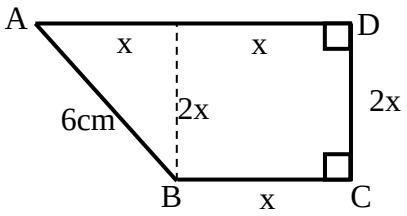
MACHAKOS COUNTY KCES TRIAL AND PRACTICE EXAMINATION 2015

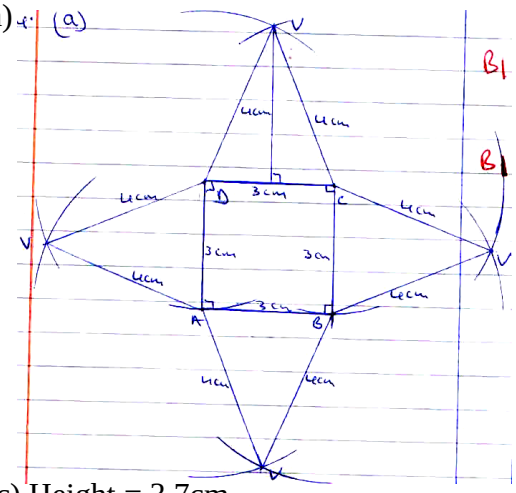
121/1

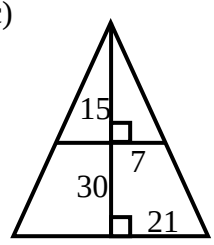
MATHEMATICS PAPER 1

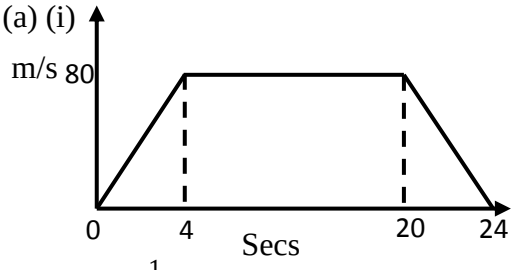
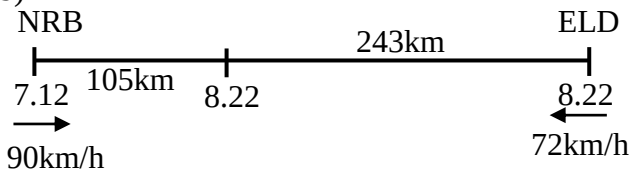
MARKING SCHEME

1.	$\frac{\frac{5}{6}\ of\ \left(\frac{13}{3}-\frac{23}{6}\right)}{\frac{5}{12}\ x\ \frac{3}{25}+\frac{14}{9}\ x\ \frac{3}{7}}$ $=\frac{\frac{5}{6}x\frac{3}{6}}{\frac{1}{20}+\frac{2}{3}}$ $=\frac{\frac{5}{12}}{\frac{43}{60}}$ $=\frac{5}{12}$ x $\frac{60}{43}$ $=\frac{25}{43}$	M1 M1 A1	For $\frac{5}{12}$ For $\frac{43}{60}$ for answer
		03	
2.	$\sqrt{\frac{\overset{18}{\cancel{504}}\ x\ \overset{1}{\cancel{143}}\ x\ 910\ x\ 10}{\underset{1}{\cancel{28}}\ x\ 117\ x\ \underset{2}{\cancel{286}}\ x\ 7}}$ $=\sqrt{\frac{\overset{9}{\cancel{18}}\ x\ \overset{130}{\cancel{910}}\ x\ 10}{117\ x\ \underset{1}{\cancel{2}}\ x\ \underset{1}{\cancel{7}}}}$ $=\sqrt{\frac{9\ x\ 13\ x\ 100}{117}}$ $=\sqrt{100}$ $= 10$	M1 M1 A1	Simplify up to perfect square $\sqrt{100}$
		03	
3.	$\left(\frac{3^3}{2^3}\right)^{x+7}=\left(\frac{2^2}{3^2}\right)^{-3x}$ $\left(\frac{3}{2}\right)^{3(x+7)}=\left(\frac{3}{2}\right)^{6x}$ $3(x + 7) = 6x$ $3x + 21 = 6x$ $x = 7$	M1 M1 A1	
		03	
4.	$30 = 2 \times 3 \times 5$ $50 = 2 \times 5^2$ $35 = 5 \times 7$ L.C.M $= 2 \times 3x\ 5^2 \times 7$ $= 1050$ mins 17 hrs 30 mins Time = 7.18 +17.30 2448 $\Rightarrow$ 12.48 a.m. Tuesday	B1 M1 A1	 For addition (Accept 0048h Tuesday)
		03	

