JOLLE

MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education

THE MOCK EXAMINATIONS, 2025

121/1 **MATHEMATICS** **PAPER**

May/June, 2025 **TIME: 2½ Hrs**

Name: MARKING GUIDE ..... Admission No: T/C

Stream: ..... Signature: ..... **Monday, 28th May, 2025; 8:00-10:30pm**

Instructions to candidates:

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

For Examiner's Use Only

Section I

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

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

SECTION I (50 marks)

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

1. Solve for T in the equation $\frac{1}{T} = \frac{1\frac{4}{5} \div \frac{2}{3} \text{ of } 2\frac{1}{4} - \frac{3}{10}}{\frac{5}{6} + \frac{22}{39} \times 1\frac{2}{11}}$. (4 marks

Numerator

$\frac{9}{5} \div \frac{3}{3} \times \frac{9}{4} - \frac{3}{10}$

$= \frac{9}{5} \div \frac{3}{2} - \frac{3}{10}$

$= \frac{18}{15} - \frac{3}{10}$

$= \frac{9}{10}$ $\surd M_1$

Denominator:

$\frac{5}{6} + \frac{22}{39} \times \frac{33}{11}$

$\frac{5}{6} + \frac{2}{3}$

$= \frac{3}{2}$ $\surd M_1$

$\frac{1}{T} = \frac{9}{10} \times \frac{2}{3}$

$\frac{1}{T} = \frac{18}{30}$ $\surd M_1$

$T = 1\frac{2}{3}$ $\surd A_1$

2. A motorist travelling at a steady speed of 120 km/h covers a section of a highway in 10minutes. To minimize accidents a speed limit is imposed. Travelling at the maximum speed allowed, the motorist takes 5 minutes longer to cover the same section. Calculate the speed limit imposed. (3 mark

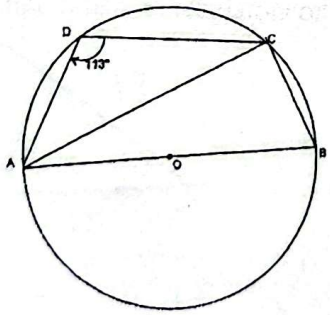
Distance $= 120 \times \frac{10}{60}$ $\surd M_1$

$= 20$km

Speed limit $= \frac{20}{\frac{15}{60}}$ $\surd M_1$

$= 80$km/h $\surd A_1$

3. The figure below shows a cyclic quadrilateral ABCD inside a circle of centre and angle ADC=113°.



$\angle ABC = 180° - 113°$

$= 67°$ $\surd B_1$

$\angle CAB = 90° - 67°$

$= 23°$ $\surd B_1$

Calculate the size of angle CAB. (2 mark

4. The length of a one-hectare rectangular piece of land which 200m is represented by 5cm on a map. Calculate the perimeter of the farm on the map. (3 mar

$W = \frac{10,000}{200}$ $\surd M_1$

$= 50m$

$\frac{200}{50} = \frac{5}{W}$

$W = \frac{5 \times 50}{200}$ $\surd M_1$

$= 1.25cm$

$P = 2(5 + 1.25)$

$= 12.5cm$ $\surd A_1$

5. Solve for t in the equation $\left(\frac{2}{3}\right)^t + \left(\frac{3}{2}\right)^t = \frac{13}{6}$. (4 marks)

$\left(\frac{2}{3}\right)^t + \frac{1}{\left(\frac{2}{3}\right)^t} = \frac{13}{6}$

Let $k = \left(\frac{2}{3}\right)^t$

$k + \frac{1}{k} = \frac{13}{6}$

$k^2 - \frac{13}{6}k + 1 = 0$ $\surd M_1$

$k = \frac{\frac{13}{6} \pm \sqrt{\frac{169}{36} - 4}}{2}$

$k = \frac{\frac{13}{6} \pm \frac{5}{6}}{2}$ $\surd M_1$

$k = \frac{3}{2}$ or $\frac{4}{6}$ $\surd A_1$

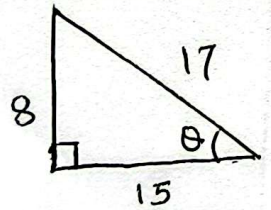
$\left(\frac{2}{3}\right)^t = \frac{3}{2} \Rightarrow \left(\frac{2}{3}\right)^t = \left(\frac{2}{3}\right)^{-1}$

$t = -1$

$\left(\frac{2}{3}\right)^t = \frac{4}{6} \Rightarrow \left(\frac{2}{3}\right)^t = \left(\frac{2}{3}\right)^1$

$t = 1$ $\surd B_1$

6. Without using calculators or Mathematical Tables evaluate $\frac{\sin\theta - \cos\theta}{\sin\theta + 2\cos\theta}$ given that $\tan\theta = \frac{8}{15}$. (3 marks)



