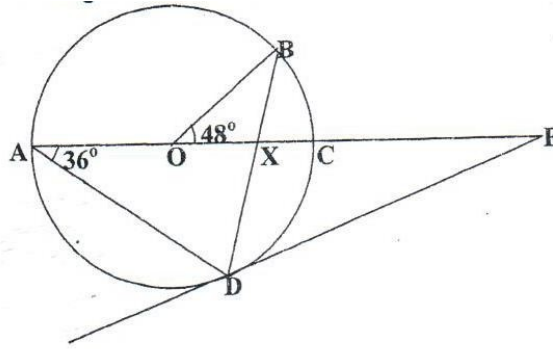
Giving reasons for your answers find the size of
a) Angle PRS   (2 marks)

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 is eternal length and breadth are 7.5 cm 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 return to downhill along the same route an average of (v + 20) km/h. given that the differences between the timer is one hour, fro 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)

GOLDLITE ONLINE EDUCATIONAL SERVICES

Kenya Certificate of Secondary Education

KCSE REPLICA SERIES EXAMS

Name ………………………………………………… Admission number ……………………

Candidate's Signature…………………………………Date……………………………………

REPLICA 8

121/1
MATHEMATICS
PAPER 1
INSTRUCTIONS TO CANDIDATES

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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 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 $\sqrt[3]{\dfrac{0.07893}{37.8 \times 43.81}}$ (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, $\angle ACD = \angle ABE = 90°$. Find the area of the triangle **ABE** (3mks)
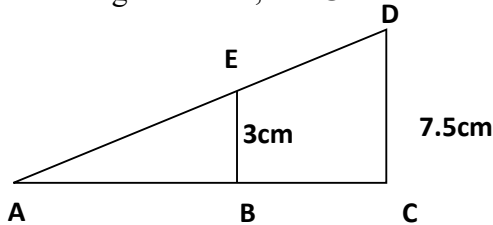
6. A square **ABCD** is such that **A**(-3,4) **C**(2,3). Equation of line **AB** is 3y-2x=18 and equation of line **CD** is _3y-2x=5_. Determine

   (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/cm³. 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 $\left(\dfrac{2x^{-3}}{5y^{-2}}\right)$ (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 negations process. What was the customer's percentage discount. (3mks)

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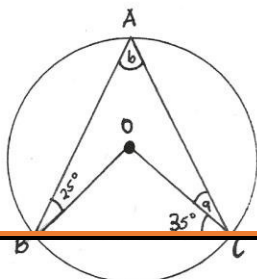
a_____

b_____

15.   Using a pair of compasses and a ruler only construct triangle **ABC** with **ABC** = 120° 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. π=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 Mwihila 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 295º from **R** at a distance of 60km. **G** is on a bearing of 340º 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)
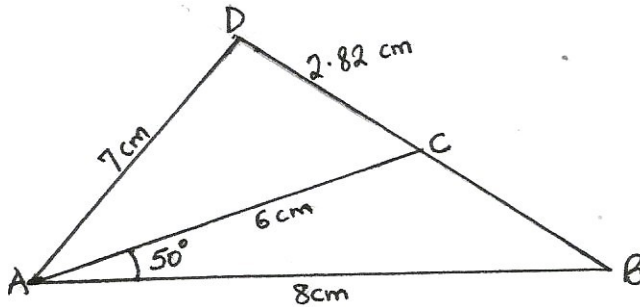
(b)Find:-

 (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**=8cm, **AC**=6cm, **AD**=7cm, **CD**=2.82cm and angle
       CAB=50º

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.
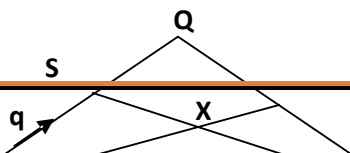
Find:

(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= t³-3t²+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)
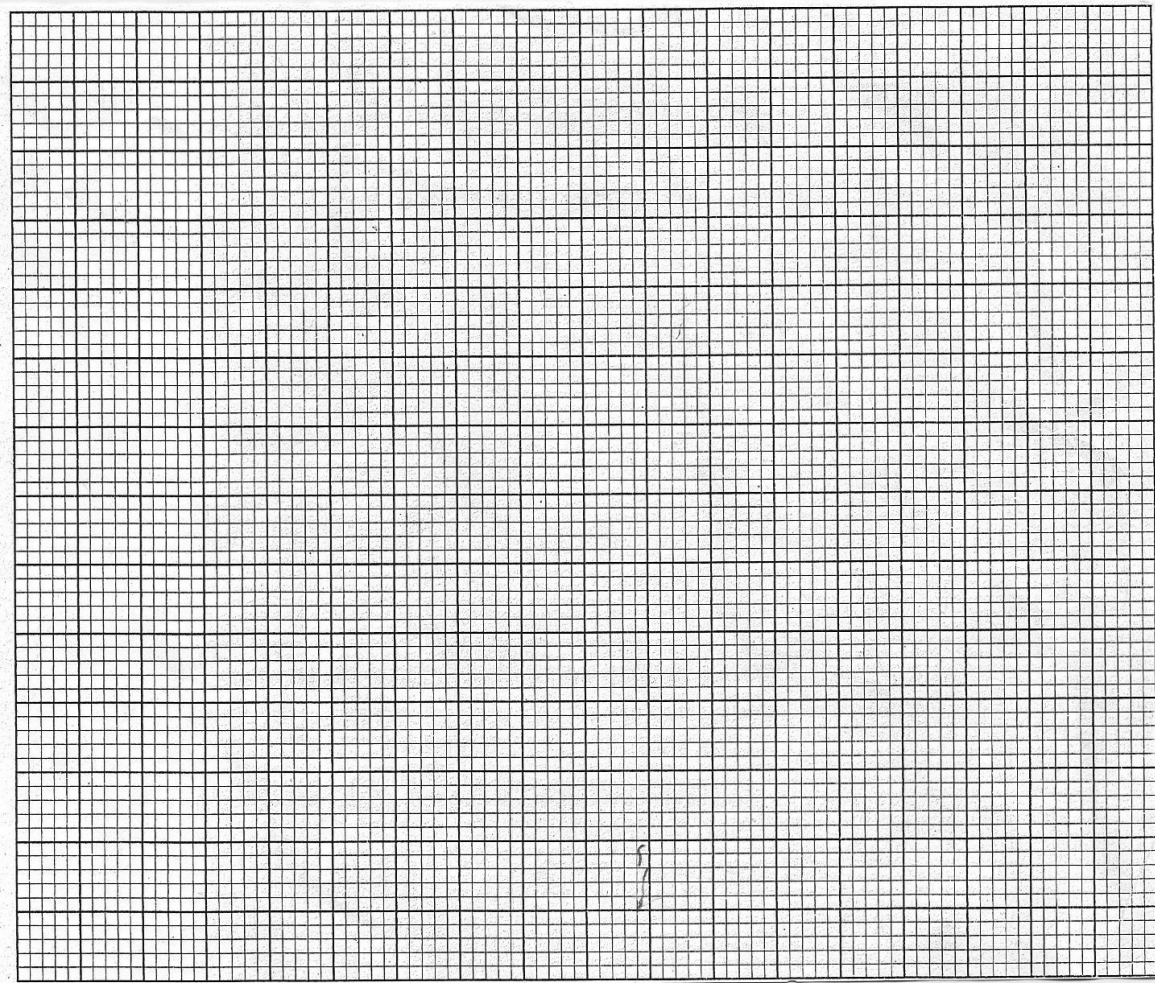
        (b) Locate
        and write down the coordinates of **A', B', C'** and **D'** and to the image of **ABCD** under a rotation of
        positive 90° centre (0,0) on the same grid   (3mks)

        (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)

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

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	TOTAL

Grand total

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)**

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

4. A line $y = mx + 8$ makes an angle of 75.97^0 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 $sin\ (3\ \theta - 50^0) - cos\ (2\ \theta + 10^0) = 0$. **(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;

  1   US $ = 117.20 Japanese yen
  1   US $ = Ksh. 72.34   **(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 290^0 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)**

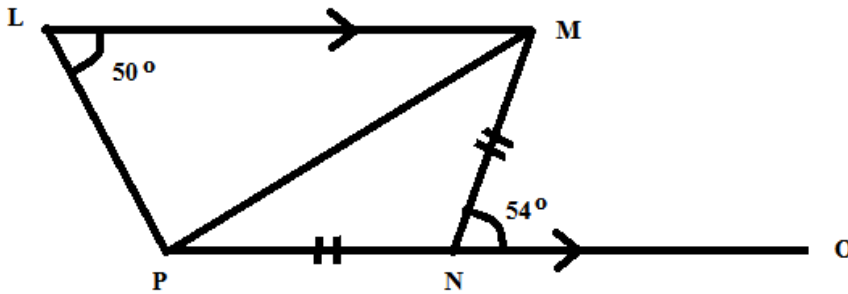**12.** Express 0.73 as fraction.   **(3 marks)**

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 π= 3.142)   **(3 marks)**
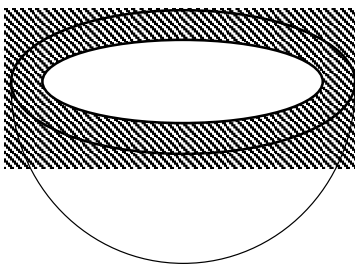
14. In the figure below ∠ MNO = 54^0, and ∠PLM = 50^0, PN = NM and PO is parallel to LM. Find the value of ∠LPM. **(3 marks)**

15. In the figure below, AB is a diameter of the circle and AB = 8cm, BC= $x$cm and AC= $2x$cm. Calculate the length of AC to 2 significant figures. **(3 marks)**
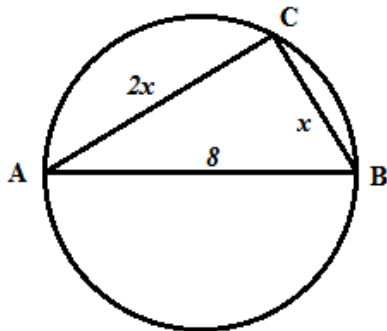
16. The angle of elevation of the top of a storey building from point P is 23.61 ^{0}. From another point Q, six metres nearer to the base of the building, the angle of depression from the top of the building is 35^0. Calculate to 1 decimal place the height of the building. **(4 marks)**

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)**
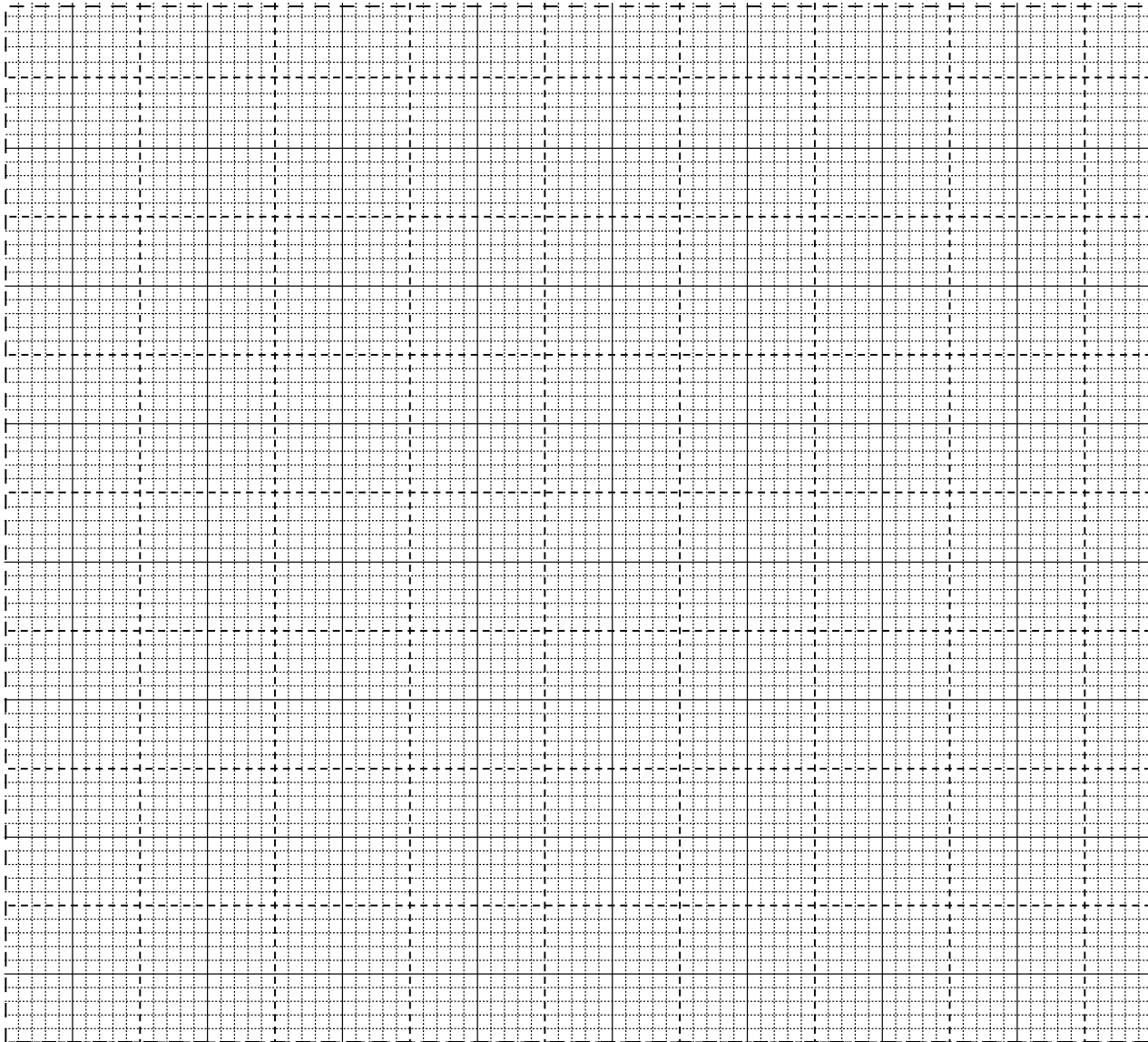
18. The diagram shows two intersecting circles of radii 20 cm and 15 cm such that their centres A and B are 30 cm apart.
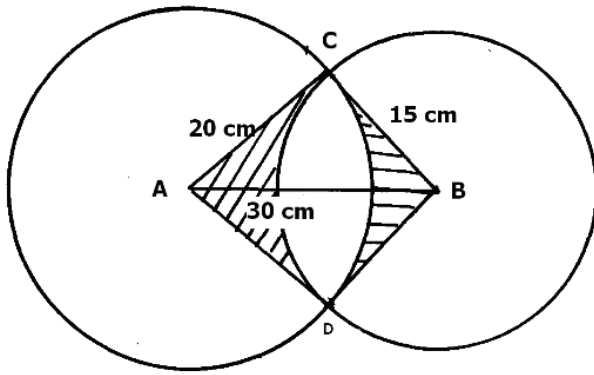
Calculate to 2 decimal places.

a) The area of sector ACD   **(3marks)**

b) The area of sector BCD   **(3marks)**

c) The length of the common 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 150^0
   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)**
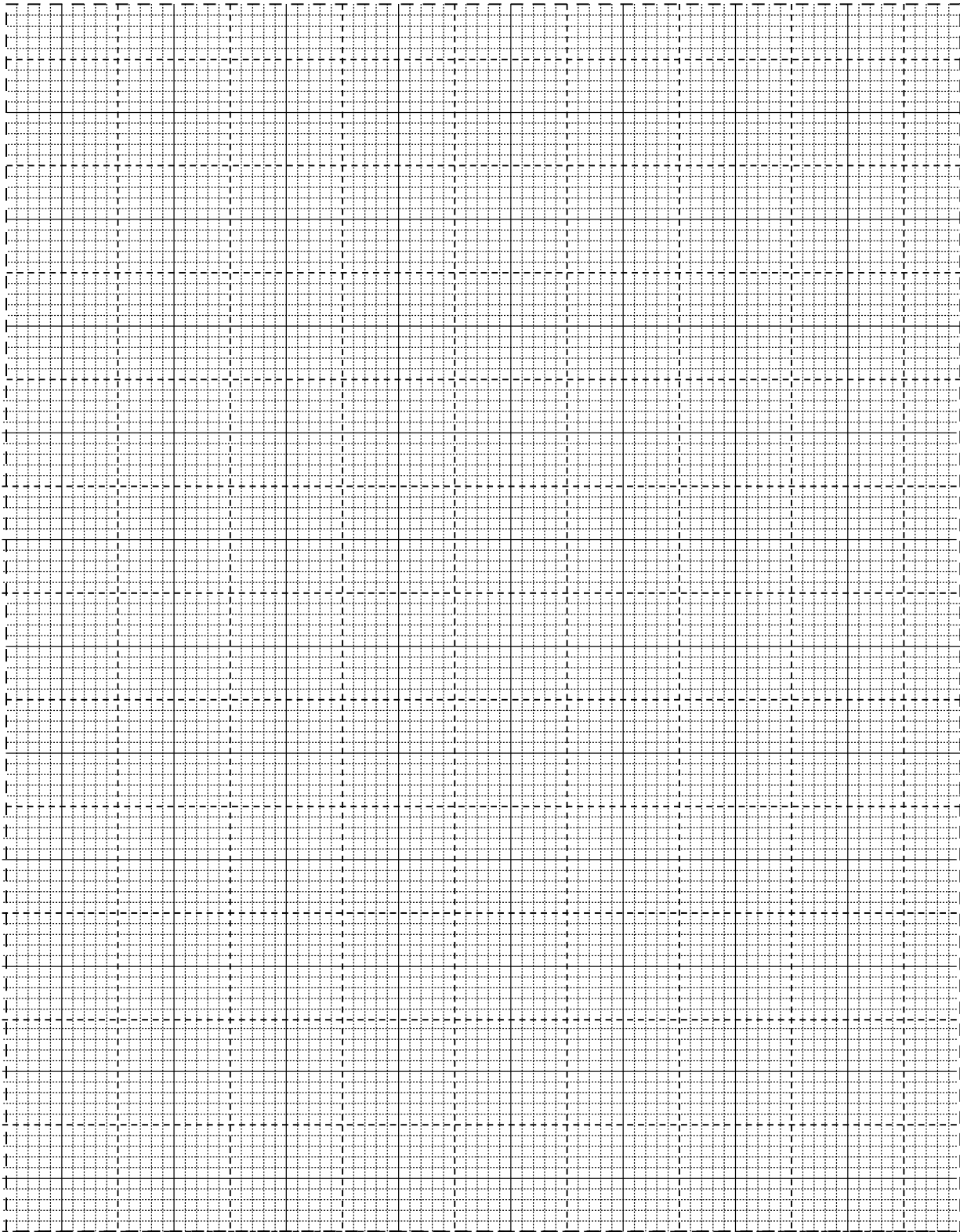
(b) Triangle $A^1B^1C^1$ is the image of triangle ABC under enlargement of scale factor 2 with the centre at $(3, 0)$. Construct and label triangle $A^1B^1C^1$. State the coordinates of the triangle $A^1B^1C^1$.

(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)**

GOLDLITE ONLINE EDUCATIONAL SERVICES
Kenya Certificate of Secondary Education
KCSE REPLICA SERIES EXAMS

Name …………………………………………… Admission number ……………………

Candidate's Signature…………………………………Date……………………………………

REPLICA 10

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

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

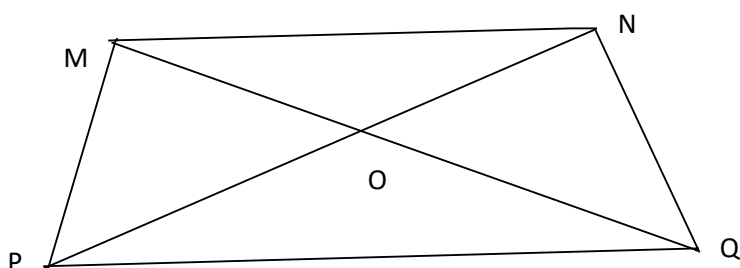*@2023CONTACT US ON 0724351706/0726960003*

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 $\dfrac{0.6845^2 \times 0.08416^{\frac{1}{2}}}{0.005937}$. **(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: $\dfrac{2 - 10x + 12x^2}{36x^2 + 3 - 21x}$.

(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 $2\log_7\left(\dfrac{7}{15}\right) + \log_7\left(\dfrac{25}{12}\right) - 2\log_7\left(\dfrac{7}{3}\right)$.

(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 US$ = 105.00 Yen

        1 US$ = 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 $c = \dfrac{5}{9}(f - 32)$ can be used to convert Fahrenheit temperature, F, to Celsius temperatures C.

For what Fahrenheit temperatures is the Celsius temperature lower than $45\,^{\circ}C$?

(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	$0 \le x < 5$	$5 \le x < 15$	$15 \le x < 25$	$25 \le x < 45$	$45 \le x < 75$
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 = 9cm, AC = 8cm and angle BAC = 60^0. **(2 marks)**
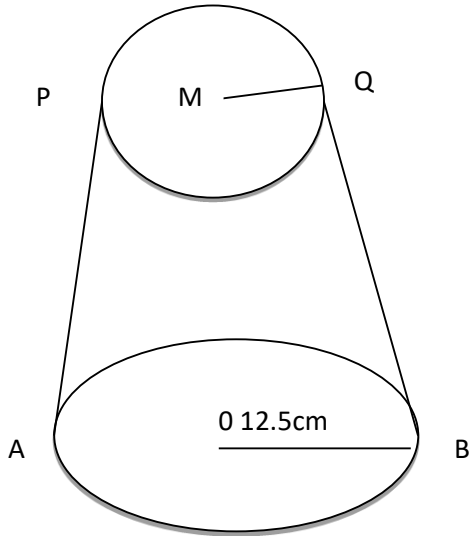
(b) On the same side of AB as C, draw the locus of a point such that angle APB = 60^0

(3 marks)

c) A region T is within the triangle ABC such that AT > 4cm and angle ACT ≥ angle BCT. Show the region T by shading it. **(5 marks)**

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 part.

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 frustrum 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 of 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.
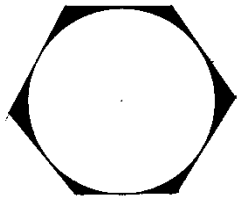
Calculate the area of the shaded region.   **(5 marks)**

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)

GOLDLITE ONLINE EDUCATIONAL SERVICES
Kenya Certificate of Secondary Education
KCSE REPLICA SERIES EXAMS

NAME ……………………………………………… ADMISSION NUMBER …………………

CANDIDATE'S SIGNATURE…………………………………DATE……………………………………………

REPLICA 1

121/2
MATHEMATICS
PAPER 2

INSTRUCTIONS TO CANDIDATES

a) Write your name, school and Index Number in the spaces provided at the top of this page

b) The paper consists of two sections. Section I and Section II.

c) Answer ALL the questions in Section I and any FIVE from Section II.

d) All answers and working must be written on the question paper in the spaces provided below each

e) Question.

f) Marks may be given for correct working even if the answer is wrong.

g) Negligence and slovenly work will be penalized

h) Non programmable silent electronic calculator and KNEC Mathematical tables may be used except

i) where stated otherwise.

