

$4 \log x + \frac{1}{2} \log x = k \log x$
 $4 + \frac{1}{2} = k$

No.	Marking scheme	marks	comments
1.	$2 \log x^2 + \log \sqrt{x} = k \log x$ $\log(x^2 x^{\frac{1}{2}}) = \log x^k$ $k = 4\frac{1}{2} \checkmark$ or 4.5	M1 A1 2	$4\frac{1}{2} \log x = k \log x$ Single logs LHS = RHS and \sqrt{x} interpreted as $x^{\frac{1}{2}}$ $\frac{1}{2}$ not allowed.
2.	$P \propto \frac{t^3}{\sqrt{s}}$ $P = \frac{kt^3}{\sqrt{s}}$ $16 = \frac{k(2)^3}{\sqrt{9}} \checkmark$ $\frac{16 \times 3}{8} = k$ $k = 6 \checkmark$ $\therefore P = \frac{6t^3}{\sqrt{s}}$ When $t = 3$ and $s = 36$ $P = \frac{6 \times 3^3}{\sqrt{36}} = \frac{6 \times 27}{6}$ $= 27 \checkmark$	M1 A1 B1 B1 4	M1 A1 B1 B1 can only if M1 was earned
3.	$P_2(1.07) = 170130$ $P_2 = \frac{170130}{1.07} \checkmark$ $= 159000$ $P_1 = \frac{159000}{1.06} \checkmark$ $= \text{Ksh. } 150000 \checkmark$	M1 M1 A1 3	$P(1.06)(1.07) = 170130$ M1 $P = \frac{170130}{(1.06)(1.07)}$ M1 $= 150000$ A1 or

\checkmark integrated

$\frac{170130}{1.06} = P$
 $\frac{P}{1.07} = A$

$170130 = 1.06p(1 + \frac{7}{100})$ M1
 $170130 = 1.06p(1.07)$
 $150000 = P$ 2

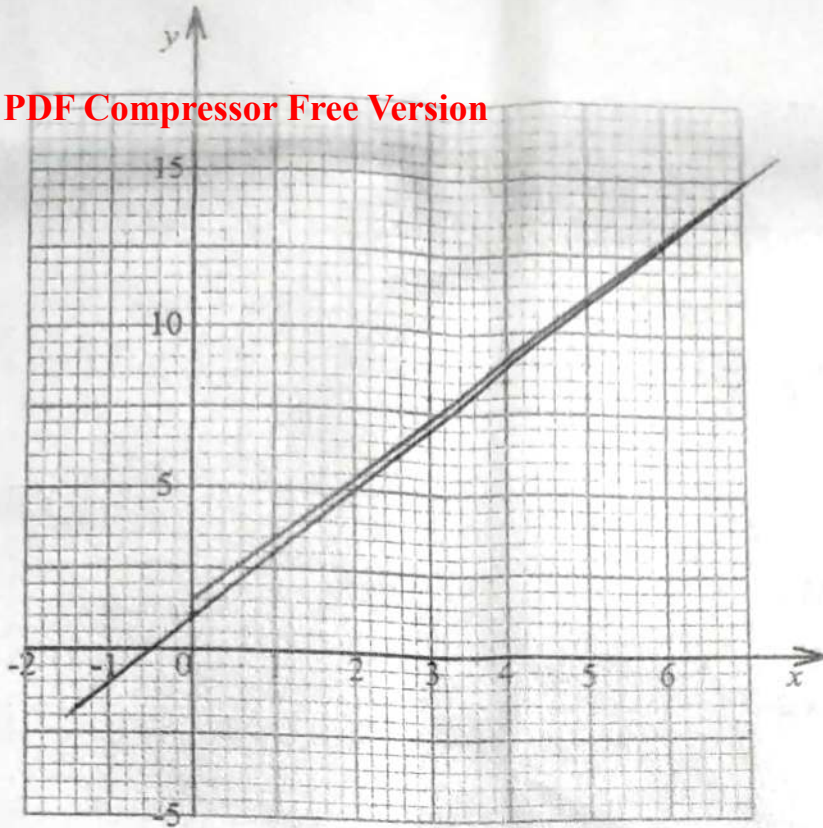
4.	$BF = 10$ $\cos 20^\circ = \frac{BC}{10}$ $BC = 10 \cos 20^\circ \quad BC = 10 \cos 20^\circ$ $= 9.4 \text{ cm}$	B1 M1 A1 3	Isosceles triangle $BF = 10$ B1 $BF = BC = 10$ m $BC = 10$ A1 $BF = BC$ must be shown (Can be looked on Diagram.
5.	$\frac{\sqrt{54} + 3\sqrt{3}}{\sqrt{3}} = \left(\frac{\sqrt{54} + 3\sqrt{3}}{\sqrt{3}} \right) \times \frac{\sqrt{3}}{\sqrt{3}}$ $= \frac{\sqrt{162} + 9}{3}$ $= \frac{9\sqrt{2} + 9}{3}$ $= 3\sqrt{2} + 3$	M1 A1 2	Denominator must be rationalized or eliminated. Or equivalent or eliminated.
6.	$AB = 6 \tan 60^\circ$ $= 10.4 \text{ cm}$ $\text{Area of triangle OAB} = \frac{1}{2} \times 6 \times 6 \tan 60^\circ$ $= 31.2 \text{ cm}^2$ $\text{Area of sector OAC} = \frac{60}{360} \times \pi \times 6^2$ $= 18.8 \text{ cm}^2$ $\text{Area of shaded part} = 31.2 - 18.8$ $= 12.4 \text{ cm}^2$ 12.3 cm	M1 M1 M1 A1 4	$OB = \frac{6}{\cos 60^\circ} = \frac{6}{\frac{1}{2}} = 12$ $\frac{1}{2} \left(\frac{6}{\cos 60^\circ} \times 6 \right) \sin 60^\circ$ <p>Follow through and apply where necessary.</p>

