

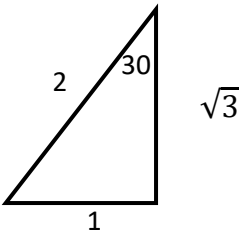
MATHEMATICS

FORM 3

PAPER 2

END OF YEAR EXAM 2025

MARKING SCHEME

	MAIN SCHEME	MARKS	COMMENTS
1	Perimeter = $2(l + w)$ Absolute error for both length and width = 0.5 Max perimeter = $2(80.5 + 60.5)$ $= 282$ Actual perimeter = $2(80 + 60)$ $= 280$ Percentage error = $\frac{282-280}{280} \times 100$ $= 0.714 \cong 0.7$	B1 M1 A1	For either max, actual or min perimeter
		03	
2	Det (Δ) = $(4 \times -2) - (3 \times 5)$ $= -8 - 15 = -23$ $-\frac{1}{23} \begin{pmatrix} -2 & -3 \\ -5 & 4 \end{pmatrix}$ $= \begin{pmatrix} \frac{+2}{23} & \frac{3}{23} \\ \frac{5}{23} & \frac{-4}{23} \end{pmatrix}$ $= -\frac{1}{23} \begin{pmatrix} -2 & -3 \\ -5 & 4 \end{pmatrix} \begin{pmatrix} 4 & 3 \\ 5 & -2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ $= -\frac{1}{23} \begin{pmatrix} -2 & -3 \\ -5 & 4 \end{pmatrix} \begin{pmatrix} 18 \\ 11 \end{pmatrix}$ $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} +3 \\ +2 \end{pmatrix}$ $x = 3, y = 2$	B1 B1 M1 A1	
		04	
3	$5(5x)^2 - 15(5^x) + 10 = 0$ Let 5^x be A $5A^2 - 15A + 10 = 0$ $(A - 2)(A - 1) = 0$ $A = 2 \quad \text{or} \quad 1$ $5^x = 2 \quad \text{or} \quad 5^x = 1$ $x = \frac{\log 2}{\log 5} \quad \text{or} \quad x = 0$	M1 M1 A1 B1	For $\checkmark$ quad equation formed Or subst in quadratation formula For both
		04	
4	$x + 3x - 30^\circ = 90^\circ$ $4x = 120$ $x = 30$  $\tan 30^\circ = \frac{1}{\sqrt{3}}$	B1 B1 B1	
		03	

5	$\angle WXZ = 180 - 60^\circ$ $= 120^\circ$ $\angle ZWX = 180 - (50 + 120)$ $= 10^\circ$ $\angle YZW = 10^\circ$ alternate angles to ZWX	B1 B1	
		02	
6	a) Cost of the mixture $\frac{120 \times 6 + 200 \times 5}{11}$ $= \frac{720 + 1000}{11}$ $= \frac{1720}{11}$ $= 156.36$ $\cong 156/-$ to the nearest shilling b) % profit = ? $\frac{250 - 156}{156} \times 100$ $= 60.26\%$	M1 A1 M1 A1	To the nearest shilling 2 d.p
		04	
7	$\frac{(\sqrt{2} + 2\sqrt{5})(\sqrt{5} + \sqrt{2})}{(\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2})}$ $\frac{\sqrt{10} + 4 + 10 + 2\sqrt{10}}{3}$ $\frac{3\sqrt{10} + 14}{3}$ $\sqrt{10} + \frac{14}{3}$	M1 M1 A1	
		03	
8	$\sqrt{42.15} = 6.4923$ $3.152^2 = 9.9351$ $\frac{3}{6.4923} + \frac{4}{9.9351}$ $3 \times 0.1540 + 4 \times 0.1007$ $0.462 + 0.4028$ $= 0.8648$	B1 M1 M1 A1	For both $\sqrt{\quad}$ and square
		04	
9	$M = \frac{P}{\sqrt{h} + k^2}$ $P = m\sqrt{h} + mk^2$ $m\sqrt{h} = P - mk^2$ $\sqrt{h} = \frac{P - mk^2}{m}$ $h = \left(\frac{P - mk^2}{m}\right)^2$	M1 M1 A1	
		03	