Section I   **FOR EXAMINER'S USE ONLY**

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

Section II

Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

Grand Total

Section I (50 marks)

Answer all questions in this section

1. The cash price of a phone is Ksh. 46,000. Linda bought the phone on hire purchase terms by paying a deposit of Ksh16,000 and the balance by 12 equal monthly installments of Ksh 3600. Find the compound rate of interest per month. (3 marks)

2. Given that $cos285° = \frac{\sqrt{6}-\sqrt{2}}{4}$, simplify $\frac{1}{cos75°}$ (3 marks)

3. Expand and simplify $(2 - \frac{1}{4}x)^6$ up to the fourth term. Hence use your expansion to solve $(1.96)^6$ correct to 3 decimal places. (4 marks)

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

5. Make x the subject of the formula;   (3 marks)

$$w = 20 - \frac{1 + x}{1 - x}$$

6. The ends of the diameter of a circle has coordinates (6,-5) and (-2,3). Find the equation of the circle in the form $x^2 + y^2 + bx + ay + c = 0$.   (4 marks)

7. The length and width of a rectangular floor are given as 24.2m and 7.2m respectively. The dimensions are given with 2.5% and 4% of error respectively. Find the range within which the area of this floor lie.
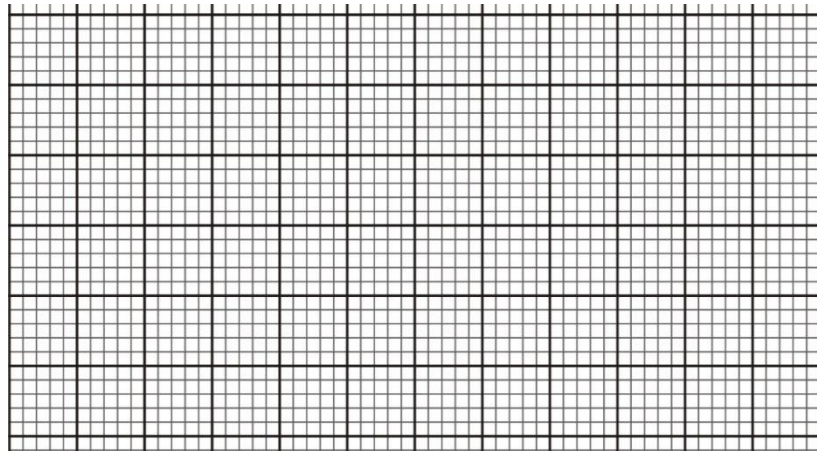(3 marks)

8. Find the period, amplitude and the phase angle of y $= \frac{11}{2}$ Cos (3x + 28^0).   (3 marks)

9. The second, sixth and the eighth terms of an arithmetic progression corresponds to the first three consecutive terms of an increasing geometric progression. If the first term of the A.P is -36, the common difference of the A.P is d and the common ratio of the G.P is r. find the value of d and r.

(4 marks)

10. A circle has two chords PQ and RS which intersect internally at point O. Given that PO= 8cm , OQ= 6cm and RO = 4.5cm, find the measurement OS.   (2 marks)

11. The position vectors of points **U, V** and **W** are $\overrightarrow{OU} = 2\mathbf{i} - \mathbf{j} + 3\mathbf{k}$, $\overrightarrow{OV} = 6\mathbf{i} - 3\mathbf{j} + 9\mathbf{k}$ and **OW** = 18**i** – 9**j** + 27**k.** Show that **U, V** and **W** are collinear points.   (3 marks)

12. The values below represent the height of different trees in a school.

34,23,65,11,12,42,33,49,40,28,69,41,37,19,24,47, Calculate the quartile deviation of the height of the trees.

(3 marks)

13. The table below shows the values of x and y. Draw the curve on the graph below hence find the gradient of the curve when x = 2   (3mks)

X	1	2	3
Y	3	2	1.7

14. In the figure below, PQRS is a cyclic quadrilateral. Point O is the centre of the circle. Angle PQO = 35° and angle PSO = 42°
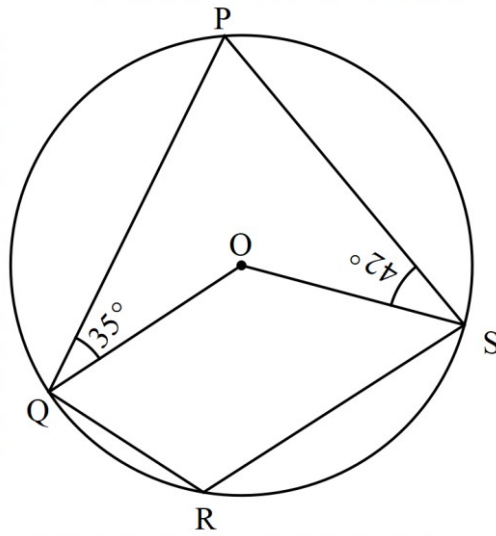
Calculate the size of angle QRS. (2 marks)

15. Use logarithm tables to evaluate (4 marks)

$$\frac{\sqrt{0.0024}}{321} \times 32.48^2$$

16. T is a transformation represented by the matrix $\begin{pmatrix} 5x & 2 \\ x & -3 \end{pmatrix}$. Under T, a square of area 10cm² is mapped onto a square 110cm². Find the values of x. (3 marks)

17. The vertices of triangle $A^1B^1C^1$ are $A^1(1,3)$, $B^1(3, -4)$ and $C^1(5, -6)$. Triangle $A^1B^1C^1$ is the image of triangle ABC under a transformation whose matrix is $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$.

    (a) Determine the coordinates of triangle ABC. (3 marks)

    (b) On the grid provided, draw the objects and the image. (2 marks)
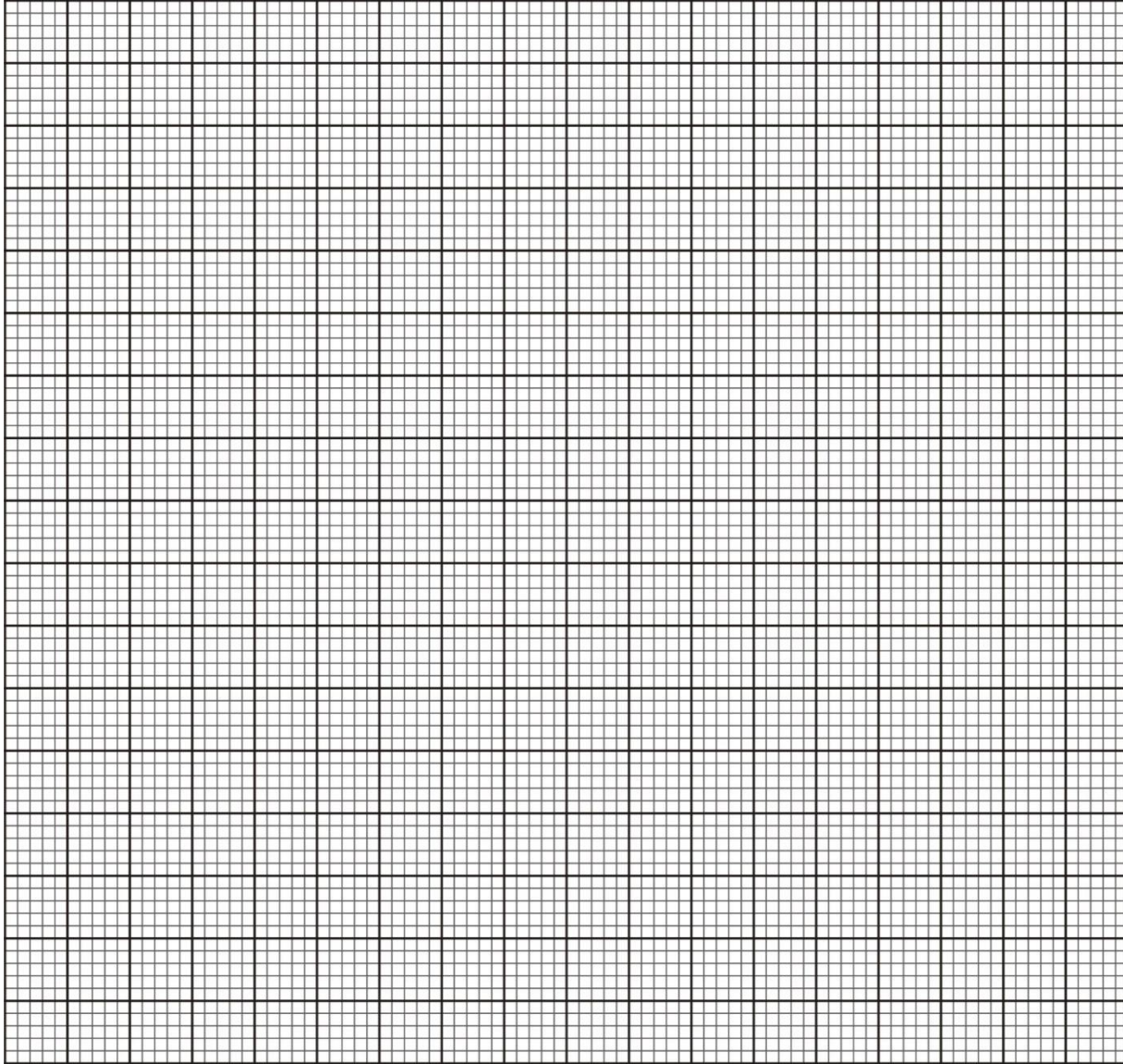
    (c) (i) Describe fully the transformation which maps ABC onto $A^1B^1C^1$. (2 marks)

    (d) The triangle ABC undergoes a transformation given by the matrix $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$, to give the image ABC. Draw the image on grid hence describe the transformation. (3 marks)

18. The table below shows the masses of form three students in a class

Mass	Freq.	
30 – 44	2	
45 – 49	8	
50 – 54	15	
55 - 59	18	
60 – 64	8	
65 – 69	4	
70 – 74	1	

Using an assumed mean of 57, calculate

   (i)   The mean.   (4 marks)

   (ii)   The standard deviation.   (6 marks)

19. (a)Using a ruler and a pair of compass only, construct triangle ABC in which AB = 8cm, and   AC=8cm and <BAC = 60^0 (2 marks)
    (b) Determine the locus L_1 of points equidistant from A and B   (1 mark)
    (c) Determine the locus L_2 of points equidistant from AC and AB   (1 mark)
    (d) Determine the locus P of points such that <APB = 140^0 (2 marks)

(e) Determine the locus Q of points such that CQ=5cm   (1mark)

(f) A point W moves inside the triangle such that $AL_1 \leq BL_1$, $< BAL_2 \leq <CAL_2$ and $CQ \geq 5cm$.
Shade the region W.   (3 marks)

20. Complete the table below, giving your values correct to 1 decimal places.   (2 marks)

$x°$	0	30	60	90	120	150	180
$3 \sin x$	0.0			3.0			
$2 - \cos x$			1.5			2.9	

(a) On the grid provided using the same axes, draw the graphs of $y = 3 \sin x$ and $y = 2 - \cos x$ for $0° \leq x \leq 360°$. Scale Y-axis- 2cm rep 1 unit. X-axis, 1cm represent 10^0

         (5 marks)

(b) Use the graph in (b) above to solve the equations;

     (i) $4 - 2 \cos x = 4$ (1 mark)

     (ii) $3 \sin x + \cos x = 2$ (2 marks)

(c) Determine the amplitude of

     (i)   3Sin x.   (1 mark)

(ii)   2 – Cos x.   (1 mark)
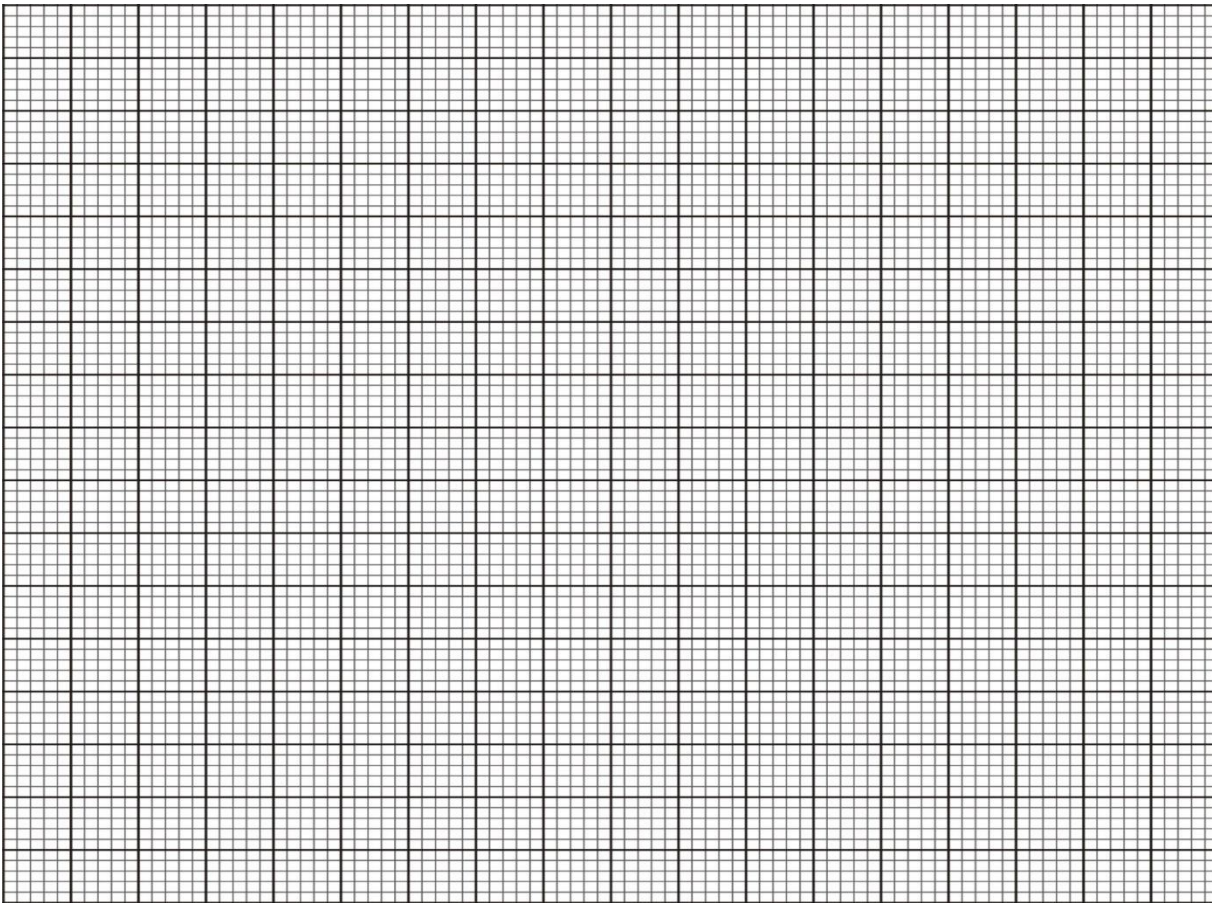
21. Triangle **OPQ** is such that OP = **p** and OQ = **q** .Point R divides OP in the ratio **1:3** and a point S divides PQ in the ratio **5:2**.OS and RQ meet at T.

a.   Express in terms of **p** and **q**.   :
i)   OS   (1 mark)

ii)   RQ   (1 mark)

b. Given that OT=kOS. Express in terms of k, **p** and **q**. (1 mark)

c. Given also that RT=hRQ, express OT in terms of h, **p** and **q**. (1 mark)

b. By expressing OT in two value of h and k. (5 marks)

c. State the ratio in which S divides **OT**. (2marks)

22. (a) The ratio of the cost of commodity X to that of commodity Y is 2:3 and the ratio of the cost of Y to the cost of commodity Z is 6:1. If the total cost of the three commodity is sh. 1100;

    (i)   Find the cost of x. (2 marks)

    (ii)   Express the cost of Z as a percentage of the cost of Y. (2 marks)

(b)A factory requires 100 workers to perform a certain job. After they have worked for 15 days the factory employs extra 26 persons for 6 days so that the job can be completed in time. How many workers would the factory have required at the beginning in order to complete the job in 12 days.

                         (3 marks)

(c)Tap A fills a tank in 20 minutes and tap B can empty the same tank when full in 25 minutes. Both taps are turned on at the same time for 10 minutes after which tap B is turned off. How long will it take tap A to fill the remaining part of the tank.   (3 marks)

23. The table below shows tax rate in 2003.

Income (sh p.m)	Tax rates in %
1 -8270	5
8271 -15790	10
15791-23310	15
23311-30830	20
30831-38350	25
38351-45870	35
45871-53390	45
Over 53390	50

Mrs Odundo earns a monthly salary of shs. 23,520, a monthly House allowance of sh. 10,000, a medical allowance of sh.3,018, a commuter allowance of sh.916 and A non-taxable allowance of sh. 4,500. He is also entitled to a personal relief of sh. 1,600 p.m.

Calculate:

(a) Calculate his taxable income per month.   (2 marks)

(b) Calculate his net monthly tax.   (5 marks)

(c) He also has the following to pay. Nhif of sh. 1500, Nssf of sh. 2,500, wcps of sh. 4,500. Calculate his net pay. (3 marks)

24. A student has a probability of 2/3 of waking up on time. If he wakes up on time there is a probability of 7/10 that he will catch the bus and be on time to school. If he oversleeps there is a probability of 2/5 that he will catch the bus. If he catches the bus the probability that he will reach school on time is 7/8, if he misses the bus there is only a probability of a 1/4 that he will be on time for school. Using the tree diagram or otherwise
(a) Determine.
(i)   The probability that he catches the bus. (3 marks)

(ii)   The probability that he is late for the school. (2 marks)

(iii) The probability that he oversleeps and is on time for school. (2 marks)

(b) Science club is made up of 6 boys and 8 girls. The club has three officials. Find the probability that the club officials has more boys than girls (3 marks)

GOLDLITE ONLINE EDUCATIONAL SERVICES

Kenya Certificate of Secondary Education
KCSE REPLICA SERIES EXAMS

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REPLICA 2

121/2
MATHEMATICS
PAPER 2

INSTRUCTIONS TO CANDIDATES

a) *Write your name, school and Index Number in the spaces provided at the top of this page*
b) *The paper consists of two sections. Section I and Section II.*
c) *Answer ALL the questions in Section I and any FIVE from Section II.*
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e) *Question.*
f) *Marks may be given for correct working even if the answer is wrong.*
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i) *where stated otherwise.*

Section I   **FOR EXAMINER'S USE ONLY**

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

Section II

Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

Grand Total

CONTACT US ON:

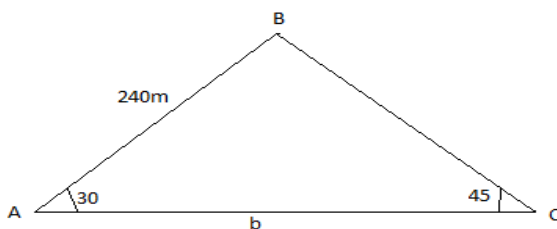1. Make L the subject given that H = $\sqrt{\left(\dfrac{3d\ (L-d)}{10L}\right)}$ (3marks)

2. Expand $\left(1 + \dfrac{1}{x}\right)^{9}$ up to the term x^3 hence use your expansion to find the estimate value of $100(1.05)^9$ correct to 4 significant figures. (4marks)

3. In the figure below it shows a triangle ABC not drawn to scale. Calculate the value of b given that AB =240m $< BAC = 30^0\ and\ < ACB = 45^0$ (3marks)

4. Without using a mathematical tables or calculators, simplify $\dfrac{3}{\sqrt{7}-\sqrt{2}} - \dfrac{2}{\sqrt{2}+\sqrt{7}}$ (3marks)

5. Show that $4y^2 + 4x^2 = 12x - 12y + 7$ is the equation of a circle, hence find the co-ordinates of the centre and the radius.   (3marks)

6. The dimensions of a rectangle are given as 4.1cm by 2.8cm. Calculate the relative error in the area.   (3marks)

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

8. At the start of the 1ˢᵗ year, Mr Cheruiyot, deposited Ksh. 180,000 in a bank which gives an interest of 12% p.a, compounded quarterly. Find the interest earn by Mr. Cheruiyot at the start of the 4ʳᵈ year. (3marks)

9. A quantity P varies partly as n and partly as the square of n. When P= -3, n= -1 and when P= 18, n=2. Find P when n =1 (3marks)

10. Find the inverse of $\begin{pmatrix} 5 & -2 \\ 2 & -1 \end{pmatrix}$ hence find the point of intersection of the lines whose equations are
$5x - 2y = 5$ (4marks)
$y = 2x - 3$

11. Evaluate the following expression without using mathematical tables or a calculator

$3 \log_{10}4 + \log_{10}125 - 3\log_{10}2.$ (3marks)

12. The area of triangle ABC is 7cm². Find the area of the image of ABC, if its transformed using the matrix $\begin{pmatrix} 4 & 5 \\ 1 & 2 \end{pmatrix}$. (3marks)

13. Given that vectors a =3i-j=2k, b= 4i+2j-k and p= 2a-b.
    i)   Express p in terms of i, j and k. (2marks)

    ii)   Hence calculate /p/ correct to 3 significant figures. (1mark)

14. In what ratio must Murang'a coffee costing sh.25g per 100g be mixed with Kisii coffee costing sh.17.50 per 100g, so that by selling the mixture at sh.25 per 100g, a profit of 25% is made. (3marks)

15. Calculate the mean absolute deviation in the following 9,2,3,4,5,5,7,8,1. (3marks)

16. Solve for x in the equation $2 \sin (x-30^0)= -\sqrt{3}$ for the range $0 \leq x \leq 360^0$. (3marks)

SECTION II (50MKS)

17. In the cuboid below, AB = 8cm, BC = 6cm, AE = 4cm
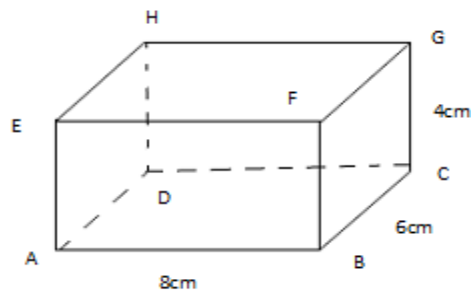
Calculate,

a) The length BD   (2marks)

b) The angle which BH makes with the plane ABCD.   (2marks)

c) The angle between EC and the plane ADHE   (2marks)

d) The angle between EA and AG   (2marks)

e) The angle between planes ABCD and EBCH   (2marks)