$\cos 60^\circ = \frac{6}{OB}$

7.	$3x^2 + 8x = 6$ $x^2 + \frac{8}{3}x + \left(\frac{4}{3}\right)^2 = \frac{6}{3} + \left(\frac{4}{3}\right)^2 \checkmark$ $\left(x + \frac{4}{3}\right)^2 = \frac{34}{9}$ $x + \frac{4}{3} = \pm \sqrt{\frac{34}{9}}$ $x = \frac{-4 \pm \sqrt{34}}{3} \quad (x \text{ is made the subject})$ $x = -3.28 \text{ or } x = 0.610$	<p>MI</p> <p>MI</p> <p>AI</p> <p>3</p>	<p>$\sqrt{34} = 5.831$ — or discriminate $-5.831 - \frac{4}{3}$ (For both). $+5.831 - \frac{4}{3}$</p>
8.	<p>W : H : D</p> <p>3 : 5 : 8</p> <p>5 : 6 : x</p> <p>No. of days = $5 \times \frac{8}{6} \times \frac{3}{5} \checkmark$</p> <p>= 4 days</p> <p>Cost = $5 \times 6 \times 4 \times 40 \checkmark$</p> <p>= Ksh 4800 \checkmark</p>	<p>MI</p> <p>MI</p> <p>AI</p> <p>3</p>	<p>Follow through for any other cases that lead to 4800,</p>

9. (a)

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SI

PI

L1

~~(0,1)~~
 (0,1) (5,11) (6,13)
 $y = 1 \pm 0.25$

(b) When $x = 0$, $y = 1.5 \pm 0.25$ ($\frac{1}{2}$ small square)

B1

4

10.

Amplitude = 2 ✓

Phase angle = $+30^\circ$ ✓

B1

B1

2

11.