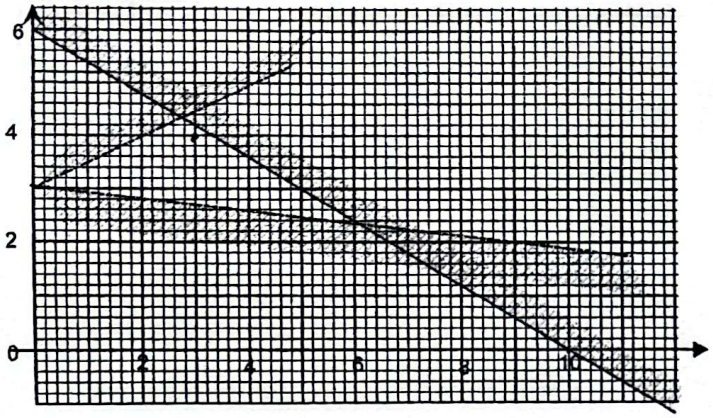
$hy = \sqrt{15^2 + 8^2}$ $\surd M_1$

$= 17$

$\frac{\frac{8}{17} - \frac{15}{17}}{\frac{8}{17} + 2\left(\frac{15}{17}\right)}$ $\surd M_1 = \frac{-\frac{7}{17}}{\frac{38}{17}}$

$= -\frac{7}{38}$ $\surd A_1$

7. Below is a diagram of a region bounded by a set of linear inequalities.



Determine the inequalities. (3 marks)

$3x+5y \leq 30$ $\surd B_1$

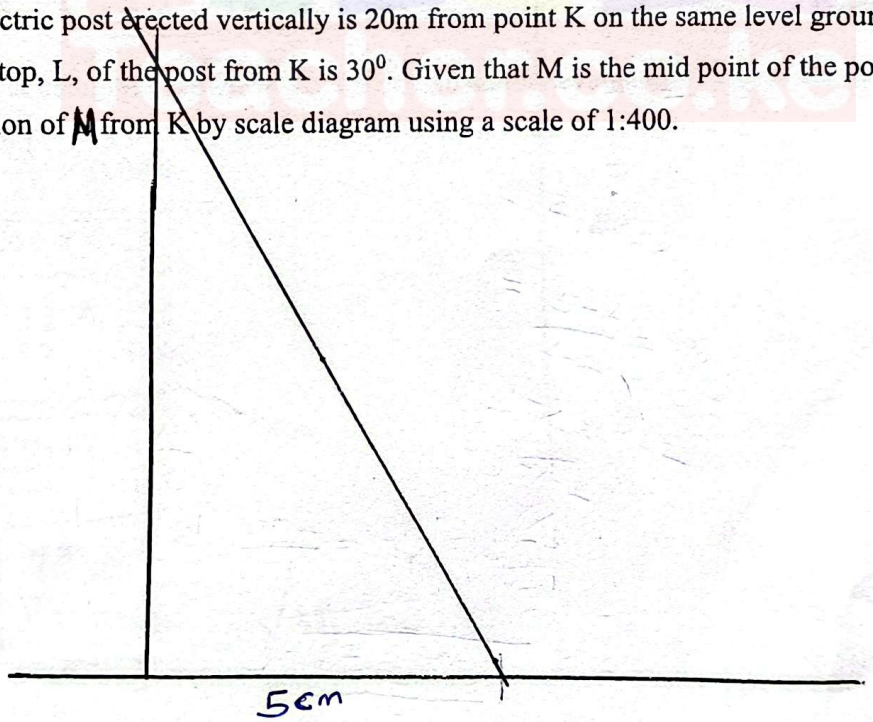
~~$x-9y \leq 27$~~ $\surd B_1$

$x+9y > 27$

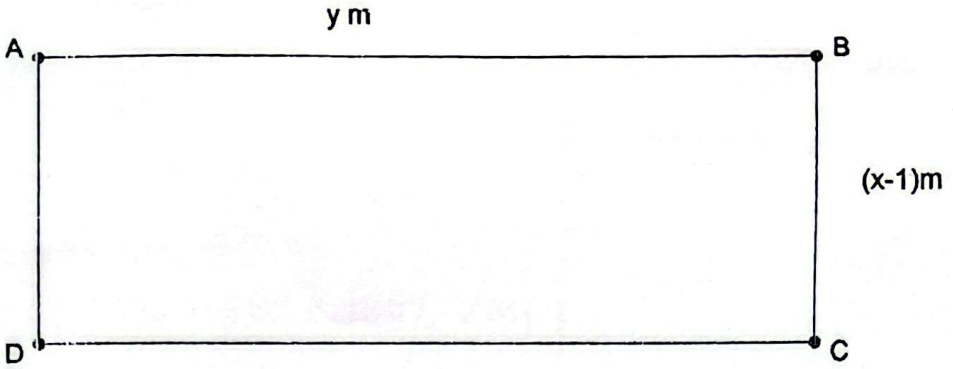
~~$2x-y > 0$~~ $\surd B_1$

$2y-x < 6$

8. An electric post erected vertically is 20m from point K on the same level ground. The angle of elevation of the top, L, of the post from K is 30^0. Given that M is the mid point of the post determine the angle of elevation of M from K by scale diagram using a scale of 1:400. (3 marks)



