MACHAKOS COUNTY KCES TRIAL AND PRACTICE EXAMINATION 2015

121/1 MATHEMATICS PAPER 1 MARKING SCHEME

	MARKING S	CHEME	
1.	$\frac{\frac{5}{6} of \left(\frac{13}{3} - \frac{23}{6}\right)}{\frac{5}{12} x \frac{3}{25} + \frac{14}{9} x \frac{3}{7}}$		
	$\overline{12} \times \overline{25} + \overline{9} \times \overline{7}$		
	$\frac{5}{6}x\frac{3}{6}$		
	$=\frac{\frac{5}{6}x\frac{3}{6}}{\frac{1}{20}+\frac{2}{3}}$		
	$=\frac{\frac{5}{12}}{\frac{43}{60}}$	M1	For 5
	$-\frac{43}{60}$	M1	For $\frac{5}{12}$ For $\frac{43}{60}$
	$=\frac{5}{12} \times \frac{60}{43}$		60
	$=\frac{25}{43}$	A1	for answer
		03	
2.	$\frac{584}{504} \times \frac{143}{143} \times 910 \times 10$		
	$\sqrt{\frac{28}{1}x 117 x \frac{286}{2} x 7}$		
	$- \frac{9}{18 \times 910 \times 10}$		
	$=\sqrt{\frac{\frac{9}{16} \times \frac{910}{117} \times 10}{\frac{117}{117} \times \frac{2}{1} \times \frac{7}{1}}}$		
	9 x 13 x 100		
	$=\sqrt{\frac{9 x 13 x 100}{117}}$	M1 M1	Simplify up to perfect severe (100
	$=\sqrt{100}$	1011	Simplify up to perfect square $\sqrt{100}$
	= 10	A1	
		03	
3.	$ \left(\frac{3^3}{2^3}\right)^{x+7} = \left(\frac{2^2}{3^2}\right)^{-3x} \\ \left(\frac{3}{2}\right)^{3(x+7)} = \left(\frac{3}{2}\right)^{6x} $		
	$\left(\frac{3}{2}\right)^{3(\chi+\gamma)} = \left(\frac{3}{2}\right)^{5\chi}$	M1	
	3(x+7) = 6x	M1	
	3x + 21 = 6x		
	x = 7	Al	
		03	
4.	$30 = 2 \times 3 \times 5$ $50 = 2 \times 5^2$		
	$50 = 2 \times 5$ $35 = 5 \times 7$		
	$JJ = J \times T$ L.C.M = 2 x 3x 5 ² x 7		
	= 1050 mins	B1	
	17 hrs 30 mins		
	Time = 7.18		
	$+\frac{17.30}{2142}$		
	2448	M1	For addition
	\Rightarrow 12.48 a.m.	A 1	(A coopt 00/8h Tuesday)
	Tuesday	A1 03	(Accept 0048h Tuesday)

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5.	x + y = 10		
	(10y + x) - (10x + y) = 54	M1	
	9y - 9x = 54		
	y - x = 6		
	f = 0		
	y + y = 10		
	$\mathbf{x} + \mathbf{y} = 10$		
	-x + y = 6	M1	
	2y = 16		
	y = 8		
	$\mathbf{x} = 2$		
	Number is 28	A1	
		03	
6.	A		
0.	$A \times x + x \square^D$		
	2x $2x$		
	6 cm $2 X$ $2 X$		
	B x C	M1	V Expression for height
	$(2x)^2 + x^2 = 6^2$	1111	\checkmark Expression for height
	$5x^2 = 36$	A 1	
	x = 2.683	A1	
	$Area = \frac{1}{2}(x + 2x)(2x)$		
	$=\frac{1}{2}(3 \times 2.683) (2 \times 2.683)$	271	
		M1	\checkmark Expression for area
	= 21.595467		
	≈ 21.60 units	A1	Accept
		04	
7.	Inter. $\angle = x$		
	Exter. $\angle = y$		
	$x + y = 180^{\circ}$		
	$\frac{\mathbf{x} + \mathbf{y} = 100}{\mathbf{x} - \mathbf{y} = 108^0}$		
	2x = 288	B1	For the inter. \angle and ext. \angle
	$x = 144^{\circ}$		
	\therefore ext. $\angle 36^{\circ}$		
	No. of sides $=\frac{360}{36}$	M1	
		A1	
	= 10 sides		
		03	
8.	Let the commission be x%		
	$\frac{x}{100}$ (500000 - 100000)	M1	✓Expression of interest
	= 4000 x		
	4000x + 10000 = 56000	M1	
	x = 12.5%	A1	
		03	
9.	Vol. cylinder $\Rightarrow \pi(14^2)h$		
		M 1	For \checkmark vol. expression for the cylinder &
	Vol. cone $\Rightarrow \frac{1}{3}\pi(7^2) \ge 18$		cone
	$\pi(14^2)h = \frac{1}{3}\pi(7^2) \ge 18$	M1	For equating to determine change in
			height
	h = $\frac{1}{3}$ x 7 ² x 18 x $\frac{1}{14^{2}}$		
	h = 1.5 cm	A1	
		03	
1		05	

			Mathematics paper 1 marking senemes
10.	$\frac{2x-4}{10} = \frac{1}{2x-4}$		
	$12 - 3x^2 - 3x + 6$		
	2(x-2) 1		For ✓ factorization
	$\frac{1}{3(2-x)(2+x)} - \frac{1}{3(x+2)}$	M1	
	2 1		
	$-\frac{2}{3(2+x)}-\frac{1}{3(x+2)}$	M1	
	$=-\frac{1}{x+2}$	A1	
	x+2	03	
11.	Drescent 4 vince a co	05	
11.	Present 4 yrs ago		
	Daugther $\Rightarrow x$ $x - 4$		
	Mother $\Rightarrow 2.5x$ $2.5x - 4$		
	x-4 1	M1	
	$\frac{x-4}{2.5x-4} = \frac{1}{3}$	1011	
	3x - 12 = 2.5x - 4	A 1	
	0.5x = 8	A1	
	x = 16	D1	
	Mother = 2.5×16	B1	
	=40 years		
	-	3	
12.	5y + 2x - 7 = 0		
	$y = -\frac{2}{5}x + \frac{7}{5}$		
	5 5		
	Gr. Line = $-\frac{2}{5}$	B1	
	$\frac{k-5}{32} = \frac{-2}{5}$	B1	
	k - 5 = -2		
	k = 3	A1	
		03	
13.	20000 x 147.86	M1	
10.	= 2,957,200		
	- 2,337,200	M1	
	2957200-2512000		
	74.50	A1	
	= 5975.84		
		03	
1.4		05	
14.	(a) (a)		B1 \checkmark Lines & angles drawn (allow ±
	BI		0.1cm)
			B1 ✓ Labelling
	B		
	hem D Ben to tree		
	lien 3 cm		
	T 3 cm - Lecm		
	A B		
	heren heren		
	(c) Height = 3.7cm		B1 (Allow ± 0.1 cm)
			3

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15.	No.	Log		
	849.6	2.9292	M1	✓ 3 Logs
	2.41	0.3820+	1 v1 1	• 5 Logs
		3.3112		
	3941	3.5956-		
		1.7156	M 1	For addition and subtraction
		÷ 3		
	8.039 x 10 ⁻¹	<u>1</u> .9052	N (1	
		= 0.8039	M1 A1	For $\checkmark \div 3$
			04	
16.	1 4 1 5 1	2	04	
10.	$\frac{1}{0.3654}$ - 4.151	2		
	$\frac{1}{0.3654} \Rightarrow 2.73$	7]		
	$\begin{array}{c} 0.3654\\ 4.151^2 \Longrightarrow 17. \end{array}$	231	B1	For both
	2.737 - 17.23			
	= -14.4		M1	
		-	A1	
17			03	
17.	(a) Original n	nembers = x 180000	B1	
		$\operatorname{each} = \frac{180000}{x}$	DI	
	Later each	$n = \frac{180,000}{x-3}$	B1	
	180,000 1	x^{-3}	M 1	
	$\frac{x-3}{x-3}$	$\frac{x-3}{x} = 3000$		
	$\frac{60}{x-3} - \frac{60}{x} =$: 1		
	60x - 60x	$x + 180 = x^2 - 3x$	N (1	
	$x^2 - 3x -$		M1	
		(x + 12) = 0	M1	\checkmark Factorization
	x = 15	,	A1	
	(b) $\frac{180,000}{15}$			
	15	= 12000	M1	
	(c) Increase =		A1	
	$\frac{3000}{12000} \ge 10$		M1	
	:	= 25%	A1	
			10	
18.	(a) r : R		D 1	
	= 1:3		B1 M1	
	(b) $\frac{7}{R} = \frac{1}{3}$		1911	
	R = 21cm		A1	
	(c)			
				Alternative method:
		7		L.S.F = $1:3$
	20 7	\mathbf{N}		V.S.F = 1:27 V.S.F frustum = 26
	30	21		\therefore Vol. = 26 x 770
				= 20020
	Vol. Big cone	$e = \frac{1}{3} x \frac{22}{7} x 21^2 x 45$	M1	20020
		$= 20790 \text{ cm}^3$		
	Vol. Small.co	one = $\frac{1}{3} \times \frac{22}{7} \times 7^2 \times 15$		
		3^{-3} 7^{-3} 7^{-3} 7^{-3}	M1	

