MATHEMATICS

Form 4 term 3

Paper 2

MARKING SCHEME

SECTION I

	WORKING	MARKS	GUIDELINES

1.	<table><tr><td>No.</td><td>Log</td></tr><tr><td>24.36 0.066547 1.48 10^{-1}x9.045 0.9045</td><td>1.3867 -2.8231 0.2098 0.1703 X 2 0.3406 0.2098 0.3406 $-1.8692 x \frac{1}{3}$ $\frac{\bar{3}}{3} + \frac{-2.8692}{3}$ =-1.9564</td></tr></table> = 0.9045	M1 M1 M1 A1	✓logs All ✓ Addn & Subtr ✓Attempt to divided by 3
		4	
2.	Error = $\frac{1}{2}$ x 0.1 = $\pm$ 0.05cm Actual length = 12.5 + 24.5 + 12.9 + 10.1 = 60.0 Max length = 12.55 + 24.55 + 12.95 + 10.15 = 60.20 Min length = 12.45 + 24.45 + 12.85 + 10.05 = 59.80 A.E. = $\frac{\text{Max} - \text{Min}}{2}$ = $\frac{60.20 - 59.80}{2}$ P.E. = $\frac{0.2 \times 100}{60}$ = 0.3%	M1 M1 A1	
		3	
3.	X R = $\frac{4.8 \times 5}{6}$ = 4 QT^2 = PT x RT QT2 = 18 x 8 QT = $\sqrt{144}$ QT = 12cm	M_1 M1 A_1	
		3	
4.	<table><tr><td>X</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr></table>	M1	

	<table><tr><td>y</td><td>5</td><td>2</td><td>1</td><td>2</td><td>5</td><td>10</td><td>17</td></tr></table> Area = $\frac{1}{2}$ (5 + 17 + 2(2 + 1 + 2 + 5 + 10) = 31 sq. Units	M1 A1	
		3	
5.	$x = \sqrt{\frac{t\,p}{2\,\mu+p}}$ $x^2 = \frac{t\,p}{2\,\mu + p}$ $2\mu\,x^2 + px^2 = tp$ $2\mu\,x^2 = tp - px^2$ $2\mu\,x^2 = p(t - x^2)$ $p = \frac{2\mu x^3}{t - x^3}$	M_1 M1 A_1	(squaring on both sides)
		3	
6.	log (3x + 9) = log 3^3 + log 100 log (3x + 9) = log 2700 3x + 9 = 2700 3x = 2691 $\frac{3x}{3} = \frac{2691}{3}$ x = 897	M1 M1 A1	
		3	
7.	a) A $\left(\frac{5 + -3}{2}, \frac{5 + -1}{2}\right)$ A (1, 2) b) $(x - a)^2 + (y - b)^2 = r^2$ $(5 - 1)^2 + (5 - 2)^2 = r^2$ $4^2 + 3^2 = 5^2$ radius 5 units $(x - 1)^2 + (y - 2)^2 = 5^2$ $x^2 - 2x + 1 + y^2 - 4y + 4 = 25$ $x^2 - 2x + y^2 - 4y - 20 = 0$	A1 M1 A1	
		3	
8.	Determinmant = 2 – 12 = –10	M1	