8, 11, 13, 14, 15, 16, 17, 19, 20

$$\left. \begin{aligned} Q_1 &= \frac{11+13}{2} = 12 \\ Q_3 &= \frac{17+19}{2} = 18 \end{aligned} \right\}$$

$$\begin{aligned} \text{Quartile deviation} &= \frac{1}{2}(18-12) \\ &= 3 \end{aligned}$$

B1

MI

A1

3

allow if one of the quartiles is 0

12.	Longitude difference = $30 - 10 = 20^\circ$ $600 \sin 20 = 20 \times 60 \cos \theta$ ✓ $\cos \theta = 0.5$ $\theta = 60^\circ$ Latitude = $60^\circ N$ ✓	BI MI AI 3	Can be simplified in working if correct use of trigonometry
PR → B) Any that can combine with PR to obtain QS (A mult)	$OQ = \frac{2}{3}p + \frac{1}{3}r$ ✓ $OS = p + 3(r - p)$ $= 3r - 2p$ ✓ $QS = -OQ + OS$ $= -\frac{2}{3}p - \frac{1}{3}r + 3r - 2p$ ✓ $= \frac{8}{3}r - \frac{8}{3}p$ ✓	BI BI MI AI 4	PR or RQ used or seen. Should connect PQ or QR used or seen. Follow through where necessary. Apply (ow -) if vector sign not completely right.
14.	$P \text{ (MW or WM)} = \frac{6}{10} \times \frac{4}{9} + \frac{4}{10} \times \frac{6}{9}$ or only one combination is seen ✓ $= \frac{24}{90} + \frac{24}{90}$ $= \frac{8}{15}$ ✓	MI MI AI 3	Anyone correct combination (both parts) ✓
15.	$\text{Det}(T) = 18$ ✓ $\text{Area of object OAB} = \frac{\text{Area of image}}{\text{Det}(T)}$ $= \frac{\frac{1}{2} \times 18 \times 6}{18}$ $= 3 \text{ units}^2$ ✓ In case of Heron's formula, follow through.	BI MI AI 3	Det = 18 All right. Should be able to handle for equivalent (any shape) det and areas.

16.

$$\int_0^2 (kx^3 - 3x^2) dx = 16$$

$$\left[\frac{kx^4}{4} - x^3 \right]_0^2 = 16$$

$$\left[\frac{k(2)^4}{4} - (2)^3 \right] - [0] = 16$$

$$4k - 8 = 16$$

$$4k = 24$$

$$k = 6$$

MI - correct integration
 - limits shown
 - equated to 16.
 MI - zero omitted at
 - substituting limits
 (Allow if one term is
 wrongly integrated)
 MI - Single terms on both
 sides.
 AI
 4

SECTION 2

17. (a)

$$a + 4d = 18 \quad (i)$$

$$a + 9d = -2 \quad (ii)$$

$$5d = -20$$

$$d = -4$$

$$a = 34$$

(b)

$$\frac{n}{2} \{2 \times 34 + (n-1)(-4)\} = 0$$

$$\frac{n}{2} \{68 - 4n + 4\} = 0$$

$$4n = 72$$

$$n = 18$$

least number of terms = 19

$$S_{19} = \frac{19}{2} \{2 \times 34 + 18(-4)\}$$

$$= \frac{19}{2} (68 - 72)$$

$$= \frac{19}{2} (-4)$$

$$= -38$$

If inequalities
 are used.

$$n > 18 - A_1$$

$$n = 19 - B_1$$

B1 - Both (i) and (ii) eqns.
 vly obtained.
 MI - ✓ attempt to solve
 equations
 AI - } can ~~use~~ for
 BI - } a and b but
 maintain order
 MI - terms listed = 19
 evidence of it
 MI - $\frac{n}{2}(72 - 4n) = 0$
 AI - State that
 list no. of terms in
 BI - 19, A, B₁ together
 MI - Can be implied in
 B if 19 terms are
 listed with evidence
 in addition
 AI - -38.

