Kenya National Examinations COUNCIL

Kenya certificate of Secondary Education

121/1 Mathematics Alt. A Paper 1

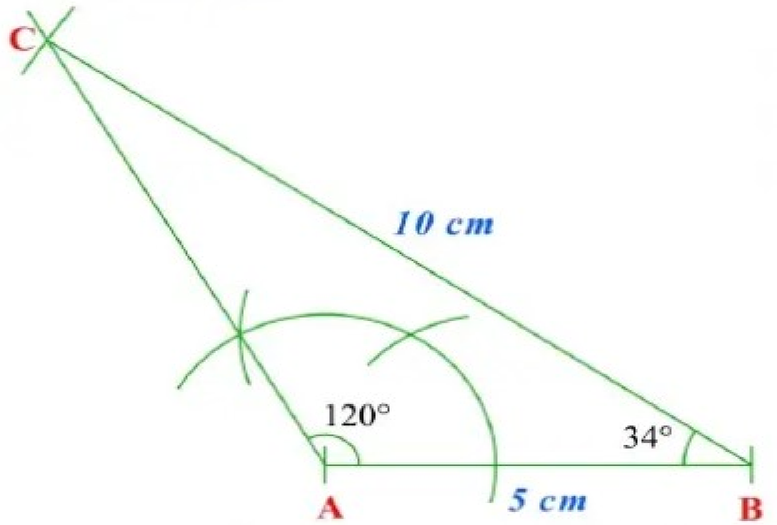
Nov. 2025 -2 $\frac{1}{2}$ hours

<u>Marking Scheme</u>

1.	$=\sqrt{\frac{11}{12}-\frac{1}{3}\ x\ \frac{2}{3}}$ $=\sqrt{\frac{11}{12}-\frac{2}{9}}$ $=\sqrt{\frac{33-8}{36}}=\sqrt{\frac{25}{36}}$ $=\frac{5}{6}$	M1 M1 A1
2.	New rate: $\frac{8}{7}$ x 210 = Kshs. 240 Amount earned = $\frac{21}{2}$ x 240 = Kshs. 2520	M1 M1 A1
3.	$(2^2)^{3x}$ x 2^3 = $\left(\frac{1}{2^5}\right)^{2x-3}$ 2^{6x} x 2^3 = $(2^{-5})^{2x-3}$ 2^{6x+3} = $2^{-10x+15}$ 6x+3 = -10x +15 16x = 12 X = $\frac{12}{16}=\frac{3}{4}$	M1 M1 A1
4.	$-1\leq\frac{5-2x}{3}$ Multiplying by 3 both sides $-3\leq 5-2x$ $2x\leq 8$ $X\leq 4$ $\frac{5-2x}{3}$ < 2x- 1 Multiplying by 3 both sides 5-2x < 6x-3 8 < 8x 1<x **Combined inequality: 1 < x ≤ 4**	M1 M1 A1

5	$\frac{210}{7} = \frac{120}{4} = 30$ Scale: 1 cm represents 30m Area of the farm =210 x 120 = 25,200 m^2 area of the flooded section = $(1+\frac{12}{2})$ x (30 x 30) = 6 300 m^2 area of the farm not flooded = 25200-6300 = 18900m^2	M1 M1 A1
6.	$240 = 2^4 \times 3^1 \times 5^1$ $150 = 2^1 \times 3^1 \times 5^2$ GCD= $2^1 \times 3^1 \times 5^1$ = 30kg Least number of needy families = $\frac{240+150}{30}$ 13 families	M1 M1 A1
7.	**Numerator** $x^2 - (2y)^2$ (x+2y)(x-2y) m1	M1 M1 A1
8.	Circumference of circular face of cone = length of the arc, l Hence l = 2 x $\frac{22}{7}$ x 7 = 44 cm Let the angle subtended by the arc at the center of the circle be θ and the radius be r $\therefore$ $\pi r^2 \ x \ \frac{\theta}{360^o}$ **= 550 -------(i) and** $2\pi r \ x \ \frac{\theta}{360^o}$ **= 44 -------(ii)** **From eqn (ii):** $\pi\theta r$ **= 7920** Substituting in (i): 7920r = 198000 R = 25 cm Height of the cone = $\sqrt{25^2 - 7^2}$ = 24 cm	M1 A1 A1
9.	Time difference from Monday 8:00am to Saturday 11:20 am will be given by (5 x 24 hours) + (1120 h-0800h) = 120 hours + 3 hours 20min 123 hours 20min = $123\frac{1}{3}$ hrs Time lost in minutes = $\frac{370}{3}$ x 18 x $\frac{1}{60}$ = 37 minutes The clock will read: 11:20 am – 37 min = 10:43 am	A1 A1 A1

10



11.