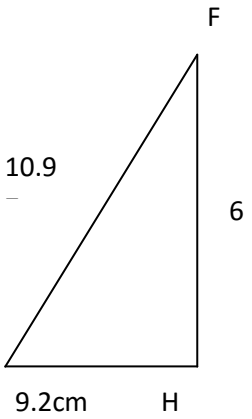
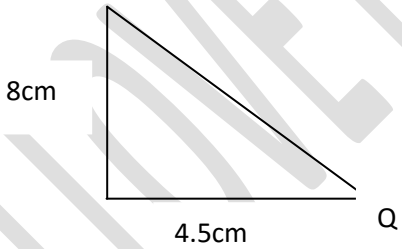
	$A.S.F = \|-10\|$ $= 10$ $10x\ 12.5 = 125\ cm^2$	M1 A1	
		10	
9.	Tap A $\quad {}^1/_8 \times 2 = {}^1/_4$ $\qquad$ Tap B $\quad {}^1/_{10} \times 1 = {}^1/_{10}$ $\frac{1}{4} + \frac{1}{10} = \frac{10+4}{40} = \frac{7}{20}$ Remaining part $\frac{13}{20}$ in a minute $\frac{1}{8} + \frac{1}{10} = \frac{9}{40}$ $\frac{13}{20} \times \frac{40}{9} = \frac{26}{9} = 2^8/_9$ min or time = 2 min 53 sec.	M_1 M_1 A_1	
		3	
10.	i) $1^5 - 5(3x) + 1^3 \times 10\,(3x)^2 - 1^2 \times 10\,(3x)^3 +$ $1 - 15x + 90x^2 - 270x^3 +$ ii) $(0.97)^5 = (1 - 0.03)^5$ $3x = 0.03$ $x = 0.01$ $(0.97)^5 = 1 - 15(0.01) + 90(0.01)^2 - 270(0.01)^3$ $= 0.8587$	M1 A1 M1 A1	
		3	
11.	$\cos 4x = -\frac{1}{2}$ $\cos^{-1} -\frac{1}{2} = 60^o$ $x = 30^o, 127.5^o, 150^o$	M1 M1 A1	
		3	
12.	P = 300,000 - 75000 = 225,000	M1	

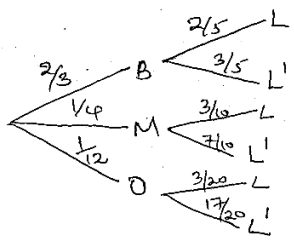
	$A = 225{,}000 \times 1.15^{1.25}$ $= \frac{225{,}000 \times 1.15^{1.25}}{15}$ $\frac{225000 \times 1.190}{15} = \frac{267950}{15}$ $= Ksh.17863$	M1 A1	
		3	
13.	$dy/dx = 3x^2-8x+2$ $y = x^3-4x^2+2x+c$ At $x = 2 \quad y=-2$ $-2 = 8-16+4+c$ $C=2$ $y = x^3- 4x^2 + 2x+2$	M1 M1 A1	
		3	
14.	$\frac{2\sqrt{5}(\sqrt{5}-2)}{(\sqrt{5}+2)(\sqrt{5}-2)}$ $\frac{10-4\sqrt{10}}{5-4}$ $\frac{10-2\sqrt{10}}{1}$ $10-2\sqrt{10}$	M1 M1 A1	For conjugate
		3	
15.	$x + y = 24$ $x^2 + y^2 = 144$ $x^2 - (24 - x)^2 = 144$ $x^2 - [576 - 48x + x^2] = 144$ $x^2 - 576 + 48x - x^2 = 144$ $48x = 720$ $x = 15$ $y = 24 - 15$ $= 9$ The two numbers are 9 and 15	M1 M1 A1	
		3	
16.	36,37,37,**39**,40,40,41,**43**,44,44,47,**52**,58,61,70	M1	Arranging in ascending or