18. Use a pair of compass and ruler only in this question
    a) Construct a parallelogram ABCD in which AB = 6cm, AD = 4cm and angle BAD = 60°
                                                                     (3marks)

b) Measure the length AC (1mark)

c) Show the locus of point P which moves so that it is equidistant from A and C (3marks)

d) The locus of point Q which moves so that angle BQD = 90° (3marks)

19. In the figure below AB and AC are tangents to the circle center O at B and C respectively, the angle AOC = 60°, radius of the circle 5cm.
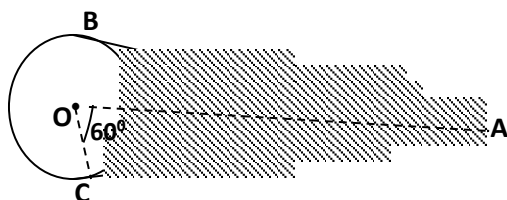
Calculate;

a) The length of AC (2marks)

b) The area of triangle OAC (2marks)

c) The area of minor sector COD (2marks)

d) The area of the shaded region (4marks)

20. a) Complete the table below for the equation $y = x^3 - 5x^2 + 2x + 7$ in the range $-2 \le x \le 5$. (2marks)

x	-2	-1	0	1	2	3	4	5
x^3		-1						125
$-5x^2$								
$2x$			0					
7	7	7	7	7	7	7	7	7
y		-1				-5		

b) Draw the graph of $y = x^3 - 5x^2 + 2x + 7$. (3marks)

c) Use your graph to solve the equation $x^3 - 5x^2 + 2x + 7 = 0$. (2marks)

d) By drawing a suitable straight line, use your graph to solve the equation $x^3 - 5x^2 + x + 4 = 0$. (3marks)
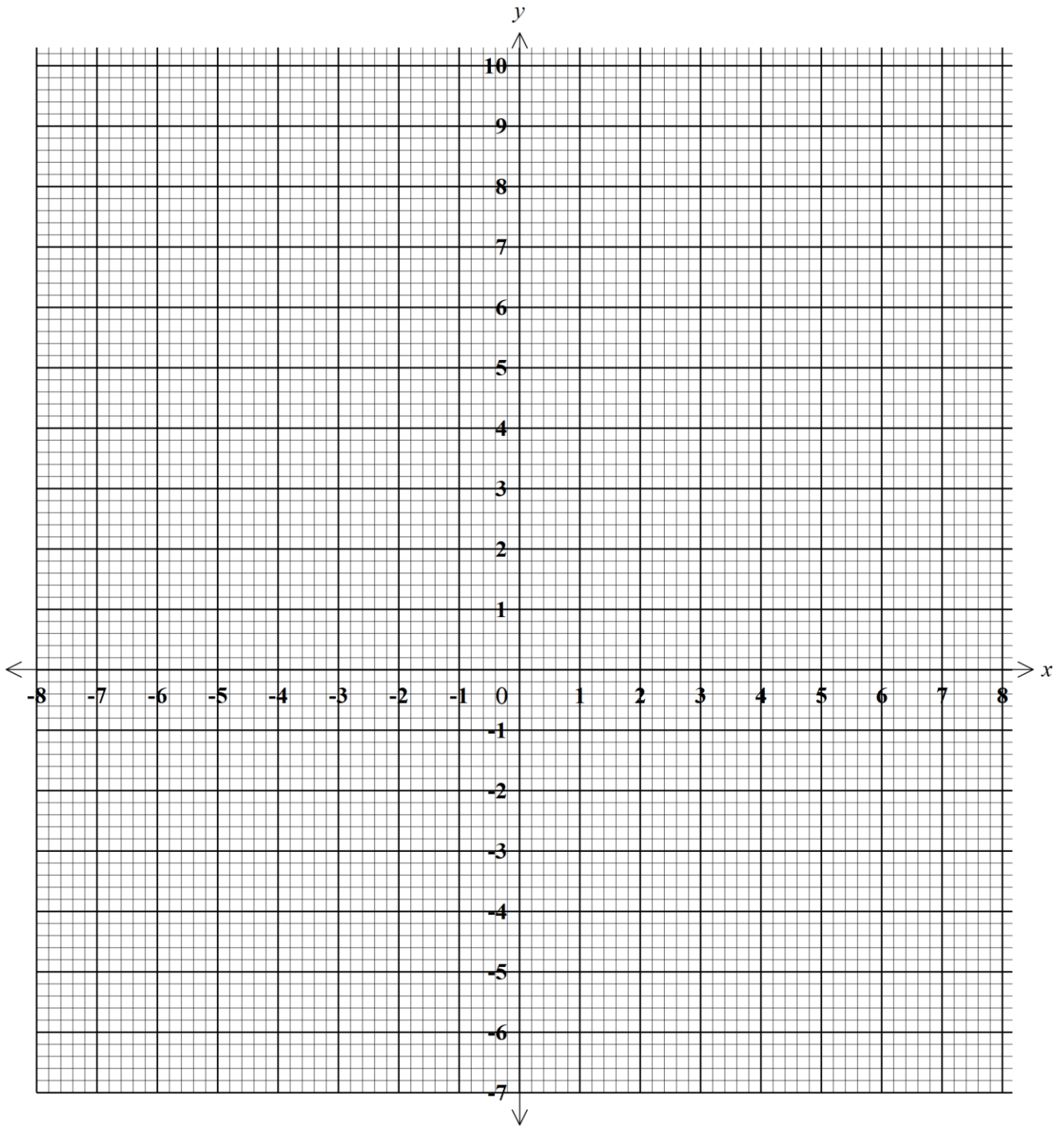
21. Mungai, Koskei and Kendie are participating in an athletic competition. The probability that Mungai, Koskei and Kendie complete the race in $\frac{3}{5}, \frac{1}{6}$ *and* $\frac{4}{7}$ respectively. Find the probability that in a competition;

   a) Only one of them completes the race. (3marks)

   b) All the three completes the race. (1mark)

   c) None of them completes the race. (1mark)

   d) Two of them complete the race. (3marks)

   e) At least one completes the race. (2marks)

22. A businessman obtained a loan of sh.450,000 from a bank to buy a matatu valued at the same amount. The bank charges interest at 24% per annum compounded quarterly

a) Calculate the total amount of money the businessman paid to clear the loan in $1\frac{1}{2}$ years to the nearest shillings   (3marks)

b) The average income realized from the matatu per day was sh.1500. The matatu worked for 3 years at an average of 280 days per year. Calculate the total income from the matatu   (3marks)

c) During the three years the value of the matatu depreciated at the rate of 16% per annum. If the businessman sold the matatu at its new value, calculate the total profit he realized by the end of the 3 years (To the nearest shillings)   (4marks)

23. A church has a sitting capacity of 468 people with the members sitting in rows which have 3 long benches and 2 short ones. The long bench takes 2 people more than the short bench. Let the number of people sitting on the short bench be x.

a) Form an expression in x for the number of rows of benches.   (2marks)

b) A new pastor finds this arrangement crowded and decides that by having one more person on each long bench, he can take out some rows and still sit the same number of people. Find an expression in x for the new number of rows of benches.   (2marks)

c) If one row of benches was taken out, find the original number of people per row. (6marks)

24. a) Fill in the table below giving the values correct to 2 decimal places.   (3marks)

x	0	30^0	60^0	90^0	120^0	150^0	180^0	210^0	240^0	270^0	300^0	330^0	360^0
Sin 2x													
3cos x-2													

b) On the grid provided draw the graphs of y=sin2x and y=3cosx – 2 of $0^0 \le x \le 360^0$ on the same axis. Use the scale of 1cm to represent 30^0 on the x axis and 1cm to represent 1 unit on the y axis.   (5marks)

c) Use the graph in (b) above to solve the equation 3 cos x – sin 2x= 2.   (2marks)

GOLDLITE ONLINE EDUCATIONAL SERVICES
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KCSE REPLICA SERIES EXAMS

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REPLICA 3

121/2
MATHEMATICS
PAPER 2

INSTRUCTIONS TO CANDIDATES

a) *Write your name, school and Index Number in the spaces provided at the top of this page*
b) *The paper consists of two sections. Section I and Section II.*
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Section I   **FOR EXAMINER'S USE ONLY**

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

Section II

Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

Grand Total

SECTION 1 (50 MARKS)
Answer all questions in this section in the spaces provided.

1. A positive two digit number is such that the product of the digits is 24. When the digits are reversed, the number formed is **greater** than the original number by 18. Find the number. (3mks)

2. Use tables of squares, square roots and reciprocals to evaluate (4mks)

$$\frac{234}{\sqrt{0.02698}} + \frac{16}{(0.18149)^2}$$

3. The height and radius of a cone are measured as 21 cm and 14.0 cm respectively. Taking $\pi = 3.142$, find the **percentage error** in the volume of the cone. (3mks)

4. Express the following in **surd form** and simplify by rationalizing the denominator without using a calculator and leave your answer in the form $a + b\sqrt{c}$ (3mks)

$$\frac{1 + Cos\ 30^0}{1 - Sin\ 60^0}$$

5. Solve for **x** in: $Log_2(x + 7) - Log_2(x - 7) = 3$ (3mks)

6. A businessman obtained a loan of Ksh 450,000 from a bank to buy a Matatu that was valued at the same amount. The bank charges interest at 24% per annum compounded quarterly per year. Calculate the **total amount** of money the businessman paid to clear the loan in $4\frac{1}{2}$ years to the nearest shilling.

   (3mks)

7. In the diagram below, BT is a tangent to the circle at B. AXCT and BXD are straight lines. AX = 6cm, CT = 8cm, BX = 4.8cm and XD = 5cm.
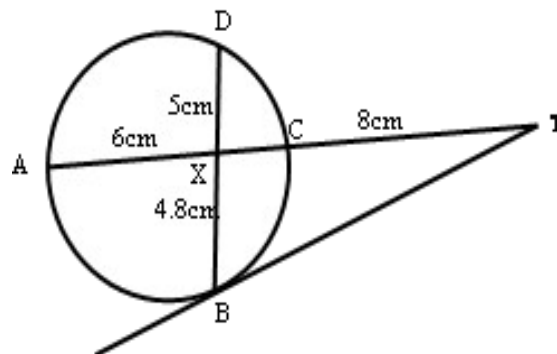
Find the length of **BT**. (3Marks)

8. Find the possible values of x given that $\begin{bmatrix} x + 8 & 8 \\ 6 & x \end{bmatrix}$ is a **singular** matrix.   (3mks)

9. The cost C of operating an electronic business is partly constant and partly varies as the square of labour input L. If **C=25,000** when **L=20** and **C=45,000** when **L=30**. Find **C** when **L=8.**
(3Mks)

10. The **2ⁿᵈ, 4ᵗʰ**and **7ᵗʰ** terms of an A.P. are the first 3 consecutive terms of a G.P. Find the **common ratio** of the G.P if the common difference of the A.P. is 2.   (3mks)

11. P and Q are two points such that OP=i + 2j + 3k and OQ = 4i + 5j – 3k. M is a point that divides PQ externally in the ratio 3:2. Find the co-ordinates of M, given that O is the origin.
(3mks)

12. A circle Centre C (5, 5) passes through points A (1, 3) and B (a, 9). Find the equation of the circle and hence the possible values of a. (4mks)

13. Tap A can fill an empty tank in 3 hours, while tap B can fill the same tank in 2 hours. When the tank is full, tap C can empty the tank in 5 hours. Tap A and C are opened for 4 hours and then closed.

    a) Determine the fraction of the tank that is still empty. (1mks)

    b) Find how long it would take to fill the remaining fraction of the tank if all the three taps are opened. (2mks)

14. Determine the interquartile range for the following set of numbers. (2mks)
    4, 9, 5, 4, 7, 6, 2, 1, 6, 7, 8.

15. Solve the equation $\sin(3x - 10)^0 = 0.4337$ for $0^0 \leq \Theta \leq 180^0$ (3mks)

16. (a) Expand and simplify $(3x - y)^4$ (2mks)

(b) Use the first three term of the expansion to approximate the value of $(6 - 0.2)^4$ (2mks)

SECTION II (50MARKS) ANSWER ANY 5 QUESTIIONS ONLY

17. Mrs. Mutua earns a basic salary of K£ 12,000 p.a. and is housed by the employer at a nominal rent of Shs 1,200 per month. She is entitled to a personal relief of K£ 1,320 p.a. and a premium relief of 10% on her insurance premium of K£ 800 p.a. The table of tax rate is as below.

Taxable income (K£ p.a.)	Rate (%)
1 – 2100	10
2101 – 4200	15
4201 – 6300	20
6301 – 8400	25
Over 8400	30

Calculate;
a) Calculate the net tax per annum. (7mks)

b) Other deductions includes W.C.P.S Shs 600 per month, NHIF Shs. 500 per month. Calculate her net pay per month.   (3mks)

18. The Line AB = 5cm is a side of a triangle ABC in which angle ABC = 90⁰ and angle BAC = 60⁰.

a) Construct triangle ABC (2mks)

b) Construct the Locus P such that angle APB = angle ACB (2mks)

c) Locate by construction points Q1 and Q2 which satisfy the conditions below:

   (i) Q1 and Q2 lie on the same side of line AB and C   (3mks)

   (ii) Area of triangle AQ1B=Area of triangle AQ2B= 3/4 Area of triangle ABC

   (iii)Angle AQ1B=Angle AQ2B =30⁰

   Measure the length of the line Q1Q2 (3mks)

d) Calculate the area above the line Q1Q2 bounded by the locus of point P   (3mks)

19. The diagram below shows a square based pyramid **V** vertically above the middle of the base. **PQ** = 10cm and **VR** = 13cm. **M** is the midpoint of **VR**.
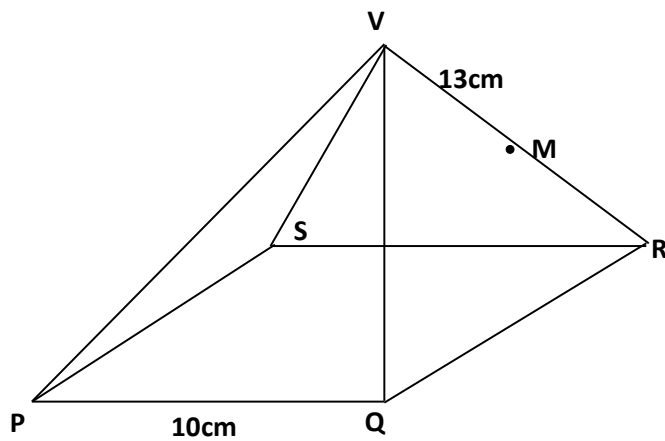
Find to 2 decimal places

(a) (i) the length **PR**.   (2mks)

(ii) The height of the pyramid.   (2mks)

(b) (i) the angle between **VR** and the base **PQRS**.   (2mks)

(ii) The angle between **MR** and the base **PQRS**.   (2mks)

(iii) The angle between the planes **QVR** and **PQRS**.   (2mks)

20. a) Complete the table below for y=sin 2x and y=sin (2x + 30) giving values to 2d.p (2mks)

X	0	15	30	45	60	75	90	105	120	135	150	165	180
Sin 2x	0				0.87				-0.87				0
Sin (2x +30)	0.5				0.5				-1				0.5

b) Draw the graphs of y=sin 2x and y = sin (2x + 30) on the axis.   (4mks)
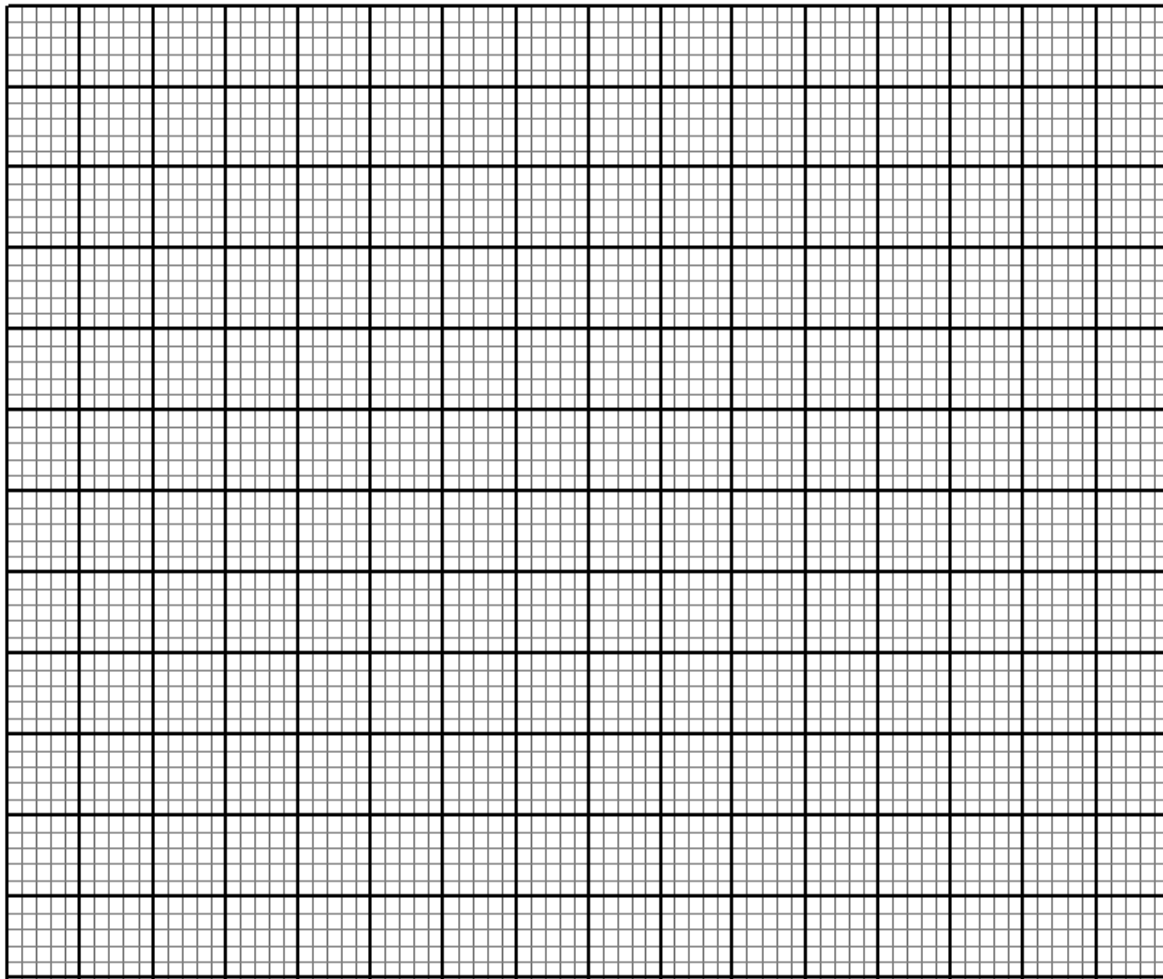
c) Use the graph to solve $\sin(2x + 30) - \sin 2x = 0$ (1mk)

d) Determine the transformation which maps $\sin 2x$ onto $\sin(2x + 30)$ (1mk)

e) State the period and amplitude of $y = \sin(2x + 30)$ (2mks)

21. OABC is a parallelogram with verities 0(0,0), A(2,0) B(3,2) and C(1,2). O,A,B,C is the image of OABC under transformation matrix. $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$
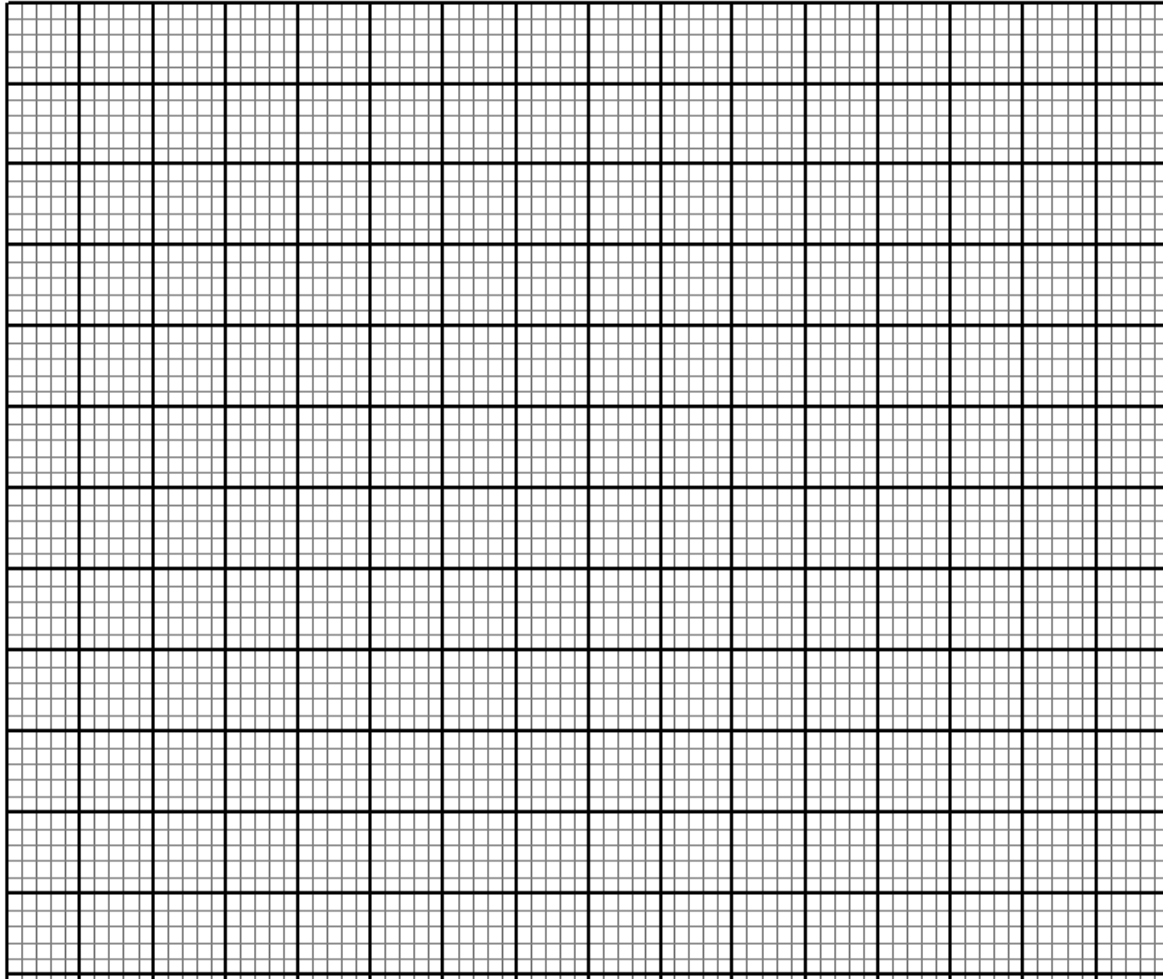
a) Find the coordinates of $O^1A^1B^1C^1$ (2mks)

ii) On the grid provided, draw OABC and $O^1A^1B^1C^1$ (2mks)

b) Find $O^{11}A^{11}B^{11}C^{11}$, the image of $O^1A^1B^1C^1$ under transformation matrix $\begin{pmatrix} 1 & 0 \\ 0 & -2 \end{pmatrix}$ (2mks)

ii) On the same grid draw $O^{11}A^{11}B^{11}C^{11}$ (1mk)

c) Find a single matrix that maps $O^{11}A^{11}B^{11}C^{11}$ onto OABC (3mks)

