KCSE 2023 CROSS-COUNTRY MOCKS

MATHEMATICS

(MOCKS TRIALS 1-10)

Compilation of 10 Annual Joint Mathematics Mock Trials amongst our KCSE 2023 Candidates within the clustered pool of Selected Top Performing National Schools in the whole Republic of Kenya.

INCLUSIVE OF BOTH PAPER 1 & 2 EXAMS.

SERIES 1

For Marking Schemes

Mr Isaboke 0746-222-000 / 0742-999-000

MWALIMU CONSULTANCY

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 1

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

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

FOR EXAMINER'S USE ONLY

SECTION I

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

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

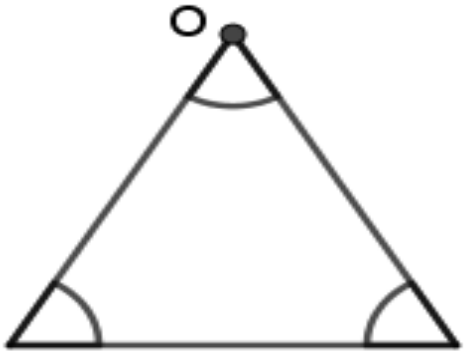
SECTION I (50 Marks)

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

1. Ibrahim spends a quarter of his monthly salary on school fees, one-ninth on water and electricity bills, two-thirds of the remainder on house up keep and saves the rest. The difference between what he saves and the amount he spends on house up keep is Kshs. 10,350. Calculate Ibrahim's monthly salary. **(3 marks)**

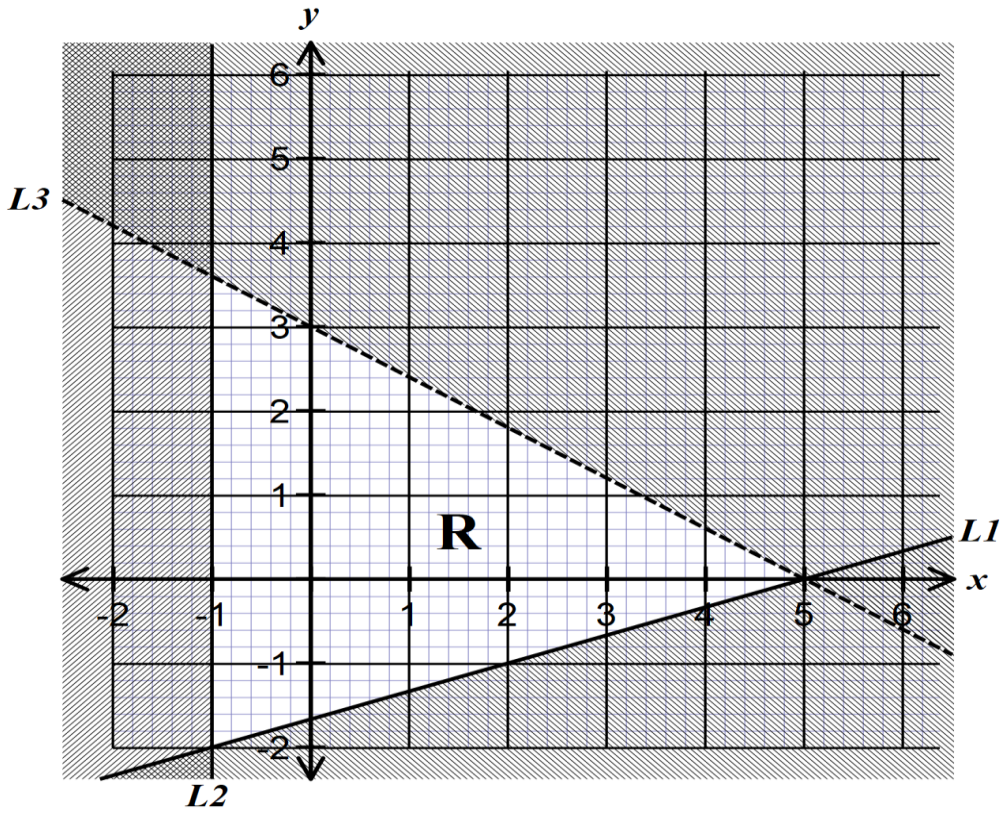
2. Lessons in Lake Primary and Kisumu Girls High Schools take 30 minutes and 40 minutes respectively. The two bells ring simultaneously at 7.50 a.m. How many times will they ring together again between 7.50 a.m. and 3 p.m.? **(3 marks)**

3. Complete the figure below to show a rotational symmetry of order 6 about O. **(3 marks)**



4. The sum of the interior angles of a regular polygon is 1260^0. Find the number of sides of the polygon, hence give the name of the polygon. **(3 marks)**

5. Find the inequalities that satisfy the region labeled **R** in the figure below. **(3 marks)**



6. Rodi walked from Kisian to Otonglo, a distance of 8 km for 1½ hours. He then took a motorbike to Rabuor that traveled at a speed of 80 km/h and took 15 minutes. From Rabuor, he boarded a car to Kendu Bay, 60 km away and took 45 minutes to arrive in Kendu Bay. Calculate his average velocity for the whole journey. **(3 marks)**

7. Simplify the expression **(3 marks)**

$$\frac{(-4b+3a)^2-(3a+4b)^2}{12a}$$

8. A saleslady earns a commission of 3% and 5% for sale of goods up to Kshs. 100,000 and above Kshs. 100,000 respectively. In a certain month. Sarah's total commission was Kshs. 15,100. Calculate the value of goods that Sarah sold that month. **(3 marks)**

9. The position vectors of points A and B are $2\boldsymbol{i}-3\boldsymbol{j}+9\boldsymbol{k}$ and $-5\boldsymbol{i}+\boldsymbol{k}$ respectively. Calculate $|\boldsymbol{AB}|$, leaving your answer in surd form. **(4 marks)**

10. Nerry paid Kshs. 955,000 for a car at Sammy Traders. This was a discount of 4.5%. Sammy Traders made a profit of 16% from this sale. What is the amount of profit that Sammy Traders realized from this sale? Give your answer to the nearest Kshs. 100. **(4 marks)**

11. Solve for θ in the equation

$2\sin(2\theta-30^0)=1$ for $0^0\leq\theta\leq360^0$ **(4 marks)**

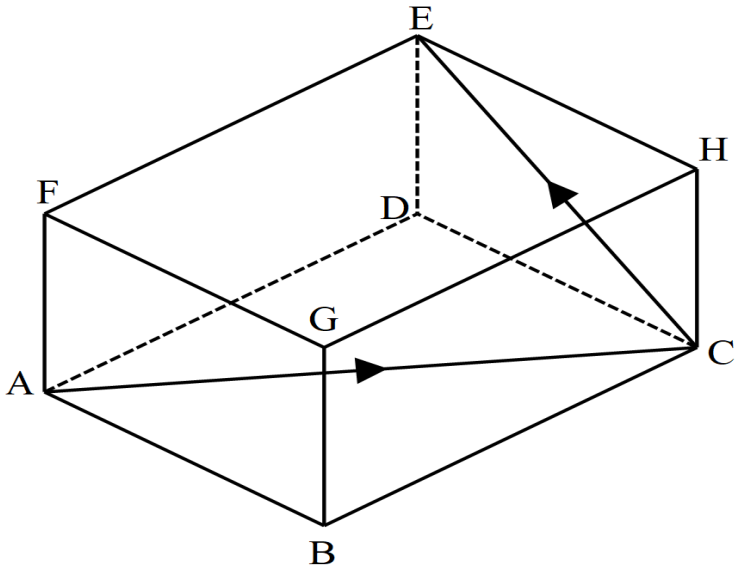
12. The line below shows a diagonal of a rhombus PQRS. Given that QS=5 cm, complete the rhombus. Hence find the PQ. **(3 marks)**

P ——————————— R

13. The cost of three toners and four cartridges is Kshs. 36,000. Oyoo bought one more toner and one less cartridge that are similar to the above and paid and paid Kshs. 1,500 more. Calculate the cost of one toner and one cartridge. **(3 marks)**

14. A measuring cylinder has a diameter of 7 cm. Water fills the cylinder up to a height of 6 cm. A solid sphere is immersed into the cylinder and the height of water in the cylinder increases to 10 cm. calculate the radius of the sphere correct to 4 significant figures. **(3 marks)**

15. The figure below shows an open cuboid ABCDEFGH. A particle traces a path from A to E through C as indicated by the arrows. Draw the net of the solid and show the path on it. **(3 marks)**



16. Without using a calculator or mathematical table, solve for x in **(2 marks)**
$x^5 = 161{,}051$

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

17. A cylindrical milk urn has diameter 40 cm and height 1.4 metres.

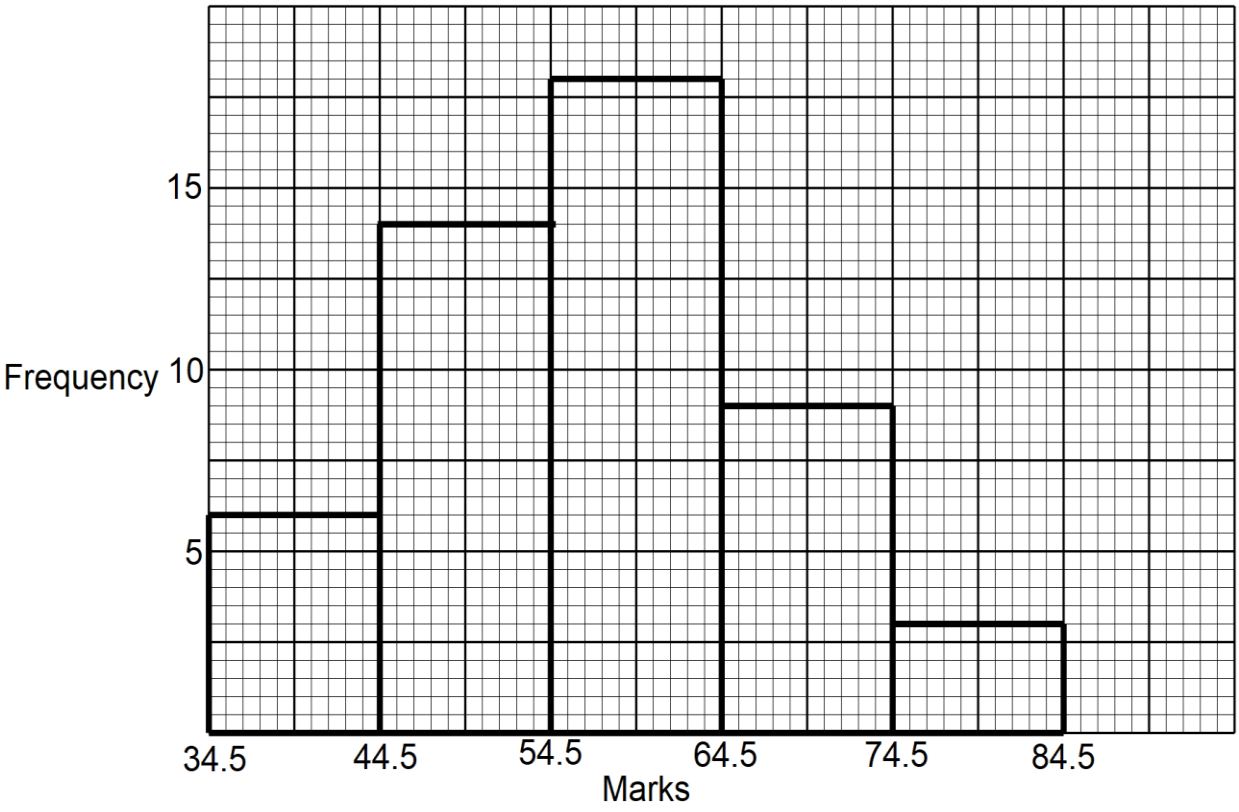
(a) Calculate the capacity of milk in litres in the urn when it is full, to the nearest litre. Use $\pi = \frac{22}{7}$. **(2 marks)**

(b) The milk is packed into tetrahedron packets of capacity 200 ml. Calculate the number of packets used. **(2 marks)**

(c) The packets are packed into boxes that contain 24 packets each. How many complete boxes are used to package the milk? **(2 marks)**

(d) Each box is sold at Kshs. 840, a profit of 12%. Calculate the buying price of each packet. **(4 mks)**

18. The figure below shows a histogram drawn for marks scored by students in a mathematics contest



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

(b) Draw a frequency distribution table from the histogram. **(2 marks)**

(c) Use the table in (b) above to calculate the mean mark **(3 marks)**

(d) On the histogram, draw a vertical line showing where the median mark lies **(4 marks)**

19. The displacement S of a particle after t seconds is given by $S = 4t^3 - \frac{5}{2}t^2 - 3t + 3$.

Determine the:

(a) velocity of the particle when $t = 3$ **(3 marks)**

(b) value of t when the particle is instantaneously at rest **(3 marks)**

(c) displacement when the particle is instantaneously at rest. **(2 marks)**

(d) acceleration of the particle when $t = 2$ seconds **(2 marks)**

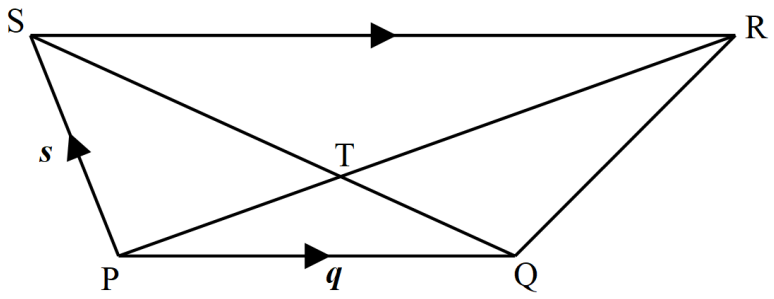
20. The distance between towns A and B is 360km. A minibus left town A at 8.15 a.m. and traveled towards town B at an average speed of 90km/hr. A matatu left town B, $2\frac{1}{3}$ hours later on the same day and travelled towards A at average speed of 110km/hr.

(a) **(i)** At what time of the day did the two vehicles meet? **(4 marks)**

(ii) How far from A did the two vehicles meet? **(2 marks)**

(b) A motorist started from her home at 10.30 a.m. on the same day as the matatu and travelled at an average speed of 100 km/h. She arrived at B at the same time as the minibus. Calculate the distance from A to her house. **(4 marks)**

21. In the figure below, PQRS is a trapezium. PQ is parallel to SR. The diagonals SQ and PR intersect at T and SR=2PQ. $\boldsymbol{PQ = q}$, $\boldsymbol{PS = s}$, $\boldsymbol{PT = hPR}$ and $\boldsymbol{ST = kSQ}$, where h and k are constants



(a) Find in terms of $\boldsymbol{q}$ and $\boldsymbol{s}$:

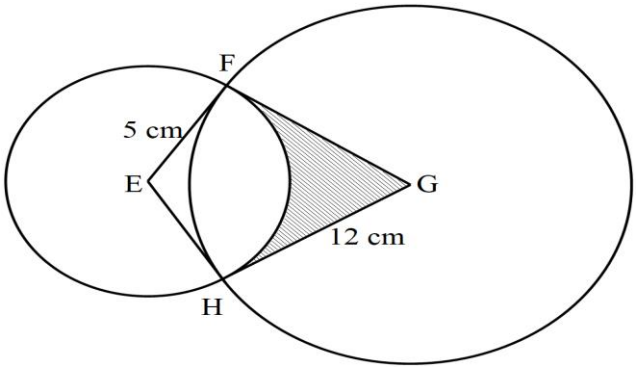
(i) $\boldsymbol{QR}$; **(2 marks)**

(ii) $\boldsymbol{PT}$; **(2 marks)**

(iii) $\boldsymbol{ST}$. **(1 mark)**

(b) Determine the values of h and k **(5 marks)**

22. The figure below, two circles, centres E and G and radii 5 cm and 12 cm respectively intersect at F and H. EG = 13 cm.



(a) Show that $\angle EFG = 90^0$. **(3 marks)**

(b) Calculate

(i) the size of obtuse $\angle FEH$ **(3 marks)**

(ii) the area of the shaded part, correct to 2 decimal places. Use π=3.142 **(4 marks)**

23. (a) Fill the table below for the function $y = x^2 - 4x + 2$ for $-1 \leq x \leq 5$ **(2 marks)**

x	-1	0	1	2	3	4	5
y							

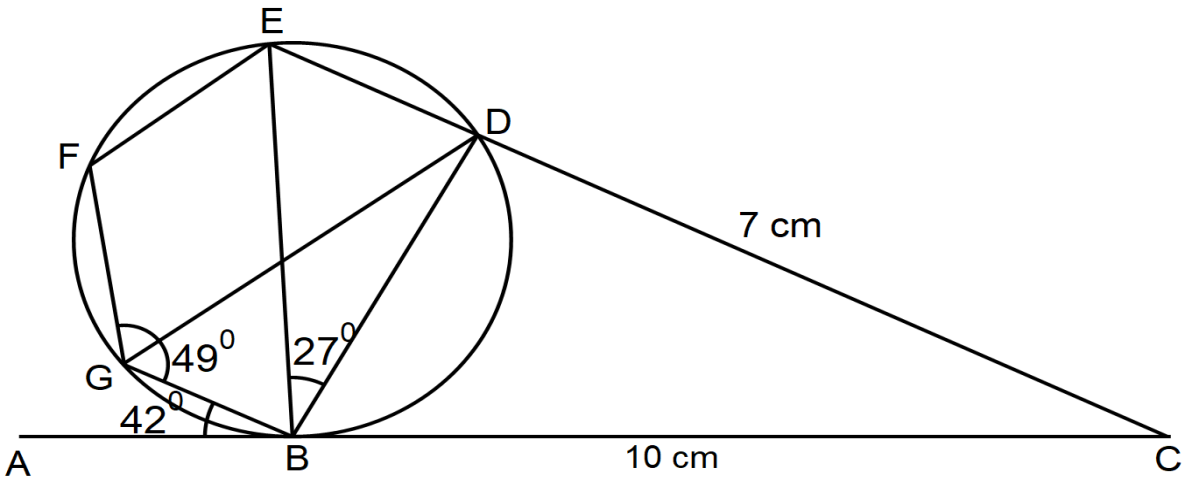
(b) (i) Draw the graph of the function $y = x^2 - 4x + 2$ for $-1 \leq x \leq 5$ **(3 marks)**

(ii) On the same axes, draw line $y = x - 1$ **(1 mark)**

(c) Determine the values of x at the points of intersection between the curve $y = x^2 - 4x + 2$ and line $y = x - 1$ **(2 marks)**

(d) Give the equation of the line of symmetry of the curve **(2 marks)**

24. In the figure below, ABC is a tangent to the circle at B.



(a) Given that $\angle ABG = 42^0$, $\angle EBD = 27^0$ and $\angle BGD = 49^0$, calculate the sizes of the following angles. Give reasons in each case

(i) $\angle DGE$ **(2 marks)**

(ii) $\angle GFE$ **(3 marks)**

(iii) $\angle DBC$ **(2 marks)**

(b) Given that BC = 10 cm and CD = 7 cm, calculate TS **(3 marks)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 1

121/2

MATHEMATICS

PAPER 2

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INDEX NO…… **ADM NO**……

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Section II

17	18	19	20	21	22	23	24	Total

Grand Total

SECTION I (50 Marks)

*Answer **all** the questions in this section in the spaces provided below each question*

1. A milk urn has a capacity of 18.48 litres. A cylindrical container of diameter 14 cm and height 10 cm is used to draw milk from the urn for sale. How many times will it be used to completely drain the milk from the urn? **(3 marks)**

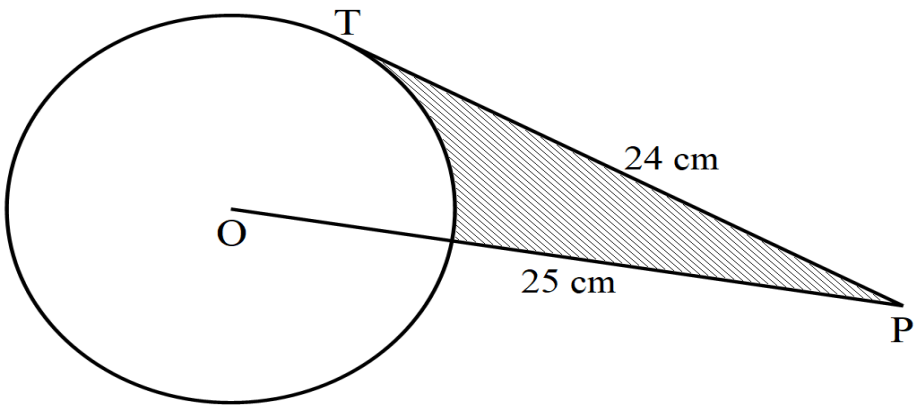
2. An arithmetic progression is such that its first term and common difference are 3 and 2 respectively. The difference of the last and forty-first terms of this progression is 48. Find the number of terms in the progression. **(3 marks)**

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

$$p = \sqrt{\frac{x^2 - q}{r + x^2}}$$

4. Find the value of p if the expression $px^2 - \frac{3}{2}x + \frac{1}{16}$ is a perfect square, given that p is a constant. **(2 marks)**

5. 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 shaded area correct to 2 decimal places. **(4 marks)**

6. 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 a conference. If Kshs. 45,000 is charged for hiring the facility for 100 participants and Kshs. 40,000 for 60 participants, find the number of participants if Kshs. 63,000 is used to hire the facility. **(4 marks)**

7. (a) Expand $(1 + 2x)^6$ in ascending powers of x up to the term in x^4 **(1 mark)**

(b) Use the expansion in (a) above to find the value of $(0.98)^6$ correct to 5 decimal place.**(2 marks)**

8. The cash price of a deep freezer is Kshs. 50,000. Mary bought the freezer on hire purchase terms by paying a deposit of Kshs. 25,000 followed by 24 equal monthly instalments of Kshs. 2,250 each. An annual interest, compounded quarterly was charged on the balance for a period of 2 years. Determine, correct to 1 decimal place, the interest rate per month. **(4 marks)**

9. The equation of a trigonometric function is $y = 3\sin(a\theta - 60)^0$. The function has a period of 720^0.

(a) Identify the phase angle of the function **(1 mark)**

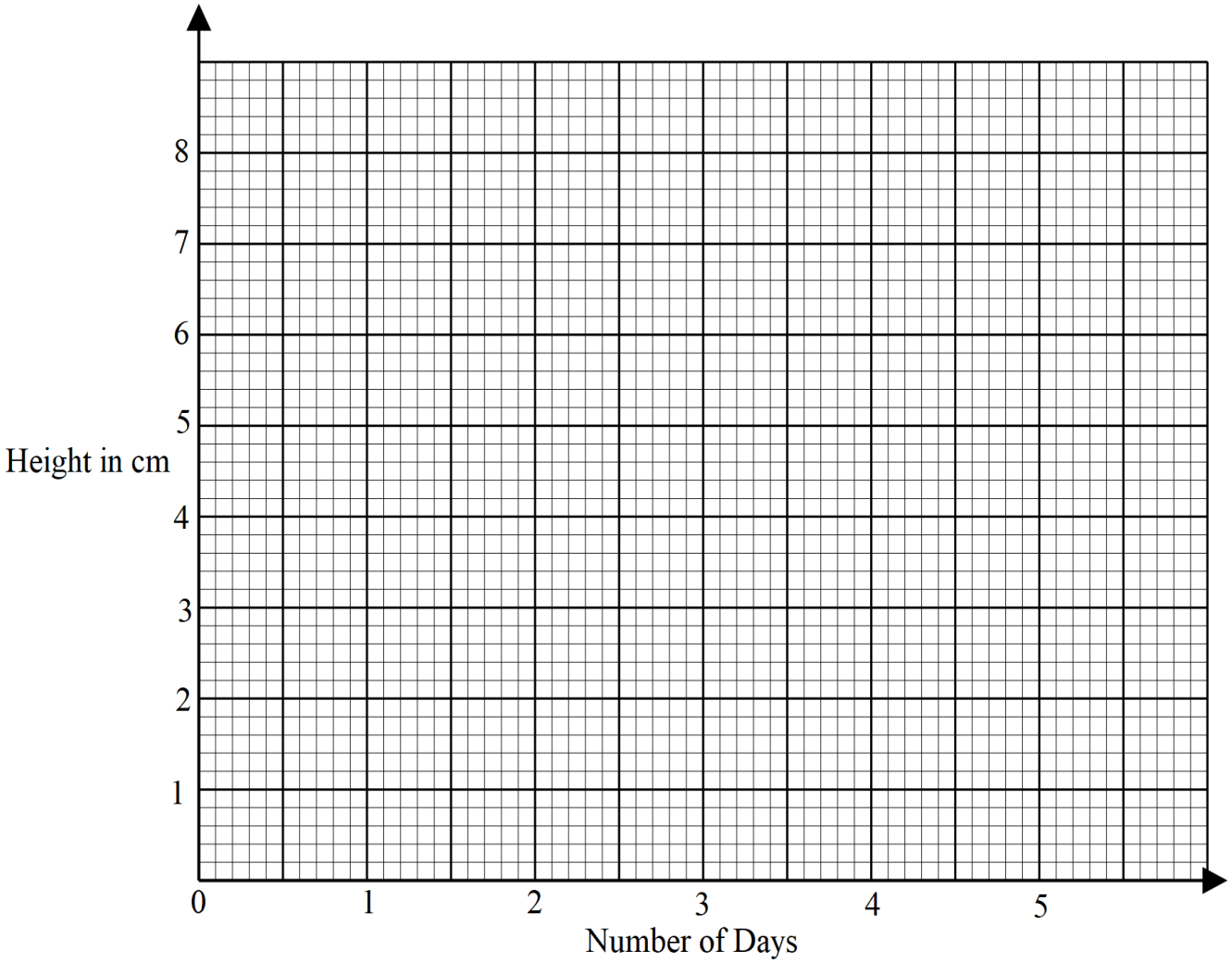
(b) Determine the value of a **(1 mark)**

10. An airport R is 4320 nautical miles to the north of another airport T (45^0S, 108^0E). find the position of T **(3 marks)**

11. The table below show the number of days (d) and heights of tree seedlings (h) in a tree nursery

Number of days (d)	1	2	3	4	5
Height (h cm)	3.7	6.0	7.5	8.3	8.8

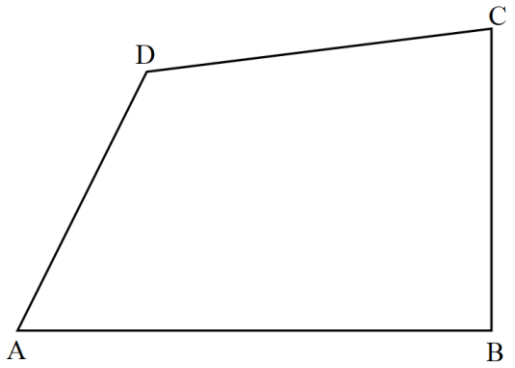
(a) On the grid provided, draw a graph to represent the information in the table given. **(2 marks)**



(b) Use the graph to determine the rate of change of height (h) with the number of days at $d = 3$ **(2 marks)**

12. The probability of Kisumu Day High School to win a hockey match is $\frac{7}{8}$. If it losses in hockey, then it has a probability of winning in soccer as $\frac{3}{4}$. Otherwise, the probability of winning the soccer match is $\frac{2}{3}$. Calculate the probability of the school winning either of the two games. **(3 marks)**

13. The figure below shows a ranch ABCD drawn to a scale of 1: 100,000. A security light tower is to be installed in the ranch such that it meets the following conditions:



- It is nearer to A than it is to B
- It is at least 200 metres from the point C
- It is further from the line CD than it is to A

Shade the possible region in the ranch where the tower would be installed to meet the above conditions. **(4 marks)**

14. Calculate the percentage error in the perimeter of a circle of radius 3.5 cm. **(3 marks)**

15. Use logarithms only to evaluate, correct to 4 decimal places **(4 marks)**

$$\sqrt[3]{\frac{14.70\tan 35^0 24'}{69.85^2}}$$

16. Solve for x in the equation **(3 marks)**

$\log(5x+75) - 2\log 3 = \log(2x-9)$

SECTION II (50 marks)

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

18. The table below shows the heights of tree seedlings measured in a tree nursery.

(a) Complete the table below. **(2 marks)**

Height	f	x	$d = x - 5.45$
3.0 – 3.9	3		
4.0 – 4.9	5		
5.0 – 5.9	7		
6.0 – 6.9	8		
7.0 – 7.9	5		
8.0 – 8.9	2		

(b) Use the table to calculate the standard deviation correct to decimal places. **(4 marks)**

(c) (i) On the grid provided, draw an ogive to represent the information above. **(2 marks)**

(ii) Use the ogive to find the range of height between the 20^{th} and the 80^{th} percentile. **(2 marks)**

18. The table below show income tax rate for the year 2019.

Taxable Income (Kshs. per month	Tax rate (Kshs per Kshs. 20
1 – 12,000	2
12,001 – 22,500	3
22,501 – 33,000	4
33, 000 – 43,500	5
43,501 – 54,000	6
54,001 and over	7

Emerick earns a basic salary of Kshs. 38,780. He is entitled to the following allowances per month: house allowance – Kshs. 10,000, medical allowance – Kshs. 3,850 and a non-taxable transport allowance of Kshs. 5,200. He is entitled to a personal tax relief of Kshs. 1,054 monthly.