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

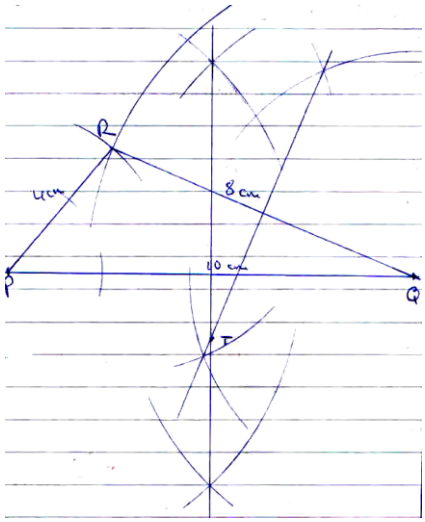
10.	$\frac{2x-4}{12-3x^2} - \frac{1}{3x+6}$ $\frac{2(x-2)}{3(2-x)(2+x)} - \frac{1}{3(x+2)}$ $-\frac{2}{3(2+x)} - \frac{1}{3(x+2)}$ $= -\frac{1}{x+2}$	M1 M1 A1	For ✓ factorization
		03	
11.	Present 4 yrs ago Daugther $\Rightarrow$ x x – 4 Mother $\Rightarrow$ 2.5x 2.5x – 4 $\frac{x-4}{2.5x-4} = \frac{1}{3}$ 3x – 12 = 2.5x – 4 0.5x = 8 x = 16 Mother = 2.5 x 16 = 40 years	M1 A1 B1	
		3	
12.	5y + 2x – 7 = 0 $y = -\frac{2}{5}x + \frac{7}{5}$ Gr. Line = $-\frac{2}{5}$ $\frac{k-5}{3--2} = \frac{-2}{5}$ k – 5 = -2 k = 3	B1 B1 A1	
		03	
13.	20000 x 147.86 = 2,957,200 $\frac{2957200-2512000}{74.50}$ = 5975.84	M1 M1 A1	
		03	
14.	(a)  (c) Height = 3.7cm		B1 ✓ Lines & angles drawn (allow ± 0.1cm) B1 ✓ Labelling B1 (Allow ± 0.1 cm)
			3