10

121/2 MS

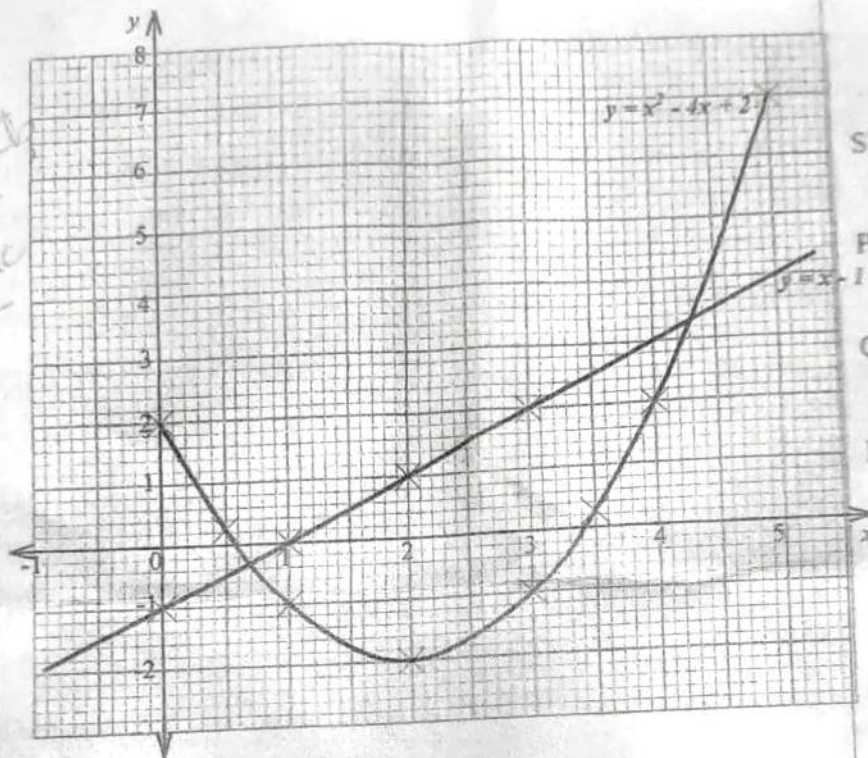
34 + 30 + 26 + 22 + 18 + 14 + 10 + 6 + 2 + -2 + -6 - 10
 - 14 - 18 - 22 - 26 - 30 - 34 - 38
 n = 19 - must be sorted
 col and keep
 implied.
 M₁ - 10
 M₂ - 10
 18 - A, B₁ - 19
 M₁ -

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✓

If curve passes through expected point then no need to draw points



S1 ✓ scale
P1 ✓ plotting for B1
C1 ✓ curve drawn

L1 $y = x - 1$ ✓ must be drawn

Correct through the line

(c) $x = 0.6 \pm 0.15$
 $x = 3.4 \pm 0.15$

B1 *as persistent scale.*
B1 *Must not be read from condensed regions of the curve*

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

$$y = x - 1$$

when $y = x - 1$, then
 $x = 0.7 \pm 0.15$
 $x = 4.3 \pm 0.15$

B1
B1

10

19. (a) Modal class 30 - 40

(b)

x	f	fx	x^2	fx^2
5	4	20	25	100
15	8	120	225	1800
25	10	250	625	6250
35	12	420	1225	14700
45	4	180	2025	8100
55	2	110	3025	6050
	40	1100		37000

B1 ✓

B1 for fx ✓

~~B1~~ For fx^2

(i)
$$\bar{x} = \frac{\sum xf}{N} = \frac{1100}{40} \checkmark$$

$$= 27.5 \checkmark$$

M1

A1

(ii)
$$s.d^2 = \frac{37000}{40} - 27.5^2 \checkmark$$

$$= 925 - 756.25$$

$$= 168.75$$

$$s.d = \sqrt{168.75} \checkmark$$

$$= 12.99 \checkmark$$

If $(fx)^2$ is used, it's a wrong method. So all method marks are lost.