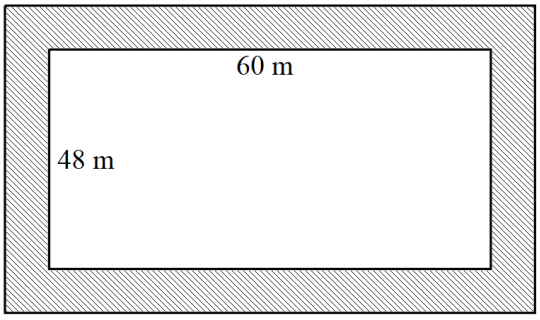
Calculate:

(a) Emerick's monthly taxable income. **(2 marks)**

(b) Emerick's monthly Pay As You Earn. **(5 marks)**

(c) His net monthly salary given that the following deductions are made from his monthly pay: NHIF – Kshs. 3,000, Bank loan – Kshs. 7,568, WCPS – Kshs. 780. **(3 marks)**

19. The figure below shows a hockey field of dimensions 60 metres by 48 m. The shaded area is an astroturf that is x metres wide.



(c) Form and simplify an expression in x for the:

(i) Area of the field and the astroturf ; **(1 mark)**

(ii) Area covered by the astroturf. **(2 marks)**

(d) Given that the shaded area is 220 m^2,

(i) find the value of x; **(4 marks)**

(ii) calculate the perimeter of the field with the turf. **(3 marks)**

20. $A'(-6,0)$, $B'(-2,-3)$ and $C'(-2,0)$ are the vertices of the image of triangle ABC under a transformation described by the matrix $\mathbf{M} = \begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix}$

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

(b) (i) On the same grid, draw triangles ABC, $A'B'C'$ **(2 marks)**

(ii) **Describe** fully the transformation **M** **(1 mark)**

(c) Triangle $A''B''C''$ is the image of triangle $A'B'C'$ such that $A''(0,6)$, $B''(6,2)$ and $C''(0,2)$

(i) Draw triangle $A''B''C''$on the same axes **(1 mark)**

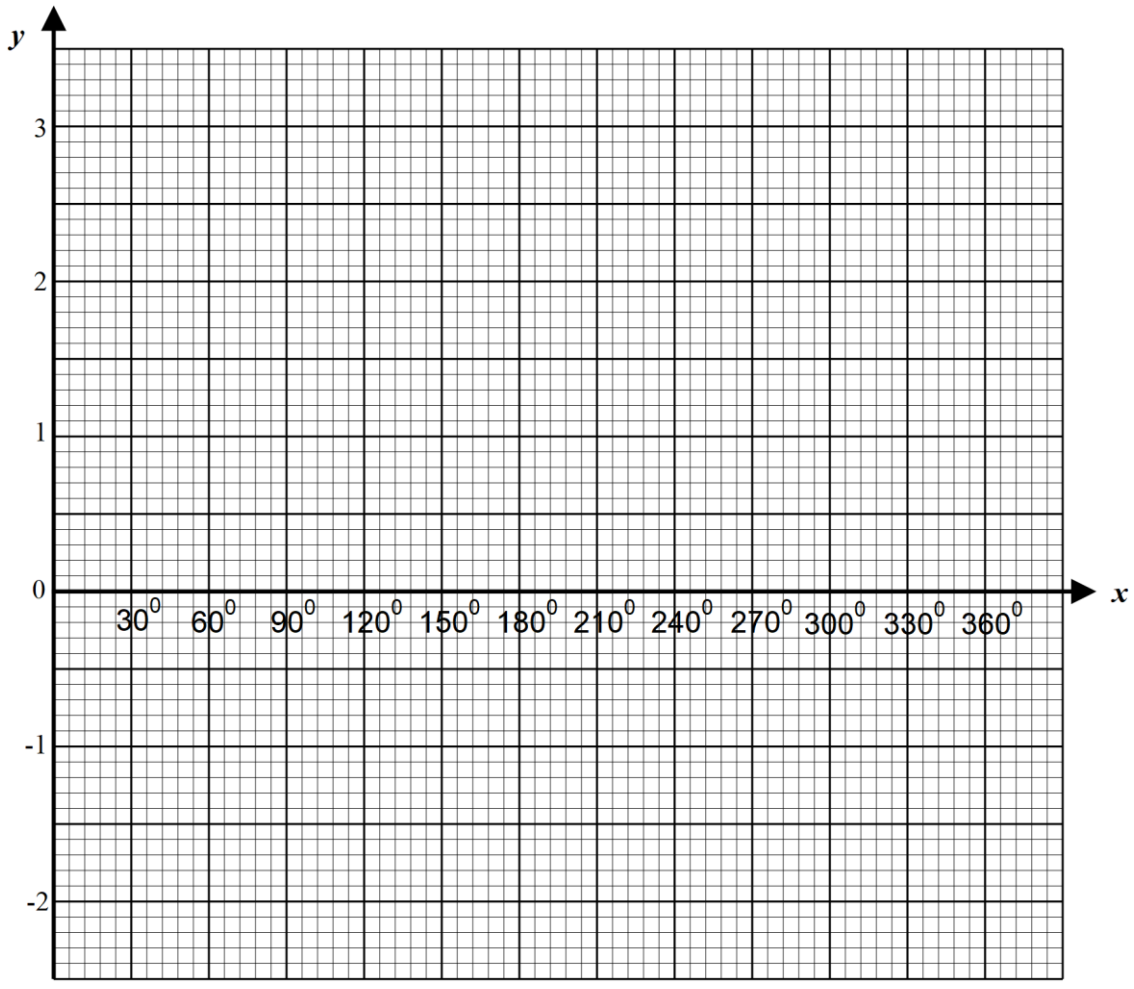
(ii) Find a single matrix of transformation that maps triangle ABC onto triangle $A''B''C''$ **(3 marks)**

21. (a) Complete the table below giving the values correct to 1 decimal place. **(2 marks)**

x^0	0	30	60	90	120	150	180	210	240	270	300	330	360
$y = 2\sin\left(\frac{3}{4}x\right) - 2\cos\left(\frac{3}{4}x\right)$	-2.0	-1.1	0.0		2.0		2.8		2.0	1.1	0.0		-2.0
$y = 1 + 2\cos x$	3.0		2.0	1.0	0.0	-0.7	-1.0		0.0	1.0		2.7	3.0

(b) On the grid provided and using the same axes, draw the graphs of **(4 marks)**

$y = 2\sin\left(\frac{3}{4}x\right) - 2\cos\left(\frac{3}{4}x\right)$ and $y = 1 + 2\cos x$ for $0^0 \leq x \leq 360^0$



(e) Using graphs in part (b),

(i) find the values of x for which: **(3 marks)**

$$1 + \cos\left(\frac{3}{4}x\right) = \sin\left(\frac{3}{4}x\right)$$

(ii) determine the values of x for which: **(1 mark)**

$$2\sin\left(\frac{3}{4}x\right) - 2\cos\left(\frac{3}{4}x\right) = 1 + 2\cos x$$

22. Awuor was paid an initial salary of Kshs. 180,000 per annum with a fixed annual increment. Wasonga was paid and initial salary of Kshs. 150,000 per annum with a 10% increment compounded annually.

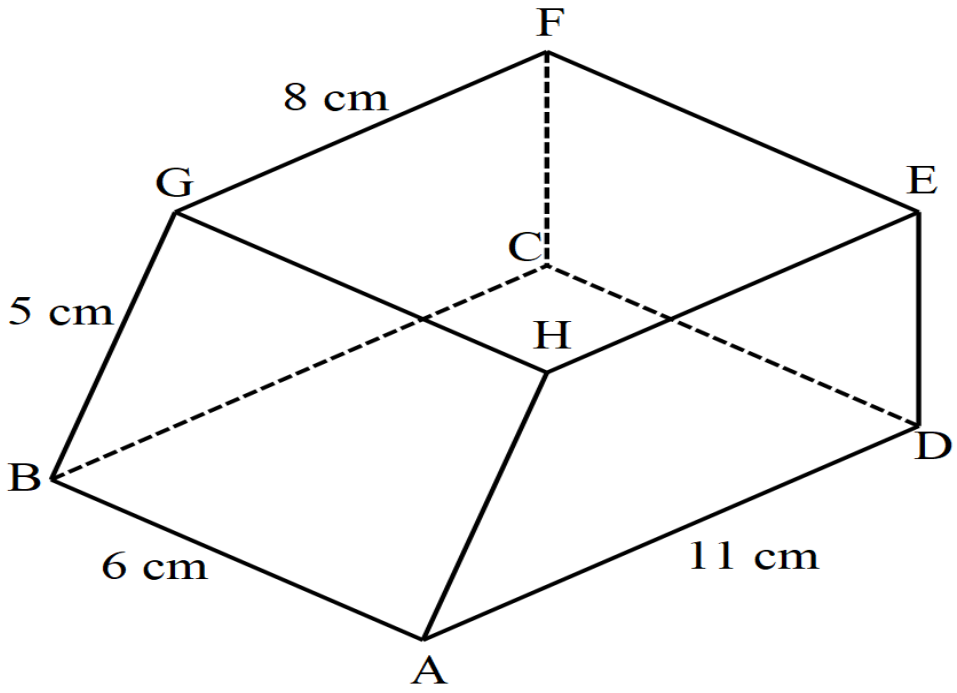
(a) Given that Awuor's annual salary in the 11th year was Kshs. 288,000, determine:

(i) Her annual increment **(3 marks)**

(ii) The total amount of money Awuor earned during the 11 years **(3 marks)**

(b) Determine Wasonga's monthly earning, correct to the nearest 10 shillings during the 11th year. **(4 marks)**

23. The figure below represents a prism ABCDEFGH of length 6 cm. the section ADEH of the prism is a trapezium in which AD=11 cm, HE=8 cm, BG=5 cm and ∠ADE=∠DEH=90^0



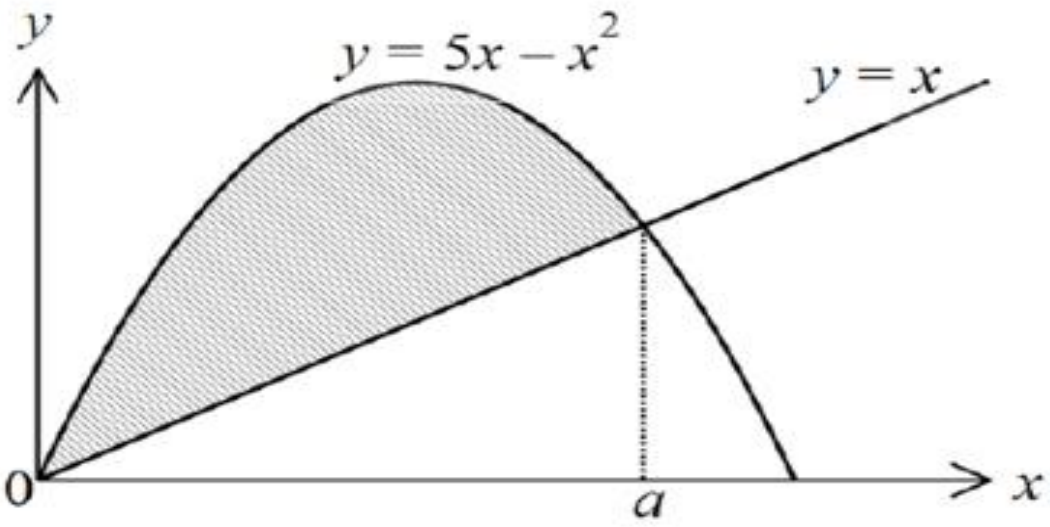
(c) Calculate correct to 1 decimal place;

(i) The angle between line DG and the plane ABCD. **(3 marks)**

(ii) The angle between planes ABGH and ABCD **(3 marks)**

(d) Calculate the volume of the prism **(4 marks)**

24. The figure below shows the area bound by the curve $y = 5x - x^2$ and the line $y = x$



(a) Find a, the value of x at the point of intersection of the curve and the line. **(3 marks)**

(b) Using the trapezium rule with 4 trapezia, estimate the area of the shaded region. **(4 marks)**

(c) By integration, calculate the exact area of the shaded region **(3 marks)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 2

121/1

MATHEMATICS

PAPER 1

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EXAMINER' S USE ONL Y

Section I

Questi	1	2	3	4	5	6	7	8	9	10	11	12	13	1	15		16	TOT
Marks																		

	Section II								
Questi	17	18	19	20	21	22	23		24	TOT
Marks										

GRAND TOTAL

(1.) Evaluate: **(3marks)**

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

(2.) A line passing through points P (4, a) and Q (3, 2) is perpendicular to the line 3y + x + 3 = 0. Find the value of a and write down equation of line PQ. **(4 marks)**

(3.) Use reciprocal tables to find the value of $(0.325)^{-1}$ hence evaluate $\left(\frac{3\sqrt{0.0000125}}{0.325}\right)$, give answer to 4 s.f. **(3marks)**

(4.) Solve for x in the **equation** **(3marks)**

$$\frac{x-3}{4} - \frac{x+3}{6} = \frac{x}{3}$$

(5.) Using the three quadratic identities only factorize and simplify**:** **(4marks)**

$$\frac{(x-y)^2-(x+y)^2}{(x^2+y^2)^2-(x^2-y^2)^2}$$

(6.) In a regular polygon, the exterior angle is $\frac{1}{3}$ of its supplement. Find the number of sides of this polygon. **(3marks)**

(7.) Find the area of a segment of a circle whose arc subtends an angle of $22\frac{1}{2}$ on the circumference of a circle, radius 10cm. **(3marks)**

(8.) Mr. Onyangos piece of land is in a form of triangle whose dimensions are 1200m, 1800m and 1500m respectively. Find the area of this land in ha.(give your answer to the nearest whole number) **(3marks)**

(9.) Two men each working for 8hours a day can cultivate an acre of land in 4 days. How long would 6men, each working 4hours a day take to cultivate 4 acres? **(3marks)**

(10.) From a viewing tower 30metres above the ground, the angle of depression of an object on the ground is 30^0 and the angle of elevation of an aircraft vertically above the object is 42^0.Calculate the height of the aircraft above the ground. **(3marks)**

(11.) Solve the following inequality and show your solution on a number line. **(3marks)**

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

(12.) Using a ruler, a pair of compasses only and (proportional) a set square, construct on the upper side division of line **BC** is 6cm, a line **BD** such that $\angle$**DBC** = 37.5°. Use the line **BD** to divide **BC** into 4 equal portions. **(3marks)**

(13). A Kenyan bank buys and sells foreign currency as shown below.

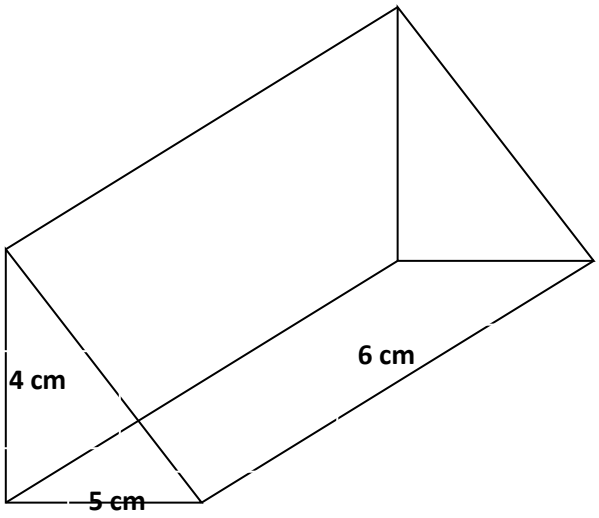
	Buying Ksh	Selling Ksh
1 US dollar ($)	103.00	106.20
1 UK pound (£)	145.00	149.95

A tourist arrived in Kenya with £9600 which he converted into Kshs at a commission of 5%. He later used ¾ of the money before changing the balance of dollars at no commission calculate; to the nearest dollar, the amount he received. **(3marks)**

(14.) A map is drawn to scale of 1:50,000. Find the area in cm^2 on the map of a field with an actual area of 60,000m^2. **(3marks).**

(15.) Two similar solids have surface areas of 48cm^2 and 108cm^2 respectively. Find the volume of the smaller solid if the bigger one has a volume of 162cm^3. **(3marks).**

(16.) The diagram below represents a prism whose cross section is a right angled triangle. Draw a labeled sketch of the net of the prism. **(3marks).**



SECTION II. ANSWER ANY FIVE QUESTIONS.

17. Four schools: Lihanda, Kagito, Bar-Sari and Ndori are such that Lihanda is 6km from Kagilo on a bearing of 158°, Bar-Sauri is to the west of Kagilo and 20km away while Ndori is to the South of Bar-sauri on a bearing of 240° from Lihanda.

a) Using a scale of 1:400,000 draw a scale diagram showing the relative positions of the four schools **(5mark)**

b) Using your diagram determine the distance and bearing of Ndori from Kagilo**.** **(2 marks)**

c) A mast is to be erected so that it is equidistant from Kagilo and Bar-sauri and 20km from Ndori. On the same diagram show the position of the mast and find its distance from **Lihanda.** **(3marks)**

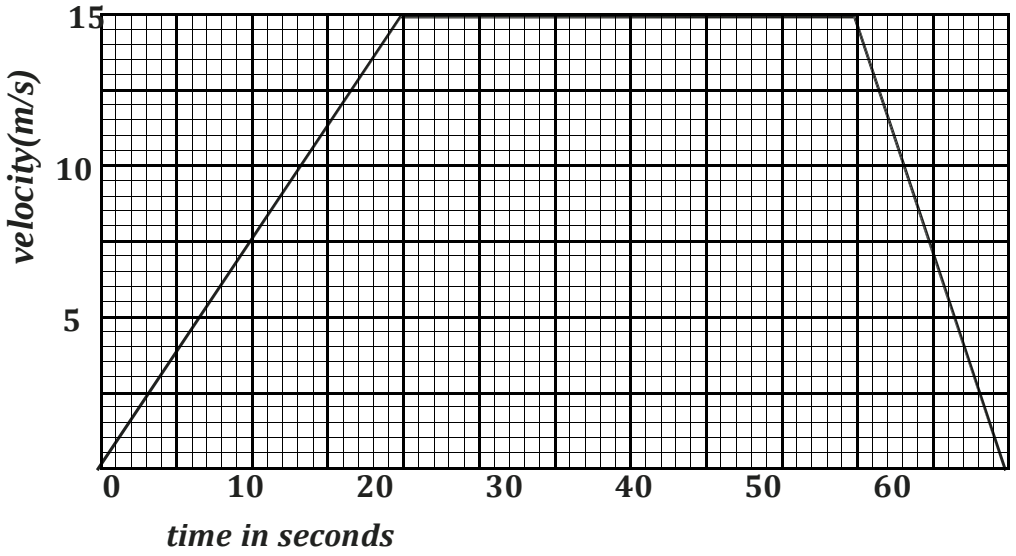
18. A commemorative stone is sculptured in a shape of a frustum of a cone with the diameters of the top and bottom faces being 28cm and 49cm respectively. If the vertical distance between the faces is 45cm, find:

i) Find the cones vertical height**.** **(2marks)**

(ii) Find the volume of the stone. **(3 marks)**

ii) Surface area of the stone. **(5 marks)**

19. The graph in figure below represents the journey made by a matatu between two bus stops.



a) What is the acceleration of the matatu? **(2 marks)**

b) Calculate the deceleration of the matatu? **(2 marks)**

c) What distance does the matatu cover while accelerating? **(2 marks)**

d) Calculate the distance covered by matatu while decelerating **(2marks)**

e) Calculate the distance between the two bus stops. **(2 marks**

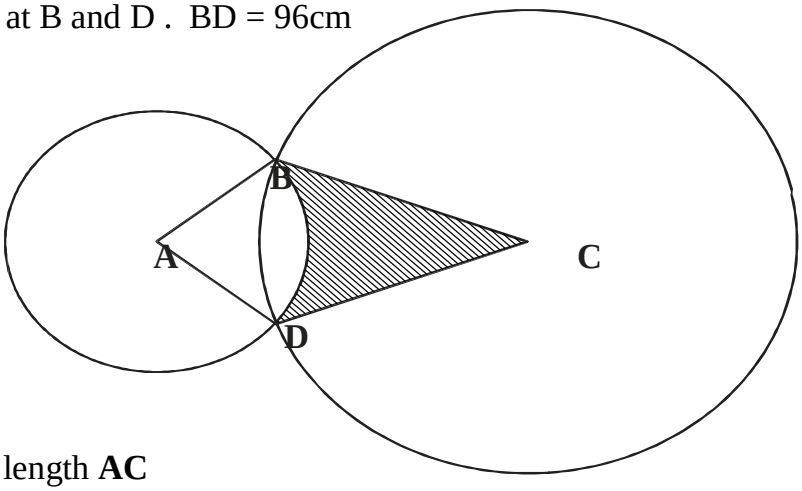
20. An amount of money was shared among five boys Ali, Juma, Musa, Khalid and Mustafa. Ali got $^{3}/_{8}$ of the total amount while Juma got $^{2}/_{5}$ of the remainder. The remaining amount was shared equally among Musa, Khalid and Mustafa, each of which received Kshs 600.

a) How much did Juma get? **(3 marks)**

b) How much was shared among the five boys. **(2 marks**

c) Ali, Juma and Mustafa invested their money and earned a profit of Kshs 1200. A third of the profit was left to maintain the business and the rest shared according to their investments. Calculate how much each got. **(5 marks)**

21. In the diagram below, two circles centres A and C have radii 70cm and 102cm respectively, intersects at B and D . BD = 96cm



a) Find the length **AC** **(3 marks)**

b) Calculate

i) Angle BAD **(2 marks)**

ii) Angle BCD **(2 marks)**

iii) The area of the shaded part. **(3 marks)**

22. An amount of money was shared among five boys Ali, Juma, Musa, Khalid and Mustafa. Ali got $^3/_8$ of the total amount while Juma got $^2/_5$ of the remainder. The remaining amount was shared equally among Musa, Khalid and Mustafa, each of which received Kshs 600.

a) How much did Juma get? **(3 marks)**

b) How much was shared among the five boys**.** **(2 marks)**

c) Ali, Juma and Mustafa invested their money and earned a profit of Kshs 1200. A third of the profit was left to maintain the business and the rest shared according to their investments. Calculate how much each got. **(5 marks)**

23. A particle P moves in a straight line such that t seconds after passing a fixed point Q. its velocity is given by the equation $2t^2 - 10t + 12$ find:

a) The values of t when p is instantaneously at rest**.** **(2 marks)**

b) An expression for the distance moved by P after t seconds**.** **(2 marks)**

c) The total distance traveled by P in the first 3 seconds after passing point O. **(3 marks)**

d) The maximum velocity attained by the body**.** **(3 marks)**

24. On the graph paper provided plot the points P(2,2) Q(2,5) and R(4,4)

a) Join them to form a triangle **PQR** **(1mk)**

b) Reflect the triangle PQR in the line x=0 and label the image s $P^1Q^1R^1$**.** **(2mks)**

c) Triangle PQR is given translation by vector T $\begin{pmatrix}2\\2\end{pmatrix}$ to $P^{11}Q^{11}R^{11}$.plot the triangle $P^{11}Q^{11}R^{11}$.**(3mks)**

d) Rotate triangle $P^{11}Q^{11}R^{11}$ about the origin through -90^0.state the coordinates of $P^{111}Q^{111}R^{111}$. **(3mks)**

e) Identify two pairs of triangle that are direct **congruence** **(1mk)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 2

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

1. *Write your name and Index number in the spaces above.*
2. *Sign and write the date of the examination in the spaces provided above.*
3. *This paper contains two sections. Section I and II.*
4. *Answer all questions in section I and ONLY five in section II.*
5. *Marks may be awarded for correct working even if the answer is wrong.*
6. *Non-programmable silent calculators may be used and KNEC Mathematical tables may be used, ex- cept where stated otherwise.*

EXAM INER' S USE ONL Y

Section I

Questi	1	2	3	4	5	6	7	8	9	10	11	12	13	1	15		16	TOT
Marks																		

	Section II								
Questi	17	18	19	20	21	22	23		24	TOT
Marks										

GRAND TOTAL

SECTION A (50 MARKS)

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

$$\sqrt[4]{\frac{(27 \times 0.0293)^2}{(825 - 94) \div 0.2861}}$$

2. Three sisters, Ann, Beatrice and Caroline together harvested Ksh 48,000 as capital & started as small business. If the share of profit is Kshs 2,300, Kshs 1,700 & Kshs 800 respectively, share proportionally.