22. The following table shows the distribution of marks obtained by 50 students in a test.

Marks	45-49	50-54	55-59	60-64	65-69	70-74	75-79

No. of Students	3	9	13	15	5	4	1

By using an assumed mean of 62, calculate

a) The mean (5mks)

b) The variance (3mks)

c) The standard deviation (2mks)

23. A box contains 3 brown, 9 pink and 15 white cloth pegs. The pegs are identical except for the colour.

(a) Find the probability of picking.
  (i) A brown peg. **(1mark)**
  (ii) A pink or a white peg. **(2 marks)**

(b) Two pegs are picked at random, one at a time without replacement. Find the probability that:

  (i) Atleast one brown peg is picked **(4marks)**

(ii)   both pegs are of the same colour.   **(3marks)**

24. A wholesaler stocks two types of rice: Refu and Tamu. The wholesale prices of 1 kg of Refu and 1 kg of Tamu are Ksh 80 and Ksh 140 respectively. The wholesaler also stocks blend A rice which is a mixture of Refu and Tamu rice mixed in the ratio 3 : 2.

a.   (i)   A retailer bought 10 kg of blend A rice. To this blend, the retailer added some Tamu rice to prepare a new mixture blend X. The ratio of Refu rice to Tamu rice in blend X was **1:2.**

Determine the amount of Tamu rice that was added.   (3marks)

(ii)   The retailer sold blend X rice making a profit of 20%. Determine the selling price of 1 kg of blend X. (3 marks)

b.   The wholesaler prepared another mixture, blend B, by mixing x kg of blend A rice with y kg of Tamu rice. Blend B has a wholesale price of Ksh130 per kg.
Determine the ratio $x : y$.   (4mks)

GOLDLITE ONLINE EDUCATIONAL SERVICES

Kenya Certificate of Secondary Education

KCSE REPLICA SERIES EXAMS

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REPLICA 4

121/2
MATHEMATICS
PAPER 2

INSTRUCTIONS TO CANDIDATES

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Section I   **FOR EXAMINER'S USE ONLY**

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

Section II

Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

Grand Total

SECTION I: 50 MARKS

1. Given that the expression $4X^2 + 28x + (K + 37)$ is a perfect square. Find the value of K.
    (3 marks)

2. Calculate the percentage error in the volume of a cylinder whose radius 8.75cm and its height 32.5cm.
    (3 marks)

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

    $b = \dfrac{C\sqrt{X^2 - 1}}{X}$

4. In the figure, O is the centre of the circle. Line AB is parallel to line DC and angle $\Delta DC = 55^0$
    Determine the size of ΔACB.   (3 marks)
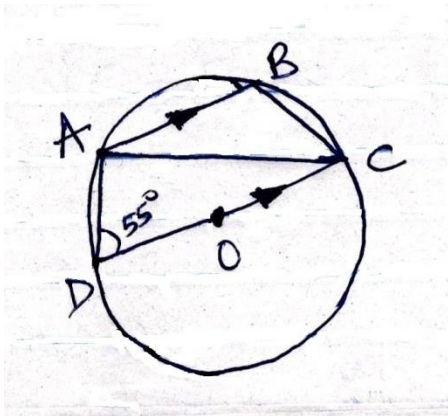
5. Solve for X given that;
    ½ Log₂ 9 + Log₂ [5x – 4] = 7   (3 marks)

6. An inlet tap can fill an empty tank in 6 hours. It takes 10hrs ro fill the tank when the inlet tap and outlet tap are both opened at the same time. Calculate the time the outlet takes to empty the full tank when the inlet tap is closed. (2 marks)

7. Solve the equation (4 marks)

$$x + 3y = 13$$
$$x^2 + 3y^2 = 43$$

8. Simplify $\dfrac{4}{\sqrt{6} + \sqrt{2}}$ (2 marks)

9. The cash price of a TV set is Ksh.20,000. A customer bought it on hire purchase terms by paying a deposit of Sh.10,000 followed by 18 equal monthly installments of Sh.900 each. Annual interest, compounded semi-annually was charged on the balance for the period of 18 months. Determine correct to 1d.p the rate of interest per annum. (4 marks)

10. The equation of a circle is given by $X^2 + 4X + y^2 - 2y - 4 = 0$. Determine the centre and radius of the circle. (3 marks)

11. In the figure AOBP is a straight line. PZ is a tangent to the circle. If PZ = 12cm and BP = 6cm, find the radius of the circle. (3 marks)
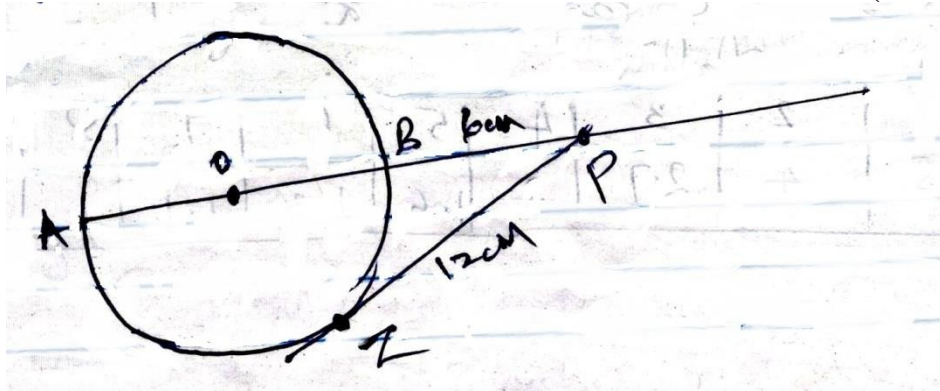
12. (a) Expand $(1 - \frac{3}{10}X)^5$ Leave the co-efficient as fraction in their lowest form.

(2 marks)

(b) Use the first three terms of the expansion in (a) above to estimate the value
$(0.97)^5$ (4 marks)

13. Using the assumed mean of 50, determine the variance of the following set of numbers;
    52, 45, 42, 59, 56, 46.   (3 marks)

14. The table below shows the value of t and the corresponding values of h for a given relation.

t	1	2	3	4	5	6	7	8
h	8	4	2.7	2	1.6	1.3	1.1	1

a) On the grid, draw the graph to represent the information on the table given.(2 marks)
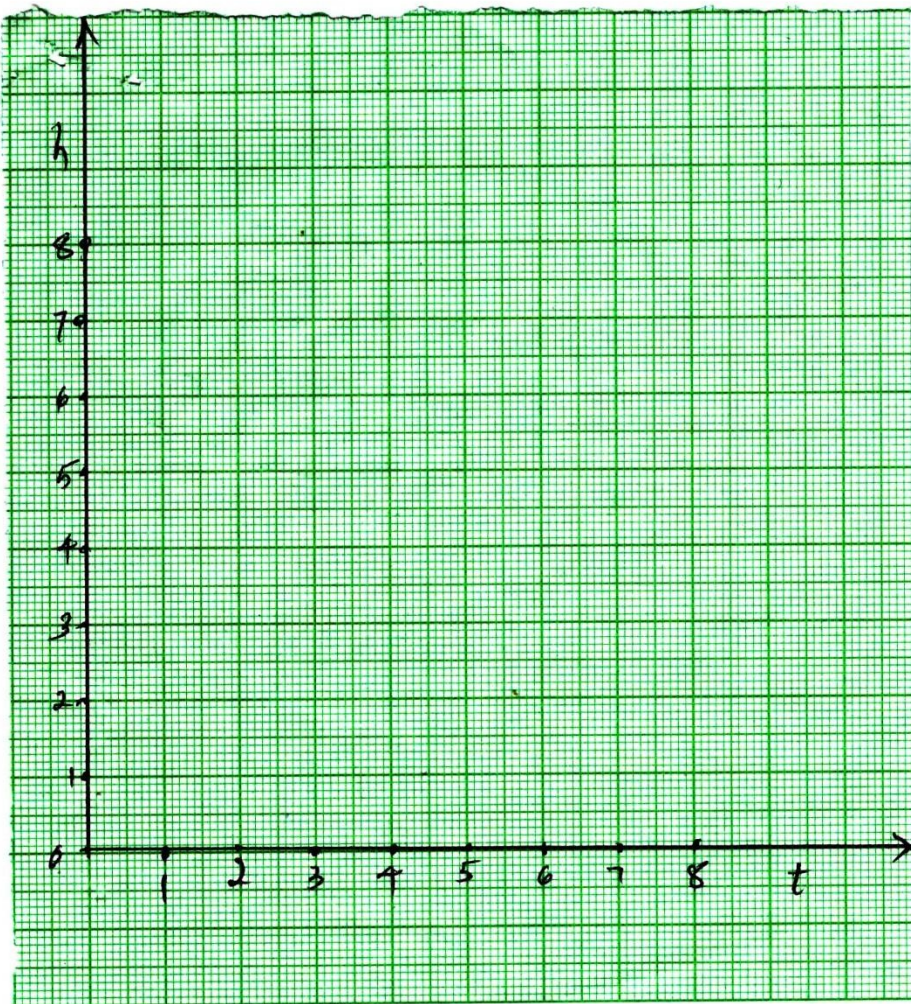
b) Use the graph to determine the rate of change of h at t = 4.   (2 marks)

15. Given that $\mathbf{P} = 2\mathbf{i} - 3\mathbf{j} + \mathbf{k}$, $\mathbf{Q} = 3\mathbf{i} - 4\mathbf{i} - 3\mathbf{k}$ and $\mathbf{R} = 3P + 2Q$, find $\left| \mathbf{R} \right|$ correct to 2 decimal places.

(3 marks)

16. Maize flour and millet flour were mixed. If the maize flour costs sh.60 per kilogram and millet flour sh.90 per kilogram, find the ratio of maize flour to millet flour that gives a mixture costing sh.85 per kilogram.   (3 marks)

SECTION II: 50 MARKS
Attempt Only Five Questions In This Section

17. A cup has 8 white plates and 4 brown ones all identical in shape and size. Mrs. Kamau selected 3 plates at random without replacement.
    a) Draw a tree diagram representing this information.   (2 marks)

    b) Find the probability that she chooses:
        (i) Two white plates and one brown in that order.   (2 marks)

(ii) At least one white plate. (3 marks)

(iii)Three plates of the same colour. (3 marks)

18. (a) A quantity P varies partly as the square of M and partly a constant. When P = 3.8, M = 2 and when P = -0.2, M = 3.
Find:
    (i) The equation that connects P and M (4 marks)

(ii) The value of P when M = 10. (1 mark)

(b) Q varies as the cube of x and inversely as the square root of R. If X is increased by 20% and R is decreased by 36%;

(i) Find the law connecting Q, X and R. (2 marks)

(ii) Find the percentage change in Q (3 marks)

19. Three consecutive terms of geometric progression are 9^{2x+1}, 81^x and 729 respectively. Calculate.

a) The value of x (3 marks)

b) Find the common ratio (2 marks)

c) Calculate the sum of the first 10 terms of the series. (2 marks)

d) Given that the fifth and sixth terms of this G.P forms the first two consecutive of arithmetic sequence; calculate the sum of the first 20 terms of the sequence. (3 marks)

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

Monthly taxable income in Kshs	Tax rates
0 – 12298	10%
12299 – 23885	15%
23886 – 35472	20%
35473 – 47059	25%
47060 and above	30%

In the year, the monthly earnings of Mr.Korir
Basic salary   Ksh.60,000
Medical allowance   Ksh.16,500
Ksh.4,837.50 was erroneously exempted from his taxations.
a) Calculate Mr. Korir taxable income (2 marks)

b) Calculate Mr. Korir net tax for that month if his personal tax relief was Sh.1408 per month.
(6 marks)

c) Calculate Mr. Korir net pay for that month. (2 marks)

21. The vertices of the triangle ABC are A(3, 3); B(1, 1) and c [5, 3] are mapped onto triangle $A_1B_1C_1$ by a matrix $\begin{pmatrix} 0 & 1 \\ 1 & -2 \end{pmatrix}$

a) (i) Find the co-ordinates of A_1 B_1 and C_1 (2 marks)

(ii) On the grid provided below, draw triangle ABC and $A_1B_1C_1$ (2 marks)
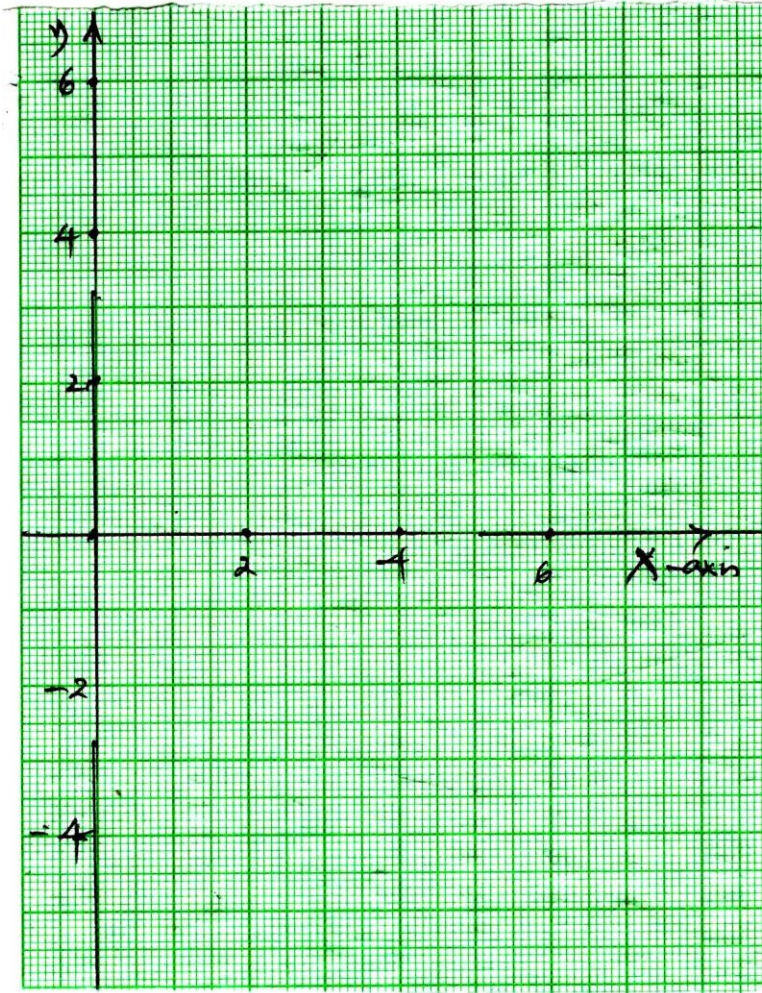
b) (i) Triangle $A_2B_2C_2$ is the image of the triangle $A_1B_1C_1$ under a transformation matrix. $\begin{pmatrix} -2 & 0 \\ 0 & -1 \end{pmatrix}$
Determine the co-ordinates of A2, B2 and C_2 (2 marks)

(ii) Find the area of triangle $A_2B_2C_2$ (2 marks)

c) Determine a single matrix that maps ABC onto $A_2B_2C_2$ (2 marks)

22. The table below shows the distances in kilometers covered by employees of a certain factory.

Distance (Km)	1 – 5	6 – 10	11 – 15	16 – 20	21 – 25	26 – 30
Number of workers	3	6	8	7	4	2

If the actual mean of the data above is 14.5km;
a) (i) Fill in the table given below.

Class	Frequency	Midpoint (x)	d = x-14.5	d^2	fd^2	
1 - 5	3					
6 – 10	6					
11 – 15	8					
16 – 20	7					
21 – 25	4					
26 - 30	2					
	$\sum f =$				$\sum fd^2 =$	

(ii) Use the values obtained from the table above to calculate standard deviations. (2 marks)

b) (i)   Find upper and lower quartiles.   (2 marks)

(ii) Hence calculate quartile deviation.   (2 marks)

23. In this question use a ruler and a pair of compasses.
   a) (i) Construct triangle ABC such that AB = 9cm, AC = 7cm and $\triangle CAB = 60^0$ (2 marks)

(ii)   Construct the locus of point P within the triangle such that P is equidistant from A and B.
                                                                     (2 marks)

(iii) Construct the locus of point Q within the triangle such that CQ ≤ 3.5cm.   (2 marks)

b) On the diagram in part (a)
(i) Shade the region R, containing all the points enclosed by the Locus of P and Q, such that AP≥BP
(2 marks)

(ii) Find the area of triangle ABC   (3 marks)

24. The table below shows some values of the curves $y_1 = 2\cos x$ and $y_2 = 3\sin x$
   a) Complete the table to 1 decimal place   (2 marks)

X⁰	0⁰	30	60	90	120	150	180	210	240	270	300	330	360
$Y_1 = 2\cos x$	2		1	0		-1.7		-1.7	-1		1	1.7	2
$Y_2 = 3\sin x$	0	1.5		3	2.6		0		-2.6			-1.5	0

b) On the grid provided, draw the graph of $y_1 = 2\cos x$ and $y_2 = 3\sin x$ for $0^0 \le x \le 360^0$
   On the same axes   (5 marks)
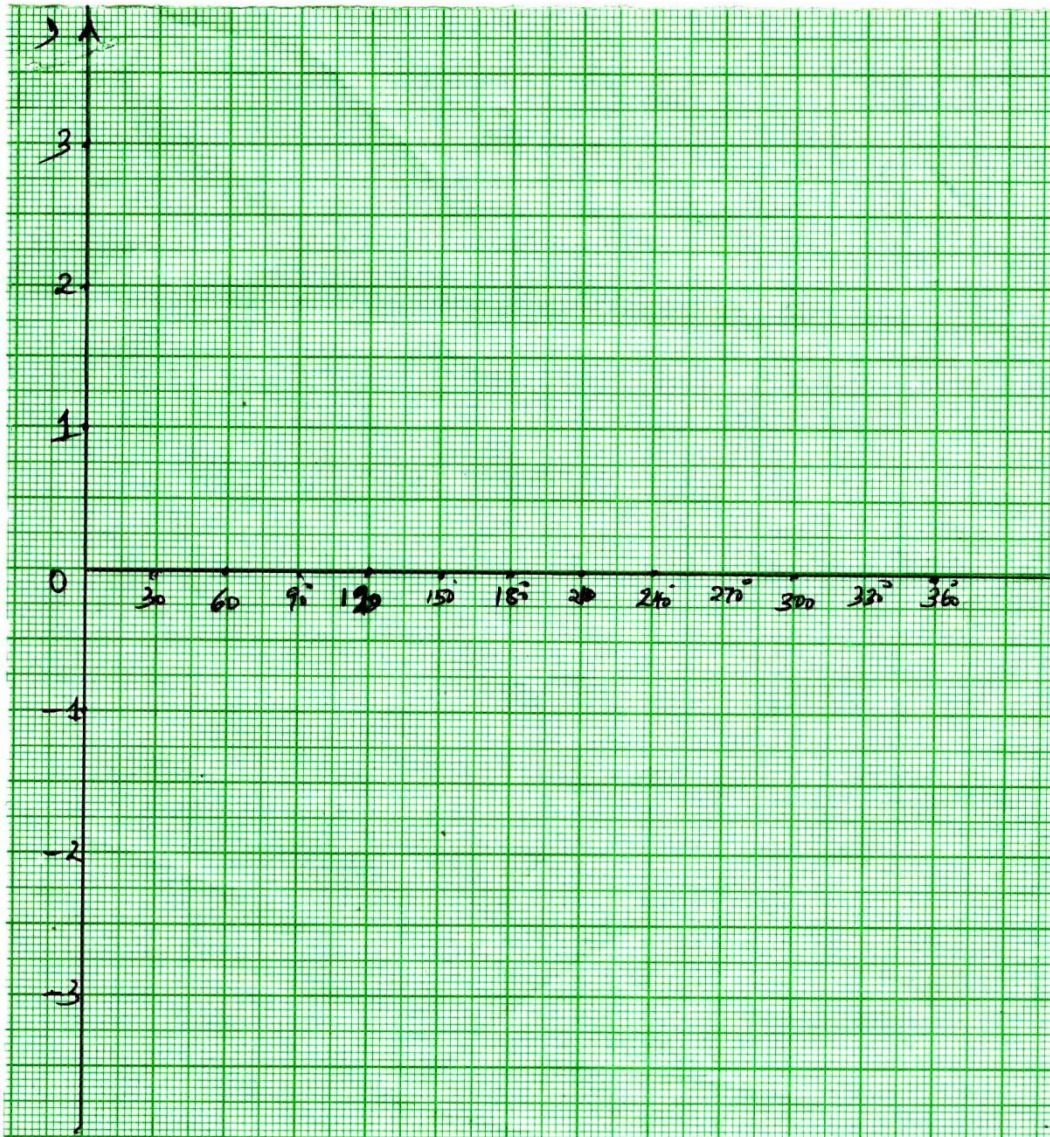
c) Use the graph to find the values of x when 2 cos x = 3 sin x (2 marks)

d) Find the difference of the amplitude of y = 2 cos x and y = 3 sin x. (1 mark)

GOLDLITE ONLINE EDUCATIONAL SERVICES

Kenya Certificate of Secondary Education

KCSE REPLICA SERIES EXAMS

NAME ………………………………………… ADMISSION NUMBER …………………

CANDIDATE'S SIGNATURE…………………………………DATE……………………………………

REPLICA 5

121/2
MATHEMATICS
PAPER 2

INSTRUCTIONS TO CANDIDATES

a) *Write your name, school and Index Number in the spaces provided at the top of this page*
b) *The paper consists of two sections. Section I and Section II.*
c) *Answer ALL the questions in Section I and any FIVE from Section II.*
d) *All answers and working must be written on the question paper in the spaces provided below each*
e) *Question.*
f) *Marks may be given for correct working even if the answer is wrong.*
g) *Negligence and slovenly work will be penalized*
h) *Non programmable silent electronic calculator and KNEC Mathematical tables may be used except*
i) *where stated otherwise.*

