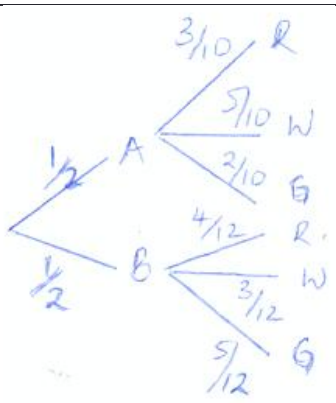
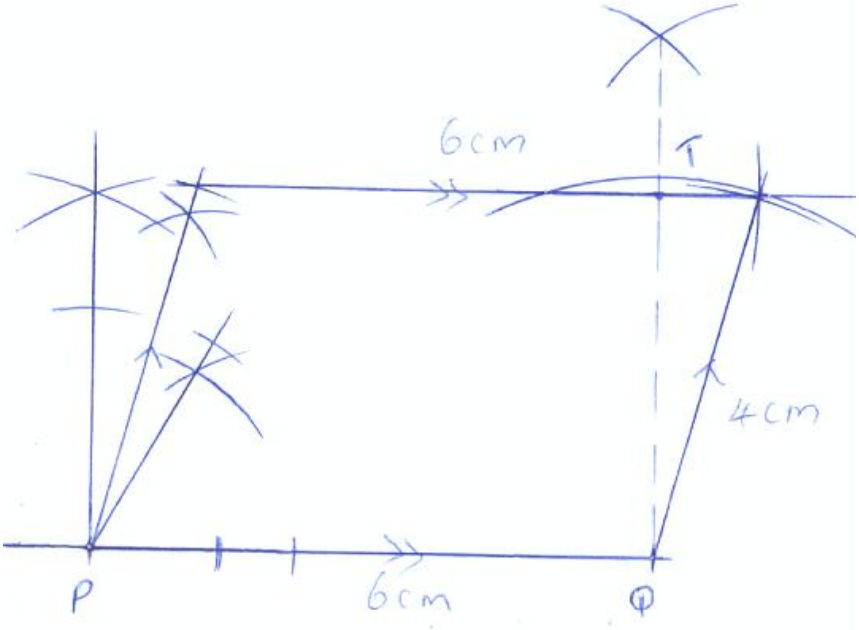
121/1
MATHEMATICS
PAPER 2
FORM 4

END OF TERM II EXAMINATION QUESTIONS

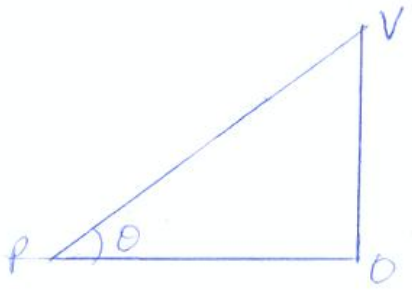
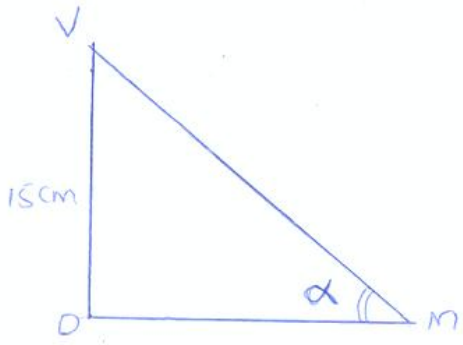
No	WORKING	Marks
1.	**No** **Log** 6.79 0.8319 0.3911 $\bar{1}.5923$ + 0.4242 Log 5 (0.6990) $\bar{1}.8445$ - $0.5797 \times \frac{3}{4}$ 2.721×10^0 0.4348 = 2.721	M1 logs M1 addition and subtraction M1 A1
2.	$3y = \frac{3}{5}x + 6$ $y = \frac{1}{5}x + 2$ a. Gradient = $\frac{1}{5}$ b. Gradient of perpendicular line = -5 $\frac{y-2}{x-1} = -5$ $y - 2 = -5x + 5$ $y = -5x + 7$	B1 M1 M1 A1
3.	Marked price = Sh. 800 Sold at 12% discount $\frac{88}{100} \times 800 = sh.704$ $\frac{120}{100}y = 704$ $\Longrightarrow y = \frac{70400}{120}$ $Trader\ paid = sh.586.60$	M1 M1 A1
4.	$\frac{\sqrt{11}}{\sqrt{11}-\sqrt{7}} \times \frac{(\sqrt{11}+\sqrt{7})}{(\sqrt{11}+\sqrt{7})}$ $\frac{\sqrt{11}(\sqrt{11}+\sqrt{7})}{11-7}$	

