FORM FOUR END OF TERM 2 2024

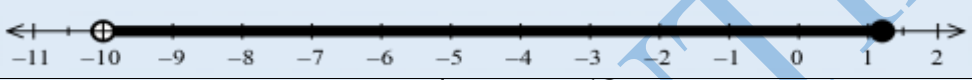
PAPER 1 MARKING SCHEME

No	WORKING	MARKS
1	$r = 0.123123123$ .....(i) $1000r$ $= 123.123123123$ ...(ii) Subtract (i) from (ii) to get; $999r = 123$ $r = \frac{123}{999} = \frac{41}{333}$	M1 M1 A1
2	Original volume = $\frac{4}{3}\pi r^3$ New volume = $\frac{4}{3}\pi(1.05r)^3 = 1.5435\pi r^3$ $\%\ increase = \frac{\left(1.5435 - \frac{4}{3}\right)\pi r^3}{\frac{4}{3}\pi r^3} \times 100\%$ $= \frac{0.2102}{\frac{4}{3}} \times 100\% = 15.7625\%$	M1 M1 A1
3	Number of hours between Mon 0545h and Fri 1945h = $(4 \times 24) + 14 = 110$ Time lost = $0.5 \times 110 = 55\ min$ Time displayed = $1945h - 55\ min = 1850h \Longrightarrow 6{:}50\ p.m$	M1 M1 A1
4	$2 \times 10 \times \frac{1}{0.9272} = 20 \times 0.1079 = 2.158$ $\sqrt[3]{20.77260} = 2.7489$ $\sqrt{0.2643} = \sqrt{26.43 \times 10^{-2}} = 0.5141$ $\Longrightarrow 2.158 + 2.7489 - 0.5141$ $= 4.3928$	M1 M1 M1 A1
5	<table><tr><td>2</td><td>640</td><td>560</td><td>680</td></tr><tr><td>2</td><td>320</td><td>280</td><td>340</td></tr><tr><td>2</td><td>160</td><td>140</td><td>170</td></tr><tr><td>5</td><td>80</td><td>70</td><td>85</td></tr><tr><td></td><td>16</td><td>14</td><td>17</td></tr></table> GCD = $2^3 \times 5 = 40$ Greatest mass = $\frac{40}{1000} = 0.04\ kg$	M1 M1 A1

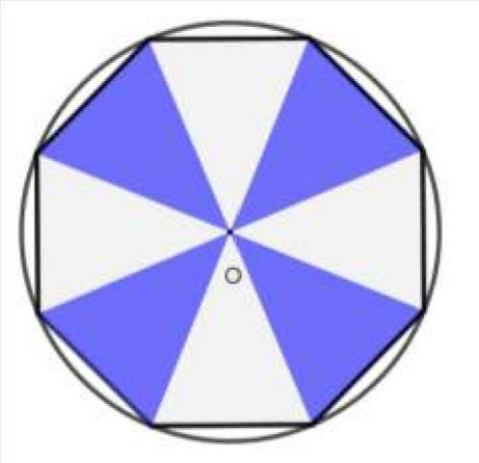
CONFIDENTIAL

6	$\frac{4(x+3)-3(x-7)-6(5-x)}{12}$ ~~$4x+12-3x+21-30+6x$~~ 12	M1 M1
	$=\frac{7x+3}{12}$	A1
7	$5(36)+(n-5)45=180$ $180+45b-225=180$ $45n=225$ $n=5\ sides$	M1 M1 A1
8	$\overline{AB}=\begin{pmatrix}2\\-1\end{pmatrix}-\begin{pmatrix}0\\-4\end{pmatrix}=\begin{pmatrix}2\\3\end{pmatrix}$ $\overline{AC}=\begin{pmatrix}4\\2\end{pmatrix}-\begin{pmatrix}0\\-4\end{pmatrix}=\begin{pmatrix}4\\6\end{pmatrix}$ $2\bar{AB}=\bar{AC}$ $\bar{AB}$ *is parallel to* $\bar{AC}$ *hence collinear sharing common point* A *.*	M1 A1 B1
9	$\frac{x^2-1(2x+3)}{x(x-3)}\ \frac{x^2-2x-3}{x(x-3)}=$ $\frac{x^2-3x+x-3}{x(x-3)}\ \frac{(x-3)(x-1)}{x(x-3)}=$ $=\frac{x-1}{x}$	M1 M1 A1
10	<table><tr><td>Class</td><td>0 – 1</td><td>2 – 3</td><td>4 – 5</td><td>6 – 7</td><td>8 – 9</td></tr><tr><td>Frequency</td><td>10</td><td>85</td><td>124</td><td>36</td><td>1</td></tr><tr><td>c. freq</td><td>10</td><td>95</td><td>219</td><td>255</td><td>256</td></tr></table> Median = $3.5+\left(\frac{128-95}{124}\right)\times 2=3.5+0.5=4.0$	B1 M1 A1