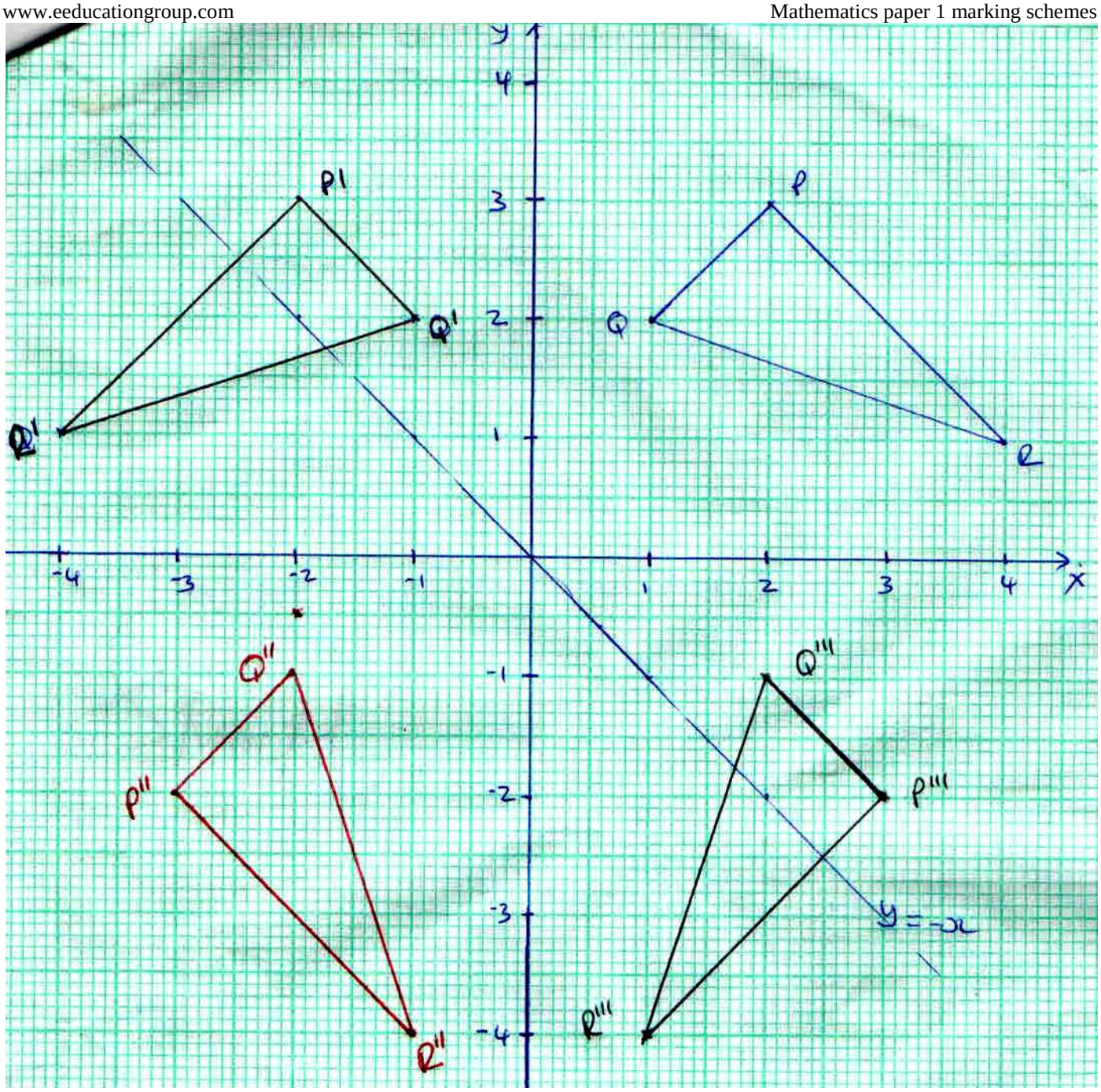
15.	No. | Log 849.6 | 2.9292 2.41 | 0.3820+ | 3.3112 3941 | 3.5956- | $\bar{1}$.7156 | ÷ 3 8.039×10^{-1} | $\bar{1}$.9052 = 0.8039	M1 M1 M1 A1	✓ 3 Logs For addition and subtraction For ✓ ÷ 3
		04	
16.	$\frac{1}{0.3654} - 4.151^2$ $\frac{1}{0.3654} \Rightarrow 2.737$ $4.151^2 \Rightarrow 17.231$ 2.737 – 17.231 = -14.494	B1 M1 A1	For both
		03	
17.	(a) Original members = x Original each = $\frac{180000}{x}$ Later each = $\frac{180,000}{x-3}$ $\frac{180,000}{x-3} - \frac{18000}{x} = 3000$ $\frac{60}{x-3} - \frac{60}{x} = 1$ $60x - 60x + 180 = x^2 - 3x$ $x^2 - 3x - 180 = 0$ $(x - 15)(x + 12) = 0$ $x = 15$ (b) $\frac{180,000}{15}$ = 12000 (c) Increase = 3000 $\frac{3000}{12000} \times 100$ = 25%	B1 B1 M1 M1 M1 A1 M1 A1 M1 A1	✓ Factorization
		10	
18.	(a) r : R = 1:3 (b) $\frac{7}{R} = \frac{1}{3}$ R = 21cm (c)  Vol. Big cone = $\frac{1}{3} \times \frac{22}{7} \times 21^2 \times 45$ = 20790cm^3 Vol. Small cone = $\frac{1}{3} \times \frac{22}{7} \times 7^2 \times 15$	B1 M1 A1 M1 M1	Alternative method: L.S.F = 1:3 V.S.F = 1:27 V.S.F frustum = 26 ∴ Vol. = 26 x 770 = 20020