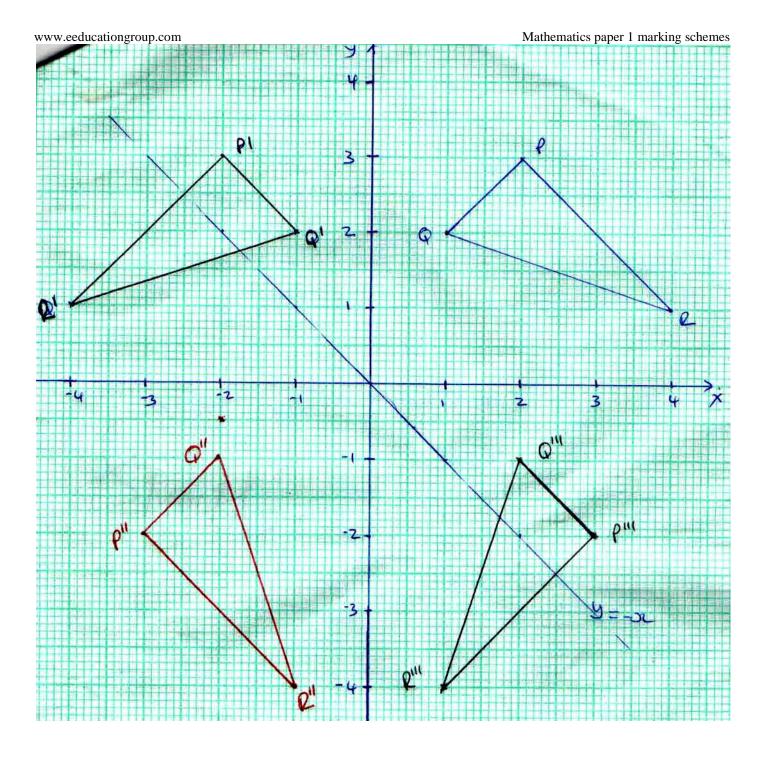
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$= 770 \text{cm}^3$ Vol. of frustrum $= 20790 - 77$	0	M1	For subtraction
$= 20020 \text{ cm}^3$	0		
(d) Vol. tank $= 150 \times 120 \times $	x 180		
Buckets $=\frac{150 x 120 x 8}{20020}$	0	M1	
= 71.93		M1 A1	
$\simeq 72$ full buck	zets	B1	
	KCIS	10	
		10	
19. (a) (i) m/s 80	7		
Secs	20 24		
Distance = $\frac{1}{2}(16 + 24) \times 80$		M1	
= 1600 m		A1	
(ii) $-\frac{80}{4}$		M1	$A_{a} = \frac{80}{20} - \frac{20}{20} = \frac{1}{20}$
$= -20 \text{m/s}^2$		A1	Accept deccel. = $\frac{80}{4}$ = 20m/s ²
(b)	ELD		
NRB 2	43km ELD		
7.12 ^{105km} 8.22	8.22		
	•		
90km/h	72km/h		
Relative distance = $348 - (9)$	$\theta(r^{\frac{7}{2}})$		
= 243km Relative speed = 162km/		B1	For both R.D & R.S
$\frac{243}{243}$			
Time taken $=\frac{243}{162}$ hrs		M1	
= 1.5 hrs	1 20 .		
	hr 30 mins	M1	
= 9.52 a.m	1.	A1	OR 348 – (1.5 x 72)
(c) 90 x $2\frac{2}{3}$ km		M1	= 240 km
= 240km		A1	
		10	
20. (a) (i) Modal class = $30 - 39$		B1	
Marks x f	fx cf	P 1	= For \checkmark x column
20-29 24.5 3	73.5 3	B1	
30-39 34.5 18	621 21	B1	For ✓ fx column
40-49 44.5 13	578.5 34		
50-59 54.5 14	763 48		
60-69 64.5 17 70-79 74.5 12	1096.5 65 894 77		
80-89 84.5 5	422.5 82		
	422.3 82		
Mean = $\frac{4449}{82}$			
$Mean = \frac{1}{82}$		M1	

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	= 54.2561		
	≅ 54.26	A1	Correct to 2 d.p
	= 34.20		-
	(ii) Median = $49.5 + \frac{41-34}{14} \times 10$	B1	For cumulative freq.
	$\begin{array}{c} (1) \text{ foredrain} & = 19.5 + 14 \\ 14 \end{array}$		
	= 54.5	M 1	
	Diff $= 54.5 - 54.26$	A1	
	= 0.24		
		10	
		10	
21.	(a) A : B : C		
	25=: 30/= : 45/=		
	5 : 2 : 1		
	$100\% = \frac{(5 x 25) + (30 x 2) + (45 x 1)}{5 + 2 + 1}$	M 1	
	= 28.75/=	A1	
	20% profit		
		M1	
	$=\frac{20}{100} \ge 28.75$	M1	
	= <u>5.75/</u> =	A1	
	(b) $\overline{A} = 27.5/=$	111	
	B = 33/=		
	C = 49.5/=		
	$\therefore 100\% = \frac{(27.5 x 5) + (33 x 2) + (49.5 x 1)}{5+2+1}$	M1	
	$100\% = \frac{5+2+1}{5+2+1}$		
	= 31.625		
	% Profit = 1.15×31.625	M1	
	= 36.36875		
		. 1	
	<i>≅</i> 36.50	A1	
	(c) $45 - 36.50$		
		M 1	
	= 8.50		
	8.5 100	M1	
	% Profit $=\frac{8.5}{36.5} \times 100$	A1	✓ Expression for profit
	= 23.29%		I III I I
	- 23.29%		
		10	
22.	(a) $5.9^2 = 7.8^2 + 6.6^2 - 2(7.8)$ (6.6) Cos P	M1	
<i>LL</i> .	$(a) \ 5.9 \ - \ 7.6 \ + \ 0.0 \ - \ 2(7.6) \ (0.0) \ COS \ F$	1/11	
	$C_{0S} P - \frac{69.59}{69.59}$		
	$\cos P = \frac{69.59}{102.96}$	M1	For making Cos P subject
	$P = 47.48^{0}$	A1	
	1 11110		
		M1	
	(b) $5.9 - 2D$		
1	(b) $\frac{5.9}{Sin47.48^0} = 2R$	N/1	
1		M1	
	5.0	A1	
1	$\mathbf{R} = \frac{5.9}{2Sin47.48^{\circ}}$		
	$2Sin47.48^{\circ}$		
1		M1	\checkmark Expression for area of triangle
	= 4.002 cm		* Follow through for other π values
1	(c) Area of $\Delta = \frac{1}{2} \times 7.8 \times 6.6 \sin 47.48^{\circ}$	M1	
			\checkmark Expression for area of circle
1	$=18.97 cm^2$	N/1	
		M1	
1	Area of circle $= 3.142 \text{ x } 4.002^2$		
1	= 50.32		
1			
1	Shaded area $= 50.32$	M1	
1	-18.97	А	For subtraction
	31.35cm ²		
		10	
		10	
1		1	

Mathematics paper 1 marking schemes

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23.	(a)		
		B1	For \checkmark measurement with the given scale (1cm = 1km)
	um San	B1	For ✓ triangle labelled.
	Q Q		
	(b) Construction of any $2 \perp$ side bisectors	B1	
	✓ Location of T Distance $RT = 5.2 km$	B1 B1	Allow ± 0.1 km
	(c) Drop \perp from T to PQ Distance = 1.5km	B1	Allow ±0.1km
	(d) $S = \frac{10+8+4}{2}$		
	= 11 km A = $\sqrt{11(11 - 10)(11 - 8)(11 - 4)}$	B1 M1	* Allow any other alternative method by calculate only.
	$= 15.19868 \text{km}^2$ $\cong 15.20 \text{km}^2$	A1	calculate only.
	= 13.20Km		
		10	
24.	(a) (i) ✓PQR drawn	B1	
	✓ P ^I Q ^I R ^I drawn	B1	
	(ii) Reflection on the line $y - axis$ (or $x = 0$) (b) (i) $P^{II}(-3,-2)$	B1	
	$\begin{array}{c} Q^{II}(-2,-1) \\ R^{II}(-1,-4) \end{array}$	B1	Coordinates can be implied on the diagram
	✓ $\Delta P^{II}Q^{II}R^{II}$ drawn (ii) Negative quarter turn about (0,0) OR	B1	
	(270^{0}) turn about (0,0) OR – 90 ⁰ turn about (0,0)	B1	
	(c) $P^{III}(3,-2)$ $Q^{III}(2,-1)$ $R^{III}(1,-4)$	B1	Coordinates can be implied on the diagram
	$\checkmark \Delta P^{III} Q^{III} R^{III} drawn$	B1	
	(d) PQR and $P^{I}Q^{I}R^{I}$ PQR and $P^{II}Q^{II}R^{II}$ $P^{I}Q^{I}R^{I}$ and and $P^{III}Q^{III}R^{III}$	B2	 for 4 pairs Allow B1 for at least 2 pairs
	$P^{\Pi}Q^{\Pi}R^{\Pi}$ and $P^{\Pi}Q^{\Pi}R^{\Pi}$		



