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KCSE NATIONAL SCHOOLS TRIALS AND JOINT SERIES 2025

MATHEMATICS PAPER 2

KABARAK HIGH
ALLIANCE BOYS
ALLIANCE GIRLS
ASUMBI GIRLS
KISII SCHOOL
KENYA HIGH
MANGU SCHOOL
MARANDA SCHOOL
MASENO SCHOOL
MERU SCHOOL
MOKASA JOINT 1
STAREHE GIRLS
STAREHE BOYS
LENANA SCHOOL
MOI GIRLS ELDORET
NAIROBI SCHOOL
FRIENDS SCHOOL KAMUSINGA

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Kenya Certificate of Secondary Education

KCSE TOP NATIONAL SCHOOLS TRIAL SERIES 2025

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

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

KABARAK HIGH SCHOOL(MOKASA 1)

(Kenya Certificate of Secondary Education (K.C.S.E.) 2025

121/2 ─ MATHEMATICS ALT A ─ Paper 2

Instructions to candidates

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

For Examiner's Use Only

Section I

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

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

SECTION I (50MARKS)

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

1. Solve for x in the equation; (3 marks)

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

2. H varies directly as V and inversely as the square of R. Find the percentage change in H if V is increased by 20% and R by 50%. (3 marks)

3. David bought a piece of land for Ksh.40,000 which appreciated by 12% p.a in the first year and 18% p.a for the subsequent years. If he sold the land after three years, how much did he get?
(3 marks)

4. Expand $\left(\frac{1}{x} + 1\right)^5$ up to the fourth term, hence use the expansion to estimate $(1.04)^5$ correct to 4 decimal places. (4 marks)

5. Rationalize and simply the surd below completely; $\frac{3}{3+\sqrt{7}}$ - $\frac{5}{3 - \sqrt{7}}$ (3 marks)

6. The figure below shows a circle centre O and a point R which is outside the circle.
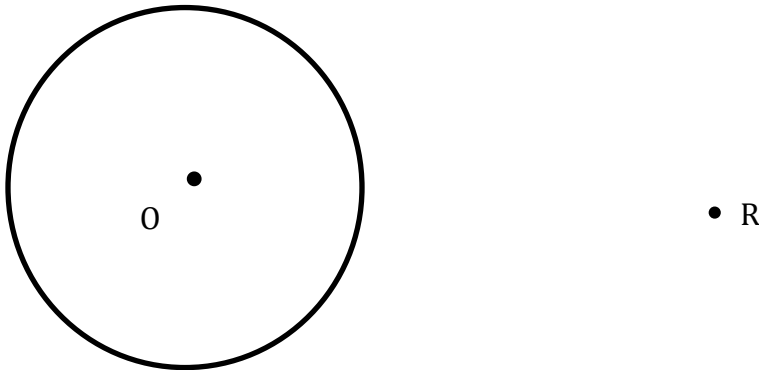
Using a ruler and a pair of compass only locate a point S on the circle such that angle   OSR $= 90^0$.
(3 marks)

7. In a G.P, the sum of the second and the third terms is 12, and the sum of the third and the fourth terms is -24. Find the first term and the common ratio. (4 marks)

8. A shopkeeper mixes sugar costing Sh. 40 per Kg with another type which costs Sh. 60 per kg. Find the ratio in which the two types should be mixed so that if a kilogram of the mixture is sold at Sh. 55, a profit of 10% is realized. (3 marks)

9. Given that $m = i - 3j + 4k$, $n = 6i + 3j - 5k$ and $q = 2m + 5n$. Find the magnitude of Q to 3 significant figures. (3 marks)

10. The following figure shows a circle centre O.
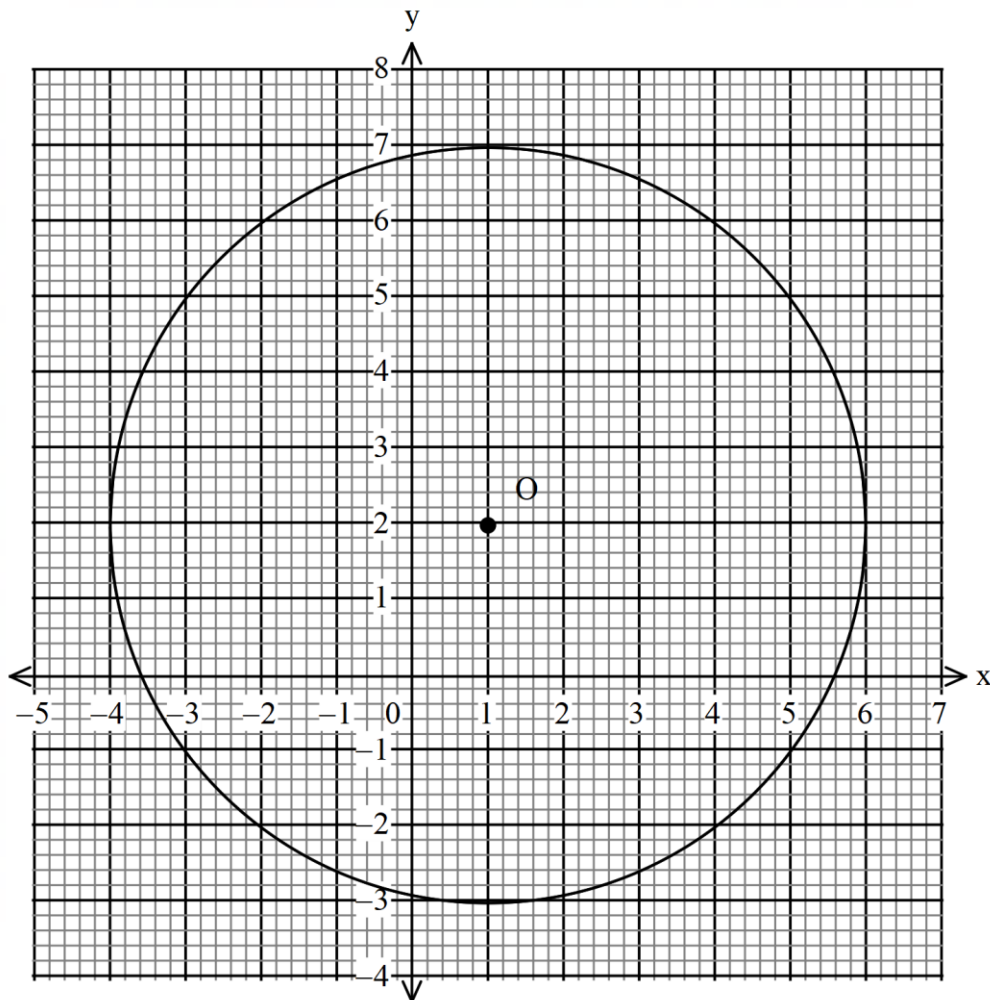
(a) Determine the equation of the circle. (2 marks)

(b) Use the equation in part (a) to determine the x-intercept of the circle correct to 4 significant figures.
(2 marks)

11. The following data represents the marks scored by 10 Kisii high school students during a mathematics contest which was held at Sacho high school.

18, 22, 12, 16, 24, 25, 29, 15, 13, 19.

Find the variance from the data above. (3 marks)

12. The radius of a cylindrical solid is exactly 7cm while its height is given correct to one decimal place as 10.0cm. Taking л to be $\frac{22}{7}$, calculate the percentage error in the volume of the solid.
(3 marks)

13. Solve for x in the equation; (3marks)

Cos (2x- 10) = 0.5 for $0^0 \leq x \leq 360°$

14. In an experiment involving two variables t and r, the results were obtained.

T	1.0	1.5	2.0	2.5	3.0	3.5
R	1.50	1.45	1.30	1.25	1.05	1.00

On the grid provided below, Draw the line of best fit for the data. (3 marks)

15. A triangle T, has vertices A(-3, 0), B(3, 0) and C(1, -4). A transformation matrix $\begin{pmatrix} 2 & 4 \\ 3 & -1 \end{pmatrix}$ makes T_1 on to triangle T_2. Calculate the area of triangle T_2. (3 marks)

16. Find the value of a if $\int_a^3 (2x + 4)\, dx = 25$. (3 marks)

SECTION II (50 marks)

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

17. A quadrilateral ABCD has vertices A(4,-4) , B(2,-4) , C(6,-6) and D(4,-2).

   a) On the grid provided, draw the quadrilateral ABCD. (1mark)

   b) ABCD is mapped onto A'B'C'D' by a transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$

   i) On the same grid, draw the image A'B'C'D'. (3 marks)

   ii). Describe the transformation that maps ABCD onto A'B'C'D' (2 marks)

   c) The coordinates of A''B''C''D'', the image of A'B'C'D' under a transformation given by the matrix $\begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix}$ are: A''(0 ,4), B''(2, 2), C''(0, 6), D''(-2, 4).

   i) Draw A'' B'' C'' D'' on the grid. (1 mark)

   ii) Determine a single matrix that maps ABCD onto A''B''C''D''. (3 marks)

18. In a class of 18 boys and 10 girls, two students have been selected to represent the school in a Mathematics contest.

   (a) Draw a tree diagram to represent this information. (2 marks)

   (b) Use the tree drawn in (a) above to find the probability that the students who were picked were:

   (i) Both girls (2 marks)

(ii)   A boy and a girl.   (2 marks)

(iii)   All boys   (2 marks)

(iv)   A boy and a girl in that order.   (2 marks)

19. The following grouped data represents marks of 100 candidates in an examination in a certain school. Study it and answer the questions that follow.

Marks	$1-10$	$11-20$	$21-30$	$31-40$	$41-50$	$51-60$	$61-70$	$71-80$	$81-90$	91 - 100
No. of Students	4	9	16	24	18	12	8	5	3	1

a) Draw a Cumulative frequency curve from the above data on the grid provided below
   (3marks)

b) Use your graph to find the following:
   i)   Median mark   (1 mark)
   ii)   The pass mark if 70% of students are to pass.   (2 marks)

   iii)   Quartile deviation.   (2 marks)

   iv)   If 55 marks was set as pass mark during the analysis of the results, estimate how many
           candidates passed.   (2 marks)

20. A triangular garden is such that AB = 8cm, angle BAC=45^0 and angle ABC = 75^0.

   a) Using a ruler and a pair of compasses only, Draw the garden.   (3 marks)

b) A water tap P is to be mounted on the garden such that it is equidistant from points A and B and from lines AB and BC. On the diagram in (a) above, Show the position of P.   (3 marks).

c) Identify by shading a region R in the plot formed under the following conditions:

i) CR $\geq$ 1.5cm.   (1 mark)

ii) R is more than 2cm from line AB.   (1 mark)

iii) R in nearer to CB than CA .   (2 marks)

21.   In a triangle OAB, **OA** = **a**, **OB** = b. Point M and N are such that AM:MB = 1:2 and ON:NA = 1:2. **OM** and **BN** intersect at x.

   (a)   Express in terms of **a** and **b**.

      (i)   **OM**   (1 mark)

      (ii)   BN   (2 marks)

   (b)   If **OX** = k **OM** and **BX** = h **BN** where k and h are constants, express **OX** in terms of:

      (i)   k, **a** and **b**   (1 mark)

      (ii)   h, **a** and **b**   (2 marks)

      (iii)   Find the values of h and k.   (3 marks)

   (c)   State the ratio in which X divides **BN**.   (1 mark)

   22. The velocity of a particle in m/s, moving in a straight line after t seconds is given by
      v = $3t^2 - 3t - 6$.
    Find:-
   i)   The acceleration of the particle after 2 seconds.   (2 marks)

ii) The distance covered by the particle between t = 1 and t = 4 seconds.   (3 marks)

iii) The time when the particle is momentarily at rest.   (2 marks)

iv) The minimum velocity attained by the particle.   (3 marks)

23. In a certain year income tax for all the income earned was charged at the rate shown below.

Monthly taxable pay in KShs	Rate of tax % in each KShs
1 -9,680	10%
9,681-18,800	15%
18,801-27,920	20%
27,921-37,040	25%
Excess over KShs 37,040	30%

Mrs. Momanyi earned a basic salary of KShs. 32,000 and a house allowance of KShs. 10,000 and a non-taxable allowance of ksh 8,000 per month. She claimed a tax relief of KSh 1056 per month. (a) Calculate her total taxable income.   (2 marks)

(b) Calculate her PAYE In that month .   (5 marks)

c) Other than tax, the following deductions are made:

(i) A service charge of Sh. 100

(ii) Health insurance fund Sh. 320

(iii) A co-operative loan of Sh. 3200

(iv) Burial benevolent fund of KSh. 200

Calculate her net monthly income from her employment. (3 marks)

24. (a) Complete the table below for $y = x^3 + 4x^2 - 5x - 5$ for $-5 \leq x \leq 2$. (2 marks)

x	-5	-4	-3	-2	-1	0	1	2
y			19			-5		

B On the grid provided, draw the graph of $y = x^3 + 4x^2 - 5x - 5$ for $-5 \leq x \leq 2$.
(3 marks)

(c) Use the graph to solve the equations.

(i) $x^3 + 4x^2 - 5x - 5 = 0$ (2 marks)

(ii) $x^3 + 4x^2 - x - 4 = 0$ (3 marks)

(iii) $x^3 + 4x - 5x - 5 = 3$ (1 mark)

GOLDLITE ONLINE SUPPLIES

Kenya Certificate of Secondary Education

KCSE TOP NATIONAL SCHOOLS TRIAL SERIES 2025

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

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

MANG'U SCHOOL TRIAL SERIES

121/2
MATHEMATICS ALT A
PAPER 2
TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES
1. Write your name and index number in the spaces provided above.
2. Sign and write the date of examination in the space provided above.
3. This paper consists of **TWO** sections. **Section I** and **Section II**.
4. Answer **ALL** the questions in **section I** and only **FIVE** questions from **Section II.**
5. All answers and working must be written on the question paper in the space provided below each question.
6. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent calculators and KNEC mathematical tables may be used except where stated otherwise.
9. This paper consists of**16** printed papers.
10. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

FOR EXAMINER'S USE ONLY

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL	

SECTION I (50 MARKS)

*Answer ALL questions in the spaces provided.*

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

2. Determine the inverse of the matrix $\begin{pmatrix} 4 & 3 \\ 5 & -2 \end{pmatrix}$. Hence find the coordinates of the point at which the two lines $4x - 18 = -3y$ and $5x - 2y = 11$ intersect. (4 marks)

3. Solve the equation.

   $5^{2x+1} - 3(5^{x+1}) + 10 = 0$ (4 marks)

4. Solve for x in the equation $\cos x = \sin(3x - 30)$. Hence determine the value of $\tan x$ leaving your answer in surd form. (3 marks)

5. In the figure below, yz is parallel to wx. Angle wzx = 50º and angle wxm = 60º. Determine the size of angle yzw. (2 marks)
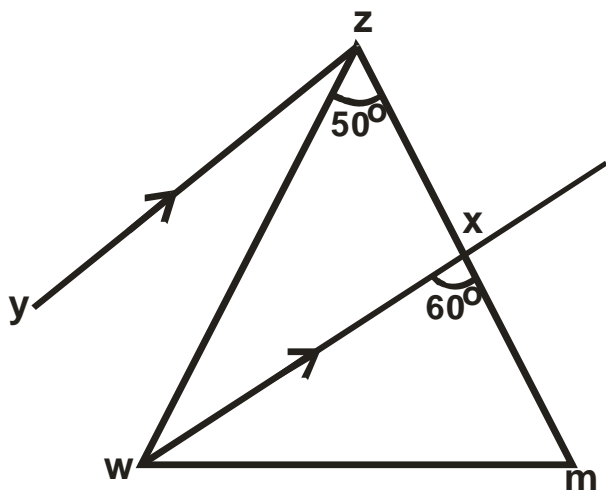
6. Kaula has two types of coffee, costing Ksh.120 and Ksh.200 respectively. He mixed them in the ratio 6 : 5 by weight.

   a) Determine to the nearest shilling the cost of one kilogramme of the mixture. (2 marks)

b) Find the percentage profit on the cost price if the mixture was sold at Ksh 250.

(give your answer in 2 d.p).   (2 marks)

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

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

8. Use squares, square roots and reciprocals tables only to evaluate;
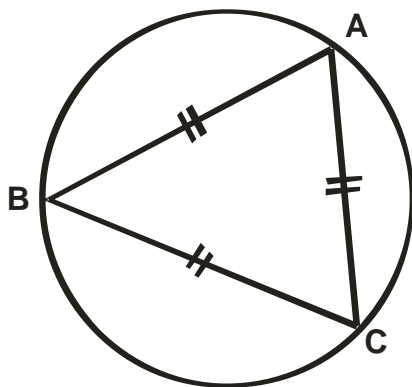
$$\frac{3}{\sqrt{42.15}} + \frac{4}{(3.152)^2}$$ (4 marks)

9. Make h the subject of the formula in

$$m = \frac{p}{\sqrt{h} + k^2}$$ (3 marks)

10. The diagram below shows an equilateral triangle ABC inscribed in a circle of radius 9cm. Calculate the length of the sides of the triangle (2 d.p)   (2 marks)


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

12. Use the trapezium rule to estimate the area bounded by the curve $y + x^2 = 4$ and the lines $y = 0$, $x = -2$ and $x = 2$ using four strips.   (3 marks)

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

14. Find the equation of the normal to the curve $y = (x^2 + 1)(x - 2)$ when x = 2. (4 marks)

15. a) Expand $\left(1 - \frac{1}{2}x\right)^5$ (1 mark)

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

16. The figure below shows a quadrilateral ABCD which is cyclic. Solve for x. (2 marks)
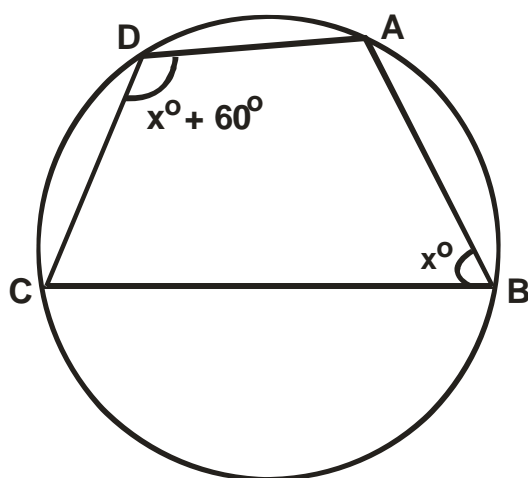
SECTION II (50 MARKS)

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

17. Mr. Kobe is a civil servant who earns a monthly salary of Ksh.21200. He has a house allowance of Ksh.12000 per month, other taxable allowances are commuter Ksh.1100, medical allowance Ksh.2000. He is entitled to a personal relief of Ksh.1240 per month.
Using the income rates below, solve the questions that follow.

| Income in Ksh. per month	Rates in Ksh per sh 20
1 – 8,400	2
8401 – 18,000	3
18001 – 30,000	4
30001 – 36,000	5
36001 – 48,000	6
Above 48,000	7

Determine;

a) i) His monthly taxable income. (2 marks)

ii) Net tax (PAYEE) (5 marks)

b) In addition to the PAYEE, the following deductions were made. Ksh.250 for NHIF, Ksh.120 service charges,he repays a loan at sh.4500 and contributes towards savings at sh.1800 every month. Calculate his net salary per month. (3 marks)

18. A triangle ABC has vertices A(-2, 6) B(2, 3) and C(-2, 3). Triangle $A^1B^1C^1$ is the image of triangle ABC under a reflection in the line x = -3.

a) Draw triangle ABC and its image $A^1B^1C^1$ on the same axis. (2 marks)

b) Triangle $A^1B^1C^1$ is mapped onto $A^{11}B^{11}C^{11}$ under a translation vector $\binom{10}{2}$. Given that A^{111}(6,-6) B^{111}(2, -3) and C^{111}(6, -3) are the images of $A^{111}B^{111}C^{111}$ under another translation.