Find the capital invested by each of them**;** **(3mks)**

3. Make t the subject of the formula **in** **(3mks)**

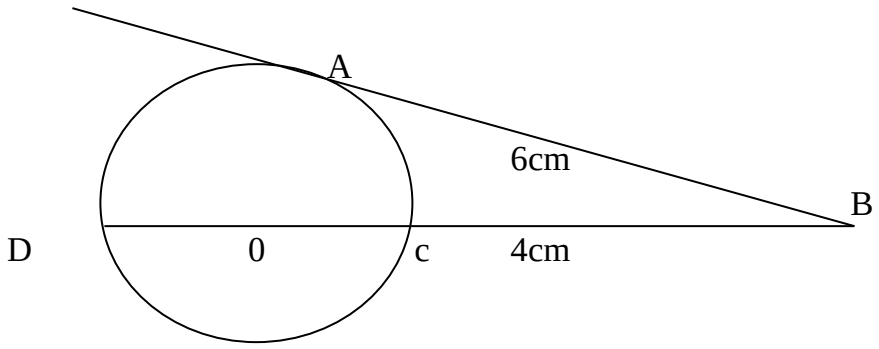
$$x\left[\frac{p + t}{t}\right]^{1/3}$$

4. Simplify the expression **(3mks)**

$$\frac{3x^2 - 4xy + y^2}{9x^2 - y^2}$$

5. A (-6, -2) and B (2, -4) are end points of a diameter of a circle. Find the co-ordinates of the center and the radius of the circle. **(3mks)**

6. In the figure below AB is a tangent to the circle and BCD is a straight line passing through the center of the circle. AB =6cm and BC= 4cm. Calculate the radius of the circle**.** **(3mks)**



7. Solve the equation below in the range $0^0 \leq x \leq 180^0$ **25 in (3x + 10) = -1.674** **(3mks)**

8. Expand and simplify $(3x - y)^4$ hence use the first three terms of the expansion to approximate the value of $(6 - 0.2)^4$ **(3mks)**

9. Find x without using table if **(3mks)**

$3 + \log {}^3{}_2 + \log_2 x = \log {}_2 5 + 2$

10. Without using mathematical table or calculator **simplify** **(3mks)**

$$\frac{3\sqrt{2} - \sqrt{3}}{2\sqrt{3} - \sqrt{2}}$$

11. Find the value of m for which the matrix transforms an object into a straight line **(3mks)**

$$\begin{pmatrix} M^2 & 1 \\ 2m-1 & 1 \end{pmatrix}$$

12. A right angled triangle has a base of 15.3cm and height 7.2cm, each measured to the nearest 3mm. Determine the percentage error in finding the area of the triangle giving your answer to 2 **dp** **(4ms)**

13. The point B(3,2) maps onto $\dot{B}$ (7,1) under a transformation T_1. Find T_1 **(2mks)**

14. Solve for x 8 y in the simultaneous equation using matrices method**.** **(4mks)**

$2x + 3y = 7$

$y - x = 2$

15. The sum of the first ten terms of an arithmetic progression in 400. If the sum of the first 6 terms of the same series is 120, find the 15^{th} term. **(3mks)**

16. Two grade of tea A & B, costing sh100 and 150 per kg respectively are mixed in the ratio 3.5 by mass. The mixture is then sold at sh 160 per kg. Find the percentage profit on the cost price. **(3mks)**

SECTION B

Attempt five questions in this section.

17. The frequency distribution table below represents the number of kilograms of meat sold in a butchery

Mass in kg	1-15	6-10	11-15	16-20	21-25	26-30	31-35
Frequency	2	3	6	8	3	2	1

Export graph

a) State the modal **frequency** **(1mk)**

b) Calculate the mean mass using assumed mean of 18kg **(5mks)**

c) Calculate the median **mass** **(4mks)**

18. A plane leaves an airport A(41.5^0 N, 36.4^0W) at 9.00AM and flies due north to Airport B on latitude 53.2^0. Taking $\prod$ as $\frac{22}{7}$ and the radius of the earth as 6370km.

a) Calculate the distance covered by the plane in **km** **(4mks)**

b) The plane stopped for 30minutes to refuel at b and flew east to C 2500km from B. Calculate

i. Position of C **(3mks)**

ii. The time the plane land at C if its speed is 500km/h

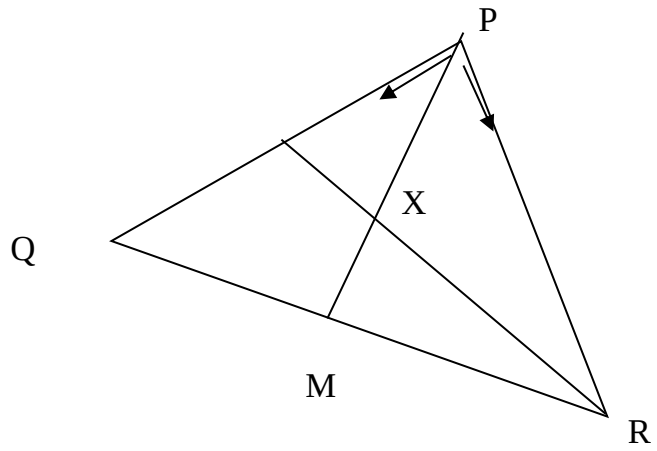
19. (a) Draw a rectangle ABCD of legth AB = 7.5cm and width 4.8cm and construct the locus of point P with the rectangle such that P is equidistant from BC & **CD** **(4mks)**

b) If the locus of P meets AB at N, measure AN **(1mk)**

c) Construct the locus of point Q with the rectangle and in the same side as D such that angle NQC $= 60^0$ **(3mks)**

d) Determine the area of the trapezium **(2mks)**

20. In the triangle PQR below L & M are points of PQ & QR respectively such that PL:LQ = 1:3 and QM :MR = 1:2. PM & PL intersect at X. Given that PQ = b and PR = c



a) Express the following vectors in terms of b & c

(i) QR **(1mk)**

(ii) PM **(1mk)**

(iii) RL **(1mk)**

b) By taking PX = KPM and RX = hRL where K and h are constants. Find two expressions for PX in terms of K, b, h and c. Hence determine the values of the constants k and h **(6mks)**

c) Determine the ratio LX:XR **(1mk)**

21. The curve given by the equation y = x^2 +1 is defined by the values in the table below.

a) Complete the table by filling in the missing values.

X	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Y	1.0		2.0		5.0		10.0		17.0		26.0		37.0

b) Sketch the curve for y = x^2 + 1 for $0 \leq x \leq 6$

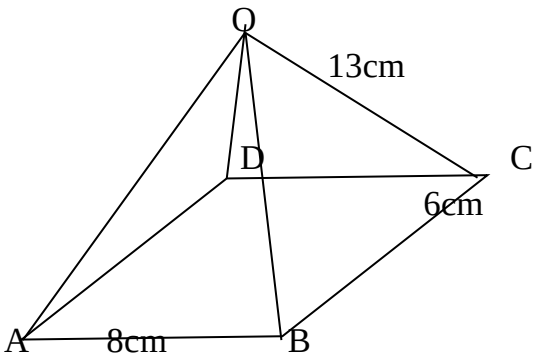
c) Use the mid-ordinate rule with 5 ordinates to find the area of the region bounded by the curve y = x^2 + 1, the axis the lines x = 0 and x = **6** **(2mk)**

d) Use method of integration to find the exact value of the area of the region in (C) above. **(2mk)**

e) Calculate the percentage eror involved in using the mid- ordinate rule to find the area. **(2mk)**

22. OABCD is a right pyramid on a rectangular base with AB = 8cm, BC = 6cm, OA = OB = OC = OD =13cm. Calculate:

a. The height of the pyramid



b. The inclination of OBC to the horizontal **(2mks)**

c. The angle between

i. OB & DC

ii. The planes OBC & OAD

23. A particle moves such that t seconds after passing a given point O, its distance 5 metres from O is given as 5 = t (t-2)(t-1)

a. Find its velocity where t = 2 seconds **(3mks)**

b. Find its minimum **velocity** **(2mks)**

c. Find the time when the particle is momentarily at rest **(3mks)**

d. Find the acceleration when t = 3 seconds **(3mks)**

24. The ……..master wishes to hire two matatus for a trip. The operators have a Toyota which carries 10 passengers and a Kombi which carries 20 passengers. Altogether 120 people have to travel. The operators have only 20 litres of fuel and the Toyota consumes 4 litres on each round trip and the Kombi 1 litre on each round trip. If the Toyota makes x round trips and the Kombi y round trips:

a. Write down four inequalities in x & y which must be **satisfied** **(2mks)**

b. Represent the inequalities graphically on the grid **provided** **(3mks)**

c. The operators charge shs 100 for each round trip in the Toyota and shs 300 for round trip in the kombi

i. Determine the number of trips made by each vehicle so as to make total cost 9 minimum **(4mks)**

ii. Find the minimum **cost** **(1mk)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 3

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

(a) Write your name, index and class number in the spaces provided above.
(b) The paper consists of two sections**:** ***section I*** and ***section II*****.**
(c) Answer **all** the questions in **section I** and any **five** in **section II**
(d) Section I has **sixteen** questions and section two has **eight** questions
(e) All answers and working must be written on the question paper in the spaces provided below each question.
(f) KNEC Mathematical table and silent non-programmable calculators may be used.

FOR EXAMINER'S USE ONLY

Section I

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

Section II

17	18	19	20	21	22	23	24	total

1. Evaluate: **(3 mks)**

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

2. Mr. Kamau son and daughter needed clothes. The son clothes were costing Ksh 324 while the daughter clothes were costing Ksh 220. Mr Kamau wanted to give them equal amounts of money. Calculate the least amount of money he would spend on the two and how many clothes each will buy. **(3 mks)**

3. Use reciprocal tables to find the value of $(0.325)^{-1}$ hence evaluate $\frac{\left(\sqrt[3]{0.000125}\right)}{0.325}$, give your answer to 4 s.f. **(3 mks)**

4. A type of paper is 40cm long, 32 cm wide and 0.8 mm thick. The paper costs sh 10 per m^2. Find the total cost of a pile of such paper of height 4.8m. **(4 mks)**

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

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

$$\frac{x-3}{4}-\frac{x+3}{6}=\frac{x}{3}$$

7. A salesman earns 3% commission for selling a chair and 4% commission for selling a table. A chair fetches K£ 75. One time, he sold ten more chairs than tables and earned seven thousand, two hundred Kenya shillings as commission. Find the number of tables and chairs sold.**4 mks)**

8. Using the three quadratic identities only factorise and simplify: **(3 mks)**

$$\frac{(x-y)^2-(x+y)^2}{(x^2+y^2)^2-(x^2-y^2)^2}$$

9. Two numbers are in the ratio 3 : 5. When 4 is added to each the ratio becomes 2 : 3. What are the numbers? **(3 mks)**

10. Given that Sin $(x + 4^0)$ = Cos $(3x)^0$. Find tan $(x + 40^0)$ to 4 s.f. **(3 mks)**

11. In a regular polygon, the exterior angle is $^1/_3$ of its supplement. Find the number of sides of this polygon. **(3 mks)**

12. Find the area of a segment of a circle whose arc subtends an angle of 22 ½^0 on the circumference of a circle, radius 10cm. **(3 mks)**

13. An airplane leaves point A (60^0S, 10^0W) and travels due East for a distance of 960 nautical miles to point B. determine the position of B and the time difference between points A and B. **(3 mks)**

14. Mr. Onyango's piece of land is in a form of triangle whose dimensions are 1200M, 1800M and 1500M respectively. Find the area of this land in ha. (Give your answer to the nearest whole number). **(3 mks)**

15. Two men each working for 8 hours a day can cultivate an acre of land in 4 days. How long would 6 men, each working 4 hours a day take to cultivate 4 acres? **(3 mks)**

16. Find the equation of a straight line which is perpendicular to the line $8x + 2y - 3 = 0$ given that they intersect at $y = 0$ leaving your answer in a double intercept form. **(3 mks)**

SECTION B

17. (a) Use the mid-ordinate rule to estimate the area bounded by the curve $y = x + 3x^{-1}$, the x-axis, lines $x = 1$ and $x = 6$. **(4 mks)**

(b) Find the exact area of the region in (a) above. **(3 mks)**

(c) Calculate the percentage error in area when mid-ordinate rule is used. **(3 mks)**

18. A car whose initial value is Ksh 600,000 depreciates at a rate of 12% p.a. Determine:

(a) Its value after 5 years. **(4 mks)**

(b) Its value of depreciation after 5 years. **(2 mks)**

(c) The number of year it will take for the value of the car to be Ksh 300,000 **(3 mks)**

19. A square whose vertices are P (1,1) Q (2,1) R(2,2) and S (1,2) is given an enlargement with centre at (0,0). Find the images of the vertices if the scale factors are: **(3 mks)**

(i) -1

(ii) ½

(iii) 3

(b) If the image of the vertices of the same square after enlargement are P^1 (1,1), Q^1 (5,1), R^1(5,5) and S^1 (1,5) find:

(i) the centre of enlargement **(4 mks)**

(ii) the scale factor of the enlargement **(3 mks)**

20. On the graph paper provided plot the point P (2,2) Q (2,5) and R (4,4).

(a) Join them to form a triangle PQR. **(1 mk)**

(b) Reflect the triangle PQR in the line X = 0 and label the image as P^1 Q^1 R^1. **(2 mks)**

(c) Triangle PQR is given a translation by vector. T $\begin{pmatrix}2\\2\end{pmatrix}$ to P^{11} Q^{11} R^{11}. Plot the triangle P^{11} Q^{11} R^{11}. **(3 mks)**

(d) Rotate triangle P^{11} Q^{11} R^{11} about the origin through -90^0. State the coordinates of P^{111} Q^{111} R^{111}. **(3 mks)**

(e) Identify two pair of triangles that are direct congruence. **(1 mk)**

21. Three warships P, Q and R are at sea such that ship Q is 400 km on a bearing of $N30^0$ E from ship P. ship R is 750 km from ship Q and on a bearing of $S60^0E$ from ship Q. an enemy warship is sighted 1000 km due south of ship Q.

(a) Use scale drawing to locate the position of ships P, Q, R and S. **(4 mks)**

(b) Find the compass bearing of: **(2 mks)**

(i) Ship P from ship S

(ii) Ship S from ship R

(c) Use scale drawing to determine: **(2 mks)**

(i) The distance of S from P

(ii) The distance of R from S

(d) Find the bearing of: **(2 mks)**

(i) Q from R

(ii) P from Q

22. The table below shows the amount in shillings of pocket money given to students in a particular school.

Pocket money (Kshs)	201 – 219	220 – 229	230 – 239	240 – 249	250 – 259	260 – 269	270 – 279	280 – 289	290 – 299
No. of students	5	13	23	32	26	20	15	12	4

(a) State the modal class. **(1 mk)**

(b) Calculate the mean amount of pocket money given to these students to the nearest shilling. **(4 mks)**

(c) Use the same axes to draw a histogram and a frequency polygon on the grid provided. **(5 mks)**

23. Given that points X (0,-2), Y (4, 2) and Z (x,6);

(a) Write down the column vector $\overrightarrow{XY}$. **(1 mk)**

(b) (i) Find $\left|\overrightarrow{XY}\right|$ leaving your answer in index form. **(3 mks)**

(ii) Given that $\left|\overrightarrow{XZ}\right|$ = 11.3170, find the coordinates of Z. **(3 mks)**

(c) Find the mid-point of the line YZ. **(3 mks)**

24. A bus and a matatu left Voi from Mombasa, 240 km away at 8.00 am. They travelled at 90 km/h and 120 km/h respectively. After 20 minutes the matatu had a puncture which took 30 minutes to mend. It then continued with the journey.

(a) How far from Voi did the catch up with the bus. **(6 mks)**

(b) At what time did the matatu catch up with the bus? **(2 mks)**

(c) At what time did the bud reach Mombasa? **(2 mks)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 3

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

Instructions to candidates

(a) Write your name, index and class number in the spaces provided above.
(b) The paper consists of two sections**:** ***section I*** and ***section II*****.**
(c) Answer **all** the questions in **section I** and any **five** in **section II**
(d) Section I has **sixteen** questions and section two has **eight** questions
(e) All answers and working must be written on the question paper in the spaces provided below each question.
(f) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question
(g) KNEC Mathematical table and silent non-programmable calculators may be used.

For examiner's use only

Section I

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

Section II

17	18	19	20	21	22	23	24	total

SECTION A

1. Without using logarithm tables or calculator, solve $3^{2x+3} - 28\,(3^x) + 1 = 0$. **(3 mks)**

2. Use a mathematical table to evaluate: **(3 mks)**

$$\left(\frac{4.28\ x\ 0.01677}{\tan 20}\right)^{\frac{1}{5}}$$

3. Simply and leave answer in surd form. **(3 mks)**

$$\frac{-9}{\sqrt{13}+\sqrt{3}} - \frac{5}{\sqrt{3}-\sqrt{13}}$$

4. The sides of triangles were measured and recorded as 8.4 cm, 10.5 cm and 15.3. Calculate the percentage error in perimeter correct to 2 d.p. **(3 mks)**

5. Simplify: **(3 mks)**

$$\frac{\log 16 + \log 81}{\log 8 + \log 27}$$

6. Simplify the expression: **(4 mks)**

$$\frac{(-36+9x^2)+(-6y+3xy)}{3x-6}$$

7. Given that $\frac{x\,(x^2-1)}{x+1}$, find dy/dx at the point (2,4). **(3 mks)**

8. (a) Expand and simplify the expression $\left(10 + \frac{2}{x}\right)^5$ **(2 mks)**

(b) Use the expression in (a) above to find the value of 14^5. **(1 mk)**

9. John buys and sells rive in packets. He mixes 30 pockets of rive A costing sh 400 per packet with 50 packets of another kind of rive B costing sh 350 per packet. If he sells the mixture at a gain of 20%, at what price does he sell a pocket? **(3 mks)**

10. A chord of AB of length 13cm subtends an angle of 670 at the circumference of a circle centre O. find the radius of the circle. **(3 mks)**

11. Find the coordinates of the image of a point (5, -3) when its rotated through 180^0 about (3,1). **(3 mks)**

12. Two points P (-3,-4) and Q (2,5) are the points on a circle such that PQ is the diameter of the circle. Find the equation of the circle in the form $ax^2 + by^2 + cx + dy + e = 0$ where a, b, c and e are constants. **(4 mks)**

13. Two metal spheres of radius 2.3 cm and 2.86 cm are melted. The molten material is used to cast equal cylindrical slabs of radius 8 mm and length 70mm. If $^1/_{20}$ of the meal is lost during casting. Calculate the number of complete slabs cast. **(3 mks)**

14. A right pyramid has a rectangular base of 12 cm by 16cm. its slanting lengths are 26 cm. Determine:

(a) The length of AC **(1 mk)**

(b) The angle AV makes with the base ABCD. **(2 mks)**

15. the inverse, T^{-1} of the matrix T $\begin{pmatrix} 4 & 6 \\ 6 & -2 \end{pmatrix}$ hence solve : **(3 mks)**

$2x + 3y = 30$

$3x - y = 10$

16. Use squares, square roots and tables to evaluate: **(3 mks)**

$3.045^2 + (49.24)^{-1/2}$

SECTION B

17. The table below shows the frequency distribution of diameter for 40 tins in millimeters.

Diameter (mm)	130 – 139	140 – 149	150 – 159	160 – 169	170 – 179	180 – 180
No of tins	1	3	7	13	10	6

Using a suitable working mean calculate:

(a) The actual mean for the grouped lengths. **(4 mks)**

(b) The standard deviation of the distribution. **(6 mks)**

18. A $^3/_2$ Bao yearly plan is a school pocket money (SPM) saving scheme requiring 12 months payments of a fixed amount of money on the same data each month. All savings earn interest at a rate of p% per complete calendar month.

Lewis Kamau decides to invest K£ 30 per month in this scheme as advised by Gumbo and Oteinde 4Q and 4P class governors a.k.a class secretaries and witnesses by very determined mathematics. Martine Mutua Mukumbu (M^3) and makes no withdrawals during the year.

(a) Show that after 12 compelete calendar months, Lewis first payment has increased in value to K£ 30 r^{12}, where $r = 1 + \frac{P}{100}$ **(4 mks)**

(b) Show that the total value, after 12 complete calendar months, of all 12 payments is

K£ 30 $r = \frac{r(r^{12}-1)}{(r-1)}$ **(3 mks)**

(c) Hence calculate the total interest received during the 12 months when the monthly rate of interest is ½ per cent. **(3 mks)**

19. A mobile dealer sells phones of two types: Nokia and Motorola. The price of one nokia and one Motorola phone is Ksh 2000 and Ksh 16000 respectively. The dealers wishes to have al least fifty mobile phones. The number of Nokia phones should be atleast the same as those of Motorola phones. He has Ksh 120,000 to spend on phones. If he purchases x Nokia phones and y Motorola phones;

(a) Write down all the inequalities to represent the above information. **(3 mks)**

(b) Represent the inequalities in part (a) above on the grid pro\vided. **(4 mks)**

(c) The profit on a nokia phone is Ksh 200 and that on a Motorola phone is Ksh 300. Find the number of phones of each type he should stock so as to maximize profit. **(3mks)**

20. The vertices of parallelogram are O (0,0), A (5,0) B (8,3) and C (3,3). Plot on the same axes:

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

(ii) Parallelogram O''A''B''C'' the image of O'A'B'C' under a transformation described by the matix $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ Describe the transformation. **(4 mks)**

(iii) Parallelogram O'''A'''B'''C''' under the enlargement, centre (0,0) and scale factor ½ **(2 mks)**

21. A particle moving with acceleration a = (10 –t) m/s^2. When t = 1 velocity V = 2 m/s and when t = 0 displacement S = OM.

(a) Express displacement and velocity in terms of t.

(b) Calculate the velocity when t = 35

(c) What is the displacement when t = 5

(d) Calculate maximum velocity.

22. (a) Three quantities x, y and t were such that the square root of y varies directly as x and inversely as t. find the percentage change in t if x decreases in ratio 4 : 5 and y increases by 44%. **(5 mks)**

(b) If y varies as the square root of x and the sum of the vale of y when x = 4 and y = 100 is 2:

(i) Find y in terms of x **(3 mks)**

(ii) Find x correct to one d.p when y = 14 **(2 mks)**

23. Use a ruler and pair of compasses only in this question. ABC is a fixed triangle in which AB = AC = 6 cm and angle BAC = 90^0. Show clearly on a two dimensional drawing the locus of Q in each case below.

(a) When Q is equidistant from both lines CA and CB. **(5 mks)**

(b) When the area of triangle ABC = areas of triangle QBC. **(5 mks)**

24. Two fair dice are tossed once. The event A and B are defined as follows:

A: the score on the two dices are the same

B: at least one die shows a 4.

(a) Draw a probability space representing the tossing. **(2 mks)**

(b) Calculate:

(i) The probability of even A **(1 mk)**

(ii) The probability of even B **(2 mks)**

(iii) The probability of even A and B **(2 mks)**

(c) If the two dice are tossed three time

(i) Draw a tree diagram showing the event A happening for the three tosses**.** **(1 mk)**

(ii) Calculate the probability that A occurs:

(a) Exactly once **(1 mk)**

(b) At least once **(2 mk)**

(c) At most once **(2 mks)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 4

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO THE CANDIDATES

- *This paper contains two sections;* ***Section*** *I and* ***Section II****.*
- *Answer all the questions in* ***section I*** *and only* ***five*** *questions from* ***Section II.***
- *All workings and answers must be written on the question paper in the spaces provided below each question.*
- *Non programmable silent electronic calculators and KNEC Mathematical tables may be used* ***EXCEP****T where stated otherwise.*
- *Show all the steps in your calculations, giving your answers at each stage.*

FOR EXAMINER'S USE ONLY

Section 1

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

Section 1I

Question	17	18	19	20	21	22	23	24	**Total**
Marks									

SECTION I (50MKS)

1. A rally car travelled for 2 hours 40 minutes at an average speed of 120km/h. the car consumes an average of 1 litre of fuel for every 4 kilometers. A litre of fuel costs Ksh.59. Calculate the amount of money spent on fuel. **(3mks)**

2. One interior angle of a polygon is equal to 80^0 and each of the other interior angles are 128°. Find the number of sides of the polygon. **(3mks)**

3. (a) Using a pair of compasses and a ruler only construct a triangle ABC and such that AB= 4cm, BC =6cm and angle ABC=135°. **(2mks)**

(b) Construct the height of triangle ABC in (a) above taking AB as the base, hence Calculate the area of triangle ABC. **(2mks)**

4. Solve the following inequalities and state the integral values **(3mks)**

$2x - 2 \leq 3x + 1 < x + 11$

5. Without using mathematical tables or calculators, **evaluate** $\sqrt{\frac{1408 \times 0.594 \times 0.012}{6.05 \times 125}}$ leaving your answer as a simplified fraction **(3mks)**

6. Two similar solids have surface areas $48cm^2$ and $108cm^2$respectively. Find the volume of the smaller solid if the bigger one has a volume of $162cm^3$. **(3mks)**

7. A triangle flower garden has an area of $28m^2$. Two of its edges are 14 metres and 8 metres. Find the angle between the two edges. **(3mks)**

8. A watch which looses a half a minute every hour.It was set read the correct time at 0445hr on Monday. Determine in twelve hour system the time the watch will show on Friday at 1845hr the same week. **(3mks)**

9. Simplify the expression: $\frac{9t^2 - 25a^2}{6t^2 + 19at + 15a^2}$ **(3mks)**

10. Use reciprocal and cube root tables to evaluate **(3mks)**

$\frac{5}{63.34} - \sqrt[3]{0.0169}$

11. A Kenya company received US Dollars M. The money was converted into Kenya Shillings in a bank which buys and sells foreign currencies.

	Buying (in Ksh)	Selling (in (Ksh)
1 Sterling Pound	125.78	126.64
1 Us Dollar	75.66	75.86

(a)If the company received Ksh.15, 132,000, calculate the amount, M received in US Dollar. **(2mks)**

(b) The company exchanged the above Kenya shillings into Sterling pounds to buy a car in Britain. Calculate the cost of the car to the nearest Sterling pound **(2mks)**

12. A trader sold a dress for Ksh 7200 allowing a discount of 10% on the marked price. If the discount had not been allowed the trader would have made a profit of 25% on the sale of the suit. Calculate the price at which the trader bought the dress. **(3mks)**

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

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

13. A certain two-digit number is equivalent to five times the sum of the digits. It is found to be 9 less than the number formed when the digits are interchanged. **Find** the number. **(3mks)**

14. A man standing 20m away from the foot of a vertical pole observes the top of the pole at an angle of elevation of 30^0. He begins to walk along a straight line on level ground towards the pole. **Calculate** how far he walked before the angle of elevation of the top of the pole becomes 80^0. **(3mks)**

15. Find the acute angle y if sin 4y = cos 2y **(2mks)**

SECTION B (50MKS)

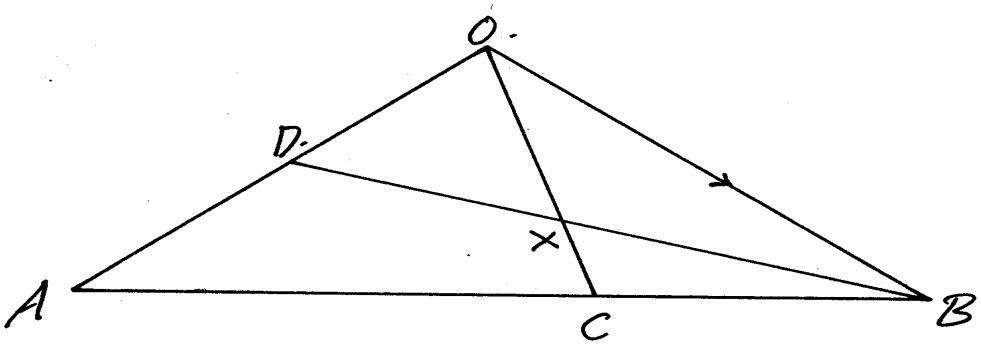
16. Mambo poured spirit into a test tube which has hemispherical bottom of inner radius 1.5cm. He noted that the spirit is 8cm high.

(a) What is the area of surface in contact with spirit? **(4mks)**

(b) Calculate volume of spirit in the test tube. **(4mks)**

(c) If Mambo obtained the mass of the spirit as 10g. Calculate the density of the spirit. **(2mks)**

17. The figure below C is a point on AB such that AC**:** CB=3:1 and D is the mid –point of OA. OC and BD intersect at X.