B1 For fx^2
 M1 Allow for use assumed mean

M1 $\sqrt{\text{simple term}}$

A1

(c) No of plants whose height $> 40 = 4 + 2 = 6 \checkmark$

$$P(\text{Height} > 40\text{cm}) = \frac{6}{40} = 0.15$$

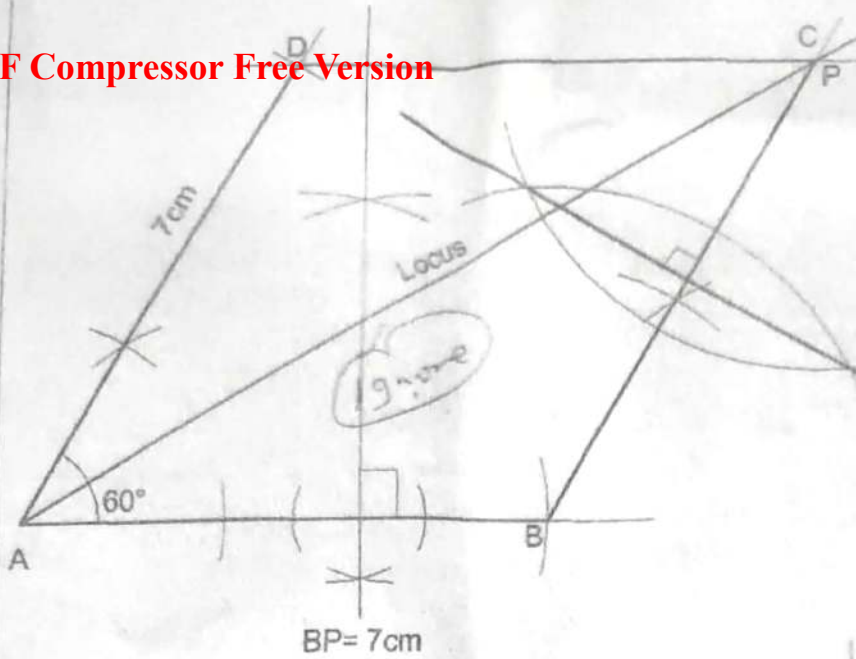
B1 $1 - \frac{34}{40}$

B1 $\frac{6}{40}$

10

20.

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(a)				
(i)	$\angle BAD = 60^\circ$	✓	B1	✓ly constructed
	Line DC or BC correctly drawn	AD = 7 cm ✓ C correctly located	B1	✓ly measured
	Parallelogram ABCD	✓	B1	✓ly located (C)
(ii)	Angle bisector of $\angle BAD$	✓	B1	ABCD completed
(iii)	bisector of BC	✓ drawn ✓	B1	✓ly constructed
(b)			BC	B1 ✓ly constructed
(i)	Point P identified & ✓ marked on line BC	✓	B1	✓ly marked on d
(ii)	BP = 7.2 ± 0.1 cm	✓	B1	
(c)	Locus of points equidistant from B and C		B2	
(d)				

10

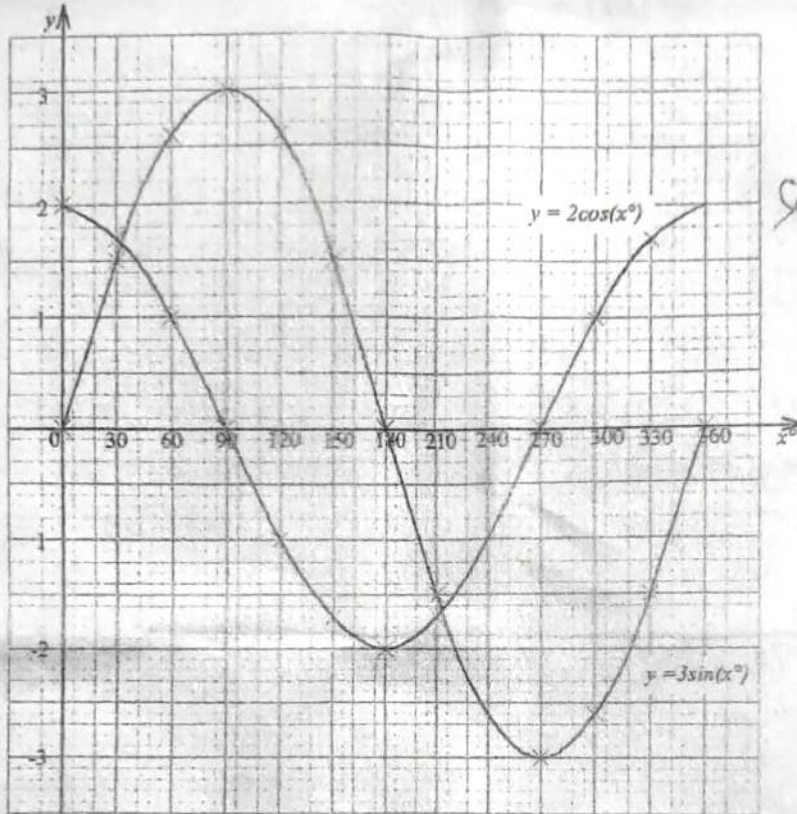
Read with the candidate

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21. (a)