i) Draw triangle $A^{11}B^{11}C^{11}$ (2 marks)

ii) Determine and describe fully the transformation that maps triangle $A^{11}B^{11}C^{11}$ onto triangle $A^{111}B^{111}C^{111}$ (3 marks)

iii) Describe fully the transformation that would map triangle ABC onto triangle $A^{111}B^{111}C^{111}$ (3 marks)

19. a) From whole numbers 1 to 10, a number is selected at random, find the probability that, the number selected is a prime or a multiple of 3. (2 marks)

b) A tetrahedron is thrown and a coin is tossed.

i) List down all the possible events in the probability space. (1 mark)

ii) Find the probability of getting atleast 2 and a head. (2 marks)

c) i) A bag contains 6 white marbles and some brown ones. If the probability of picking a brown marble is 0.6, find the number of marbles in the bag. (3 marks)

ii) Two marblesare then picked, one at a time from the bag in c(i) above, with replacement. Find the probability that the marbles picked are of different colours. (2 marks)

20. Three villages PQR are located from central town X which is on a bearing of 340° from another town Y. Village Q is east of town X and 6km from town Y, on the bearing of 040° while village P is on a bearing of 045° from town X. Village R and P are due north of town Y. Village R is on a bearing of 250° from village Q.

a) By scale drawing represent the above information in a diagram. (7 marks)

b)   From the diagram find;

i)   The bearing of village R from town X.   (1 mark)

ii)   The distance between;

Village P and Q   (1 mark)

Village R and town Y   (1 mark)

21.   ABCDEFGH is a prism where ABCD, FGHE, BCHG and ADEF are rectangles while AFGH and DCHE are trapezia. AB = 10cm, FG = 8cm, BC = 18cm and CH = 4.5cm.
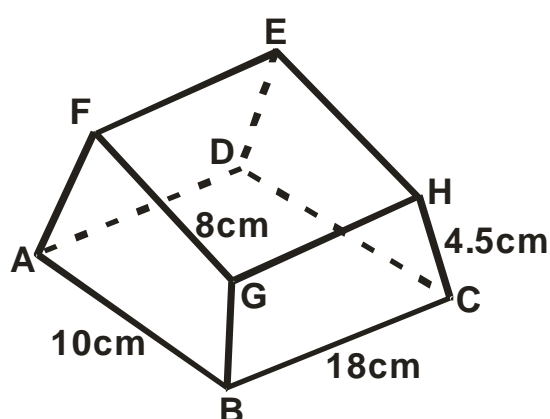
a)   Calculate the length of AH.   (4 marks)

b)   Calculate the angle between planes ABCD and BCHG.   (2 marks)

c)   The angle between the plane ABCD and ABHE   (2 marks)

d)   The volume of the prism.   (2 marks)

22.   a) Complete the table for $0° \leq x \leq 360°$ for the functions y = sin x and y = $\frac{1}{2}$ sin 2x (2 marks)

x	0	30	60	90	120	150	180	210	240	270	300	330	360
$\frac{1}{2}$ sin 2x	0.00		0.43			0.25	0		-0.43		-0.43		0
Sin x	0.00	0.5		1			0	-0.5			-0.87		0

6

b) Using a scale of 1cm represent 30° on the x-axis and 4cm to represent 1 unit on the y-axis, draw the graph of $y = \frac{1}{2}\sin 2x$ and $y = \sin x^o$ for $0^o \leq x \leq 360^o$ on the same axis. (5 marks)

c) Use your graph to find the range $\frac{1}{2}\sin 2x \leq \sin x$ (1 mark)

d) State the period and amplitude for the curve $y = \frac{1}{2}\sin 2x$ (2 marks)

23. The displacement s metres of a particle moving along a straight line after t seconds is given by
$$s = -2t^3 + \frac{3}{2}t^2 + 3t + 4$$

a) Find its initial acceleration. (3 marks)

b) Calculate;

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

ii) Its displacement by the time it comes to rest momentarily. (2 marks)

c) Calculate the maximum velocity attained. (2 marksA

certain carpenter has been contracted by a college to supply a number of beds and doors. He has to supply almost 100 items. He has a total of 480 man hours to do the work. In addition, the following conditions should be met.

	Beds	Doors
Minimum number of items	10	20
Man hours per item	2	6
Profit per item	200	300

Taking x to represent the number of beds and y the number of doors:

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

b) Represent the inequalities on the grid provided. (4 marks)

c) Find the maximum profit that can be got from the supply. (2 marks)

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Kenya Certificate of Secondary Education

KCSE TOP NATIONAL SCHOOLS TRIAL SERIES 2025

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

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

MARANDA SCHOOL TRIAL SERIES

121/2
MATHEMATICS ALT A
FORM FOUR

Time: $2\frac{1}{2}$ *HOURS*

INSTRUCTION TO CANDIDATE'S:

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

FOR EXAMINER'S USE ONLY:

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	TOTAL

Grand Total	

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Answer all questions in this section in the spaces provided

1. Use completing square method to solve $2x^2 - 4x - 5 = 0$ (3 marks)

2. Find the radius and the centre of a circle whose equation is $2x^2 + 2y^2 - 6x + 10y + 9 = 0$. (3 marks)

3. A bag contains 10balls of which 3 are red, 5 are white and 2 are green. Another bag contains 12balls of which 4 are red, 3 are white and 5 are green. A bag is chosen at random and then a ball chosen at random from the bag. Find the probability that the ball so chosen is red. (3 Marks)

4. (a) Expand and simplify the binominal expression $(1 + \tfrac{1}{2}x)^6$ (2 marks)

   (b) Use the expansion up to the fourth term to evaluate $(1.05)^6$ to 2 decimal places. (2 Marks)

5. The latitude and longitude of two stations **P** and **Q** are (47ºN, 25ºW) and (47ºN, 70ºW) respectively. Calculate the distance in nautical miles between **P** and **Q** along the latitude 47ºN. (3 Marks)

6. Solve the equation $4 \sin x = 5 - 4 \cos^2 x$ for $0° \le x \le 360°$ (4 Marks)

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

8. The marks obtained by 10 students in a math test were:- 25, 24, 22, 23, 20, 26, 21, 23, 22 and 24. Calculate the Standard deviation. (3 Marks)

9. Brand **A** tea costing Kshs.80 per kg is mixed with Brand **B** tea costing Kshs.100 per kg such that the mixture is sold at Kshs.114 making a profit of 20%. Find the ratio of **A:B** (3 Marks)

10. B varies partly as the square of **M** and partly as the inverse of **N**. **B,M** and **N** are such that when **M**=2, **N**= ½ , **B**=96 while when **M**= 3 , **N**=2, **B** = 46. Write an expression for **B** in terms of **M** and **N.**
(3 Marks)

11. The cash price of a T.V set is Ksh.26,000. Linda bought the set on hire purchase terms by paying a deposit of Ksh.6,000 and the balance by 24 equal monthly installments of Kshs.1,045.30. Find the compound rate of interest per year. (3 Marks)

12. Evaluate without using tables or calculators. (3 Marks)
Log (3x + 8) - 3 log2 = log (x – 4)

13. In the circle below chords **PQ** and **RS** interest intersect at **X** .Given that **RX**=8cm, **XS**=3cm and **PQ** =10cm.Calculate **PX** (3Marks)
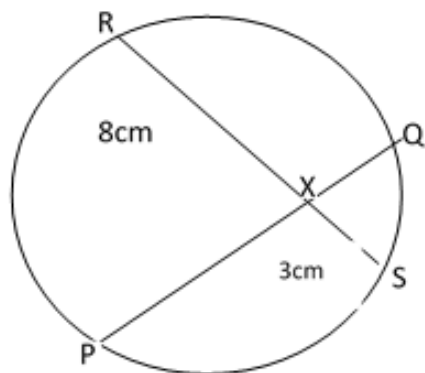
14. Given that the temperature of fluid A = 2.7°C, B = 9.8°C and C= 4.2^0, find the percentage error in calculation $\frac{A+B}{C}$ (3 marks)

15.   Simplify the expression $\dfrac{3x^2 - 4xy + y^2}{9x^2 - y^2}$ (3 Marks)

16. Simplify giving your answer in rationalised form   (3 marks)

$$\frac{Cos\,60^0}{Cos\,60^0 - Sin\,60^0}$$

SECTION 11 (50 MARKS)
Answer ONLY FIVE questions in this section in the spaces provided.

17. The table below shows income tax rates.

Monthly income in the Kenya shillings	Tax rates percentage (%) in each shilling
Up to 10164	10
From 10165 to 19740	15
From 19741 to 29320	20
From 29321 to 37040	25
From 37041 and above	30

In one year, Mr. Kamau's monthly earning was as follows:

Basic salary   20,000

House allowance   12,000

  Medical allowance 2,808

  Transport allowance 1,764

  a) Calculate:

  i.   Mr. Kamau's taxable income.   (2 marks)

  ii.   Tax charged on Mr. Kamau's earning   (4 marks)

  b) Mr. Kamau was entitled to the following tax reliefs:

  i.   Monthly personal relief at the rate of 15% of the premium paid. If Mr. Kamau paid a monthly premium of Kshs.2,500 and cooperative shares of Kshs.5,000 per month, calculate his net

       salary.   (4 marks)

18. a) Triangle XYZ has the vertices X(2,-1) Y(4,-1) and Z(4,2) is mapped onto triangle X'Y'Z' by transformation matrix $T_1=\begin{pmatrix} 1 & -3 \\ 0 & 1 \end{pmatrix}$. Determine the coordinates of X'Y'Z'. (2 Marks)

b) Another triangle X''(2,10) Y''(2,14) and Z'' (-4,-4) is the image of X'Y'Z' after transformation T_2. Determine the matrix of transformation T_2. (3 Marks)

c) Find the single matrix of transformation T^{-1} that maps X''Y''Z'' onto XYZ. (3 Marks)

d) Given that the area of triangle XYZ is 15 cm², Find the area of the triangle X''Y''Z''. (2 Marks)

19. The second, third and fourteenth terms of arithmetic progression are the three consecutive terms of a geometric progression. The 10th term of the arithmetic progression is 18. Find:
a) The first term and the common difference of the progression. (4 marks)

b) The sum of the first 10 terms of the Arithmetic progression. (2 marks)

c) The sixth term f the G.P. (4 marks)

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

x	0	15	30	45	60	75	90	105	120	135	150	165	180
sin 2x	0	0.5		1		0.5	0	-0.5				-0.5	
sin (2x + 30)		0.866	1		0.5	0			-1.0		-0.5		0.5

b) Draw the graph of y = sin 2x and y = sin (2x + 30°). On the same axis. Take 1cm to represent 15° on the horizontal axis and 4cm to represent one unit on the vertical axis. (5 marks)

c) Use the graph to solve $\sin(2x + 30^O) - \sin 2x = 0$ (1 mark)

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

e) State the period of $y = \sin)2x + 30^O)$ (1 mark)

21. In the figure below OAB is a triangle in which M divides OA in the ratio 2:3 and N

divides OB in the ratio 4:1. AN and BM intersects at X
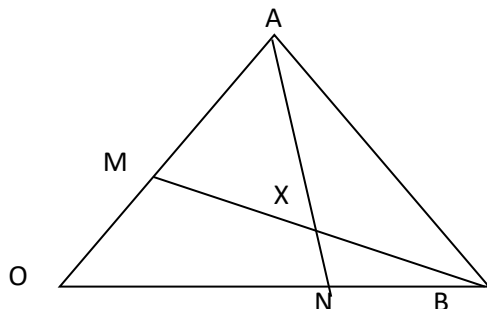
(a) Given that $OA = a$ and $OB = b$, express in terms of a and b

(i) AN (1 Mark)

(ii) BM (1 Mark)

(iii) AB (1 Mark)

(b) If $AX = sAN$ and $BX = tBM$, where **s** and **t** are constants, write two expressions for OX in terms of **a**, **b**, **s** and **t**. Find the value of **s** and **t** hence write OX in term of **a** and **b.**   (7 Marks)

22. The table below shows the masses of Form Four students in a school.

Mass (kg)	40-44	45 - 49	50-54	55- 59	60-64	65-69	70-74
No. of	3	30	29	33	13	1	1

Using an assumed mean of 57, calculate :

a) the mean   (3 marks)

b) the standard deviation   (4 marks)

c) The lower quartile. (3 marks)

23. Using a ruler and a pair of compass only.
  a) Construct a triangle PQR such that PR=7.5 cm, PQ=5.0 cm and $< QPR = 60^0$. (3 Marks)

  b) Construct the locus T of points which are equidistant from a point L and passes through the vertices P, Q and R. (2 Marks)
  c) Locate the locus S on T such that it is equidistant from sides PQ and QR of the triangle. (2 Marks)
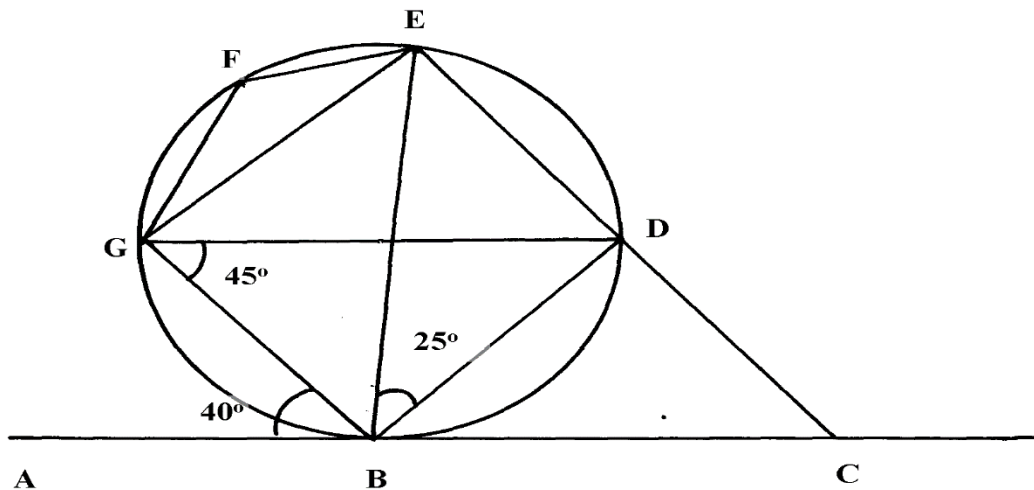
  d) Locate the locus of points G enclosed by PQ and QS such that QG< $3.5cm$. (2 Marks)

  e) Measure SL. (1 Mark)

24. In the figure below ABC is a tangent to the circle at B. Given that <ABG=40°, <BGD=45°, and <DBE=25° as shown below.

Find the sizes of the following angles giving reasons in each case:

  a) ∠BDG (2 Marks)

  b)∠DGE (2 Marks)

  c)∠EFG (2 Marks)

  d)∠CBD (2 Marks)

  e)∠BCD (2 Marks)

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

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

STAREHE GIRLS' CENTRE MOCK EXAMINATION 2024

MATHEMATICS
Paper 2
Time: 2½ Hours

Instructions to candidates

1. *Write your name, admission number and class in the spaces provided above.*

2. *The paper contains two sections: **Section I** and **Section II**.*

3. *Answer **ALL** the questions in **Section I** and **ANY FIVE** questions from **Section II**.*

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

5. *Marks may be awarded for correct working even if the answer is wrong.*

6. *Negligent and slovenly work will be penalized.*

7. *Non-programmable silent electronic calculators and mathematical tables are allowed for use.*

For Examiner's use only

Section I

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

Section II

17	18	19	20	21	22	23	24	Total

Grand Total %

Section I – (50 marks). Answer all questions

1) Use logarithm tables to solve 4marks

$$\left(\frac{2.925\times0.0784}{log432.4}\right)^{\frac{-2}{3}}$$

2) a. Expand and simplify $\left(\frac{1}{2}x - \frac{1}{3}y\right)^4$ 2marks

   b. Hence evaluate $\left(\frac{1}{\sqrt{2}} - \frac{1}{\sqrt{3}}\right)^4$ leaving your answer in surd form 2marks

3) A mixture is made by mixing 4kg of long grain rice costing sh 60 per kg with 9kg of short grain rice costing sh 50 per kg. How many kilograms of long grain rice should be added to the mixture so that the resulting mixture can be sold at sh 66 per kg and a profit of 20% is made.
3marks

4) Find the centre and radius of a circle whose equation is $2x^2 + 2y^2 - 12y - 14 = 0$

   3marks

5) Peter invested a certain amount of money in a financial institution at compound interest compounded quarterly. At the end of the third year it had amounted to sh 18980 and by the end of the fifth year it had amounted to sh 20530. Find the rate of interest

   4marks

6) A point C divides the line AB with coordinates A (3, 4 ,-5) , B (-1,10,7) externally in the ratio 5 **:** 3. Find the coordinates of C 3marks

7) A and B are points on latitude 70^0N.Their longitudes are 62^0W and 118^0E respectively. Find the shortest distance between A and B in nautical miles. 2marks
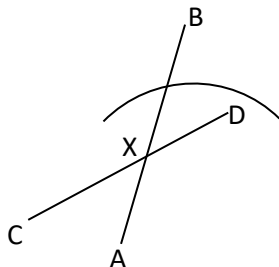
8) Estimate the area enclosed by the curve $y = \frac{1}{4x+1}$ and the *x* axis from $x = 0$ to $x = 2$ using mid ordinate rule with four strips. (Leave your answer as a fraction).

3marks

9) In the figure below AB and CD are chords intersecting internally at point X. If CD = 6.5cm, CX = 2.5cm and BX = 2.2 cm Calculate the length of AX.

2marks

10) Calculate the standard deviation of the given data   3marks

3, 7, 2, 1, 8, 9, 13, 6, 4, 7

11)   Make C the subject of a formula in the equation   3marks

$$v^2 = \frac{r}{3} + \sqrt{\frac{1+c^2}{r^2}}$$

12) The forth term of a geometric sequence is 48 and the seventh term is 384.Find the common ratio and the ninth term of the sequence.   3marks

13) The masses of two objects to the nearest 100g are 51kg, and 43kg find the percentage error in the difference of their masses.   3marks

14) Solve the equation $9tan^2\theta + tan\theta = 10$ for $0^0 \le \theta \le 360^0$ 4marks

15) The volume V of a cylinder varies jointly as the square of the radius R and the height H. If the radius is increased by 10% and the height decreased by 20% find the percentage change in the volume.   3marks
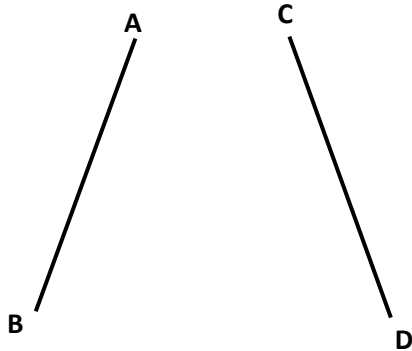
16) a. Determine the inverse of the matrix $T = \begin{pmatrix} 1 & 2 \\ 1 & -1 \end{pmatrix}$ 1mark

   b. Hence find the co-ordinates of the point of intersection of the lines whose equation are $x + 2y = 7$ and $x - y = 1$ 2marks

SECTION II – (50 MARKS).
Answer ONLY five questions

17. a. AB and CD are chords of a circle Construct the circle with centre O and measure its radius 4marks

b. Construct the loci of a points x which are equidistant from line AB and CD   1mark

c. locate the loci of a points Y which are equidistant from points C and D   1mark

d. Construct the loci of a points Z which are 2cm from the circumference of the circle.
                                                                     1marks

e. A point P moves such that CP ≥ DP, It is not more than 2cm from the circumference of the circle and its distance from line CD is not more than its distance from AB. Show the region P by shading it.   3marks

18)a. Complete the table below, giving values correct to two decimal places.