MACHAKOS COUNTY KCSE TRIAL AND PRACTICE EXAMINATION 2015

121/2 MATHEMATICS PAPER 2 MARKING SCHEME

1	MARKING SCHEME		
1.	(a) Working area = $25 \times 16 = 400 \text{ cm}^2$		
	Maximum area = $25.5 \times 16.5 \text{ cm}^2 = 420.75 \text{ cm}^2$		
	Minimum area = $24.5 \text{ x } 15.5 = 379.75 \text{ cm}^2$		
	Max. possible error		
	= 420.75 - 400 or		
	400 - 379.75		
	$= \pm 20.75$	B1	
	(b) % error in area		
	$= \frac{\text{Absolute error}}{\text{Working area}} \ge 100$		
	$=\frac{20.75}{400} \times 100$	M1	
		A1	
	= 5.1%		
		03	
2.	This is a GP with 1^{st} term ,a = 3 million and common ratio, r = 2		
	Required is the 7 th term of GP		
	$Tn = ar^{n-1}$		
	7^{th} term, $T_7 = ar^{7-1} = ar^6$		
	$= 3 \times 2^{6}$	M1	
	$= 3 \times 64$		
	= 192 million	A1	
		02	
3.	$\cos^2\theta + \sin^2\theta = 1$	~-	1
5.	$\cos^2\theta = 1 - \sin^2\theta$		
	$6(1 - \operatorname{Sin}^2 \theta) - \operatorname{Sin} \theta - 4 = 0$	M1	
	$6\mathrm{Sin}^2\mathrm{O} + \mathrm{Sin}\mathrm{\Theta} - 2 = \mathrm{O}$	1111	
	Let $y = \sin \theta \Rightarrow 6y^2 + y - 2 = 0$		
	$6y^2 - 3y + 4y - 2 = 0$		
	3y(2y-1) + 2(2y-1) = 0		
	(3y+2)(2y-1) = 0	M1	
	3y + 2 = 0		
	3y = -2		
	$y = -\frac{2}{3}$		
	or		
	2y - 1 = 0		
	2y = 1		
	$y = \frac{1}{2}$		
	$\sin \theta = \frac{-2}{3} \text{ or } \frac{1}{2}$		
	Hence $\theta = 30^{\circ}, 150^{\circ}$	A1	
		03	
4.	$x^2 - 8x + y^2 + 12y = -16$		
4.			
	$x^2 - 8x + 16 + y^2 + 12y + 36 = -16 + 16 + 36$		
1	Expressions as perfect squares $(x^2 + x^2)^2 = 2$		
1	$(x-4)^2 + (y+6)^2 = 36$	M1	
1	$(x-a)^2 + (y-b) = r^2$		
1	a = 4		
	b = -6		
	$r = \sqrt{36} = 6$		
	Centre $(4,-6)$ and radius = 6 units	A1	
		02	
1	1		1