	$\frac{11+\sqrt{77}}{4}$	M1 A1
5.	Length = $(3x+12)$ cm Width = $(x-4)$ cm $(3x+12)^2+(x-4)^2=200^2$ $10x^2+64x-39840=0$ $x=\frac{-64\pm\sqrt{4096+1593600}}{20}$ ¿ $\frac{-64\pm1264}{20}=\frac{1200}{20}=60\,cm$ Area = $192\times56=10752\,cm^2$	 M1 M1 M1 A1
6.	$\log(x-1)-\log(3x+2)=\log25-\log100$ $\log\frac{x-1}{3x+2}=\log\frac{25}{100}$ $100(x-1)=25(3x+2)$ $100x-100=75x+50$ $25x=150$ $x=6$	 M1 M1 A1
7.	$(x-y)^5=x^5+5x^4(-y)^1+10x^3(-y)^2+10x^2(-y)^3+5x(-y)^4-y^5$ $=x^5-5x^4y+10x^3y^2-10x^2y^3+5xy^4-y^5$ $9.8=(10-0.2)\Longrightarrow x=10\ y=0.2$ $(9.8)^5=10^5-5\times10^4\times0.2+10\times10^3\times0.2^2-10\times10^20.2^3+5\times10\times0.2^4-0.2^5$ ¿ $100\,000-10\,000+400-8+0.08-0.00032$ ¿ $90392.0797(4d.p)$	B1 M1 A1
8.	$\int_2^4(x^2+2x-15)dx=\frac{x^3}{3}+x^2-15x\Big\vert_2^4$ $=\frac{(4)^3}{3}+4^2-15(4)-\left(\frac{2^3}{3}+2^2-15(2)\right)$ $=\frac{64}{3}+16-60-\frac{8}{3}-4+30$ ¿ $\frac{2}{3}$ units	M1 M1 A1
9.	$p(x-y)=xy$ $px-py=xy$	M1

	$(p+x)y=px$ $y=\frac{px}{p+x}$	M1 A1
10.	$\angle BAD=70°$ And $\angle BCD+\angle BAD=180°$ $\angle BCD=180°-70°$ $\therefore 110°$	B1 B1
11.	$S_n=\frac{n}{2}[4+(n-1)4]=800$ $n[4+(n-1)4]=1600$ $n(4+4n-4)=1600$ $4n+4n^2-4n=1600$ $4n^2=1600$ $n=\sqrt{400}=\pm 20$ No of terms = 20	M1 A1
12.	 $P(AR)\vee P(BR)=\left(\frac{1}{2}\times\frac{3}{10}\right)+\left(\frac{1}{2}\times\frac{4}{12}\right)$ $\therefore \frac{3}{20}+\frac{2}{6}=\frac{29}{60}$	M1 M1 A1
13.	$\begin{pmatrix}3 & 2\\ -1 & 0\end{pmatrix}\begin{pmatrix}5\\2\end{pmatrix}=\begin{pmatrix}19\\-5\end{pmatrix}+\begin{pmatrix}-6\\11\end{pmatrix}=\begin{pmatrix}13\\6\end{pmatrix}$	M1 M1 A1
14.	Distance = $45\times 60\cos 47°=1909.2nm$	M1 A1