2marks

x^0	0	15	30	45	60	75	90	105	120	135	150	165	180
Tanx^0													
2sin2x^0 - 2													

b. Draw the graph of $y = tanx^0$ and $y = 2sin2x^0 - 2$ 4marks

c. From your graph state the amplitude and period of $y = 2sin2x^0 - 2$ 1mark

d. Use your graph to solve the equation   2marks
    i. $\frac{1}{2}tanx^0 + 1 = sin2x^0$

    ii. $sin2x^0 = 0$ 1mark

19 In order to ensure optimal health a lab technician needs to feed the rabbits on a daily diet containing a minimum of 24grams of fat, 36grams of carbohydrates and 4grams of protein. Rather than order rabbit food that is custom blended it is cheaper to order food X and food Y and blend them for an optimal use. One packet of food X contains 6grams of fat ,12 grams of carbohydrates ,2 grams of proteins and costs Sh 50.While one packet of food Y contains 12grams of fat,12 grams of carbohydrates,1 gram of proteins and it costs
Sh 60

a. Form all the inequalities to represent the information above.   4marks
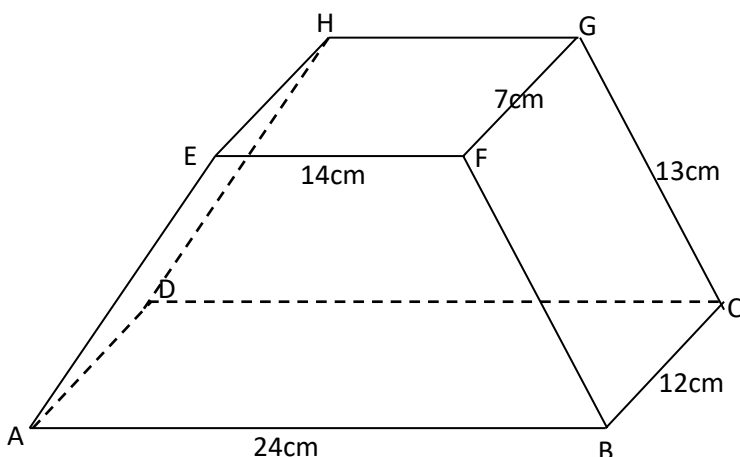
b. Graph the inequalities   4marks

c. Determine the number of packets of type X and Y feed that should be used for optimal health at minimum cost.   2marks

20. The diagram below shows the frustum of a rectangular based pyramid. The base ABCD is a rectangle of side 24cm by 12cm.The top EFGH is a rectangle of side 14cm by 7cm.Each of the slanting edges of the frustum is 13cm.

Determine the
a. altitude of the frustum   4marks

b. angle between the line AG and the base ABCD   3marks

c. Volume of the frustum   3marks

21. At the Kenya medical research institute a new drug is being tried. A sample of eighty sick rats is being used. Sixty of these rats are given drugs and the rest are not. A half of those given drugs are put on a high calorie diet while three quarters of those who are not given drugs were put on the same diet. For the ones who are treated and put on a high calorie diet the probability of dying is 0.1 and 0.2 if not put on a high calorie diet. For the ones who are not treated and put on a high calorie diet the probability of dying is 0.4 and 0.6 if not put on a high calorie diet.
   a. Draw a tree diagram to represent the above information.   2marks

   b. Calculate the probability that a rat picked at random
      i.   Is given drugs, put on a high calorie diet and will die   1mark

      ii.   Is given drugs and will die .   2marks

      iii. Will die   3marks

      iv.   Is not given drugs and will not die   2marks

22. The table below shows the rate at which income tax was charged for all income earned in the year 2012

Taxable income per month in k£	Rate of tax per k£
1 - 236	10%
237 - 472	15%
473 - 708	20%
709 - 944	25%
945 and above	30%

a. A tax of ksh1200 was deducted from Mr. Rono's monthly salary. He was entitled to a personal relief of ksh 1064 per month. Calculate his monthly

   i.   Gross tax in k£.   1mark

   ii.   Taxable income in ksh 5marks
b. He was entitled to a house allowance of ksh 3000 and medical allowances of ksh 2000 calculate his monthly basic salary in ksh.   1mark

c. Every month the following deductions were made from his salary electricity bill of sh 680, water bill of sh 460, co-operative shares of sh1250 and loan repayment of sh 2000 calculate his net salary in ksh.   3marks

23. A particle is moving with an acceleration of $(t - 4)$ m/s^2 where t is time in seconds. When t is 2 seconds the velocity is 4m/s and when t is 0 the displacement is 0m

   a. Express velocity in terms of t   2marks

   b. Find the displacement of the particle during the third second.   2marks

   c. Calculate the interval of time when the velocity was not more than 4m/s
                                                            3marks

   d. Calculate the minimum velocity.   3marks

24. In the figure below O is the centre of the circle and ABCDEA is a regular polygon inscribed in a circle. Line GEF is a tangent to the circle at point E

   A) Find angle
      i.   AEG   1marks

      ii. OEC   2marks

      iii. DFE   2marks

      iv. Obtuse angle AOC   2marks

   B) If the sides of the pentagon are 6cm find the area of the circle giving your answer to one decimal place   3marks

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Kenya Certificate of Secondary Education
KCSE TOP NATIONAL SCHOOLS TRIAL SERIES 2025

Name …………………………………… **Admission number** ……………………
Candidate's Signature…………………………Date……………………………………

ASUMBI GIRLS HIGH SCHOOL TRIAL SERIES

121

MATHEMATICS

FORM 4 PAPER 2

TIME: 2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

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

For Examiner's Use Only

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

17	18	19	20	21	22	23	24		Grand	
									Total	

1

SECTION I (50 Marks)

Answer all questions in this section.

1. Without using mathematical tables or a calculator, evaluate:
   $2 \log 5 - \frac{1}{2} \log 16 + 2 \log 40.$ (3 marks)

2. a) Expand and simplify the binomial expression $(2 + x)^5$ upto the term in x^3. (2 marks)

   b) Use your expression to estimate the value of $(1.97)^5$ (2 marks)

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

4. At point A, Grace observed the top of a flag post at an angle of $30°$. After walking 25 m towards the foot of the flag post, she stopped at point B where she observed it again at angle of $60°$. Find the height of the flag post. (3 marks)

5. Simplify $\dfrac{\sqrt{5}}{\sqrt{7}-\sqrt{2}}$ (2 marks)

6. (a) Find the range of values of x which satisfies the following inequalities simultaneously (3 marks)

   $$4x - 9 \le x + 6$$
   $$4 + x \ge 8 - 3x$$

   (b) Represent the range of values of x in (a) above on a number line. (1 mark)

7. Make t the subject of the formula; $s = ut + \frac{1}{2}at^2$ (3 marks)

8. A trader mixes 350 kg of beans type A costing Sh. 84 per Kg with 140 kg of beans type B costing Sh. 105 per Kg. Calculate the selling price per kg of the mixture if the trader makes a profit of 25% (3 marks)

9. The figure below is a graph of $y = 2x^2$ for $-1.5 \leq x \leq 2.5$.
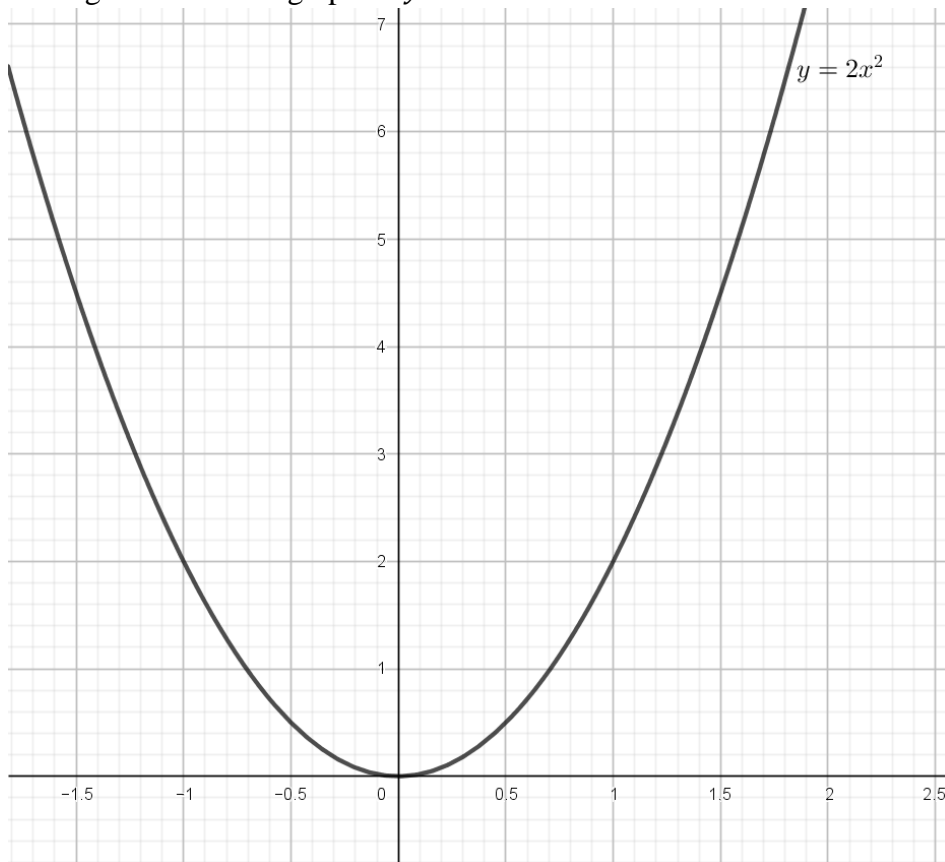
Use the graph to find the gradient at:
   (i) $x = 1.5$ (2 marks)

   (ii) $x = -0.8$ (2 marks)

10. Given the function $y = 2\cos(x + 30°)$ for $0° \leq x \leq 540°$, state:
   i. The period (1 mark)

   ii. The phase angle (1 mark)

3

11. Determine the interquartile range for the following set of numbers (2 marks)

10,15,14,17,12,13

12. The diagram below represents a cuboid PQRSTUVW in which UV = 4.5cm, VW = 8cm and WR = 6cm
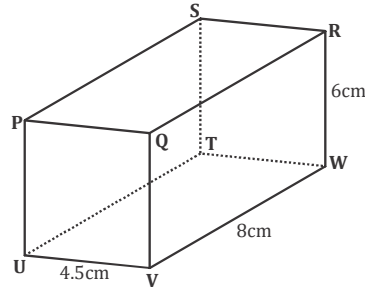
Calculate the size of the angle between the lines UR and UW (3 marks)

13. Given that $r = i + 2j - k, s = 4i - j + 2k, t = 2i + 3k$ and O is the origin, determine the coordinates of P if $OP = r - 3s + t$. (3 marks)

14. Bag contains 14 beads of which x are red and the remainder blue .When 4 Red beads are removed ,the probability of selecting a red bead is $\frac{2}{5}$ .Find the value of x (3 marks)

15. Calculate the area of the unshaded region given that AC is an arc of a circle centre B. Given that AB = BC = 14cm, CD = 8cm and angle $ABD = 75°$ (3 marks)

4
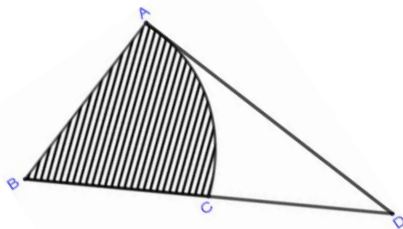
16. If $A = 2.3, B = 8.7$ and $C = 2.2$, find the percentage error in $\frac{A+B}{C}$ (4 marks)

SECTION B (50 Marks)

17. The mass, m, grams of a cylinder varies jointly as the square of its radius, r, and its height, h.

   a) Find the percentage change in the mass if the radius is tripled and the height is halved. (3 marks)

   b) Given that $m = 990g$ when $r = 3cm$ and $h = 7cm$;
      i.   Find the equation connecting m, r and h. (3 marks)

      ii. Calculate the value of m when r =3.5cm and h =5cm. (2 marks)

   c) Taking $\pi = \frac{22}{7}$ calculate the density of the cylinder (2 marks)

18. The table below shows the distribution of marks scored by 60 students in a test.

Marks	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
Frequency	2	5	6	10	14	11	9	3

   a) On the grid provided draw a cumulative frequency curve of the data. (3 marks)
   (Take 1cm to represent 5 students on the vertical scale and 1 cm to represent 10 marks on the horizontal scale).

   b) From the curve in (a) above
      i.   Estimate the median mark (1 mark)

      ii. Determine the quartile deviation. (2 marks)

iii. Determine the 10th and 90th percentile range. (2 marks)

c) It is given that students who score over 45 marks pass the test. Use your graph in (a) above to estimate the percentage of students that pass. (2 marks)

19. Seats in the theatre area arranged in rows. The number of seats in this theatre form the terms of an arithmetic series.
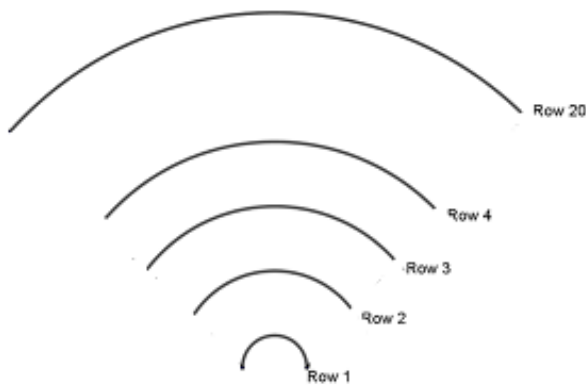

The sixth row has 23 seats and the fifteenth row has 50 seats. The theatre has 20 rows in total. Find:
i. The number of seats in the first row. (4 marks)

ii. The number of seats in the eleventh row. (2 marks)

iii. The number of seats in this theatre. (4 marks)

20. The figure below represent a model of a solid structure in the shape of a frustum of a cone with a hemispherical top. The diameter of the hemispherical part is 70cm and is equal to the diameter of the top of the frustum. The frustum has a base diameter of 30 cm and slant height of 60 cm (use $\pi = 3.142$)

6
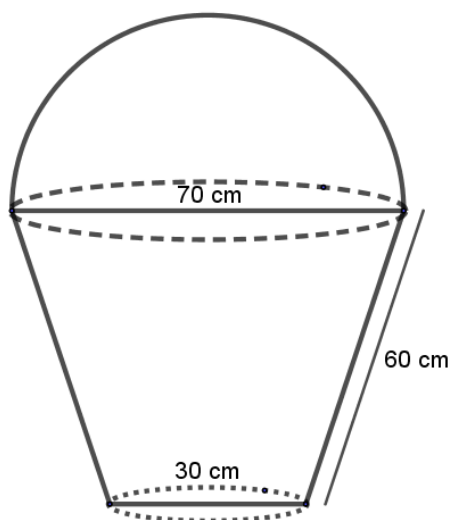
Calculate

    a) The area of the hemispherical surface. (2 marks)

    b) The slant height of cone from which the frustum was cut. (2 marks)

    c) The surface area of the frustum. (2 marks)

    d) The area of the base (2 marks)

    e) The total surface area of the model. (2 marks)

21. 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;   (3 marks)
NHIF – Ksh 1000,
Union dues – Kshs 455
BBF – Ksh 200.

22. Machine K makes 45% of the biscuits. Machine J makes 30% of the biscuits. The rest of
the biscuits are made by machine L. It is known that 2% of the biscuits made by machine
J are broken, 3% of the biscuits made by machine K are broken and 5% of the biscuits
made by machine L are broken. A biscuit is selected at random.
  a. Draw a tree diagram to illustrate all the possible outcomes and associated
   probabilities.   (2 marks)
  b. Using the tree diagram, calculate the probability that the biscuit is:
    i. Made by machine J and is not broken.   (3 marks)
    ii. Broken.   (3 marks)
    iii. Broken but not made by machine K.   (2 marks)

23. The diagram below shows a circle center **O.** BF is a tangent to the circle at **B.** Angle
$DAC = 20^0$ and angle $FBD = 50^0$
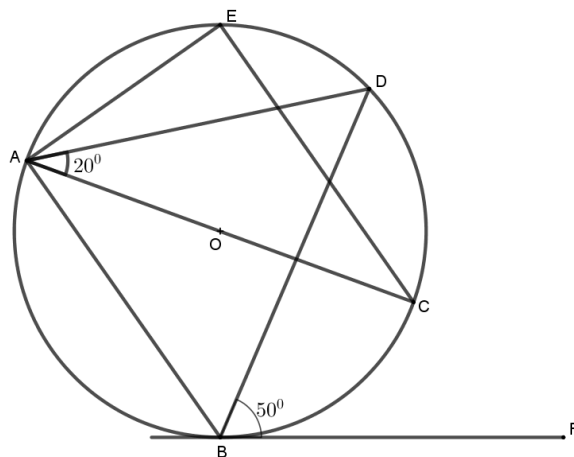
Giving reasons in each case, find;
a) Angle AEC   (2 marks)

8
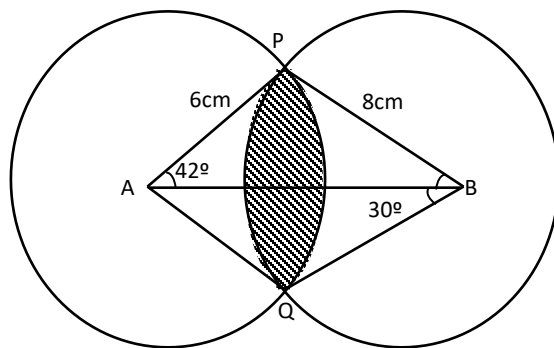
b) Angle CAB   (2 marks)

c) Angle ADB   (2 marks)

d) Angle BCD   (2 marks)

e) Angle AOB (**reflex)**   (2 marks)

24. The figure below shows two circles centres A and B and radii 6 cm and 8 cm respectively. The circles intersect at P and Q. Angle PAB = 42^0 and angle ABQ = 30^0.

(a) Find the size of angle PAQ and angle PBQ.   (2 marks)

(b) Calculate, to one decimal place the area of:
     i. Sector APQ and PBQ.   (2 marks)

     ii. Triangle APQ and PBQ.   (2 marks)

   iii. The shaded area (Take $\pi = \frac{22}{7}$)   (4 marks)

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

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

ALLIANCE BOYS HIGH SCHOOL

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 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.
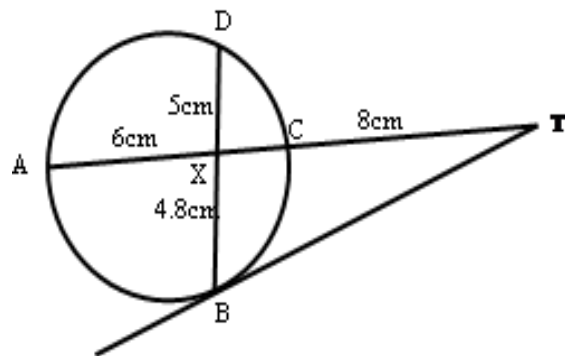
Find the length of **BT**.   (3Marks)

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 $\mathrm{Sin}(3x - 10)^0 = 0.4337$ 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 = 90^0 and angle BAC = 60^0.