9. The figure below shows a rectangular kitchen garden whose length is y m and width (x − 1) m.



Given that the perimeter and the area of the garden are 32 m and 48 m^2 respectively, determine its dimensions. (3 mark

$2y + 2x - 2 = 32$

$\Rightarrow 2y + 2x = 34$

$y = 17 - x$

$(17 - x)(x - 1) = 48$ $\surd M_1$

$x^2 - 18x + 65 = 0$

$x = \frac{18 \pm \sqrt{18^2 - 4 \times 65}}{2}$

$x = \frac{18 \pm 8}{2}$ $\surd M_1$

$= 13$ or 5

When $x = 13$ $y = 4$ *

When $x = 5$ $y = 12$

Dimensions: Length = 12m, Width = 4m $\surd A$

10. Without using Mathematical Tables or Calculators evaluate (3 mark

$$\frac{\sqrt[3]{2\frac{93}{125} \times 0.064}}{\sqrt{1.44 \times 0.25}}$$

$$= \frac{\sqrt[3]{\frac{343}{125} \times \frac{64}{1000}}}{\sqrt{\frac{144}{100} \times \frac{25}{100}}}$$

$$= \frac{\sqrt[3]{\frac{7^3}{5^3} \times \frac{4^3}{10^3}}}{\sqrt{\frac{12^2}{10^2} \times \frac{5^2}{10^2}}}$$ $\surd M_1$

$$= \frac{\frac{7}{5} \times \frac{4}{10}}{\frac{12}{10} \times \frac{5}{10}}$$ $\surd M_1$

$$= \frac{28}{50} \times \frac{100}{60}$$

$$= \frac{28}{30}$$

$$= \frac{14}{15}$$ $\surd A_1$

11. Maria working as a salesperson sold out goods whose marked price were Ksh. 340,000 at a 3% discount. Calculate the percentage at which she earned a commission of Ksh.16,490. (3 marks)

S.P = $\frac{97}{100} \times 340,000$ $\surd M_1$

= 329,800

Commission rate

= $\frac{16\,490}{329\,800} \times 100\%$ $\surd M_1$

= 5% $\surd A_1$

12. Solve for the value of k in the logarithmic equation $\log_8(8k+6) - \log_8(k-3) = \frac{1}{3}$. (3 marks)

$\log_8\left(\frac{8k+6}{k-3}\right) = \frac{1}{3}$ $\surd M_1$

$\frac{8k+6}{k-3} = 2$ $\surd M_1$

$k = -2$ $\surd A_1$

13. Kiplimo and Johnny began a 8000m together at the starting point. Kiplimo took 45s to complete a lap o 400m while Johnny took 60s. The two ~~were together~~ were together at the starting point a number of times. Determine the time in minutes that Johnny ran alone to finish the race after Kiplimo had finished. (4 marks

Number of laps = $\frac{8000}{400}$ $\surd M_1$

= 20

Time taken by Kiplimo to finish the race

= 45×20 $\surd M_1$

= 900s

Time taken by Johnny to finish the race

= 20×60 $\surd M_1$

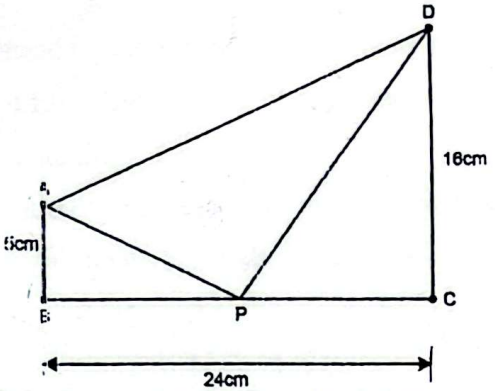
= 1200s

Time which Johnny ran alone

= $\frac{300}{60}$

= 5 minutes $\surd A_1$

14. In the figure below BC=24cm, < APD =< PCD =< PBA = 90°.



Calculate, correct to 2 decimal places, the length AD given that P is the midpoint of BC. (3 marks)