	= 770cm^3 Vol. of frustrum = 20790 – 770 = 20020cm^3 (d) Vol. tank = 150 x 120 x 180 Buckets = $\frac{150\ x\ 120\ x\ 80}{20020}$ = 71.93 ≅ 72 full buckets	M1 M1 A1 B1	For subtraction
		10	
19.	(a) (i)  Distance = $\frac{1}{2}$ (16 + 24) x 80 = 1600m (ii) -$\frac{80}{4}$ = - 20m/s^2 (b)  Relative distance = 348 – $\left(90x\frac{7}{6}\right)$ = 243km Relative speed = 162km/hr Time taken = $\frac{243}{162}$hrs = 1.5 hrs Time = 8.22 + 1hr 30 mins = 9.52 a.m. (c) 90 x 2$\frac{2}{3}$km = 240km	M1 A1 M1 A1 B1 M1 M1 A1 M1 A1	Accept deccel. = $\frac{80}{4}$ = 20m/s^2 For both R.D & R.S OR 348 – (1.5 x 72) = 240km
		10	
20.	(a) (i) Modal class = 30 – 39 Mean = $\frac{4449}{82}$	B1 B1 B1 M1	 = For ✓x column For ✓ fx column

Marks	x	f	fx	cf
20-29	24.5	3	73.5	3
30-39	34.5	18	621	21
40-49	44.5	13	578.5	34
50-59	54.5	14	763	48
60-69	64.5	17	1096.5	65
70-79	74.5	12	894	77
80-89	84.5	5	422.5	82
			4449	

	= 54.2561 ≅ 54.26 (ii) Median = $49.5 + \frac{41-34}{14}$ x 10 = 54.5 Diff = 54.5 – 54.26 = 0.24	 A1 B1 M1 A1	 Correct to 2 d.p For cumulative freq.
		10	
21.	(a) A : B : C 25=: 30/= : 45/= 5 : 2 : 1 100% = $\frac{(5\ x\ 25)+(30\ x\ 2)+(45\ x\ 1)}{5+2+1}$ = 28.75/= 20% profit = $\frac{20}{100}$ x 28.75 = 5.75/= (b) A = 27.5/= B = 33/= C = 49.5/= ∴ 100% = $\frac{(27.5\ x\ 5)+(33\ x\ 2)+(49.5\ x\ 1)}{5+2+1}$ = 31.625 % Profit = 1.15 x 31.625 = 36.36875 ≅ 36.50 (c) 45 – 36.50 = 8.50 % Profit = $\frac{8.5}{36.5}$ x 100 = 23.29%	 M1 A1 M1 A1 M1 M1 A1 M1 M1 A1	 ✓ Expression for profit
		10	
22.	(a) $5.9^2 = 7.8^2 + 6.6^2 – 2(7.8)(6.6)\ Cos\ P$ Cos P = $\frac{69.59}{102.96}$ P = 47.48^0 (b) $\frac{5.9}{Sin47.48^0} = 2R$ R = $\frac{5.9}{2Sin47.48^0}$ = 4.002cm (c) Area of Δ = $\frac{1}{2}$ x 7.8 x 6.6 Sin 47.48^0 = $18.97cm^2$ Area of circle = 3.142 x 4.002^2 = 50.32 Shaded area = 50.32 -18.97 31.35cm^2	M1 M1 A1 M1 M1 A1 M1 M1 M1 M1 A	 For making Cos P subject ✓ Expression for area of triangle * Follow through for other π values ✓ Expression for area of circle For subtraction
		10	

