

KAPSABET HIGH SCHOOL

MATHEMATICS

Paper 2

MARKING SCHEME

SECTION I

	WORKING	MARKS	GUIDELINES																																
1.	<table><tr><th>No.</th><th>Log</th></tr><tr><td>24.36</td><td>1.3867</td></tr><tr><td>0.066547</td><td><u>-2.8231</u></td></tr><tr><td></td><td>0.2098</td></tr><tr><td>1.48</td><td>0.1703</td></tr><tr><td></td><td><u>X 2</u></td></tr><tr><td></td><td>0.3406</td></tr><tr><td></td><td>0.2098</td></tr><tr><td></td><td><u>0.3406</u></td></tr><tr><td></td><td>$-1.8692 \times \frac{1}{3}$</td></tr><tr><td></td><td>$\frac{3}{3} - 2.8692$</td></tr><tr><td></td><td>$\frac{3}{3} + \frac{3}{3}$</td></tr><tr><td>$10^{-1} \times 9.045$</td><td>$= -1.9564$</td></tr><tr><td>0.9045</td><td></td></tr><tr><td> </td><td></td></tr><tr><td>$= 0.9045$</td><td></td></tr></table>	No.	Log	24.36	1.3867	0.066547	<u>-2.8231</u>		0.2098	1.48	0.1703		<u>X 2</u>		0.3406		0.2098		<u>0.3406</u>		$-1.8692 \times \frac{1}{3}$		$\frac{3}{3} - 2.8692$		$\frac{3}{3} + \frac{3}{3}$	$10^{-1} \times 9.045$	$= -1.9564$	0.9045		 		$= 0.9045$		M1 M1 M1 A1	✓logs All ✓ Addn & Subtr ✓Attempt to divided by 3
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2.	$\text{Error} = \frac{1}{2} \times 0.1 = \pm 0.05\text{cm}$ $\text{Actual length} = 12.5 + 24.5 + 12.9 + 10.1 = 60.0$ $\text{Max length} = 12.55 + 24.55 + 12.95 + 10.15 = 60.20$ $\text{Min length} = 12.45 + 24.45 + 12.85 + 10.05 = 59.80$ $\text{A.E.} = \frac{\text{Max} - \text{Min}}{2} = \frac{60.20 - 59.80}{2}$ $\text{P.E.} = \frac{0.2}{60} \times 100 = 0.3\%$	M1 M1 A1																	
		3																	
3.	$\text{X R} = \frac{4.8 \times 5}{6}$ $= 4$ $\text{QT}^2 = \text{PT} \times \text{RT}$ $\text{QT}^2 = 18 \times 8$ $\text{QT} = \sqrt{144}$ $\text{QT} = 12\text{cm}$	M1 M1 A1																	
		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><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> $\text{Area} = \frac{1}{2} (5 + 17 + 2(2 + 1 + 2 + 5 + 10))$ $= 31 \text{ sq. Units}$	X	-2	-1	0	1	2	3	4	y	5	2	1	2	5	10	17	M1 M1 A1	
X	-2	-1	0	1	2	3	4												
y	5	2	1	2	5	10	17												
		3																	
5.	$x = \sqrt{\frac{tp}{2\mu + p}}$ $x^2 = \frac{tp}{2\mu + p}$ $2\mu x^2 + px^2 = tp$ $2\mu x^2 = tp - px^2$ $2\mu x^2 = p(t - x^2)$ $p = \frac{2\mu x^3}{t - x^3}$	M1 M1 A1	(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.	Determinant = $2 - 12 = -10$ A.S.F = $ -10 $ $= 10$ $10 \times 12.5 = 125 \text{ cm}^2$	M1 M1 A1	
		10	
9.	Tap A $\frac{1}{8} \times 2 = \frac{1}{4}$ $\frac{1}{4} + \frac{1}{10} = \frac{10 + 4}{40} = \frac{7}{20}$ Remaining part $\frac{13}{20}$ in a minute $\frac{1}{8} + \frac{1}{10} = \frac{9}{40}$ $\frac{13}{20} \times \frac{40}{9} = \frac{26}{9} = 2\frac{8}{9} \text{ min}$	Tap B $\frac{1}{10} \times 1 = \frac{1}{10}$ M1 M1	