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 =30^0

   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**.
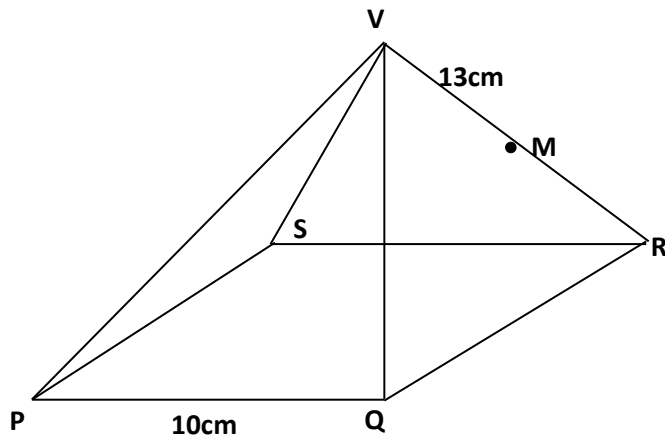

Find to 2 decimal places

(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)
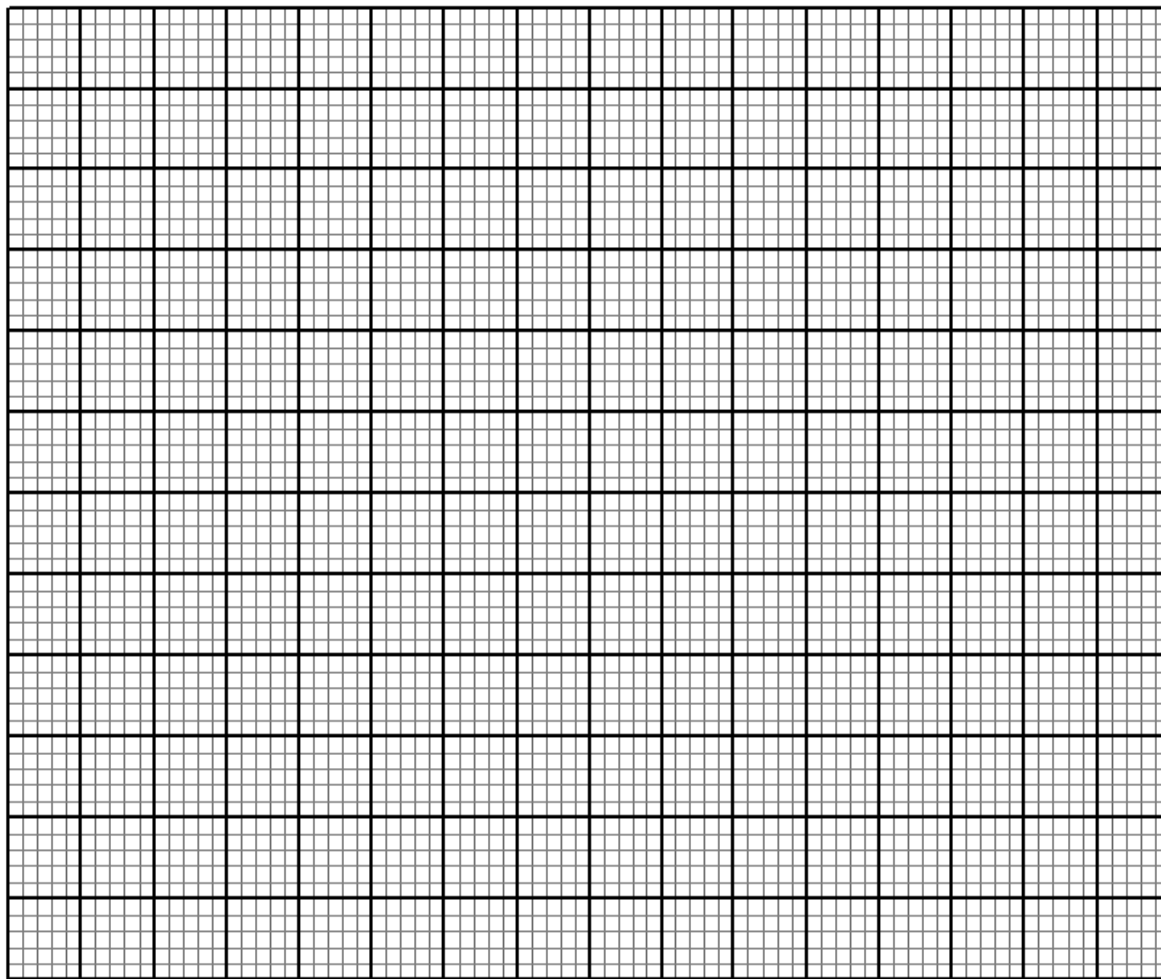
c) Use the graph to solve $sin\ (\ 2x\ +\ 30) - sin\ 2x\ =\ 0$ (1mk)

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. $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$
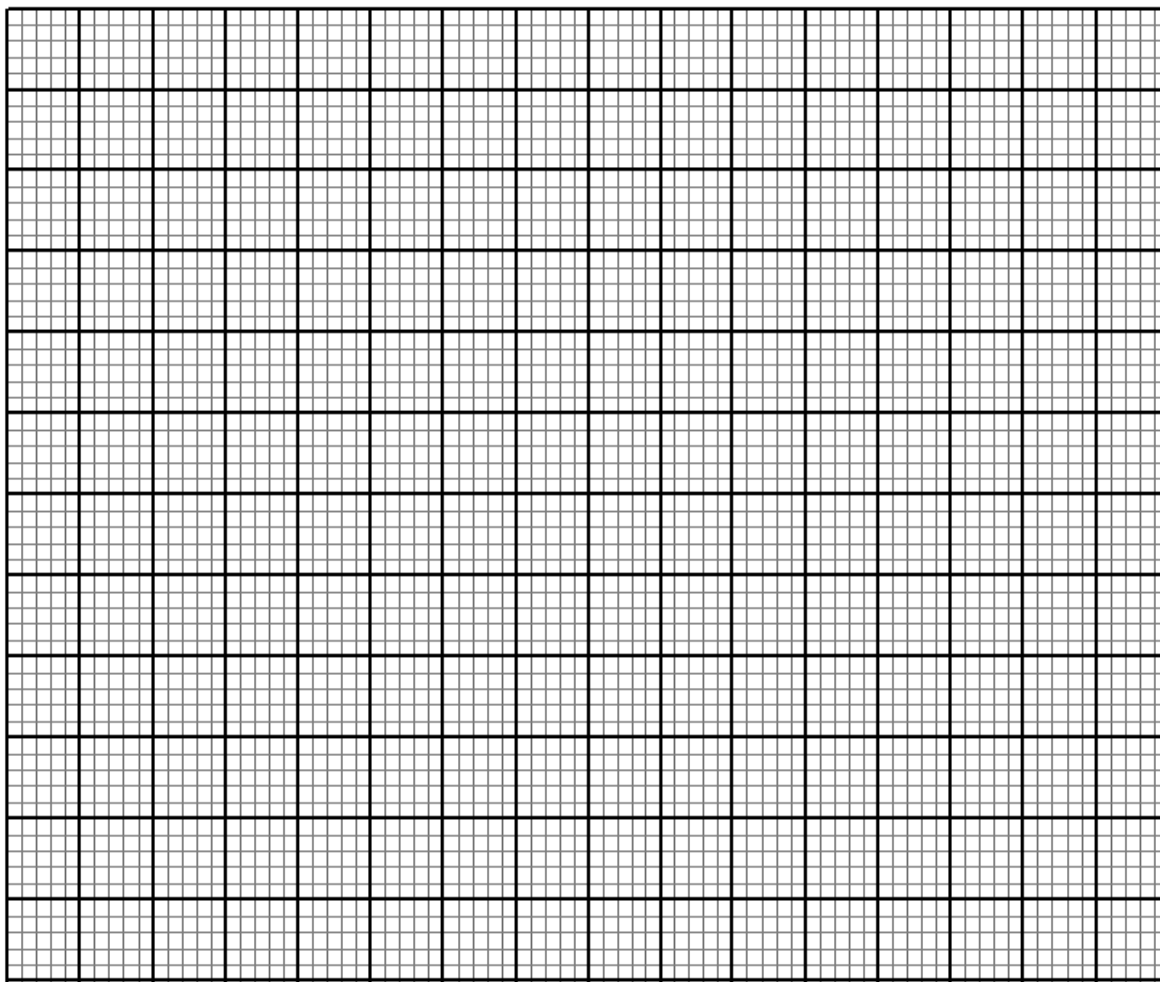
a) Find the coordinates of $O^1A^1B^1C^1$ (2mks)

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)

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Kenya Certificate of Secondary Education
KCSE TOP NATIONAL SCHOOLS TRIAL SERIES 2025

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

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

ALLIANCE GIRLS HIGH SCHOOL

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 B (50 MARKS)

Do all questions in this section

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 $\dfrac{1}{r}=\dfrac{1}{p^2}+\dfrac{1^{\square}}{q}$ (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°.
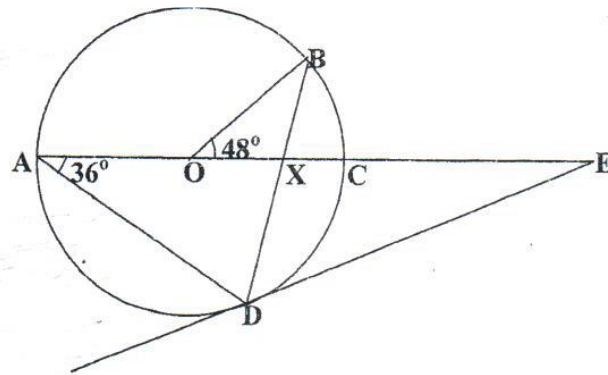
A) Find the value of the following angles:-
   i)   Angle ADE   (2 marks)
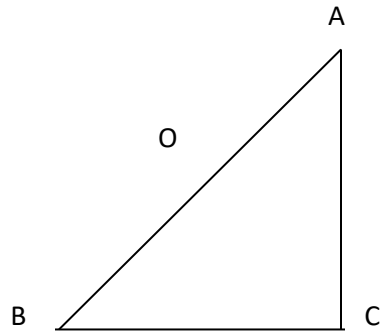
   ii)   Angle BCD   (2 marks)

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 $0\ 0 \le x \le 8$ 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 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)
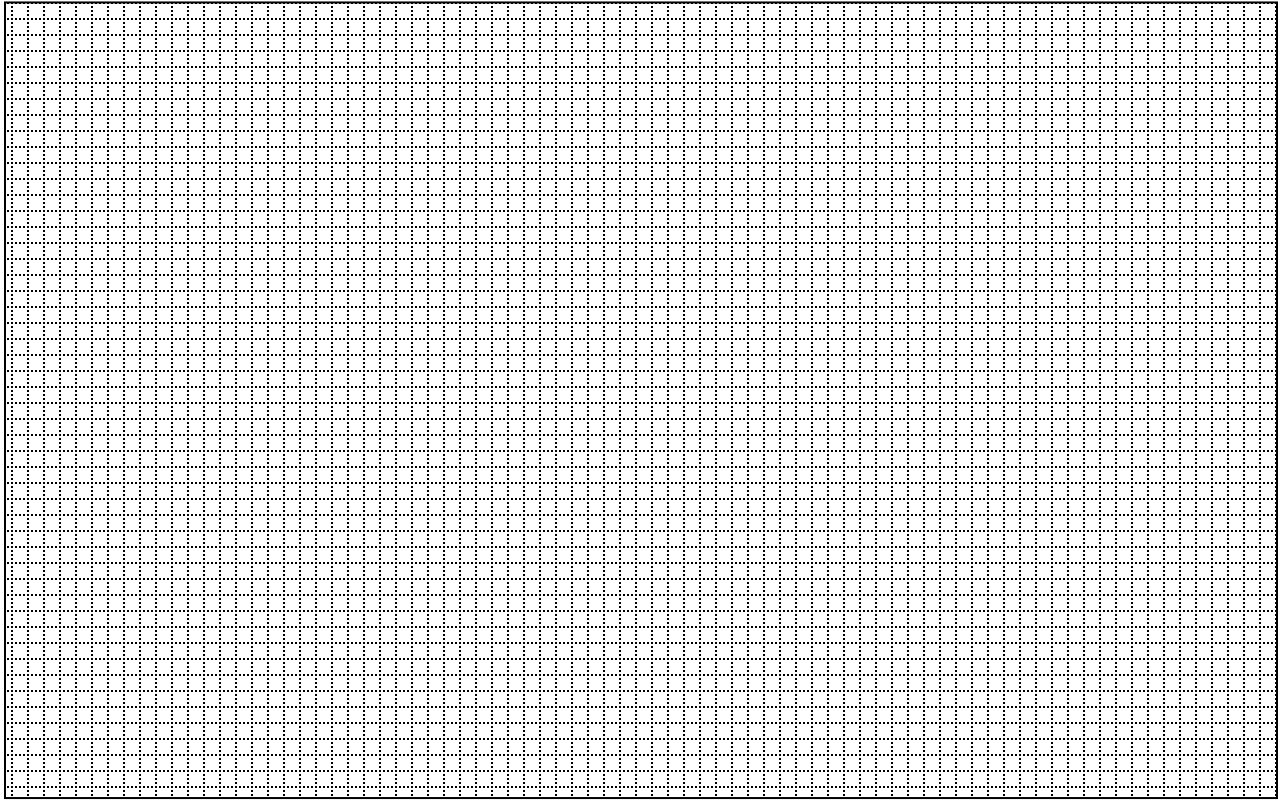
b) Use the graph to estimate the median mark   (2 marks)

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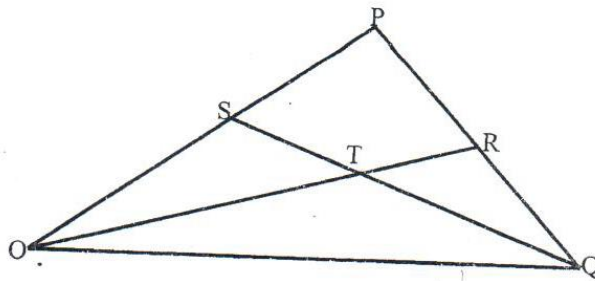
In the figure above, OPQ is a triangle in which QS = ¾ OP and RP = 2:1

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)
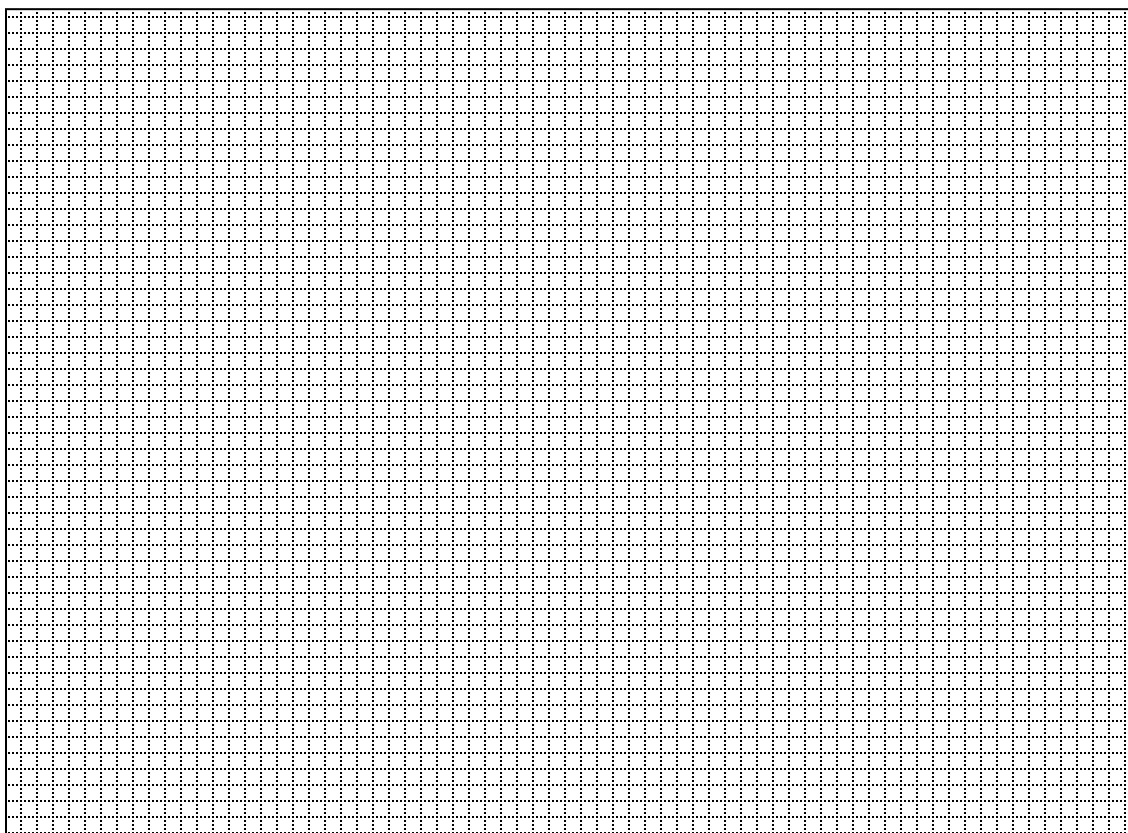
c) Use your graph to estimate to roots of the equation $x^3 - 2x^2 - 4x + 7 = 0$ (1 mark)

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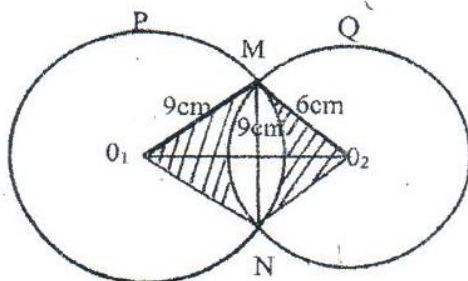
a) Find the value of
   i.   Angle MP_1N.   (2 marks)

   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)

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

FRIENDS' SCHOOL KAMUSINGA TRIAL 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 [ ]

*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 $(60^0\text{N}, 0^0)$, 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.
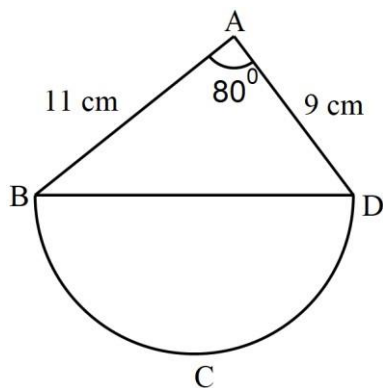
Calculate the area of the semi-circle, correct to 2 decimal places. Use $\pi = 3.142$ (4 marks)

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)