Given that **OA** = **a** and **OB** = **b**

(a) Write the vectors below in terms of **a** and **b**.

(i) **AB** **(1mk)**

(ii) **OC** **(2mks)**

(iii) **BD** **(1mk)**

(b) If **BX** = h **BD**, express **OX** in terms of **a**, **b**, and h. **(1mk)**

(c) If **OX** = K**OC**, find h and k. **(4mks)**

(d) Hence express **OX** in terms of **a** and **b** only. **(1mk)**

18. A straight line L_1 has a gradient $^{-}½$ and passes through point P (-1, 3). Another line L_2 passes through the points Q (1, -3) and R (4, 5). Find.

(a) The equation of L_1. **(2mks)**

(b) The gradient of L_2. **(1mk)**

(c) The equation of L_2. **(2mks)**

(d) The equation of a line passing through a point S (0, 5) and is perpendicular to L_2. **(3mks)**

(e) The equation of a line through R parallel to L_1. **(2mks)**

19. A certain number of people agreed to contribute to buy novels worth sh. 1200. Five of them pulled out and the others agreed to contribute an extra Sh. 10 each. Their contribution brought novels worth sh.200 more than they originally expected.

a) If the original number of people was x, write an expression of how much each was to contribute. **(1mk)**

b) Write down two expressions on how much each contributed after the five pulled out and reduced them to a single equation. **(2mks)**

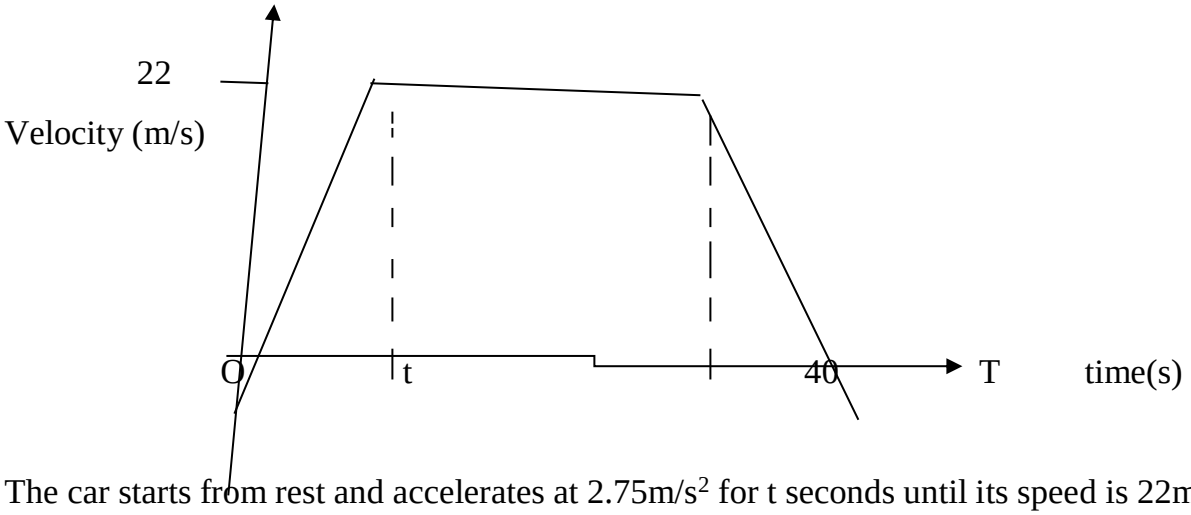
c) Calculate how many people made the contribution **(5mks)**

d) How much did each contribute? **(2mks)**

20. (a) In 2001 the total cost of manufacturing an article was Sh.1250 and this was divided between the cost of material, labour and transport in the ratio 8: 14: 3. In 2004 the cost of the material was doubled, labour cost increased by 30% and transport costs increased by 20%. Calculate the cost of manufacturing the article in 2004. **(6mks)**

(b) For the same article in (a) above, the cost of manufacturing in 2005 was sh. 1981 as a result of increase in labour costs only. Find the percentage increase in labour cost of 2004. **(4mks)**

21. The figure below shows a velocity – time graph of a car journey.



The car starts from rest and accelerates at 2.75m/s^2 for t seconds until its speed is 22m/s. It then travels at this velocity until 40 seconds after starting. Its breaks bring it uniformly to rest. The total journey is 847m long and takes T seconds.

Calculate the

(b) Value of t **(3mks)**

(c) Distance travelled during the first t seconds **(2mks)**

(d) Value of T **(3mks)**

(e) Final deceleration **(2mks)**

22. A triangle with A(-4, 2), B(-6, 6) and C(-6, 2) is enlarged by a scale factor -1 and centre (-2, 6) to produce triangle $A^1B^1C^1$.

a) Draw triangle ABC and $A^1B^1C^1$.and state its coordinates **(4mks)**

b) Triangle $A^1B^1C^1$ is then reflected in the line y = x to give triangle $A^{11}B^{11}C^{11}$.draw $A^{11}B^{11}C^{11}$.and state its coordinates **3mks**

c) **If triangle** $A^{11}B^{11}C^{11}$ is mapped onto $A^{111}B^{111}C^{111}$ whose co-ordinates are $A^{111}(0, -2)$, $B^{111}(4, -4)$ and $C^{111}(0, -4)$ by a rotation. Find the centre and angle of rotation. **(3mks)**

23. The following are masses of 25 people taken in a clinic.

20	35	29	45	60
66	56	29	48	37
59	64	24	28	32
35	45	48	52	55
54	55	36	39	35

(a) Using a class width of 8 and starting with the lowest mass of the people. Make a frequency distribution table for the data. **(3mks)**

(b) Calculate the median mass of the people. **(3mks)**

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

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 4

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO THE CANDIDATES

- *This paper contains two sections;* ***Section*** *I and* ***Section II****.*
- *Answer all the questions in* ***section I*** *and only* ***five*** *questions from* ***Section II.***
- *Non programmable silent electronic calculators and KNEC Mathematical tables may be used* ***EXCEP****T where stated otherwise.*
- *Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.*

FOR EXAMINER'S USE ONLY

Section 1

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

Section 1I

Question	17	18	19	20	21	22	23	24	**Total**
Marks									

SECTION I (50MKS)

1. Simplify by rationalising the denominator

$$\frac{\sqrt{2} + \sqrt{3}}{\sqrt{6} - \sqrt{3}}$$ **(3mks)**

2. Find the value of x in the equation $\log_{10}(2x-1) + \log_{10} 3 = \log_{10}(8x-1)$. **(3mks)**

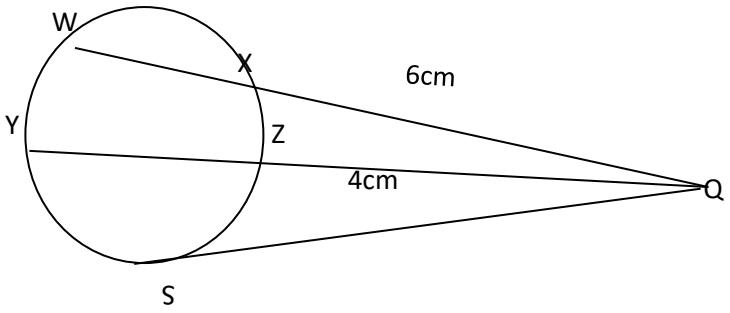
3. Find the compound interest on sh. 200,000 for 2 years at 14% pa. Compounded semi-annually. **(3mks)**

4. The ratio of 12^{th} to 10^{th} term in a geometric series is 9:1. Find the common ratio. **(3mks)**

5. i) Expand $(2 - \frac{1}{4}x)^5$ **(2mks)**

ii) Use your expansion to find the value of $(1.96)^5$ correct to 3 decimal places **(2mks)**

6. Chord WX and YZ intersect externally at Q. The secant WQ = 11cm and QX = 6cm while ZQ = 4cm.



(a) Calculate the length of chord YZ. **(2mks)**

(b) Using the answer in (a) above, find the length of the tangent SQ. **(2mks)**

7. Given that $\begin{bmatrix} y-1 & y+1 \\ 3y & y \end{bmatrix}$ is a singular matrix, find the possible values of y. **(3mks)**

8. The masses to the nearest kg of 50 adults were recorded as follows:

Mass (kg)	Frequency (f)
45 – 50	2
51 – 56	10
57 – 62	11
63 – 68	20
69 – 74	6
75 – 80	1

Calculate the quartile deviation. **(3mks)**

9. P varies as the cube of Q and inversely as the square root of R. If Q is increased by 20% and R decreased by 36%, find the percentage change in P. **(3mks)**

10. Solve $8\cos^2 x - 2\cos x - 1 = 0$ **(3mks)**

11. Make χ the subject of the formula:

$$A = \sqrt{\frac{3 + 2\chi}{5 - 4\chi}}$$ **(3mks)**

12. The position vectors of A and B are given as **a**= 2**i**-3**j**+4**k** and **b**= -2**i**-**j**+2**k** respectively. Find to 2decimal places, the length of the vector $\overrightarrow{AB}$. **(3mks)**

13. Find the centre and the radius of a circle whose equation is

$x^2-6x+y^2-10y+30=0$ **(3mks)**

14. A point (x, y) is mapped onto (13, 13) by two transformations M followed by T where $T = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$ and $x = \begin{pmatrix} 3 & 1 \\ 2 & 4 \end{pmatrix}$. Find the point (x y) **(3mks)**

15. Given that $2 \le A \le 4$ and $0.1 \le B \le 0.2$. Find the minimum value of $\frac{AB}{A - B}$

(3mks)

16. In a transformation, an object with area $9cm^2$ is mapped onto an image whose area is $54cm^2$. Given that the matrix of transformation is $\begin{bmatrix} x & x-1 \\ 2 & 4 \end{bmatrix}$ find the value of x **(3mks)**

SECTION II (50MKS)

17. The table below shows the rates of taxation in a certain year.

Income in K£ pa	Rate in Ksh per K£
1 – 3900	2
3901 – 7800	3
7801 – 11700	4
11701 – 15600	5
15601 – 19500	7
Above 19500	9

In that period, Juma was earning a basic salary of sh. 21,000 per month. In addition, he was entitled to a house allowance of sh. 9000 p.m. and a personal relief of ksh.105 p.m He also has an insurance scheme for which he pays a monthly premium of sh. 2000. He is entitled to a relief on premium at 15% of the premium paid.

(a) Calculate how much income tax Juma paid per month. **(7mks)**

(b) Juma's other deductions per month were cooperative society contributions of sh. 2000 and a loan repayment of sh. 2500. Calculate his net salary per month. **(3mks)**

18. Wainaina has two dairy farm A and B. Farm A produces milk with 3 ½ percent fat and farm B produces milk with 4 ¾ percent fat. Determine;

(a) The total mass of milk fat in 50kg of milk from farm A and 30kg from farm B. **(3mks)**

(b) The percentage of fat in a mixture of 50kg of milk from A and 30kg of milk from farm B. **(2mks)**

(c) Determine the range of values of mass of milk from farm B that must be used in a 50kg mixture so that the mixture may have at least 4 percent fat. **(5mks)**

19. A cupboard has 7 white cups and 5 brown ones all identical in size and shape. There was a blackout in the town and Mrs. Kamau had to select three cups, one after the other without replacing the previous one.

(a) Draw a tree diagram for the information. **(2mks)**

(b) Calculate the probability that she chooses.

(i) Two white cups and one brown cup. **(2mks)**

(ii) Two brown cups and one white cup. **(2mks)**

(iii) At least one white cup. **(2mks)**

(iv) Three cups of the same colour. **(2mks)**

20. (i) complete the table below, giving the values correct to 2 decimal places **(2mks)**

X^0	0^0	15^0	30^0	45^0	60^0	75^0	90^0	105^0	120^0	135^0	150^0	165^0	180^0
Cos $2X^0$	1.00	0.87		0.00	-0.5		-1.00		-0.5	0.00	0.50	0.87	1.00
Sin (X^0+30^0)	0.50	0.71	0.87	0.97	1.00		0.87	0.71	0.50		0.00		-0.50

(ii) Using the grid provided draw on the same axes the graph of $y=\cos 2X^0$ and $y=\sin(X^0+30^0)$ for $0^0 \leq X \leq 180^0$. **(4mks)**

(iii) Find the period of the curve $y=\cos 2x^0$ **(1mk)**

(iv) Using the graph, estimate the solutions to the equations;

(a) $\sin(X^0+30^0)=\cos 2X^0$ **(1mk)**

(b) $\cos 2X^0=0.5$ **(1mk)**

21. The For a sample of 100 bulbs, the time taken for each bulb to burn was recorded. The table below shows the result of the measurements.

Time(in hours)	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
Number of bulbs	6	10	9	5	7	11	15	13	8	7	5	4

(a) Using an assumed mean of 42, calculate

(i) the actual mean of distribution **(4mks)**

(ii) the standard deviation of the distribution **(3mks)**

(b) Calculate the quartile deviation **(3mks)**

22. (a) Using a ruler and a pair of compasses only, construct a parallelogram ABCD such that AB=9 cm, AD=7 cm and angle BAD=60^o. **(3mks)**

(b) On the same diagram, construct:

(i) The locus of a point P such that P is equidistant from AB and AD; **(1mk)**

(ii) The locus of a point Q such that Q is equidistant from B and C; **(1mk)**

(iii) The locus of a point T such that T is equidistant from AB and DC; **(1mk).**

(c) (i) Shade the region R bounded by the locus of P, the locus of Q and the locus of T. **(1mk)**

(ii) Find the area of the region shaded in (d)(i) above. **(3mks)**

23. The points A (1,4), B(-2,0) and C (4,-2) of a triangle are mapped onto $A^1(7,4)$, $B^1(x,y)$ and C^1 (10,16) by a transformation N = $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$. Find

(i) Matrix N of the transformation **(4mks)**

(ii) Coordinates of B^1 **(2mks)**

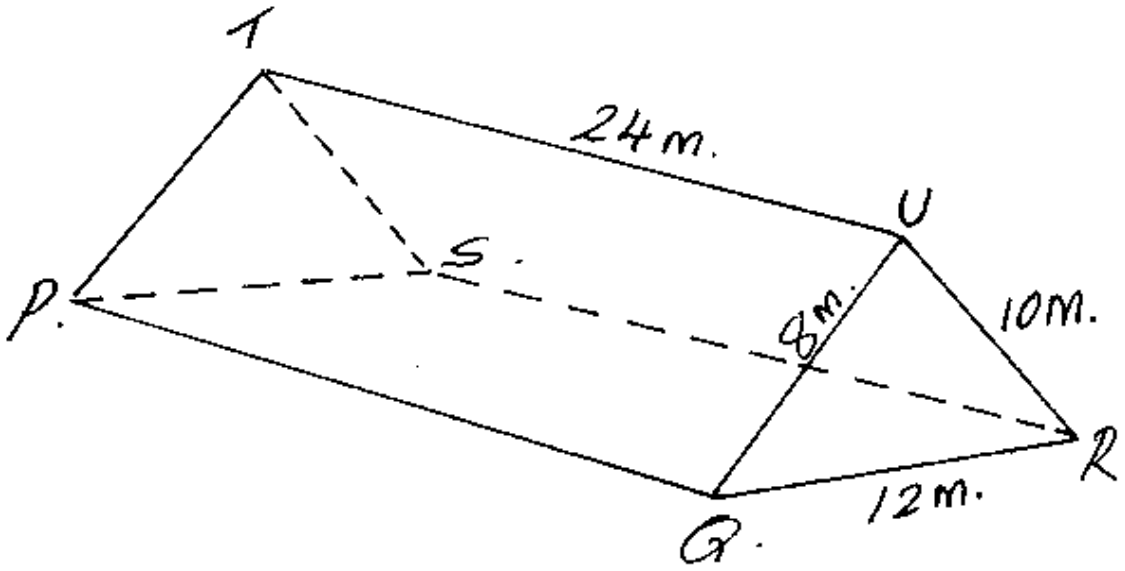
(iii) $A^{II}B^{II}C^{II}$ are the image of $A^1B^1C^1$ under transformation represented by matrix

M = $\begin{pmatrix} 2 & -1 \\ 0 & 0 \end{pmatrix}$ Write down the co-ordinates of $A^{II}B^{II}C^{II}$ **(2mks)**

(vi)A transformation N followed by M can be represented by a single transformation K.

Determine K **(2mks)**

24. The roof of a ware house is in the shape of a triangular prism as shown below



Calculate

(a) The angle between faces RSTU and PQRS **(3mks)**

(b) The space occupied by the roof **(3mks)**

(c) The angle between the plane QTR and PQRS **(4mks)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 5

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

Instructions to Candidates

(a) *Write your name and index number in the spaces provided below*

(b) *Sign and write the date of examination in the spaces provided above.*

(c) *The paper consists of **TWO** sections: **Section I** and **Section II**.*

(d) *Answer **ALL** questions in **Section I** and **ONLY** five from **Section II**.*

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

(f)Show all the steps in your calculations, giving your answers at each stage in the spaces below each question

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 **GRANT TOTAL**

17	18	19	20	21	22	23	24	Total	

SECTION 1 (50 MARKS)

Answer all the questions in the space provided below each question

1. Find the equation of a straight line passing through the points A (1,-3) and B (-2, 5).Express your answer in the form ax + by = c where a, b and c are integers. **(3marks)**

2. Evaluate without using mathematical tables or calculator $\frac{-10\div2+6\times4-8\times5}{-5+(-12)\div3\times2}$ **(3marks)**

3. Solve for x in the equation $\frac{Cos(2x-30)^\circ}{Sin(3x+10)^\circ} = tan45^\circ$ **(3marks)**

4. Two taps P and Q together can fill a water tank in 6 minutes. Tap P alone takes 5 minutes longer than tap Q. How many minutes does it take tap P alone to fill the tank? **(3marks)**

5. Given that, $27^{5x-2y} = 243 \quad and \quad 81^{2x-y} = 3$, Calculate the values of x and y. **(3marks)**

6. A point P is mapped onto P' by a negative quarter turn about the origin. P' is mapped onto P'' by a translation represented by the vector $\begin{pmatrix}-2\\3\end{pmatrix}$. If P'' has coordinates (11,-5) determine the coordinates of p. **(3marks)**

7. A metallic pipe which is 21 meters long has an internal radius of 13 cm and an external radius of 15 cm. if the density of the metal is 8620 kg/ m^3, find its mass. **(3marks)**

8. Using logarithms evaluate $\sqrt[3]{\frac{82.73\times0.2943^2}{613.5}}$ **(3marks)**

9. A proper fraction is such that the denominator exceeds the numerator by 3. If 2 is subtracted from both the numerator and denominator, the fraction formed is $\frac{1}{8}$ less. Determine the original fraction**.** **(3 marks)**

10. Given that OM = 2i +3j -6k and ON = -3i + 5j +k.Find the magnitude of MN to 2 decimal places. **(3marks)**

11. Find the range of the integral values of x in the inequality $10 < 3(x+2) < 35$, giving your answer in the form $a \le x \le b$ **(3marks)**

12. Simplify completely $\frac{2-2x}{6x^2-x-12} \div \frac{x-1}{2x-3}$ **(3marks)**

13. The marked price of a recliner sofa set in a furniture store was ksh 400,000.A customer bought the recliner at 10% discount. The dealer still made a profit of 20%, Calculate the amount of money the dealer paid for the recliner**.** **(3marks)**

14. Draw a line AB of length 9 cm. On one side of line AB construct the locus of a point P such that the area of triangle ABC is 13.5 cm^2.On this locus locate two positions of a point P1 and P2 such that $\angle AP1B = \angle AP2B = 90^o$

15. Given that the area of an image is four times the area of the object under a transformation whose matrix is $\begin{pmatrix}x & x-4\\ x+8 & x\end{pmatrix}$, find the possible value of x . **(3 marks)**

16. Construct a triangle ABC in which AB = 5cm and AC = 8cm and $\angle ABC = 105^\circ$. Using line AC, locate point x on AB produced such that AX: XB =3: -2. **(4marks)**

SECTION II (50 MARKS)

Answer only five questions in this section

17. The table below shows the weekly salary (k£) paid to workers in a school.

Salary (k£)	$50 \leq x \leq 100$	$100 \leq x \leq 150$	$150 \leq x \leq 250$	$250 \leq x \leq 350$	$350 \leq x \leq 500$
No. of Workers	25	27	30	26	24

a) Calculate the differences between the mean and the median. **(6 marks)**

b) Draw a frequency polygon to illustrate the above information. **(4marks)**

18. a) Complete the table of values for the equation, $y = -2x^2 + x + 8$. **(2marks)**

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

b) Use the values above to draw the graph of $y = -2x^2 + x + 8$. **(3marks)**

c) Using the graph drawn above Solve the equations:-

(i) $2x^2 = x + 8$ **(2marks)**

(ii) $-2x^2 + 4x + 12 = 0$ **(3marks)**

19. Three towns P, Q and R are such that Q is 16 km north of P and the distance of R is 12 km from P and on a bearing of 60 ^{o} from Q.

a).Using a scale of 1cm to represent 4km, Make a scale drawing showing the relative positions of the three towns. **(3marks)**

b) Using the scale drawing above, find the

i) Distance of R from Q. **(1mark)**

ii) Bearing of P from Q. **(1mark)**

iii) How far town R is east of Q **(1mark)**

c) A Passenger in an aero plane after take-off from town R spotted town P at an angle of depression of 48^o, by means of a scale drawing determine the vertical height of the plane at town R. **(3marks)**

20. a) The equation of a straight line L_1 is of the form $3y + 2x = 5$. L_1 is perpendicular to L_2 and meets it at the point where $X = -2$, determine the equation of L_2 in the form y = mx+c where m and c are constants. **(5marks)**

b) L_3 is parallel to the line L_2 and passes through the point (-3,2).,find the equation of L_3, leaving your answer in its double intercept form. **(3marks)**

c) Determine the angle of inclination of L_2 to the Y-axis. **(2marks)**

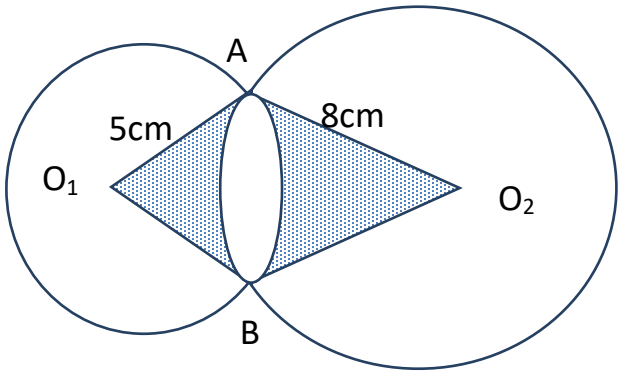
21. The points **P, Q, R** and **S**, have position vectors **2p, 3p, r** and **3r** respectively, relative to an origin O. A point **T** divides **PS** internally in the ratio 1:6.

a) Find, in its simplest form **OT, QT** and **TR** in terms of **p** and **r**. **(6 marks)**

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

C) Determine the ratio in which **T** divides **QR**. **(1mark)**

22. In the figure below, O_1 and O_2 are the centers of the circles whose radii are 5 cm and 8 cm respectively. The circles intersect at A and B and angle $AO_1O_2 = 64^\circ$.



Calculate the area of the:-

a) Sector

i) AO1B **(2marks)**

ii) AO2B **(3 marks)**

b) Intersecting region**.** **(3marks)**

c) The shaded region**.** **(2marks)**

23. a) Find the x –intercept of the curve $y = (x+2)(x-1)^2$. **(1mark).**

b) Find the gradient function of the curve $y = (x+2)(x-1)^2$ **(2marks)**

c) Find the co-ordinates of the turning point. Hence sketch the curve $y= (x+2)(x-1)^2$**.** **(4 marks)**

d) Calculate the exact area enclosed by the curve and the x - **axis** **(3marks)**

24. P and Q are two points on latitude 40°N.Their longitudes are 30°E and 150°W respectively. Find to one decimal place :(Take the radius of the earth = 6370km and $\pi = \frac{22}{7}$)

a) The distance in km between P and Q along the parallel of latitudes**.** **(2marks)**

b) The shortest distance along the earth's surface between P and Q in km. **(3marks)**

c) A weather forecaster reports that the center of a cyclone at (40°N, 60°W) is moving due north at 24 knots. How long will it take to reach a point (45°N, 60°W). **(2marks)**

d) A plane leaves P at 2.15 pm at a speed of 350 knots to town R (40^oN, 65^oE). Determine the time at R when the plane arrived. **(3marks)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 5

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

Instructions

- *Write your name, class, admission number, school, date and signature in spaces provided above.*
- *The paper contains **two** sections **I** and **II.***
- *Answer **all** questions in section **I** and **any five** questions from section **11** in the spaces provided below each question.*
- *Show all the steps in your calculations giving your answers at each stage in the spaces below each question.*
- *Non-programmable silent electronic calculator and mathematical tables may be used except where stated otherwise.*

FOR EXAMINER'S USE ONLY

SECTION A

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

PERCENTAGE

SCORE

SECTION B

17	18	19	20	21	22	23	24	TOTAL

SECTION I (50 MARKS)

*Answer **all** the questions from this section*

1. The expression $(1 + \frac{x}{2})$ is taken as an approximation for $\sqrt{1+x}$. Find the percentage error in doing so if x = 0.44. (Give answer correct to 2 d.p) **(3 Marks)**

2. Express the following in surd form and simplify by rationalizing the denominator. $\frac{1}{cos60° - sin45°}$ **(3 Marks)**

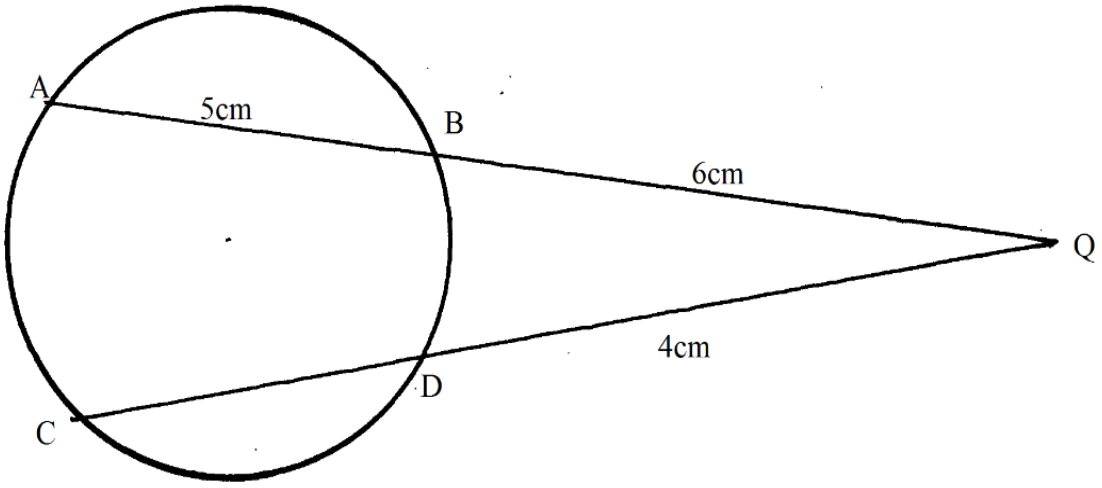
3. Make q the subject of the formula **(3 Marks)**

P= $\sqrt[3]{\frac{nq-m}{q}}$

4. The data below shows the age of 10 pupils picked at random in a primary school 6, 11, 13, 14, 8, 7, 12, 20, P and 9 if $\sum fx^2 = 1360$. Determine the value of P hence, find the standard Deviation to 3d.p **(4 Marks)**