10	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$ Let one of the sides be a $\therefore \frac{a}{\sin 60} = 2 \times R$ $\rightarrow \frac{a}{\sin 60} = \frac{2 \times 9}{T}$ $\rightarrow a = 18 \sin 60$ $a = 18 \times 0.8660$ $= 15.588$ $= 15.59 \text{ cm}$	M1 A1	
		02	
11	$\frac{(3x+1)(3x-1)}{(3x-1)(x+1)}$ $= \frac{(3x+1)}{x+1}$	B1 B1 B1	For num For deno
		02	
12	$(x+3)^2 + (-y-2)^2 = 3^2$ $x^2 + 6x + 9 + y^2 + 4y + 4 = 9$ $x^2 + y^2 + 6x + 4y + 4 = 0$	M1 M1 A1	
		03	
13	Wambua: Amount = $6400 \left(1 + \frac{15}{100}\right)^3$ = $6400(1.15)^3$ = Sh. 9734 Interest = $9734 - 6400$ = Sh. 3334 Muinde: Interest = $12800 = \frac{25}{200} \times 3$ = Sh. 4800 Muinde's investment by $(4800 - 3334)$ = Sh. 1466	B1 B1 A1	
14	a) $1 + \frac{-5}{2}x + 10\left(\frac{1}{2}x\right)^2 + 10\left(-\frac{1}{2}x\right)^3 + 5\left(-\frac{1}{2}x\right)^4 + \left(-\frac{1}{2}x\right)^5$ $1 - \frac{5}{2}x + \frac{5}{2}x^2 - \frac{5}{4}x^3 + \frac{5}{16}x^4 - \frac{5}{32}x^5$ $x = 0.04$ b) $1 - \frac{5}{2}(0.04) + \frac{5}{2}(0.04)^2 - \frac{5}{4}(0.04)^3$ $1 - 0.1 + 0.004 - 0.00008$ $= 0.90392$	B1 M1 A1	✓Substitution CAO
		03	

15	$x + 60 + x = 180^\circ$ $2x + 60 = 180$ $2x = 120$ $x = \frac{120}{2}$ $= 60^\circ$	M1 A1	For eqn
		02	
16	$\text{Log}(x-1) = \text{Log} 12 - \text{Log}(x-2)$ $= \text{Log}\left(\frac{12}{x-2}\right)$ $x-1 = \frac{12}{x-2}$ $(x-1)(x-2) = 12$ $x^2 - 3x + 2 = 12$ $x^2 - 3x - 10 = 0$ $x^2 + 2x - 5x - 10 = 0$ $x(x+2) - 5(x+2) = 0$ $(x-5)(x+2) = 0$ $x-5 = 0$ $x = 5$ $x+2 = 0$ $x = -2$ Drop the -ve value $x = 5$	M1 M1 A1	
		03	

SECTION II

17	a) i) Taxable income $21200 + 12000 + 1100 + 2000$ $= 36,300$ ii) Payee $\text{First } \frac{8400}{20} \times 2 = 840/-$ $\text{Next } \frac{9600}{20} \times 3 = 1440/-$ $\text{Next } \frac{12000}{20} \times 4 = 2400/-$ $\text{Next } \frac{6000}{20} \times 5 = 1500/-$ $\text{Remaining } \frac{300}{20} \times 6 = 90/-$ Tax payable $6,270/-$ Less personal relief <u>1,240</u> Net payee $= 5,030/-$ b) Net salary $36,300 (5030 + 250 + 120 + 4500 + 1800)$ Net salary $= 36,300 - 11700$ $= 24,600/-$	M1 A1 B1 B1 B1 M1 A1 M1 M1 A1	Subtract relief from Tot.Tax.
		10	

18	a) Prime No 2, 3, 5, 7 Multiple of 3 3, 6, 9 but 3 cannot be selected twice P(Prime number or multiple of 3) $= \frac{6}{10}$ b) i) <table border="1"><tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>H</td><td>H1</td><td>H2</td><td>H3</td><td>H4</td></tr><tr><td>T</td><td>T 1</td><td>T 2</td><td>T 3</td><td>T 4</td></tr></table> ii) P (at least 2 and a head) P(H2 or H3 or H4) $= \frac{3}{8}$ c) i) $P(B) = \frac{x}{x+6} = \frac{3}{5}$ $5x = 3x + 18$ $2x = 18$ $x = 9$ No of members = $9 + 6 = 15$ ii) P(W and B) or P(B and W) $= P(W) \times P(B) + P(B) \times P(W)$ $= \frac{6}{15} \times \frac{3}{5} + \frac{3}{5} \times \frac{6}{15}$ $= \frac{6}{25} + \frac{6}{25} = \frac{12}{25}$		1	2	3	4	H	H1	H2	H3	H4	T	T 1	T 2	T 3	T 4	B1 B1 B1 B1 M1 A1 B1 M1 A1	Or equivalent Or equivalent
	1	2	3	4														
H	H1	H2	H3	H4														
T	T 1	T 2	T 3	T 4														
		10																
19	(a) Let cost of a cow be x Let cost of a goat be y $3x + 25y = 75000$ x 2 } Both $2x + 33y = 69600$ x 3 } $6x + 50y = 150000$ $6x + 99y = 208800$ - $-49y = -58800$ $y = 1200$ $3x + 30000 = 75000$ $3x = 45000$ $x = 15000$ Cow = Sh. 15000; Goat = Sh. 1200 (b) SP for cows = $\frac{140}{100} \times 15000 \times 3$ $= \text{Sh. } 63000$ SP for goats = $\frac{150}{100} \times 1200 \times 25$ $= \text{Sh. } 45000$ Amount received = $63000 + 45000$ $= \text{Sh. } 108000$	B1 M1 A1 M1 A1 M1 M1 A1 M1 A1																
		10																