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


y
x
4
3
2
1
-1
-2
-3
-4
-4
-3
-2
-1
1
2
3
4
P1
Q1
R1
P
Q
R
Q''
P''
R''
Q'''
P'''
R'''
y = -x

MACHAKOS COUNTY KCSE TRIAL AND PRACTICE EXAMINATION 2015

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MATHEMATICS PAPER 2

MARKING SCHEME

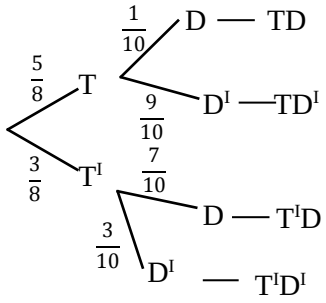
1.	(a) Working area = 25 x 16 = 400cm^2 Maximum area = 25.5 x 16.5cm^2 = 420.75 cm^2 Minimum area = 24.5 x 15.5 = 379.75cm^2 Max. possible error = 420.75 – 400 or 400 – 379.75 = ± 20.75 (b) % error in area = $\frac{\text{Absolute error}}{\text{Working } area}$ x 100 = $\frac{20.75}{400}$ x 100 = 5.1%	B1 M1 A1	
		03	
2.	This is a GP with 1st term ,a = 3 million and common ratio, r = 2 Required is the 7th term of GP Tn = ar^{n-1} 7th term, T_7 = ar$^{7-1}$ = ar^6 = 3 x 2^6 = 3 x 64 = 192 million	M1 A1	
		02	
3.	Cos$^2\theta$ + Sin$^2\theta$ = 1 Cos$^2\theta$ = 1 – Sin$^2\theta$ 6(1 – Sin$^2\theta$) – Sin θ - 4 = 0 6Sin^{2}0 + Sin θ - 2 = 0 Let y = Sin θ ⇒ 6y^2 + y – 2 = 0 6y^2 – 3y + 4y – 2 = 0 3y(2y – 1) + 2(2y – 1) = 0 (3y + 2) (2y – 1) = 0 3y + 2 = 0 3y = -2 y =- $\frac{2}{3}$ or 2y – 1 = 0 2y = 1 y = $\frac{1}{2}$ Sin θ = $\frac{-2}{3}$ or ½ Hence θ = 30^0, 150^0	M1 M1 A1	
		03	
4.	x^2 – 8x + y^2 + 12y = -16 x^2 – 8x + 16 + y^2 + 12y + 36 = -16 + 16 + 36 Expressions as perfect squares (x – 4)^2 + (y + 6)^2 = 36 (x – a)^2 + (y – b) = r^2 a = 4 b = - 6 r = $\sqrt{36}$ = 6 Centre(4,-6) and radius = 6 units	M1 A1	
		02	

