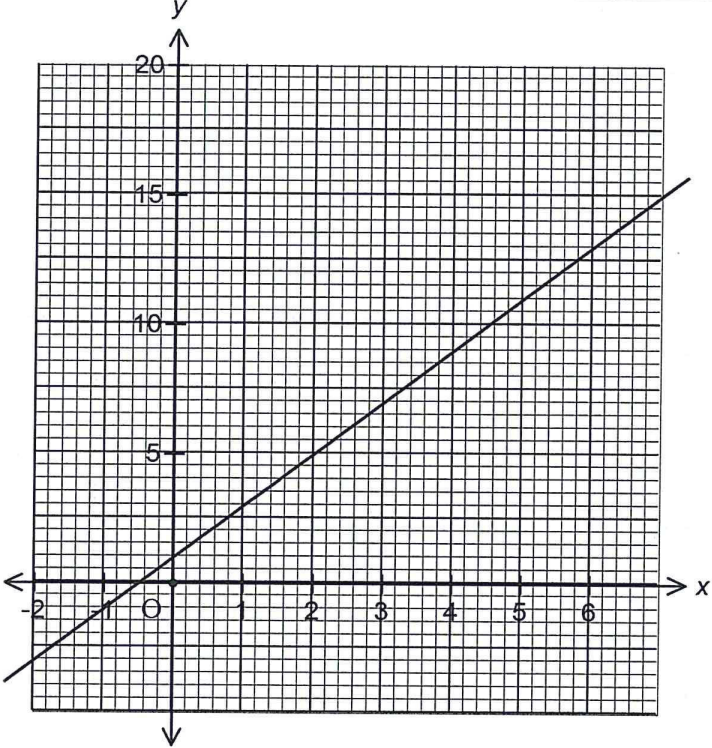


4.3.2 Mathematics Alternative A Paper 2 (121/2)

No.	Marking scheme	marks	comments
1.	$2 \log x^2 + \log \sqrt{x} = k \log x$ $\log (x^4 x^{\frac{1}{2}}) = \log x^k$ $k = 4\frac{1}{2}$	<p>M1</p> <p>A1</p> <p>2</p>	
2.	$P \propto \frac{t^3}{\sqrt{s}}$ $P = \frac{kt^3}{\sqrt{s}}$ $16 = \frac{k(2)^3}{\sqrt{9}}$ $\frac{16 \times 3}{8} = k$ $k = 6$ $\therefore P = \frac{6t^3}{\sqrt{s}}$ <p>When $t = 3$ and $s = 36$</p> $P = \frac{6 \times 3^3}{\sqrt{36}} = \frac{6 \times 27}{6}$ $= 27$	<p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p> <p>4</p>	
3.	$P_2(1.07) = 170130$ $P_2 = \frac{170130}{1.07}$ $= 159000$ $P_1 = \frac{159000}{1.06}$ $= \text{Ksh } 150000$	<p>M1</p> <p>M1</p> <p>A1</p> <p>3</p>	

4.	$BF = 10$ $\cos 20^\circ = \frac{BC}{10}$ $BC = 10 \cos 20^\circ$ $= 9.4 \text{ cm}$	B1 M1 A1 3	Isosceles triangle
5.	$\frac{\sqrt{54+3\sqrt{3}}}{\sqrt{3}} = \left(\frac{\sqrt{54+3\sqrt{3}}}{\sqrt{3}} \right) \times \frac{\sqrt{3}}{\sqrt{3}}$ $= \frac{\sqrt{162+9}}{3}$ $= \frac{9\sqrt{2}+9}{3}$ $= 3\sqrt{2}+3$	M1 A1 2	Or equivalent
6.	$AB = 6 \tan 60^\circ \text{ or } OB = \frac{6}{\cos 60}$ $\text{Area of triangle OAB} = \frac{1}{2} \times 6 \times 6 \tan 60^\circ$ $\text{Area of sector OAC} = \frac{60}{360} \times \pi \times 6^2$ $\text{Area of shaded part} = 31.18 - 18.85$ $= 12.3 \text{ cm}^2$	M1 M1 M1 A1 4	

