MARKING GUIDE FOR MOCKS

456/1 MATHEMATICS PAPER ONE

SET TWO

	SOLUTION	MARKS	COMMENTS
1.	$\frac{(75.86-24.14)(75.86+24.14)}{5.172}$	M_1	for factorising using difference of two squares.
	$\frac{51.72 \times 100}{5.172}$	M_1	for correct subtraction and correct addition
	$\frac{51.72 \times 100 \times 10}{5.172 \times 10}$ or $\frac{5.172 \times 1000}{5.172}$	M_1	for multiplying top and bottom by 10 or equiv.
	$= 1000$	A_1	N.B. Accept correct long multiplication
		04	
2.	$32m^3t - 4t$		
	$4t(8m^3 - 1)$	M_1	
	$4t\{(2m)^3 - 1^3\}$	M_1	Using $a^3-b^3=(a-b)(a^2+ab+b^2)$
	$4t(2m-1)(4m^2+2m+1)$	$M_1 A_1$	
		04	
3.	let $x = 2.1666...$ or equiv.		
	$100x = 216.66...$ }	B_1	
	$-\ 10x = 21.66...$ }		
	$90x = 195$	M_1	for correct subtraction.
	$\frac{90x}{90} = \frac{195}{90}$		
	$x = \frac{195}{90}$	A_1	
	$x = 2\frac{1}{6}$	A_1	
		04	

	MARK	
$23-x+x+25-x+13=52$	M1	
$61-x=52$		
$9=x$	A1	
$n(A')=16+13$		
$=29$	A1	
	04	

5. Grad. of $\overline{KL} = \frac{3-0}{12-3}$ or $\frac{3}{9}$ or $\frac{1}{3}$ — M1

If gradient of perpendicular is m,

$m \times \frac{1}{3} = -1$

$m = -3$ — M1

Equation of line is $y=mx+c$

$y=-3x+c$ (6, 1)

$1=(-3\times6)+c$ — M1

$1=-18+c$

$c=19$

∴ equation is $y=-3x+19$ — A1

04

Accept:

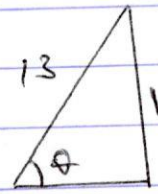
$\frac{y-1}{x-6} = -3$

$y-1=-3(x-6)$

$y-1=-3x+18$

$y=-3x+19$

6.

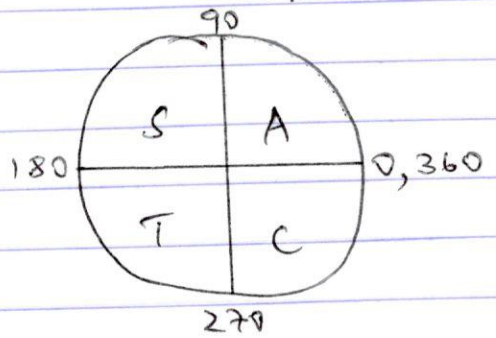


$h^2=13^2-5^2$ — M1

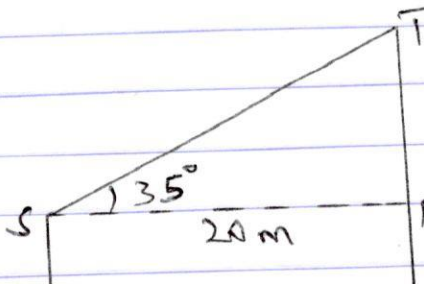
$h=\sqrt{169-25}$

$h=\sqrt{144}$

$h=12$ — A1



	MARK	
7. (i) Mode = 18	B_1	for 18 seen.
(ii) 10, 11, 12, 13, 15, 16, 16, 17, 17, 18, 18, 18, 19, 20, 20		
median = 17	B_1	for 17 seen.
(iii) mean $= \frac{\Sigma x}{n}$		
$= \frac{240}{15}$	M_1	
$= 16$	A_1	
	04	
8. A.S.F. = det. (M.D.T.)		
det. $P = (2 \times n) - (3 \times -2)$		
$= 2n + 6$	M_1	$2n+6 = \frac{20}{5}$
A.S.F. $=$ Image area / Object area		earns M_1, M_1
$= \frac{20}{5}$		
$= 4$	M_1	
$2n + 6 = 4$	M_1	
$2n = -2$		
$n = -1$.	A_1	
	04	
9.		



	MARK	
Height of tree = $\overline{QR} + \overline{RT}$		
$= 1.35 + 14.00415$	$M_1\surd$	$M_1\surd$ for his (14.00415m)
$= 15.35m$	A1	
	04	

10. $2x - y = 20$

$3y + x = 3$

$\Rightarrow 2x - y = 20$

$x + 3y = 3$

$\begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 20 \\ 3 \end{pmatrix}$ — M_1 or equivalent.