15.	 QT = $3.9 \pm 0.1 cm$	M1 - Angle SPQ Parallel lines M1 Diagram M1 B1
16.	Mixture A $B:M = 3:5$ Mass of maize = $\frac{3}{8} \times 72 = 45 kg$ Total mass of mixture = 170 kg Maize = $\frac{9}{17} \times 170 = 90 kg$ Beans = $\frac{8}{17} \times 170 = 80 kg$ Maize in mixture B = 45 kg Beans in A = 72 – 45 = 27 kg Beans in B = 98 – (45 + 27) = 26 kg Ratio in mixture B B: M = 26 : 45	B1 M1 M1 A1
17.	a. $\begin{pmatrix} 5 & 1 \\ -1 & 3 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 19 \\ 9 \end{pmatrix}$ Det = 15 + 1 =16 $\frac{1}{16}\begin{pmatrix} 3 & -1 \\ 1 & 5 \end{pmatrix}\begin{pmatrix} 5 & 1 \\ -1 & 3 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{16}\begin{pmatrix} 3 & -1 \\ 1 & 5 \end{pmatrix}\begin{pmatrix} 19 \\ 9 \end{pmatrix}$ $\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{16}\begin{pmatrix} 48 \\ 64 \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ $x = 3 \; y = 4$	B1 M1 M1 M1 M1 A1 M1