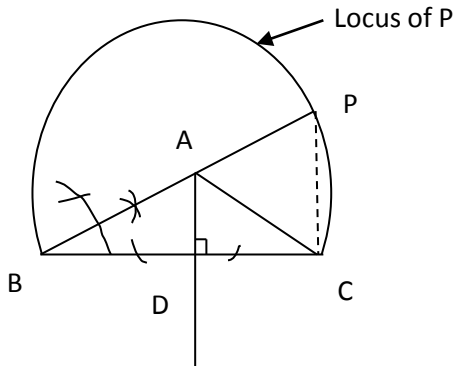
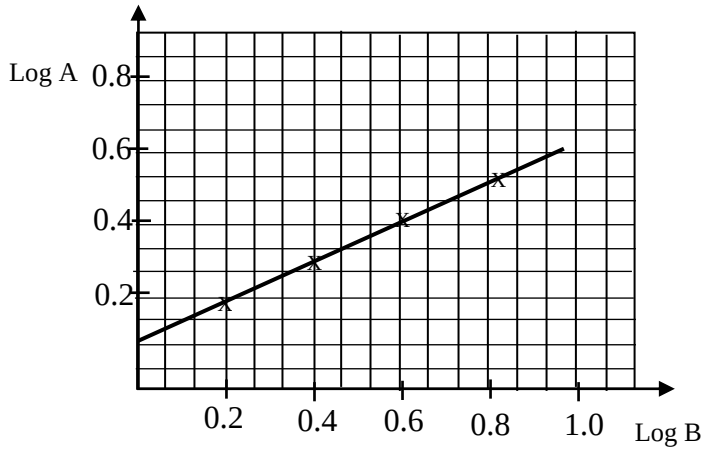
5.	$P = L + KQ^2$ where K and L are constants $40 = L + 4K$ ----------(i) $65 = L + 9K$ ----------(ii) } Both $-25 = -5K$ $K = 5$ Subst. for K in eqn (i) $L + 20 = 40$ $L = 20$ Hence $P = 20 + 5Q^2$ when $Q = 4$ $P = 20 + 5(4)^2$ $= 100$	B1 M1 M1 A1	
6.	(a) Modal class is 50 – 54 (b) Median = $49.5 + \left(\frac{\frac{45}{2}-14}{15}\right)5$ $= 51.5$kg	B1 M1 A1	
7.	Determinant of T = Area scale factor Det. T = $\frac{10}{2.5} = 4$ Hence $a(a-2) - (-2a) = 4$ $a^2 - 2a + 2a = 4$ $a^2 = 4$ $a = \pm 2$ When a = 2, T = $\begin{pmatrix} 0 & -2 \\ 2 & 2 \end{pmatrix}$ When a = -2, T = $\begin{pmatrix} -4 & -2 \\ -2 & -2 \end{pmatrix}$	 M1 A1 B1 B1	
		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)	B1 M1 A1	
		03	
9.	$\text{Log}(x-1) = \text{Log}\,12 - \text{Log}(x-2)$ $= \text{Log}\left(\frac{12}{x-2}\right)$ $x - 1 = \frac{12}{x-2}$ $(x-1)(x-2) = 12$ $x^2 - 3x + 2 = 12$ $x^2 - 3x - 10 = 0$ $x^2 + 2x - 5x - 10 = 0$ $x(x+2) - 5(x+2) = 0$ $(x-5)(x+2) = 0$ $x - 5 = 0$ $x = 5$ $x + 2 = 0$ $x = -2$ Drop the –ve value $x = 5$	 M1 M1 A1	`
		03	