5. $P = L + KQ^{2}$ where K and L are constants 40 = L + 4K(i) 5 = L + 9K(ii) Both 2.5 = -5K(iii) $L + 20 = 40Hence P = 20 + 5Q^{2}(iii) L = 20Hence P = 20 + 5(4)^{2}(iii) M1= 100$		eeducationgroup.com	Ma	athematics paper 2 marking scheme
$ \begin{vmatrix} 40 - 1 - 4 4K & \dots \\ 65 = 1 - 9K & \dots \\ 7.5 = -5K & \dots \\ K = 5 \\ Subst. for K in eqn (i) L + 20 = 40 \\ L = 20 \\ Hence P = 20 + 5(4)^2 & M1 \\ = 100 & A1 \\ \hline P = 20 + 5(4)^2 & M1 \\ = 100 & A1 \\ \hline (b) Median = 49.5 + \left(\frac{x_{-14}}{15}\right)^5 & M1 \\ = 51.5kg & M1 \\ \hline (b) Median = 49.5 + \left(\frac{x_{-14}}{15}\right)^5 & M1 \\ = 51.5kg & A1 \\ \hline Determinant of T = Area scale factor \\ Det. T = \frac{10}{25} = 4 \\ Hence (a_1 - 2) - (-2a) = 4 \\ a^2 - 2a + 2a = 4 \\ a^2 = 4 \\ a^2 = 4 \\ a^2 = 4 \\ a^2 = 4 \\ a = 2 \\ \hline When a = 2, T = \left(\frac{d}{2} - \frac{2}{2}\right) & B1 \\ \hline When a = -2, T = \left(-\frac{d}{2} - \frac{2}{2}\right) & B1 \\ \hline When a = -2, T = \left(-\frac{d}{2} - \frac{2}{2}\right) & B1 \\ \hline When a = -2, T = \left(-\frac{d}{2} - \frac{2}{2}\right) & B1 \\ \hline When a = -2, T = \left(-\frac{d}{2} - \frac{2}{2}\right) & B1 \\ \hline When a = -2, T = \left(-\frac{d}{2} - \frac{2}{2}\right) & B1 \\ \hline When a = -2, T = \left(-\frac{d}{2} - \frac{2}{2}\right) & A1 \\ \hline M1 & \frac{1}{2} + \frac{1}{2} $	5.	$P = L + KQ^2$ where K and L are constants		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		40 = L + 4K(i)	B1	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		65 = L + 9K(ii) > Both		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		-25 = - 5K	M1	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		$P = 20 \pm 5 (A)^2$	M1	
6. (a) Modal class is 50 - 54 (b) Median = 49.5 + $\left(\frac{\frac{32}{2} - 14}{15}\right)^{5}$ = 51.5kg 7. Determinant of T = Area scale factor Det. T = $\frac{12}{25} = 4$ Hence $a(a - 2) - (-2a) = 4$ $a^{2} - 2a + 2a = 4$ $a^{2} - 2a + 2$				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	6			<u> </u>
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	0.		ы	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		(b) Median = $49.5 \pm \left(\frac{10}{2} - 14\right) 5$	2.51	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		$\left(\begin{array}{c} 0 \end{array} \right)$		
7. Determinant of T = Area scale factor Det. $T = \frac{10}{25} = 4$ Hence $a(a - 2) - (-2a) = 4$ $a^2 - 2a + 2a = 4$ $a^2 - 2a + 2a = 4$ $a^2 = 4$ $a = \pm 2$ When $a = 2, T = \begin{pmatrix} 0 & -2 \\ -2 & -2 \end{pmatrix}$ When $a = -2, T = \begin{pmatrix} -4 & -2 \\ -2 & -2 \end{pmatrix}$ (a) $\left(2 - \frac{1}{2}y\right)^5 = 32 - 40y + 20y^2 - 5y^3 + \frac{5}{9}y^4 - \frac{1}{32}y^5$ (b) Non (1.98) = (2 - 0.02) $= 2 - \frac{1}{2}(0.04)$ Substitute $y = 0.04$ $\therefore \left\{2 - \frac{1}{2}(0.04)\right\}^5 = 32 - 40(0.04) + 20(0.04)^2 - 5(0.04)^3$ ($2 - 0.02\right)^5 = 32 - 1.6 + 0.032 - 0.00032$ ($1.98\right)^5 = 30.43168$ = 30.432 (5 s.f) A1 9. Log (x-1) = Log (12 - Log (x - 2)) $x - 1 = \frac{12}{x-2}$ (x - 1) (x - 2) = 12 $x^2 - 3x + 2 = 12$ $x^2 - 3x + 2 = 12$ $x^2 - 3x - 10 = 0$ x(x + 2) - 5(x + 2) = 0 x(x + 2) - 5(x + 2) = 0 x(x + 2) - 5(x + 2) = 0 x - 5 =		= 51.5kg	AI	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	7.	Determinant of $T = $ Area scale factor		
Hence $a_1^{(a)} - 2) - (-2a) = 4$ $a^2 - 2a + 2a = 4$ $a^2 - 2a + 2a = 4$ $a = \pm 2$ When $a = 2, T = \begin{pmatrix} 0 & -2 \\ 2 & -2 \end{pmatrix}$ When $a = 2, T = \begin{pmatrix} -4 & -2 \\ -2 & -2 \end{pmatrix}$ When $a = -2, T = \begin{pmatrix} -4 & -2 \\ -2 & -2 \end{pmatrix}$ $(a) \left(2 - \frac{1}{2}y\right)^5 = 32 - 40y + 20y^2 - 5y^3 + \frac{5}{8}y^4 - \frac{1}{32}y^5$ (b) Non (1.98) $= (2 - 0.02)$ $= 2 - \frac{1}{2}(0.04)$ Substitute $y = 0.04$ $\therefore \left\{2 - \frac{1}{2}(0.04)\right\}^5 = 32 - 40(0.04) + 20 (0.04)^2 - 5(0.04)^3$ $(2 - 0.02)^5 = 32 - 1.6 + 0.032 - 0.00032$ $(1.98)^5 = 30.43168$ = 30.432 (5 s.f) A1 9. $\log (x-1) = \log 12 - \log (x-2)$ $= \log \left(\frac{12}{x-2}\right)$ $x - 1 = \frac{12}{x^2}$ (x - 1) (x - 2) = 12 $x^2 - 3x + 2 = 12$ $x^2 - 5x - 10 = 0$ x(x + 2) - 5(x + 2) = 0 x - 5 = 0 x = 5 x + 2 = 0 x = 5 x =				
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $		$a^2 = 4$		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			A 1	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				
When a = -2, T = $\left(\frac{1}{2}, \frac{2}{-2}\right)$ (04 8. (a) $\left(2 - \frac{1}{2}y\right)^5 = 32 - 40y + 20y^2 - 5y^3 + \frac{5}{8}y^4 - \frac{1}{32}y^5$ (b) Non (1.98) = (2 - 0.02) $= 2 - \frac{1}{2}(0.04)$ Substitute y = 0.04 $\therefore \left\{2 - \frac{1}{2}(0.04)\right\}^5 = 32 - 40(0.04) + 20(0.04)^2 - 5(0.04)^3$ (2 - 0.02)^5 = 32 - 1.6 + 0.032 - 0.00032 (1.98)^5 = 30.43168 = 30.432(5 s.f.) A1 9. Log (x-1) = Log 12 - Log (x - 2) $= Log\left(\frac{12}{x-2}\right)$ $x - 1 = \frac{12}{x-2}$ (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 = 0 x = 5 x + 2 = 0 x = 5 x + 2 = 0 x = 5 x + 2 = 0 x = 5 A1 M1 M1 M2 M1 M2 M1 M1 M1 M1 M1 M1 M1 M1 M1 M1				
8. $(a) \left(2 - \frac{1}{2}y\right)^{5} = 32 - 40y + 20y^{2} - 5y^{3} + \frac{5}{8}y^{4} - \frac{1}{32}y^{5}$ $(b) \text{ Non } (1.98) = (2 - 0.02)$ $= 2 - \frac{1}{2}(0.04)$ Substitute $y = 0.04$ $\therefore \left\{2 - \frac{1}{2}(0.04)\right\}^{5} = 32 - 40(0.04) + 20 (0.04)^{2} - 5(0.04)^{3}$ $(2 - 0.02)^{5} = 32 - 1.6 + 0.032 - 0.00032$ $(1.98)^{5} = 30.43168$ $= 30.432 (5 \text{ s.f.})$ A1 9. $\text{Log } (x-1) = \text{Log } 12 - \text{Log } (x-2)$ $= \text{Log } \left(\frac{12}{x-2}\right)$ $x - 1 = \frac{12}{x-2}$ $(x-1) (x-2) = 12$ $x^{2} - 3x + 2 = 12$ $x^{2} - 3x + 2 = 12$ $x^{2} - 3x + 2 = 12$ $x^{2} - 3x - 10 = 0$ $x^{2} + 2x - 5x - 10 = 0$ $x^{2} + 2x - 5x - 10 = 0$ $x(x + 2) - 5(x + 2) = 0$ $x(x + 2) - 5(x + 2) = 0$ $x - 5 = 0$ $x - 5$ $x - 2$ $Drop the -ve value x = 5 A1 $		When $a = -2$ T $-(-4 -2)$	ВІ	
8. $ (a) \left(2 - \frac{1}{2}y\right)^{5} = 32 - 40y + 20y^{2} - 5y^{3} + \frac{5}{8}y^{4} - \frac{1}{32}y^{5} \\ (b) \text{ Non } (1.98) = (2 - 0.02) \\ = 2 - \frac{1}{2}(0.04) \\ \text{ Substitut } y = 0.04 \\ \therefore \left\{2 - \frac{1}{2}(0.04)\right\}^{5} = 32 - 40(0.04) + 20(0.04)^{2} - 5(0.04)^{3} \\ (2 - 0.02)^{5} = 32 - 1.6 + 0.032 - 0.00032 \\ (1.98)^{5} = 30.43168 \\ = 30.432(5 \text{ s.f}) \\ \text{A1} \\ \hline \\ 9. \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^{2} + 2x - 5x - 10 = 0 \\ x(x+2) - 5(x+2) = 0 \\ (x-5)(x+2) = 0 \\ x-5 = 0 \\ x-5 \\ x+5 \\ x+5 = 0 \\ x-5 \\ x+5 \\$		(-2 -2)		ļ
(b) Non (1.98) = $(2 - 0.02)$ $= 2 - \frac{1}{2}(0.04)$ Substitute y = 0.04 $\therefore \left\{2 - \frac{1}{2}(0.04)\right\}^5 = 32 - 40(0.04) + 20(0.04)^2 - 5(0.04)^3$ $(2 - 0.02)^5 = 32 - 1.6 + 0.032 - 0.00032$ $(1.98)^5 = 30.43168$ = 30.432 (5 s.f) A1 9. Log (x-1) = Log 12 - Log (x - 2) $= Log \left(\frac{12}{x-2}\right)$ $x - 1 = \frac{12}{x-2}$ (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 =			04	
(b) Non (1.98) = $(2 - 0.02)$ $= 2 - \frac{1}{2}(0.04)$ Substitute y = 0.04 $\therefore \left\{2 - \frac{1}{2}(0.04)\right\}^5 = 32 - 40(0.04) + 20(0.04)^2 - 5(0.04)^3$ $(2 - 0.02)^5 = 32 - 1.6 + 0.032 - 0.00032$ $(1.98)^5 = 30.43168$ = 30.432 (5 s.f) A1 9. Log (x-1) = Log 12 - Log (x - 2) $= Log \left(\frac{12}{x-2}\right)$ $x - 1 = \frac{12}{x-2}$ (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 =	8.	$(a)\left(2-\frac{1}{2}n\right)^{5}-32-40n+20n^{2}-5n^{3}+5n^{4}-1n^{5}$		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			B1	
Substitute y = 0.04 $ \begin{array}{c} \left \begin{array}{c} \left\{ 2 - \frac{1}{2}(0.04) \right\}^{5} = 32 - 40(0.04) + 20(0.04)^{2} - 5(0.04)^{3} \\ (2 - 0.02)^{5} = 32 - 1.6 + 0.032 - 0.00032 \\ (1.98)^{5} = 30.43168 \\ = 30.432 (5 s.f) \end{array}\right \qquad A1 $ $ \begin{array}{c} \left \begin{array}{c} \left \begin{array}{c} \left \begin{array}{c} \left \\ A1 \\ \end{array}\right \\ \left \\ \left \\ A1 \\ \end{array}\right \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\ \left \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\$				
Substitute y = 0.04 $ \begin{array}{c} \left \begin{array}{c} \left\{ 2 - \frac{1}{2}(0.04) \right\}^{5} = 32 - 40(0.04) + 20(0.04)^{2} - 5(0.04)^{3} \\ (2 - 0.02)^{5} = 32 - 1.6 + 0.032 - 0.00032 \\ (1.98)^{5} = 30.43168 \\ = 30.432 (5 s.f) \end{array}\right \qquad A1 $ $ \begin{array}{c} \left \begin{array}{c} \left \begin{array}{c} \left \begin{array}{c} \left \\ A1 \\ \end{array}\right \\ \left \\ \left \\ A1 \\ \end{array}\right \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\ \left \\ \left \\ A1 \\ \end{array}\right \\ \hline \left \\ \left \\$		$=2-\frac{1}{2}(0.04)$		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		2		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Substitute $y = 0.0$ T		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		(1)5		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		$\therefore \left\{2 - \frac{1}{2}(0.04)\right\} = 32 - 40(0.04) + 20(0.04)^2 - 5(0.04)^3$	M1	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $				
9. $\log (x-1) = \log 12 - \log (x-2)$ $= \log \left(\frac{12}{x-2}\right)$ $x - 1 = \frac{12}{x-2}$ (x - 1) (x - 2) = 12 $x^2 - 3x + 2 = 12$ $x^2 - 3x + 2 = 12$ $x^2 - 3x - 10 = 0$ $x^2 + 2x - 5x - 10 = 0$ x(x + 2) - 5(x + 2) = 0 (x - 5) (x + 2) = 0 x - 5 = 0 x - 5 = 0 x = 5 x + 2 = 0 x = -2 Drop the -ve value x = 5 A1 A1				
A1039. $Log (x-1) = Log 12 - Log (x-2)$ $= Log \left(\frac{12}{x-2}\right)x - 1 = \frac{12}{x-2}M1(x-1) (x-2) = 12x^2 - 3x + 2 = 12x^2 - 3x - 10 = 0x^2 + 2x - 5x - 10 = 0x(x+2) - 5(x+2) = 0(x-5) (x+2) = 0x - 5 = 0x = 5x + 2 = 0x = -2Drop the -ve valuex = 5M1$				
9. $\log (x-1) = \log 12 - \log (x-2)$ $= \log \left(\frac{12}{x-2}\right)$ $x - 1 = \frac{12}{x-2}$ (x-1) (x-2) = 12 $x^2 - 3x + 2 = 12$ $x^2 - 3x - 10 = 0$ x(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 M1 M1 M1 M1 M1 M1 M1 M1		- 30.432 (3 8.1)	Α 1	
9. $\log (x-1) = \log 12 - \log (x-2)$ $= \log \left(\frac{12}{x-2}\right)$ $x - 1 = \frac{12}{x-2}$ $(x - 1) (x - 2) = 12$ $x^2 - 3x + 2 = 12$ $x^2 - 3x - 10 = 0$ $x^2 + 2x - 5x - 10 = 0$ $x(x + 2) - 5(x + 2) = 0$ $(x - 5) (x + 2) = 0$ $x - 5 = 0$ $x = -5$ $x + 2 = 0$ $x = -2$ Drop the -ve value x = 5				ļ
$ = 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 = 0 $ $ x = 5 $ $ x + 2 = 0 $ $ x = -2 $ $ Drop the -ve value $ $ x = 5 $ $ A1$			03	ļ
$\begin{array}{c} x - 1 = \frac{12}{x-2} & \text{M} 1 \\ (x - 1) (x - 2) = 12 \\ x^2 - 3x + 2 = 12 \\ x^2 - 3x - 10 = 0 \\ x^2 + 2x - 5x - 10 = 0 \\ x(x + 2) - 5(x + 2) = 0 \\ (x - 5) (x + 2) = 0 \\ x - 5 = 0 \\ x = 5 \\ x + 2 = 0 \\ x = -2 \\ \text{Drop the -ve value} \\ x = 5 \end{array} \qquad \qquad$	9.			•
$\begin{array}{c} x - 1 = \frac{12}{x-2} & \text{M} 1 \\ (x - 1) (x - 2) = 12 \\ x^2 - 3x + 2 = 12 \\ x^2 - 3x - 10 = 0 \\ x^2 + 2x - 5x - 10 = 0 \\ x(x + 2) - 5(x + 2) = 0 \\ (x - 5) (x + 2) = 0 \\ x - 5 = 0 \\ x = 5 \\ x + 2 = 0 \\ x = -2 \\ \text{Drop the -ve value} \\ x = 5 \end{array} \qquad \qquad$		$= \text{Log}\left(\frac{12}{12}\right)$		
$ \begin{array}{c} (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 = 0 \\ x = -5 \\ x + 2 = 0 \\ x = -2 \\ Drop the -ve value \\ x = 5 \end{array} $ M1				
$ \begin{array}{c} (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 = 0 \\ x = -5 \\ x + 2 = 0 \\ x = -2 \\ Drop the -ve value \\ x = 5 \end{array} $ M1		$X - 1 = \frac{1}{x - 2}$	M1	
$ \begin{array}{l} 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 \end{array} $ M1		(x-1)(x-2) = 12		
$\begin{vmatrix} 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 \end{vmatrix} $ M1				
$ \begin{array}{c c} 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 \end{array} \qquad \qquad$				
$ \begin{array}{c} 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 \end{array} \qquad \qquad$				
$ \begin{array}{c} (x-5) (x+2) = 0 \\ x-5 = 0 \\ x = 5 \\ x+2 = 0 \\ x = -2 \\ Drop \ the \ -ve \ value \\ x = 5 \end{array} \qquad \qquad$				
$ \begin{array}{c} x - 5 = 0 \\ x = 5 \\ x + 2 = 0 \\ x = -2 \\ Drop the -ve value \\ x = 5 \end{array} $ A1			M1	
$ \begin{array}{c} x = 5 \\ x + 2 = 0 \\ x = -2 \\ Drop the -ve value \\ x = 5 \end{array} \hspace{1.5cm} A1 $				
$ \begin{array}{c} x+2=0\\ x=-2\\ Drop \ the -ve \ value\\ x=5 \end{array} \hspace{1.5cm} A1 \end{array} $				
$ \begin{array}{c} x = -2 \\ Drop the -ve value \\ x = 5 \end{array} $ A1				
Drop the -ve value $x = 5$ A1				
x = 5			A 1	
		-	AI	
03		$\lambda - J$		<u> </u>
			03	