Section I **FOR EXAMINER'S USE ONLY**

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

Section II

Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

Grand Total

1. Solve for x

$$(\log_3 x)^2 - \frac{1}{2}\log_3 x = \frac{3}{2} \qquad\qquad [4marks]$$

2. In the figure below PT is a tangent to the circle from an external point P. $PT = 24\ cm$ and $OP = 25\ cm$.
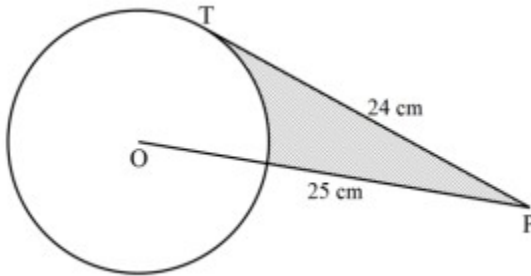
Calculate the area of the shaded region correct to 2 decimal places   [4marks]

3. Find the value of w in the expression $wx^2 - \frac{3}{2}x + \frac{1}{16}$ is a perfect square , given that w is a constant

[2marks]

4. Simplify

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

5. The cost C of hiring a conference facility for one day consists of two parts, one which is fixed and the other varies as the number of participants n attending the conference. If Kshs 45000 is charged for hiring the facility for 100 participants and Kshs 40000 for 60 participants, Find the number of participants if 63000 is used to hire the facility

$$[3marks]$$

6. Juma a form 2 student was told to pick two number x and y from a set of digits 0, 1, 2, 3, 4, 5 and 6. Find the probability that $|x - y|$ is atleast 3.   [3marks]

7. Given that the matrix $\begin{pmatrix} 3x & x \\ x-6 & -3 \end{pmatrix}$ maps a triangle A(0,0), B(2, 1) and c(3, 5) on to a straight line. Find the possible values of x.   [3marks]

8. The points with co-ordinates A(13,3) and B(-3,-9) are the end of diameter of a circle centre O. Determine ;

    (i)   The coordinates of O   [1mark]

    (ii)   The equation of the circle expressing it in the form
            $x^2 + y^2 + ax + by + c = 0$ [3marks]

9. Two containers have base areas of 750cm^2 and 120cm^2 respectively. Calculate the volume of the larger container in litres given that the volume of the smaller container is 400cm^3.
                                                                            (3 marks)

10. The cash price of a laptop is 4800. Wambui bought it on hire purchase by making a deposit of kshs. 10000 followed by 24 monthly instalments of kshs 2000 each. Calculate the monthly rate at which compund interest was charged   [3marks]

11. A merchant blends 350kg of KAKUZI tea costing shs. 84 per kg with 140 kg of KETEPA tea costing sh.105 per kg. calculate the price at which he must sell 1kg of the mixture to attain 20 % profit.
                                    [3marks]

12. The graph below is part of the straight line graph obtained from the initial equation $V = aP^n$
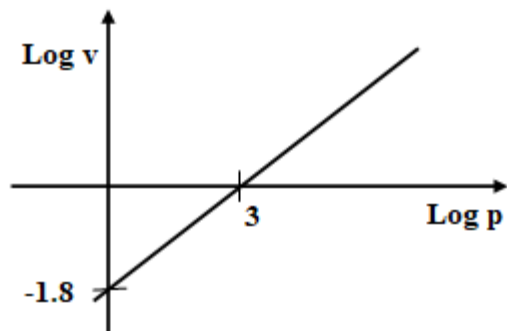
Write down the equation of a straight line in the form of $y = mx + c$ hence use the graph to find the of **a** and **n**   [*3marks*]

13. State the amplitude, period and phase angle of $y = 2 \sin (\frac{1}{2}x + 30^0)$

    (i)   Amplitude   (1 mark)

    (ii)   Period   (1 mark)

    (iii)   Phase angle   (1 mark)

14. Given the position vectors $\overrightarrow{OA} = 4\mathbf{i} + 8\mathbf{j} - 2\mathbf{k}$ and $\overrightarrow{OB} = 3\mathbf{k} - \mathbf{i} - 2\mathbf{j}$. Point C divides vector AB in the ratio of 3:-1. Find the magnitude of $\overrightarrow{OC}$. Give your answer to 2dp
                    [*3marks*]

15. 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 a certain month of the year Mr. Mogaka had a total deduction of ksh5,000, he got a personal tax relief of kshs.1056 and paid kshs.3944 for NHIF, WCPS and sacco loan repayment.
Calculate
(i)   P.A.Y.E.   (1 mark)

(ii)   Monthly income/salary   (3 marks)

16. In the figure given below, O is the centre of circle. If $\angle BCA = 80^0$ and $\angle CBO = 10^0$.
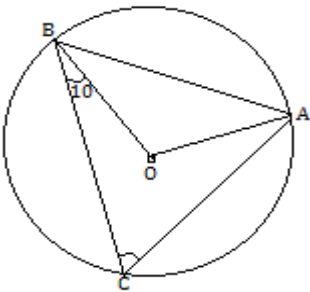
Determine the size of $\angle CAB$.   (3 marks)

17. In the figure below $\overrightarrow{OB} = b; OC = 3\overrightarrow{OB}$ and $OA = a$
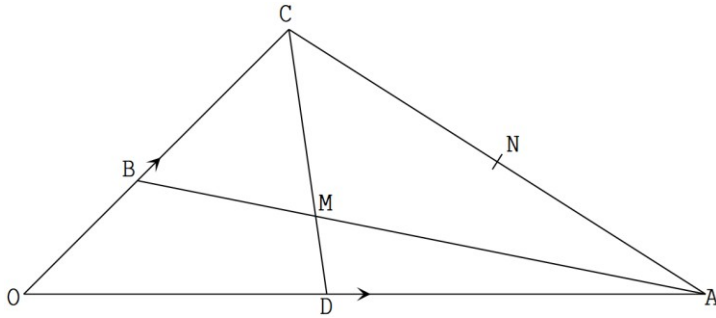
a) Given that $OD = \frac{1}{3}OA$ and $AN = \frac{1}{2}AC$, CD and AB meet at M. Determine in terms a and b.

i) $\overrightarrow{AB}$ (1 mark)

ii) $\overrightarrow{CD}$ (1 mark)

b) Given that $\overrightarrow{CM} = k\overrightarrow{CD}$ and $\overrightarrow{AM} = h\overrightarrow{AB}$. Determine the values of the scalars k and h.

(5 marks)

c) Show that O, M and N are collinear. (3 marks)

18. The table below shows the marks scored by form four students in a mathematics test in Amani secondary school.

Marks	Mid-point X	Frequency f	$d = x - A$	fd	d^2	fd^2
40-44		3				
45-49		30				
50-54		29				
55-59		33				
60-64		13				
65-69		1				
70-74		1				
		$\Sigma\ f =$		$\Sigma\ fd =$		$\Sigma\ fd^2 =$

Using an assumed mean of 57
    a) Complete the table   (4 marks)
    b) Determine
      i)   the mean mark   (2 marks)

      ii)   The standard deviation   (2 marks)

    c) Find the mark scored by the 50th student.   (3 marks

19. An arithmetic progression AP has the first term a and the common difference d.

(a) Write down the third, ninth and twenty fifth terms of the AP in terms of a and d.

(2marks)

(b) The AP above is increasing and the third, ninth and twenty fifth terms form the first three consecutive terms of a geometric progression (G.P). The sum of the seventh and twice the sixth term of AP is 78. Calculate

(i) The first term and common difference of the A.P (5marks)

(ii) The sum of the first 5 terms of the G.P (3marks)

20. (a) (i) Taking the radius of the earth, R=6370km and $\pi = \frac{22}{7}$, calculate the shortest distance between two cities P(60^0N, 29^0W) and Q(60^0N, 31^0E) along the parallel of latitude.
(3marks)

(ii) If it is 1200hrs at **P**, what is the local time at **Q** (3marks)

(b) An aeroplane flew due south from a point A(60^0N, 45^0E) to a point B, the distance covered by the aeroplane was 8000km, determine the position of B. (4marks)

21. (a) Complete the table below to 2 decimal places.   (2mks)

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

(b) Draw the graphs of $y = sin (x - 30^{\circ})$ and y= – Cos x on the same axes, for $0^0 \le x \le 360^0$.   (5mks)
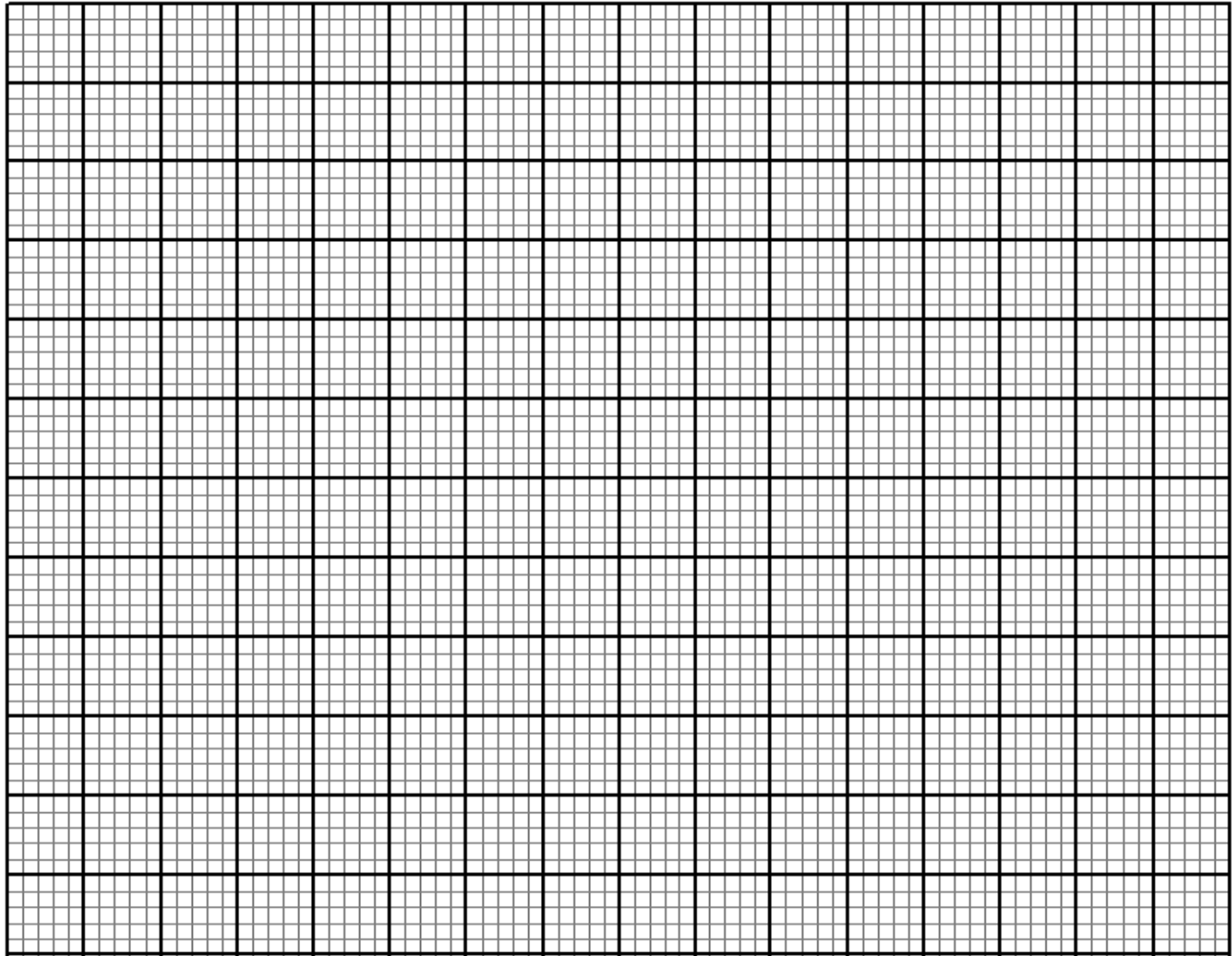
   d) Use your graph to solve the equation s

      (i) $sin (x - 30^{\circ}) + Cos x = 0$.   (2marks)

      (ii) $-Cos x = 0.5$ (1 marks)

22. Kamau, Njoroge and Kariuki are practicing archery. The probability for Kamau hitting the target is $\frac{2}{5}$, that of Njoroge hitting the target is $\frac{1}{4}$ and that of Kariuki hitting the target is $\frac{3}{7}$.

Find the probability that in one attempt;
a) Only one hits the target   (2marks)

b) All three hit the target   (2marks)

c) None of them hits the target   (2marks)

d) Two hit the target   (2marks)

e) At least one hits the target   (2marks)

23. Figure below is a pyramid on a rectangular base. PQ=16cm, QR = 12cm and VP = 13cm.

13cm

16cm

12cm
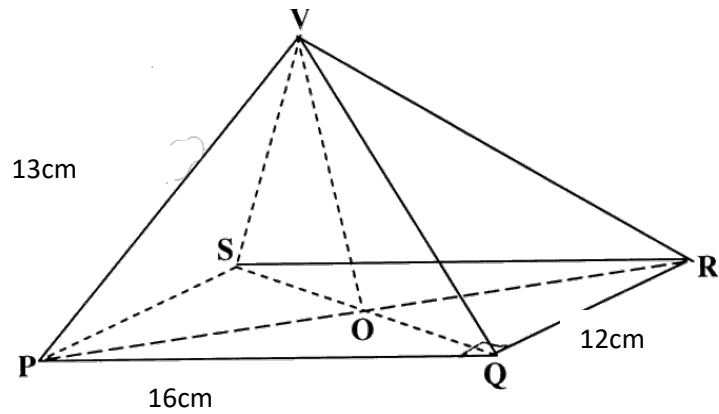
Find

(a) The length of **QS**. (2marks)

(b) The height of the pyramid to 1 decimal place. (2marks)

(c) The angle between **VQ** and the base. (2marks)

(d) The angle between plane **VQR** and the base. **(**2marks)

(e) The angle between planes **VQR** and **VPS** **(**2marks)

24. **ABCD is** a quadrilateral with vertices as follows: **A** (3, 1), **B** (2, 4) **C** (4, 3) and **D** (5, 1)

(a) (i) On the grid provided draw the quadrilateral **ABCD** and the image **A'B'C'D'** under a transformation
With matrix $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$. Find the co-ordinates of **A'B'C'D'** (3marks)
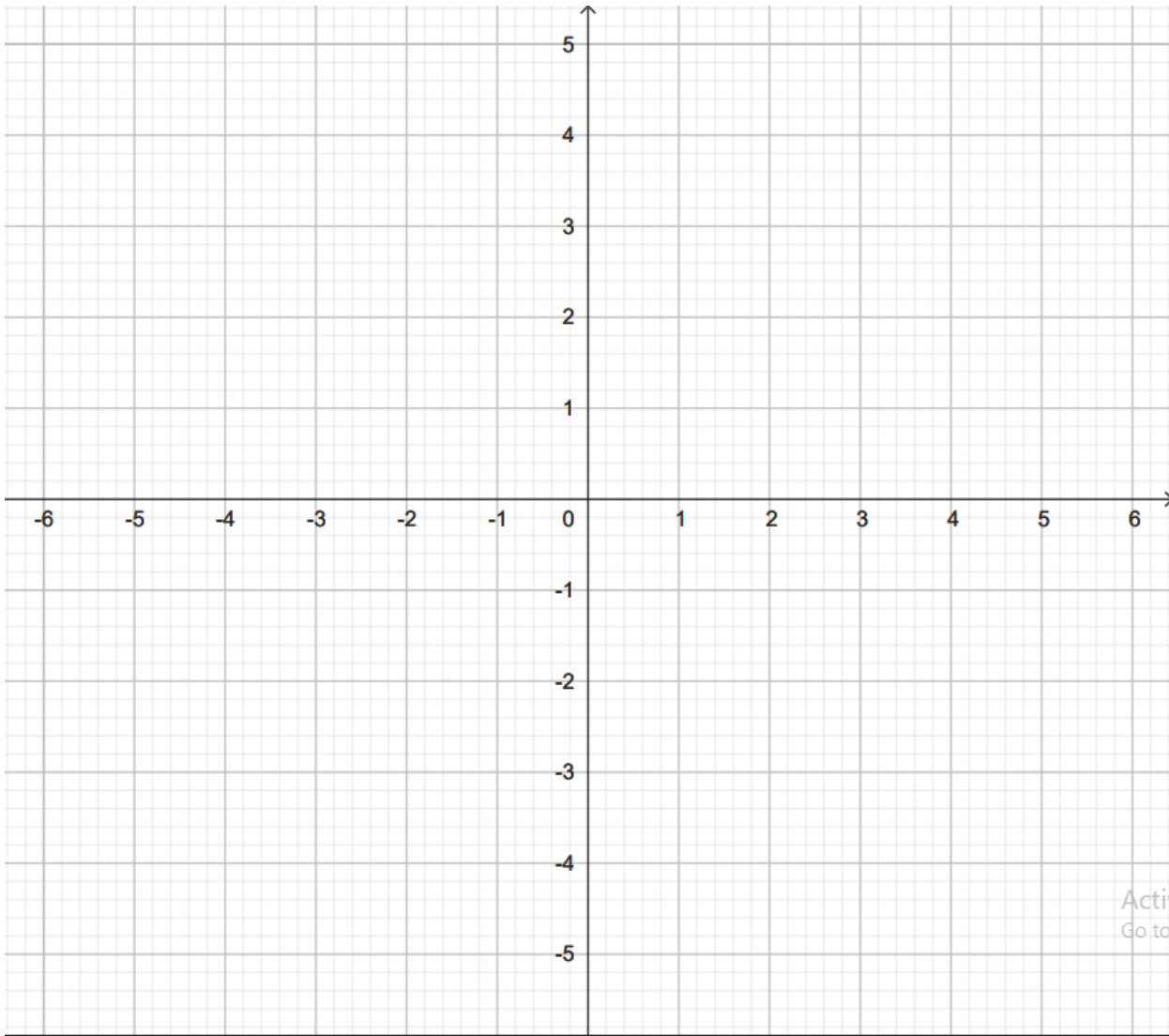
(ii) Describe the transformation that maps **ABCD** onto **A'B'C'D'** fully   (1mark)

(b) A transformation represented by the matrix $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ maps **A'B'C'D'** onto **A''B''C''D''** find the co-ordinates of **A''B''C''D''**. Plot **A''B''C''D''** on the same grid.   (3marks)

(c) Determine a single transformation that maps **A''B''C''D''** onto **ABCD**. Describe this transformation fully.   (3marks)

GOLDLITE ONLINE EDUCATIONAL SERVICES
Kenya Certificate of Secondary Education
KCSE REPLICA SERIES EXAMS

NAME ………………………………………………… ADMISSION NUMBER ……………………

CANDIDATE'S SIGNATURE………………………………………DATE……………………………………

REPLICA 6

121/2
MATHEMATICS
PAPER 2

INSTRUCTIONS TO CANDIDATES

a) *Write your name, school and Index Number in the spaces provided at the top of this page*
b) *The paper consists of two sections. Section I and Section II.*
c) *Answer ALL the questions in Section I and any FIVE from Section II.*
d) *All answers and working must be written on the question paper in the spaces provided below each*
e) *Question.*
f) *Marks may be given for correct working even if the answer is wrong.*
g) *Negligence and slovenly work will be penalized*
h) *Non programmable silent electronic calculator and KNEC Mathematical tables may be used except*
i) *where stated otherwise.*

Section I   **FOR EXAMINER'S USE ONLY**

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

Section II

Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

Grand Total

SECTION I (50 Marks)

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

1. Solve for x in the equation below without using a mathematical table or calculator. (4 marks) $(\log_{10} x)^2 = 3 - \log_{10} x^2$

2. The base of a right angled triangle is 4.1 cm and the height is 5.0 cm. Calculate the percentage error in the area of the triangle. (3 marks)

3. Given that $\tan \theta = \frac{1}{\sqrt{5}}$, θ is an acute angle, without using a calculator or mathematical tables, find $\sin(90 - \theta)$, leaving your answer in simplified surd form. (2 marks)

4. Find the interest on Ksh. 200,000 for 2 years at 14% per annum compounded semi-annually. (3 marks)

5. Make v the subject of the formula (3 marks)

$$S = \frac{dv}{\sqrt{cv^2 - f}}$$

6. A coffee trader buys two grades of coffee at Kshs. 80 and Kshs. 100 per packet. Find the ratio in which she should mix the two brands so that by selling the mixture at Kshs. 120 per packet, a 25% profit realized? (3 marks)

7. A bakery prepares cakes for sale. It has 80 eggs and 10 cups of sugar for use. It bakes two cake types: P and Q. Type P cake requires 6 eggs and 2 cups of sugar while type Q cake requires 12 eggs and three-quarters cup of sugar. By letting type P cakes to be x and type Q cakes to be y, form all the inequalities that represent
   the above information. (3 marks)

8. Find the radius and the centre of a circle whose equation is given by $3x^2 + 3y^2 + 6x - 12y - 12 = 0$. (3 marks)

9. The equation of a trigonometric function is $y = 2 \cos(bx - 60)^0$. The period of the function is 120^0.
   (a) Determine the value of b (1 mark)

(b) Deduce the phase angle of the function. (1 mark)

10. A point R is 2100 nautical miles to the east of another point Q $(60^0N, 0^0)$, find the position of P.(3 marks)

11. An arithmetic progression is such that its first term is 200 and common difference 500. Given that
$S_n = 80,100$, find the value of n (4 marks)

12. (a) Expand $(3 + x)^5$ in ascending powers of x up to the term in x^3.   (1 mark)

(b) Use the expansion in (a) above to approximate the value of $\left(3\frac{1}{50}\right)^5$ correct to 4 decimal places.
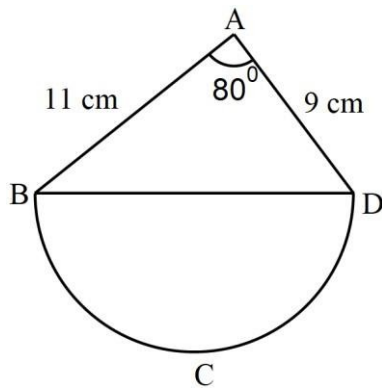
(2 marks)

13. **P** varies as the cube of **Q** and inversely as the square root of **R**. If **Q** is reduced by 20% and **R** increased by 21%, find the percentage change in **P**. (3 marks)

14. Use tables of squares, reciprocals and square roots only to evaluate   (4 marks)
$$\frac{1}{345^2} + \sqrt{0.6789}$$
2.