7.	$3x^2 + 8x = 6$ $x^2 + \frac{8}{3}x + \left(\frac{4}{3}\right)^2 = \frac{6}{3} + \left(\frac{4}{3}\right)^2$ $\left(x + \frac{4}{3}\right)^2 = \frac{34}{9}$ $x + \frac{4}{3} = \pm \sqrt{\frac{34}{9}}$ $x = \frac{-4 \pm \sqrt{34}}{3}$ $x = -3.28 \text{ or } x = 0.610$	M1 M1 A1 3	$\sqrt{34} = 5.831$
8.	W : H : D 3 : 5 : 5 5 : 6 : x No. of days = $5 \times \frac{8}{6} \times \frac{3}{5}$ = 4 days Cost = $5 \times 6 \times 4 \times 40$ = Ksh 4800	M1 M1 A1 3	

9. (a)		S1 P1 L1	
	(b) When $x = 0, y = 1$	B1	
		4	
10.	Amplitude = 2 Phase angle = 30°	B1 B1	
		2	
11.	<p>8, <u>11, 13</u>, 14, 15, 16, <u>17, 19</u>, 20</p> $\left. \begin{aligned} Q_1 &= \frac{11+13}{2} = 12 \\ Q_3 &= \frac{17+19}{2} = 18 \end{aligned} \right\}$ <p>Quartile deviation = $\frac{1}{2}(18-12)$ = 3</p>	B1 M1 A1	
		3	

12.	Longitude difference = $30 - 10 = 20^\circ$ $600 = 20 \times 60 \cos \theta$ $\cos \theta = 0.5$ $\theta = 60^\circ$ Latitude = 60°N	B1 M1 A1	
13.	$\mathbf{OQ} = \frac{2}{3}\mathbf{p} + \frac{1}{3}\mathbf{r}$ $\mathbf{OS} = \mathbf{p} + 3(\mathbf{r} - \mathbf{p})$ $= 3\mathbf{r} - 2\mathbf{p}$ $\mathbf{QS} = -\mathbf{OQ} + \mathbf{OS}$ $= -\frac{2}{3}\mathbf{p} - \frac{1}{3}\mathbf{r} + 3\mathbf{r} - 2\mathbf{p}$ $= \frac{8}{3}\mathbf{r} - \frac{8}{3}\mathbf{p}$	B1 B1 M1 A1	
14.	$P \text{ (MW or WM)} = \frac{6}{10} \times \frac{4}{9} + \frac{4}{10} \times \frac{6}{9}$ $= \frac{24}{90} + \frac{24}{90}$ $= \frac{8}{15}$	M1 M1 A1	Any one MW or WM Attempt to add
15.	$\text{Det}(T) = 18$ $\text{Area of object OAB} = \frac{\text{Area of image}}{\text{Det}(T)}$ $= \frac{\frac{1}{2} \times 18 \times 6}{18}$ $= 3 \text{ units}$	B1 M1 A1	