	or time = 2 min 53 sec.	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.	$\cos 4x = -\frac{1}{2}$ $\cos^{-1} -\frac{1}{2} = 60^\circ$ $x = 30^\circ, 127.5^\circ, 150^\circ$	M1 M1 A1	
		3	
12.	$P = 300,000 - 75000$ $= 225,000$ $A = 225,000 \times 1.15^{1.25}$ $= \frac{225,000 \times 1.15^{1.25}}{15}$ $\frac{225000 \times 1.190}{15} = \frac{267950}{15}$ $= \text{Ksh.17863}$	M1 M1 A1	
		3	
13.	$\frac{dy}{dx} = 3x^2 - 8x + 2$ $y = x^3 - 4x^2 + 2x + c$ At $x = 2$ $y = -2$ $-2 = 8 - 16 + 4 + c$ $C = 2$ $y = x^3 - 4x^2 + 2x + 2$	M1 M1 A1	
		3	

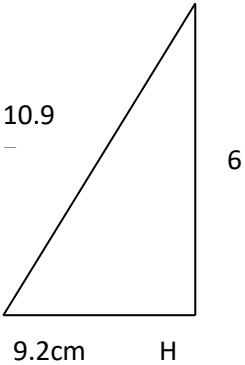
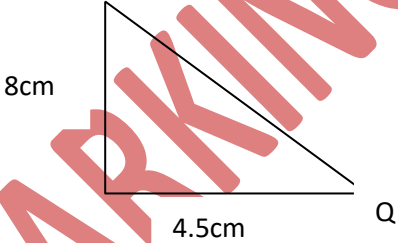
14.	$\frac{2\sqrt{5}(\sqrt{5} - 2)}{(\sqrt{5} + 2)(\sqrt{5} - 2)}$ $\frac{10 - 4\sqrt{10}}{5 - 4}$ $\frac{10 - 2\sqrt{10}}{1}$ $10 - 2\sqrt{10}$	M1 M1 A1	For conjugate
		3	
15.	$x + y = 24$ $x^2 + y^2 = 144$ $x^2 - (24 - x)^2 = 144$ $x^2 - [576 - 48x + x^2] = 144$ $x^2 - 576 + 48x - x^2 = 144$ $48x = 720$ $x = 15$ $y = 24 - 15$ $= 9$ 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 $Q_1 = 39$ $Q_3 = 52$ Interquartile range = $(52 - 39)$ $= 13$	M1 M1 A1	Arranging in ascending or descending order
		4	

SECTION II

	WORKING	MKS	GUIDELINES
17.	a) taxable income $35750 + 12500 = 48250 = \text{sh.}48250$ b) $9860 \times \frac{10}{100} = 986$ $9860 \times \frac{75}{100} = 1479$ $9860 \times \frac{20}{100} = 2976$ $9860 \times \frac{25}{100} = 2465$ $8810 \times \frac{30}{100} = 2643$ $\underline{\hspace{1cm}}$ 9545 Total less relief $\underline{1062}$ sh.8483pm	M₁ A₁ M₁ M₁ M₁ M₁ A₁	

	c) $WCPS = \frac{2}{100} \times 35750 = 715$ Total deduction $(8483 + 715 + 1325 + 480) = 11000$ Net salary = 48250 <u>- 11000</u> sh.37250 p.m	M_1 M_1 A_1	
		10	