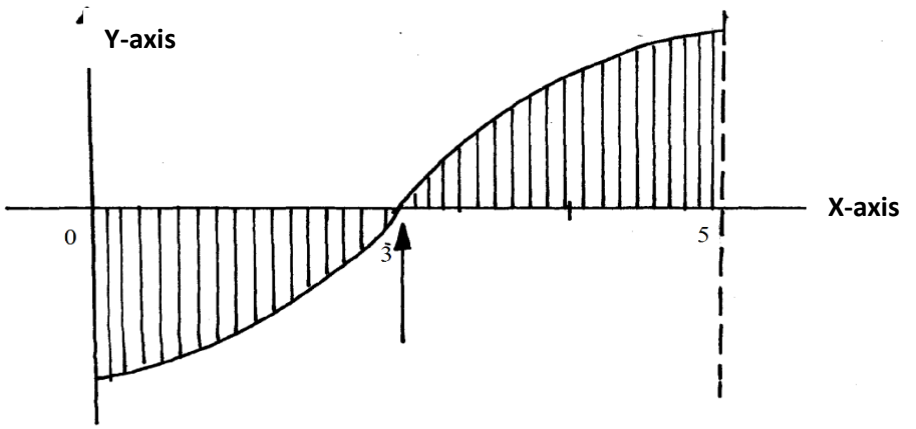
5. The volume, V of a cylinder varies jointly as its height, (h) and the square of its radius, (r), Calculate the percentage increase in its volume (V), when radius increases by 5% and height, h increases by 10%. **(3 Marks)**

6. Chords AB and CD in the figure below intersect externally at Q. if AB = 5cm BQ = 6cm and DQ = 4cm, calculate the length of chord CD**.** **(2 Marks)**



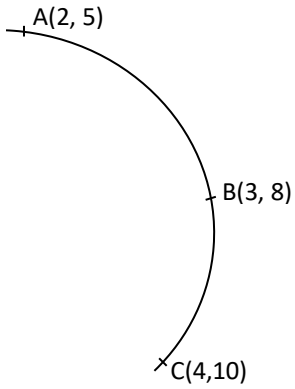
7. Jane can do a piece of job in 4 days while Mary can do the same piece of work in 7 days. Mary and Jane did the job together for two days before Jane fell sick. Mary was left to complete the job. How long did it take to do the job? **(3 Marks)**

8. The sketch below represents the graph of $y=x^2-x-6$.Find the area bounded by the curve, x-axis, y-axis and the line x=5. **(3 Marks)**



9. Use matrix method to determine the co-ordinates of the point of intersection of the two lines. 3x-2y=13, 2y+x+1=0 **(3 Marks)**

10. The figure **below** shows an arc of a circle through three points A, B and C.



Calculate the co-ordinates of the centre of the circle. **(4 Marks)**

11. A bag contains 4 white balls and 5 Red balls of similar shape and size. Two balls are picked at random without replacement. Find the probability that both balls are:

a) White **(1 Mark)**

b) Of different colour **(2 Marks)**

12. A point $P(2,-3)$ undergoes transformation represented by the matrix $\begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$. **Find** the Co-ordinate of the image of P. **(2 Marks)**

13. Expand $(2+x)^6$ up to the fourth term. **(2 Marks)**

Hence use the above expansion to evaluate $(1.96)^6$ correct to 4 d.p. **(2 Marks)**

14. Find the value of x in the equation $10\sin^2 x - 7\cos x + 2 = 0$ for the range $270^\circ \leq x \leq 360^\circ$ **(3 Marks)**

15. Find the value of x in **(3 Marks)**

Log(x-2) + log (x+1) = 1 + log 4

16. The sum of two numbers is 9. The sum of the square of the number is 41. Find the numbers **(4 Marks)**

SECTION II (50 MARKS)

*Answer **FIVE** questions **ONLY** from this section*

17. The table below shows the taxation rates for income earned.

Income in ksh pm	Tax rates (%)
1 – 9680	10
9681 – 18800	15
18801 – 27920	20
27921 – 37040	25
Excess over 37041	30

In that year, Mr. Hamisi paid a net tax of KSh. 5,512 per month. He gets a house allowance of KShs. 10,000, medical allowance of KShs. 2400 and acting allowance of KShs. 2820 per month. He was entitled to a monthly personal relief of KShs. 162. He has a life insurance policy for which he pays a monthly premium of KSh. 1,500 and claims a relief at a rate of 10% of the premium paid per month. The following deductions also made every month.

(i) N.H.I.F. KSh. 320

(ii) Co-operative society shares KSh. 6000

(iii) Union dues KSh. 200

(a) Calculate Mr. Hamisi's monthly basic salary in KSh. **(7 Marks)**

(b) Calculate his net monthly salary. **(3 Marks)**

18. A jet leaves town P(30°S, 26°W) at 2.00 p.m on Monday and flew due \north to town Q(50°N,26°W).

a) Calculate the distance covered by the jet in Km. (**take $\prod = {}^{22}/_{7}$ and R=6370)** **(3 Marks)**

b) After 35 min stoppage at town Q the jet flew due East to town R a distance of 2500 nautical miles from town Q.

Find i) the position of town R **(3 Marks)**

ii) The local time the jet landed at R if its average speed for the whole journey is 1000km/h. (Take 1nm=1.853km) **(4 Marks)**

19. Use a ruler and a pair of compasses only in all constructions in this question.

(a) Construct the rectangle ABCD such that AB = 7.2cm and **BC = 5.6cm.** **(3 Marks)**

b) Constructs on the same diagram the locus L_1 of points equidistant from A and B to meet with another locus L_2 of points equidistant from AB and BC at M. Measure the acute angle formed at M by L_1 and L_2. **(3 Marks)**

c) Construct on the same diagram the locus of point K inside the rectangle such that K is less than 3.5cm from point M. Given that point K is nearer to B than A and also nearer to BA than BC, shade the possible region where K lies. Hence calculate the area of this region. Correct to one decimal place. **(4 marks)**

20. (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 arithmetic sequence exceeds the third term of the geometric sequence by 2. Find the common difference and the sum of the first 50 terms of an AP**.** **(6 Marks)**

21. a) Draw triangle PQR whose vertices are P(1,1) Q(-3,2) and R(0,3) on the grid provided. **(1 Mark)**

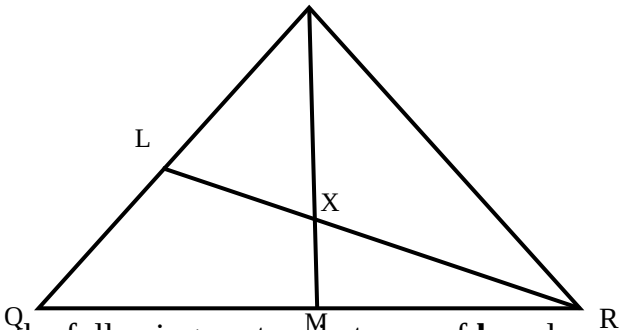
b) Find the coordinates of triangle $P^1Q^1R^1$ the image of triangle PQR under the transformation whose matrix is $\begin{pmatrix}3 & 0\\ 1 & 1\end{pmatrix}$. Draw triangle $P^1Q^1R^1$. **(3 Marks)**

c) $P^1Q^1R^1$ is then transformed onto $P^2Q^2R^2$ by the transformation with matrix $\begin{pmatrix}\frac{2}{3} & 0\\ \frac{-2}{3} & 2\end{pmatrix}$

Find the coordinates of $P^2Q^2R^2$ and draw triangle $P^2Q^2R^2$ **(3 Marks)**

d) Describe fully a single transformation which maps PQR onto $P^2Q^2R^2$. Find the matrix of this transformation **(3 Marks)**

22. In the triangle PQR below, L and M are points on PQ and QR respectively such that PL: LQ=1:3 and QM:MR=1:2, PM and RL intersect at X, given that PQ = **b** and PR = **c**,



(a) Express the following vectors in terms of **b** and **c**

(i) **QR** **(1mark)**

(ii) **PM** **(1mark)**

(iii) **RL** **(1mark)**

(b) By taking **PX** = h**PM** and **RX** = k**RL** where h and k are constants find two expressions of **PX** in terms of h, k, **b** and **c**. Hence determine the values of the constant h and k. **(6marks)**

(c) Determine the ratio LX: XR **(1mark)**

23. a) Complete the table below for the function $y=2x^2 + 4x -3$ **(2 Marks)**

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

b) On the grid provided, draw the graph of the function $y=2x^2 + 4x -3$ for $-4 \leq x \leq 2$ using the scale of 1cm to represent 1 unit on axis and 1cm to represent 2 units on y-axis. **(3 Marks)**

c) Use the graph above to:

i) Determine the roots of the equation $2x^2 + 4x -3=0$ **(2 Marks)**

ii) Solve the equation $2x^2 +x -5 =0$ **(3 Marks)**

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

a) Its velocity when $t = 4$ seconds **(3 Marks)**

b) Its displacement at the time in (a) above **(3 Marks)**

c) The displacement during the third second **(4 Marks)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 6

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

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

FOR EXAMINER'S USE ONLY

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	TOTAL		GRAND TOTAL	

SECTION I (50 MARKS)

Answer ALL the questions from this section.

1. Find the reciprocals of 0.216 correct to 3 decimal places hence evaluate;

$$\frac{\sqrt[3]{0.512}}{0.216}$$ **(3 marks)**

2. Without using a calculator, evaluate;

$$\frac{1\frac{1}{5}-1\frac{1}{3}}{\frac{1}{8}-\left(-\frac{1}{2}\right)^2}-\frac{7}{15} \text{ of } 2$$ **(4 marks)**

3. Three bells ring at intervals of 9 minutes, 15 minutes and 21 minutes. The bells will next ring together at 11.00pm. Find the time the bells had last rang together. **(3 marks)**

4. Simplify the expression.

$$\frac{6x^2-13x+6}{4x^2-9}$$ **(3 marks)**

5. Without using a calculator or mathematical tables, solve the equation

$2\log_{10} x - 3\log_{10} 2 + \log_{10} 32 = 2$ **(4 marks)**

6. A line L passes through point (3, 1) and is perpendicular to the line 2y = 4x + 5.

Determine the equation of line L. **(3 marks)**

7. A forex bureau in Kenya buys and sells foreign currencies as shown below.

Currency	Buying (Ksh)	Selling (Ksh)
Chinese Yuan	12.34	12.35
South African rand	11.28	11.37

A businesswoman from China converted 195,250 Chinese Yuan into Kenya shillings.

a) Calculate the amount of money in Kenya shillings that she received. **(1 mark)**

b) While in Kenya, the businesswoman spent Ksh.1,258,000 and then converted the balance into South African Rand. Calculate the amount of money to the nearest Rand that she received. **(3 marks)**

8. The seventh term of an A.P is 20 and the sum of the first 20 terms is 610.

Find the first term and the common difference. **(3 marks)**

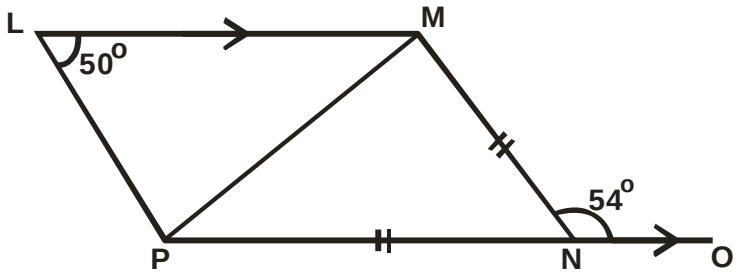
9. The points P, Q and R lie on a straight line. The position vectors of P and R are $2i + 3j + 13k$ and $5i - 3j + 4k$ respectively. Q divides PR internally in the ratio 2 : 1. Find

a) The position vector of Q. **(2 marks)**

b) Distance of Q from the origin. **(1 mark)**

10. In the figure below, ∠MNO = 54°, ∠PLM = 50°, PN = NM and PO is parallel to LM.

Find the value of ∠LPM. **(3 marks)**



11. Two matrices A and B are such that A = $\begin{pmatrix} k & 4 \\ 3 & 2 \end{pmatrix}$ and B = $\begin{pmatrix} 1 & 2 \\ 3 & -4 \end{pmatrix}$.

Given that the determinant of AB = 10, find the value of k. **(3 marks)**

12. Two pipes A and B can fill an empty tank in 3 hours and 5 hours respectively. Pipe C can empty the full tank in 4 hours. If the three pipes A, B and C are opened at the same time, find how long they will take to fill the tank. **(3 marks)**

13. Determine the equation of the normal to the curve $y = x^2 - 3x + 1$ at a point (-2, 3) giving your answer in the form ax + by = c. **(3 marks)**

14. The size of each interior angle of a regular polygon is five times the size of exterior angle.

Find the number of sides of the regular polygon. **(3 marks)**

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

$x + 8 > 4x - 6 \geq 3(4 - x)$ **(2 marks)**

16. John had two bags A and B containing sugar. If he removed 2kg from bag A and added to bag B, the mass of sugar in bag B would be four times the mass of sugar in bag A. If he added 10kg of sugar to the original amount of sugar in each bag, the mass of sugar in B would be twice the mass of the sugar in bag A.

Calculate the original mass of sugar in each bag. **(3 marks)**

SECTION II (50 MARKS)

Answer any FIVE questions from this section

17. The table below shows the height measured to the nearest cm of 101 pawpaw trees.

Height in cm	20 – 24	25 – 29	30 – 34	35 – 39	40 – 44	45 – 49	50 – 54	55 – 59
Frequency	2	15	18	25	30	6	3	2

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

b) Calculate to 2 decimal places.

i) The mean height **(4 marks)**

ii) The difference between the mean height and the median height. **(5 marks)**

18. Three pegs R, S and T are on the vertices of a triangular plan field. R is 300m from S on a bearing of 300^o and T is 450m directly South of R.

a) Using a scale of 1cm to represent 60m, draw a diagram to show the position of the pegs. **(3 marks)**

b) Use the scale drawing to determine;

i) The distance between T and S in metres. **(2 marks)**

ii) The bearing of T from S. **(1 mark)**

c) Find the area of the field in hectares correct to one decimal place. **(4 marks)**

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

a) Draw a tree diagram to show the events. **(3 marks)**

b) Using the tree diagram above determine the probability that

i) Mr. Mutuku will not be bitten by a rabid dog. **(2 marks)**

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

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

20. The volume $V cm^3$ of a solid depends partly on r^2 and partly on r^3 where r is one of the dimensions of the solid.

When r = 1, the volume is $54.6cm^3$ and when r = 2, the volume is $226.8cm^3$.

a) Find the expression for V in terms of r. **(5 marks)**

b) Calculate the volume of solid when r = 4. **(3 marks)**

c) Find value of r for which the two parts of the volume are equal. **(2 marks)**

21. The equation of a curve is given by $y = 5x - \frac{1}{2}x^2$

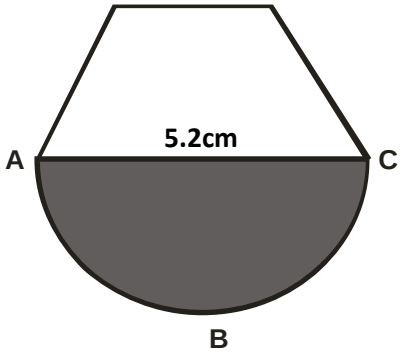
a) Draw the curve of $y = 5x - \frac{1}{2}x^2$ for $0 \leq x \leq 6$. **(3 marks)**

b) By integration find the area bounded by the curve, the line x = 6 and the x-axis. **(3 marks)**

c) **i)** On the same graph in (a) draw the line y = 2x **(1 mark)**

ii) Determine the area bounded by the curve and the line y = 2x **(3 marks)**

22. The diagram below shows a cross section of a bottle. The lower part ABC is a hemisphere of radius 5.2cm and the upper part is a frustum of a cone. The top radius of the frustum is one third of the radius of the hemisphere. The hemisphere part is completely filled with water as shown in the diagram.



When the container is inverted, the water now completely fills on the frustum part.

a) Determine the height of the frustum part. **(7 marks)**

b) Find the surface area of the frustum part of the bottle. **(3 marks)**

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

a) The time the bus arrives at Eldoret. **(2 marks)**

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

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

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

24. a) Complete the table below for the function $y = 2x^3 + 5x^2 - x - 6$. **(3 marks)**

x	–4	–3	–2	–1	0	1	2
$2x^3$	–128	–54					
$5x^2$							
-x	4	3					
-6	–6	–6	–6	–6	–6	–6	–6
y	–50				–6	0	

b) Draw the graph of $y = 2x^3 + 5x^2 - x - 6$ for $-4 \leq x \leq 2$ **(3 marks)**

c) By drawing a suitable line, use the graph in (b) to solve the equations

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

ii) $2x^3 + 5x^2 - x + 2 = 0$ **(2 marks)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 6

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

a) *Write your **name** and **index number** in the spaces provided above.*

b) *Sign and write the **date** of examination in the spaces provided above.*

c) *This paper consists of **two** sections, **section I** and section II.*

d) *Answer **ALL** the questions in **section I** and only **five** questions from **section II**.*

FOR EXAMINER'S USE ONLY

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	TOTAL		GRAND TOTAL	

SECTION I (50 MARKS)

Answer ALL the questions from this section.

1. Use logarithms to evaluate, **(4 marks)**

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$$

2. Make P the subject of the formula

$$d = \sqrt[3]{\frac{P}{q-P}}$$ **(3 marks)**

3. Find the circle centre and radius whose equation is

$3x^2 + 3y^2 + 18x - 6y + 18 = 0$ **(3 marks)**

4. The volumes of two similar cylindrical containers are $27cm^3$ and $64cm^3$ respectively. Given that the height of the smaller container is 12cm, find the height of the larger container.**(2 mks)**

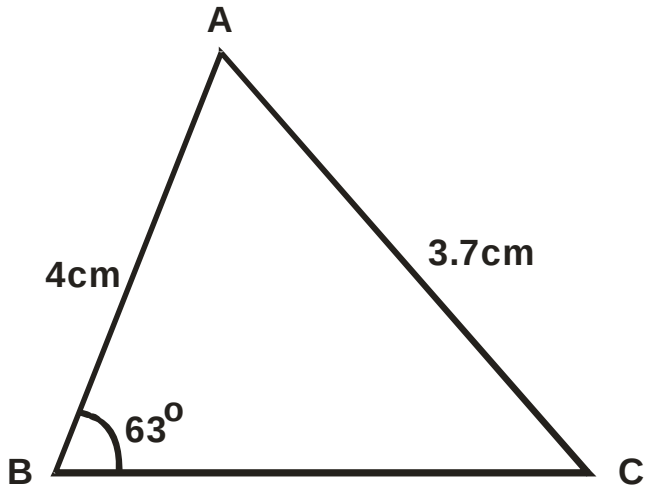
5. $3cm^3$ of water is added to $2cm^3$ of a certain medicine which costs sh.12 per cm^3. The chemist sells the diluted medicine at sh.6 per cm^3. Calculate the percentage profit. **(3 marks)**

6. Given that $4y = 3\sin\frac{2}{5}$ for $0 < \theta < 360^o$. Determine

a) The amplitude of the curve **(1 mark)**

b) The period of the curve. **(1 mark)**

7. Find the length BC of the following triangle if AC = 3.7cm, AB = 4cm and angle ABC = 63^o. **(3 marks)**

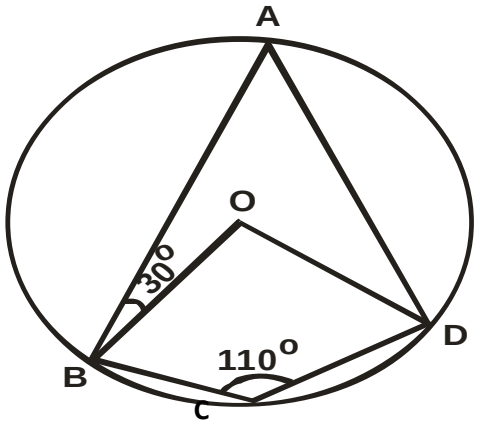


8. Solve for x in the equation

$27^{x-1} \times 3^{x+1} = 729$ **(3 marks)**

9. In the figure below ABCD is a cyclic quadrilateral. Point O is the centre of the circle.

$\angle ABO = 30^o$ and $\angle BCD = 110^o$.



Calculate the size of angle ADB. **(2 marks)**

10. Three people Mutua, Wanza and Kiilu contributed money to start a business. Mutua contributed a quarter of the money and Wanza two fifths of the reminder. Kiilu's contribution was one and a half times that of Mutua. They borrowed the rest of the money from a bank which was sh.60,000 less than Kiilu's contribution. Find the total amount required to start the business. **(4 marks)**

11. Simplify $\frac{\sqrt{3}}{\sqrt{3}-\sqrt{2}}$ **(3 marks)**

12. Expand $\left(2-\frac{1}{4}x\right)^5$ and use the first three terms to find the value of 1.975^5 to four significant figures. **(4 marks)**

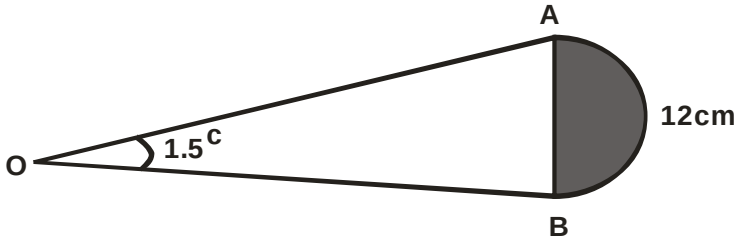
13. The radius of a spherical ball is measured as 7cm correct to the nearest centimeter. Determine to 2 decimal places, the percentage error in calculating the surface area of the ball. **(3 marks)**

14. Given that $\tan\theta = \frac{1}{\sqrt{5}}$ where θ is an acute angle, find without using tables or calculator $\sin(90-\theta)$ leaving your answer in the simplified surd form. **(4 marks)**

15. Given that a = 1.2, b = 0.02 and c = 0.2, express $ac \div b$ in the form $\frac{m}{n}$ where m and n are integers. **(3 marks)**

16. The diagram below shows sector AOB of a circle centre O.

$\angle AOB = 1.5^C$ and arc AB is of length 12cm.



a) Determine the radius OA of the circle. **(1 mark)**

b) Calculate the area of the shaded region. Give your answer correct to 3 s.f. **(3 marks)**

SECTION II (50 MARKS)

Answer any FIVE questions from this section

17. The table below shows the taxation rates.

Income (£ per month)	Rate %
0 – 382	10
383 – 754	15
755 – 1126	20
1127 – 1498	25
1499 – 1870	30
1871 – 2242	35
Over 2242	40

Mueni is housed by her employer but pays a nominal rent of sh.1200 per month. She is entitled to a personal relief of sh.950 per month. If her monthly P.A.Y.E is sh.7024,

a) Calculate her gross income. **(5 marks)**

b) In addition to the tax the following monthly deductions are also made

Sacco shares Ksh. 1200

Coop loan Ksh.1500

Union dues Ksh.300

Calculate

i) Her monthly salary. **(3 marks)**

ii) Net monthly salary **(2 marks)**

18. Use a ruler and compasses only for all construction in this question.

a) Construct a triangle ABC in which AB = 8cm, BC = 7.5cm and $\angle ABC = 112\frac{1}{2}^{o}$. **(3 marks)**

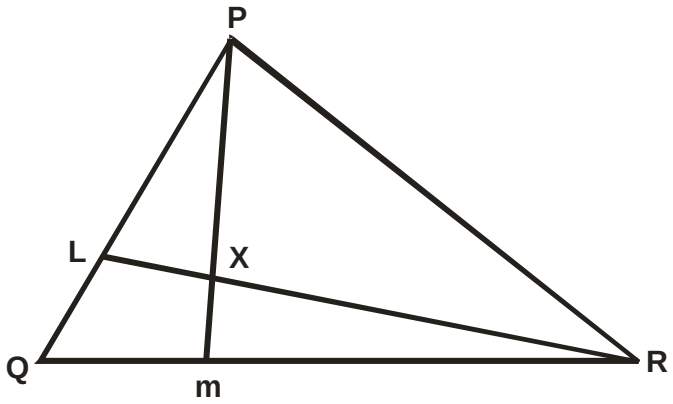
b) Measure the length of AC. **(1 mark)**

c) By shading the unwanted region show the locus of P within the triangle ABC such that AP $\leq$ BP, AP > 3cm. Mark the required region as P. **(3 marks)**

d) Construct a normal from C to meet AB produced at D. **(1 mark)**

e) Locate the locus of R in the same diagram such that the arc of triangle ARB is $\frac{3}{4}$ the arc of the triangle ABC. **(2 marks)**

19. In the triangle PQR below, L and M are points on PQ and QR respectively such that PL : LQ = 1 : 3 and Qm : mR = 1 : 2. Pm and RL intersect at X. Given that $\underset{\sim}{PQ} = \underset{\sim}{b}$ and $\underset{\sim}{PR} = \underset{\sim}{c}$



a) Express the following vectors in terms of $\underset{\sim}{b}$ and $\underset{\sim}{c}$.

i) $\underset{\sim}{QR}$ **(1 mark)**

ii) $\underset{\sim}{Pm}$ **(1 mark)**

iii) $\underset{\sim}{RL}$ **(1 mark)**

b) By taking $\underset{\sim}{PX} = h\underset{\sim}{Pm}$ and $\underset{\sim}{RX} = k\underset{\sim}{RL}$ where h and k are constants. Find two expressions of PX in terms of h, k, $\underset{\sim}{b}$ and $\underset{\sim}{c}$. Hence determine the values of the constants h and k.

(6 marks)

c) Determine the ratio LX : XR. **(1 mark**

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

$O^IA^IB^IC^I$ is the image of OABC under a transformation matrix $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$.

a) i) Find the coordinates of $O^IA^IB^IC^I$ **(2 marks)**

ii) On the graph provided, draw OABC and $O^IA^IB^IC^I$ **(2 marks)**

b) i) Find $O^{II}A^{II}B^{II}C^{II}$, the image of $O^IA^IB^IC^I$ under the transformation matrix $\begin{pmatrix} 1 & 0 \\ 0 & -2 \end{pmatrix}$.

(2 marks)

ii) On the same grid, draw $O^{II}A^{II}B^{II}C^{II}$. **(1 mark)**

c) Find the single matrix that maps $O^{II}A^{II}B^{II}C^{II}$ onto OABC. **(3 marks)**

21. An aircraft leaves town P (30°S, 17°E) and moves directly towards Q (60°N, 17°E). It then moved at an average speed of 300 knots for 8 hours Westwards to town R. Determine

a) The distance PQ in nautical miles. **(2 marks)**

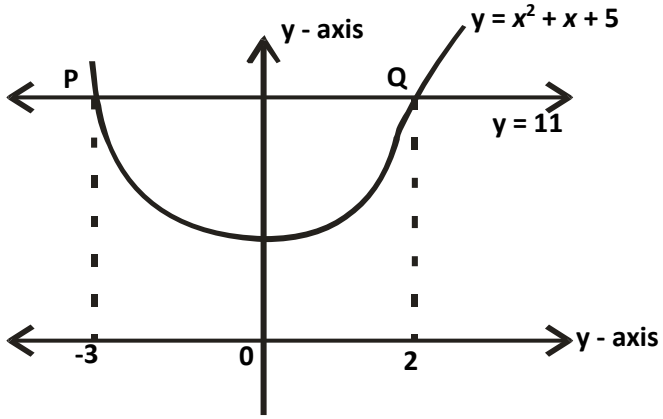
b) The position of town R. **(4 marks)**

c) The local time at R if local time at Q is 3.12p.m **(2 marks)**

d) The total distance moved from P to R in kilometers. (Take 1nm = 1.853km) **(2 marks)**

22. The figure below is a sketch of a curve whose equation is $y = x^2 + x + 5$.

It cuts the line y = 11 at points P and Q.