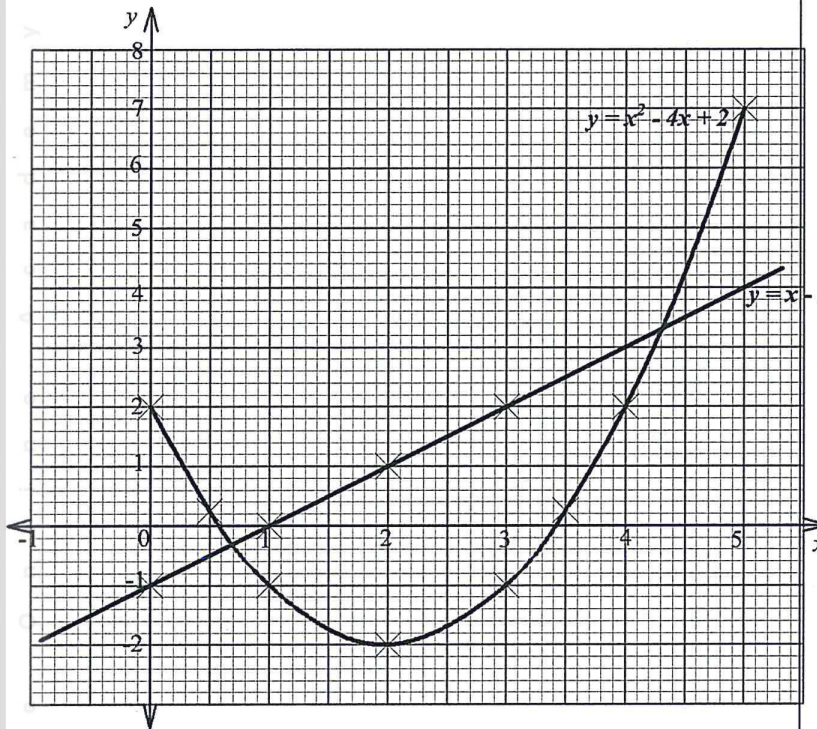
16.	$\int_0^2 (kx^3 - 3x^2) dx = 16$ $\left[\frac{kx^4}{4} - x^3 \right]_0^2 = 16$ $\left[\frac{k(2)^4}{4} - (2)^3 \right] - [0] = 16$ $4k - 8 = 16$ $4k = 24$ $k = 6$	M1 M1 M1 A1 4	
SECTION 2			
17. (a)	$\left. \begin{aligned} a + 4d &= 18 & \text{(i)} \\ a + 9d &= -2 & \text{(ii)} \end{aligned} \right\}$ $5d = -20$ $d = -4$ $a = 34$	B1 M1 A1 B1	Both (i) and (ii)
(b)	$\frac{n}{2} \{2 \times 34 + (n-1)(-4)\} = 0$ $\frac{n}{2} \{72 - 4n\} = 0$ $4n = 72$ $n = 18$ <p>least number of terms = 19</p> $S_{19} = \frac{19}{2} \{2 \times 34 + 18(-4)\}$ $= \frac{19}{2} (68 - 72)$ $= \frac{19}{2} (-4)$ $= -38$	M1 M1 A1 B1 M1 A1	
		10	

18. (a)

x	0	1	2	3	4	5
$y = x^2 - 4x + 2$	2	-1	-2	-1	2	7

B2 for all correct
B1 at least 4✓

(b)



S1 ✓ scale
P1 ✓ plotting
C1 ✓ curve drawn
L1 $y = x - 1$ ✓
drawn

(c)

$$x = 0.6 \pm 0.05$$

$$x = 3.4 \pm 0.05$$

B1
B1

(d)

$$\begin{cases} y = x^2 - 4x + 2 \\ 0 = x^2 - 5x + 3 \end{cases}$$

$$y = x - 1$$

when $y = x - 1$, then

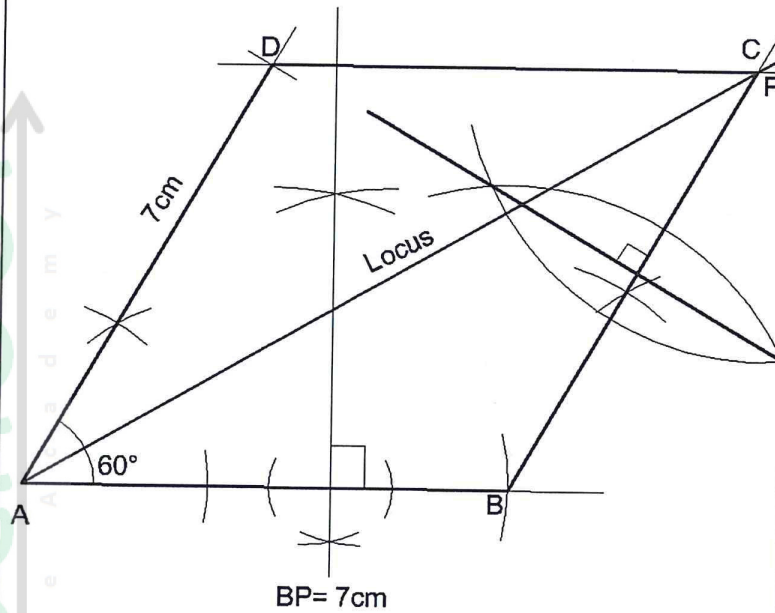
$$\left. \begin{array}{l} x = 0.7 \pm 0.05 \\ x = 4.3 \pm 0.05 \end{array} \right\}$$