$DP = \sqrt{16^2 + 12^2}$ $\surd M_1$

$= 20$

$AP = 5^2 + 12^2$ $\surd M_1$

$= 13$

$AD = \sqrt{13^2 + 20^2}$ $\surd M_1$

$= 23.85$ $\surd A_1$

15. The points $A^1(-2,5)$ and $B^1(4,-1)$ are the images of A and B respectively under a translation. Given that the coordinates of A is (0,1) find the coordinates of B. (3 marks)

$\begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 0 \\ 1 \end{pmatrix} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$

$x = -2$

$y = 4$

$T = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$

$K + \begin{pmatrix} -2 \\ 5 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$ $\surd M_1$

$K = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$

$\begin{pmatrix} 2 \\ -4 \end{pmatrix} + B = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$ $\surd M_1$

$B = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$

$B(2,3)$ $\surd A_1$

$\begin{pmatrix} -2 \\ 4 \end{pmatrix} + \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$

$-2 + a = 4 \Rightarrow a = 6$

$4 + b = -1 \Rightarrow b = -5$

$B = \begin{pmatrix} 6 \\ -5 \end{pmatrix}$

16. Use the mid-ordinate rule to estimate the area enclosed by the curve $y = -x^2 + 2x + 8$, the y-axis and x-axis using four strips. (3 marks)

At x axis

$-x^2 + 2x + 8 = 0$

$x = \dfrac{-2 \pm \sqrt{2^2 + 4 \times 8}}{-2}$

$= \dfrac{-2 \pm 6}{-2}$ $\surd M_1$

$= 4$ or -2

$h = \dfrac{4 + 2}{4}$

$= 1.5$

x	-1.25	0.25	1.75	3.25
y	3.9375	8.4375	8.4375	3.93

$A = 1.5(3.9375 + 8.4375 + 8.375 + 3.9$

$= 37.125$ $\surd A_1$

SECTION II (50 marks)

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

17. To knead a standard dough for making bread Supa Loaf Bakery requires 1kg of salt for every 150kg of wheat flour and also 3kg of sugar for every 2kg of salt.

Calculate the:

a) ratio of sugar:salt:flour in the standard dough. (2 marks)

Sugar : salt : flour
3 : 2
1 : 150 $\surd M_1$

$= 3 : 2 : 300$ $\surd A_1$

b) amount of sugar wasted to the nearest milligram from 1.2 tonne of dough given that 2.5% of the dough usually form bread crumbs which are not sold. (2 marks)

Mass of crumbs
$= \frac{2.5}{100} \times 1200$ $\surd M_1$
$= 30\text{kg}$

Mass of sugar wasted
$= \frac{3}{305} \times 30\text{kg}$
$= 2951\text{mg}$ $\surd A_1$

c) cost of buying sugar, salt and wheat flour for preparing 12.2 tonnes of the dough given that 1kg of sugar, 5kg of salt and 50kg of wheat flour cost Ksh. 115, Ksh.165 and Ksh.2025 respectively. (3 marks)

Cost of sugar $= \frac{3}{305} \times 12200 \times 115$ $\surd M_1$
$= 13,800$

Cost of salt $= \frac{2}{305} \times 12200 \times \frac{165}{5}$
$= 2640$

Cost of flour $= \frac{300}{305} \times 12200 \times \frac{2025}{50}$ $\surd M_1$
$= 486,000$

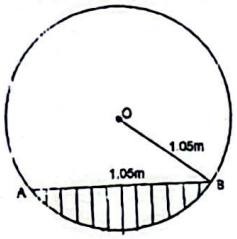
Total cost $= 486,000 + 2640 + 13800$
$= 502,440$ $\surd A$

d) lowest selling price of 1kg of loaf bread, to the nearest shilling, if the bakery has to make atleast 10% profit and also pay for other production costs which are always 15% of the cost of materials required used. (3 marks)

Total cost of production
$= \frac{115 \times 502\,440}{100}$ $\surd M_1$

Selling price per kg
$= \frac{110 \times 577806}{12200}$ $\surd M_1$
$= 54/=$ $\surd A_1$

18. The diagram below shows a cross section of a 4m long water bowser used by Maranda High School made by cutting off the shaded part along AB=1.05m from a circular metallic plate of radius 1.05m.