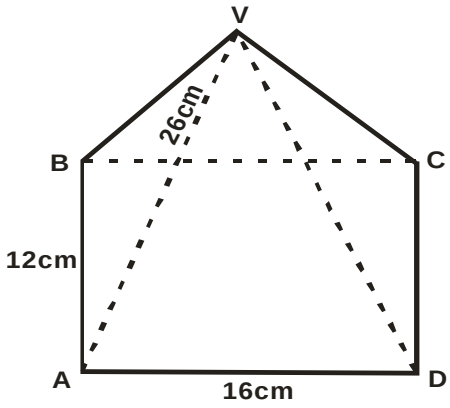


a) Find the area bounded by the curve $y = x^2 + x + 5$ and the line y = 11 using the trapezium rule with 5 strips. **(5 marks)**

b) Calculate the difference in the area if the mid-ordinate rule with 5 ordinates was used instead of the trapezium rule. (**5 marks)**

23. The figure below represents a rectangular based pyramid VABCD. AB = 12cm and AD = 16cm.

Point O is vertically below V and VA = 26cm.



Calculate:

a) The height, VO, of the pyramid. **(4 marks)**

b) The angle between the edge VA and the plane ABCD. **(3 marks)**

c) The angle between the planes VAB and ABCD. **(3 marks)**

24. The distances S metres from a fixed point O, covered by a particle after t seconds is given by equation

$S = t^3 – 6t^2 + 9t + 5$

a) Calculate the gradient to the curve at t = 0.5 seconds. **(3 marks)**

b) Determine the values of S at the maximum and minimum turning points of the curve. **(4 marks)**

c) On the space provided, sketch the curve of $S = t^3 – 6t^2 + 9t + 5$. **(3 marks)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 7

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES:

- *Write your **name**, **admission number** , **Signature** and write **date** of examination in the spaces provided*
- *The paper contains **two** sections. Section I and Section II.*
- *Answer **ALL** the questions in section I and any **five** questions in section II.*
- *Show all steps in your calculations below each question.*
- *Marks may be given for correct working even if the answer is wrong.*
- *Non programmable silent electronic calculators and KNEC mathematical table may be used, except where stated otherwise.*

FOR EXAMINERS USE ONLY

SECTION I

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

SECTION II

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

GRAND TOTAL

SECTION I (50 MARKS)

Answer all the questions from this section

1. Simplify **(3 marks)**

$$\frac{\frac{2}{3}+\frac{2}{3}\ of\ \frac{4}{9}\div\frac{8}{5}-\frac{2}{15}\div\frac{8}{15}}{\frac{5}{6}-\frac{2}{12}\div\frac{3}{2}\times\frac{9}{7}}$$

2. Nyongesa spent a total of sh 970 on buying 3 text books and 5 pens. If he had bought 2 text books and 8 pens he would have saved sh 90. Find the cost of one text book. **(3 marks)**

3. The volumes of two similar solid cones are 1080cm^3 and 1715cm^3. If the curved surface area of the smaller cone is 840cm^2, find the curved surface area of the larger cone. **(4 marks)**

4. The exterior angle of a regular polygon is a quarter the size of an interior angle. Determine the number of sides of the polygon. **(3 marks)**

5. $\cos\theta = \frac{1}{\sqrt{3}}$ where θ is an acute angle. Without using mathematical tables or calculator, find:

(a) $\boldsymbol{\sin\theta}$ **(2 marks)**

(b) $\boldsymbol{\tan(90-\theta)}$ **(1 mark)**

6. Solve the inequality $4x-3 > x \geq \frac{3x-5}{2}$ and give your answer as a compound inequality **(3 marks)**

7. Simplify $16^{-3/4} \times 64^{2/3} \times \left(\frac{1}{4}\right)^{-3/2}$ **(3 marks)**

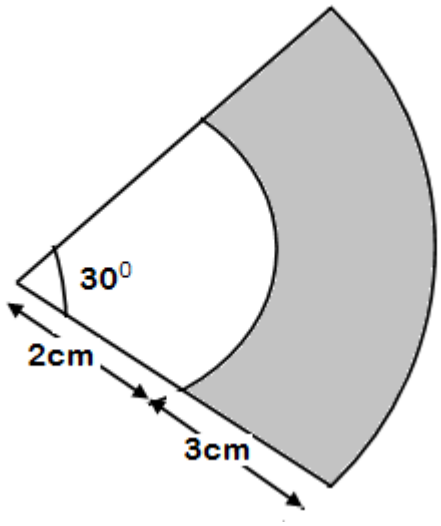
8. Boaz comes to Kenya with 5 600 Euros which he exchanges to Kenya Shillings. While in Kenya he spends Kshs 280 700 touring various parts of Mombasa County and donates Kshs 120 000 to a school for the blind. He then converts the remaining amount to sterling pounds and leaves Kenya. The exchange rates at the time were as follows:

Currency	Buying (Kshs)	Selling (Kshs)
1 Euro	105.63	105.98
1 Sterling pound	120.23	120.54

Calculate the amount of sterling pounds that he had as he was leaving Kenya. **(3 marks)**

9. Traffic lights at three different functions show green light at the intervals of 10 seconds, 12 seconds and 15 seconds. They all show green at 1.00pm. At what time had they previously shown green together? **(3 marks)**

10. Find the area of the shaded region in the figure below. **(3 marks)**



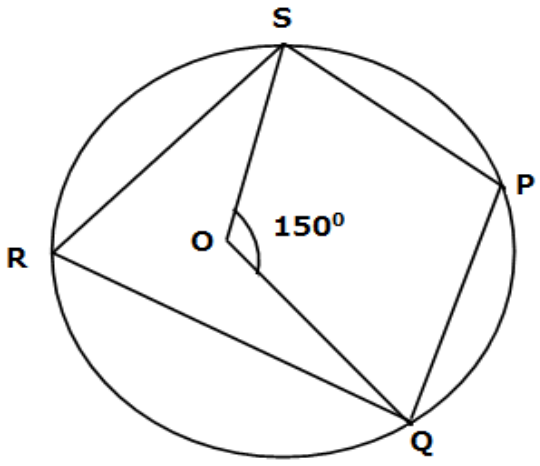
11. The point M $\left(\frac{1}{2}, 1\right)$ is the mid – point of points $A(a, -3)$ and $B(4, b)$. Find the values of a and b and hence the magnitude of $\overrightarrow{AB}$ **(3 marks)**

12. Calculate the volume of 2kg of a cork if the density of the cork is 0.25g/**cm^3.(3 marks)**

13. Solve the equation $2x^2 + 4x + 1 = 0$ using completing the square method**.** **(3 marks)**

14. PQRS is a trapezium in which PQ and SR are parallel. If PQ = 7cm, SR = 3cm, QR = 5cm and the area of PQRS is 18cm^2, calculate the height PS. **(3 marks)**

15. PQRS is a cyclic quadrilateral and O is the center of the circle. Angle QOS = 150^0.



Find the size of:

(a) Angle QPS **(2 marks)**

(b) Angle QRS **(1 mark)**

16. The heights of two vertical poles UV and XY are 15m and 8m respectively. They area 32m apart and on a horizontal ground as shown in the figure below.



Calculate the angle of elevation of V from Y **(3 marks)**

SECTION II (50 MARKS)

Answer FIVE questions ONLY from this section

17. (a) Given the matrix $Q = \begin{pmatrix} 5 & 24 \\ 4 & 30 \end{pmatrix}$,find its inverse matrix Q **(2 marks)**

(b) Two friends Kamara and Teso, bought bulls at sh b per bull and goats at sh g per goat. Kamara spent sh.96,000 in buying 5 bulls and 24 goats while Teso spent sh 93,000 in buying 4 bulls and 30 goats

(i) Form a matrix equation to represent this equation **(1 mark)**

(ii) Use the inverse matrix Q^{-1} in (a) above to find the cost of one bull and that of one goat **(3 marks)**

(c) Kamara sold all his animals at a profit of 30% per bull and 40% per goat. Teso sold his animals at a profit of 25% per bull and 50% per goat. Determine who made more profit and by how much. **(4 marks)**

18. A bus left Kampala travelled towards Dar-es-Salaam at an average speed of 70km/h. after $3\frac{1}{2}$hrs, a car left Dar-es-Salaam and travelled along the same road towards Kampala at an average speed of 90km/h. the distance between Kampala and Dar-es-Salaam is 1077km.

a) Find:

(i) The distance of the bus from Kampala when the car left Dar-es-salaam **(2 marks)**

(ii) The distance of the bus from Dar-es-Salaam when the car left the bus **(4marks)**

b) After the car met the bus, the car stopped for 30 minutes. The car then continued with its journey and reached Kampala at the same time the car reached Dar-es-Salaam. At what new average speed between the meeting point and Kampala car move**.** **(4marks)**

19. The following table shows masses to the nearest kilogram, of 200 animals in Moseti's farm.

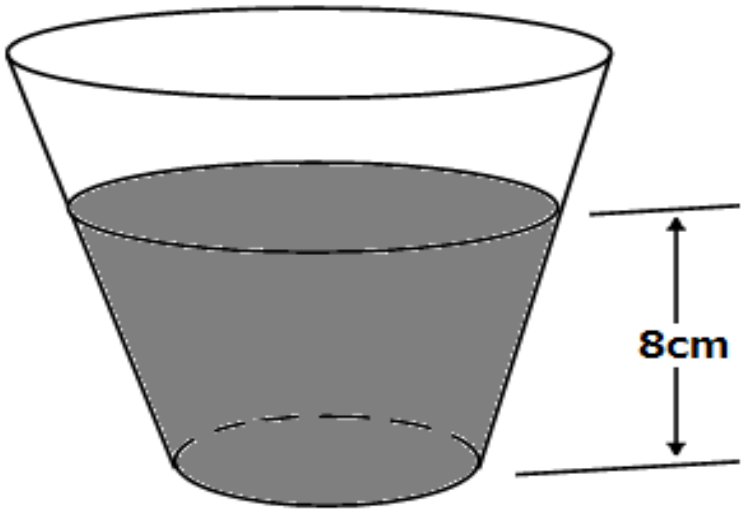
Mass (kg)	40-49	50-59	60-69	70-79	80-89	90-99	100-109
frequency	9	25	58	52	30	16	10

a) Using the assumed mean of 74.5, find the actual mean **(4 marks)**

b) Find the median mass **(3marks)**

c) Calculate the standard deviation of the data **(3marks)**

20. The diagram below represents a glass in form of a frustum of a cone, with milk to a depth of 8cm. the internal radius of the glass bottom is 3cm while the radius of a circular surface of milk is 5cm.



a) How many litres of milk correct to 2 significant figures are in the glass? **(3marks)**

b) A metallic hemisphere solid accidentally drops inside the milk. The level of glass in milk then rises by 6mm. if no milk splashed out of the glass when the solid dropped in, find

(i) The volume of the hemisphere solid **(4marks)**

(ii) The radius of the hemisphere solid **(3marks)**

21. In January, 2008, Kelly and Wasanga contributed sh 455,040 and sh 682,560 respectively and used the money to start a business. They agreed that the profit from the business would be shared as from the business would be shared as follows.

24% to be shared equally

36% to be shared in their ratio of contribution

40% to be retained for the running of the business.

a) The total profit for the year was 2008 was sh 750,000

(i) The difference in their total shares of profits **(4 marks)**

(ii) Calculate the amount that was retained for the running of the business**.** **(2marks)**

b) In January 2009, Wasanga took his whole share of profit to a bank that offered a compound interest at the rate of 6% per annum. If the interest was compounded semi-annually, calculate his total interest in the bank in December 2011. **(4marks)**

22. A rectangular tree nursery measuring 16m by 14 m is situated at the centre of a rectangular piece of land. A path of uniform width runs all around the tree nursery. The width of the path is x metres and the area of the piece of land 360m2. The path is graveled at the cost sh 75 per square metre.

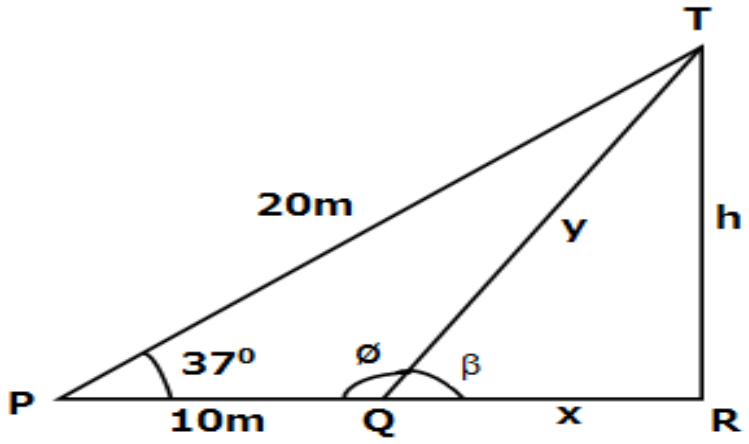
a) Determine

(i) The value of x **(5marks)**

(ii) The dimensions of the field **(2marks)**

b) Calculate the cost of gravelling the path **(3marks)**

23. The diagram below shows a vertical electricity pole TR supported by two wires PT and QT. the points PQ and R are collinear and on the horizontal ground. The angle of elevation of T from P is 37^0 and the distance between P and Q is 10m



Given that the length of PT is 20m, calculate to the nearest whole numbers

a) The length of the wire QT **(3marks)**

b) The angle of elevation of T from Q **(3marks)**

c) The height of TR of the electricity pole **(2marks)**

d) The length of P from R **(2marks)**

24. Two vertices of the triangle are A(3,6) and B(7,12)

a) Find the equation of the line AB **(3marks)**

b) Find the equation of the perpendicular bisector of line AB **(4marks)**

c) Given that AC is perpendicular to AB and the equation of line BC is $y = -5x + 47$, find the co-ordinates of C **(3marks)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 7

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

a) *Write your name, index number, class and school in the spaces provided above.*
b) *This paper consists of TWO sections I & II*
c) *Answer ALL the questions in section I and only FIVE questions from section II*
d) *Show all the steps in your calculations giving your answers at each stage*
e) *Marks may be given for correct working even if the answer is wrong.*
f) *Non-programmable silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.*

FOR EXAMINERS USE ONLY

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

SECTION 1 (50 marks) Answer all questions in this section

1. Use logarithms to evaluate , **(4marks)**

$$\sqrt[3]{\frac{24.36\ x\ 0.066547}{1.48^2}}$$

2. Make d the subject of the formula **(3marks)**

$$a^2 = \sqrt{\frac{1-d^2}{b^2} - \frac{b}{3}}$$

3. Simplify the following surds leaving your answer in the form a+ b$\sqrt{c}$ **(3marks)**

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

4. (a) Expand the binomial expression $\left(x - \frac{1}{x}\right)^4$ up to the third term. **(1mark)**

(b) Use the expansion above (where x > 1) to estimate the value of $(99)^4$ to 3 s.f. **(2marks)**

5. A(3,2) and B(7,4) are points on the circumference of a circle. Given that chord AB passes through the centre of the circle determine the equation of the circle. **(4marks)**

6. Without using logarithms tables of calculator: Evaluate. **(3marks)**

$\log_{10} 96 + \frac{3}{4}\log_{10} 625 - \log_{10} 12$

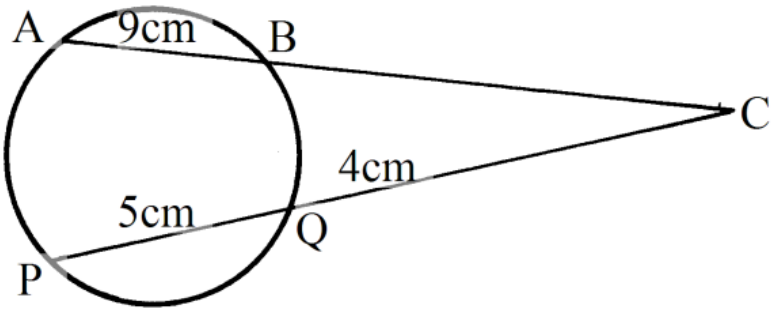
7. Solve for x given that the following is a singular matrix. **(3mks)**

$$\begin{pmatrix} 1 & 2 \\ x^2 & x+3 \end{pmatrix}$$

8. The sides of a triangle were measured and recorded as 8.4 cm, 10.5 cm and 15.32 cm.Calculate the percentage error in it's perimeter 2d.p. **(3marks)**

9. Given that 64, b, 4…. are in continued proportion, find the value of b**.** **(3marks)**

10. The figure below shows a circle centre O. AB and PQ are chords intersecting externally at a point C. AB=9cm, PQ=5cm and Qc =4cm, find the length BC. **(3marks)**



11. Two variables x and y are such that y varies directly as x^n where n is a constant. Given that y=320 when x=16 and y = 2560 when x = 64. Find the value of n. **(3marks)**

12. A man sold a motor cycle at 84000. The rate of depreciation was 5% per annum. Calculate the value of the motor cycle after 3 years to 1d.p**.** **(3marks)**

13. Vector **r** has a magnitude of 14 and is parallel to vector **s**. Given that **s** = 6**i** – 2**j** +3**k**, express vector **r** in terms of **i, j** and **k**. **(3marks)**

14. Solve for x in the range $0 \leq x \leq 360^0$

If $2\sin^2 x + \sin x - 1 = 0$ **(4marks)**

15. The prefects body of a certain school consists of 7 boys and 5 girls. Three prefects are to be chosen at random to represent the school at a certain function at Nairobi. Find the probability that the chosen prefects are boys**.** **(2mks)**

16. A trigonometric function is given **as** **(4mks)**

$y = 0.5 \cos (2x - 40)^0$

Determine (a) Amplitude

(b) Period

(c) Phase angle

SECTION B(50 MARKS)

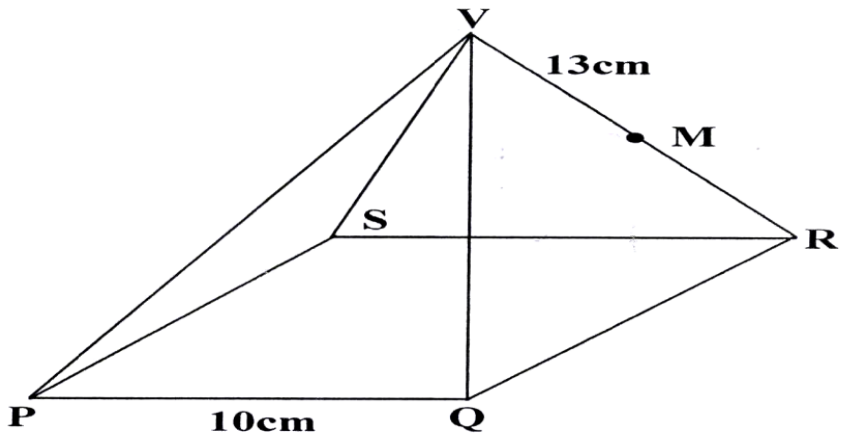
Answer any five questions from this section in the spaces provided.

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

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

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

18. 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

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

(ii) the height of the pyramid **(2marks)**

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

(ii) the angle between **MR** and the base **PQRS** **(2marks)**

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

19. Complete the following table for the equation

$y = 2x^3 + 3x^2 - 6x - 4$ for the values $-3 \leq x \leq 2$ **(2marks)**

x	-3	-2	-1	0	1	2
$2x^3$		-16		0	2	16
$3x^2$	27		3	0		12
-6x		12		0		-12
-4	-4	-4	-4	-4	-4	-4
y		4		-4		12

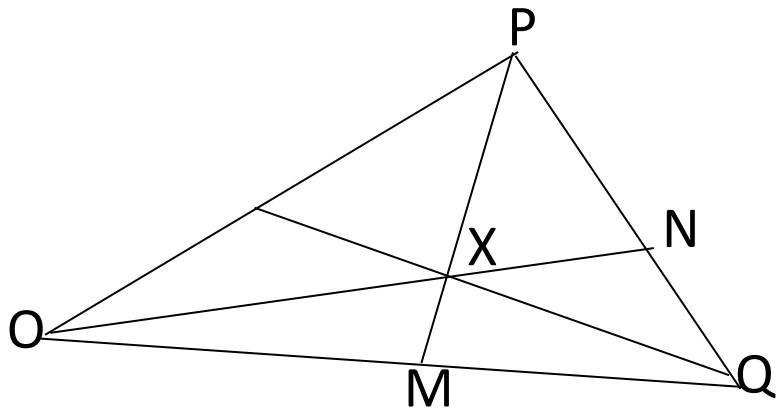
On the grid provided draw the graph of $y=2x^3 + 3x^2 - 6x - 4$ **(3marks)**

c)By drawing a suitable straight lines use your graph to solve the equations

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

(ii) $2x^3 + 3x^2 - 6x - 4 = 0$ **(3marks)**

20. The diagram below shows a triangle **OPQ** in which **M** and **N** are points on **OQ** And **PQ** respectively such that **OM**= $\frac{2}{3}$ **OQ** and **PN** = $\frac{1}{4}$**PQ**. Lines **PM** and **ON** meets at **X.**



(a) Given that **OP** = **p** and **OQ**= **q** express in term of **p** and **q** the vectors.

(i) **PQ** **(1mark)**

(ii) **PM** **(1marks)**

(iii) **ON** **(1marks)**

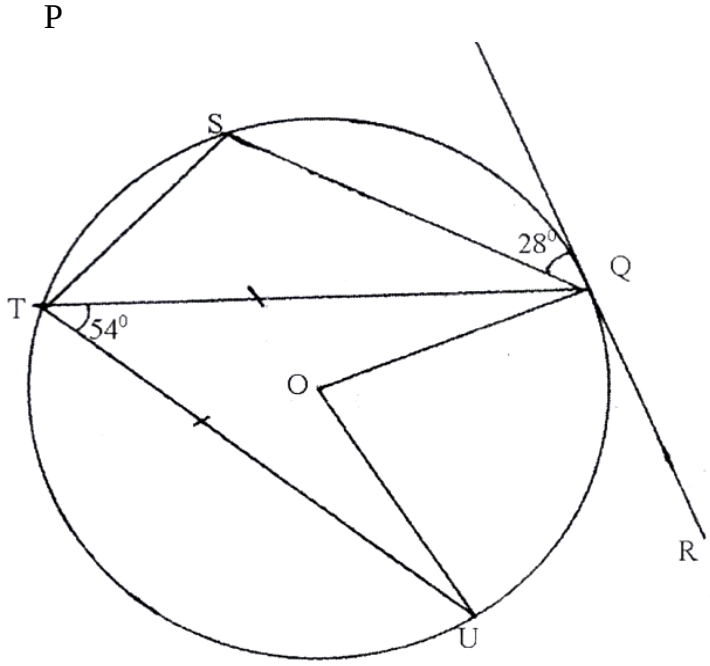
(b) You are further given that **OX**=**KON** and **PX**=**hPM**.

(i) Express **OX** in terms of P and q in two different ways. **(2marks)**

(ii) Find the value of h and **K**. **(4marks)**

(iii) Find the ratio **PX**:**XM** **(1mark)**

21. In the figure below , O is the centre of the circle.PQR is a tangent to the circle at Q. Angle PQS=28^0, angle UTQ=54^0 and UT=TQ



Giving reasons, determine the size of

(a) Angle STQ **(2mks)**

(b) Angle TQU **(2mks)**

(c) Angle TQS **(2mks)**

(d) Reflex angle **UOQ** **(2mks)**

22. Mr. Kimutai a teacher from Tuiyotich Secondary School earns K£12000 per annum and lives in a house provided by the employer at a minimum rent of Ksh2000 per month. He gets a family relief of K£1320p.a and is entitled to a relief of 10% of his insurance of K£800p.a.

(a) Calculate his annual tax bill based on the table below**.** **(6mks)**

Income slab in k£p.a Rate

1 – 2100	10%
2101 – 4200	15%
4201 – 6300	25%
6301 – 8400	35%
Over 8400	45%

(b) Kimutai other deductions include.