CONFIDENTIAL

11	Distance between the two vehicles at 9.00 a.m. = $540 - (60 \times 1) = 480km$ Relative speed = $120 + 60 = 180\ km/h$ Time taken = $\frac{480}{180} = 2\ h\ 40\ min$ Meeting time = 9.00 $a.m + 2h$ 40 min = 11:40 $a.m$	M1 M1 M1 A1
12	$6 - 4x \geq x < \frac{4x + 10}{3}$ $6 - 4x \geq x \Longrightarrow x \leq 1.2\ 3x <$ $4x + 10 \Longrightarrow x > -10$  	M1 A1 B1
13	$\tan 60° + 5sin\frac{4}{5}\alpha - 5cos\frac{13}{15}\alpha = \tan 60°$	
	$\frac{4}{5}\alpha + \frac{13}{15}\alpha = 90°$ $\frac{12\alpha + 13\alpha}{15} = 90$ $25\alpha = 15 \times 90$ $\alpha = \frac{15 \times 90}{25} = 54°$	M1 M1 A1
14	$2_{3(2x)} \times 3_{-2}^{y} = 2_2 \times 3_2$ $2^{6x} = 2^2 \Longrightarrow 6x = 2; x = \frac{1}{3}$ $3^{-y}{}_2 = 3^2 \Longrightarrow -y = 2; y = -4$	M1 M1 A1

CONFIDENTIAL

15		B1 for any one correct shaded region B2 for all correct shaded regions
16	Amount in US dollars = $1\,000\,000 \div 134 = 7462\ dollars$ Expenses = $190 + 4500 = 4690\ dollars$ Balance in dollars = $7462 - 4690 = 2772\ USD$ $USD\ 2772\ in\ Euros = \frac{2772 \times 129}{143.52} = 2493\ Euros$ Final balance in Euros = $2493 - 2000 = 493\ Euros$	M1 M1 A1
17	a) $\frac{3}{2} = \frac{y-4}{x-3}$ $-3(x-3) = 2(y-4)$	M1 M1 A1
	$-3x + 9 = 2y - 8$ $3x + 2y - 17 = 0$ b) $m_2 = -1 \div -1.5 = \frac{2}{3}$ $\frac{2}{3} = \frac{y+1}{x-2}$ $2(x-2) = 3(y+1)$ $2x - 4 = 3y + 3$	M1 M1
	$2x - 3y - 7 = 0$	A1