B1
B1

10

19. (a)	Modal class 30 – 40				B1	
(b)	x	f	fx	x^2	fx^2	
	5	4	20	25	100	
	15	8	120	225	1800	B1 for $fx \checkmark$
	25	10	250	625	6250	
	35	12	420	1225	14700	B1 For $\checkmark fx^2$
	45	4	180	2025	8100	
	55	2	110	3025	6050	
		40	1100		37000	
(i)	$\bar{x} = \frac{\sum xf}{N} = \frac{1100}{40}$				M1	
	$= 27.5$				A1	
(ii)	$s.d^2 = \frac{37000}{40} - 27.5^2$				M1	
	$= 925 - 756.25$					
	$= 168.75$				M1	
	$s.d = \sqrt{168.75}$				A1	
	$= 12.99$					
(c)	No of plants whose height $> 40 = 4+2 = 6$				B1	
	$P(\text{Height} > 40\text{cm}) = \frac{6}{40} = 0.15$				B1	
					10	

20.



(a)

- (i) $\angle BAD = 60^\circ$
 Line DC or BC correctly drawn
 Point C correctly located
 Parallelogram ABCD

B1
 B1
 B1
 B1

- (ii) Angle bisector of $\angle BAD$

B1

- (iii) bisector of BC ✓ drawn

B1

(b)

- (i) Point P identified and ✓ marked on line DC

B1

- (ii) $BP = 7 \pm 0.1\text{cm}$

B1

(c)

- Locus of points equidistant from B and C

B2

(d)

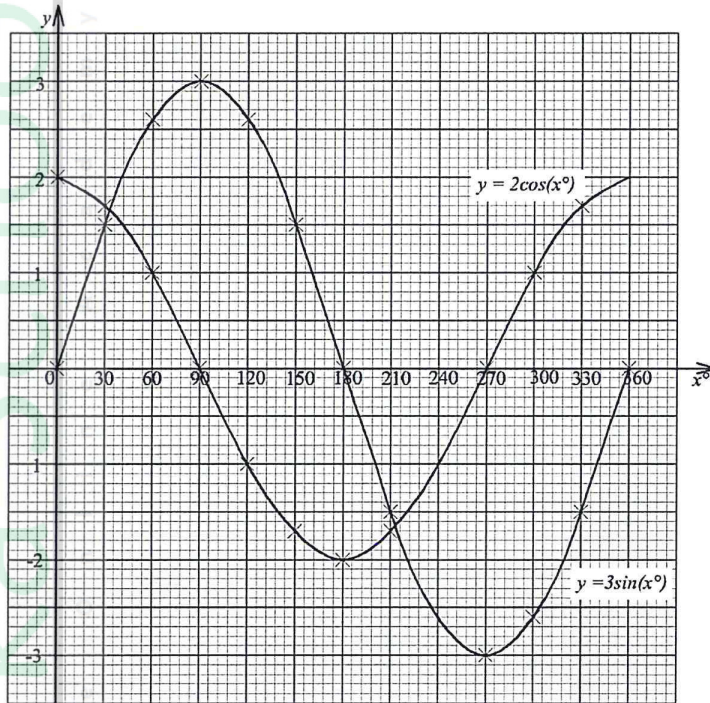
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21. (a)

x	0°	30°	60	90	120	150	180	210	240	270	300	330	360
$2\cos x$		1.7			-1		-2			0		1.7	
$3\sin x$			2.6			1.5		-1.5		-3	-2.6		