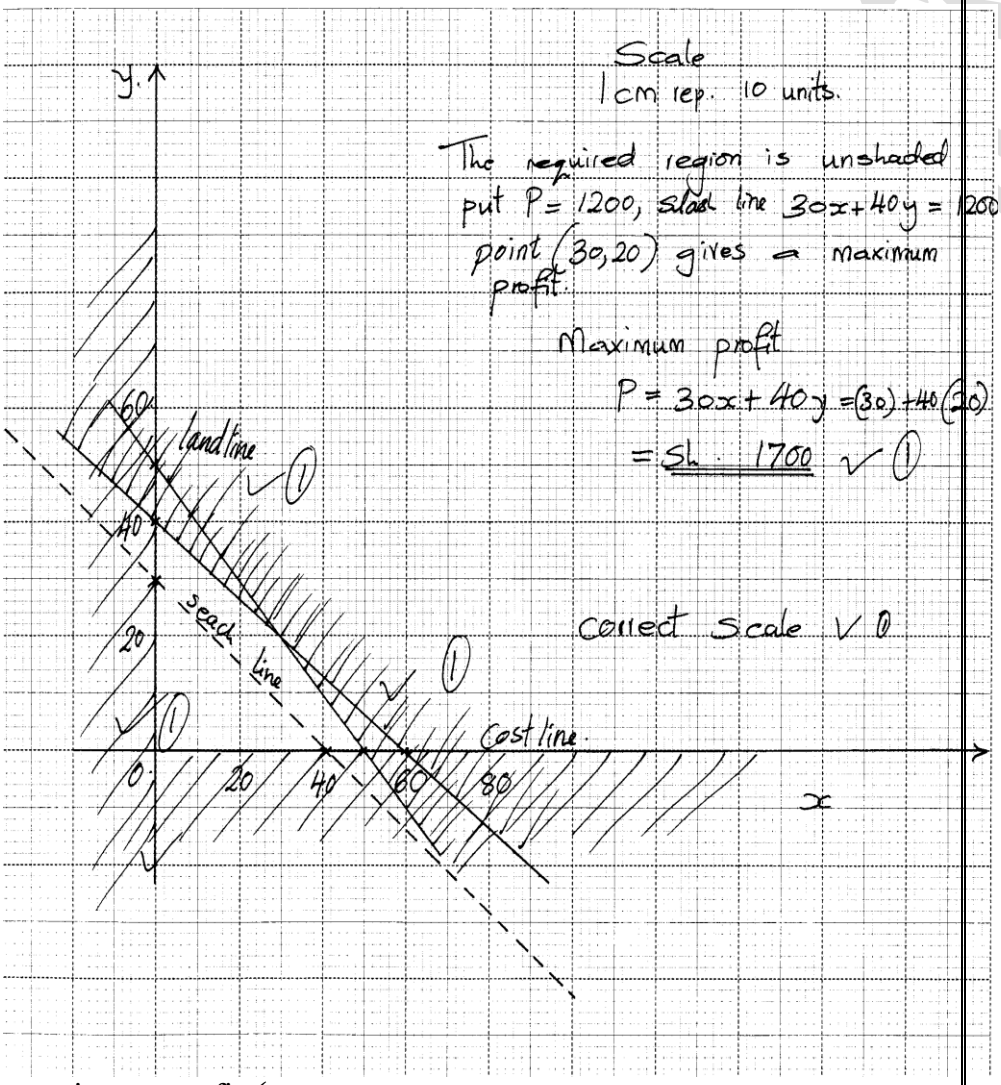
	$Q_1 = 39$ $Q_3 = 52$ Interquartile range = $(52 - 39)$ $= 13$	 M1 A1	descending order
		4	

SECTION II

	WORKING	MKS	GUIDELINES
17.	a) taxable income 35750 + 12500 = 48250= sh.48250	 M_1 A_1	
	b) 9860 x $^{10}/_{100}$ = 986 9860 x $^{75}/_{100}$ = 1479 9860 x $^{20}/_{100}$ = 2976 9860 x $^{25}/_{100}$ = 2465 8810 x $^{30}/_{100}$ = 2643 9545 Total less relief 1062 sh.8483pm	M_1 M_1 M_1 M_1 A_1	
	c) WCPS = $^{2}/_{100}$ x 35750 = 715 Total deduction (8483 + 715 + 1325 + 480) = 11000 Net salary = 48250 - 11000 sh.37250 p.m	 M_1 M_1 A_1	
		10	

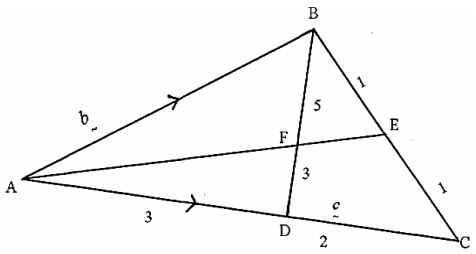
18.	PH2 = $4.5^2 + 8^2$ $= \sqrt{20.25 + 64}$ = 9.2 FC = $\sqrt{FH^2 + HC^2}$ = $9.2^2 + 6^2$ = 10.97cm b). i).tanθ = $6/9.2$ tan θ = 0.6522 θ = 33^0  ii). Tan θ = $8/4.5$ Al Tan θ 1.7750 θ = 60.60^0  c). Cosine rul $6^2 = 10^2 + 8^2 - 2x8x10 \cos\theta$ 36 = 100 +64 -160 Cosθ 36 = 164 -160 cos θ Cos θ = $128/16$ Cos θ =0.8 = 36.91	M1 A1 M1 A1 M1 M1 A1 M1 M1 A1	
		10	