15. In the figure below, AD = 9 cm, AB = 11cm and angle BAD = 80^0. BD is the diameter of the semi-circle BCD.

   Calculate the area of the semi-circle, correct to 2 decimal places. Use π = 3.142   (4 marks)

16. Two regular polygons have sides n and $n + 3$. Given that the ratio of the sum of their interior angles is 1: 2, calculate the value of n.   (3 marks)

SECTION II (50 Marks) *Answer any **five** question in this section*

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

Taxable Income (Ksh per month)	Tax Rate (%)
0 – 13 450	10
13 451 – 26 350	15
26 351 – 39 250	20
39 251 – 52 150	25
52 151 and above	30

   In that year, the monthly earnings for Amilo were as follows: basic salary Ksh 35 500, house allowance – Ksh 12 600 and other allowances that amount to Ksh. 5 872 were exempted from taxation.
   Amilo contributes 12.5% of her basic salary to a pension scheme. She is entitled to a personal tax relief of Ksh 1 845 per month. Calculate:
   (a) Amilo's taxable income in Ksh per month.   (2 marks)

(b) Amilo's P.A.Y.E that month. (5 marks)

(c) Amilo's net pay that month, given that the following are deducted monthly from her salary; NHIF – Ksh 1 000, Union dues – Kshs 455 and BBF – Ksh 200.   (3 marks)

18. A mode is in the shape of a polygon with vertices A, B, C, D and E such that; AB=4.4 cm, AE=10 cm, ED=5.2 cm and BC=7.9 cm. The bearing of B from A is 030^0 and A is due east of E, while D is due north of E and angle EDC=120^0

(a) Using a ruler and a pair of compasses only,
   (i)   Construct the accurate plan of the model.   (4 marks)
   (ii)   Measure DC.   (1 mark)

(b) A foundation plaque is to be placed closer to CD than CB, nearer to D than to E and not more than 6 cm from A.
   (i)   Construct the locus of points equidistant from CB and CD.   (1 mark)
   (ii)   Construct the locus of points equidistant from E and D.   (1 mark)
   (iii)Construct the locus of points 6 cm from A.   (1 mark)

(c) Shade and label as R, the region within which the foundation plaque could be placed in the garden.
                                                                        (2 marks)

19. The probability that it rains on a certain day is 0.8. If it rains the probability that a school bus will be stuck in a traffic jam is 0.7 but otherwise it is 0.4. If the bus is stuck in the jam, the probability that students using it to school will arrive late is 0.6, otherwise the probability of students using the bus to arrive late is 0.3.
  (a) Draw a tree diagram to represent this information. Use the letters R, J and L to represent the events of rain, jam and late respectively   (2 marks)

  (b) Determine:
    (i)   The probability that it rains, the bus isn't held in the jam but the students arrive late in school.
                                                                                              (1 mark)

    (ii) The probability that students arrive in school on time.   (3 marks)

    (iii) The probability that the students arrive in school late.   (2 marks)

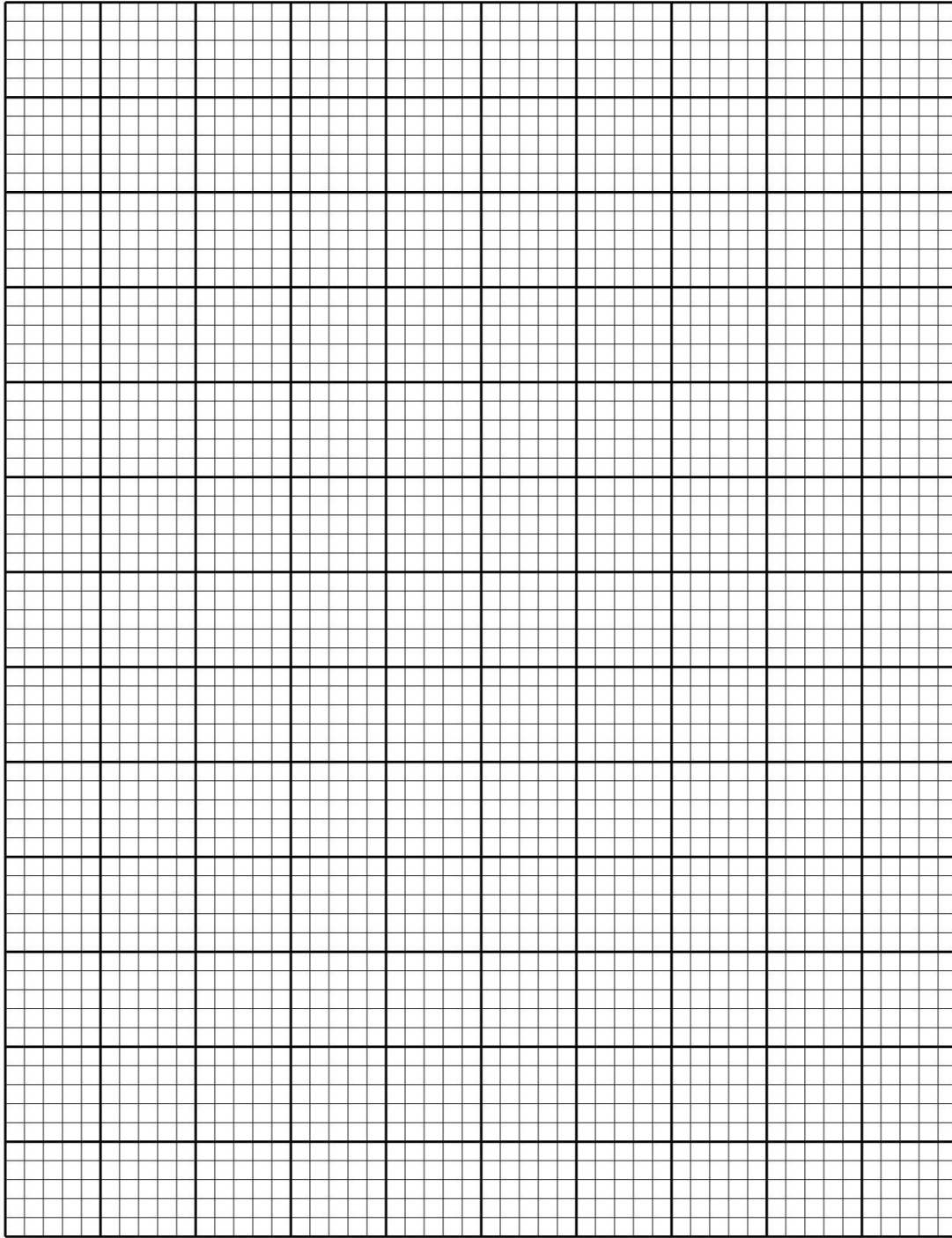   (iv) The probability that the bus is held in the jam.   (2 marks)
20. The vertices of a triangle ABC are $P'(-1, 1)$, $B'(-5, 4)$ and $C'(-1, 2)$ under a transformation whose matrix is $\begin{pmatrix} -2 & 1 \\ 1 & 0 \end{pmatrix}$

(a) Find the coordinates of ABC (3 marks)

(b) On the grid provided, draw triangles ABC and $A'B'C'$. (2 marks)

(c) Triangle $A''B''C''$ is the image of triangle $A'B'C'$ under a transformation represented by the matrix
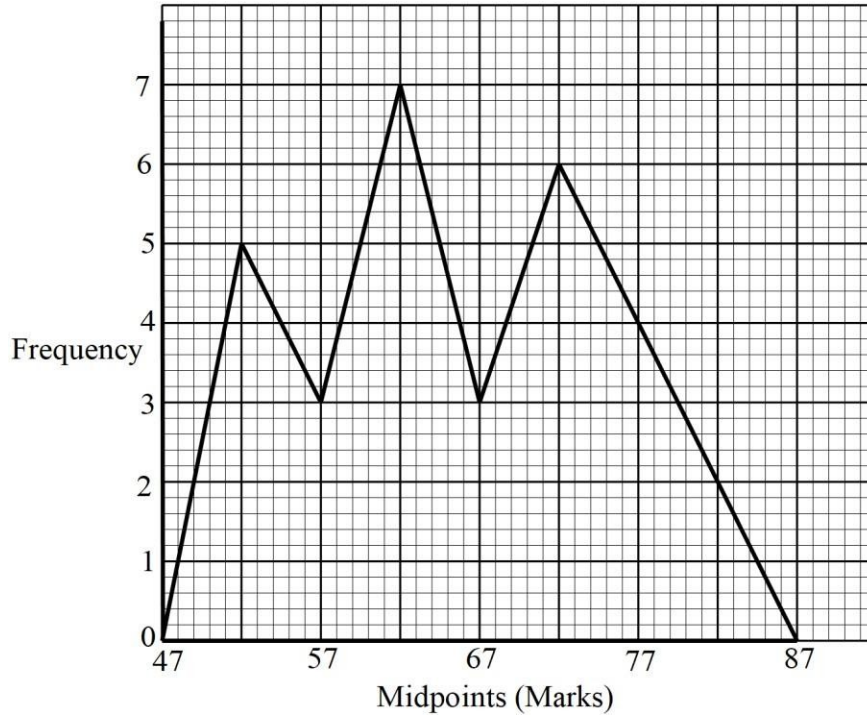
$\begin{pmatrix} -1 & 0 \\ 0 & -2 \end{pmatrix}$

(i) Determine the coordinates of $A''B''C''$.   (2 marks)

(ii) On the same grid, draw $A''B''C''$. (1 mark)

(d) Another transformation **T** maps $A''B''C''$ on to $A'''B'''C'''$ such that $A'''(-1, -2)$, $B'''(-5, -8)$ and $C'''(-1, -4)$. Describe **T** fully. (2 marks)

21. The figure below shows a frequency polygon representing the scores of Form 4 Green students in a History contest.

Midpoints (Marks)

(a) Generate the frequency distribution table for the data under the headings given in the table below.

(5 marks)

x	f	$d = \dfrac{x - 67}{5}$	fd	fd^2
	$\Sigma f =$		$\Sigma fd =$	$\Sigma fd^2 =$

10

(b) Calculate the standard deviation of the marks.　　(3 marks)

(c) The mean weight of 11 babies in a clinic is 4.5 kg. If one more baby comes to the clinic, the total mass of the babies becomes 60 kg. Find the mass of the additional baby.　　　　　　　(2 marks)

22. In a triangle OAB, $OA = 12a$, and $OB = 12b$. P and Q are points on OA and OB respectively such that $3OP = OA$ and $OQ = \frac{1}{3}OB$. M is the midpoint of AB.

(a) Express the following in terms of a and b

　　　　　　　　　　　　(i) OM　　(1 mark)

　　　　　　　　　　　　(ii) PM　　(1 mark)

11

(b) **OM** and **BP** intersect at R such that **PR** $= k$**PB** and **OR** $= h$**OM**.

          (i) Express **PR** in two ways   (2 marks)

          (ii) Hence find the values of h and k (3 marks)

(c) Show that A, R and Q are collinear.   (3 marks)

23. The figure below represents a right pyramid with a vertex V and a rectangular base PQRS. VP=VQ=VR=VS=18 cm. PQ=16 cm and QR=12 cm. M and O are the midpoints of QR and PR respectively.
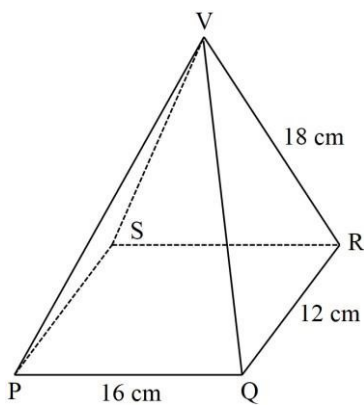
Calculate, correct to 2 decimal places;

(a) The length of the projection of the line VP on the plane PQRS   (2 marks)

(b) The angle between the lines VP and the plane PQRS.   (2 marks)

(c) the angle between planes VQR and VPS.   (4 marks)

(d) The angle between the planes VQR and PQRS   (2 marks)

24. Two functions, $x + y = 4$ and $y = x^2 + 2$, intersec at C and D
   (a) Determine the coordinates of C and D   (4 marks)

   (b) Using the trapezium rule with 6 trapezia, estimate the area bound by $y = x^2 + 2$, the x-axis and the vertical lines through C and D.   (4 marks)

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

GOLDLITE ONLINE EDUCATIONAL SERVICES
Kenya Certificate of Secondary Education
KCSE REPLICA SERIES EXAMS

NAME ………………………………………… ADMISSION NUMBER …………………

CANDIDATE'S SIGNATURE…………………………………DATE……………………………………

REPLICA 7

121/2
MATHEMATICS
PAPER 2

INSTRUCTIONS TO CANDIDATES

a) *Write your name, school and Index Number in the spaces provided at the top of this page*
b) *The paper consists of two sections. Section I and Section II.*
c) *Answer ALL the questions in Section I and any FIVE from Section II.*
d) *All answers and working must be written on the question paper in the spaces provided below each*
e) *Question.*
f) *Marks may be given for correct working even if the answer is wrong.*
g) *Negligence and slovenly work will be penalized*
h) *Non programmable silent electronic calculator and KNEC Mathematical tables may be used except*
i) *where stated otherwise.*

Section I   **FOR EXAMINER'S USE ONLY**

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

Section II

Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

Grand Total

1. A picture frame is rectangular in shape with dimensions 10 cm by 14 cm. Calculate the maximum percentage error in the area of the frame. (3 marks)

2. On the grid provided below, draw the circle whose equation is $2x^2 + 2y^2 + 8x - 10 = 0$. (4 marks)
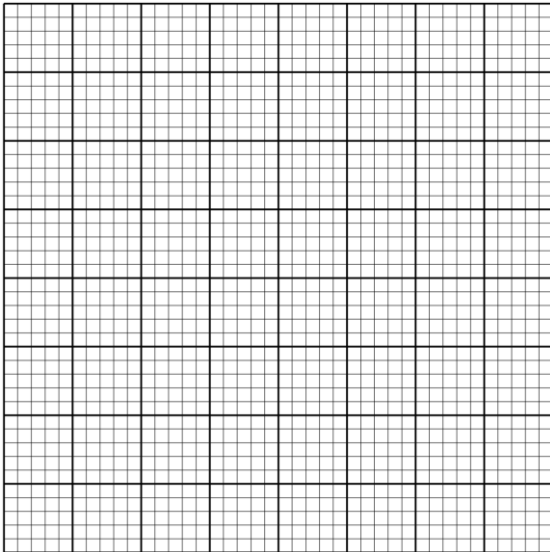
3. Without using a mathematical table or a calculator, find the values of a, b and c given that: (3 marks)
$$\frac{\tan 60^0}{1 - \cos 30^0} = a + b\sqrt{c}$$

2

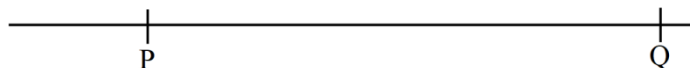4. Without using mathematical tables or a calculator, evaluate: (3 marks)

$$2\log_3 9 - \frac{1}{2}\log_3 144 + \log_3 972$$

5. Make A the subject of the formula (3 marks)

$$T = \frac{2m}{n}\sqrt{\frac{L - A^2}{3k}}$$

6. Expand $(1 - 2x)^7$ in ascending powers of x up to the term in x^4. Hence use your expansion to find the value of $(0.98)^7$. (3 marks)
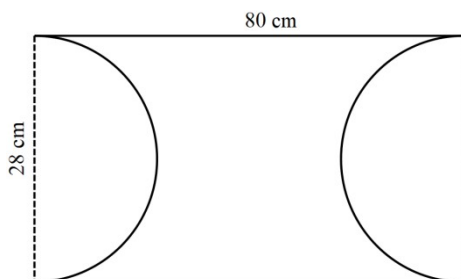
7. The line PQ below is part of a triangle PQR in which $\angle QPR = 75^0$ and PR=5.5 cm.

$$\text{P} \qquad\qquad\qquad\qquad \text{Q}$$

Using a ruler and a pair of compasses only;
(a) complete triangle PQR. (1 mark)

(b) determine the shortest distance from R to PQ. (1 mark)

8. The figure below shows cross-section of a steel beam used in a construction site.


80 cm

28 cm

Calculate the volume of the beam if it is 1.8 m long. Use $\pi = \dfrac{22}{7}$ (3 marks)

9. Given that $\mathbf{p} = 2\mathbf{i} - 3\mathbf{j} + \mathbf{k}$ and $\mathbf{q} = 3\mathbf{i} - 4\mathbf{j} - 3\mathbf{k}$, a point R divides the line PQ externally in the ratio of 4: 1. Find the coordinates of R. (3 marks)

10. Find the obtuse angle made by the line $3x + 4y = 12$ and the $x-$ axis, correct to 1 decimal place.

(3 marks)

11. In a transformation, an object with area 9 square units is mapped onto its image whose area is 54 square units. Given that the transformation matrix is $\begin{pmatrix} x & x-1 \\ 2 & 4 \end{pmatrix}$. Find the value of x.

(3 marks)

12. The figure below shows the graph of $\log P$ against $\log Q$.
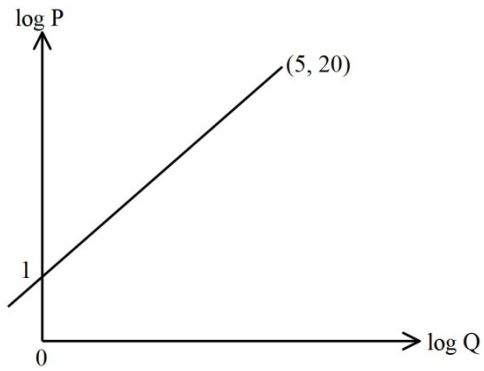
Given that $P = aQ^n$, find the values of a and n.

(3 marks)

5

13. Five geometrical sets and three mathematical tables cost sh. 2,816 while three geometrical sets and five mathematical tables cost sh. 3,360. Use the matrix method to determine the cost of each item. (4 marks)

14. The length of an arc of a circle is $\frac{1}{5}$ of its circumference. If the area of the circle is 346.5 cm^2, find the area of the sector enclosed by this arc. (3 marks)

15. Rose a branding machine on hire purchase. The cash price of the branding machine is Kshs. 750,000. She pays a deposit of Kshs. 275,000 and followed by 15 monthly installments of Kshs. 55,000 each. Calculate the monthly rate at which compound interest was charged. (4 marks)

16. Jose had 200 buckets of water each having a mass of 20 kg. After one week, due to evaporation, the mass decreased in the ratio 29: 32. Calculate the total mass lost to evaporation. (3 marks)

SECTION II (50 Marks)

6

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

Taxable pay per month (Kshs)	Tax rate (%)
1 – 9,680	10%
9,681 – 18,800	15%
18,801 – 27,920	20%
27,921 – 37,040	25%
37041 – and above	30%

That year Marylinnet paid net tax of Kshs. 4,312 per month. Her total monthly taxable allowances amounted to Kshs.15,220 and he was entitled to a monthly relief of Ksh. 1,062. Every month the following deductions were made; NHIF – Kshs.320, Union dues – Ksh.200, Co-operative shares – Ksh. 500.

Calculate:

(a) Marylinnet's monthly basic salary in Kshs. (7 marks)

(b) Her monthly net salary in Kshs. (3 marks)

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18. In the figure below, ABC is a triangle in which AB = 6 cm, BC = 11 cm and AC = 7 cm (not drawn to scale). The circle centre O passes through A, B and C.
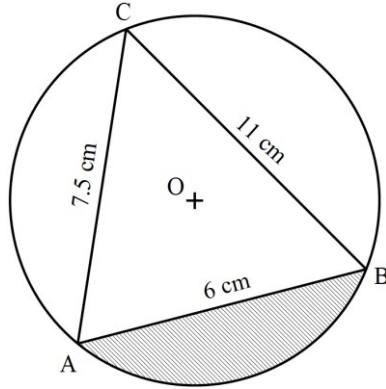
Calculate correct to 1 decimal place
(a) angle ACB   (3 marks)

(b) radius of the circle.   (2 marks)

(c) shaded area.   (5 marks)

8

19. (a) Given the series $2 + 4 + 8 + 16 + \cdots + 16384$

(i) Identify the type of series. (2 marks)

(ii) Find the number of terms in the series (3 marks)

(iii) Calculate the sum terms in the series (2 marks)

(b) Given that the sum of the first n terms of the sequence $3 + 7 + 11 + 15 + \ldots$ is 820, find the last term of the sequence (3 marks)

9

20. The table below shows the distribution of marks scored by 110 students in a test.

Marks	11 – 20	21 – 30	31 – 40	41 – 50	51 – 60	61 – 70	71 – 80	81 – 90
No. of Students	7	$a+3$	12	$2a+13$	37	11	6	3

(a) Find the value of a. (1 mark)

(b) Using $d = \dfrac{x-45.5}{10}$, calculate, to 4 significant figures;

    (i) The mean mark. (4 marks)

    (ii) The standard deviation. (3 marks)

(c) If 60% of the students passed, calculate the pass mark. (2 marks)

10

21. A water vendor has a tank of capacity 18900 litres. The tank is being filled from two pipes A and B that are closed immediately the tank is full. Water flows at the rate of 150,000 cm^3 per minute and 120,000 cm^3 per minute from pipes A and B respectively.

(a) Calculate the time it takes to fill the tank if both taps A and B are opened at the same time in hours.

(4 marks)

(b) On a particular day the vendor started refilling the empty tank using taps A and B but was forced to start serving his clients after 25 minutes of filling. Given that the draining tap C supply 20 litres per minute to the clients, determine the exact time of the day the tank was filled assuming that the clients supply was continuous from 11.15 a.m.