www.	eeducationgroup.com	Mathematics pap	er 2 marking schem
10.	(a) $\angle BDC = \angle PBC = 35^{\circ} (\angle s \text{ in a alt seg.})$	B1	
	In $\angle ABC$, $\angle ABC = 90^{\circ}$ (\angle in semicircle)		
	and $\angle BAC = \angle BDC = 35^{\circ} \text{ s} (\angle \text{s in same seg.})$	B1	
	$\therefore \angle ACB = 180 - (90 + 35) (\angle \text{sum of } \Delta)$	D 1	
	$= 55^{\circ}$	B1	
		03	
11.	Cross – multiply both equation we have		
	4x - 4 = y + 1 => 4x - y = 5 3x + 3 = 2y - 2 => 3x - 2y = -5		
	5x + 5 - 2y - 2 - 25x - 2y5		
	4x - y = 5		
	3x - 2y = -5	B1	
	8x - 2y = 10		
	3x - 2y = -5	M1	
	$5x = 15$ $x = 3\checkmark$		
	x = 3v Substitute for x in equation (i)	Both	
	12 - y = 5	Bom	
	$\begin{array}{c} 12 y = 5 \\ y = 7 \checkmark \end{array}$	A1	
12.	Wambua:		
	Amount = $6400 \left(1 + \frac{15}{100}\right)^3$		
	$= 6400(1.15)^3$ = Sh. 9734		
	-511.9734 Interest = 9734 - 6400		
	= Sh. 3334	B1	
	Muinde: Interest	DI	
	$= 12800 = \frac{25}{200} \times 3$		
	= Sh. 4800	B1	
	Muinde's investment by		
	(4800 – 3334)		
	= Sh. 1466	A1	
		A1	
13.	$3y\left(q+\frac{1}{r}\right) = y\left(q+\frac{1}{r}\right) + P$		
	$3qy + \frac{3y}{x} = qy + \frac{y}{x} + P$		
	$3qy-qy=\frac{y}{x}-\frac{3y}{x}+P$	M1	
	$2qy = P - \frac{2y}{r}$		
	$\frac{2y}{x} = P - 2qy$	M1	
	X		
	$x = \frac{2y}{P-2qy}$ or $x = \frac{-2y}{2yq-P}$	A1	
		03	
14.	$\mathbf{p} = 2\mathbf{a} - \frac{1}{3}\mathbf{b} + \mathbf{c}$	M1	
	$\begin{bmatrix} r & -z & 3z & zz \\ 0 & 1 & 0 & (6) & (-3) \end{bmatrix}$		
	$=2(-2)-\frac{1}{2}(-3)+(2)$		
	$\left(\begin{array}{c} 1 \end{array} \right) \left(\begin{array}{c} 3 \end{array} \right) \left(\begin{array}{c} 3 \end{array} \right)$		
	$ \begin{aligned} & = 2 \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix} - \frac{1}{3} \begin{pmatrix} 6 \\ -3 \\ 9 \end{pmatrix} + \begin{pmatrix} -3 \\ 2 \\ 3 \end{pmatrix} \\ &= \begin{pmatrix} 2 & -2 & +-3 \\ -4 &1 & +2 \\ 2 & -3 & +3 \end{pmatrix} = \begin{pmatrix} -3 \\ -1 \\ 2 \end{pmatrix} \\ & \mathbf{P} = \sqrt{(-3)^2 + (-1)^2 + 2^2} \\ &= \sqrt{9 + 1 + 4} \end{aligned} $	A 1	
	$\begin{vmatrix} = \begin{pmatrix} -4 &1 & +2 \\ 2 & -2 & +2 \end{vmatrix} = \begin{pmatrix} -1 \\ 2 & -1 \end{vmatrix}$	A1	
	$\begin{bmatrix} 2 & -3 & +3 \\ 10 & \sqrt{(-2)^2 + (-1)^2 + 2^2} \end{bmatrix} $		
	$ \mathbf{f} = \sqrt{(-3)^2 + (-1)^2 + 2^2}$		
	$= \sqrt{9 + 1 + 4}$		
	$=\sqrt{14} + \underline{P} = 3.74$	B1	

	eeducationgroup.com	Mathematics paper 2 marking scheme
15.	(a) dy = (2x - 4)dx	
	$\int dy = \int (2x - 4) dx$	
	$y = \frac{2x^2}{2} - 4x + C$	
	$=x^{2} - 4x + C$	M1
	Passes through point (0,3) when $x = 0$, $y = 3$	
	C = 3	
	Required equations is	
	$y = x^2 - 4x + 3$	
	$y - x = \pi x + J$	A1
	dy	
	(b) $\frac{dy}{dx} = 0$	
	2x - 4 = 0, x = 2	
	Substitute $x = 2$ in the equation.	
	$y = 2^2 - 4(2) + 3$	
	y = 2 - 4(2) + 3 = 4 - 8 + 3	
	= -1	
		B1
	Hence turning point is (2,-1)	
	da	03
16.	$(a)\frac{ds}{dt} = (3t - t^2)$	
	$\int dt = \int 3t - t^2 dt$	
	$S = \frac{3}{2}t^2 - \frac{1}{3}t^3 + C$	B1
	(b) when $t = 0$, $s = 0$	
	$0 = \frac{3}{2}(0) - \frac{1}{3}(0)^3 + C$	
1	C = 0	
	$S = \frac{3}{2}t^2 - \frac{1}{2}t^3$	M1
	$t^2 \left(\frac{3}{2} - \frac{1}{3}t\right) = 0$	
		A1
	$t = 4.5 \ seconds$	
		03
17.	(a) Let cost of a cow be x	
	Let cost of a goat be y	
	3x + 25y = 75000x 2	B1
	2x + 33y = 69600 x 3 Both	
	6x + 50y = 150000	M1
	6x + 90y = 100000	1711
	-49y = -58800	
	y = 1200	A1
	$3 \times 30000 = 75000$	M1
	3x = 45000	A1
	x = 15000	
	Cow = Sh. 15000; Goat = Sh. 1200	
	(b) SP for cows = $\frac{140}{100}$ x 15000 x 3	M1
	= Sh. 63000	
		M1
	SP for goats $=\frac{150}{100} \times 1200 \times 25$	
	= Sh. 45000	A1
	Amount received = $63000 + 45000$	M1
	= Sh. 108000	A1
	- 511. 100000	10
		10
L	1	