19.	a) $^{10}/_{360}$ x 2 x $^{22}/_{7}$ x 6370 = 1112km b) i) 110 x 60 = 6600nm ii) 180 x 60 x cos 35^0 = 8850nm. c) 420 = $\frac{6600}{T_1}$ $T_1 = \frac{6600}{420}$ = 15hr 43min 420 = $\frac{8850}{T_2}$ T_2 = 21h 4min T_2 – T1 = 21hr 4min – 15hr 43min = 5hrs 21min	M1 A1 M1 A1 M1 A1 M1 M1 M1 A1	
		10	
20.	a)  b) P(BL) or P(ML) or P(OL) $= \frac{2}{3} \times \frac{2}{5} + \frac{1}{4} \times \frac{3}{10} + \frac{1}{12} \times \frac{3}{20}$ $= \frac{4}{15} + \frac{3}{40} + \frac{1}{80}$ $= \frac{17}{48}$ c) P(BL) or P(OL) $\frac{2}{3} \times \frac{2}{5} + \frac{1}{12} \times \frac{3}{20}$ $\frac{4}{15} + \frac{1}{80}$ $\frac{67}{240}$ d) P(Not late to school) = 1 – P(Late to school) $= 1 - \frac{17}{48} = \frac{31}{48}$	B1 B1 M1 A1 M1 A1 M1 A1 M1 A1	

		10	
21.	a) Let the carrots be x, potatoes y and the total profit be p. The inequalities that represents this information are: $x + y = \leq 50$ $40x + 60y \leq 2400$ $x \geq 0$. and $y \geq 0$	B1 B1 B1 B1	
	b)  maximum profit✓ P= 30x + 40y = 30(30) + 40 (20) = sh 1700✓	M1 A1	

		10	
22.	(a) (i) n^{th} term = a + (n – 1)d Last term = -5 + (n – 1)d = 135 (n – 1)d = 140	M1	
	Sum of n^{th} term = $^{n}/_{2}$(2a + (n – 1)d	M1	
	$^{n}/_{2}$(-10 + 140) = 975		
	$^{n}/_{2}$ x 130 = 975	M1	
	n = $\frac{975 \times 2}{130}$ n = 15	A1	
	Alternatively.	M1	
	Sum = $\frac{n}{2}(a + L)$ $= \frac{n}{2}(-5 + 135) = 975$	M1	
	$= \frac{n}{2}(130) = 975$ $= \frac{130n}{2} = 975$ $n = 15$	A1	
	(ii) n^{th} term = a + (n – 1)d -5 - 14d = 135 14d = 140 d = 10	M1 A1	
	(c) s = 27, a = 36 $s = a + ar + ar^2$ $27 = 36 + 36r + 3r^2$ $3 = 4 + 4r + 4r^2$ $4r^2 + 4r + 1 = 0$ $(2r + 1)^2 = 0$ $r = -\frac{1}{2}$	M1 M1 M1 A1	
		10	

23.



a)

(i) $\underset{\sim}{BD} = -\underset{\sim}{b} + \frac{3}{5}\underset{\sim}{c} = \frac{3}{5}\underset{\sim}{c} - \underset{\sim}{b}$

(ii) $\underset{\sim}{AE} = \underset{\sim}{b} + \frac{1}{2}\left(-\underset{\sim}{b} + \underset{\sim}{c}\right) = \underset{\sim}{b} - \frac{1}{2}\underset{\sim}{b} + \frac{1}{2}\underset{\sim}{c}$

$= \frac{1}{2}\underset{\sim}{b} + \frac{1}{2}\underset{\sim}{c}$ or $= \frac{1}{2}\left(\underset{\sim}{b} + \underset{\sim}{c}\right)$