(6 marks)

11

22. The vertices of a triangle ABC are A(2,2), B(2,−2) and C(−1,−4) as shown in the figure below.
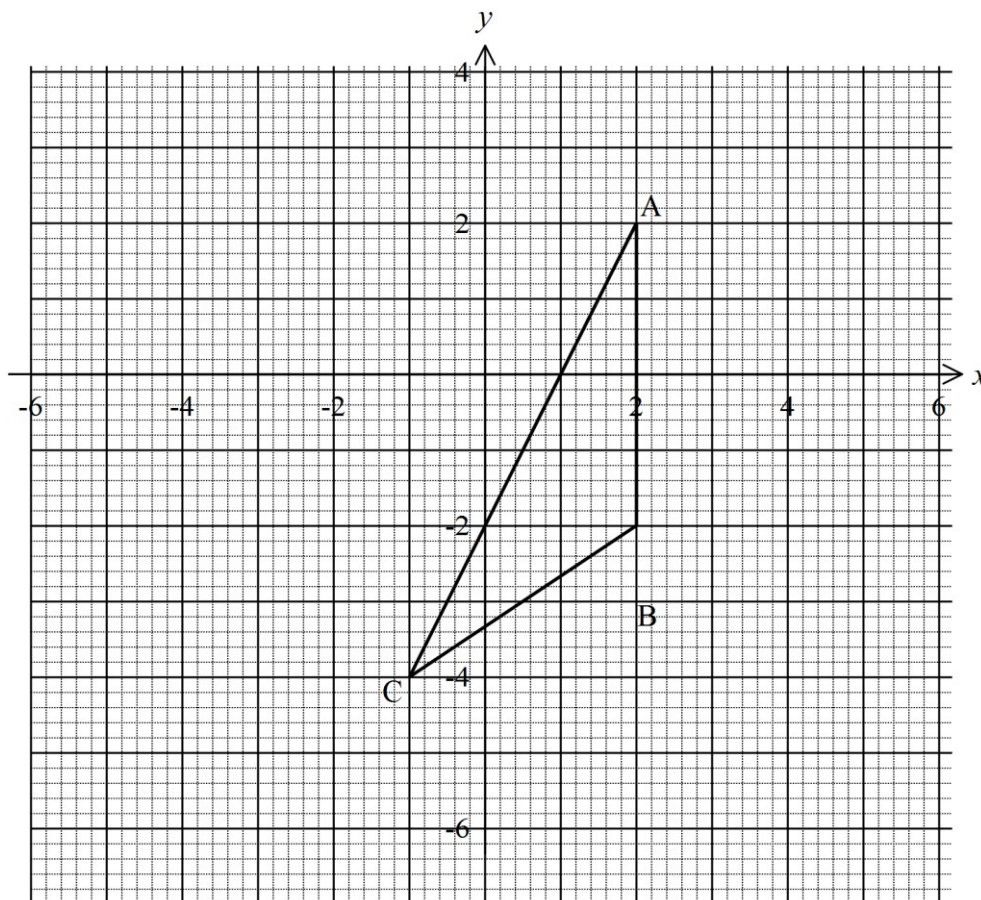
(a) If the vertex B(2,−2) is mapped onto B′(5,−2) by a shear with x – axis invariant.

  (i)   Find the matrix that represents the shear in (a) (i) above.   (2 marks)

  (ii) Draw triangle A′B′C′, the image of triangle ABC, under the shear.   (3 marks)

12

(b) A transformation matrix $\mathbf{T} = \begin{pmatrix} 0 & 1 \\ 1 & 1.5 \end{pmatrix}$ maps triangle $A'B'C$ onto $A'B'C''$. Draw triangle $A'B'C''$.

(2 marks)

(c) A transformation matrix $\mathbf{U}$ maps triangle $A'B'C''$ onto triangle ABC

    (i)   Determine the transformation matrix $\mathbf{U}$.   (2 marks)

    (ii)   Describe the transformation represented by $\mathbf{U}$.   (1 mark)

23. The probability of Patrick passing his exam is 0.8 that of James is 0.6 while that of Linda is 0.2.
    (a) Draw a tree diagram to represent the above information   (2 marks)

    (b) Use your tree diagram to find the probability that;
        (i)   Exactly two students pass in the exam   (2 marks)

        (ii)   At most two students pass the exam   (2 marks)

        (iii) Only one student passes the exam   (2 marks)

        (iv)   At least one passes in the exam   (2 marks)

14

24. A triangle OPQ is such that $OP = 3OS$ and $3OR = OQ$. T is a point on QS sch that $4QT = 3QS$. Given that $OP = p$ and $OQ = q$,

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

   (i)   **SR**   (1 mark)

   (ii)   **QS**   (1 mark)

   (iii)   **PT**   (2 marks)

15

(iv) **TR** (3 marks)

(b) Show that the points P, T and R are collinear. (3 marks)

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GOLDLITE ONLINE EDUCATIONAL SERVICES

Kenya Certificate of Secondary Education
KCSE REPLICA SERIES EXAMS

NAME ………………………………………… ADMISSION NUMBER …………………

CANDIDATE'S SIGNATURE…………………………………DATE……………………………………

REPLICA 8

121/2
MATHEMATICS
PAPER 2

INSTRUCTIONS TO CANDIDATES

a) Write your name, school and Index Number in the spaces provided at the top of this page
b) The paper consists of two sections. Section I and Section II.
c) Answer ALL the questions in Section I and any FIVE from Section II.
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i) where stated otherwise.

Section I   **FOR EXAMINER'S USE ONLY**

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

Section II

Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

Grand Total

1. A man deposits his money in a savings bank on a monthly basis. Each deposits exceeds the previous one by Shs 500. If he started by depositing Shs 1500, how' much will he have deposited in 12 months? (3mks)

2. Make x the subject in the formula: $M = \sqrt{\dfrac{x-p}{p(1+px)}}$ (3mks)

3. Calculate the shortest distance in nautical miles between M(45°N, 38°E) and N(45°N, I 42°W) (3mks)

4. Two circles of radii 3cm and 8cm have their centres 13cm apart. Calculate the length of the direct common tangent. (2mks)

5. (a) Expand $(1- \frac{1}{2} x)^6$ (2mks)

(b) Hence use the above expansion to the fourth term to find the value of $(0.98)^6$ (2mks)

6. The points P, Q and R lie on a straight line. The position vectors of P and R are
    $2i + 3j + 13k$ and $5i - 3j + 4k$ respectively. Q divides PR internally in the ratio 2:1. Find:
    (a) the position vector of Q in terms of $i, j,$ and k.   (2mks)

    (b) the distance of Q from the origin.   (1 mk)

7. Solve for x: $(\log_3 x)^2 - \frac{1}{2}\log_3 x = \frac{3}{2}$ (4mks)

8. Find the longest side of the right-angled triangle whose other sides are; $(\sqrt{2} + 1)$cm and
    $(\sqrt{2} - 1)$cm long, leaving your answer in surd form.   (3mks)

9. A circle whose centre is C(2, 3) passes through a point P(a, b). A point M(-2, $-\frac{5}{2}$) is the mid-point of

the line segment CP.
(a) Calculate the co-ordinates of P   (1 mk)

(b) Determine the equation of the circle in the form $ax^2 + by^2 + cx + dy + e = 0$ where a, b, c,
   d and e are integers.   (3mks)

10.   In the figure below, PS = PQ, PQ = 10cm, $\angle$ PSQ=5O°, QR = 12cm and $\angle$ SQR = 62°.   (3mks)
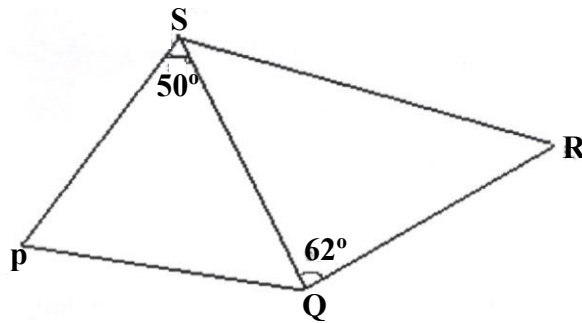
   Find $\overline{SR}$ (3mks)

11.   A quantity y varies partly as the square of x, and partly as x. When $y = 20$, $x = 2$ and when $y = 36$, $x = 3$.
      Find the equation showing the relationship between x and y.   (3mks)

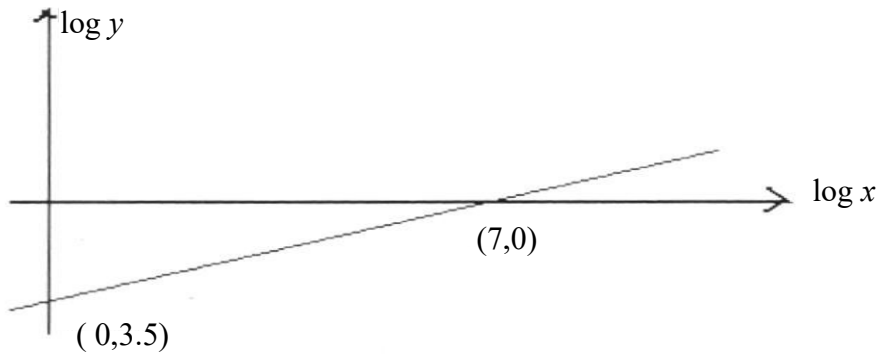12. The graph below is part of a straight line obtained from the initial equation $y = ax^n$.

$$\uparrow \log y$$

$$(7,0)$$

$$\log x$$

$$(\,0,3.5)$$

Use the graph to calculate the values of a and n (3mks)

13. The price of a new car is Shs. 800,000. If it depreciates at a constant rate to Shs 550,000 within 4 years, find the annual rate of depreciation. (3mks)

14. Solve the equation $2\cos 2\,(x + 30) = 1$ for $0 \le x \le 360$. (3mks)

15. A mixture of sand, cement and ballast is in the ratio 5:1:3. If the cost of 7 tonnes of sand is Sh 3000, 5 tonnes of cement sh 50,000 and 8 tonnes of ballast Sh 4000, find the cost of 7tonnes of the mixture. (3mks)

16. In the figure below, PAQ is a tangent to the circle at point A. (3mks)
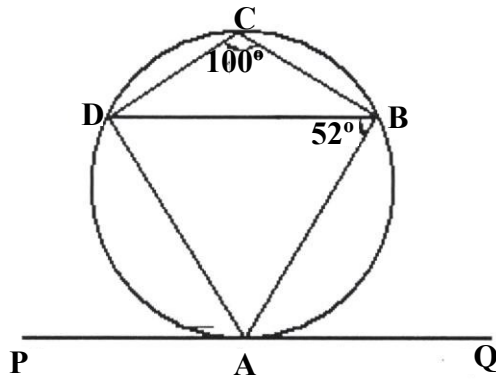
Find angle DAB and angle BAQ. giving reasons for your answer.

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

17. The table below shows the income tax rates for the year 2006.

Taxable Income per Tax rates KSh per K	Annum in K
1-5808	2
5809-11280	3
11281-16752	4
16753-22224	5
22225 and above 6	

In the year 2006, Ali's monthly earnings were as follows:
Basic Salary KShs 22,600;House Allowance Kshs 12,000;
Medical Allowance Kshs 2,880;Transport Allowance KShs 340
Ali was entitled to a monthly personal relief of Sh 1162 and an insurance relief of Sh 450.
Every month the following deductions were made:
NHIF KShs 320; Insurance Premium Shs 3000;Sacco Loan repayment Shs 6000
Sacco Share contribution Shs 1500; Workers Union dues Shs 200
Calculate:
a) Ali's taxable income in K£ p.a. (1 mk)

b) Ali's monthly tax paid in Kshs (4mks)

c) Ali's monthly net income from his employment in KShs (2mks)

d) If Ali received a 10% increase in his basic salary, calculate the corresponding percentage increase on the income tax. (3mks)

18.   A man goes to work either by a matatu or by bus from Monday to Thursday. If he goes by matatu the probability that he will be late is $^1/_5$ while if he goes by bus, the probability that he will be late is $^1/_8$.
a)   Suppose he tosses a coin to decide whether to go by a matatu or by bus. what is the probability that he will be late? (4mks)

b) If he travels by matatu, what is the probability that he will be late
   (i) every day (2mks)

   (ii) On any three days (4mks)

19. The figure below is a cuboid ABCDFFGH such that AB 8cm, BC = 6cm and CF 4cm.
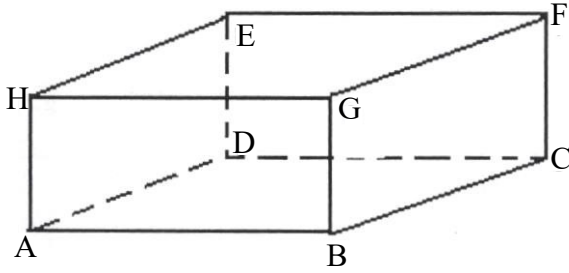
Determine:
a) the length
(i) AC   (2mks)

(ii) AF   (2mks)

b) The angle AF makes with plane ABCD.   (2mks)

c) The angle plane AEFB makes with the plane ABCD   (2mks)

d) Find the angle between line EG and line DC   (2mks)

20   (a) Complete the table below for the equation $y = x^3 - 5x^2 + 2x + 9$ (2mks)

x	-2	-1	0	1	2	3	4	5
x^3	-8	.	0	1	8	27	64	125
$-5x^2$		-5	0	-5	-20		-80	
$2x$	-4	-2	0	2	4	6	8	10
9	9	9	9	9	9	9	9	9
y			9	7	1		1	

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

c) Use your graph to estimate the roots of the equation $x^3 - 5x^2 + 2x + 9 = 0$ between x = 1 and x 4.   (2mks)

d) By drawing a suitable line on the same axis, estimate the roots of the equation
$x^3 - 5x^2 + x + 5 = 0$ (3mks)

21. The following table shows the distribution of marks obtained by 50 students.

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

a) By using a suitable assumed mean, calculate:

(i) the mean (5mks)

b) the variance (3mks)

c) the standard deviation (2mks)

22. (a) Without using a protractor or a set square, construct a parallelogram PQRS such that
PQ = 7.5cm, PS = 5cm and ∠QPS = 67½ °. (4mks)
On the same diagram locate:
(b) A point X such that it is equidistant from P and Q. (1 mk)
(c) A point M such that ∠QMS 90°. M is on the same side of QS as R. [2mks]
(d) A region inside the parallelogram in which a variable Y lies such that PY RY and
∠QYS ≥90°. Shade the region represented by Y. (3mks)

23   (a) Calculate the turning point of the function $y = x^3 - 3x$ and state their nature. Hence sketch the curve.   (5mks)

      (b) Find the area of each of the two segments of the curve $y = x^3 - 3x$ cut off by the x-axis.   (5mks)

24.   Rectangle ABCD in which A(1,3), B(8,3), C(8,5) and D(1,5) undergoes a shear with x = 4 as the invariant line.
      a) Plot the rectangle ABCD   (1 mk)
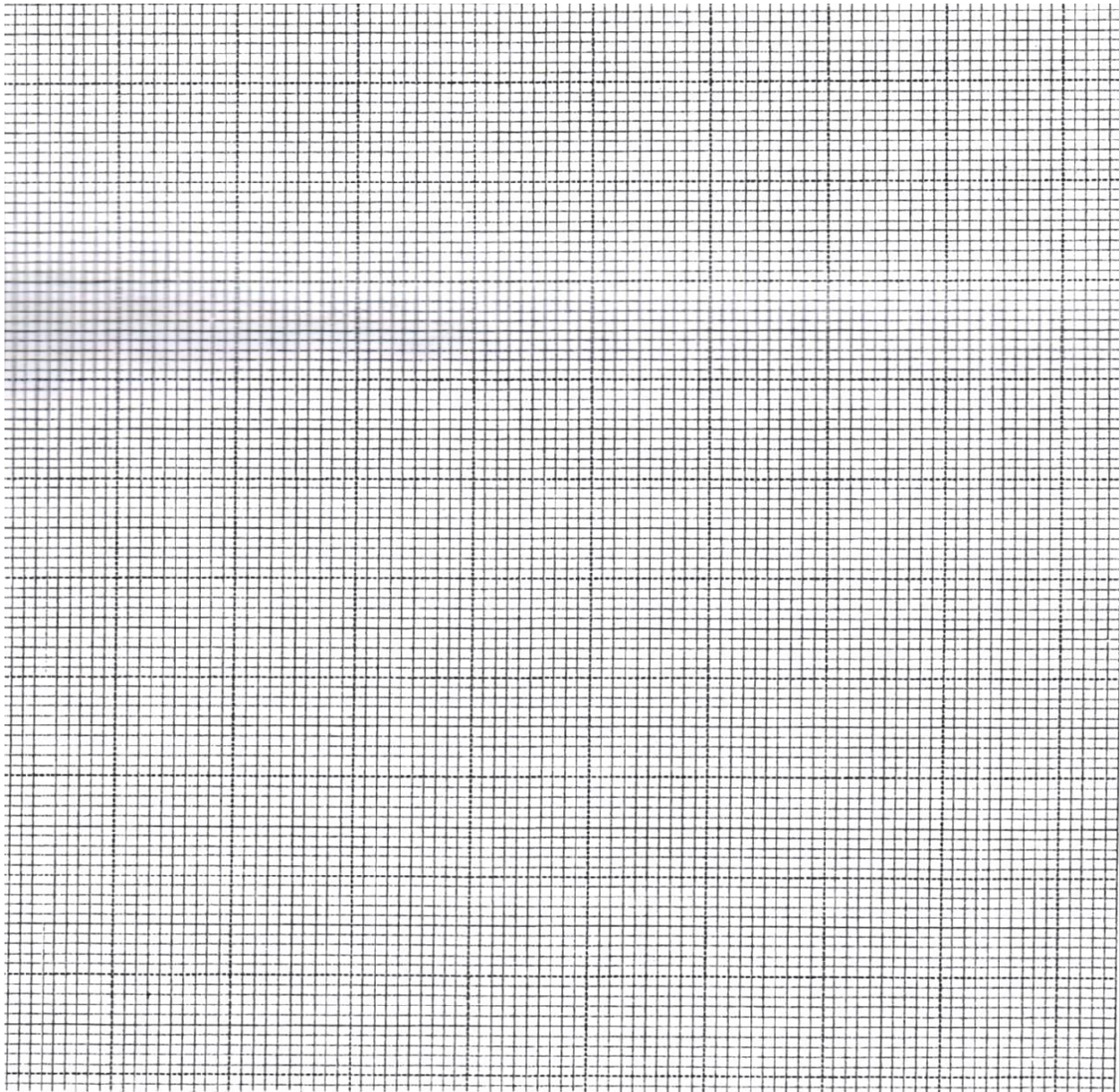
      b) If the point C is mapped on the point $C^1(8,9)$ under this transformation, determine the co ordinates of A^1, B^1 and D^1.   (3mks)

      c) Plot the figure A^1, B^1, C^1, D^1 (1 mk)

d) Find the matrix representing this transformation. (3mks)

e) Using the determinant of the matrix in (d) above, find the area of the figure A^1, B^1, C^1, D^1 (2mks)

GOLDLITE ONLINE EDUCATIONAL SERVICES

Kenya Certificate of Secondary Education

KCSE REPLICA SERIES EXAMS

NAME ……………………………………………… ADMISSION NUMBER ……………………

CANDIDATE'S SIGNATURE…………………………………DATE……………………………………

REPLICA 9

121/2
MATHEMATICS
PAPER 2

INSTRUCTIONS TO CANDIDATES

a) Write your name, school and Index Number in the spaces provided at the top of this page
b) The paper consists of two sections. Section I and Section II.
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Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
Marks																	

Section II

Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

Grand Total

1. Evaluate $\dfrac{\frac{1}{2}\,of\,3\frac{1}{2}+1\frac{1}{2}(2\frac{1}{2}-\frac{2}{3})}{\frac{3}{4}of\,2\frac{1}{2}\div\frac{1}{2}}$ (3 marks)

2. Make P the subject of the formula $\dfrac{1}{r}=\dfrac{1}{p^2}+\dfrac{1}{q}$ (3 marks)

3.

   a) Expand $(1-2x)^2$ up to the term in x^3 (1 mark)

   b) Use the expansion above o evaluate $(1.02)^6$ to decimal places   (2 marks)

4. Given the matrix $\begin{pmatrix} 5-x & 2 \\ 3x & 4 \end{pmatrix}$ has no inverse, find the value of x.   (2 marks)

5. Kiprono buys tea costing sh. 112 per kilogram and shs 132 per kilogram and mixes them, then sells the mixture at shs. 150 per kilo gram. If he is making profit of 25% in each kilogram of the mixture, determine the ratio in which he mixes the tea.   (3 marks)

6. Given that: $\frac{3}{3\sqrt{5}} + \frac{3\sqrt{5}}{3-\sqrt{5}} = a + b\sqrt{5}$. Find the values of A and B   (3 marks)

7. P varies directly as Q and inversely as the square of R. if P is increased by 20% and R is decreased by 10%. Find percentage changes in Q.   (3 marks)

8. Ashanti is a salesman and earns a commission on sales based on the monthly rates shown in the table below:-

Sales (kshs)	Commission rate % of sales
The first 5,000	10%
The second 3,000	15%
Sales above 8,000	20%

In addition, she earns a basic monthly pay of kshs. 6,700 during a certain month, she   earned a total salary amounting to kshs. 8,368. How much worth of sales did she make?
                    (4 marks)

9. In the figure below, O is the centre of the circle. A, B, C , and D are points on the circumference of the circle. A, o, X and C are points on a straight line. DE is a tangent to the circle at D. Angle BOC = 48°nad angle CAD = 36°.
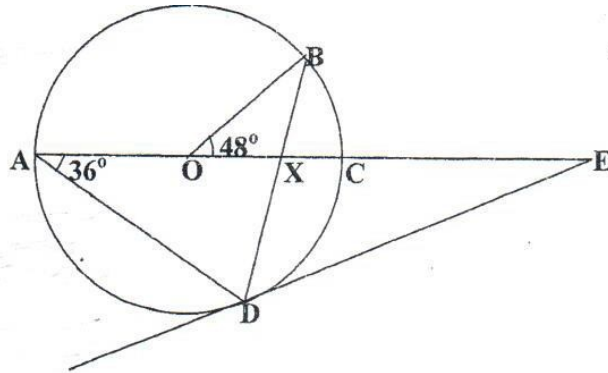
A) Find the value of the following angles:-
   i)   Angle ADE   (2 marks)

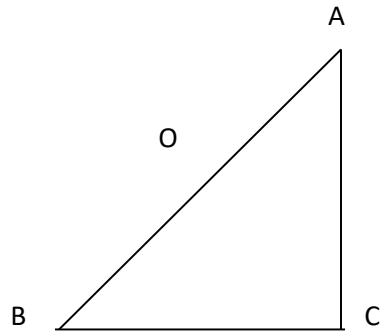   ii)   Angle BCD   (2 marks)

10. Given that p = 3^y express the equation   (3 marks)
       $3^{(2y-1)} + 2 \times 3^{(y-1)} = 1$ in terms of P hence or otherwise find y.