10.	(a) $\angle BDC = \angle PBC = 35^0$ ($\angle$s in a alt seg.) In $\angle ABC$, $\angle ABC = 90^0$ ($\angle$in semicircle) and $\angle BAC = \angle BDC = 35^0$ s ($\angle$s in same seg.) $\therefore \angle ACB = 180 - (90 + 35)$ ($\angle$sum of Δ) $= 55^0$	B1 B1 B1	
		03	
11.	Cross – multiply both equation we have $4x - 4 = y + 1 \Rightarrow 4x - y = 5$ $3x + 3 = 2y - 2 \Rightarrow 3x - 2y = -5$ $4x - y = 5$ $3x - 2y = -5$ $8x - 2y = 10$ $3x - 2y = -5$ - $5x = 15$ $x = 3$✓ Substitute for x in equation (i) $12 - y = 5$ $y = 7$ ✓	 B1 M1 Both A1	
12.	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	
		A1	
13.	$3y\left(q + \frac{1}{x}\right) = y\left(q + \frac{1}{x}\right) + P$ $3qy + \frac{3y}{x} = qy + \frac{y}{x} + P$ $3qy - qy = \frac{y}{x} - \frac{3y}{x} + P$ $2qy = P - \frac{2y}{x}$ $\frac{2y}{x} = P - 2qy$ $x = \frac{2y}{P-2qy}$ or $x = \frac{-2y}{2yq-P}$	 M1 M1 A1	
		03	
14.	$\underset{\sim}{p} = 2\underset{\sim}{a} - \frac{1}{3}\underset{\sim}{b} + \underset{\sim}{c}$ $= 2\begin{pmatrix}1\\-2\\1\end{pmatrix} - \frac{1}{3}\begin{pmatrix}6\\-3\\9\end{pmatrix} + \begin{pmatrix}-3\\2\\3\end{pmatrix}$ $= \begin{pmatrix}2 & -2 & +-3\\-4 & --1 & +2\\2 & -3 & +3\end{pmatrix} = \begin{pmatrix}-3\\-1\\2\end{pmatrix}$ $\lvert\underset{\sim}{P}\rvert = \sqrt{(-3)^2 + (-1)^2 + 2^2}$ $= \sqrt{9 + 1 + 4}$ $= \sqrt{14}$ + $\lvert\underset{\sim}{P}\rvert = 3.74$	M1 A1 B1	

15.	(a) $dy = (2x - 4)dx$ $\int dy = \int (2x - 4)dx$ $y = \frac{2x^2}{2} - 4x + C$ $= x^2 - 4x + C$ Passes through point (0,3) when x = 0, y = 3 C = 3 Required equations is $y = x^2 - 4x + 3$ (b) $\frac{dy}{dx} = 0$ $2x - 4 = 0$, x = 2 Substitute x = 2 in the equation. $y = 2^2 - 4(2) + 3$ $= 4 - 8 + 3$ = -1 Hence turning point is (2,-1)	M1 A1 B1	
		03	
16.	(a) $\frac{ds}{dt} = (3t - t^2)$ $\int ds = \int 3t - t^2)\, dt$ $S = \frac{3}{2}t^2 - \frac{1}{3}t^3 + C$ (b) when t = 0, s = 0 $0 = \frac{3}{2}(0) - \frac{1}{3}(0)^3 + C$ C = 0 $S = \frac{3}{2}t^2 - \frac{1}{3}t^3$ $t^2\left(\frac{3}{2} - \frac{1}{3}t\right) = 0$ $t = 4.5\ seconds$	B1 M1 A1	
		03	
17.	(a) Let cost of a cow be x Let cost of a goat be y $3x + 25y = 75000 \times 2$ $2x + 33y = 69600 \times 3$ Both $6x + 50y = 150000$ $6x + 99y = 208800$ - $-49y = -58800$ $y = 1200$ $3 \times 30000 = 75000$ $3x = 45000$ $x = 15000$ Cow = Sh. 15000; Goat = Sh. 1200 (b) SP for cows = $\frac{140}{100} \times 15000 \times 3$ = Sh. 63000 SP for goats = $\frac{150}{100} \times 1200 \times 25$ = Sh. 45000 Amount received = 63000 + 45000 = Sh. 108000	B1 M1 A1 M1 A1 M1 M1 A1 M1 A1	
		10	