Calculate to the nearest:

a) litre the capacity of the bowser. (4 mark

Area of the shaded part

$= \frac{60^0}{360^0} \times \frac{22}{7} \times 1.05^2 - \frac{1}{2} \times 1.05^2 \sin 60^0$ $\surd M_1$

$= 0.10010349616383\ m^3$

Area of cross section $= \frac{22}{7} \times 1.05^2 - 0.10010349616383$ $\surd M_1$

$= 3.364896503836 17\ m^2$

Volume in litres $= 3.364896503836 17 \times 4 \times 1000$ $\surd M_1$

$= 13460$ litres $\surd A_1$

b) minute the time it will take three pipes opened at the same time: two inlet pipes A and B and an outlet pipe C to completely fill it given that pipe A has a radius of 2.8 cm and water flows through i at a speed of 10 m/s while B has a radius of 3.5 cm and water flows through it at a speed of 12 m/s and an outlet pipe C has a radius of 4.2 cm and water flows through it at a speed of 10 m/s. (4 mark

Volume of water filled in 1s $= \frac{22}{7} \times 2.8^2 \times 1000 + \frac{22}{7} \times 3.5^2 \times 1200 - \frac{22}{7} \times 4.2^2 \times$ $\surd M$

$= 15400\ cm^3$

Time taken to fill the tank $= \frac{13460000}{15400}$ $\surd M_1$

Time in minutes $= \frac{874\frac{2}{77}}{60}$ $\surd M_1$ $= 15$ minutes $\surd A_1$

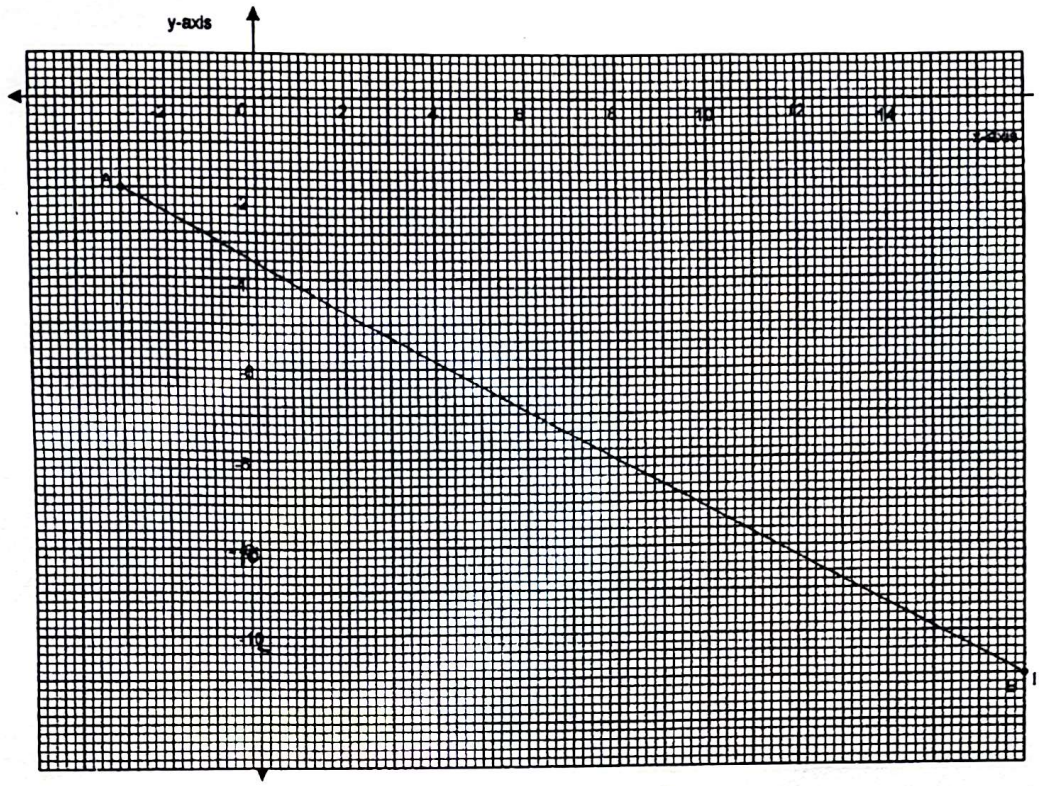
c) m^2 the surface area of the material used to make it. (2 mark

$\surd M_1$

Surface Area $= \frac{300^0}{360^0} \times \frac{22}{7} \times 2 \times 1.05 \times 4 + 1.05 \times 4 + 3.364896$

$= 29.564896503 8362\ m^2$ $\surd A_1$

19. The figure below shows a graph of line AB.



Determine the: A(-3, -2) B(17, +13)

a) equation of line AB in the form $ax + by = c$ where a, b and c are integers. (3 marks)

$m = \frac{-2-13}{-3-17}$ $\sqrt{M_1}$ $\quad \frac{-11}{20} = \frac{y+2}{x+3}$ $\sqrt{M_1}$

$= -11/20$ $\quad 11x + 20y = -73$ $\sqrt{A_1}$

b) coordinates at which line CD which passes through the point (10, −3) and is perpendicular to AB intersects it. (4 marks)