8
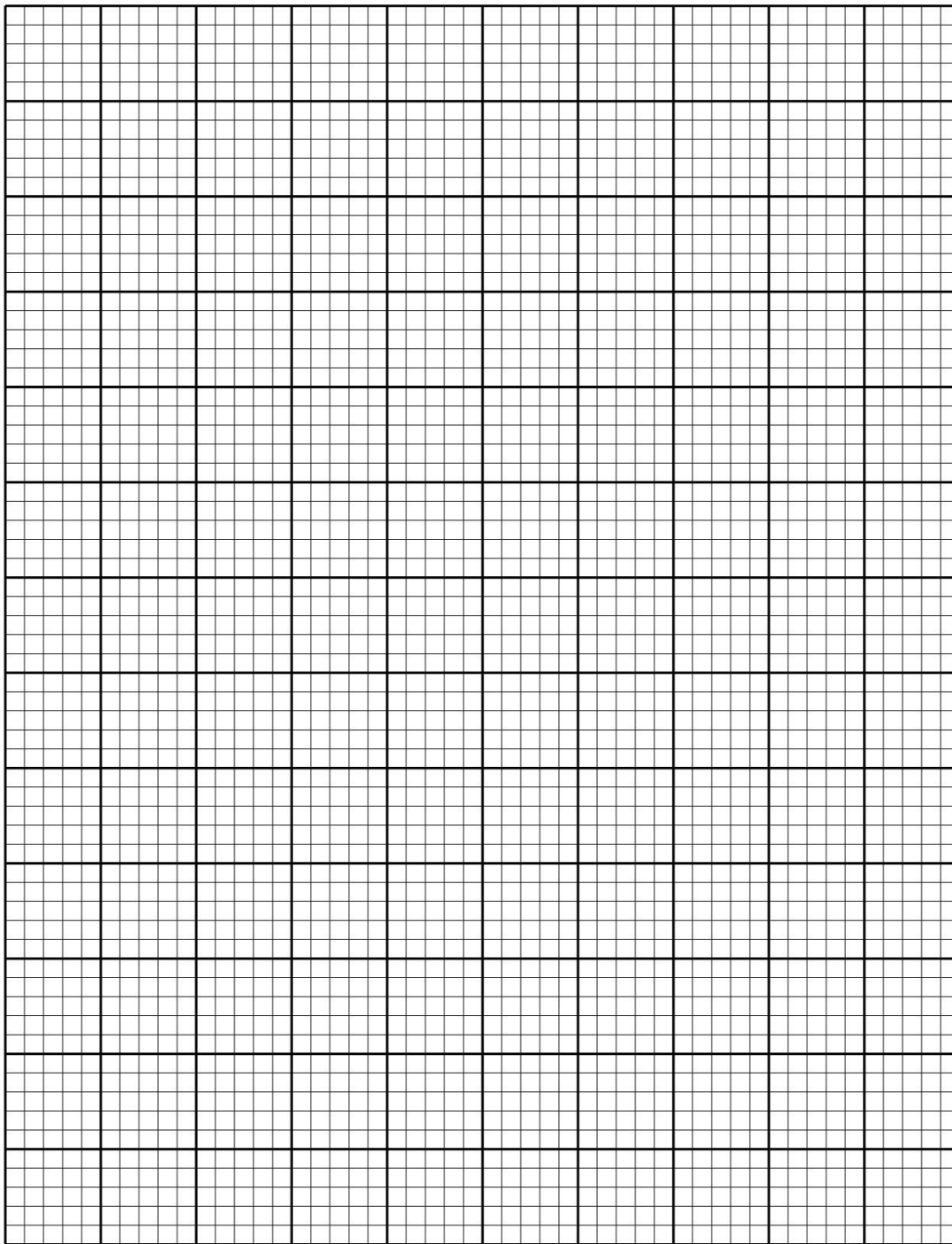
(c) Triangle $A''B''C''$ is the image of triangle $A'B'C'$ under a transformation represented by the matrix
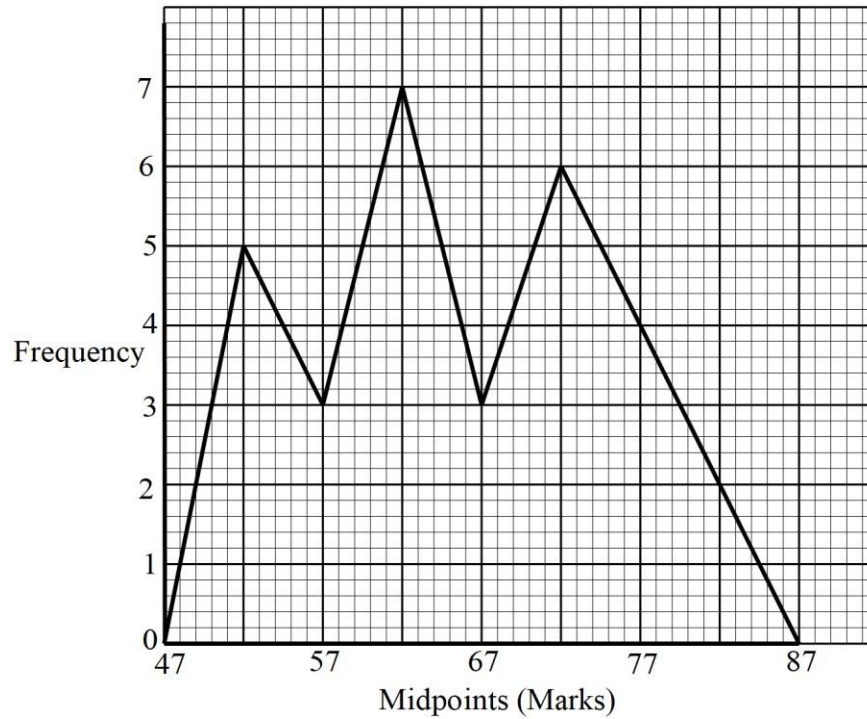
$$\begin{pmatrix} -1 & 0 \\ 0 & -2 \end{pmatrix}$$

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

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

(d) Another transformation **T** maps $\square A''B''C''$ on to $\square A'''B'''C'''$ 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.
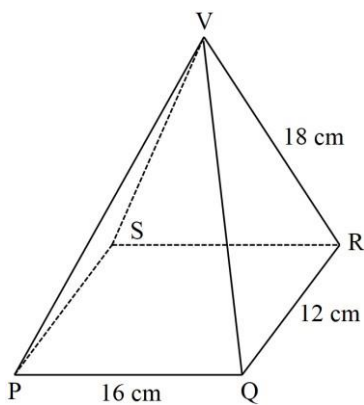
Calculate, correct to 2 decimal places;

(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)

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KAPSABET HIGH SCHOOL TRIAL 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

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: $M = \sqrt{\dfrac{x\text{-}p}{p(1+px)}}$ (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 $(1\text{-} \tfrac{1}{2}x)^6$ (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 Rare
    $2i + 3j + 13k$ and $5i — 3j + 4k$ respectively. Q divides FR 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, $-^5/_2$) is the mid-point of

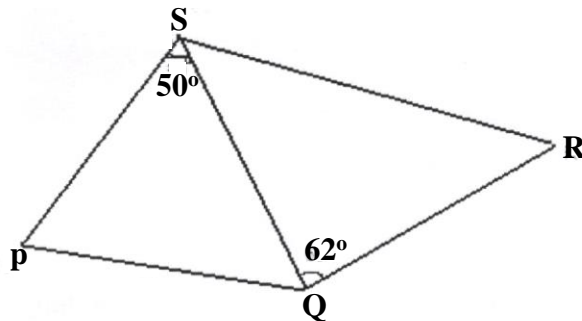the line segment CP.
(a) Calculate the co-ordinates of P   (1 mk)

(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 $y = ax^n$.


log y

(7,0)

log x

(0,3.5)
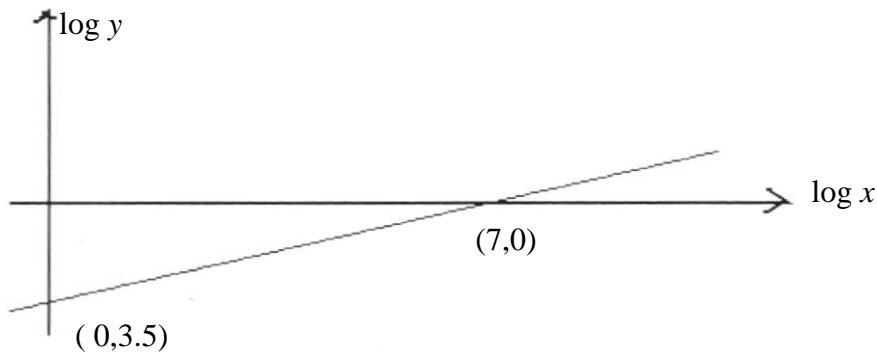
Use the graph to calculate the values of *a* and *n* (3mks)

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 2Cos 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)
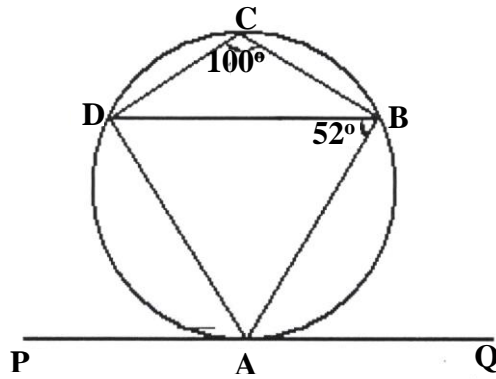
Find angle DAB and angle BAQ. giving reasons for your answer.

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 $\frac{1}{5}$ while if he goes by bus, the probability that he will be late is $\frac{1}{8}$.
    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.
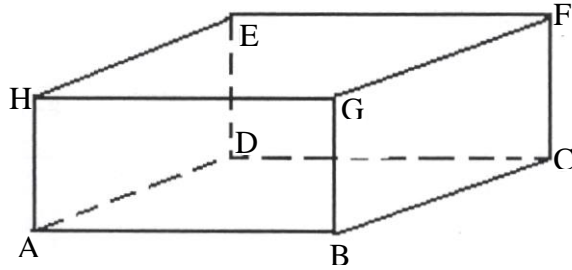
Determine:
a) the length
(i) AC   (2mks)

(ii) AF   (2mks)

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

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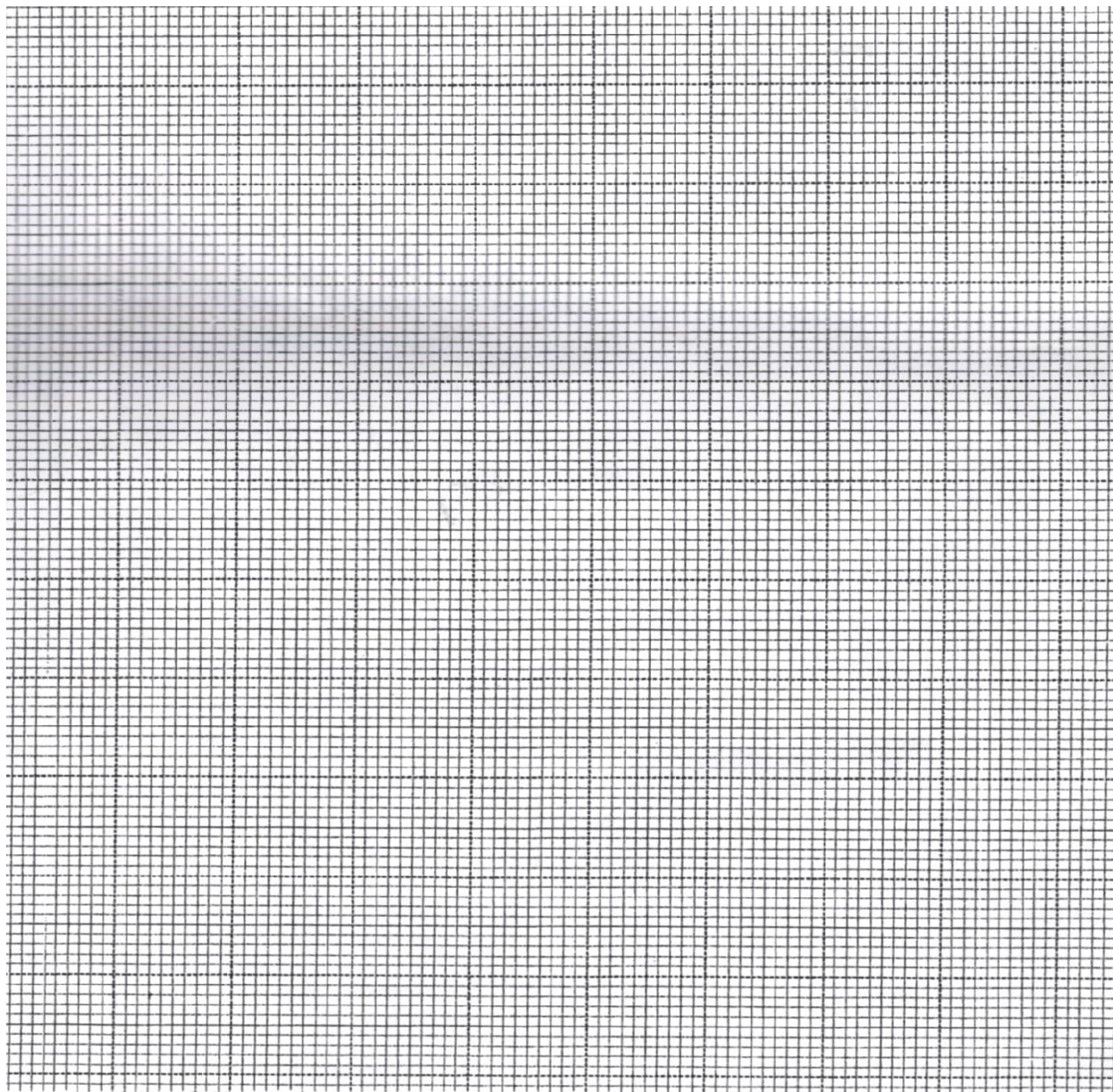

d) Find the angle between line EG and line DC   (2mks)

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 $-2 \le x \le 5$ (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)
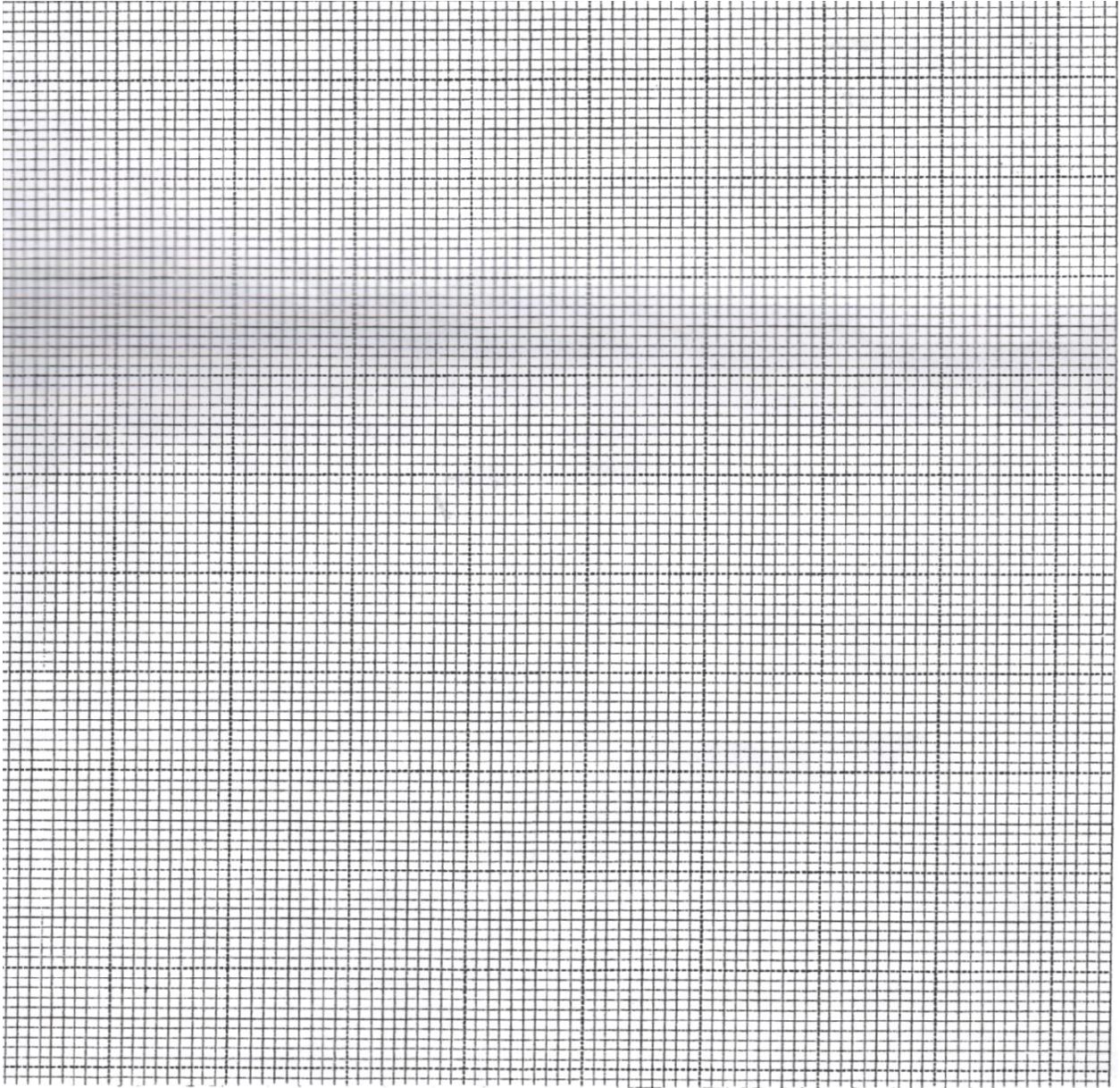
23   (a) Calculate the turning point of the function $y = x^3 - 3x$ and state their nature. Hence sketch the curve.   (5mks)

      (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)

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KENYA HIGH SCHOOL TRIAL 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.
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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

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

2. Expand $\left(1 + \frac{1}{x}\right)^9$ 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)
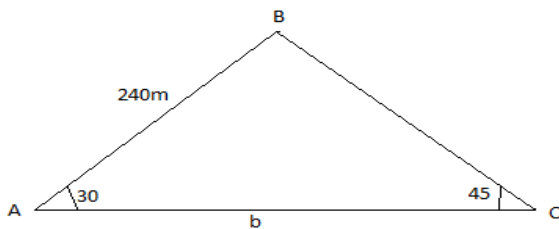
4. Without using a mathematical tables or calculators, simplify $\dfrac{3}{\sqrt{7}-\sqrt{2}} - \dfrac{2}{\sqrt{2}+\sqrt{7}}$ (3marks)

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)

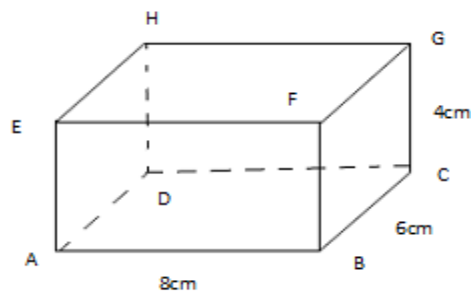15. Calculate the mean absolute deviation in the following 9,2,3,4,5,5,7,8,1.   (3marks)

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 = 90º (3marks)

19. In the figure below AB and AC are tangents to the circle center O at B and C respectively, the angle AOC = 60⁰, radius of the circle 5cm.
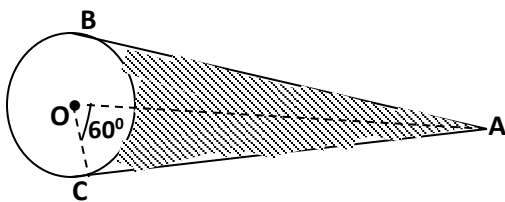
Calculate;

a) The length of AC (2marks)

b) The area of triangle OAC (2marks)