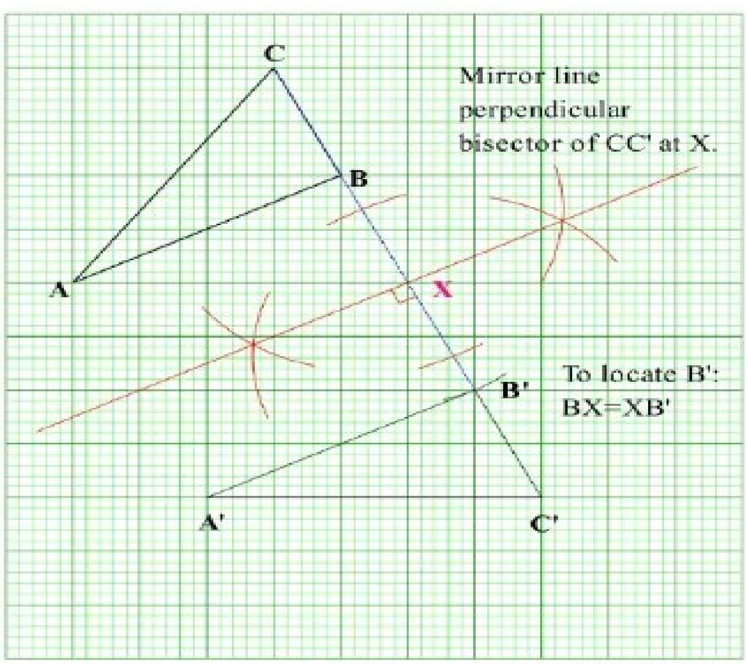
BP = SP - profit
BP = SP + loss
Therefore; SP – profit = SP + loss
2740 – 3x = 2340 + 2x M1
5x = 400
X=80 A1
Shopkeeper paid 2340 + 2(80) = or 2740 – 3(80) = Kshs 2,500 A1

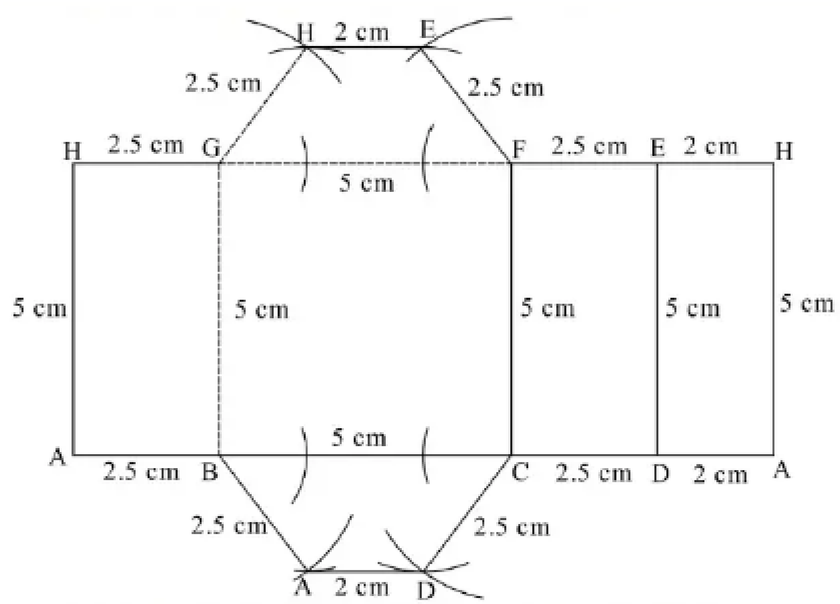
12.

i	5	5	10
Frequency f= fd x i	7	2 x 5 = 10	1.5 x 10
fd	1.4	2	1.5

A1
A1
A1

13.