$\begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}\begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}\begin{pmatrix} 20 \\ 3 \end{pmatrix}$ — M_1 or equivalent.

$\begin{pmatrix} 7 & 0 \\ 0 & 7 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 63 \\ -14 \end{pmatrix}$ — M_1

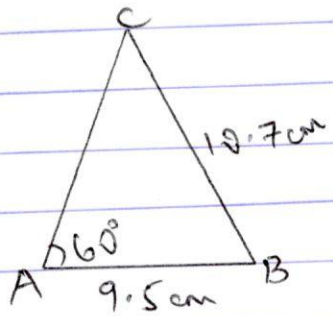
$\begin{pmatrix} 7x \\ 7y \end{pmatrix} = \begin{pmatrix} 63 \\ -14 \end{pmatrix}$

$7x = 63$, $7y = -14$

$x = 9$, $y = -2$ — A1 for both values of x and y correct.

04

11. (a)



Sketch — B1 for correct sketch including 60° at point A, $\overline{AB} = 9.5$ and $\overline{BC} = 10.7$. Accurate construction without sketch earns B1.

Angle of 60° correctly constructed at point A. — M1

	MARK	
(b) Mediator of $\overline{AC}$ correctly drawn	M1	
Mediator of $\overline{BC}$ correctly drawn	M1	
Point of intersection of the mediators marked as N.	A1	
(c) Correct circle drawn using point N as centre and drawn to pass through at least two of the vertices and very close to the third vertex.	A1	
Radius of circle = 6.2cm ± 0.2	A1	(6.0 to 6.4) cm.
(d) Area of circle = πr^2		6.0 → 113.11 cm^2
$= 3.142 \times 6.2 \times 6.2$	M1	6.1 → 116.91 cm^2
$= 120.778\ cm^2$		6.3 → 124.70 cm^2
$\approx 120.8\ cm^2$	A1	6.4 → 128.69 cm^2
	12	