18.	(a) M maps P(x,y) onto PI(x^I,y^I) $m\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} x^I \\ y^I \end{pmatrix} = \begin{pmatrix} 3x-2 \\ x+3y \end{pmatrix}$ $M = \begin{pmatrix} 3 & -2 \\ 1 & 3 \end{pmatrix}$ (b) Det. m = (3 x 3) – (-2x1) = 11 $M^{-1} = \frac{1}{11}\begin{pmatrix} 3 & 2 \\ -1 & 3 \end{pmatrix}$ (c) M (A, B, C,D) = (A^I, B^I, C^I,D^I) (A, B, C,D) = M^{-1} = (A^I, B^I, C^I,D^I) $\frac{1}{11}\begin{pmatrix} 3 & 2 \\ -1 & 3 \end{pmatrix}\begin{pmatrix} 16 & -8 & 8 & 9 \\ -2 & 1 & -1 & -8 \end{pmatrix}$ $= \frac{1}{11}\begin{pmatrix} 44 & -22 & 22 & 11 \\ -22 & 11 & -11 & -33 \end{pmatrix}$ $= \begin{pmatrix} 4 & -2 & 2 & 1 \\ -2 & 1 & -1 & -3 \end{pmatrix}$ Hence A (4,-2), B(-2, 1), C(2,-1), D(1,-3)	M1 A1 M1 A1 B1 M1 M1 A1 B2	
		10	
19.	(a) From Δ PQT, PQ = $\frac{50}{\text{Tan } 25.4}$ = 105.3m (b) From Δ PRT, PR = $\frac{50}{\text{Tan } 64.7}$ = 23.63m QR = PQ – PR = 105.3 – 23.63 QR = 81.67m (c) Distance = $\frac{81.67}{1000}$km; Time = $\frac{14}{60\ x\ 60}$ hr Speed = $\frac{81.67}{1000}$ x $\frac{60\ x\ 60}{14}$ = 21km/hr	M1 A1 M1 A1 M1 A1 B1 B1 M1 A1	
		10	
20.	(a) Angle subtended between P and Q on great circle 7 + 13 = 20^0 Radius of arc PQ = 6370km 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 B1 M1 A1 M1 for 60 M1 A1 M1 A1	
		10	

21.	(a) Total number of fowls in sample 30 + 18 = 48 (i) P (Treated) = $\frac{30}{48} = \frac{5}{8}$ (ii) P (not treated) = $\frac{18}{48} = \frac{3}{8}$ (b)  (i) P(TD) $= \frac{5}{8} \times \frac{1}{10}$ $= \frac{1}{16}$ (ii) P(T^ID) $= \frac{3}{8} \times \frac{7}{10}$ $= \frac{21}{80}$ (iii) P(TD^I) $= \frac{5}{8} \times \frac{9}{10}$ $= \frac{9}{16}$ (iv) P(T^ID^I) $= \frac{3}{8} \times \frac{3}{10}$ $= \frac{9}{80}$	B1 B1 M1 A1 M1 A1 M1 A1 M1 A1	
		10	
22.	(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 = $\left(\frac{3}{4} - \frac{3}{4}m\right)$p + mq $\frac{n}{3} = \frac{3}{4} - \frac{3m}{4}$ 4n + 9m = 9…… (i) $\frac{2n}{3}$ = m, M = $\frac{2n}{3}$ ……....(ii) $4n + 9\left(\frac{2n}{3}\right) = 9$ 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	

23.	(a)  (b) Measurement, BC = 7.5cm (c) ∠BAC is angle at centre while ∠BPC is angle at circumference and BC is a chord. ∴ ∠BAC = 2∠BPC (d) AD = 2.2cm (e) Area ∠ABC = $\frac{1}{2}$ x BC x AD = $\frac{1}{2}$ x 7.5 x 2.2 = 8.25cm^2		Constr. of 60^0 at B – B1 Dissecting 60^0 – B1 Identify point C and drawing line AC – B1 7.5±0.1cm B1 Indent A – B1 Arc BPC drawn B1 For constr. ✓ perp.B1 2.2±0.1 cm B1 M1 } follow through A1 } question
		10	
24.	(a) A = KB^n Log A = Log KBn = Log k + log KB^n = nlogB + LogK	M1 A1	
	(b) Log 0.18 0.29 0.40 0.51 0.65 Log 0.20 0.40 0.60 0.81 1.06	B2	
	 		S1 P1 L1
	(c) Gradient of line = $\frac{0.65-0.18}{1.06-0.2}$ = 0.5465 n = 0.5 Hence Log K = 0.07 K = $10^{0.07}$ = 1.175 = 1.2 (1 d.p)	M1 A1 B1	
		10	