B1

B1



S1 - Correct linear scale

P1 - Correct plotting of $y = 2\cos x$

P1 - Correct plotting of $y = 3\sin x$

C1 - Correct curve of $y = 2\cos x$ drawn

C1 - Correct curve of $y = 3\sin x$ drawn

(c) $2\cos x - 3\sin x = 0$

$\Rightarrow 2\cos x = 3\sin x$

$x = 34^\circ$ and $x = 214^\circ$

B1

B1

(d) $y = 1.6$ and $y = -1.6$

B1

10

22. (a)	Length of MP		
	$MP^2 = 10^2 + 10^2$	M1	
	$MP = \sqrt{200} = 14.14$	A1	
(b)	Angle between MU and plane MNPQ		
	$\tan \theta_1 = \frac{15}{\sqrt{200}}$	M1	
	$\theta_1 = \tan^{-1} \left(\frac{15}{\sqrt{200}} \right)$		
	$= 46.69$	A1	
(c)	Length VO		
	h = Height of pyramid		
	$= \sqrt{(13^2 - 7.07^2)}$	M1	
	$= 10.91$		
	$VO = 15 + h = 15 + 10.91$	M1	
	$= 25.91$	A1	
(d)	Angle between planes VST and RSTU		
	$\cos \theta_2 = \frac{5}{12}$	B1	Identification of
	$\theta_2 = \cos^{-1} \left(\frac{5}{12} \right)$	M1	√angle
	$= 65.38^\circ$	A1	
		10	

23. (a)	Taxable income	M1	
(i)	$= 52000 + 7800 + 5000$ $= \text{Ksh } 64800$	A1	
(ii) (a)	Tax payable	B1	
	$11180 \times 0.1 = 1118$		
	$10534 \times 0.15 = 1580.10$ $10534 \times 0.2 = 2106.80$ $10534 \times 0.25 = 2633.50$	M1	For 2 nd , 3 rd and 4 th band
	$22018 \times 0.3 = 6605.4$	M1	
	Total tax = 14043.8	M1	
	Net tax = 14043.8 – 1280	M1	
	= 12763.8	A1	
(b)	Additional tax		
	$= \frac{4}{100} \times 52000 \times 0.3$ $= \text{Ksh } 624$	M1	
	Net salary = 64800 – 12763.8 – 624 + $\left(\frac{4}{100} \times 52\ 000\right)$	M1	
	= Ksh 53492.20	A1	
		10	

24. (a)

$$x \geq 30 \quad ; \quad y \geq 20$$

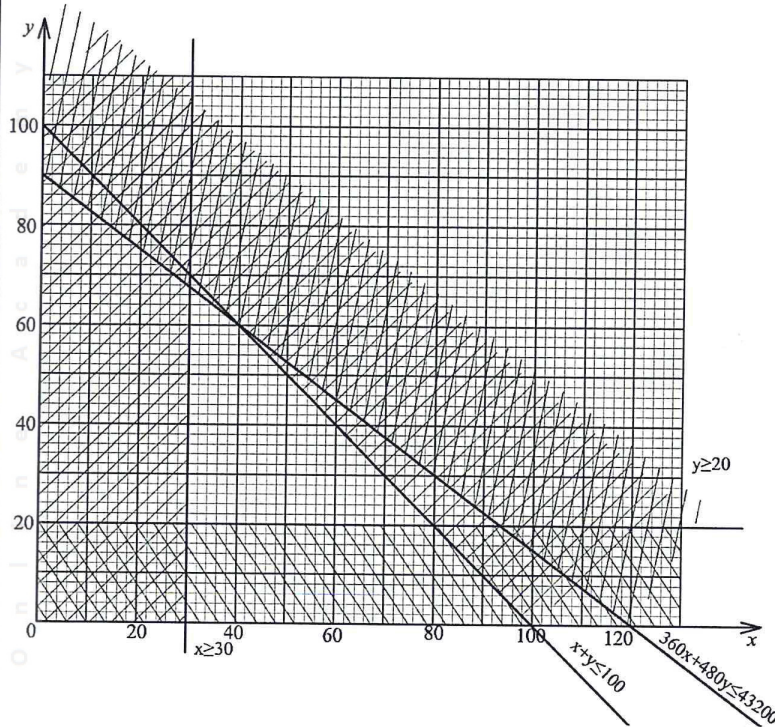
$$x + y \leq 100$$

$$360x + 480y \leq 43200 \text{ or } 3x + 4y \leq 360$$

B1
B1
B1

Both ✓

(b)



B1

$$y = 20$$

B1

$$x = 30$$

B1

$$x + y = 100$$

B1

$$3x + 4y = 360$$

(c)

$$\text{Objective function} = 50x + 60y$$

$$\text{Profit} = 50 \times 40 + 60 \times 60$$

$$= 5600$$

B1

M1

A1

10