12. (a) Jacob Son

Now: $2x$ x

20 yrs ago: $2x-20$ $x-20$

$(2x-20)(x-20) = 750$ M1

$2x^2 - 40x - 20x + 400 = 750$ M1

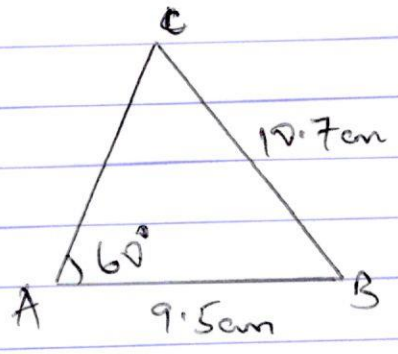
$2x^2 - 60x - 350 = 0$

$x^2 - 30x - 175 = 0$ or equiv M1

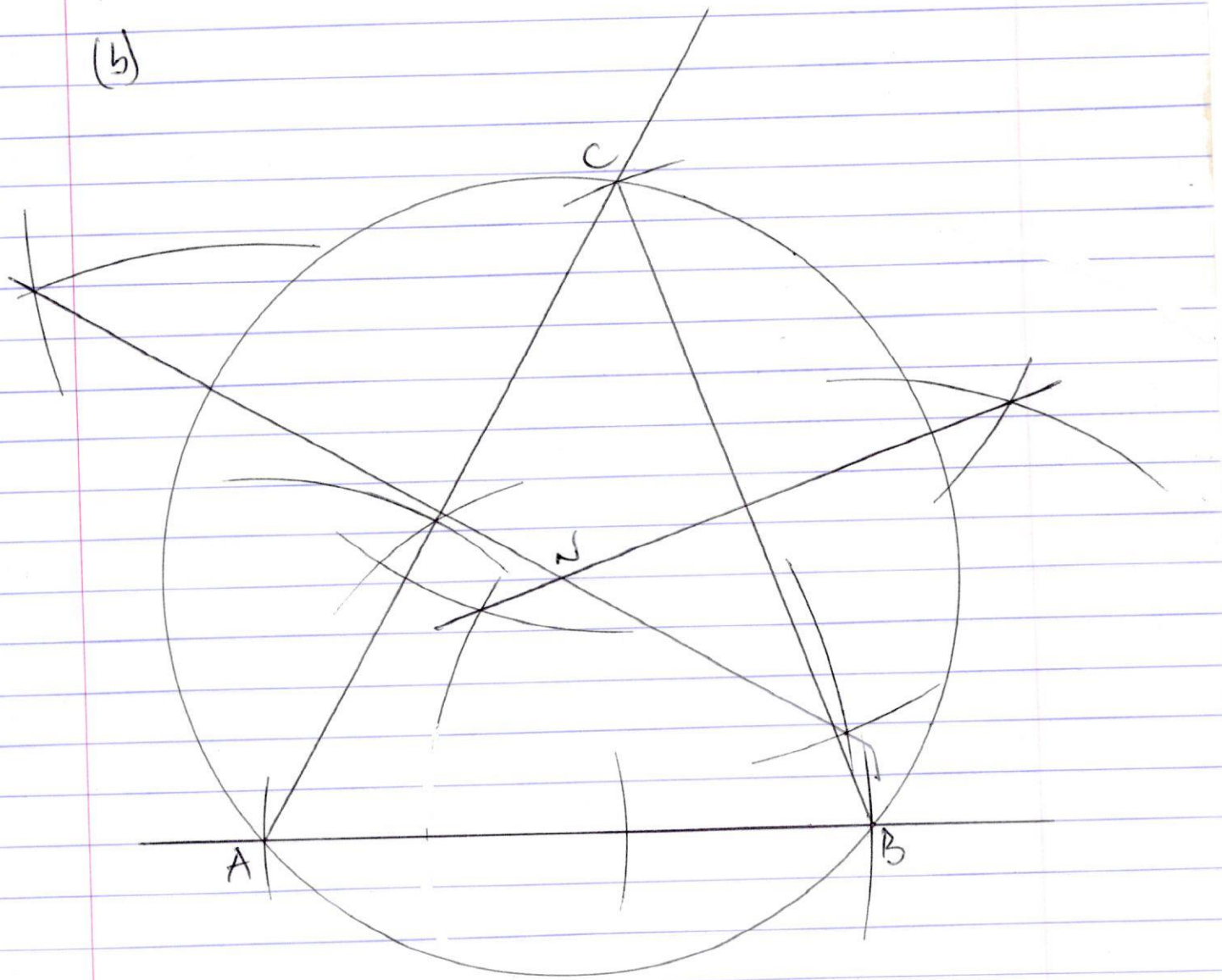
$x^2 - 35x + 5x - 175 = 0$

$x(x-35) + 5(x-35) = 0$

11. (a)



(b)



Angle ACB = 50°

(c) Radius of circle = 6.2cm

		MARK	
∴ Son is 35 years		A1	
Jacob is $2 \times 35 = 70$ years		A1	
(b)	$R = \sqrt{\frac{Mb^3}{t}}$		
	$R^2 = \frac{Mb^3}{t}$	M1	for squaring both sides.
	$b^3 = \frac{R^2 t}{M}$	M1	for multiplying both sides by t/M.
	$b = \sqrt[3]{\frac{R^2 t}{M}}$	A1	
	$b = \sqrt[3]{\frac{50 \times 50 \times 0.4}{8}}$	M1	
	$b = \sqrt[3]{125}$	M1	
	$b = 5$	A1	
		12	

13.

(a)

CLASS	TALLY	f	x	fx
20-29	III	3	24.5	73.5
30-39	~~IIII~~ III	8	34.5	276.0
40-49	~~IIII~~ ~~IIII~~	10	44.5	445.0
50-59	~~IIII~~ ~~IIII~~ IIII	14	54.5	763.0
60-69	~~IIII~~ IIII	9	64.5	580.5
70-79	IIII	4	74.5	298.0
80-89	II	2	84.5	169.0
		$\Sigma f = 50$		$\Sigma fx = 2605$

B1 for all correct classes

M1 for all correct f column.

M1 for all correct x column.

M2 for all correct fx column.
M1 for 5 to 6 correct
M0 for 4 or less correct

A1 for correct Σfx.

	MARK	
(ii) Labelling both axes	B_1	
All bars correctly drawn	M_1	
Correct diagonals drawn to estimate modal mark	M_1	
Modal mark = 53.5 ± 0.5	A_1	(53 to 54)
	12	

14. (a) (i) $R = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ B_2

(ii) $E = \begin{pmatrix} -\frac{1}{4} & 0 \\ 0 & -\frac{1}{4} \end{pmatrix}$ B_2

(b)(i) $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} 4 & 8 & 8 \\ 8 & 4 & 12 \end{pmatrix}$ M_1

$= \begin{pmatrix} 4 & 8 & 8 \\ -8 & -4 & -12 \end{pmatrix}$ A_1

$K'(4,-8)$, $L'(8,-4)$, $M'(8,-12)$ A_1 for all three points correct.