18. (a) M maps P(x,y) onto P(x(x)') $m\binom{x}{y} = \binom{x}{y} = \binom{x}{y} = \binom{x}{x+3y}$ MI $M = \binom{3}{1} = \frac{3}{-2}$ MI $M = \binom{3}{1} = \frac{3}{-2}$ MI $M = \binom{3}{1} = \binom{3}{-2}$ MI $M = \binom{3}{1} = \binom{3}{-2}$ MI $M = \binom{3}{1} = \binom{3}{-2}$ MI $M = \binom{3}{1} = \binom{3}{1} = \binom{3}{2}$ MI $M = \binom{3}{1} = \binom{3}{1} = \binom{3}{2} = \binom{3}{1} = $	www.e	eeducationgroup.com	Mathematics paper 2 marking scheme
$ \begin{split} & m \Big(\begin{smallmatrix} \mathbf{y} \\ \mathbf{y} \\ = \Big(\begin{smallmatrix} \mathbf{y}_{1} \Big) = \Big(\begin{smallmatrix} \mathbf{y}_{1} + \mathbf{y}_{1} \\ \mathbf{x}_{1} + \mathbf{y}_{2} \Big) & A1 \\ & M1 \\ & M1 \\ & M1 \\ = M1 \\ & M1 = \begin{smallmatrix} 1 \\ \mathbf{M1} \\ & M1 = \begin{smallmatrix} 1 \\ \mathbf{M1} \\ \mathbf{M1} = \begin{smallmatrix} 1 \\ \mathbf{M1} \\ \mathbf{M1} = \begin{smallmatrix} 1 \\ \mathbf{M1} \\ \mathbf{M1} \\ \mathbf{M1} = \begin{smallmatrix} 1 \\ \mathbf{M1} \\ \mathbf{M1} \\ \mathbf{M1} = \begin{smallmatrix} 1 \\ \mathbf{M1} \\ M1$	18.	(a) M maps $P(x,y)$ onto $PI(x^I,y^I)$	
$\begin{array}{c} I = \begin{pmatrix} 3 & -2 \\ 3 & 3 \end{pmatrix} & A1 \\ (b) \text{ Det. } m = (3 \times 3) - (-2 \times 1) & A1 \\ m = 11 & A1 \\ M^{+} = \frac{1}{11} \begin{pmatrix} 3 & 2 \\ -1 & 3 \end{pmatrix} & M^{+} \\ (c) \text{ M} (A, B, C, D) = (A^{+}, B^{+}, C^{+}, D^{+}) \\ (c) \text{ M} (A, B, C, D) = (A^{+}, B^{+}, C^{+}, D^{+}) \\ \frac{1}{11} \begin{pmatrix} -3 & 2 \\ -1 & -1 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} 44 & -22 & 22 & 11 \\ -1 & 3 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} -42 & -22 & 21 \\ -1 & -3 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} -42 & -22 & 21 \\ -2 & 1 & -1 & -8 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} -42 & -22 & 21 \\ -2 & 1 & -1 & -3 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} -42 & -22 & 21 \\ -2 & 1 & -1 & -3 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} -42 & -22 & 21 \\ -2 & 1 & -1 & -3 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} -23 & -23 $		$\begin{pmatrix} x \end{pmatrix}$ $\begin{pmatrix} x^{I} \end{pmatrix}$ $\begin{pmatrix} 3x-2 \end{pmatrix}$	M1
$\begin{array}{c} I = \begin{pmatrix} 3 & -2 \\ 3 & 3 \end{pmatrix} & A1 \\ (b) \text{ Det. } m = (3 \times 3) - (-2 \times 1) & A1 \\ m = 11 & A1 \\ M^{+} = \frac{1}{11} \begin{pmatrix} 3 & 2 \\ -1 & 3 \end{pmatrix} & M^{+} \\ (c) \text{ M} (A, B, C, D) = (A^{+}, B^{+}, C^{+}, D^{+}) \\ (c) \text{ M} (A, B, C, D) = (A^{+}, B^{+}, C^{+}, D^{+}) \\ \frac{1}{11} \begin{pmatrix} -3 & 2 \\ -1 & -1 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} 44 & -22 & 22 & 11 \\ -1 & 3 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} -42 & -22 & 21 \\ -1 & -3 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} -42 & -22 & 21 \\ -2 & 1 & -1 & -8 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} -42 & -22 & 21 \\ -2 & 1 & -1 & -3 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} -42 & -22 & 21 \\ -2 & 1 & -1 & -3 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} -42 & -22 & 21 \\ -2 & 1 & -1 & -3 \end{pmatrix} & M^{+} \\ \frac{-1}{11} \begin{pmatrix} -23 & -23 $		$m(v) = (v^{I}) = (x + 3y)$	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		$M = \begin{pmatrix} 0 & -1 \\ 1 & 3 \end{pmatrix}$	A1
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		(b) Det. $m = (3 \times 3) - (-2x1)$	M1
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		= 11	A1
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		1(3 2)	B1
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		$M = \frac{1}{11} \begin{pmatrix} -1 & 3 \end{pmatrix}$	
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		(c) M (A, B, C,D) = $(A^{I}, B^{I}, C^{I}, D^{I})$	
$\frac{1}{11}\begin{pmatrix} 44 & -22 & 22 & 11 \\ -11 & -22 & 11 & -11 & -33 \end{pmatrix} = \begin{pmatrix} 4 & -2 & 2 & 2 & 11 \\ -2 & 1 & -1 & -3 & 32 \\ = \begin{pmatrix} 4 & -2 & 2 & 1 \\ -2 & 1 & -1 & -3 & 32 \\ 1 & -2 & 1 & -1 & -3 & 32 \\ 1 & -2 & -2 & -1 & -3 & 32 \\ 1 & -2 & -2 & -2 & -1 & 32 \\ 1 & -2 & -2 & -2 & -1 & 32 \\ 1 & -2 & -2 & -2 & -1 & -3 & 32 \\ 1 & -2 & -2 & -2 & -2 & -2 & -2 \\ 1 & -2 & -2 & -2 & -2 & -2 & -2 & -2 \\ 1 & -2 & -2 & -2 & -2 & -2 & -2 & -2 & $		$(A, B, C, D) = M^{-1} = (A^{I}, B^{I}, C^{I}, D^{I})$	
$\frac{1}{11}\begin{pmatrix} 44 & -22 & 22 & 11 \\ -11 & -22 & 11 & -11 & -33 \end{pmatrix} = \begin{pmatrix} 4 & -2 & 2 & 2 & 11 \\ -2 & 1 & -1 & -3 & 32 \\ = \begin{pmatrix} 4 & -2 & 2 & 1 \\ -2 & 1 & -1 & -3 & 32 \\ 1 & -2 & 1 & -1 & -3 & 32 \\ 1 & -2 & -2 & -1 & -3 & 32 \\ 1 & -2 & -2 & -2 & -1 & 32 \\ 1 & -2 & -2 & -2 & -1 & 32 \\ 1 & -2 & -2 & -2 & -1 & -3 & 32 \\ 1 & -2 & -2 & -2 & -2 & -2 & -2 \\ 1 & -2 & -2 & -2 & -2 & -2 & -2 & -2 \\ 1 & -2 & -2 & -2 & -2 & -2 & -2 & -2 & $		1(3 2)(16 - 8 8 9)	M1
$\begin{bmatrix} \frac{1}{11} \begin{pmatrix} 44 & -22 & 21 & 11 \\ -11 & -22 & 11 & -11 & -33 \end{pmatrix} \\ = \begin{pmatrix} 4 & -2 & 2 & 1 \\ -2 & 1 & -1 & -3 \end{pmatrix} \\ Hence A (4,-2), B(-2, 1), C(2,-1), D(1,-3) \end{bmatrix} $ 10 19. (a) From $\triangle PQT, PQ = \frac{50}{7an 25.4} \\ = 105.3m \\ A1 \\ B2 \\ \hline \\ 100 \\ \hline \\ 19. \\ (b) From \triangle PRT, PR = \frac{50}{7an 26.47} \\ = 23.63m \\ QR = PQ - PR = 105.3 - 23.63 \\ QR = 81.67m \\ QR = 81.67m \\ \hline \\ C) Distance = \frac{81.67}{1000} km; \\ Time = \frac{14}{100} h^{1} \\ Time = \frac{14}{100} h^{1} \\ \hline \\ C) Distance = \frac{81.67}{1000} x \frac{60 \times 60}{14} \\ = 21 km/hr \\ \hline \\ C) Distance of arc PQ = \frac{6370 km}{220} \\ Radius of arc PQ = \frac{20}{6370 km} \\ Distance of arc PQ = \frac{20}{200} x 2 x \frac{27}{2} x 6370 \\ = 2224km (4 s.f.) \\ \hline \\ (b) Distance in Nautical Miles \\ PQ = 60 \times 20 \\ = 1200Nm \\ \hline \\ C) Speed of aircraft \\ = 360nm/hr \\ Time taken = \frac{1200}{340} \\ Time taken = \frac{120}{340} \\ Time taken \\ Time taken$		$\frac{11}{11} \begin{pmatrix} -1 & 3 \end{pmatrix} \begin{pmatrix} -2 & 1 & -1 & -8 \end{pmatrix}$	
$\begin{bmatrix} \frac{1}{11} \begin{pmatrix} 44 & -22 & 21 & 11 \\ -11 & -22 & 11 & -11 & -33 \end{pmatrix} \\ = \begin{pmatrix} 4 & -2 & 2 & 1 \\ -2 & 1 & -1 & -3 \end{pmatrix} \\ Hence A (4,-2), B(-2, 1), C(2,-1), D(1,-3) \end{bmatrix} $ 10 19. (a) From $\triangle PQT, PQ = \frac{50}{7an 25.4} \\ = 105.3m \\ A1 \\ B2 \\ \hline \\ 100 \\ \hline \\ 19. \\ (b) From \triangle PRT, PR = \frac{50}{7an 26.47} \\ = 23.63m \\ QR = PQ - PR = 105.3 - 23.63 \\ QR = 81.67m \\ QR = 81.67m \\ \hline \\ C) Distance = \frac{81.67}{1000} km; \\ Time = \frac{14}{100} h^{1} \\ Time = \frac{14}{100} h^{1} \\ \hline \\ C) Distance = \frac{81.67}{1000} x \frac{60 \times 60}{14} \\ = 21 km/hr \\ \hline \\ C) Distance of arc PQ = \frac{6370 km}{220} \\ Radius of arc PQ = \frac{20}{6370 km} \\ Distance of arc PQ = \frac{20}{200} x 2 x \frac{27}{2} x 6370 \\ = 2224km (4 s.f.) \\ \hline \\ (b) Distance in Nautical Miles \\ PQ = 60 \times 20 \\ = 1200Nm \\ \hline \\ C) Speed of aircraft \\ = 360nm/hr \\ Time taken = \frac{1200}{340} \\ Time taken = \frac{120}{340} \\ Time taken \\ Time taken$			M1
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Hence A (4,-2), B(-2, 1), C(2,-1), D(1,-3) B2 19 (a) From \triangle PQT, PQ = $\frac{50}{Tan 25.4}$ M1 = 105.3m A1 (b) From \triangle PRT, PR = $\frac{50}{Tan 64.7}$ M1 = 23.63m A1 QR = PQ - PR = 105.3 - 23.63 M1 QR = 81.67m A1 (c) Distance = $\frac{81.67}{1000}$ km; B1 Time = $\frac{14}{600 \times 60}$ hr B1 Speed = $\frac{81.67}{1000}$ x $\frac{60 \times 60}{14}$ A1 = 21 km/hr A1 20. (a) Angle subtended between P and Q on great circle M1 7 + 13 = 20 ⁰ A1 B1 Distance of arc PQ = 6370km B1 Distance of arc PQ = 6370km B1 Distance of arc PQ = 20 × 2 × $\frac{22}{7}$ x 6370 M1 = 1200Nm A1 (c) Speed of aircraft A1 = 360mm/hr A1 = 360mm/hr A1 = 3200Nm A1 (c) Speed of aircraft A1 = 360mm/hr A1 = 360mm/hr A1 = 3 ¹ / ₃ hr A1 <td></td> <td>$-\frac{11}{11}(-22 11 -11 -33)$</td> <td></td>		$-\frac{11}{11}(-22 11 -11 -33)$	
Hence A (4,-2), B(-2, 1), C(2,-1), D(1,-3) B2 19 (a) From \triangle PQT, PQ = $\frac{50}{Tan 25.4}$ M1 = 105.3m A1 (b) From \triangle PRT, PR = $\frac{50}{Tan 64.7}$ M1 = 23.63m A1 QR = PQ - PR = 105.3 - 23.63 M1 QR = 81.67m A1 (c) Distance = $\frac{81.67}{1000}$ km; B1 Time = $\frac{14}{600 \times 60}$ hr B1 Speed = $\frac{81.67}{1000}$ x $\frac{60 \times 60}{14}$ A1 = 21 km/hr A1 20. (a) Angle subtended between P and Q on great circle M1 7 + 13 = 20 ⁰ A1 B1 Distance of arc PQ = 6370km B1 Distance of arc PQ = 6370km B1 Distance of arc PQ = 20 × 2 × $\frac{22}{7}$ x 6370 M1 = 1200Nm A1 (c) Speed of aircraft A1 = 360mm/hr A1 = 360mm/hr A1 = 3200Nm A1 (c) Speed of aircraft A1 = 360mm/hr A1 = 360mm/hr A1 = 3 ¹ / ₃ hr A1 <td></td> <td>$=\begin{pmatrix} 4 & -2 & 2 & 1 \\ 2 & -4 & -4 & -2 \end{pmatrix}$</td> <td>A1</td>		$=\begin{pmatrix} 4 & -2 & 2 & 1 \\ 2 & -4 & -4 & -2 \end{pmatrix}$	A1
$\frac{1}{19.} \text{(a) From } \Delta \text{ PQT, } \text{PQ} = \frac{50}{\text{Tan } 25.4} \\ = 105.3 \text{m} \\ \text{(b) From } \Delta \text{ PRT, } \text{PR} = \frac{50}{\text{Tan } 25.4} \\ = 23.63 \text{m} \\ \text{(b) From } \Delta \text{ PRT, } \text{PR} = \frac{50}{\text{Tan } 64.7} \\ = 23.63 \text{m} \\ \text{QR} = \text{PQ} - \text{PR} = 105.3 - 23.63 \\ \text{QR} = 81.67 \text{m} \\ \text{(c) Distance} = \frac{81.67}{1000} \text{km}; \\ \text{Time} = \frac{14}{60 \times 60} \text{hr} \\ \text{B1} \\ \text{Speed} = \frac{81.67}{1000} \text{x} \frac{60 \times 60}{14} \\ = 21 \text{km/hr} \\ \text{I0} \\ \text{20.} \text{(a) Angle subtended between P and Q on great circle} \\ 7 + 13 = 20^{\circ} \\ \text{Radius of arc } \text{PQ} = 6370 \text{km} \\ = 222 \text{km} (\text{Ar}) \\ \text{Comparence of arc } \text{PQ} = 6370 \text{km} \\ = 222 \text{km} (4 \text{ s.f.}) \\ \text{(b) Distance in Nautical Miles} \\ \text{PQ} = 60 \times 20 \\ = 1200 \text{Nm} \\ \text{(c) Speed of aircraft} \\ = 360 \text{m/hr} \\ \text{Time taken} = \frac{1200}{360} \\ = 3\frac{1}{3} \text{ hr} \\ \text{or } 3h 20 \text{ min} \\ \text{A1} \\ \end{array}$			
19. (a) From \triangle PQT, PQ = $\frac{50}{Tan 25.4}$ = 105.3m (b) From \triangle PRT, PR = $\frac{50}{Tan 64.7}$ = 23.63m QR = PQ - PR = 105.3 - 23.63 QR = 81.67m (c) Distance = $\frac{81.67}{1000}$ km; Time = $\frac{14}{60 \times 60}$ hr B1 Speed = $\frac{81.67}{1000} \times \frac{60 \times 60}{14}$ = 21km/hr 10 20. (a) Angle subtended between P and Q on great circle 7 + 13 = 20 ⁰ Kaller A1 Radius of arc PQ = 6370km Distance of arc PQ = 6370km B1 Distance of arc PQ = 36070km B1 Distance of arc PQ = 36070km B1 Distance of arc PQ = 370km B1 Distance of arc PQ = 370km B1 Distance of arc PQ = 6370km B1 Distance of arc PQ = 370km B1 Distance of arc PQ = 370km B1 A1 A1		$\pi \text{ence } A (4,-2), B(-2, 1), U(2,-1), D(1,-3)$	
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$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	19.	(a) From \triangle PQT, PQ = $\frac{50}{\text{Tan 25.4}}$	MI
(b) From $\triangle PRT$, $PR = \frac{50}{Tan 64.7}$ = 23.63m M1 QR = PQ - PR = 105.3 - 23.63 M1 QR = 81.67m A1 (c) Distance $= \frac{81.67}{1000}$ km; B1 $Time = \frac{14}{60 \times 60}$ hr B1 $Speed = \frac{81.67}{1000} \times \frac{60 \times 60}{14}$ A1 = 21km/hr A1 20. (a) Angle subtended between P and Q on great circle M1 $7 + 13 = 20^{0}$ A1 Radius of arc PQ = 6370km B1 Distance of arc PQ = $\frac{20}{360} \times 2 \times \frac{27}{2} \times 6370$ M11 = 2224km (4 s.f.) A1 (b) Distance in Nautical Miles M1 for 60 PQ = 60 x 20 = 1200Nm (c) Speed of aircraft = 360mm/hr Time taken $= \frac{1200}{360}$ M1 $= 3\frac{1}{3}$ hr or 3h 20 min A1 $PQ = 60 \times 20$ A1 A1		= 105.3m	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			
$\begin{array}{c c} QR = PQ - PR = 105.3 - 23.63 & M1 \\ QR = 81.67m & A1 \\ (c) Distance = \frac{81.67}{1000} km; & B1 \\ Time = \frac{14}{60 \times 60} hr & B1 \\ \hline Speed = \frac{81.67}{1000} x \frac{60 \times 60}{14} & M1 \\ = 21 km/hr & I0 \\ \hline \hline \hline \\ 20. & (a) Angle subtended between P and Q on great circle & M1 \\ 7 + 13 = 20^0 & A1 \\ Radius of arc PQ &= 6370 km & B1 \\ Distance of arc PQ &= 6370 km & B1 \\ Distance of arc PQ &= \frac{20}{360} x 2 x \frac{22}{7} x 6370 & A1 \\ = 2224 km (4 \text{ s.f.}) & M1 \\ (b) Distance in Nautical Miles & M1 for 60 \\ PQ &= 60 \times 20 & M1 \\ = 1200 Nm & A1 \\ \hline \\ (c) Speed of aircraft & A1 \\ = 360 nm/hr & M1 \\ Time taken &= \frac{1200}{360} & M1 \\ = 3\frac{1}{3} hr & A1 \\ \hline \end{array}$			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			
(c) Distance $=\frac{81.67}{1000}$ km; Time $=\frac{14}{60 \times 60}$ hrB1Speed $=\frac{81.67}{1000} \times \frac{60 \times 60}{14}$ $= 21$ km/hrB1101020. (a) Angle subtended between P and Q on great circle $7 + 13 = 20^0$ Radius of arc PQ $= 6370$ km Distance of arc PQ $= \frac{20}{360} \times 2 \times \frac{22}{7} \times 6370$ $= 2224$ km (4 s.f.)M1 A1(b) Distance in Nautical Miles $PQ = 60 \times 20$ $= 1200$ Nm (c) Speed of aircraft $= 360$ m/hr Time taken $= \frac{1200}{360}$ $= 3\frac{1}{3}$ hr or 3h 20 minM1 A1			
$\begin{array}{c c} & Time = \frac{1014}{60 \times 60} hr \\ Speed = \frac{81.67}{1000} x \frac{60 \times 60}{14} \\ = 21 km/hr \\ \hline \\ \hline \\ \hline \\ \hline \\ 20. & (a) Angle subtended between P and Q on great circle \\ 7 + 13 = 20^0 \\ Radius of arc PQ = 6370 km \\ Distance of arc PQ = \frac{20}{360} x 2 x \frac{22}{7} x 6370 \\ = 2224 km (4 \text{ s.f.}) \\ \hline \\ (b) Distance in Nautical Miles \\ PQ = 60 \times 20 \\ = 1200 Nm \\ (c) Speed of aircraft \\ = 360 nm/hr \\ Time taken = \frac{1200}{360} \\ = 3\frac{1}{3} hr \\ or 3h 20 \min \\ \hline \\ \end{array}$			
$\begin{array}{c c} & Time = \frac{1014}{60 \times 60} hr \\ Speed = \frac{81.67}{1000} x \frac{60 \times 60}{14} \\ = 21 km/hr \\ \hline \\ \hline \\ \hline \\ \hline \\ 20. & (a) Angle subtended between P and Q on great circle \\ 7 + 13 = 20^0 \\ Radius of arc PQ = 6370 km \\ Distance of arc PQ = \frac{20}{360} x 2 x \frac{22}{7} x 6370 \\ = 2224 km (4 \text{ s.f.}) \\ \hline \\ (b) Distance in Nautical Miles \\ PQ = 60 \times 20 \\ = 1200 Nm \\ (c) Speed of aircraft \\ = 360 nm/hr \\ Time taken = \frac{1200}{360} \\ = 3\frac{1}{3} hr \\ or 3h 20 \min \\ \hline \\ \end{array}$		(c) Distance = $\frac{81.67}{1000}$ km;	B1
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Distance of arc PQ = $\frac{20}{360}$ x 2 x $\frac{22}{7}$ x 6370 = 2224km (4 s.f.) (b) Distance in Nautical Miles PQ = 60 x 20 = 1200Nm (c) Speed of aircraft = 360nm/hr Time taken = $\frac{1200}{360}$ = $3\frac{1}{3}$ hr or 3h 20 min M1 A1 M1 A1 M1 A1 M1 A1			
= 2224 km (4 s.f.) (b) Distance in Nautical Miles PQ = 60 x 20 = 1200Nm (c) Speed of aircraft = 360nm/hr Time taken = $\frac{1200}{360}$ = $3\frac{1}{3}$ hr or 3h 20 min M1 for 60 M1 A1 M1 A1 M1 A1 M1 A1		$\frac{1}{20} = \frac{20}{2} = \frac{22}{22} = \frac{22}{2}$	
= 2224 km (4 s.f.) (b) Distance in Nautical Miles PQ = 60 x 20 = 1200Nm (c) Speed of aircraft = 360nm/hr Time taken = $\frac{1200}{360}$ = $3\frac{1}{3}$ hr or 3h 20 min M1 for 60 M1 A1 M1 A1 M1 A1 M1 A1		Distance of arc PQ = $\frac{1}{360}$ x 2 x $\frac{1}{7}$ x 6370	
PQ = 60 x 20 = 1200Nm (c) Speed of aircraft = 360nm/hr Time taken = $\frac{1200}{360}$ = $3\frac{1}{3}$ hr or 3h 20 min M1 for 60 M1 A1 M1 A1 A1		= 2224km (4 s.f.)	
PQ = 60 X 20 = 1200Nm (c) Speed of aircraft = 360nm/hr Time taken = $\frac{1200}{360}$ = $3\frac{1}{3}$ hr or 3h 20 min M1 A1 M1 A1 A1		(b) Distance in Nautical Miles	M1 for 60
$ \begin{array}{c c} = 1200 \text{Nm} \\ \text{(c) Speed of aircraft} \\ = 360 \text{nm/hr} \\ \text{Time taken} = \frac{1200}{360} \\ = 3\frac{1}{3} \text{ hr} \\ \text{or 3h 20 min} \end{array} $		$PQ = 60 \times 20$	
(c) Speed of aircraft = 360nm/hr Time taken = $\frac{1200}{360}$ = $3\frac{1}{3}$ hr or 3h 20 min M1 A1		= 1200Nm	
Time taken = $\frac{1200}{360}$ = $3\frac{1}{3}$ hr or 3h 20 min M1 A1		(c) Speed of aircraft	
$= 3\frac{1}{3} hr$ or 3h 20 min A1		= 360nm/hr	
$= 3\frac{1}{3} hr$ or 3h 20 min A1		Time taken = $\frac{1200}{100}$	M1
or 3h 20 min A1			1VI 1
of 5h 20 min		$=3\frac{2}{3}$ hr	
		or 3h 20 min	AI
			10