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

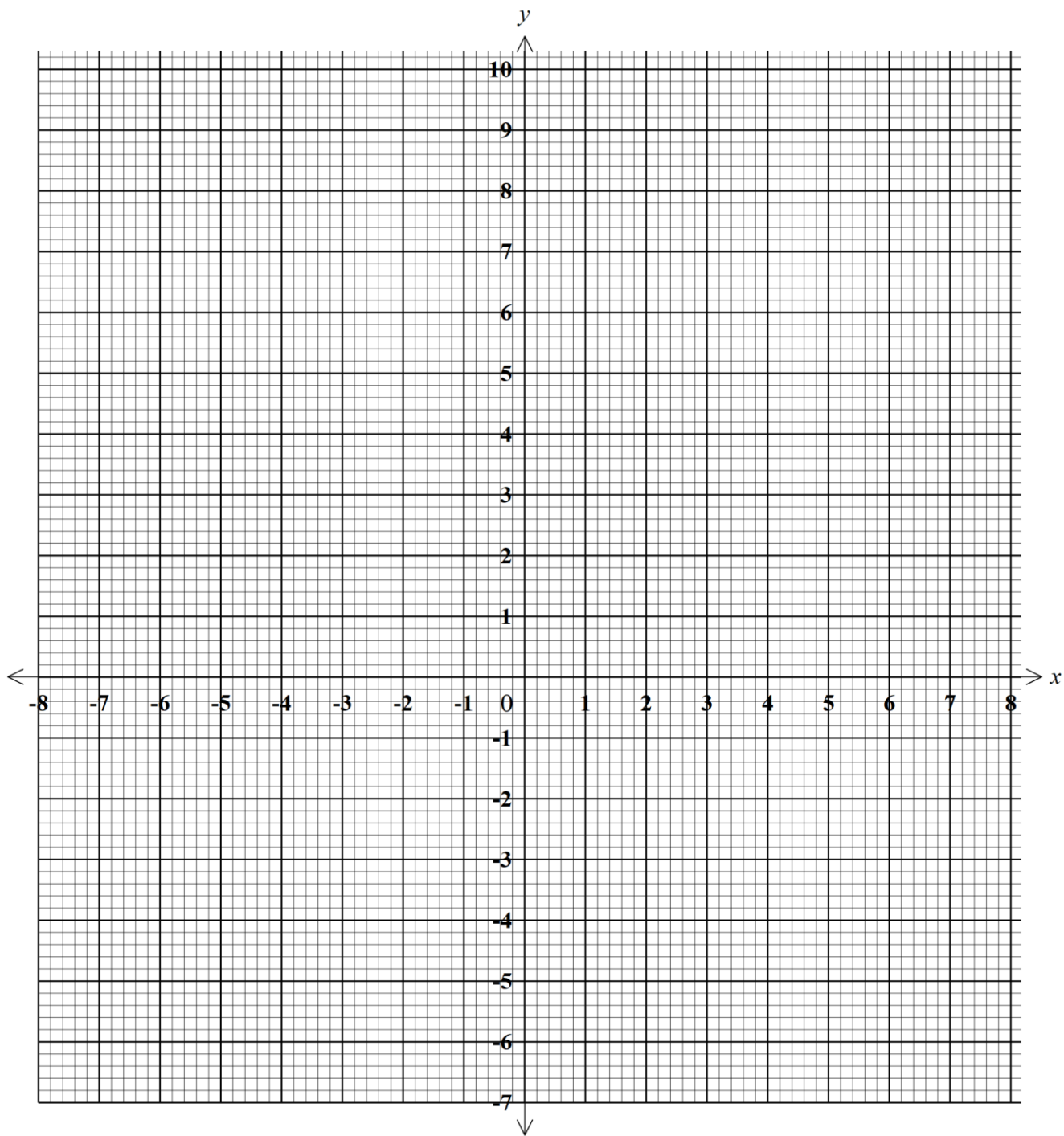d) The area of the shaded region (4marks)

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)

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KISII SCHOOL TRIAL 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.*

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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

Answer all the questions from this section in the spaces provided

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

$$s = \frac{wd}{t}\left(t - \frac{d}{2}\right)$$

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)**

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

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)**

$$\dfrac{\sqrt{63} + \sqrt{72}}{\sqrt{32} + \sqrt{28}}$$

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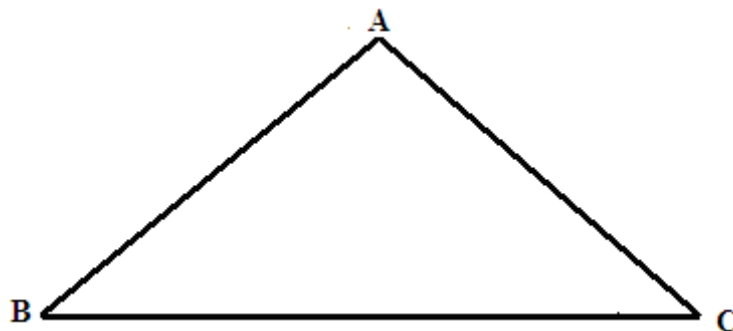
(i) Draw the locus of points equidistant from sides AB and AC.

(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)**

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)**
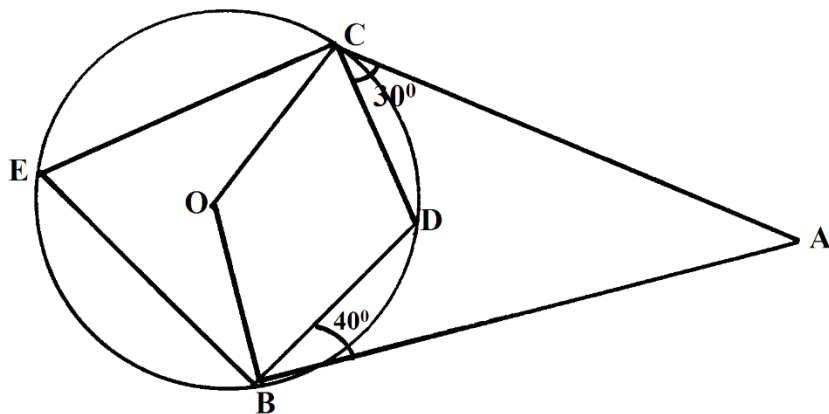
(b) Probability of drawing a black ball and white ball.

(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
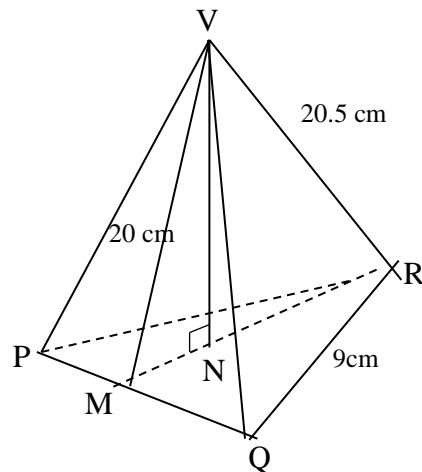
Calculate

(a) The length RM   **(2marks)**
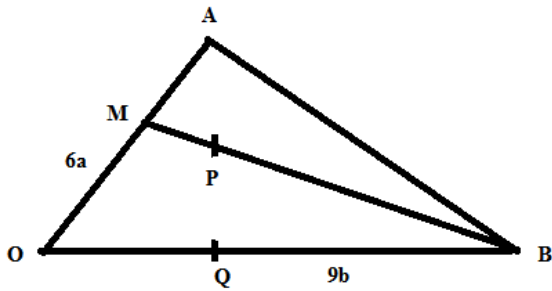
(b) The length of the model.   **(4marks)**

(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)

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Kenya Certificate of Secondary Education

KCSE TOP NATIONAL SCHOOLS TRIAL SERIES 2025

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

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

LENANA SCHOOL TRIAL 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

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)
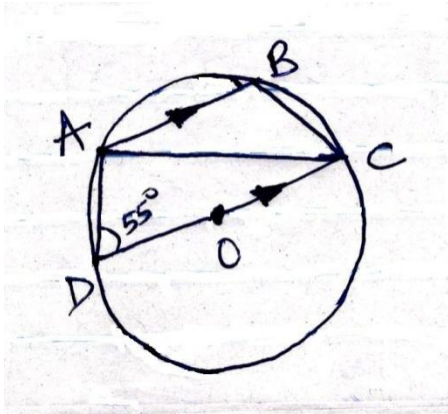
5. Solve for X given that;
    $\tfrac{1}{2} Log_2\ 9 + Log_2\ [5x - 4] = 7$ (3 marks)

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)
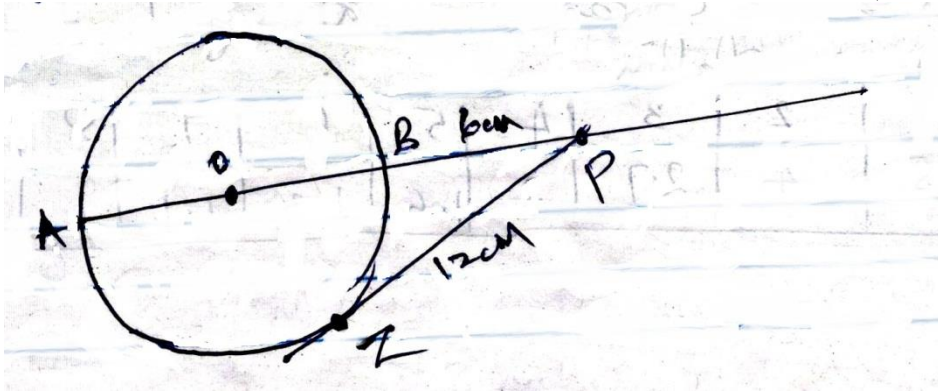
12. (a) Expand $\left(1 - \frac{3}{10}X\right)^5$ Leave the co-efficient as fraction in their lowest form.
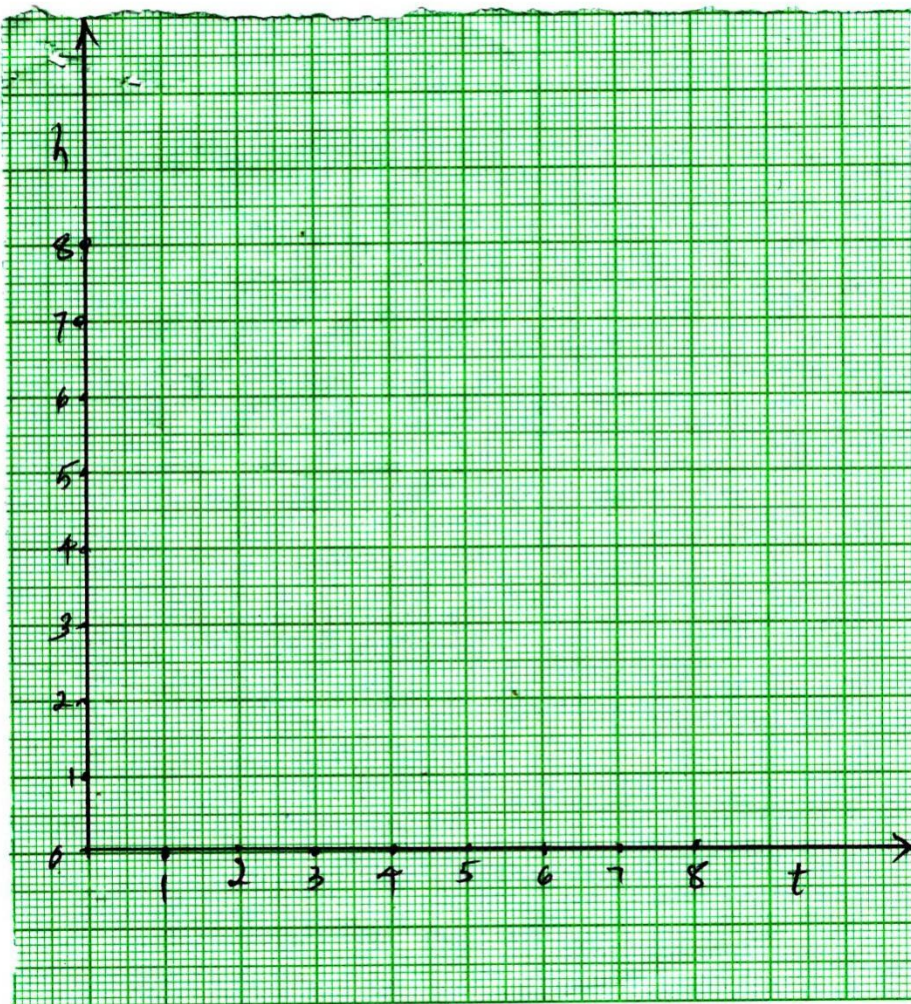
(2 marks)

(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 **P** = 2**i** – 3**j** + **k**, Q = 3**i** – 4**i** – 3**k** and **R** = 3P + 2Q, find │**R**│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)
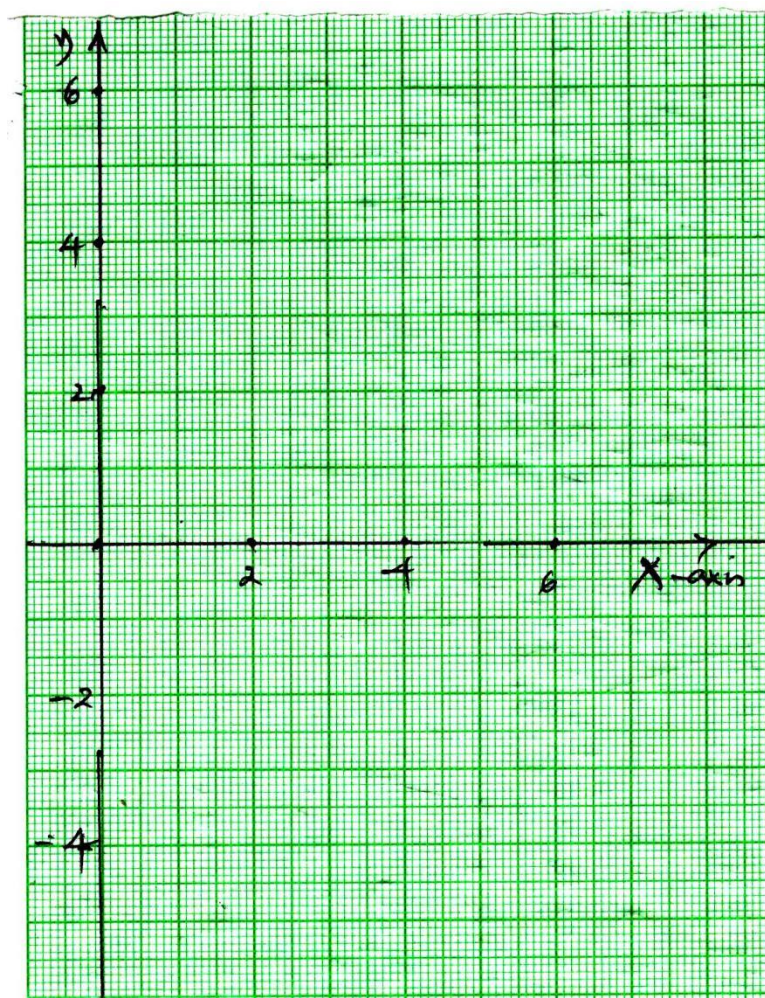
b) (i) Triangle $A_2B_2C_2$ is the image of the triangle $A_1B_1C_1$ under a transformation matrix. $\begin{pmatrix} -2 & 0 \\ 0 & -1 \end{pmatrix}$
Determine the co-ordinates of A2, B2 and C_2 (2 marks)

(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 $\Delta CAB = 60^0$ (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)
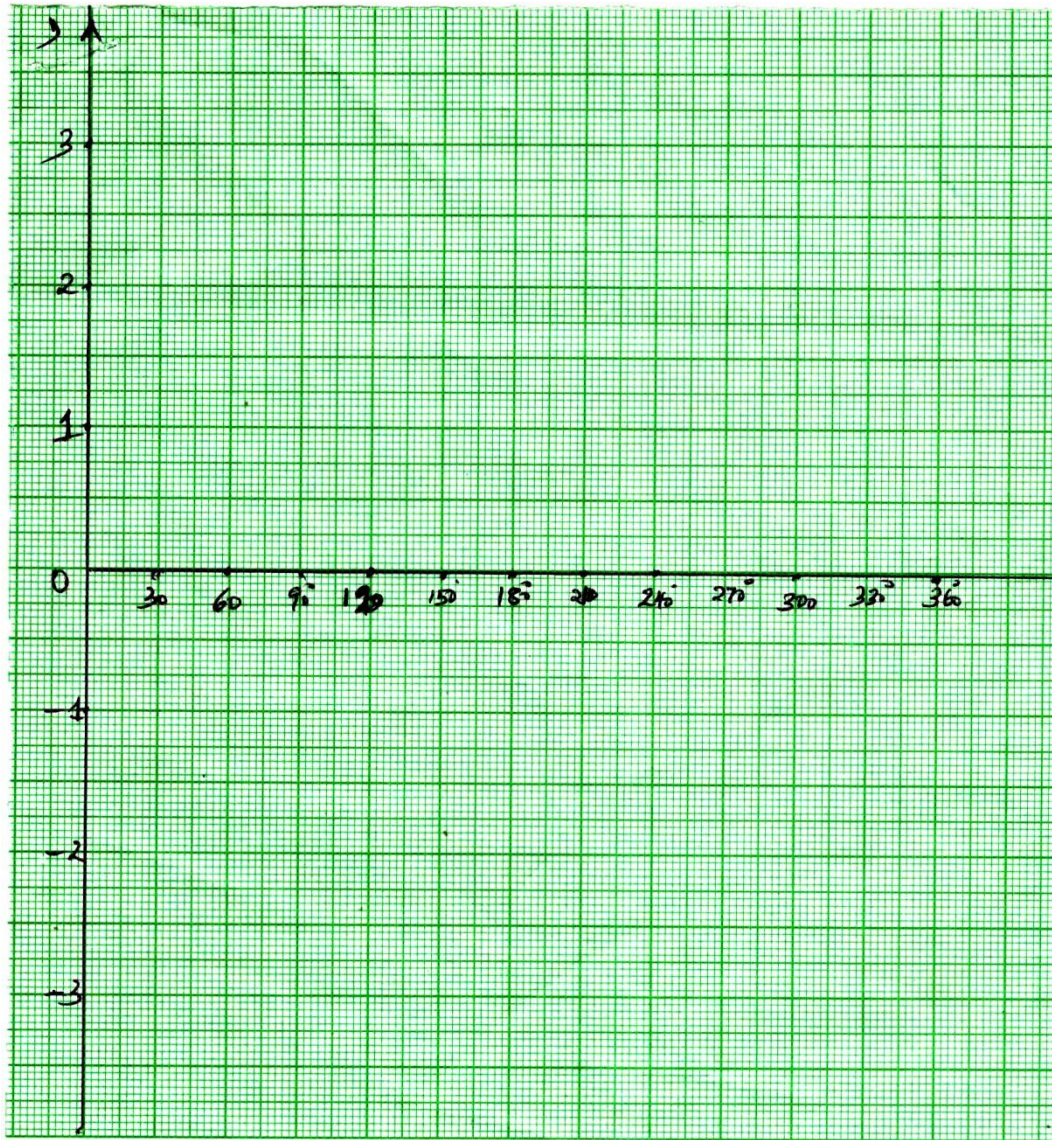

(ii) Find the area of triangle ABC   (3 marks)

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)

X^0	0^0	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)

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KCSE TOP NATIONAL SCHOOLS TRIAL SERIES 2025

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

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

MERU SCHOOL TRIAL 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

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)
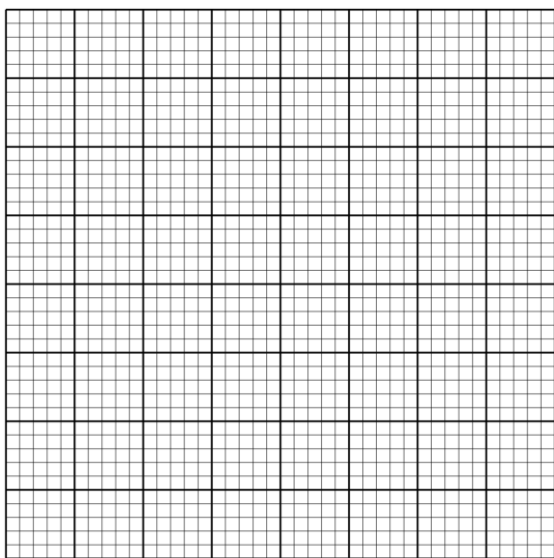
3. Without using a mathematical table or a calculator, find the values of a, b and c given that: (3 marks)
$$\frac{\tan 60^0}{1 - \cos 30^0} = a + b\sqrt{c}$$

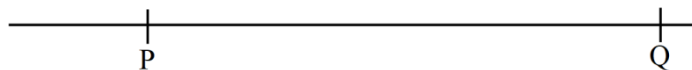4. Without using mathematical tables or a calculator, evaluate: (3 marks)

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

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)

3

7. The line PQ below is part of a triangle PQR in which $\angle QPR = 75^0$ and PR=5.5 cm.

P   Q

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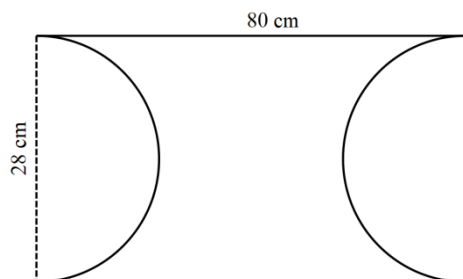(a) complete triangle PQR.   (1 mark)

(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.