$m_{CD} = \frac{20}{11}$ $\sqrt{B_1}$ $\quad 20x - 11y = 233$

$11x + 20y = -73$

$\frac{20}{11} = \frac{y+3}{x-10}$ $\sqrt{M_1}$ $\quad -521y = 4023$ $\sqrt{M_1}$

$y = -7\frac{376}{521} = -7.722$ $\quad x = 7.403$

Pt of inters

(7.403, -7.7

c) size, to 1 decimal place, of the obtuse angle which line CD makes with x-axis. (2 marks)

$\tan\theta = \frac{20}{11}$ $\sqrt{M_1}$ $\quad \theta = 61.189°$

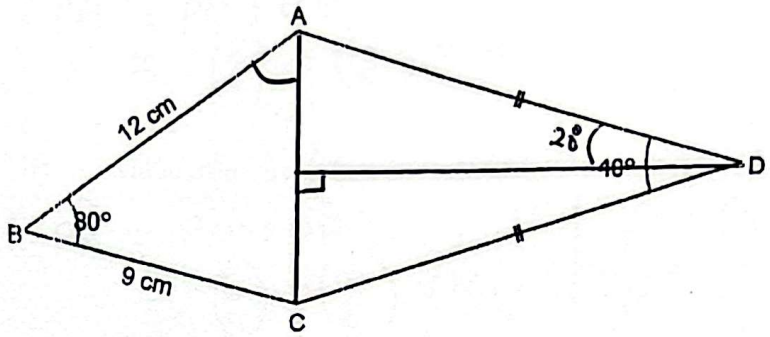
Obtuse $= 180° - 61.189°$

$= 118.8°$ $\sqrt{A_1}$

d) x-intercept of line AB. (1 mark)

At x intercept $y = 0$ $\Rightarrow 11x = -73$ $\quad x = 6.\dot{6}\dot{3}$ $\sqrt{B_1}$

20. The figure below is a quadrilateral ABCD in which AB = 12 cm, BC = 9 cm, CD = AD, and ∠ABC = 80° and ∠ADC = 40°.



Calculate, correct to one decimal place, the:

i) length AC. $= \sqrt{9^2 + 12^2 - 2\times 9\times 12 \cos 80^\circ}$ √M1 (2 ma

$= 13.7$ cm √A1

ii) length DC. (2 ma

$\sin 20^\circ = \frac{6.85}{DC}$ √M1

$DC = 20.0$ cm √A1

iii) size of angle BAD. (3 mar

$9^2 = 12^2 + 13.7^2 - 2\times 12\times 13.7 \cos A$ √M1

$A = 40.32^\circ$

$\angle CAD = 90^\circ - 20^\circ$ √M1

$= 70^\circ$

$\angle BAD = 40.32^\circ + 70^\circ$

$= 110.3^\circ$ √A1

b) Calculate the area of the quadrilateral ABCD, correct to one decimal place. (3 mar

$A = \frac{1}{2}\times 9\times 12 \sin 80^\circ$ √M1 $+ \frac{1}{2}\times 20.0^2 \sin 40^\circ$ √M1

$= 181.7$ cm² √A1

21. The points P and Q have co-ordinates (6,4)and (10,5)respectively.

a) Determine the:

i) modullus of vector PQ to two decimal places. (3 ma

$\vec{PQ} = \vec{PO} + \vec{OQ}$ $\sqrt{M_1}$

$= -\begin{pmatrix}6\\4\end{pmatrix} + \begin{pmatrix}10\\5\end{pmatrix}$ $\sqrt{M_1}$

$= \begin{pmatrix}4\\1\end{pmatrix}$

$\vec{PQ} = \sqrt{4^2 + 1^2}$ $\sqrt{M_1}$

$= 4.12$ units $\sqrt{A_1}$

ii) value of m given that co-ordinates of point R is (m, 8) and points P, Q and R are collinear (4 ma

$\vec{PR} = \vec{PO} + \vec{OR}$

$= -\begin{pmatrix}6\\4\end{pmatrix} + \begin{pmatrix}m\\8\end{pmatrix}$ $\sqrt{M_1}$