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21.	(a) Total number of fowls in sample $30 + 18 = 48$	54	
	(i) P (Treated) $=\frac{30}{48}=\frac{5}{8}$	B1	
	(ii) P (not treated) = $\frac{18}{48} = \frac{3}{8}$	B1	
	$\frac{1}{2}$ /D — TD		
	(b) $\frac{5}{8}$ T $\frac{10}{9}$ DI TDI		
	$\frac{8}{10}$ $\frac{9}{10}$ D^{I} $-TD^{I}$		
	$\frac{3}{10}$ D — T ⁱ D		
	10 $^{\prime}D^{I}$ — $T^{I}D^{I}$		
	() D(TD) 5 1	M1	
	(i) P(TD) $=\frac{5}{8}x\frac{1}{10}$	M1 A1	
	$=\frac{1}{16}$		
	$=\frac{1}{16}$ (ii) P(T ^I D) $=\frac{3}{8}x\frac{7}{10}$	M1	
	(ii) $P(TD) = \frac{3}{8} \frac{x}{10}$ $= \frac{21}{80}$ (iii) $P(TD^{I}) = \frac{5}{8} \frac{y}{10}$ $= \frac{9}{16}$ (iv) $P(T^{I}D^{I}) = \frac{3}{2} \frac{x}{3} \frac{3}{10}$	A1	
	(iii) $P(TD^{I}) = \frac{5}{8} x \frac{9}{10}$	M1	
	$=\frac{9}{16}$	A1	
	(iv) $P(T^{I}D^{I}) = \frac{3}{3}x \frac{3}{3}$	M1	
	$= \frac{9}{16}$ (iv) P(T ^I D ^I) = $\frac{3}{8} \times \frac{3}{10}$ $= \frac{9}{80}$	A1	
	80	10	
22.	(a) (i) $PQ = PO + OQ$		
	= -p + q or q - p (ii) OR = OP + PR	B1	
	(n) OK = OI + IK = $n + \frac{2}{(-n + a)}$	M1	
	$= p + \frac{2}{3}(-p + q) = \frac{1}{3}p + \frac{2}{3}q$		
	$\begin{array}{c} -{}_{3}p + {}_{3}q \\ \text{(iii) } SQ = SO + OQ \end{array}$	A1	
	$= -\frac{3}{2}OP + OO$		
	$= -\frac{3}{4}OP + OQ$ $= -\frac{3}{4}p + q \text{ or } q - \frac{3}{4}p$	D 1	
		B1	
	(b) OT = $n(\frac{1}{3}p + \frac{2}{3}q)$	B1	
	From DOST		
	OT = OS + ST		
	$=\frac{3}{4}p + m(\frac{3}{4}p + q)$	M1	
	$\frac{n}{3}p + \frac{2n}{3}q = \left(\frac{3}{4} - \frac{3}{4}m\right)p + mq$	M1	
		1411	
	$\frac{n}{3} = \frac{3}{4} - \frac{3m}{4}$		
	4n + 9m = 9(i)	M1	
	$\frac{2n}{3} = m, M = \frac{2n}{3}$ (ii)	1411	
	$4n+9\left(\frac{2n}{3}\right)=9$	M1	
	4n + 6n = 9 $10n = 9$		
	$n = \frac{9}{2}$	Both	
	$n = \frac{9}{10}$ $M = \frac{2}{3} x \frac{9}{10} = \frac{3}{5}$	A1	
	$1 V I - \frac{1}{3} X \frac{1}{10} - \frac{1}{5}$		
		10	