Calculate the volume of the beam if it is 1.8 m long. Use $\pi = \frac{22}{7}$ (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 $\log Q$.
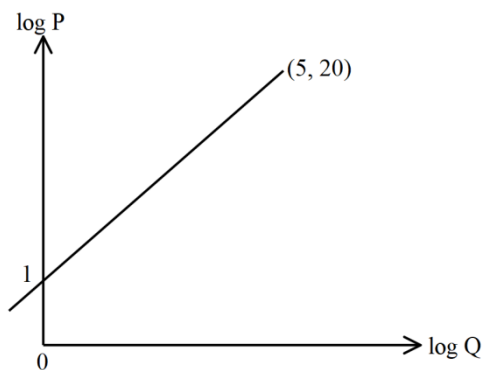
Given that $P = aQ^n$, find the values of a and n.

(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)

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.
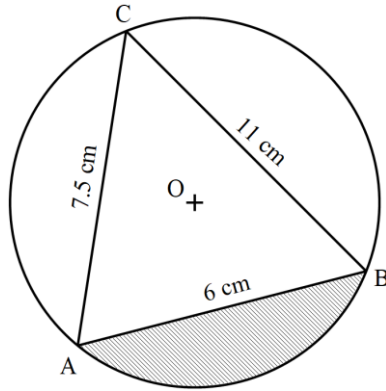
Calculate:

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

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

FOR MS CALL 0724351706

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 $3 + 7 + 11 + 15 + \ ...$ 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.
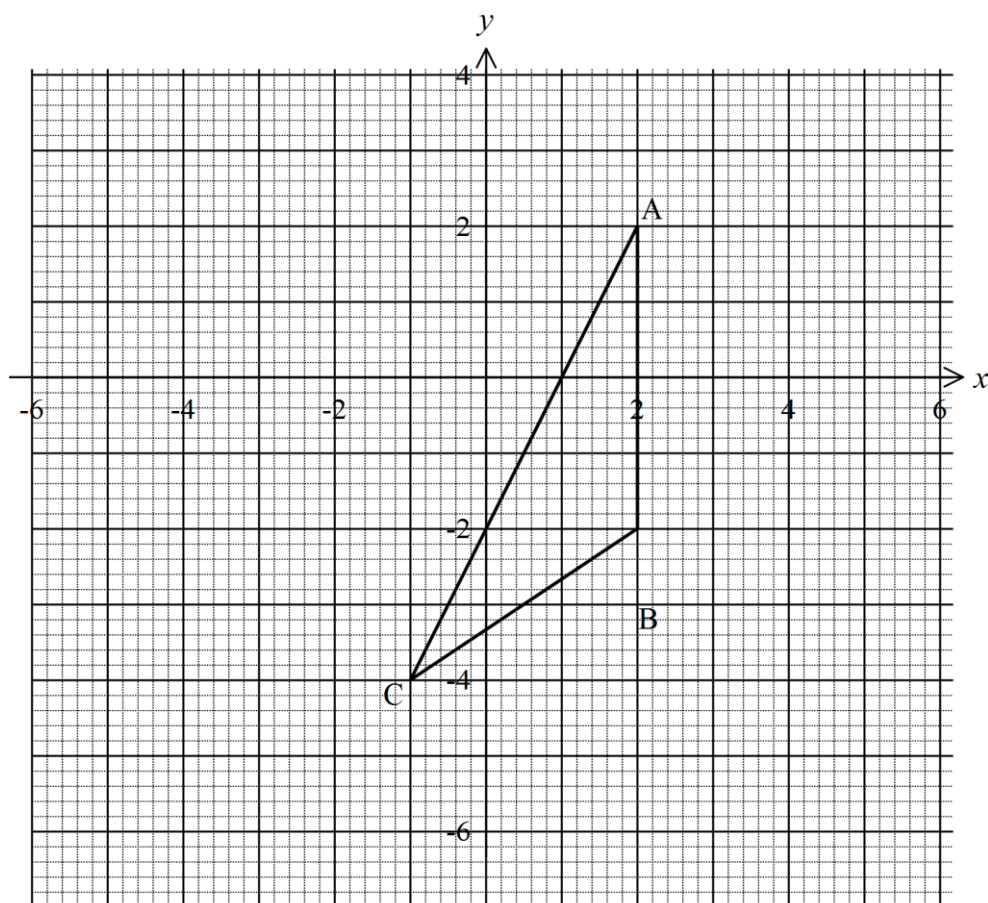
(a) If the vertex $B(2,-2)$ is mapped onto $B'(5,-2)$ by a shear with x – axis invariant.

    (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)

FOR MS CALL 0724351706

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** = 3**OS** and 3**OR** = **OQ**. T is a point on QS sch that 4**QT** = 3**QS.**
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)

THIS IS THE LAST PRINTED PAGE.

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Kenya Certificate of Secondary Education

KCSE TOP NATIONAL SCHOOLS TRIAL SERIES 2025

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

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

MOI GIRLS' ELDORET HIGH SCHOOL TRIAL 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

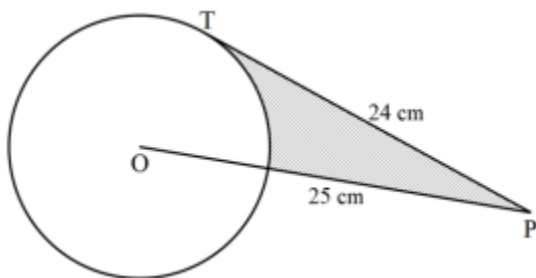| Question	17	18	19	20	21	22	23	24	TOTAL
Marks									

Grand Total

Section I (50 Marks)
Answer ALL questions in this section in the spaces provided

1. Solve for x

$$(\log_3 x)^2 - \frac{1}{2}\log_3 x = \frac{3}{2}$$ [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 $V = aP^n$
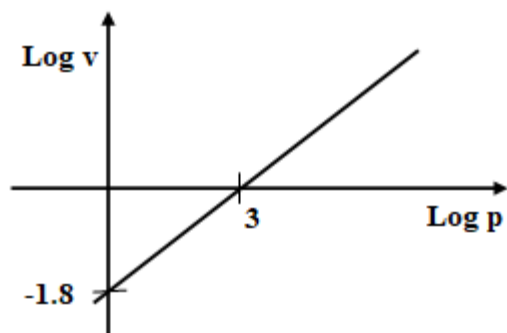
Write down the equation of a straight line in the form of $y = mx + c$ hence use the graph to find the of **a** and **n**   [3marks]

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

   (i)   Amplitude   (1 mark)

   (ii)   Period   (1 mark)

   (iii)   Phase angle   (1 mark)

14. Given the position vectors $\overrightarrow{OA} = 4i + 8j - 2k$ and $\overrightarrow{OB} = 3k - i - 2j$. 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
$1 \le x < 9681$	10%
$9681 \le x < 18801$	15%
$18801 \le x < 27921$	20%
$27921 \le x < 37040$	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)

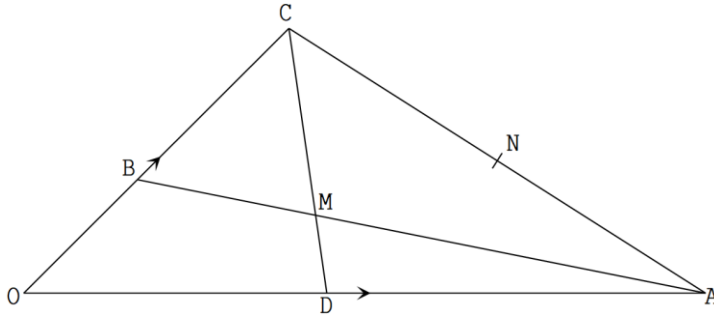16. In the figure given below, O is the centre of circle. If $\angle BCA = 80^0$ and $\angle CBO = 10^0$.
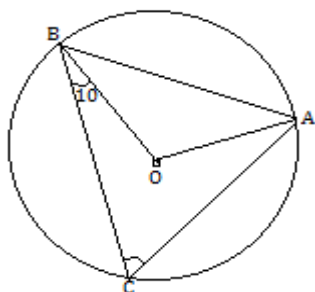
Determine the size of $\angle CAB$.   (3 marks)

17. In the figure below $\overrightarrow{OB} = b;\ OC = 3\overrightarrow{OB}$ and $OA = a$

a) Given that $\overrightarrow{OD} = \frac{1}{3}\overrightarrow{OA}$ and $\overrightarrow{AN} = \frac{1}{2}\overrightarrow{AC}$, $\overrightarrow{CD}$ and $\overrightarrow{AB}$ 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				
		$\sum f =$		$\sum fd =$		$\sum fd^2 =$

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^{0}N, 29^{0}W) and Q(60^{0}N, 31^{0}E) 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^{0}N, 45^{0}E) 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)
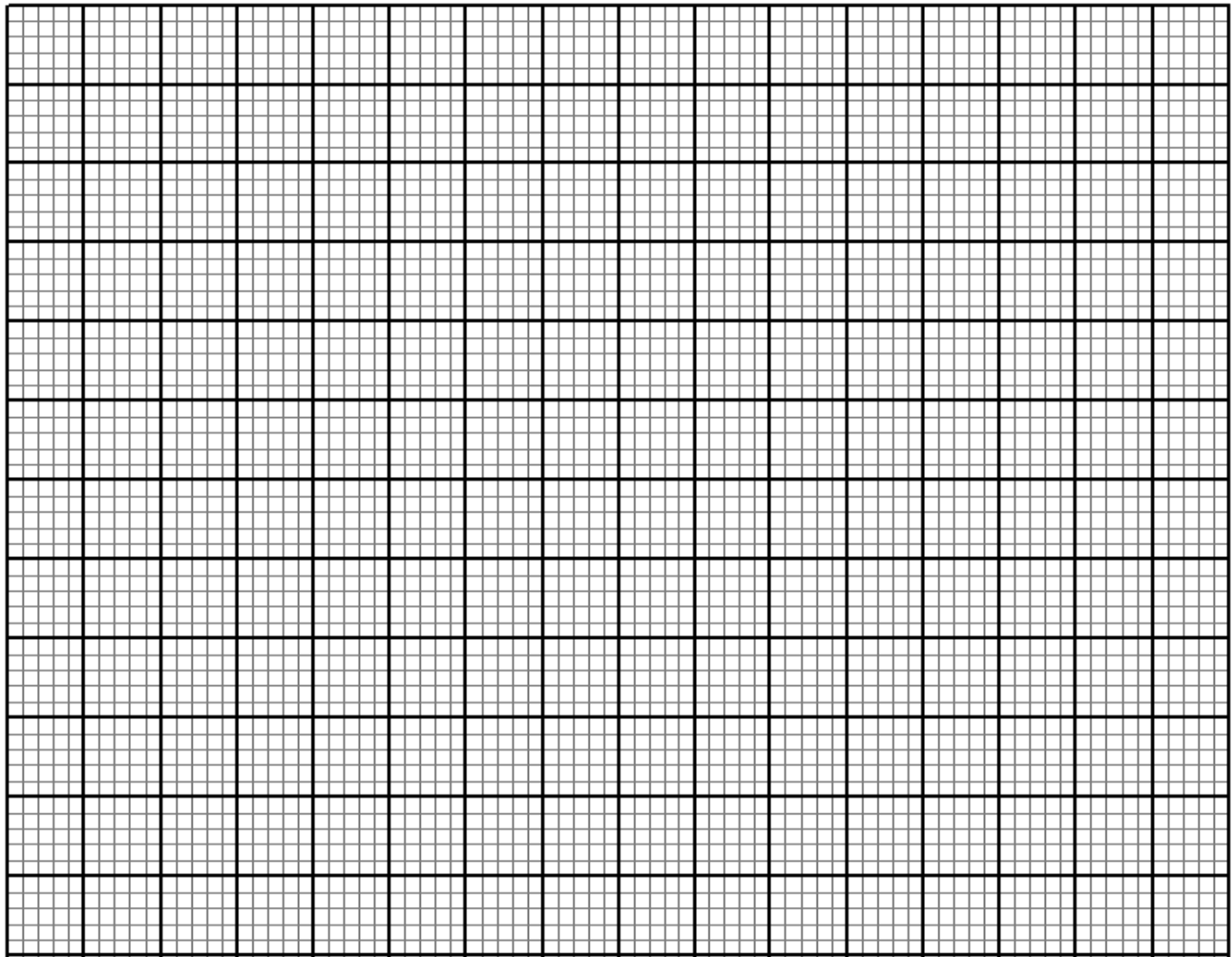
d) Use your graph to solve the equation s

    (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)

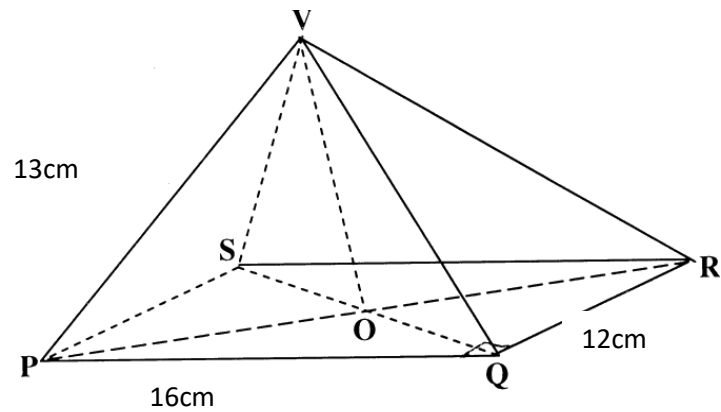b) All three hit the target   (2marks)

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.

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)
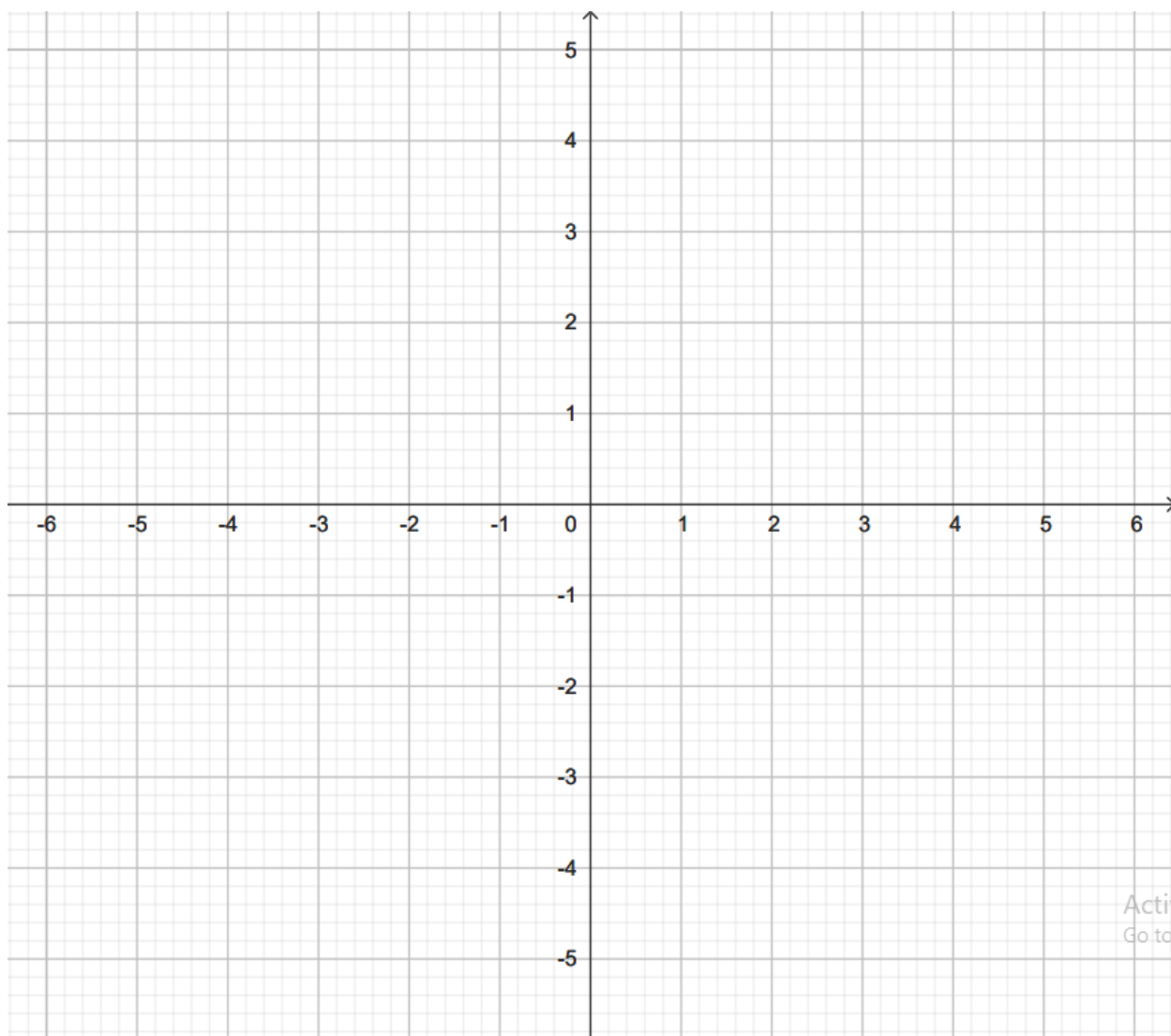
(ii) Describe the transformation that maps **ABCD** onto **A'B'C'D'** fully   (1mark)

(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)

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

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STAREHE BOYS CENTER SCHOOL TRIAL 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*
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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

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 $y = \frac{11}{2} \text{Cos} (3x + 28^0)$. (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 $\mathbf{OW} = 18\mathbf{i} - 9\mathbf{j} + 27\mathbf{k}$. 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
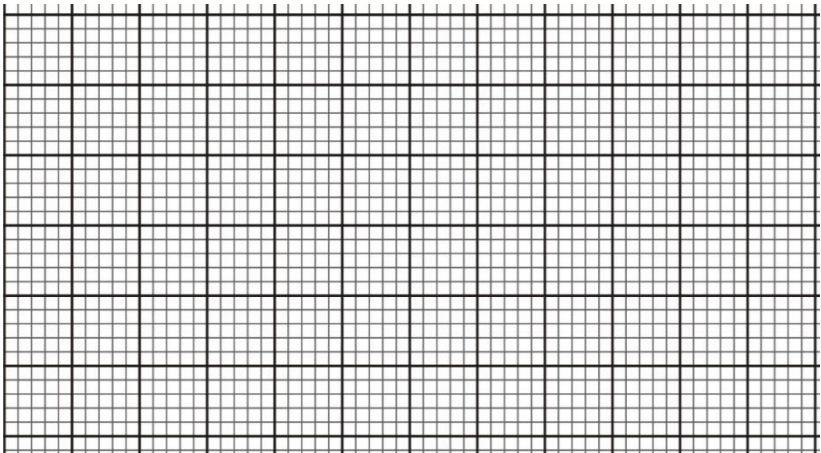
14. In the figure below, PQRS is a cyclic quadrilateral. Point O is the centre of the circle. Angle PQO = 35° and angle PSO = 42°
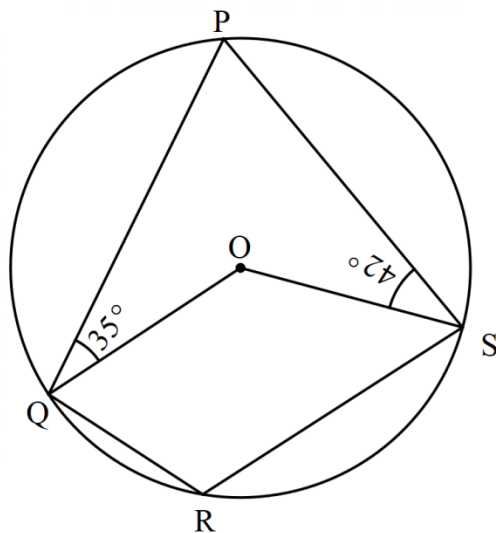
Calculate the size of angle QRS. (2 marks)