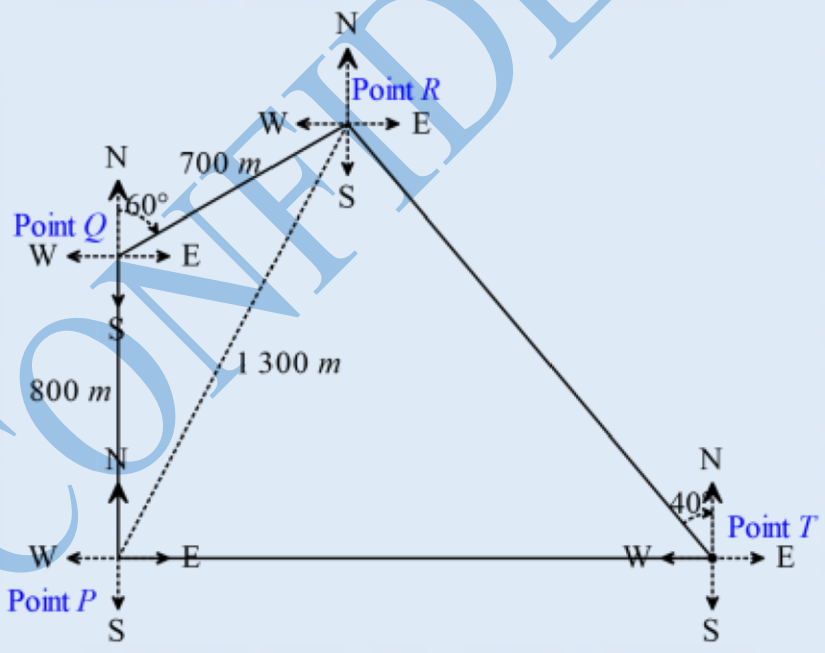
CONFIDENTIAL

	c) $3x + 2y = 17$ ..... (i) $2x - 3y = 7$..... (ii) $from\ (ii);\ x = \frac{7+3y}{2}$ $3\left(\frac{7+3y}{2}\right) + 2y = 17$ $21 + 9y + 4y = 34$ $13y = 13; y = 1$ $x = \frac{7+3(1)}{2} = \frac{10}{2} = 5$ Value of $a = 5, b = 1$	M1 M1 A1 B1
18	a) Volume = $\frac{4}{3} \times \frac{22}{7} \times 5^3 = 523.81\ cm^3$ Mass = $2.4 \times \frac{4}{3} \times \frac{22}{7} \times 125 = 1257.1g$ Mass in kg = $\frac{1257.1}{1000} = 1.2571\ kg$	M1 M1 M1 A1
	b) $\frac{22}{7} \times 8^2 \times h = \frac{4}{3} \times \frac{22}{7} \times 5^3$ $h = \frac{4}{3} \times 125 \times \frac{1}{64} = 2.60\ cm$	M1 M1 A1
	c) $\frac{22}{7} \times 5^2 \times h = \frac{4}{3} \times \frac{22}{7} \times 5^3$ $h = \frac{4}{3} \times 125 \times \frac{1}{25} = \frac{20}{3} = 6.67\ cm$	M1 M1 A1
19	a) Using cosine rule; $PQ^2 = PR^2 + RQ^2 - 2 \times PR \times RQ \times \cos R$ $130^2 = 97^2 + 58^2 - (2 \times 97 \times 58 \times \cos R)$ $16900 = 9409 + 3364 - 11252\ cosR$ $16900 - 12773 = -11252 \cos R$ $\cos R = -\frac{4127}{11252} = -0.3668$ $R = \cos^{-1}(-0.3668) = 111.52°$	M1 M1 A1
	b) Area of PQRS = $\left(\frac{1}{2} \times 43 \times 97 \times \sin 63°\right) + \left(\frac{1}{2} \times 97 \times 58 \times \sin 111.52\right)$ $= 1858 + 2617$ $= 4475\ m^2$	M1 A1
	c) $\sin 63° = \frac{SX}{43}$ $SX = 43 \times \sin 63 = 38.31\ m$	M1 A1

CONFIDENTIAL

	d) $\tan 3.9 = \frac{TS}{43}$ $TS = 43 \times \tan 3.9 = 2.93\ m$ $\tan\theta = \frac{2.93}{38.31} = 0.0765$ $\theta = \tan^{-1}(0.0765) = 4.37°$	M1 M1 A1
20	a) Det M $=(4 \times 6) - (3 \times 5) = 24 - 15 = 9$	
	$M^{-1} = \frac{1}{9}\begin{pmatrix} 6 & -3 \\ -5 & 4 \end{pmatrix} = \begin{pmatrix} \frac{2}{3} & \frac{-1}{3} \\ \frac{-5}{9} & \frac{4}{9} \end{pmatrix}$	
	b) $200r + 150w = 805\ 000\ 200r +$ $240w = 960\ 000$ $4r + 3w = 16\ 100$ $5r + 6w = 24\ 000$ $\begin{pmatrix} 4 & 3 \\ 5 & 6 \end{pmatrix}\begin{pmatrix} r \\ w \end{pmatrix} = \begin{pmatrix} 16\ 100 \\ 24\ 000 \end{pmatrix}$ $\begin{pmatrix} \frac{2}{3} & \frac{-1}{3} \\ \frac{-5}{9} & \frac{4}{9} \end{pmatrix}\begin{pmatrix} 4 & 3 \\ 5 & 6 \end{pmatrix}\begin{pmatrix} r \\ w \end{pmatrix} = \begin{pmatrix} \frac{2}{3} & \frac{-1}{3} \\ \frac{-5}{9} & \frac{4}{9} \end{pmatrix}\begin{pmatrix} 16\ 100 \\ 24\ 000 \end{pmatrix}$ $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} r \\ w \end{pmatrix} = \begin{pmatrix} 2\ 733.33 \\ 1\ 722.22 \end{pmatrix}$ Cost of rice = Sh. 2 733.33 Cost of wheat = Sh. 1 722.22	M1 M1 M1 A1
	c) Cost of rice = Sh. 2 733.33 × 1.08 = 2952. Cost of wheat = Sh. 1722.22 × 0.96 = 1 653.33 $August\ sales = (100 \quad 300)\begin{pmatrix} 2952 \\ 1653.33 \end{pmatrix}$ $= 295\ 200 + 495\ 999 = Sh.\ 791\ 199$	M1 M1 M1 A1