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23.	(a) Locus of P		Constr. of 60° at B – B1 Dissecting 60° – B1 Identify point C and
	B D C	drawing line AC – B1	
	 (b) Measurement, BC = 7.5cm (c) ∠BAC is angle at centre while ∠BPC is angle at circumference and I chord. 	7.5±0.1cm B1 Indent A – B1 Arc BPC drawn B1	
	$\therefore \angle BAC = 2\angle BPC$ (d) $AD = 2.2cm$		For constr. ✓ perp.B1
			2.2±0.1 cm B1
	(e) Area $\angle ABC = \frac{1}{2} \times BC \times AD$		2.2±0.1 CIII D1
	$=\frac{1}{2} \times 7.5 \times 2.2$	M1 follow through	
	$= 8.25 \text{cm}^2$		A1 auestion
			10
24.	(a) $A = KB^{n}$ Log A = Log KBn $= Log k + log KB^{n}$ = nlogB + LogK	M1 A1	
	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	B2	
	Log A 0.8 0.6 0.4 0.2 0.2 0.4 0.6 0.8 1.0 Log B		S1 P1 L1
	(c) Gradient of line $=\frac{0.65-0.18}{1.06-0.2} = 0.5465$ n = 0.5	M1 A1	
	Hence Log K = 0.07 K = $10^{0.07} = 1.175$ = 1.2 (1 d.p)	B1	
		10	