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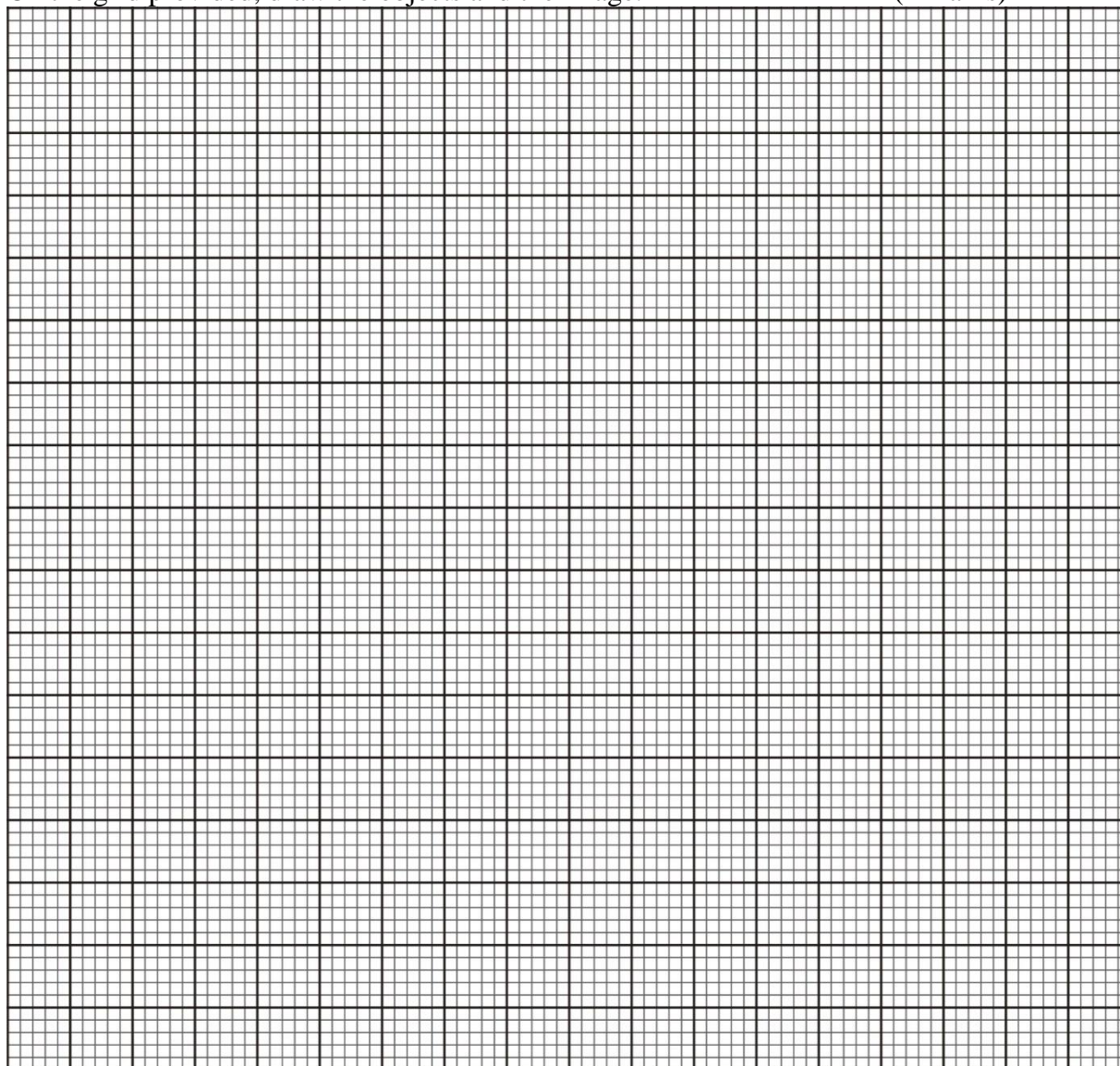
17. The vertices of triangle $A^1B^1C^1$ are $A^1(1,3), B^1(3,-4)$ and $C^1(5,-6)$. Triangle $A^1B^1C^1$ is the image of triangle ABC under a transformation whose matrix is $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$.

(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)

9

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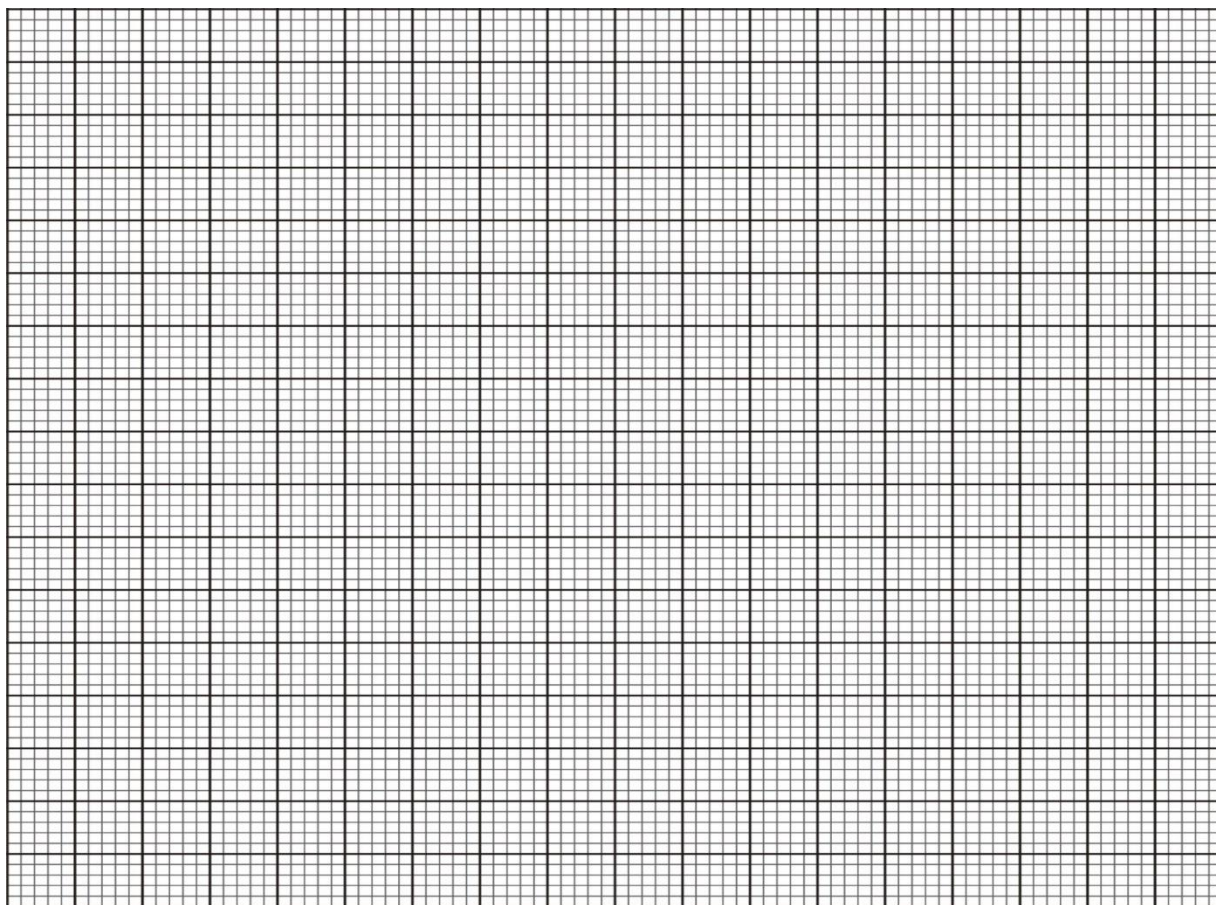
21. Triangle **OPQ** is such that OP = **p** and OQ = **q** .Point R divides OP in the ratio **1:3** and a point S divides PQ in the ratio **5:2**.OS and RQ meet at T.

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

ii)   RQ   (1 mark)

10

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)

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

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KANGA SCHOOL TRIAL SERIES

121/2

MATHEMATICS

FORM 4 PAPER 2

TIME: 2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

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

For Examiner's Use Only

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

| 17	18	19	20	21	22	23	24	Grand
								Total

SECTION I 50 Marks

Attempt all the questions in this section

1. By correcting each number to one significant figure approximate the value of 655×0.007 hence calculate the percentage error arising from this approximation. (3 marks)

2. Make P the subject of the formula in $X = \sqrt{\dfrac{Y(P-Y)}{P-1}}$ (3 marks)

3. Solve the equation $4x^2 + 7x + 3 = 0$ using completing the square method. (3 marks)

4. The equation of a circle is given as $4x^2 + 4y^2 - 16x + 24y + 3 = 0$. Find the centre of the circle and its radius. (3 marks)

5. How many terms of the series $3 + 6 + 9 + 12 + \cdots$ will give sum to be 6390 (3 marks)

6. Solve for x; $\log_{27}(x+5) - \log_{27}(x-3) = \dfrac{2}{3}$ (3 marks)

7. In the figure below, O is the centre of the circle. A, B, C and D are points on the circumference of the circle. Line AB is parallel to line DC and angle $DAB = 55°$. Determine the size of angle ABC.
   (3 marks)
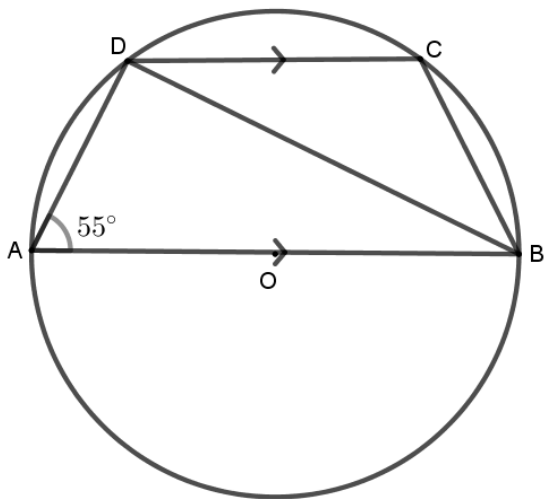
8. The following table shows the distribution of marks of 80 students

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Frequency	1	6	10	20	15	5	14	5	3	1

Calculate the semi-interquartile range. (4 marks)

**9.** Express $\cos 45°$ in surd form hence rationalize $\dfrac{14}{2-\cos 45°}$, leaving the answer in the form $a + b\sqrt{c}$.
(3 marks)

**10.** State the amplitude and period of $y = 2 \cos x$ (2 marks)

11. A bag contains 3 black balls and 6 white ones. If two balls are drawn from the bag one at a time, find the probability of drawing a black ball and a white ball without replacement.
(3 marks)

12. The diagram below shows a circle centre O. AP is the tangent to the circle, AB is diameter of the circle and chord CD intersect the diameter AB at X. Given that CX = 5 cm, XD = 3 cm, XB = 2 cm and angle OPA is 23°. Find the length of the tangent AP. (3 marks)
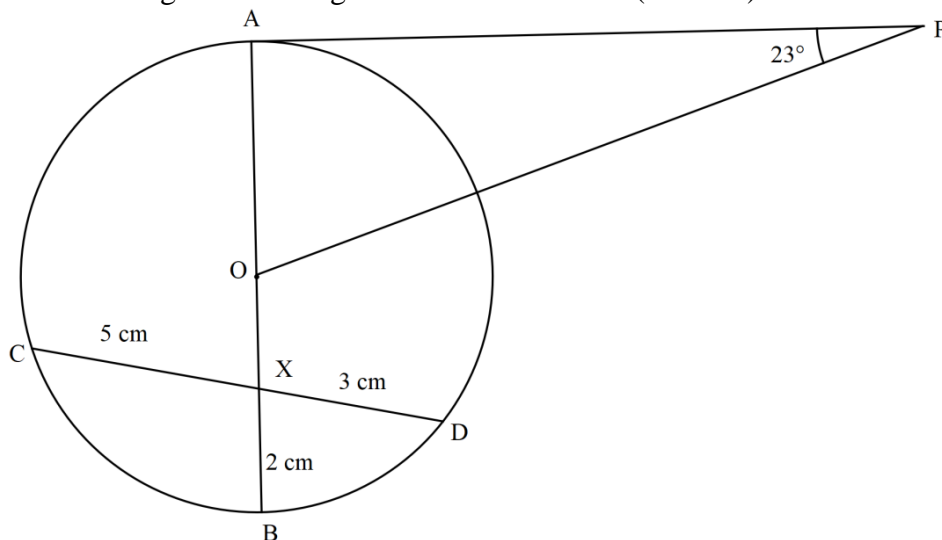
13. The diagram below represents a cuboid PQRSTUVW in which UV = 4.5cm, VW = 8cm and WR = 6cm
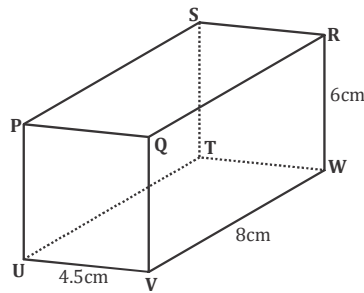
Calculate the size of the angle between the lines UR and UW   (3 marks)

14. Find the matrix of transformation of triangle PQR with vertices $P(1,3)$ $Q(3,3)$ and $R(2,5)$. The vertices of the image of the triangles is $P'(1,-3)Q'(3,-3)$ and $R'(2,-5)$
(3 marks)

15. y is a function of x such that $y = \left(2x - \frac{1}{x}\right)^8$.

   a) Express the function in expanded format upto the constant term.   (1 mark)

   b) Use your expansion in (a) above to find y given that $y = \left(0.8 - \frac{1}{x}\right)^8$ (2 marks)

16. Two types of rice x and y cost Ksh. 60 and Ksh. 72 per kilogram respectively. The two types are mixed such that the cost of a kilogram of the mixture is Ksh. 70. Calculate the ratio $x:y$ of the mixture.
(3 marks)

SECTION II 50 Marks
Attempt any FIVE questions only in this section

17. X varies as the cube of Y and inversely as square root of Z. X $=$ 6 when Y $=$ 3 and   Z $=$ 49.
   (a) Find;
   (i) An expression connecting X, Y and Z   (3 marks)

   (ii) X when Y = 7 and Z = 16   (2 marks)

(iii) Y when X = 8 and Z = 25   (2 marks)

b) If Y is increased by 20% and Z is decreased by 36%, find the percentage increase in X.
(3 marks)

18. (a) The first term of a geometric progression is 36. The sum of the first three terms is 27. Calculate the common ratio and the value of the second term.   (4 marks)

(b) The first term of an AP is 2. The first term of a geometric sequence is also 2 and its common ratio equals the common difference of the arithmetic sequence. The square of the fifth term of the arithmetic sequence exceeds the third term of the geometric sequence by 2. Find;
   i.   The common difference.   (3 marks)

   ii.   The sum of the first 50 terms of the arithmetic progression.   (3 marks)

19. The distance(s) covered by a toy car at intervals of one second are given in the table below.

Time,t (sec)	1	2	3	4	5	6
Distance,s (cm)	2	10	30	68	130	222

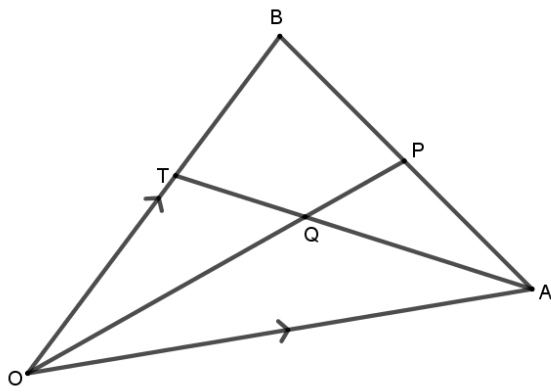   (a) Draw the graph of **s** against **t**.   (3 marks)

   (b) Use the graph to find;
        i.   The speed when $t = 3.5 \; seconds$.   (2 marks)

        ii.   The average speed between the 3rd and 5th seconds.   (2 marks)

20. In the figure below OA = $\breve{a}$ and OB = $\breve{b}$.

Points P and T divide AB and OB internally in the ration $2:3$ and $1:3$ respectively. Lines OP and AT meet at Q.

a) Find in terms of $\breve{b}$ and $\breve{a}$
- (i)   AT   (2 mark)

- (ii)   AP   (2 marks)

- (iii)   OP   (2 marks)

b) If $OQ = kOP$ and $AQ = hAT$ where k and h are constants express OQ in two different ways and hence find the values of h and k.   (4 marks)

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

Annual taxable income in Kenya shillings	Tax rate in %
$0 - 144\,000$	5
$144\,001 - 300\,000$	10
$300\,001 - 468\,000$	15
$468\,001 - 648\,000$	20
$648\,001 - 840\,000$	25
Above $840\,000$	30

During that year Kamau's annual tax in the sixth band was Kshs.108 000

(a) Determine Kamau's annual gross tax.   (3 marks)

(b) If he enjoyed annual relief of Kshs.21 000 annually, determine his monthly net tax (P.A.Y.E)
    (2 marks)

(c) Determine Kamau's gross salary per month.   (3 marks)

(d) The following deductions were also made from Kamau's salary every month: Cooperative shares Kshs.8 000,
Co-operative loan Kshs.12 000,
Pension scheme Kshs.4 000
Union dues Kshs.2000.
Determine Kamau's monthly net salary during that year.   (2 marks)

22. Peter, John and James are practicing archery. The probability of peter hitting the target is $\frac{2}{5}$, that of john hitting the target is $\frac{1}{4}$ and that of james hitting the target is $\frac{3}{7}$.
Find the probability that in one attempt;
a) Only one hit the target.   (3 marks)

b) All the three hit the target   (2 marks)

c) None of them hit the target.   (2 marks)

d) Two hit the target.   (3 marks)

23. The Points A', B' and C' are the images of $A(4, 1), B(0, -2)$ and $C(-2, 4)$ respectively under a transformation represented by the matrix $M = \begin{pmatrix} -1 & 1 \\ 2 & -3 \end{pmatrix}$
a) Plot ΔABC and $\Delta A'B'C'$ and write down the coordinates of A', B' and C' (3 marks)

b) A'', B'' and C'' are the images of A', B' and C' under another transformation whose matrix is $N = \begin{pmatrix} 2 & -1 \\ 1 & 2 \end{pmatrix}$. Write down the coordinates of A'', B'' and C'' and plot $\Delta A''B''C''$.
(4 marks)

c) Transformation M followed by N can be represented by a single transformation P. Determine the matrix for P.   (3 marks)

24. (a) (i) Draw the graph of $y = 2x^2 - 3x - 5$ for $-2 \leq x \leq 3$.   (4 marks)

(ii) Use the graph to solve the equation $2x^2 - 3x - 5 = 0$.   (1 mark)

(b) Using the same axes, draw the graph of $y = -2x - 2$.   (2 marks)

(c) From the graphs, find the values of x which satisfy the simultaneous equations;
$2x^2 - 3x - 5$
$y = -2x - 2$ (1 mark)
(d) Write down the quadratic equation which is satisfied by the values of x where the two graphs intersect.
(2 marks)