(b) $\underset{\sim}{AF} = \underset{\sim}{AB} + \underset{\sim}{BF} = \underset{\sim}{b} + t\left(\frac{3}{5}\underset{\sim}{c} - \underset{\sim}{b}\right)$

$= \underset{\sim}{b} - t\,\underset{\sim}{b} + \frac{3}{5}t\,\underset{\sim}{c} = \underset{\sim}{b}(1-t) + \frac{3}{5}t\,\underset{\sim}{c}$

$\underset{\sim}{AF} = n\,\underset{\sim}{AE} = n\left(\frac{1}{2}\underset{\sim}{b} + \frac{1}{2}\underset{\sim}{c}\right)$

$\therefore \underset{\sim}{b}(1-t) + \frac{3}{5}t\,\underset{\sim}{c} = \frac{1}{2}n\,\underset{\sim}{b} + \frac{1}{2}n\,\underset{\sim}{c}$

Then 1-t= $\frac{1}{2}n$ and $\frac{1}{2}n = \frac{3}{5}t$

2-2t=n 5n=6t

$n = \frac{6}{5}t$

$\therefore 2 - 2t = \frac{6}{5}t$

10-10t=6t

10=16t therefore, $\boldsymbol{t = \frac{10}{16} = \frac{5}{8}}$

$n = \frac{6}{5}t = \frac{6}{5} \times \frac{5}{8} = \frac{3}{4}$

(c) BF=tBD

$\frac{BF}{BD} = \frac{5}{8}$

$\therefore BD : DF = 8 : -3$

		10	

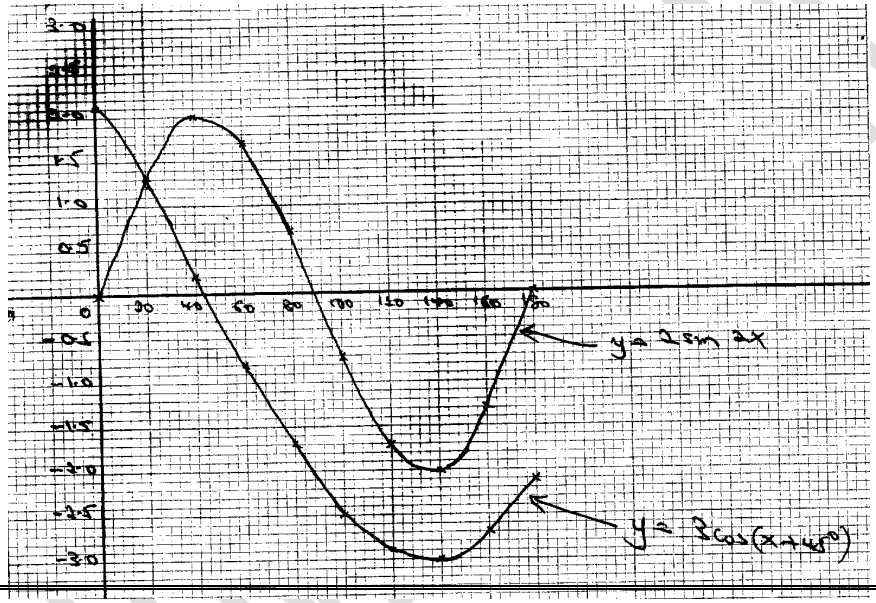
24.

X	0^o	20^o	40^o	60^o	80^o	100^o	120^o	140^o	160^o	180^o
2 sin 2x	0	**1.28**	1.97	**1.73**	0.68	-0.68	-1.73	**-1.97**	-1.28	0.00
3 cos (x+45°)	2.12	1.27	**0.17**	-0.78	**-1.72**	-2.46	**-2.90**	**-2.99**	-2.72	-2.12

c) $y = 2 \sin 2x$
Amplitude = 2
Period = 180^0

$y = 3 \cos(x + 45^0)$
Amplitude = 3
Period = 360^o

(a) $2 \sin 2x - 3 \cos (x + 45^0) = 0$
$X = 20^O$



10