- W.C.P.S = sh600.00pm
- NHIF = sh500.00pm

Calculate Kimutai's net salary monthly**.** **(4mks)**

23. (a) Use the mid-ordinate rule with five strips to estimate the area bounded by the curve $y = x^2 + 1$, the x–axis, lines x=1 and x=**6** **(4mks)**

(b) Find the exact area of the region in (a) **above** **(3mks)**

(c) Calculate the percentage error in area when mid-ordinate rule is used. **(3mks)**

24. 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. **(2mks)**

(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 **(5mks)**

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

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 8

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES:

1. *Write your name, index number and school in the spaces provided above.*
2. *Sign and Write the date of examination in the spaces provided above.*
3. *This paper consists of two Sections; Section **I** and Section **II**.*
4. *Answer all the questions in Section **I** and any **FIVE** questions from Section **II**.*
6. *Non-programmable silent electronic calculators and **KNEC** Mathematical tables may be used.*

FOR EXAMINER'S USE ONLY:

SECTION I

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

SECTION II **GRAND TOTAL**

17	18	19	20	21	22	23	24	TOTAL

SECTION I (50 MARKS)

Answer ALL questions in this section in the spaces provided

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

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

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

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

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

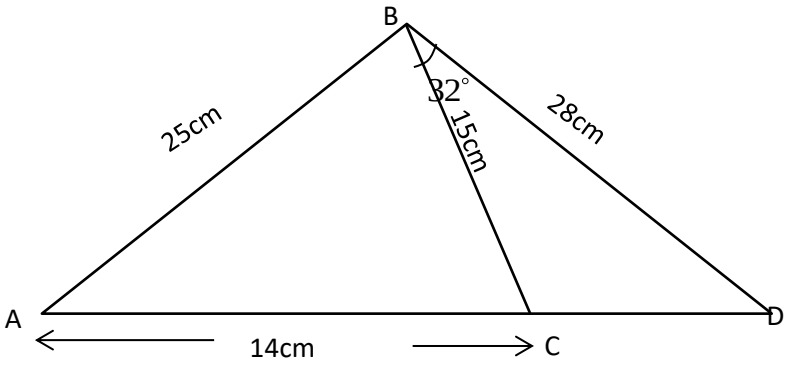
5. One interior angle of a certain polygon is 84^0. If each of the other angles is 147^0, how many sides does this polygon have? **(3 mks)**

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

	Buying shs	Selling shs
Riyal	19.68	19.78

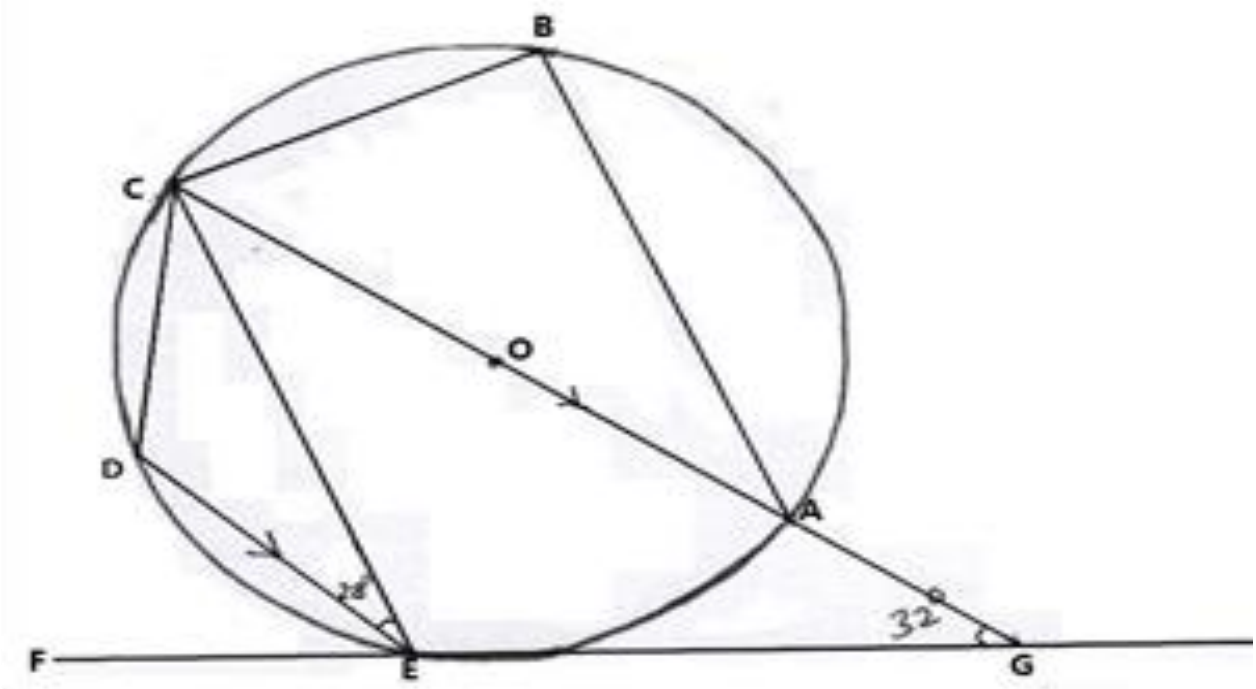
A tourist arrived with 5480 Riyal which he changed to Kshs. He spend $\frac{2}{3}$ of the total in visiting various sites. As he was leaving he changed all he had to Riyal. How much did he leave with? Answer to 1 d.p. **(3 mks)**

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



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

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



Calculate

(a) AEG **(2mks)**

(b) ABC **(2mks)**

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

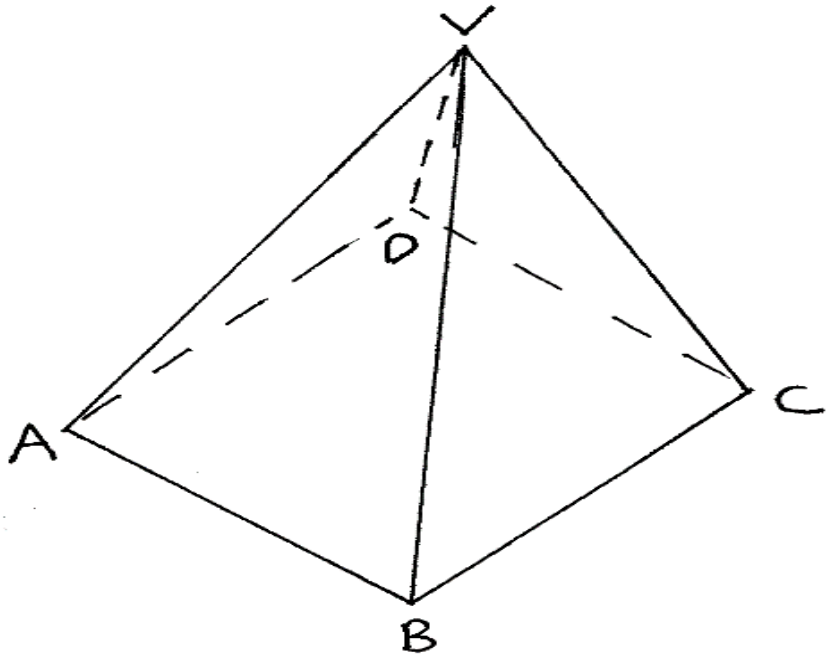
11. The line which joins the point A (3, K) and B (-2, 5) is parallel to the line whose equation is 5y+2x-7=0. Find the value of K. **(3mks)**

12. Given that Cos A = $\frac{5}{13}$ and angle A is acute, without using tables or calculator, find the value of **(3 mks)**

2 tan A + 3 sin A.

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

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



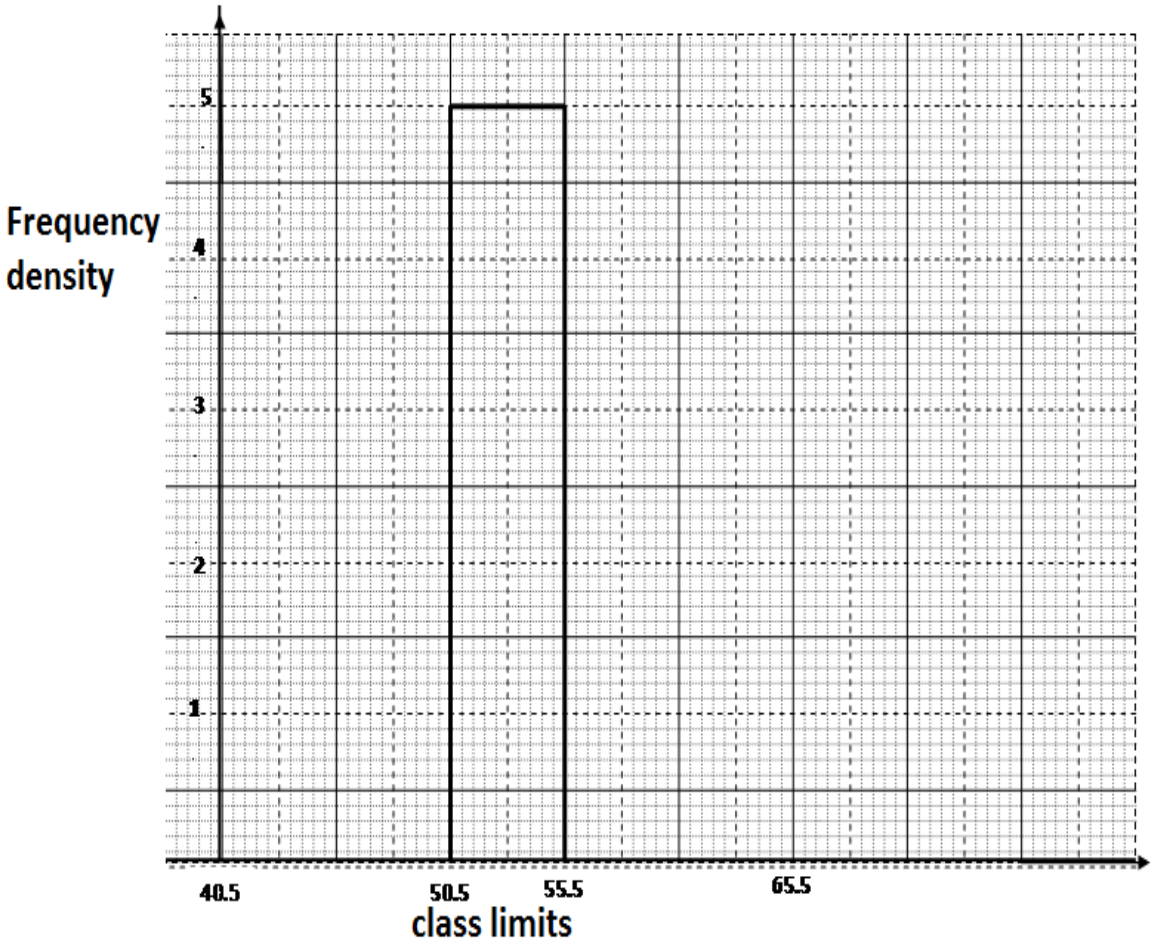
(a) Draw its net and label it. **(2mks)**

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

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

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

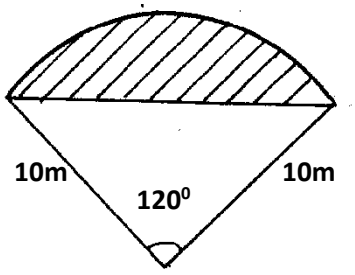
Mass(kg)	frequency
41-50	20
51-55	
56-65	40



SECTION II: (50 MARKS)

Answer only FIVE question from this section.

17. The ends of the roof of a workshop are segment of a circle of radius 10m. The roof is 20m long .The angle at the centre is 120^0 as shown in the figure below.



(a) Calculate:

(i) The area of one end of the roof. **(4mks)**

(ii) The area of the curve surface of the roof. **(2mks)**

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

18. A rectangular tank whose internal dimensions are 1.7m by 1.4m by 2.2m is three quarters full of milk.

a) Calculate the volume of milk in litres. **(3 marks)**

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

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

ii) The number of full packets of milk. **(2 marks)**

iii) The amount of money realized from the sell of milk. **(2 marks)**

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

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

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

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

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

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

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

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

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

21. Matrix P is given by

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

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

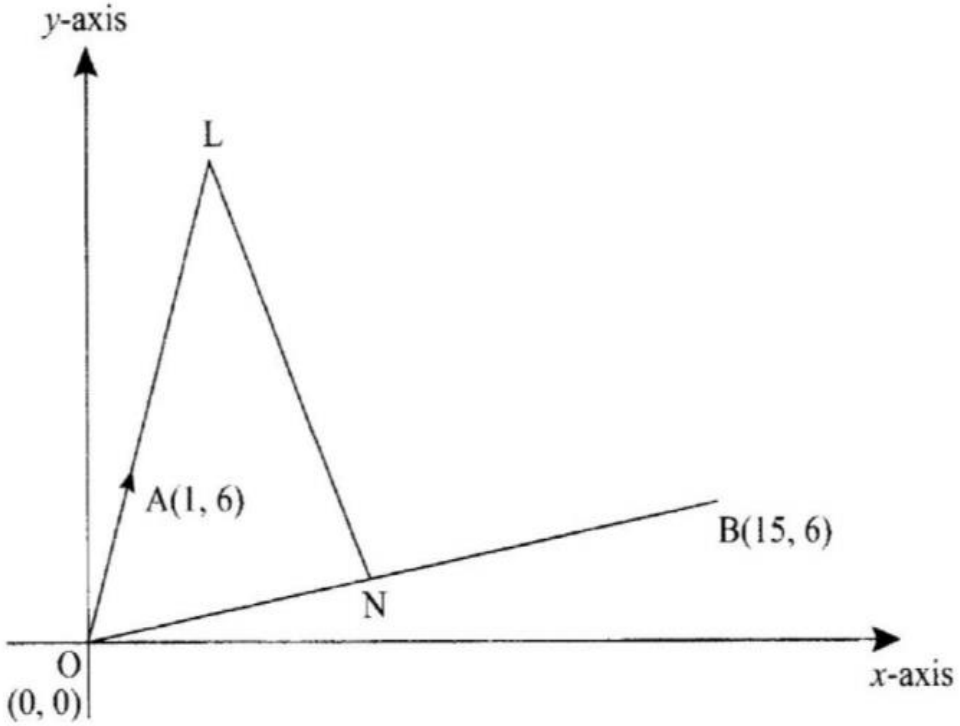
(b) Two institutes regions and Alphax purchased beans at sh.B per bag and maize at sh.M per bags. Regions purchased 8 bags of beans and 14 bags of maize for sh. 47,600. Alphax purchased 10 bags of beans and 16 bags of maize for sh. 57,400.

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

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

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

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



(a) Vector LN. **(3 marks)**

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

(c) If line OM is produced to T such that OM:MT = 6:1

(i) Find the position vector of T. **(1 mark)**

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

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

x	-2	-1	0	1	2	3
y						

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

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

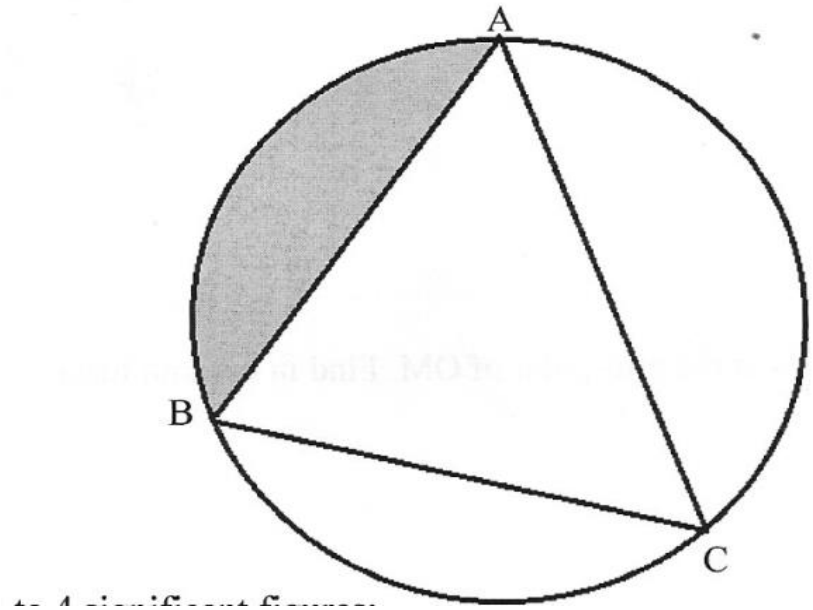
(e) From your graph, find the value of X which satisfy the simultaneous equations. **(1 mk)**

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

$y = 2x - 2$

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

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



Calculate to 4 significance figures:

(a) The angle ACB **(3mks)**

(b) The radius of the circle. **(3mks)**

(c) The area of the shaded region **(4mks)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 8

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

a) Write your name, index number and date in the spaces provided at the top of this page.
b) Write name, admission number and class in the spaces provided above.
*c) This paper contains **TWO** sections: **section I** and **section II***
d)** Answer **ALL** the questions in **Section I** and only **five** questions from **section II.
e) Show all the steps in your calculations, giving your answers at each stage
f) Marks may be given for correct working even if the answer is wrong.
*g) **Non-programmable** silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.*

FOR EXAMINER'S USE ONLY:

Section I

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

Section II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

SECTION 1 (50 MARKS)

Answer all questions in this section in the spaces provided.

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

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

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

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

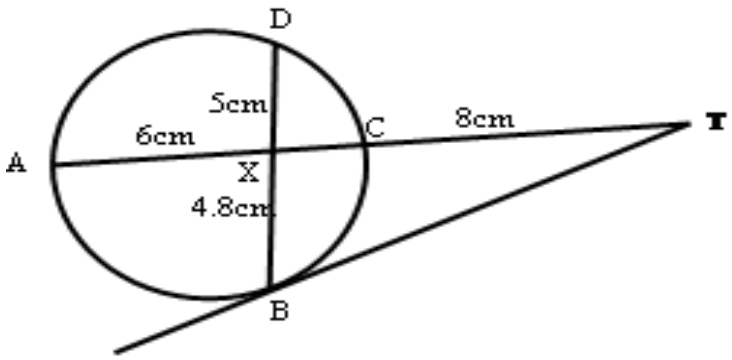
4. Express the following in **surd form** and simplify by rationalizing the denominator without using a calculator and leave your answer in the form a + $b\sqrt{c}$ **(3mks)**

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

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 $\begin{pmatrix} x+8 & 8 \\ 6 & x \end{pmatrix}$ 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 $\text{Sin}(3x - 10)^0 = 0.4337$ for $0^0 \leq \Theta \leq \mathbf{180^0}$ **(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 = 90º and angle BAC = 60º.

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)**

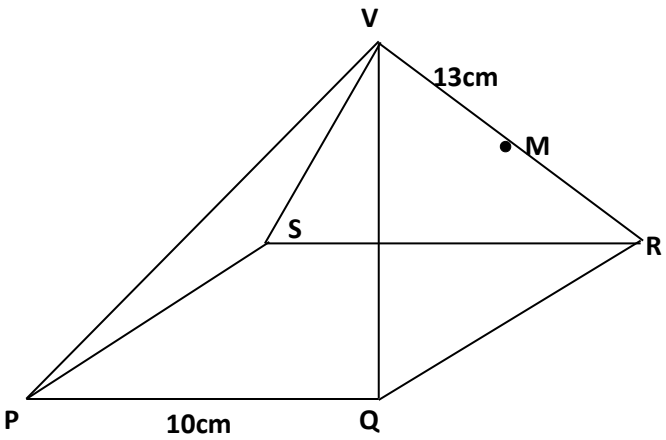
(ii) Area of triangle AQ1B=Area of triangle AQ2B= 3/4 Area of triangle ABC

(iii)Angle AQ1B=Angle AQ2B =30º

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)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 9

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

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

SECTION 1

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

SECTION 2

17	18	19	20	21	22	23	24		GRAND TOTAL

SECTION I (50Mrks)

Answer ALL the Questions in the section

1. Evaluate: **3mks**

$$\frac{2\frac{1}{2}\ of\ 1\frac{3}{4} - 5\frac{1}{4}}{1\frac{2}{5} + 2(1\frac{1}{4} - 2\frac{3}{4})}$$

2. An electrician made a loss of 30% by selling a multi plug at Sh. 1400. What profit would he have made if he sold the multi plug at sh 2300. **3mks**

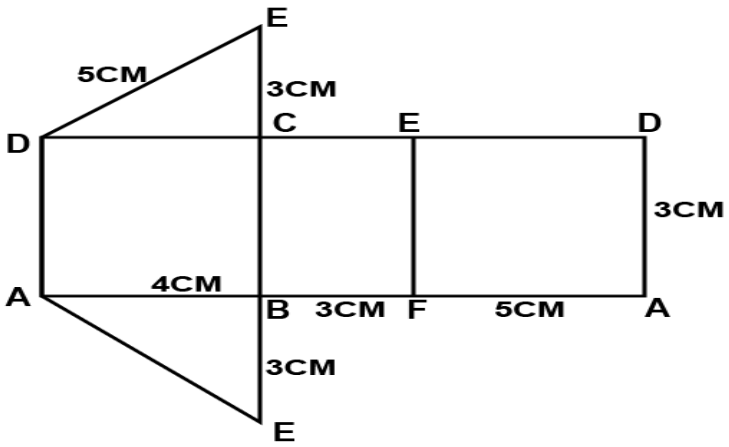
3. Simplify $\sqrt{\frac{12x^4y^{-1}z^5}{3x^{-2}y^{-3}z^3}}$ **2mks**

4. Solve the following inequalities and represent the solutions on a number line

X + 1≤ 4x – 5< 3x + 2

5. The figure below shows a net of a solid.

Sketch the solid of the net showing the hidden edges with broken lines**.** **2mks**



a. Find the surface area of the solid. **2mks**

6. Determine the quartile deviation for the following distribution. **3mks**

3,4,9,5,4,7,6,2,1,6,7,8,9

7. Given that $2^{3/2x} = 4096$, find the value of x **2mks**

8. It would take 15men 8days to dig a trench of 240m long. Find how many days it would take 18men to dig a trench 360meters long working at the same rate. **3mks**

9. Use logarithms to evaluate. **4mks**

$$\sqrt[3]{\frac{0.921\ x\ 0.00739}{0.023}}$$

10. A regular polygon is such that its exterior angle is one eighth the size of interior angle. Find the number of sides of the polygon. **3mks**

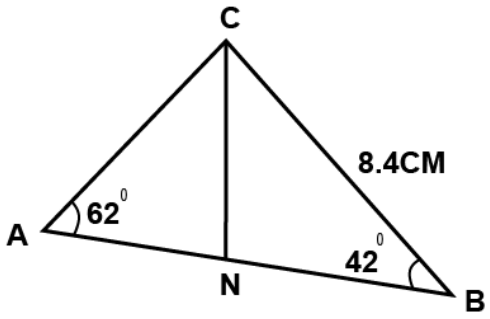
11. A translation vector $\begin{pmatrix} x-1 \\ 2-y \end{pmatrix}$ maps a point A(4,6) onto A^{I}(9,12). Find the value of x and y. **3mks**

12. A Canadian tourist arrived in Nairobi with Canadian dollars 6200. She converted all his money into Kenya Shillings and then spent a total of Kshs. 100,000. She paid her Kenyan tour guide a commission equivalent to 20% of the remainder. Given that 1 canadian dollar = Ksh. 48.12. calculate

A. How much she got in kenya shillings after converting all her money. **1mk**

B. The amount of kenya shillings she was left with at the end. **2mks**

13. In the figure below <A=62°, <B = 42°, BC = 8.4cm and CN is a bisector of angle ACB. Calculate to 1dp the length of CN. **3mks**



14. A father is now four times as old as his son. Five years ago, he was exactly one year and half times as old as his son will be in ten years from now. Determine the sum of their present ages. **4mks**

15. **4mks**

16. Factorize and simplify the expression. **3mks**

$$\frac{x^2 + 6x + 9}{x^2 - 9}$$

SECTION II (50 marks)

Answer any FIVE questions from this section

17. The triangle ABC with coordinates A(2,3), B(4,2) and C(1,1) is mapped onto triangle $A^1B^1C^1$ by a reflection in the line y + x = 0.

a. (i) Draw triangle ABC and its image $A^1B^1C^1$on the same plane. **3mks**

(ii) Triangle $A^1B^1C^1$ is mapped onto $A^{11}B^{11}C^{11}$ by a transformation represented by the matrix.

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

Draw triangle $A^{11}B^{11}C^{11}$ and describe fully a single transformation that maps triangle ABC onto triangle $A^{11}B^{11}C^{11}$ **4mks**

b. Triangle ABC is mapped onto xyz with A being mapped onto x, B onto Y and C onto Z. given that the coordinates of x is (-4,3), Y is (0,2) and Z is (-1,1), find the matrix representing the transformation. **3mks**

18. A lorry left town A for B at 6.50pm at an average speed of 60km/h. at 8.35pm, a car left tow A for B at an average speed of 90km/h. if A is 317km from B. determine:

a. The distance of the lorry from town A when the car took off. **3mks**

b. The distance the car travelled to catch up with the lorry. **4mks**

c. What time of the day did the car catch up with the lorry? Give your answer in 24hrs system. **3mks**

19. Three ships X, Y and Z are approaching a habour H. X is 150km from the habour on a bearing of O90°. Y is 130km from the habour on a bearing of 130°E and Z is 180km to the west of Y.

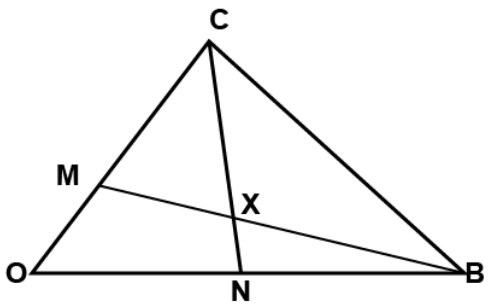
a) Taking a scale of 1cm to represent 20km, make a scale drawing of the routes of the three ships to the habour. **2mks**

b) What is the distance between ships X and Z? **2mks**

c) Find the bearing of H from Z. **2mks**

d) If ship Y is travelling at a speed of 50km/h how long will it take to reach the harbor. **2mks**

20. The figure below shows a triangle OAB with O as the origin. OA=$\underline{a}$ OB = $\underline{b}$, OM 2/5$\underline{a}$ and ON = 2/3$\underline{b}$.



a) Express in terms of $\underline{a}$ and $\underline{b}$ the vectors

(i) BM **1mk**

(ii) AN **1mk**

b) Vector OX can be expressed in two ways: OB + KBM or OA + hAN, where K and h are constants.

Express OX in terms of:

i. $\underline{a}$, $\underline{b}$ and k. **2mks**

ii. $\underline{a}$, $\underline{b}$ and h. **2mks**

c) find the valuesof k and h. **4mks**

21. in a certain meeting, there were 95men in attendance. There were 50 more women than men and twice as many children as men.

a. Determine the number of people in attendance. **2mks**

b. Find the percentage of children in attendance, correct to 3 significant figures. **2mks**

c. A hall for the meeting was fitted with benches that could accommodate eighher 10 children or 7 adults per bench.

Find the number of benches

i. Used by the children **2mks**

ii. Completely filled by the adults. **2mks**

iii. Adults who would fill the unoccupied space. **2mks**

22. a) The point A(-2, 4) and B(3,-6) lies on a straight line AB, find

(i) the equation of the line perpendicular to AB and passing through **A** **3mks**

(ii) The equation of the line parallel to AB and passing through the point. **(3,-1).** **3mks**

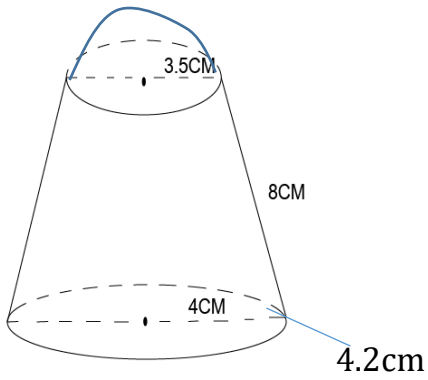
b) The points A and B are translated by a vector

M = $\begin{pmatrix} 2 \\ -1 \end{pmatrix}$. Find

(i) the images of A and B. **2mks**

(ii) the equation of the line passing through A^1 and B^1 the images of A and B respectively. **2mks**

23. The figure below represents a solid made up of a conical frustum and a hemispherical top. The slant height of the frustum is 8cm and its base radius is 4.2cm.