x	0°	30°	60	90	120	150	180	210	240	270	300	330	360
2cosx		1.7			-1		-2			0			
3sinx			2.6			1.5		-1.5		-3	-2.6		

B1 } B2
B1 } B1
5.



- Select
- S1 - Correct linear scale
 - P1 ✓ Correct plotting of $y = 2\cos x$
 - C1 ✓ curve of $y = 2\cos x$ drawn
 - 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

Read with the candidate all times.

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

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

$x = 34^\circ$ or $214^\circ \pm \frac{1}{2}$ (Scale on ~~the~~ x axis)

$x = 214^\circ$ ✓

B1 34°

B1 214°

(d) $y = 1.6$ and $y = -1.6 \pm \frac{1}{2}$ (Scale only - x axis)

Range: (1.65 - 1.65)

B1 Both vthly station.

10

22. (a)	Length of MP	M1 A1	$\sqrt{200}$ 14.14
	$MP = \sqrt{200} = 14.14 \checkmark$		
(b)	Angle between MU and plane MNPQ	M1	or 2 equivalent statements - $\tan \theta = \frac{15}{14.14}$
	$\tan \theta_1 = \frac{15}{\sqrt{200}} \checkmark$		
	$\theta_1 = \tan^{-1} \left(\frac{15}{\sqrt{200}} \right)$	A1	
	$= 46.69^\circ$		
(c)	Length VO	M1	
	h = Height of pyramid		
	$= \sqrt{(13^2 - 7.07^2)} \checkmark$		
	$= 10.91$		
	$VO = 15 + h = 15 + 10.91 \checkmark$	M1	
	$= 25.91 \text{ cm} \checkmark$	A1	
(d)	Angle between planes VST and RSTU	B1	can be impo
	$\cos \theta_2 = \frac{5}{12} \checkmark$	M1	Identification of angle on the diag equivalent Tan, Sin
	$\theta_2 = \cos^{-1} \left(\frac{5}{12} \right)$		
	$= 65.39^\circ \checkmark$ (7).	A1	65.39 If sine is used.
		10	

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23. (a)	<p>Taxable income</p> <p>(i) $= 52000 + 7800 + 5000$ ✓ $= \text{Ksh } 64800$</p>	MI AI	
(ii) (a)	<p>Tax payable</p> <p>$11180 \times 0.1 = 1118$ ✓</p> <p>$10534 \times 0.15 = 1580.1$</p> <p>$10534 \times 0.2 = 2106.8$</p> <p>$10534 \times 0.25 = 2633.5$</p> <p>$22018 \times 0.3 = 6605.4$</p> <p>Total tax = 14043.8</p> <p>Net tax = $14043.8 - 1280$ ✓ $= 12763.8$ ✓</p>	<p>MI</p> <p>MI</p> <p>MI</p> <p>MI</p> <p>AI</p> <p>MI</p> <p>AI</p>	<p>For 2nd, 3rd and 4th bands</p>
(b)	<p>Additional tax</p> <p>$= \frac{4}{100} \times 52000 \times 0.3$ ✓</p> <p>$= \text{Ksh } 624$</p> <p>Net salary = $64800 - 12763.8 - 624$ ($64800 + 2080$) - ($12763.8 - 624$) $= \text{Ksh } 51412.20$ 53492.20</p>	<p>MI</p> <p>MI</p> <p>AI</p>	<p>$\frac{30}{100} \times 2080$</p> <p>equivalents.</p>

Subtractions are method so let be 2080

$66880 - 13387.8 - MI$ (b).