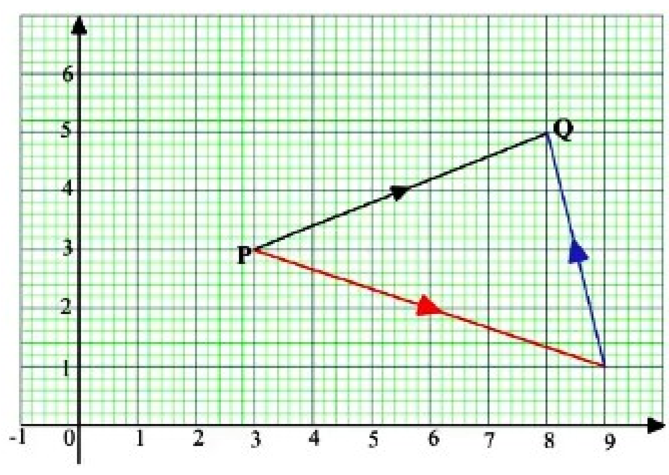


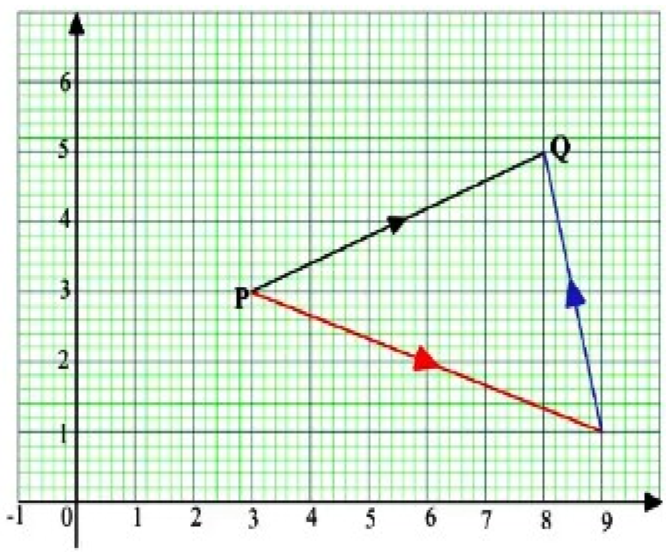
14.		
15	$\frac{1}{2}$ x 5 x 8 x sin θ = 10 sin θ = $\frac{10}{20}$ = 0.5 θ = $\sin^{-1}(0.5)$ = 30^{o} tan 30^{o} = $\frac{BC}{8}$ BC = 8 tan 30^{o} = 8 x 0.5774 = 4.6192	M1 M1 A1
16	$\frac{dy}{dx}$ = 6x – 4 Gradient of tangent = $\frac{dy}{dx}$ at P(1,-1) =6(1)-4 =2 $(y-y_1) = m(x-x_1)$ y-(-1) = 2(x-1) y+1 = 2x-2 y = 2x – 3 Hence: 2x – y = 3	A1 M1 A1

SECTION II

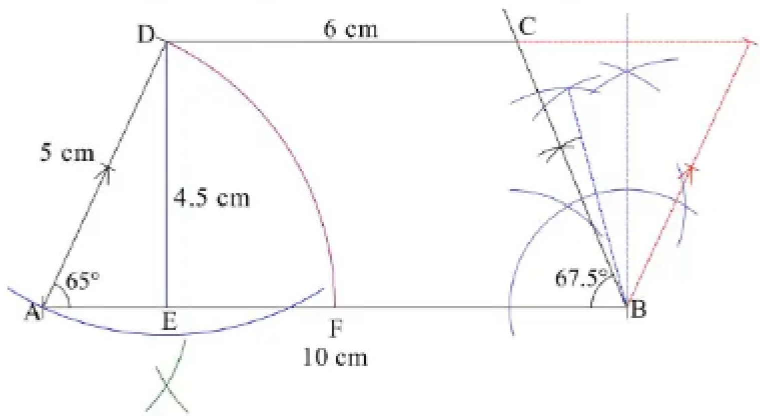
17. (a) (i)	Relative speed = 75 + 45 120km/h Relative time = $\frac{160}{120}$ = $1\frac{1}{3}$ h = 1h 20 min Meeting time: 1150h + 1 h 20 min 1310 h (1:10 pm)	M1 M1 M1 A1
(ii)	The distance, in km, from town A to town C. d = 45km/h x $\frac{4}{3}$ h = 60km OR d = 160km – (75km/h x $\frac{4}{3}$ h) = 160-100 = 60km	M1 A1
(b)	Total time the lorry requires from A to B = $\frac{160}{45}$ = $3\frac{5}{9}$h Total time travelled by lorry up to when the car left C: 1h 20min + 1h 40 min = 3 hours Remaining time to get B = $\left(3\frac{5}{9} - 3\right)h$ = $\frac{5}{9}$ h This is the same amount of time the car uses to cover distance from C to A Speed = $\frac{60km}{\frac{5}{9}h}$ = 60 x $\frac{9}{5}$ = 108km/h	M1 M1 M1 A1
18. (a)	Volume of rectangular block = 6 x 6 x 10 = 360cm^3 AC = $\sqrt{6^2 + 6^2}$ = $\sqrt{72}$ = $6\sqrt{2}$ cm Midpoint of AC = $\frac{6\sqrt{2}}{2}$ = $3\sqrt{2}$ Height of pyramid = $\sqrt{5^2 - \left(3\sqrt{2}\right)^2}$ = $\sqrt{7}$ = 2.646 Volume of pyramid = $\frac{1}{3}$ x 6^2 x 2.646 = 31.79 cm^3 volume of solid = 360 + 31.749 = 391.749 cm^3	M1 M1 M1 A1