If the radius of the hemispherical top is 3.5cm

a. Find the area of:

i. The circular base **2mks**

ii. The curved surface area of frustum. **4mks**

iii. The hemispherical surface **2mks**

b. A similar solid has a total surface area of 81.5cm2. determine the radius of the base. **2mks**

24. Using a ruler and a pair of compasses, construct parallelogram ABCD such that AB = 8cm, diagonal AC = 12cm and angle BAC = 22.5° **4mks**

a) Measure (i) The diagonal BD **1mk**

(ii) The angle ABC **1mk**

b) Draw the circumference of triangle ABC **2mks**

c) Calculate the area of the circle drawn **2mks**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 9

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

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

SECTION 1

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

SECTION 2

17	18	19	20	21	22	23	24		GRAND TOTAL

SECTION I (50Mks)

Attempt ALL Questions from this section

1. Make x the subject of the formula **3mks**

$$P = \sqrt{\frac{x + 2w}{4x + 3R}}$$

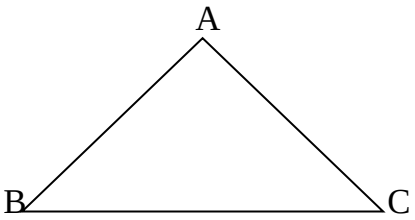
2. P varies partly as the square of v and partly as the cube of v. when V=2, P = -20 and when v = -3, P=135. Find the relationship between P and v. **3mks**

3. Expand $(1 + 2x)^7$ up to x^3, hence use the expansion to estimate the value of $(1.02)^7$ correct to four decimal places. **3mks**

4. Simplify the following by rationalizing the denominator. **3mks**

$$\frac{\sqrt{2} - 1}{4\sqrt{2} - 3}$$

5. The diagram below represents a field ABC.



(a) Draw the locus of points equidistant from sides AB and AC **2mks**

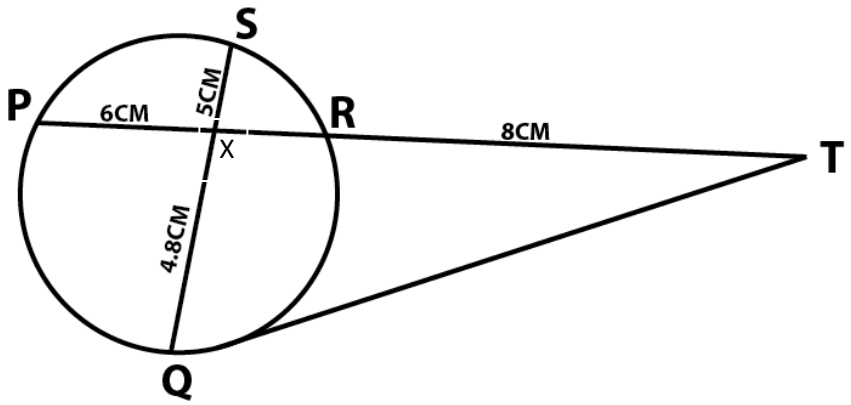
(b) Draw the locus of points equidistant from points A and C. **2mks**

C) A coin is lost within a region which is nearer to point A than to point C and closer to side AC than to side AB. Shade the region where the coin can be located. **2mks**

6. Given x = 13.4cm and y=4.3cm. calculate the percentage error in x/y correct to 4 d.p **3mks**

7. If matrix $A = \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$ Find B given that $A^2 = (A + B)$. **3mks**

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



Find the length of

a. XR **2mks**

b. QT **2mks**

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

10. A blender mixes two brands of juice A and B to obtain 70mls of the mixture worth Ksh. 165 per litre. If brand A is valued at Kshs. 168 per litre and brand B at Ksh. 153 per litre bottle, calculate the ration in which the brands A and B are mixed**.** **(2mks)**

11. Without using logarithm tables solve the equation log

$(5x – 4) = \log(x + 2) + {}^1/_3 \log 27$. **3mks**

12. a) Use reciprocal tables to find the value of $= {}^1 / {}_{0.325}$ **1mk**

b) Hence, evaluate $\frac{\sqrt[3]{0.000125}}{0.325}$ **1mk**

13. The G.C.D of three numbers is 45 and the LCM is 18900. Two of the numbers are 675 and 540. Find the other possible numbers. **3mks**

14. solve for θ given that θ is acute and $\sin(3\theta - 50^o) – \text{Cos}(20 + 10^o) = 0$ **3mks**

15. A container of height 90cm has a capacity of 4.5L. What is the height of a similar container of volume $9cm^3$. **3mks**

16. A point R divides a line PQ internally in the ration 3:4. Another point S, divides the line PR externally in the ratio 5:2. Given that PQ = 8cm, calculate the length of RS, correct to 2 decimal places. **3mks**

SECTION II (50mrks)

Attempt any FIVE questions from this section

17. Complete the table below for the function

(a) $y=x^2 + {}^{12}/_x – 15$ for $0.5 \leq x \leq 4$

X	0.5	1	1.5	2	2.5	3	3.5	4
y	9.25			-5	-4			

(b) Draw the graph of $y=x^2 + {}^{12}/_x – 15$ for $0.5 \leq x \leq 4$. using a scale of 2cm rep 1 unit on the x – axis and 2cm for 5 units on the y – axis. **3mks**

(c) (i) from your graph, state the range of values of x for which $y=x^2 + {}^{12}/_x \leq 18$ **3mks**

(ii) By adding a suitable straight line to your graph, solve the equation $y = x^2 + {}^{12}/_x – 5x + 20$.**3mks**

18. The product of the first three terms of a geometric progression is 64. If the first term is a and the common ratio is r.

(a) Express r in terms of a **3mks**

(b) Given that the sum of the three terms is 14,

(i) Calculate the values of a and r and hence write down two possible sequences each up to the 4^{th} term. **5mks**

(ii) Find the product of the 50^{th} terms of the two sequences **2mks**

19. The table below shows income tax rates for certain year.

Monthly income in Kenya Shillings (Kshs	Tax rate in each shillings
0 – 10164	10%
10165 – 19740	15%
19740 – 29316	20%
29317 – 38892	25%
Over 38892	30%

A tax relief of Kshs. 1162 per month was allowed. In a certain month of the year, an employee's taxable income in the fifth band was Ksh. 2108.

(a) Calculate

i) Employees total income in that month **2mks**

ii) The tax payable by the employee in that month. **5mks**

(b) The employee's income includes a house allowance of Ksh. 15,000 per month. The employees contributed 5% basic salary to a cooperative. Calculate the employee net pay for that month. **3mks**

20. 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**

21. A red and black dice are rolled and the events x, y and z are defined as follows.

X = the red die shows a 4

Y = the sum of the scores of the two dice is 6

Z = the black dice shows a 3

a. Find the probability of event x **2mks**

b. The probability of events x and y **3mks**

c. Which event is mutually exclusive to x **1mk**

d. Which event is independent of x **2mks**

e. The probability of event Y **2mks**

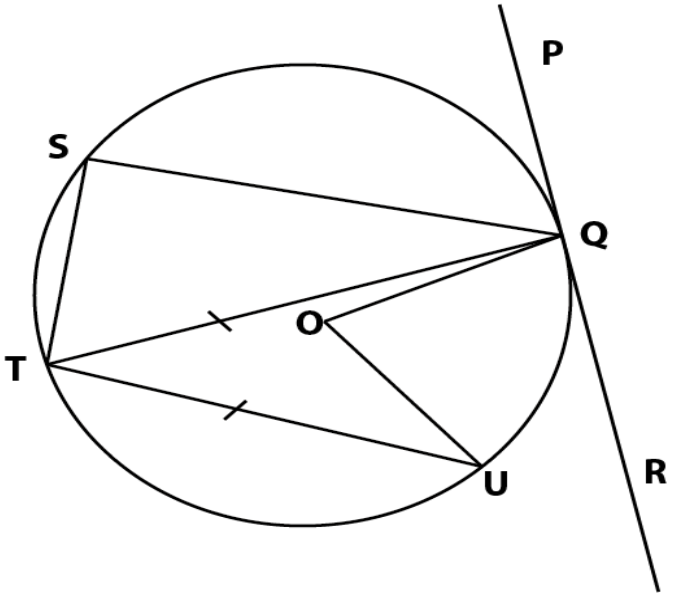
22. a) Complete the table below **2mks**

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

b) Draw the graphs of y=sin(x-30) and y=-Cos x on the same axes, for $0º \leq x \leq 360º$ **(5mks**

c) Use your graph to solve the equation sin(x - 30º) + Cos x = 0 **(3mks)**

23. In the figure below, O is the centre of the circle, PQR is the tangent to the circle at Q, Angle PQS=28º, angle UTV = 54º and UT = TQ



Giving reasons, determine the size of

a) Angle STR **2mks**

b) Angle TQU **2mks**

c) Reflex angle TQS **2mks**

d) Reflex angle UOQ **2mks**

e) Angle TQR **2mks**

24. The cost c of producing n items varies directly as n and partly as the inverse of n to produce two items it costs Ksh. 135 and to produce three items it costs Ksh. 140. Calculate

a) The constant of proportionality and hence write the equation connecting c and n. **5mks**

b) The cost of producing 10 items **2mks**

c) The number of items produced at a cost of Ksh. 756. **3mks**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 10

121/1

MATHEMATICS

PAPER 1

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO DANDIDATES

1. *Write your name, index number and class.*
2. *The paper contains two sections: Section I and II*
3. *Answer ALL questions in section I and ONLY 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.*

FOR EXAMINER'S USE ONLY

SECTION 1

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	25	TOTAL

GRAND TOTAL

1. Evaluate without using a calculator **(2 Marks)**

$$\frac{23.4 - 2(5.2 + 5.3)}{3.2\ x\ 1.2}$$

2. In Blessed Church choir, the ratio of males to females is 2:3. On one Sunday service, ten male members were absent and six new female members joined the choir as guests for the day. If on this day the ratio of males to females was 1:3, how many regular members does the choir have?

(3 Marks)

3. A Kenyan bank buys and sells foreign currency as shown below.

	Buying	Selling
	Kenya shillings	Kenya shillings
1 Euro	84.15	84.26
1 US Dollar	80.12	80.43

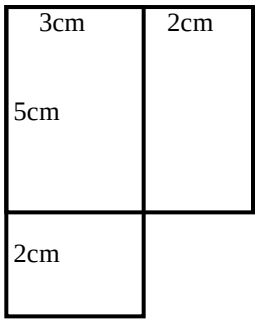
A tourist travelling from Britain arrives in Kenya with 5000 Euros. He converts all the Euros to Kenya shillings at the bank. While in Kenya he spends a total of KSh. 289,850 and then converts the remaining Kenya shillings to US dollars at the bank. Calculate (to nearest dollar) the amount he receives?

(3 Marks)

4. Simplify the expression. **(3 Marks)**

$$\frac{4x^2 - 16y^2}{6x^2 - 8xy - 8y^2}$$

5. Complete the figure below so as to make the net of a cuboid. Hence determine the surface area of the cuboid. **(4 Marks)**



6. The sum of the interior angles of a regular polygon is 1080^0. Calculate

(a) The number of sides of the polygon **(2 Marks)**

(b) The sizes of the exterior and interior angles of the polygon. **(2 Marks)**

7. If $3^{(2x)} - 4(3^x) + 3 = 0$. Find the possible values of x **(3 Marks)**

8. Three similar pieces of timber of length 240cm, 320cm and 380cm are cut into equal pieces. Find the largest possible area of a square which can be made from any of the three pieces**.(3 Marks)**

9. The sum of digits formed in a two digit number is 16. When the number is subtracted from the number formed by reversing the digits, the difference is 18. Find the number **(3 Marks)**

10. Solve for x given that **(3 Marks)**

$Log_{10}(x - 1) + 1 = Log_{10}(x - 4)$

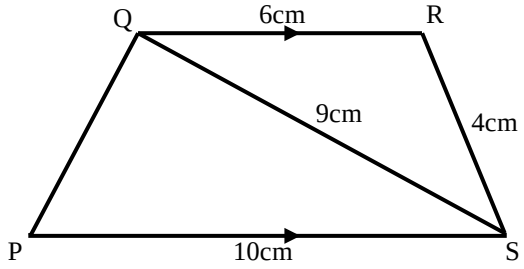
11. Three pens and four exercise books cost Sh. 87. Two pens and five exercise books cost Sh. 93. Find the cost of one pen and one exercise book. **(4 Marks)**

12. A farmer has enough feed to last 45 cows for 30 days. If he buys 5 more cows, how long will the feed last? **(2 Marks)**

13. Find the equation of the line perpendicular to $3x - 7y - 20 = 0$, and passes through the point (5,2) **(3 Marks)**

14. Wanza sold a bag of potatoes for Sh. 420 and made a profit. If she sold it at Sh. 320, she could have made a loss. Given that the profit is thrice the loss, how much did she pay for the bag of potatoes? **(3 Marks)**

15. In the figure below PQRS is a trapezium with QR parallel to PS. QR = 6cm, RS = 4cm, QS = 9cm and PS = 10cm.



Calculate

(a) The size of angle SQR **(2 Marks)**

(b) The area of triangle PQS **(2 Marks)**

16. Given that $\text{Cos}(x - 20)^0 = \text{Sin}(2x + 32)^0$ and x is an acute angle, Find $\tan(x - 4)^0$ **(3 Marks)**

SECTION II (50 MARKS)

Answer Only Five Questions In This Section

17. An expedition has 5 sections AB, BC, CD, DE and EA. B is 200m on a bearing of 050^0 from A. C is 500m from B. The bearing of B from C is 300^0. D is 400m on a bearing 230^0 from C. E is 250m on a bearing 025^0 from D.

(a) Sketch the route **(1 Mark)**

(b) Use the scale of 1cm to 50m to draw the accurate diagram representing the route. **(5 Marks)**

(c) Use your diagram to determine

(i) Distance in metres of A from E **(2 Marks)**

(ii) Bearing of E from A

18. A business lady bought 100 quails and 80 rabbits for Sh. 25,600. If she had bought twice as many rabbits and half as many quails she would have paid Sh. 7,400 less. She sold each quail at a profit of 10% and each rabbit at a profit of 20%.

(a) Form two equations to show how much she bought the quails and the rabbits **(2 Marks)**

(b) Find the cost of each **(3 Marks)**

(c) Calculate the profit she made from the sale of the 100 quails and 80 rabbits **(3 Marks)**

(d) What percentage profit did she make from the sale of the 100 quails and 80 rabbits **(2 Marks**

19. The table below shows the length of 40 seedlings.

Length in (mm)	Frequency
118-126	3
127 – 135	4
136 – 144	10
145 – 153	12
154 – 162	5
163 – 171	4
172-180	2

Determine

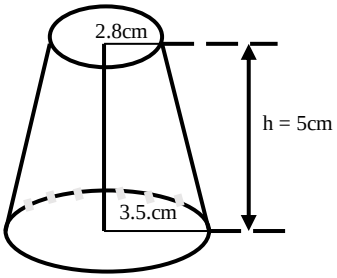
(a) (i) The modal class **(1 Mark)**

(ii) The median class **(2 Marks)**

(b) (i) The mean of the seedlings **(4 Marks)**

(ii) The median of the seedlings **(3 Marks)**

20. Find



(a) The surface area of the frustrum **(5 Marks)**

(b) The volume of frustrum shown. **(5 Marks)**

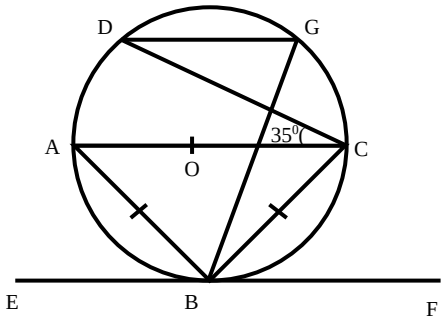
21. Triangle ABC vertices A (-2, 6), B (2, 3) and C (-2, 3) is reflected in the line x = -3 to give the image $A_1B_1C_1$. $A_1B_1C_1$ is translated by the vector $\begin{pmatrix}10\\2\end{pmatrix}$ to give image $A_2B_2C_2$. $A_3B_3C_3$ with coordinates A_3 (6,-6) B_3 (2,-3) and C_3 (6,-3) is the image of $A_2B_2C_2$ after transformation.

Plot all the triangles in the grid provided and determine

(i) The transformation that maps $A_2B_2C_2$ onto $A3B_3C_3$ **(2 Marks)**

(ii) The simple transformation that maps ABC onto $A_3B_3C_3$ **(2 Marks)**

22. In the figure below AOC is a diameter of the circle centre O; AB = BC and $\angle ACD = 35^0$. EBF is a tangent to the circle at B. G is a point on the minor arc CD.



Giving reason

(a) Calculate the size of

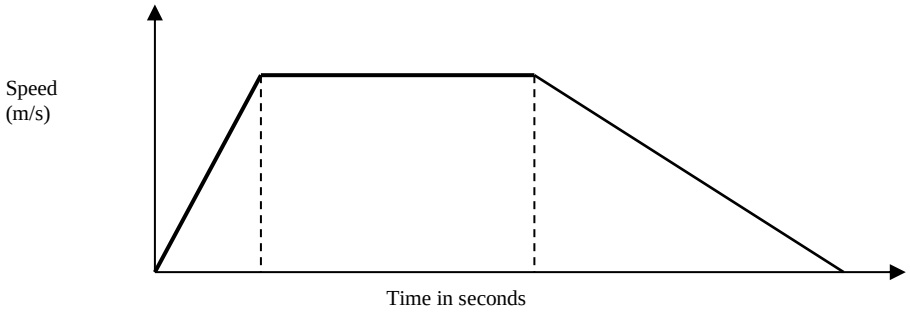
(i) ∠BAD **(3 Marks)**

(ii) The obtuse ∠BOD **(2 Marks)**

(iii) ∠BGD **(2 Marks)**

(b) Show that ∠ABE = ∠CBF **(3 Marks)**

23. The diagram below shows the speed-time graph for a bus travelling between two stations. The bus begins from rest and accelerates uniformly for 30 seconds. It then travels at a constant speed for 60 seconds and finally decelerates uniformly for 40 seconds.



Given that the distance between the two stations in 2090m. Calculate

(a) The maximum speed, in km/h the bus attained **(3 Marks)**

(b) The acceleration **(2 Marks)**

(c) The distance travelled during the last 20 seconds **(2 Marks)**

(d) The time the bus takes to travel the first half of the journey **(3 Marks)**

24. The members of a photograph club decided to buy a camera worth Shs. 4000 by each contributing the same amount of money. Fifteen member failed to pay their contribution due to various reasons. As a result each of the remaining members had to contribute Sh. 60 more.

(a) Find the number of members in the club **(7 Marks)**

(b) What was the percentage increase in the contribution per month? **(3 Marks)**

KCSE CROSS-COUNTRY MOCKS

2023 SERIES 1 TRIAL 10

121/2

MATHEMATICS

PAPER 2

TIME: 2½ HOURS

NAME……

SCHOOL…… **SIGN**……

INDEX NO…… **ADM NO**……

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

a) *Write your name and index number in the spaces provided above.*
b) *This paper consists of **TWO** sections. Section I and Section II.*
c) *Answer **ALL** the questions in section I and only **FIVE** questions from Section II.*
d) *Show all the steps in your calculations, giving your answers at each stage*
e) *Marks may be given for correct working even if the answer is wrong.*
f) *Non-programmable silent calculators and KNEC mathematical tables may be used except where stated otherwise.*

FOR EXAMINER'S USE ONLY

SECTION I

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

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL	

SECTION I (50 MARKS)

Answer ALL the questions in this section.

1. Use logarithms to evaluate:

$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$ **(4 marks)**

2. a) Expand $\left(1 - \frac{1}{2}x\right)^6$ to fourth term. **(2 marks)**

b) Use the expansion above to evaluate $(0.98)^6$ **(2 marks)**

3. 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. **(3 marks)**

4. Object A of the area $10cm^2$ is mapped onto its image B of area $60cm^2$ by a transformation whose matrix is given by P = $\begin{pmatrix} x & 4 \\ 3 & x+3 \end{pmatrix}$. Find the positive values of x. **(3 marks)**

5. Without using a calculator or mathematical tables, express $\frac{\sqrt{3}}{1-Cos\ 30^0}$ in surd form and simplify. **(3 marks)**

6. The position vector of A and B are a = 4**i** + 4**j** – 6**k** and b = 10**i** + 4**j** + 12**k.** D is a point on AB such that AD:DB is 2:1. Find the co-ordinates of D. **(3 marks)**

7. A variable Z varies directly as the square of X and inversely as the square root of Y. Find percentage change in Z if X is increased by 20% and Y decreased by 19%. **(3 marks)**

8. Pipe A can fill a tank in 2 hours, Pipe B and C can empty the tank in 5 hours and 6 hours respectively. How long would it take:

a) To fill the tank if A and B are left open and C is closed. **(2 marks)**

b) To fill the tank with all pipes open. **(2 marks)**

9. Given that Sin $\left(\frac{2}{3}x + 20^0\right)$– Cos $\left(\frac{5}{6}x + 10^0\right)$ = 0. Without using a mathematical table or a calculator, determine tan$(x + 20^0)$. **(3 marks)**

10. Make P the subject of the formula $XY^P = Q^{PX}$ **(3 marks)**

11. The coordinates of the end points of diameter are A(2,4) B(–2,6). Find the equation of a circle in the form $ax^2 + by^2 + cx + dy + e = 0$ **(3 marks)**

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

13. The first, the second and sixth terms of an increasing arithmetic progression are the three consecutive terms of a geometric progression. If the first term of the arithmetic progression is 2, find:

a) Common difference of the arithmetic progression **(2 marks)**

b) Common ratio of the geometric progression. **(1 mark)**

14. Solve for x in the equation

$\frac{6x-4}{3} - \frac{2x-1}{2} = \frac{6-5x}{6}$ **(2 marks)**

15.The length and breadth of a rectangular floor garden were measured and found to be 4.1m and 2.2m respectively. Find the percentage error in its area. **(3 marks)**

16. Given that $4y = 3\ \text{Sin}\ \frac{2}{5}x$ for $0 \leq x \leq 360$. Determine:

a) Amplitude of the curve. **(1 mark)**

b) Period of the curve. **(2 marks)**

SECTION II (50 MARKS)

Answer any FIVE questions in this section.

17.Asteel manufacturing factory had a sample of 5 iron rods of various lengths. The lengths of the rods were measured and recorded in the table below:

Length (cm)	8-10	11-13	14-16	17-19	20-22	23-25	26-28
No. of rods	4	7	11	15	8	5	3

a) State the frequency of the modal class. **(1 mark)**

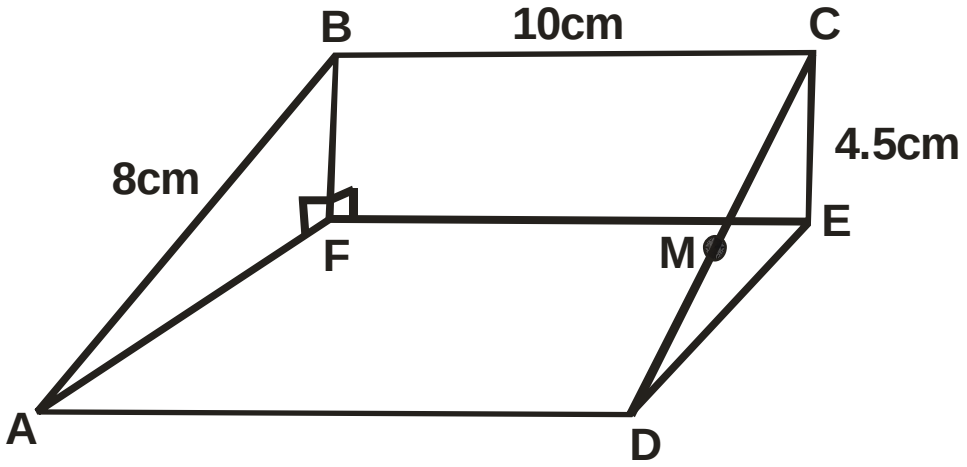
b) Using 18 as an assumed mean, calculate:

i) Actual mean **(5 marks)**

ii) Variance **(3 marks)**

iii) Standard deviation **(1 mark)**

18.



The above diagram represents a wooden prism. ABCD is a rectangle. Points E and F are directly below C and B respectively. M is the midpoint of CD. AB = 8cm, BC= 10cm and CE= 4.5cm.

a) The size of angle CDE. **(2 marks)**

b) Calculate:

i) Length of AC. **(2 marks)**

ii) The angle CAE makes with the plane ADEF. **(2 marks)**

c) Find the:

i) Length of MB. **(2 marks)**

ii) Angle CBM. **(2 marks)**

19. Anaeroplane flies from a point P(60^0N, 45^0W) to a point Q(60^0N, 135^0E). Given that the radius of the earth is 6370km,

a) Calculate the shortest distance between P and Q:

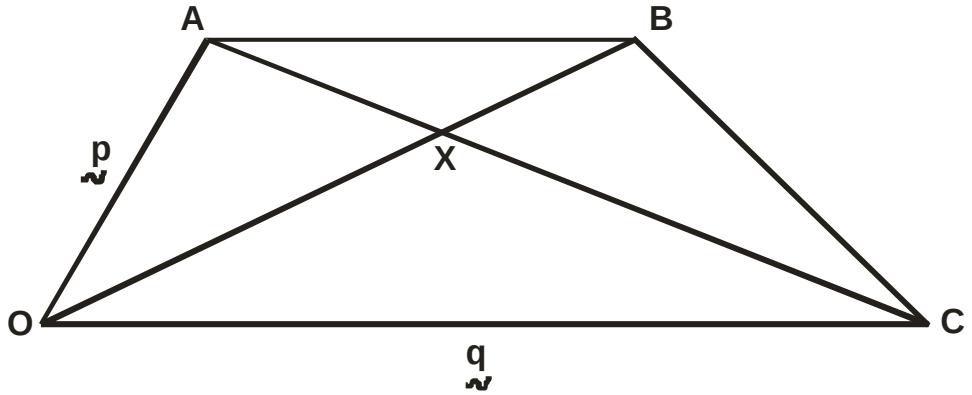
i) inkilometres (km) **(3 marks)**

ii) in nautical miles (nm) **(1 mark)**

b) If the plane flew at a speed of 600 knots, how long did it take to move from P to Q**.?(2 marks)**

c) The plane left P at 10.00a.m on Monday. At what time did it arrive at Q if it travelled along a parallel latitude at the same speed. **(4 marks)**

20. In the figure belowOA = **p** and OC = **q**. Vector AB = $\frac{3}{4}$OC. Express in terms of unit vectors **p** and **q** the vectors.



a)

i) AC **(1 mark)**

ii) OB **(1 mark)**

iii) BC **(1 mark)**

b) Vector AC intersects with vector OB at X such that AX = tAC and OX = hOB. By expressing OX in two ways in terms of t and h,

Find:

i) Scalars t and h **(5marks)**

ii) the ratio OB: BX **(2 marks)**

21. Two fair dice one a regular tetrahedron (4 faces) and the other a cube are thrown. The scores are added together. Complete the table below to show all possible outcomes. **(2 marks)**

CUBE

TETRAHEDRON	1	2	3	4	5	6
1						
2						
3						
4						

a) Find the probability that:

i) The sum is 6. **(1 mark)**

ii) The sum is an odd number. **(1 mark)**

iii) The sum is 6 or 9. **(2 marks)**

b) If a player wins a game by throwing a sum of 6 or 9, draw a tree diagram and use it to find probability that he wins at least once when the dice are thrown twice. **(4 marks)**

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

Taxable pay per month Ksh	Tax rate
1 -9680	10%
9681 – 18800	15%
18801 – 27920	20%
27921 – 37040	25%
37040 – and above	30%

That year Mary paid net tax of Ksh.5,512 p.m. Her total monthly taxable allowances amounted to Ksh.15220 and he was entitled to a monthly relief of Ksh. 162. Every month the following deductions were made.

- NHIF – Ksh.320
- Union dues – Ksh.200
- Co-operative shares – Ksh.7500

a) Calculate Mary's monthly basic salary in Ksh. **(7 marks)**

b) Calculate her monthly net salary. **(3 marks)**

23. A number of people working at a factory decided to raise 72000 to buy a plot of land. Each person was to contribute the same amount. Before contributions five people retired from working at the factory and thus did not contribute. The same target of 72000 was still to be met by the remaining.

a) If n stands for the number of people working in the factory originally, show that the increase in the contribution per person was shs.$\frac{360000}{n\,(n-5)}$ **(3 marks)**

b) If the increase in contribution per person was sh.1200, find the number of people originally working at the factory. **(4 marks)**

c) Calculate the percentage increase in the contributions per person caused by retirement, giving your answer to one decimal place. **(3 marks)**

24.a) Complete the table below for the functions y = 3Sin x and y = 4Cos (2x - 10) **(2 marks)**

x	0	15	30	45	60	75	90	105	120	135	150	165
3Sin x	0	0.78						2.90			1.50	
4Cos (2x-10)	3.94		2.57			3.06				-0.69		3.06

b) Using a scale of 1cm to rep 1 unit on the vertical axis and 1cm to rep 150 on the horizontal axis, draw both curves on the same axes. **(5 marks)**

c) Use your curves to solve 3 Sin x – 4 Cos (2x -10) = 0 **(2 marks)**

d) State the phase angle of the curve y = 4 Cos (2x -10) **(1 mark)**

THE END

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