CONFIDENTIAL

21	a) $V = t^2 - 2t + 4$ | t | 2 | 4 | 6 | 8 | 10 | 12 | | V | 4 | 12 | 28 | 52 | 84 | 124 | Displacement $= 2(4 + 12 + 28 + 52 + 84 + 124)$ $= 2(304)$ $= 608\ m$	B2 M1 A1
	b) $displacement = \int_1^{13}(t^2 - 2t + 4)\ dt$ $= \left[\frac{t^3}{3} - t^2 + 4t + c\right]_1^{13}$ $= \left(732\frac{1}{3} - 169 + 52\right) - \left(\frac{1}{3} - 1 + 4\right)$	M1 M1 M1 A1
	$= 612\ m$ c) $percentage\ error = \left(\frac{612-608}{612}\right) \times 100\% = 0.6536\%$	M1 A1
22	a)	
	 	B4
	b) (i) $PR = 6.5 \pm 0.1\ cm$ $PR = 6.5 \times 200 = 1300 \pm 20\ m$ (ii) Bearing of P from R = $180 + 28 = 208 \pm 1°$	M1 A1 B1

CONFIDENTIAL

	c) $\tan 65° = \frac{h}{1300}$ $h = 1300 \times \tan 65$ $= 1300 \times 2.145 = 2\,788.5\ m$	M1 M1 A1
23	a) Revenue $= 14 \times 4 \times 250 = Sh.\ 14\,000$ Profit = Sh. $14\,000 - 6000 = sh.\ 8000$	M1 A1
	b) Profit $= (8000 \times 30) - 10\,000 = Sh.\ 230\,000$	B1
	c) Savings = $0.4 \times 230\,000 = sh.\ 92\,000$ 1st share = $0.24 \times 230\,000 = sh.\ 55\,200$ 2nd share = $0.36 \times 230\,000 = sh.\ 82\,800$ Betty's share = $\left(\frac{82\,800}{3}\right) + \left(\frac{5}{14} of\ 55\,200\right) = 27\,600 + 19\,714.29$ $= Sh.\ 47\,314.29$	M1 M1 M1 M1 A1
	d) Amount given = Sh. $(3 \times 475\,000) = Sh.\ 1\,425\,000$ $0.95\ of\ x = 1\,425\,000$ $x = \frac{1\,425\,000}{0.95} = Sh.\ 1\,500\,000$	M1 A1
24	a) Using cosine rule; $15^2 = 20^2 + 30^2 - (2 \times 20 \times 30 \times \cos\theta)$ $225 = 400 + 900 - 1200 \cos\theta$ $\theta = \cos^{-1}(0.8958) = 26.39°$ $\angle CAD = 2 \times 26.39 = 52.78°$ Area of sector ACD = $\frac{52.78}{360} \times \frac{22}{7} \times 20 \times 20$ $= 184.31\ cm^2$	M1 M1 A1
	b) Using cosine rule; $20^2 = 15^2 + 30^2 - (2 \times 15 \times 30 \times \cos\alpha)$ $400 = 225 + 900 - 900 \cos\theta$ $\theta = \cos^{-1}(0.8056) = 36.33°$ $\angle CAD = 2 \times 36.33 = 72.66°$ Area of sector CBD = $\frac{72.66}{360} \times \frac{22}{7} \times 15 \times 15$ $= 142.725\ cm^2$	M1 M1 A1
	c) $\sin 36.33 = \frac{x}{15}$ $x = 15 \times \sin 36.33 = 8.89\ cm$ CD = $2 \times 8.89 = 17.78\ cm$	M1 A1

CONFIDENTIAL

	d) Area of ΔACD and ΔBCD $= (0.5 \times 400 \times \sin 52.78°) + (0.5 \times 225 \times \sin 72.66°)$ $= 159.26 + 107.37 = 266.63\ cm^2$	B1
	e) Area of segments = $(184.31 + 142.73) - 266.63 = 60.41\ cm^2$ Area of shaded region = $266.63 - 60.41 = 206.22\ cm^2$	B1

CONFIDENTIAL