$= \begin{pmatrix}m-6\\4\end{pmatrix}$

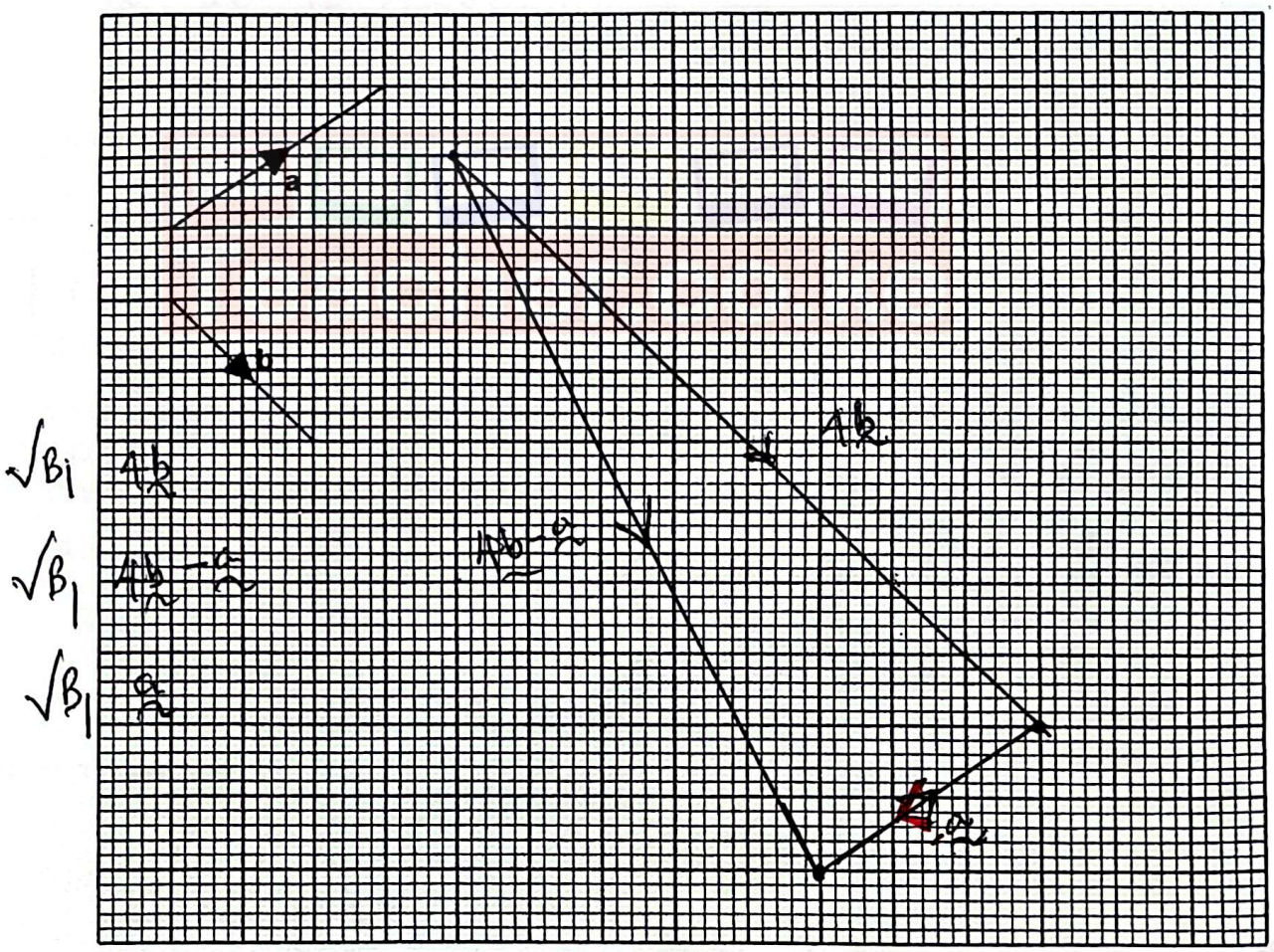
$\begin{pmatrix}m-6\\4\end{pmatrix} = k\begin{pmatrix}4\\1\end{pmatrix}$ $\sqrt{M_1}$ where k is a scalar

$k = 4$

$m - 6 = 16$

$m = 22$ $\sqrt{A_1}$

b) On the grid provided represent the resultant vector $4\mathbf{b} - \mathbf{a}$ besides the given vectors **a** and **b** represented below. (3 ma