MARKING SCHEME 2023

18.	$PH^2 = 4.5^2 + 8^2$ $= \sqrt{20.25 + 64} = 9.2$ $FC = \sqrt{FH^2 + HC^2}$ $= 9.2^2 + 6^2 = 10.97\text{cm}$ b). i). $\tan \theta = 6/9.2$ $\tan \theta = 0.6522$ $\theta = 33.2^\circ$  ii). $\tan \theta = 8/4.5$ $\tan \theta = 1.7750$ $\theta = 60.60^\circ$  c). Cosine rule $6^2 = 10^2 + 8^2 - 2 \times 10 \times 8 \cos \theta$ $36 = 100 + 64 - 160 \cos \theta$ $36 = 164 - 160 \cos \theta$ $\cos \theta = 128/160$ $\cos \theta = 0.8$ $\theta = 36.91^\circ$	M1 A1 M1 A1 M1 M1 A1	
		10	

19.	a) $\frac{10}{360} \times 2 \times \frac{22}{7} \times 6370$ = 1112km b) i) 110×60 = 6600nm ii) $180 \times 60 \times \cos 35^\circ$ = 8850nm. c) $420 = \frac{6600}{T_1}$ $T_1 = \frac{6600}{420}$ = 15hr 43min $420 = \frac{8850}{T_2}$ $T_2 = 21\text{h } 4\text{min}$ $T_2 - T_1 = 21\text{hr } 4\text{min} - 15\text{hr } 43\text{min}$ = 5hrs 21min	M1 A1 M1 A1 M1 A1 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	

21.

- a) Let the carrots be x , potatoes y and the total profit be p .
The inequalities that represents this information are:

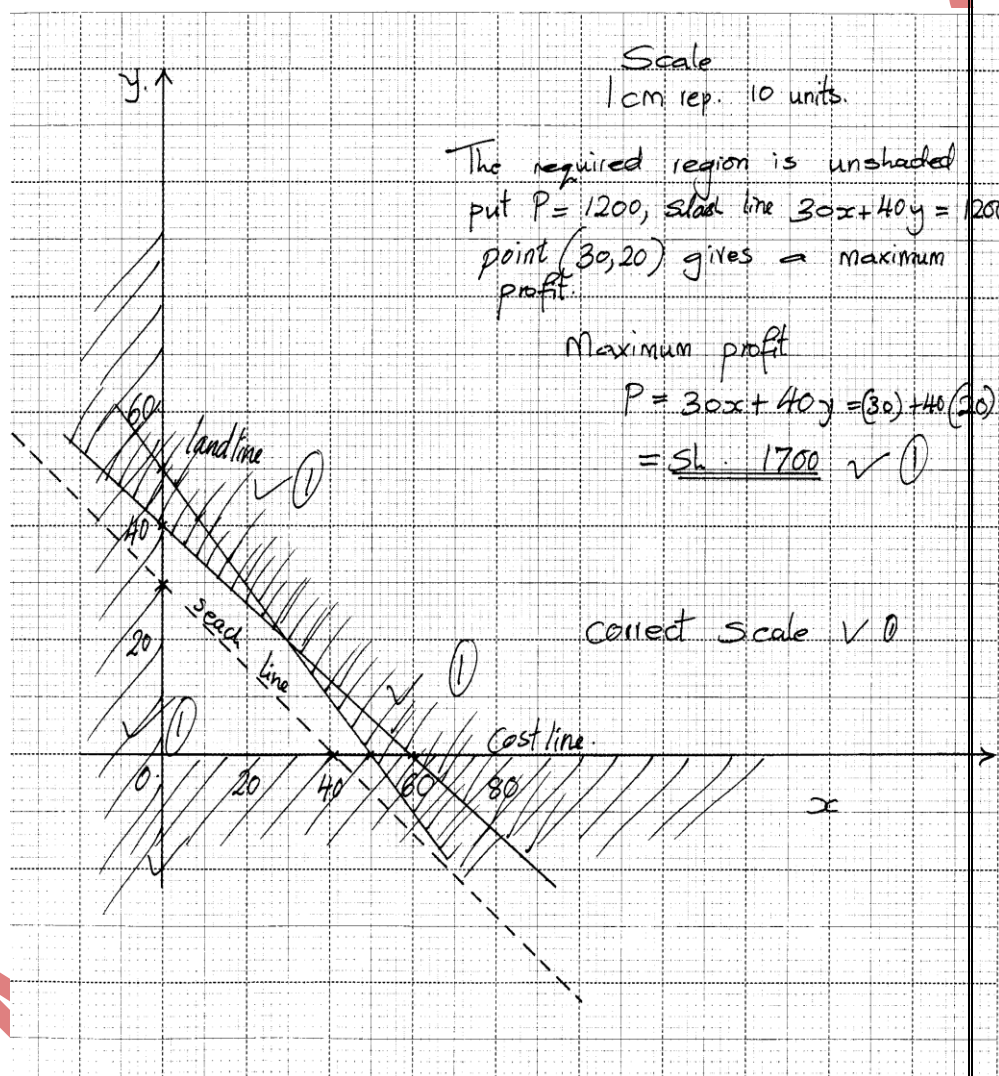
$$x + y \leq 50$$

$$40x + 60y \leq 2400$$

$$x \geq 0 \text{ and}$$

$$y \geq 0$$

b)



maximum profit ✓

$$P = 30x + 40y = 30(30) + 40(20)$$

$$= \text{sh } 1700 \checkmark$$

10

B1

B1

B1

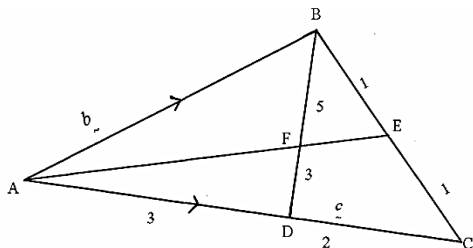
B1

M1

A1

		10	
22.	(a) (i) $n^{\text{th}} \text{ term} = a + (n - 1)d$ Last term $= -5 + (n - 1)d = 135$ $(n - 1)d = 140$ Sum of $n^{\text{th}} \text{ term} = \frac{n}{2}(2a + (n - 1)d)$ $\frac{n}{2}(-10 + 140) = 975$ $\frac{n}{2} \times 130 = 975$ $n = \frac{975 \times 2}{130}$ $n = 15$ Alternatively. Sum $= \frac{n}{2}(a + L)$ $= \frac{n}{2}(-5 + 135) = 975$ $= \frac{n}{2}(130) = 975$ $= \frac{130n}{2} = 975$ $n = 15$ (ii) $n^{\text{th}} \text{ term} = a + (n - 1)d$ $-5 + 14d = 135$ $14d = 140$ $d = 10$ (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 M1 M1 M1 A1 M1 A1 M1 M1 M1 A1	
		10	

23.



a)

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

$$(ii) \quad \underline{AE} = \underline{b} + \frac{1}{2}(-\underline{b} + \underline{c}) = \underline{b} - \frac{1}{2}\underline{b} + \frac{1}{2}\underline{c} \\ = \frac{1}{2}\underline{b} + \frac{1}{2}\underline{c} \quad \text{or} = \frac{1}{2}(\underline{b} + \underline{c})$$

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

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

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

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

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

$$2-2t=n$$

$$5n=6t$$

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

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

$$10-10t=6t$$

$$10=16t$$

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

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

$$(c) \quad \underline{BF} = t\underline{BD}$$

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

$$\therefore \underline{BD} : \underline{DF} = 8 : -3$$

10

24.

X	0°	20°	40°	60°	80°	100°	120°	140°	160°	180°
$2 \sin 2x$	0	1.28	1.97	1.73	0.68	-0.68	-1.73	-1.97	-1.28	0.00
$3 \cos (x+45^\circ)$	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°

$y = 3 \cos(x + 45^\circ)$
 Amplitude = 3
 Period = 360°

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