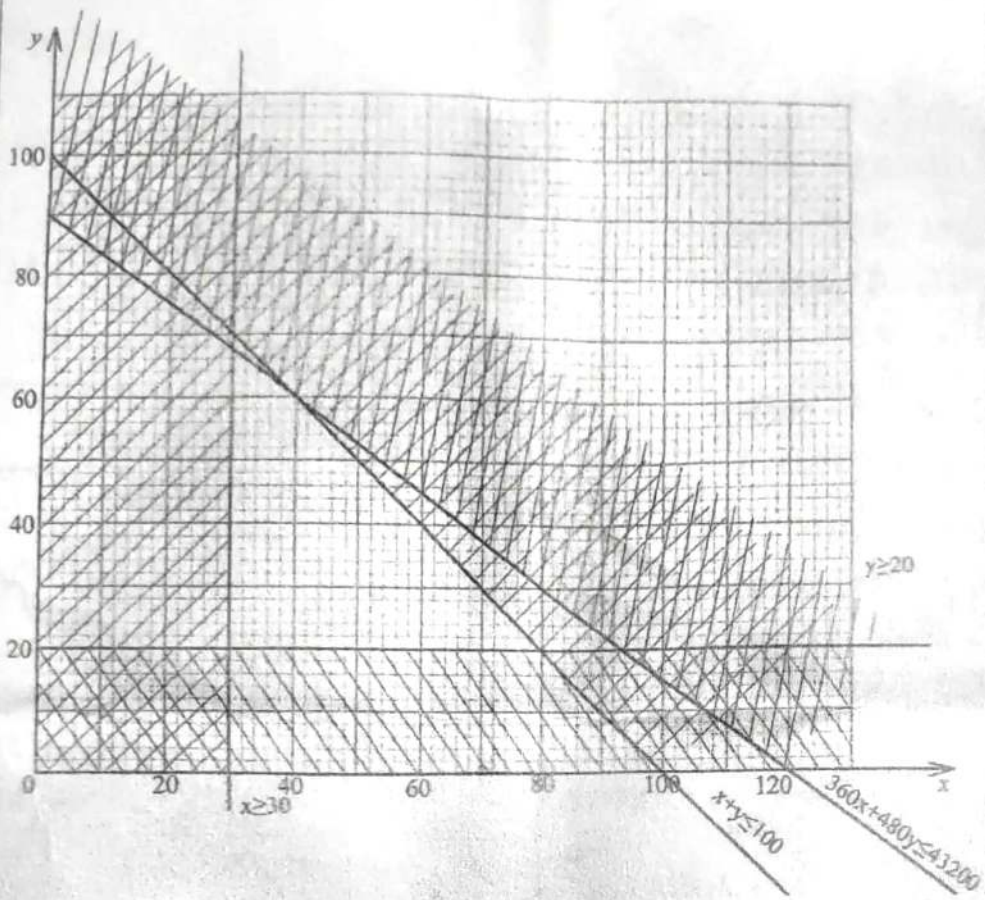
$53492.20 - AI$

24. (a) $x \geq 30$; $y \geq 20$ ✓
 $x + y \leq 100$ ✓
 $360x + 480y \leq 43200$ or $3x + 4y \leq 360$

B1 Both ✓
 B1
 B1

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(b)



If inequalities are reversed or equal signs missing. ✓
 B1 ✓ $y \geq 20$ ✓ shaded ✓
 B1 ✓ $x \geq 30$ ✓ shaded ✓
 B1 ✓ $x + y \leq 100$ ✓ shaded ✓
 B1 ✓ $3x + 4y \leq 360$ ✓ shaded ✓
 ✓ the area is shaded

(c)

Profit function = $50x + 60y$
 Profit = $50 \times 40 + 60 \times 60$
 = 5600

✓ Search line drawn or inspection using

B1 - 3 points ✓
 M1 - one affected (40, 60).
 A1 (substitution $40 \times 50 + 60 \times 60$)
 A1 = 5600
 10 Apply (ow +

If neither search line or inspection used but M1, A1 ✓