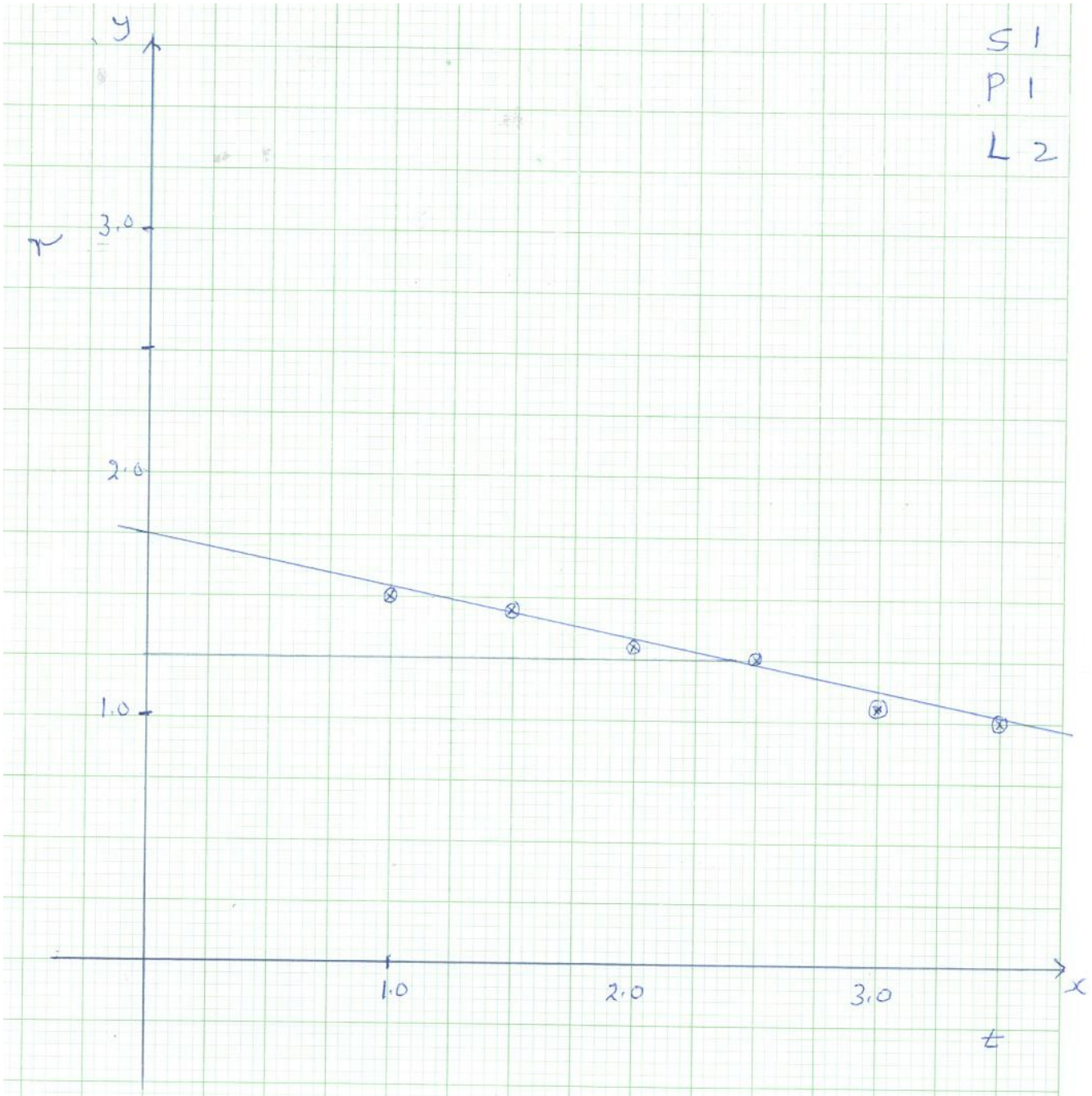
	b. The distance = $\sqrt{(3-11)^2+(4+2)^2}$	M1
	¿ $\sqrt{64+36}$	M1
	¿ $\sqrt{100}$	
	¿ $10\,units$	A1
18.	a. $\frac{dV}{dt}=a\ V=\int a\,dt$	M1
	$V=9t-3\frac{t^2}{2}+c$	M1
	When t = 0 , V = 7	M1
	7 = c	
	$V=9t-3\frac{t^2}{2}+7$	A1
	b. Maximum velocity occurs when a = 0	M1
	$9-3t=0$	M1
	$3t=9\ t=3\,secs$	A1
	$V_{max}=27-\frac{3\times 9}{2}+7=34-\frac{27}{2}=\frac{41}{2}=20.5\,m/s$	
	c. $V=\frac{ds}{dt}\Longrightarrow S=\int\left(9t-\frac{3}{2}t^2+7\right)dt$	
	$S=\frac{9}{2}t^2-\frac{1}{2}t^3+7t+c$	M1
	For maximum velocity t =3	
	$S=\frac{9}{2}(3)^2-\frac{(3)^2}{2}+7(3)$	M1
	¿ $\frac{81}{2}-\frac{27}{2}+21$	
	¿ $\frac{75}{2}$	A1
	¿ $37\frac{1}{2}m$	
19.	a. Line PO is the projection of line VP	
	PO = $\frac{1}{2}$ PR	M1
	$PR^2=PQ^2+QR^2$	
	¿ $16^2+12^2=256+144$	M1
	$PR=\sqrt{400}=20$	A1
	Line PO = 10 cm.	

		
	b. $\cos\theta = \frac{PO}{PV} = \frac{10}{18}$	M1 M1
	$\theta = 56.3°$	A1
	c. Angle between the planes VQR and PQRS is angle OMV	M1
		
	VO = $\sqrt{324-100} = \sqrt{224} \cong 15\,cm$	M1
	$\tan\alpha = \frac{15}{8} = 1.875$	M1
	$\alpha = 61.9°$	A1
20.	a. Time difference = 3 hrs	M1
	Angle difference = $\frac{3\times 360}{24} = 45°$	M1
	Latitude of B is $60°$ E	A1
	b. (i) distance = $850 \times \frac{7}{2} = 2975\,km$	M1 M1
	$\frac{45}{360} \times 6370 \times 2 \times 3.142 \times \cos\theta = 2975$	M1
	$\cos\theta = \frac{2975\times 360}{45\times 2\times 3.142\times 6370} = 0.5946$	A1
	$\theta = \cos^{-1} 0.5946 = 53.5°$	
	r = R cos 53.5^0 = 3789 km	M1
	(ii) radius of the latitude r = R cos θ	M1 A1