(b)	Area of face ABGF = 6 x 10 =60 cm^2 Area of face BGFC = 6 x 10 = 60 cm^2 Area of face ACHF = $6\sqrt{2}$ x 10 = 84.853 cm^2 Area of face AVC = $\frac{1}{2}$ x $\sqrt{72}$ x 2.646 = 11.226 cm^2 Area of face FGH = $\frac{1}{2}$ x 6 x 6 = 18 cm^2 For triangular faces VAB and VBC : s = $\frac{5+5+6}{2}$ = 8 Area = 2 x $\sqrt{8(8-6)(8-5)(8-5)}$ = 24 cm^2 **Total surface area = 60 + 60 + 84.853 + 11.226 +18 + 24 = 258.079** cm^2	M1 M1 M1 M1 M1 M1
19. (i)	$m_{l1} = \frac{9-6}{3-(-3)} = \frac{3}{6}$ $= \frac{1}{2}$	M1 A1
(ii)	$m_{l1} = m_{l1} = \frac{1}{2}$ $(y - y_1) = m(x - x_1)$ Y - 0 = $\frac{1}{2}$ (x-5) Y = $\frac{1}{2}x + \frac{5}{2}$	M1 M1
(b) (i)	$m_{l3} = -(\frac{2}{1}) = -2$ $(y - y_1) = m(x - x_1)$ $y-6 = -2(x-3)$ $y-6 = -2x-6$ $y=-2x$	M1 A1
(ii)	$\frac{1}{2}x + \frac{5}{2} = -2x$ 2.5x = -2.5 X = -1 Y=-2(-1)=2 P(-1,2)	M1 A1

20.(a)	7x + 14y =133 3000x + 4000y = 47000 3x + 4y = 47	M1 M1
(b)	Matrix of coefficients, variables and constants: $\begin{pmatrix}7 & 14\\3 & 4\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}133\\47\end{pmatrix}$ Determinant of matrix of coefficients = (7 x 4) – (14 x 3) = -14 Inverse of matrix of coefficients = $\frac{1}{-14}\begin{pmatrix}4 & -14\\-3 & 7\end{pmatrix}=\begin{pmatrix}{}^{-2}/_{7} & 1\\ {}^{3}/_{14} & -{}^{1}/_{2}\end{pmatrix}\begin{pmatrix}133\\47\end{pmatrix}$ $\begin{pmatrix}(-\frac{2}{7}\times 7)+(1\times 3) & \left(-\frac{2}{7}\,x14\right)+(1\,x\,4)\\ (\frac{3}{14}\,x\,7)+(-\frac{1}{2}\,x\,3) & \left(\frac{3}{14}\,x\,14\right)+(-\frac{1}{2}\,x\,4)\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=$ $\begin{pmatrix}\left(-\frac{2}{7}x133\right)+(1\,x\,47)\\ \left(\left(-\frac{3}{14}\,x\,133\right)+\left(-\frac{1}{2}\,x\,47\right)\right)\end{pmatrix}=\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}9\\5\end{pmatrix}$ $\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}9\\5\end{pmatrix}$ X= 9, y=5	M1 M1 M1 M1 A1
(c)	Total paid for the sand = (133 x 500) Ksh. 66,500 Profit = ksh. (66,500 -47000) = Ksh. 19,500	M1 M1 M1
12. (a)	 **PQ = OQ = OP** = $\begin{pmatrix}\mathbf{8}\\\mathbf{5}\end{pmatrix}-\begin{pmatrix}\mathbf{3}\\\mathbf{3}\end{pmatrix}$ = $\begin{pmatrix}\mathbf{5}\\\mathbf{2}\end{pmatrix}$	