20	(a) From ΔPQT, $PQ = \frac{50}{\tan 25.4}$ $= 105.3\text{m}$ (b) From ΔPRT, $PR = \frac{50}{\tan 64.7}$ $= 23.63\text{m}$ $QR = PQ - PR = 105.3 - 23.63$ $QR = 81.67\text{m}$ (c) Distance = $\frac{81.67}{1000}\text{km}$; Time = $\frac{14}{60 \times 60}\text{hr}$ Speed = $\frac{81.67}{1000} \times \frac{60 \times 60}{14}$ $= 21\text{km/hr}$	M1 A1 M1 A1 M1 A1 B1 B1 M1 A1	
		10	

21	(a) (i) $PQ = PO + OQ$ $= -p + q$ or $q - p$ (ii) $OR = OP + PR$ $= p + \frac{2}{3}(-p + q)$ $= \frac{1}{3}p + \frac{2}{3}q$ (iii) $SQ = SO + OQ$ $= -\frac{3}{4}OP + OQ$ $= -\frac{3}{4}p + q$ or $q - \frac{3}{4}p$ (b) $OT = n(\frac{1}{3}p + \frac{2}{3}q)$ From DOST $OT = OS + ST$ $= \frac{3}{4}p + m(\frac{3}{4}p + q)$ $\frac{n}{3}p + \frac{2n}{3}q = (\frac{3}{4} - \frac{3}{4}m)p + mq$ $\frac{n}{3} = \frac{3}{4} - \frac{3m}{4}$ $4n + 9m = 9$..... (i) $\frac{2n}{3} = m$, $M = \frac{2n}{3}$(ii) $4n + 9(\frac{2n}{3}) = 9$ $4n + 6n = 9$ $10n = 9$ $n = \frac{9}{10}$ $M = \frac{2}{3} \times \frac{9}{10} = \frac{3}{5}$	B1 M1 A1 B1 B1 M1 M1 M1 M1 Both A1	
		10	
22	(a) $A = KB^n$ $\log A = \log KB^n$ $= \log k + \log KB^n$ $= n \log B + \log K$	M1 A1	

	(b)														
	<table><tr><td>Log</td><td>0.18</td><td>0.29</td><td>0.40</td><td>0.51</td><td>0.65</td></tr><tr><td>Log</td><td>0.20</td><td>0.40</td><td>0.60</td><td>0.81</td><td>1.06</td></tr></table>	Log	0.18	0.29	0.40	0.51	0.65	Log	0.20	0.40	0.60	0.81	1.06	B2	
Log	0.18	0.29	0.40	0.51	0.65										
Log	0.20	0.40	0.60	0.81	1.06										
		S1 P1 L1													
	(c) Gradient of line $= \frac{0.65-0.18}{1.06-0.2} = 0.5465$ $n = 0.5$ Hence $\text{Log } K = 0.07$ $K = 10^{0.07} = 1.175$ $= 1.2 \text{ (1 d.p.)}$	M1 A1 B1													

23	(a) Angle CBD (2 mks) $\angle CBD = 90 - 42 = 48^\circ$ Angle sum of a triangle (b) Angle ODB (2 mks) $\angle ODB = 180 - 42$ $= \frac{138}{2} = 69^\circ$ Angles of an isosceles triangle (c) Angle BAD (2 mks) $\angle BAD = \frac{1}{2} \times 138 = 64^\circ$ Angle at the centre is twice one at the circumference (d) Angle ABC (2 mks) $\angle ABD = 42^\circ$ Alternate segment angles (e) Angle ODA (2 mks) $\angle ODA = 360 - (64 + 222) = 74^\circ$		
		10 mrks	
24			

24)

$$y = 2x^2 - 7x - 2$$

x	-1	0	1	2	3	4	5	6
y	7	-2	-7	-8	-5	2	13	28

$$y = 2x - 7$$

x	-1	2	5
y	-9	-3	3