11. The diagram below shows a triangle ABC. Construct its image $A^1B^1C^1$ under a rotation of -120° about centre O. (3 marks)

12. Given that cos x -= 0.75; where x is an acute angle, find without using mathematical tables or calculators the following trigonometric ratios:

a) Tan X (1 mark)

b) $Sin^2 (90-x)$ (2 marks)

13. A farmer has 200m of fencing with which three sides of a rectangular enclosure, the fourth side being existing wall of the yard. Find in metres the dimension of the largest possible field that can be enclosed. (3 marks)

14. The point with co-ordinates (6,1) and (-4,9) are the ends of a diameter of a circle centre A

   A) Find the co-ordinates of the centre.   (1 mark)

   B) Determine the equation of the circle in the form $x^2 + y^2 + ax + by = C$ where A, B, and C are
   constants.   (3 marks)

15. Use the trapezium rule to establish the area under the curve $Y = x2 + x - 6$ over the interval 0 $0 \leq x \leq 8$ using 4 trapezia   (3 marks)

16. Wambua invested sh. 6,400 at 15% per annum compound semiannually interest for 3 years. Muinde invested twice that amount at 12 ½ % per annum simple interest for the same period of time. Find whose investment earned more interest and by how much.   (4 marks)

17. .

a) Find the quadratic equation whose roots are $\frac{-3}{4}$ and $\frac{2}{3}$ and write it in the form ax2 + bx + c = 0 where a, b and c are integers.   (3 marks)

b) The length of a floor of a rectangular hall is 9m more than its width. The area of the floor is 136m^2.

   i)   Calculate the perimeter of the floor   (4 marks)

   ii)   A rectangular carpet is placed on the hall leaving am area of 64cm^2. If the length of the carpet is twice its width, determine the width of the carpet
                                                                 (2 marks)

18. In the geographical progression, the sum of the second and third terms is 6; and the sum of the third and fourth terms is 1-12. Find:

a)   .
   i)   The first term   (3 marks)

   ii) The common ration   (3 marks)

b) The sum of consecutive of an arithmetical progression -19 ½. If the first tern is 16 ½ and the common difference is -3. Find the number of terms.   (4 marks)

19. The table below shows the number of students who scored marks in mathematics test.

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Frequency	3	6	10	10	12	17	15	16	7	4

a) Draw a cumulative frequency graph for the data.   (3 marks)
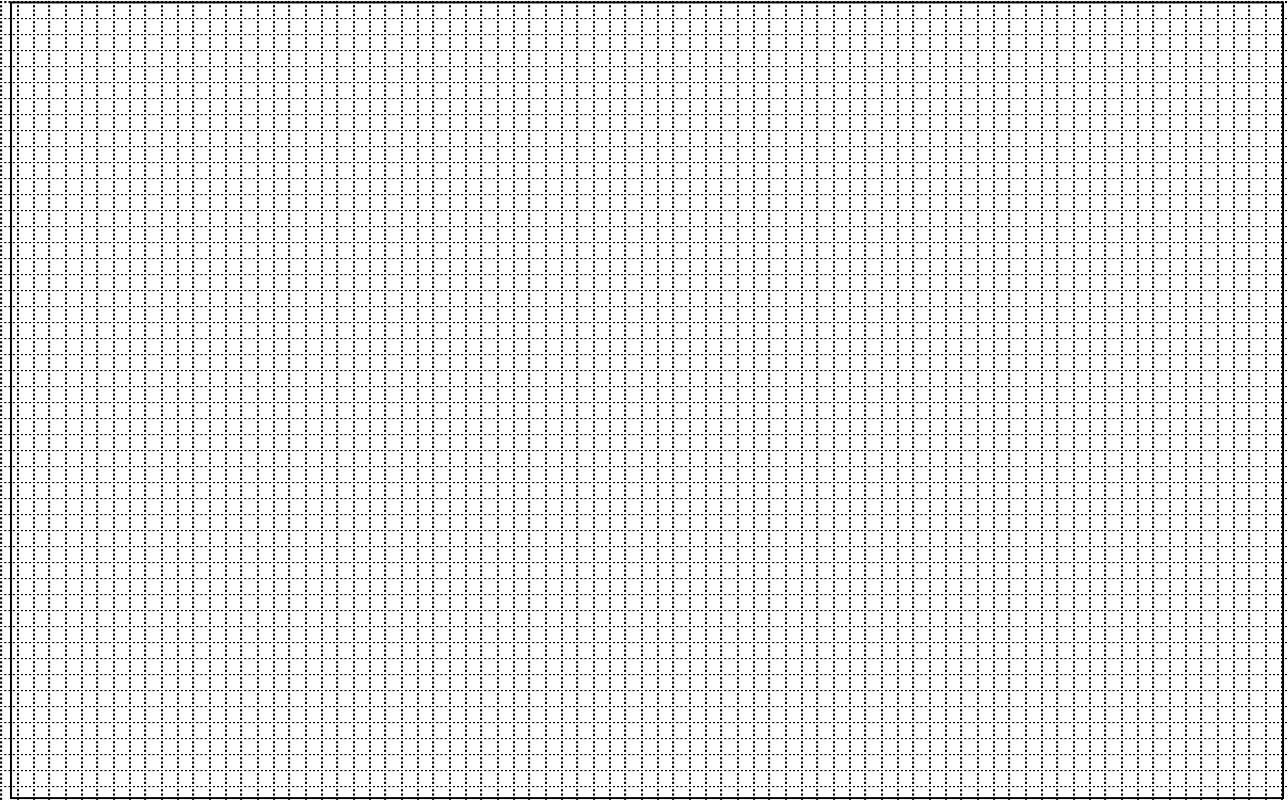
b) Use the graph to estimate the median mark   (2 marks)

c) If students who score over 40 marks pass the test the tests estimates the percentage of the students who passed   (2 marks)

d) Calculate the inter quartile deviation.   (3 marks)

20. The probability of a candidate passing her secondary examination is 4/5. If she passes the examination the probability of her joining a university is 2/3. if she fails her examination, the probability of joining a university is ¼. If she joins the university the probability of getting a job is 6/7 and if he does not join the university the probability of getting a job is 2/9

   a) Draw a tree diagram.   (2 marks)

b) The probability that she fails her examination   (2 marks)

c)   Find the probability that she got a job after failing her secondary examination
                                                    (2 marks)

d) The probability that she joins university   (2 marks)

e) The probability that she did not get a job   (2 marks)

**21.** At 12.30pm, a ship leaves island A (80° N, 45°E) and sails due west for 120 hours to another island B at an a average speed of 27 knots.
   a) Find the position of island B   (3 marks)

   b) The ship then sails due north to another island C which lies on latitude 75°N. Find the shortest distance between islands B and C in km.   (3 marks)

c) The ship had stopped at B for 70 minutes before it sailed to island C. I the ship increase its speed by 20% between B and C find the time arrival at island C to the nearest minute.
(4 marks)

22.
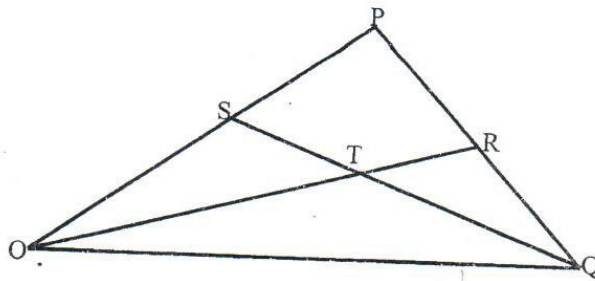
In the figure above, OPQ is a triangle in which QS = ¾ OP and RP = 2:1

Line QR and SQ meet at T.

a) Given that O P = p and OQ = Q, Express the following vectors in terms of P and Q.
   i)   PQ   (1 mark)

   ii)   OR   (2 marks)

   iii)   SQ   (1 mark)

b) You are further given that ST = Msq and OT = Nor. By expressing OT in two ways, determine the values of m and n.   (5 marks)

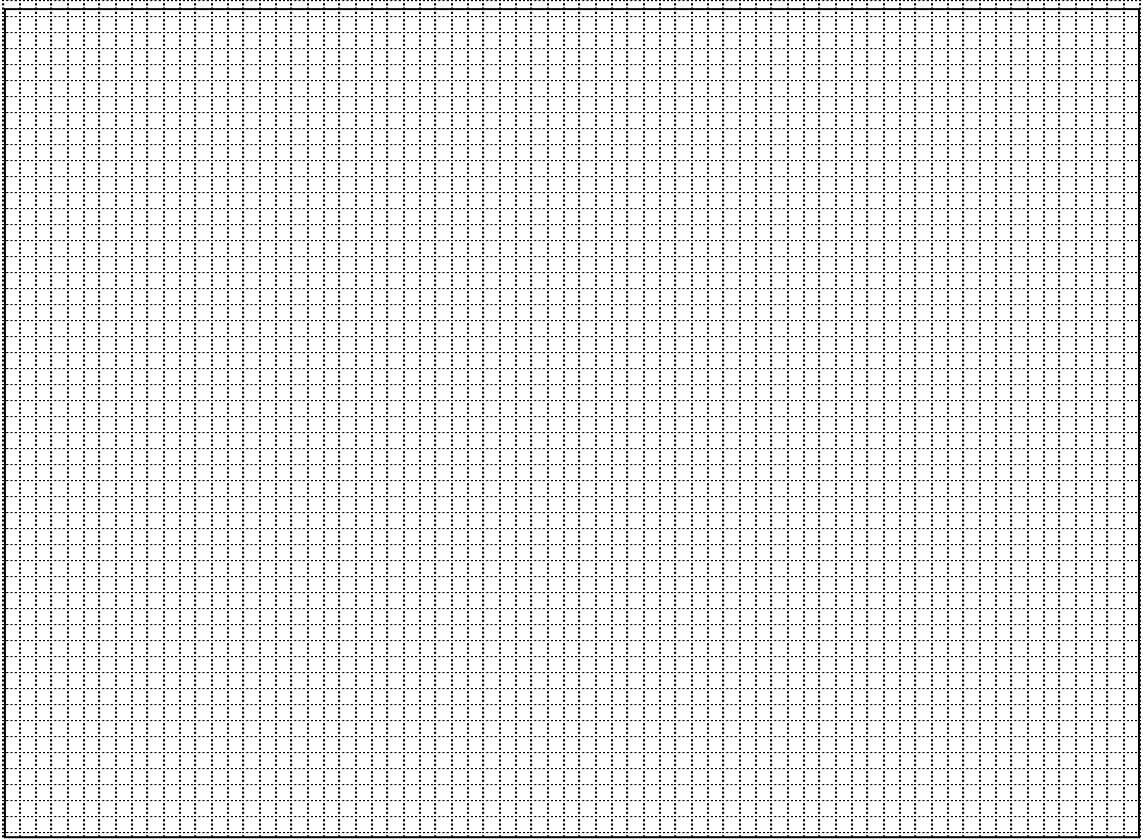c) Find the ratio in which Q divides ST   (1 marks)

23. .
a) Complete the table below for the equation $y = x^3 - 2x^2 - 4x + 7$

X	-3	-2	-1		1	2	3	4
Y	-26		8	7	2		8	

b) Using the scale 1 cm to represent 1 unit on x – axis and 1 cm to represent 5 units on the y – axis, draw the graph of $y = x^3 - 2x^2 - 4x + 7$ (3 marks)

c) Use your graph to estimate to roots of the equation $x^3 - 2x^2 - 4x + 7 = 0$ (1 mark)
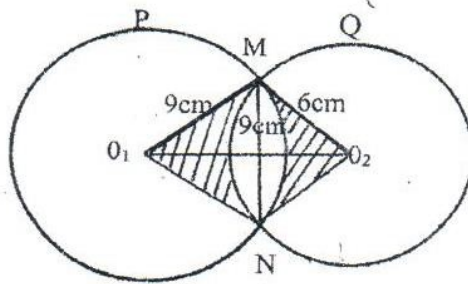
d) By drawing straight lines, use your graph to solve the equation.   (2 marks)
   i) $x^3 - 2x^2 - 4x + 2 = 0$

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

24. The following figure shows two circles P and Q with centre O1 and O2 respectively and their radii are 9 cm and 6 cm respectively. The common chord MN is 9 cm long. (Not drawn in scale).

a) Find the value of
   i.   Angle MP_1N.   (2 marks)

   ii. Angle MO_2N (2 marks)

b) Find the area of:
   i)   Triangle MO_1N (2 marks)

   ii) Triangle MO_2N (1 marks)

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

GOLDLITE ONLINE EDUCATIONAL SERVICES

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REPLICA 10

121/2
MATHEMATICS
PAPER 2

INSTRUCTIONS TO CANDIDATES

a) *Write your name, school and Index Number in the spaces provided at the top of this page*

b) *The paper consists of two sections. Section I and Section II.*

c) *Answer ALL the questions in Section I and any FIVE from Section II.*

d) *All answers and working must be written on the question paper in the spaces provided below each*

e) *Question.*

f) *Marks may be given for correct working even if the answer is wrong.*

g) *Negligence and slovenly work will be penalized*

h) *Non programmable silent electronic calculator and KNEC Mathematical tables may be used except*

i) *where stated otherwise.*

Section I   **FOR EXAMINER'S USE ONLY**

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

Section II

Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

Grand Total

SECTION A (50 Marks)

Answer all the questions from this section in the spaces provided

1. Make t the subject of the formula **(3marks)**

$$s = \frac{wd}{t}(t - {}^{d}/_{2})$$

2. a) Show that the circle with equation $(x - 3)^2 + (y - 4)^2 = 25$ passes through the origin.

   (1mark)

   b) Find the coordinates of another point (not the origin) where the circle cuts the x-axis.

   (3marks)

3. A survey carried out in a rural town on the number of young people who went for HIV test was shown in the table below

Percentage infected	$36-39$	$40-43$	$44-47$	$48-51$	$52-55$	$56-59$
No of people	6	5	3	3	2	1

Calculate the quartile deviation of the data. **(4marks)**

4. A shear parallel to the x-axis (the invariant line) maps $(1,2)$ onto point $(5,2)$

a) Determine the shear factor. **(2marks)**

b) Hence state the shear matrix. **(1mark)**

5. A colony of bees was found to have 250 bees at the beginning. Thereafter the number of bees doubled every two days. Find how many bees there were after 16 days **(3marks)**

6. Solve $2\sin^2 x - 3\sin x + 1 = 0$ for $0^0 \leq x \leq 360^{\,0}$ **(3marks)**

7. The circumference of the circle of latitude x^0 south is 3751nm. Find x to the nearest whole number.

                                                                             (3marks)

8. a) Determine the turning point of the curve $y = x^3 - 3x^2 + 3x - 6$ **(2marks)**

    b) State the nature of the point identified in a above,   **(1mark)**

9. Nine men working 8 hours a day can weed a field in 15 days. How many hours a day must 27 men work in order to weed the same field in 5 days? **(2marks)**

10. Solve the equation below using the completing square method

$3x^2 - 7x + 2 = 0$ **(3marks)**

11. Given that $tan\ \theta = x$ show that **(3marks)**

$$\frac{Cos\ \theta sin^2\ \theta + cos^2\ \theta}{Sin\ \theta} = \frac{1}{x}$$

12. (a) Expand and simplify the binomial expression $(2 - x)^6$ **(1 mark)**

(b) Use the expansion up to the term in x^3 to estimate $\left(1\dfrac{99}{100}\right)^6$ to 3 decimal places. **(2marks)**

13. Without using calculators or mathematical tables simplify **(3marks)**

$$\frac{\sqrt{63} \;+\; \sqrt{72}}{\sqrt{32} \;+\; \sqrt{28}}$$

14. A line L_1 has the equation $x+2y = 4$. The line L_2 is perpendicular to L_1 and passes through the origin

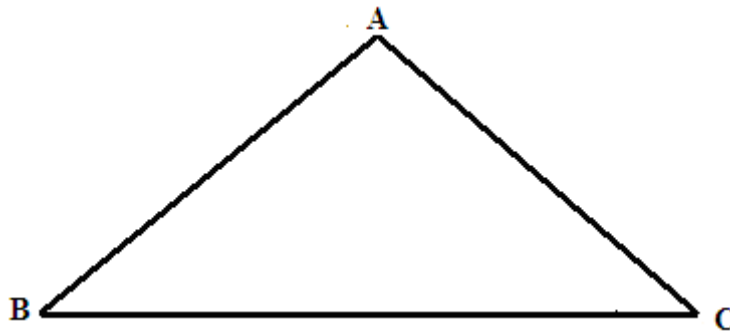(a) Determine the equation of L_2. **(1mark)**

(b) Find using matrix method the co-ordinates of the intersection point of the two lines.

(2marks)

15. By correcting each number to one significant figure, approximate the value of 788×0.006. Hence calculate the percentage error arising from this approximation. **(3marks)**

16. The diagram below represents a garden ABC.

(i)   Draw the locus of points equidistant from sides AB and AC.

(ii) Draw the locus of points equidistant from points A and C

(iii) A bead is lost within a region which is nearer to point A than to point C and closer to side AC than to side AB. Show by shading the region where the bead can be located.   **(3marks)**

SECTION II (50 MARKS)

Attempt any five questions in this section

17. A bag contains 3 black balls and 6 white balls. If two balls are drawn from the bag one a time, find the:-

    (a) Probability of drawing two white balls

        (i) with replacement   **(2marks)**

        (ii) without replacement   **(2marks)**
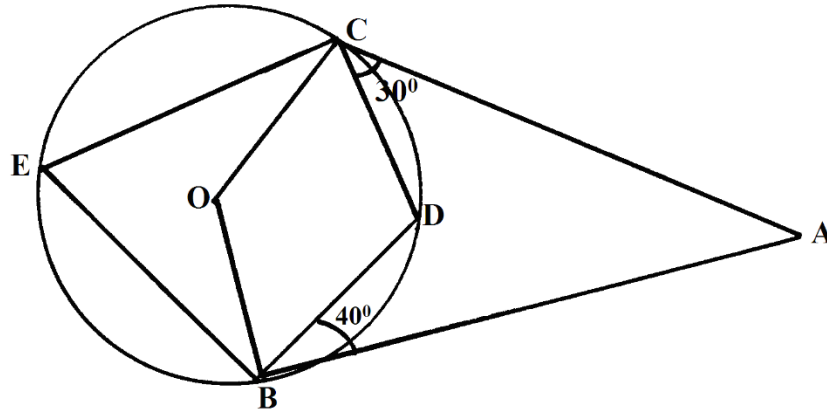
    (b) Probability of drawing a black ball and white ball.

        (i) with replacement   **(3marks)**

        (ii) without replacement   **(3marks)**

18. In the figure below, O is the centre of the circle AB and AC are tangents. Angle ABD = 40^0 and ACD = 30^0. Find:

(i) Angle CEB   (6marks)

(ii) Angle OCB   (2marks)

(iii)Angle CAB   (2marks)

19. Income rates for income earned were charged as follows.

Income in sh. per month	Rate in Ksh. per sh.20
1 – 8, 400	2
8401 – 18, 000	3
18001 – 30, 000	4
30, 001 – 36, 000	5
36, 001 – 48, 000	6
48, 001 and above	7

A civil servant earns a monthly salary of ksh.19, 200. His house allowance is ksh.12, 000 per month. Other allowances per month are transport ksh.13, 000 and medical allowance ksh.2, 300. He is entitled to a personal relief of ksh.1, 240 per month. Determine

(a) (i) His taxable income per month   **(2 marks)**

   (ii) Net tax   **(5 marks)**

(b) In addition, the following deductions were made.

       NHIF sh.230
       Service charge ksh.100
       Loan repayment ksh.4, 000
       Cooperative shares of ksh.1, 200

Calculate his net salary per month   **(3marks)**

20. The figure below represents a model of a tower VPQR. The horizontal base PQR is an equilateral triangle of sides 9cm. The length of the edges are VP = VQ = VR = 20.5cm. Point M is the mid-point of PQ and VM = 20cm. Point N is on the base and vertically below V
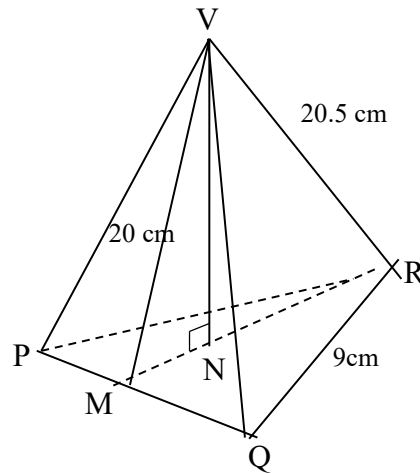
Calculate

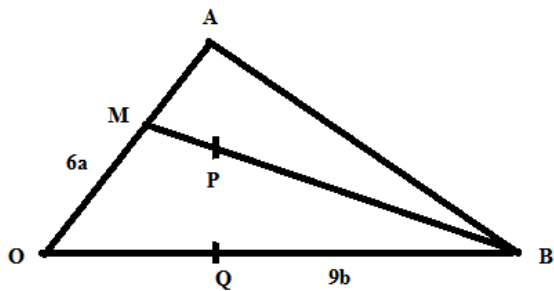(a) The length RM   **(2marks)**

(b) The length of the model.   **(4marks)**

(c) The angle between

    (i) Plane VPR and the base   **(2marks)**

    (ii) Line VR and the base   **(2marks)**

21. In $\triangle AOB$, $\mathbf{OA} = 6\mathbf{a}$ $\mathbf{OB} = 9\mathbf{b}$. M is the midpoint of OA and P lies on MB such that $MB = 5MP$

a) Express in terms of $\mathbf{a}$ and $\mathbf{b}$ the following vectors; giving your answer in its simplest form.

    (i) **MB**

    (ii) **AB**

    (iii) **AB**

    (iv) **AP**   **(6 marks)**

b) Given that Q lies on OB such that $\mathbf{OQ} = 3\mathbf{b}$ express $\mathbf{AQ}$ in terms of $\mathbf{a}$ and $\mathbf{b}$ **(1 mark)**

c) Hence show that A, P and Q are collinear.   **(3 marks)**

22. A tailor makes two types of garments A and B. Garment A requires 3m of material while B requires 2 ½ m of material. The tailor uses not more than 600m of material daily in making both garments. The tailor must make not more than 100 garments of type A and not less than 80 of type B each day.

(a) Write down four inequalities from this information.   **(4 marks)**

(b) Draw a graph for the inequalities shading the unwanted regions.   **(4 marks)**

(c) If the tailor makes a profit of sh.80 on garment A and a profit of sh. 60 on garment B, how many garments must she make in order to maximize her total profit if all the garments are sold at once.

(2 marks)

23. (a) Using the trapezium rule, estimate the area enclosed by the curve $y = x^2$, the x-axis and the line $x = 5$ and $x = 2$ taking 7 ordinates. **(3 marks)**

(b) Find the exact area. **(3 marks)**

(c) Find the % error in using trapezium rule. **(2 marks)**

(d) Estimate the area using mid-ordinate rule. **(2 marks)**

24. A publisher employs two agents John and James. John is paid at a rate of sh.240 per week. James is paid at the rate ofsh. 185 per week. John earns no commission on the first 1800 books sold and a commission at a rate of 5% on each extra book sold. James earns a commission of 2.5% on each book sold.In a certain year, each sold a total of 15000 books at the rate of sh. 83.50.

a) Find who earned more money and by how much. *(assume 1 year has 52 weeks)* **(7 marks)**

b) In another year James earned a total of sh. 51370. Calculate the number of books he sold that year.

(3marks)