	Angle of latitude A and B is $53.5°N$	
21.	a. (i) $\frac{dy}{dx}=2x+1 \; at \; x=-4, \frac{dy}{dx}=-7$ $y=\int (2x+1)\,dx$ $y=x^2+x+c$ at $x=-4, y=6$ $6=16-4+c \quad c=-6$ $y=x^2+x-6$ (ii) at x- axis, y = 0 $\Longrightarrow y=\frac{2}{2}x^2+x-¿$ $0=x^2+x-6$ $x^2+3x-2x-6=0$ $(x-2)(x+3)=0$ $x=-3 \vee x=2$ b. Area = $\int_{-3}^{2}(x^2+x-6)\,dx$ $=\left(\frac{2^3}{3}+\frac{2^2}{2}-(6\times 2)+c\right)-\left(\frac{(-3)^3}{3}+\frac{(-3)^2}{2}-(6\times -3)+c\right)$ $=-8-\frac{81}{6}=\frac{-129}{6}=-21.5 \; square \; units$ Negative means the curve is below the x - axis	M1 M1 A1 B1 M1 A1 both values M1 M1M1 A1
22.	a. $\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} 17 & 0 \\ 0 & 17 \end{pmatrix}=\begin{pmatrix} 15 & -8 \\ 8 & 15 \end{pmatrix}$ $17a+0b=15 \; a=\frac{15}{17}$ $17c=8 \; c=\frac{8}{17}$ $17b=-8 \; b=\frac{-8}{17}$ $17d=15 \; d=\frac{15}{17}$ A = $\frac{1}{17}\begin{pmatrix} 15 & -8 \\ 8 & 15 \end{pmatrix}$ b. Under rotation the matrix is	M1 M1 M1 A1 M1

	$\begin{pmatrix}\cos\theta & -\sin\theta\\ \sin\theta & \cos\theta\end{pmatrix}$	M1
	$\cos\theta=\frac{15}{17}\Longrightarrow\theta=\cos^{-1}\left(\frac{15}{17}\right)$	A1
	$¿28.1°$	
	c. Image of (1, 0) about (2, 3) through 180^0 is (3, 6). Use Cartesian.	
	Final image of (1, 0) under S is (3, 6) followed by R is	
	$\begin{pmatrix}\frac{15}{17} & \frac{-8}{17}\\ \frac{8}{17} & \frac{15}{17}\end{pmatrix}\begin{pmatrix}3\\6\end{pmatrix}=\begin{pmatrix}\frac{-3}{17}\\ \frac{114}{17}\end{pmatrix}$	M1 M1 A1
	Image is $\begin{pmatrix}\frac{-3}{17} & \frac{114}{17}\end{pmatrix}$	
23	a) $6^2=9^2+10^2-180\cos C$	M1
	$180\cos C=81+100-36=145$	M1
	$\cos C=¿\frac{145}{180}=0.8056¿$	M1
	$C=\cos^{-1}0.8056$	M1
	$¿36.3°$	
	$2R=\frac{AB}{\sin C}=\frac{6}{\sin 36.3°}$	M1
	$R=\frac{3}{\sin 36.3°}=5.07\,cm$	A1
	b) Area of circle = 3.142×5.07^2	M1
	$¿80.76\,cm^2$	
	Area ΔABC = $0.5\times9\times10\sin36.3°=26.64\,cm^2$	M1
	Area of shaded region = $80.76-26.64$	M1
	$¿54.12\,cm^2$	A1
24.	a)	
	b) (i) On the graph.	
	(ii) Equation $r=-4.8t+1.75$	
	(iii) $0=-4.8t+1.75$	
	$4.8t=1.75$	

	$t = \frac{1.75}{4.8} \cong 0.36$	



S 1
P 1
L 2

(b) (i) a = gradient $= \frac{0 - 2.4}{1.75 - 1.25} = \frac{-2.4}{0.5}$ M1

$= -4.8$ A1

k – y-intercept $= 1.75$ B1