(b)(i)	$k\begin{pmatrix}3\\-1\end{pmatrix} + h\begin{pmatrix}-1\\4\end{pmatrix} = \begin{pmatrix}5\\2\end{pmatrix}$ $\begin{pmatrix}3k\\-k\end{pmatrix} + \begin{pmatrix}-h\\4h\end{pmatrix} = \begin{pmatrix}5\\2\end{pmatrix}$ $\begin{pmatrix}3k-h\\-k+4h\end{pmatrix} = \begin{pmatrix}5\\2\end{pmatrix}$ 3k – h = 5…….(i) h = 3k-5 4h-k =2 ……..(ii) m1	M1
b (ii)	Ka = $2\begin{pmatrix}3\\-1\end{pmatrix} = \begin{pmatrix}6\\-2\end{pmatrix}$ hb = $1\begin{pmatrix}-1\\4\end{pmatrix} = \begin{pmatrix}-1\\4\end{pmatrix}$ PQ = $\begin{pmatrix}6\\-2\end{pmatrix} + \begin{pmatrix}-1\\4\end{pmatrix} = \begin{pmatrix}5\\2\end{pmatrix}$  Drawn in red and blue	
(c)	$\lvert k\mathbf{a}\rvert = \sqrt{6^2 + (-2)^2}$ $= \sqrt{36+4} = \sqrt{40} = 6.325$	

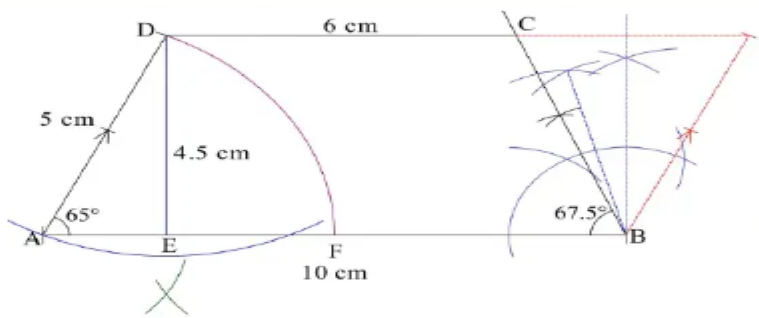
22



(a)(i) DC = 6cm — 4 marks

(ii) DE = 4.5 cm — 2 marks

(iii) — 1 mk



(b)

Area of the trapezium = 1/2 (10 + 6) × 4.5 = 36 cm²	M1
Area of sector ADF = $3.142 \times 5^2 \times \frac{65^o}{360^o}$ = 14.1826 cm²	M1
Area of trapezium ABCD that lies outside the arc: = 36 − 14.1826 = 21.8174 cm²	M1

23. (a)

litres	Tally	Frequency,f	Class mark, x	fx	cf
1.5-1.9	~~IIII~~ II	7	1.7	11.9	7
2.0-2.4	~~IIII~~ III	8	2.2	17.6	15
2.5 – 2.9	~~IIII~~ ~~IIII~~ I	11	2.7	29.7	26
3.0-3.4	~~IIII~~ II	7	3.2	22.4	33
3.5-3.9	IIII	4	3.7	14.8	37
4.0-4.4	III	3	4.2	12.6	40
		$\sum f$=40		$\sum fx$=109	

(b)(i)	$\overline{x} = \frac{\sum fx}{\sum f}$ = $\frac{109}{40}$ = **2.725 litres** **Mean amount = 2.725 x 160 = Ksh. 436**	4 marks
b (ii)	**Median position =** $\frac{40}{2}$ **20**th **Median class: 2.5 – 2.9** **Median = 2.45 +** $\left(\frac{20-5}{11}\right)$ **x 0.5 = 2.6773** **Median amount = 2.6773 x 160** **= Kshs. 428.37**	 M1 M1 A1
24. (a)i	2x + 2y = 60 x+y = 30 y=30 - x	 M1
(ii)	A = (x+50)(y+40) but y = 30 – x Hence: A = (x+50)(30-x+40) =(x+50)(70-x) A = 3500 + 20x $-x^2$	 M1 M1 A1
(b)(i)	$\frac{dA}{dx}$ = 20 – 2x Area is max when $\frac{dA}{dx}$ = 0 20x-2x =0 X=10 Y = 30-10=20 50+10 = 60 m 40 + 20 60 m Dimensions of AGEF is 60m by 60m.	M1 M1 M1
(ii)	60 x 60 = 3600 m^2 **OR** A_{max} **= 3500 + 20(10) -** $\mathbf{10^2}$ **= 3600** m^2	M1M1 M1 M1