22. The equation of a curve is given as $y = 3x^2 - x^3$.

a) Determine the coordinates of the turning points of the curve. (4 mark

$\frac{dy}{dx} = 6x - 3x^2$ $\surd M_1$

At turning pts $\frac{dy}{dx} = 0$

$\Rightarrow 6x - 3x^2 = 0$

$3x(2-x) = 0$

$x = 0$ or 2 $\surd A_1$

When $x = 0$ $y = 0$

hence pt $(0,0)$ $\surd B_1$

When $x = 2$ $y = 3(2)^2 - 2^3$

$= 4$

hence turning pt is $(2,4)$ $\surd B_1$

b) Determine the nature of the stationary points. (2 marks

x	-1	0	1
$\frac{dy}{dx}$	-9	0	3
Nature	\	—	/

$(0,0)$ is a minimum pt $\surd B_1$

x	1	2	3
$\frac{dy}{dx}$	3	0	-9
Nature	/	—	\

hence pt $(2,4)$ is a maximum pt $\surd B_1$

c) Determine the intercepts. (2 marks

At x intercept $y = 0$

$3x^2 - x^3 = 0$

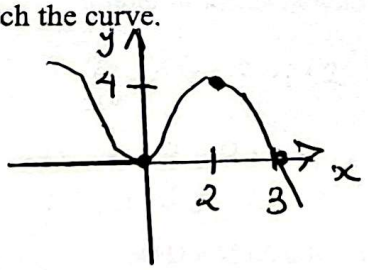
$x^2(3-x) = 0$

$x = 0$ or 3 $\surd B_1$

At y intercept $x = 0$

$y = 0$ $\surd B_1$

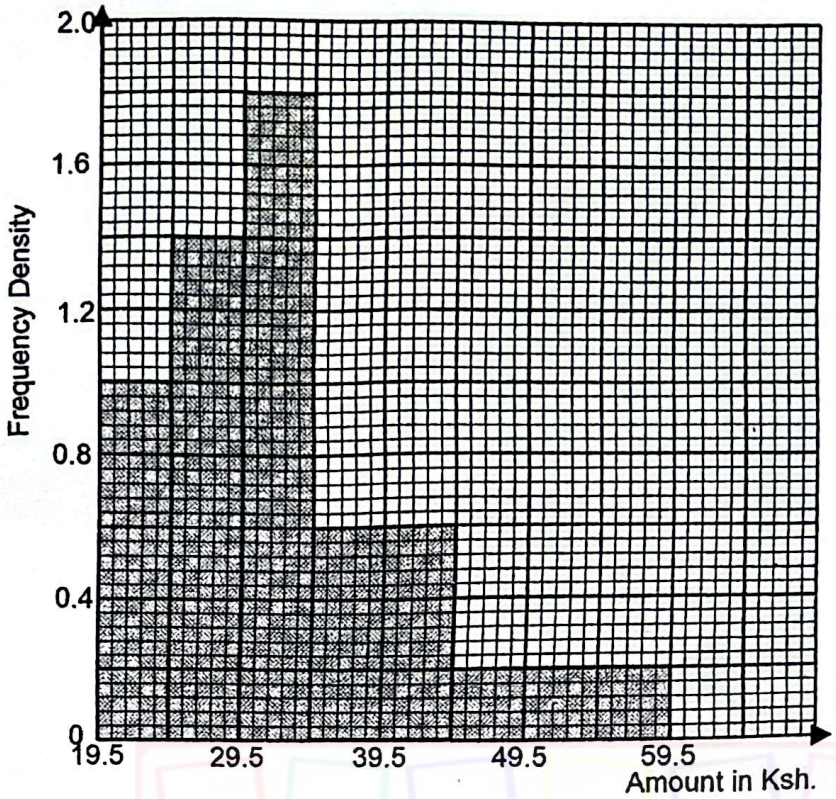
d) Sketch the curve. (2 marks)



$\surd B_1$ Correct plots of turning pts

$\surd B_1$ Correct sketch through all the intercepts

24. Below is a histogram representing the amount of money, in Kenyan shillings, spent on airtime by a group of 30 teachers in a particular day.



a) Use the histogram to determine the:

i) median amount of money spent on airtime by the 30 teachers. (3 mark

class	Area	Cumulative Area
20 - 24	5	5
25 - 29	7	12
30 - 34	9	21
35 - 44	6	27
45 - 59	3	30

$\frac{1}{2}$ CA $= \frac{1}{2} \times 30$
$= 15$

$\sqrt{B_1}$

$1 \cdot 8x = 15 - 12$ $\sqrt{M_1}$
$x = 1\frac{2}{3}$
Median $= 29.5 + 1\frac{2}{3}$
$= 31\frac{1}{6}$ $\sqrt{A_1}$
or
$31.1\dot{6}$

ii) number of teachers who spent more than Ksh. 41.50 on airtime that day. (2 mark

$\frac{7}{10} \times 6 = 4.2$
$4.2 + 21$
$= 25.2$ $\sqrt{B_1}$

More than 41.50
$30 - 25.2$
$= 4.8$

No of peopl
$= 4$ $\sqrt{B_1}$

b) Complete the frequency distribution table below using the histogram above. (2 m

Amount (Ksh)	Frequency
20-24	5
25-29	7
30-34	9
35-44	6
45-59	3

$\checkmark B_1$ $\checkmark B_1$

c) Calculate the average amount of money in Kenya shillings spent by each teacher on that particula day. (3 mar

fx_s 110, 189, 288, 237, 156 $\checkmark B_1$

Mean Amount $= \frac{110+189+288+237+156}{30}$ $\checkmark M_1$

$= 32.\dot{6}$ $\checkmark A_1$

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