(ii) $\begin{pmatrix} -\frac{1}{4} & 0 \\ 0 & -\frac{1}{4} \end{pmatrix}\begin{pmatrix} 4 & 8 & 8 \\ -8 & -4 & -12 \end{pmatrix}$ M_1

$= \begin{pmatrix} -1 & -2 & -2 \\ 2 & 1 & 3 \end{pmatrix}$ A_1

$K''(-1,2)$ $L''(-2,1)$ $M''(-2,3)$ A_1 for all three points correct.

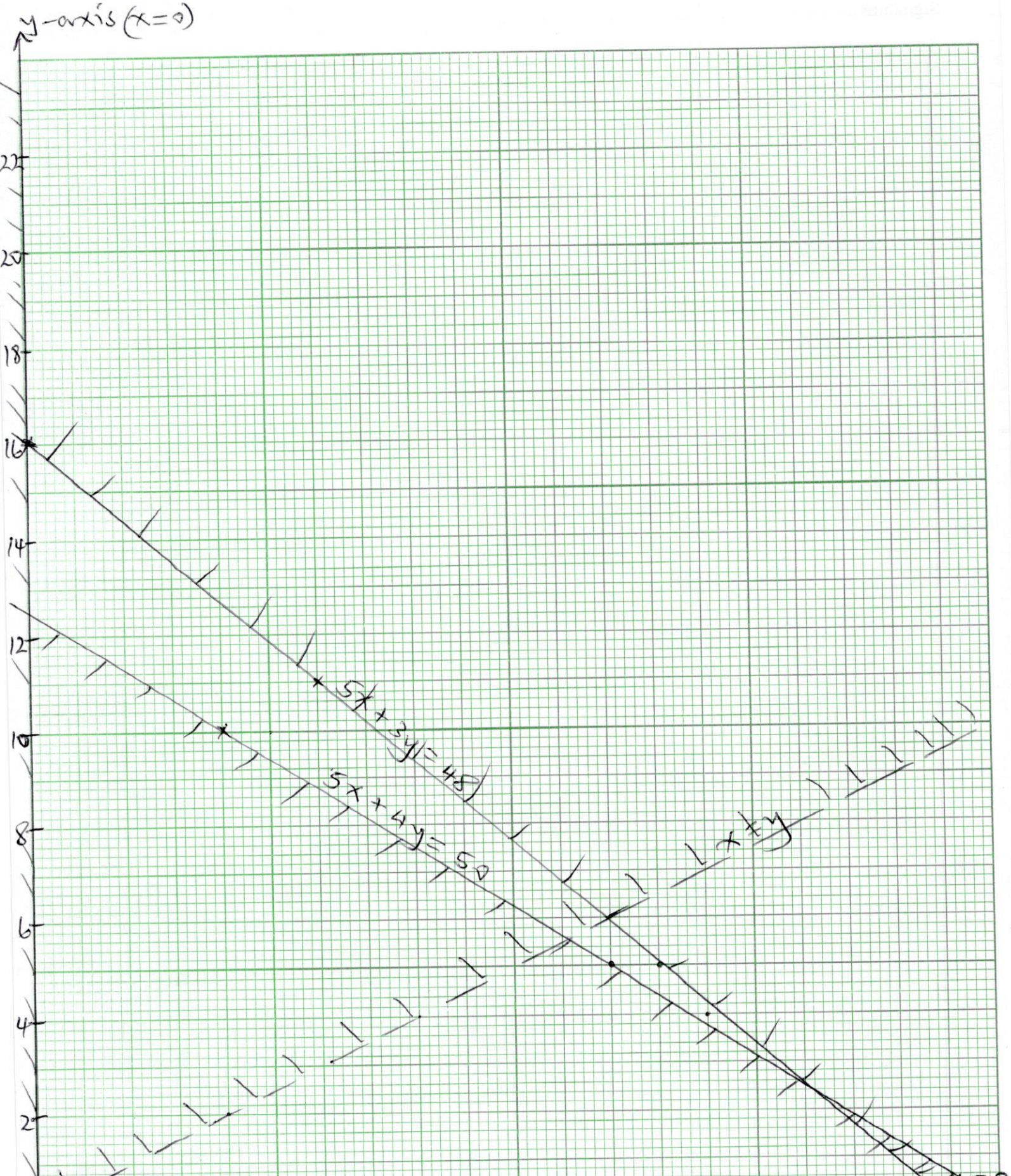
(c) Single matrix is equal

	MARK
15. (a) (i) $(130 \quad 135 \quad 125)$	B_1
(ii) $(50 \quad 60 \quad 100)$	B_1
(b) (i) $\begin{pmatrix} 5000 \\ 3000 \\ 2000 \end{pmatrix}$	B_1
(ii) $\begin{pmatrix} 3000 \\ 2000 \\ 1000 \end{pmatrix}$	B_1
(c) (i) $(130 \quad 135 \quad 125)\begin{pmatrix} 5000 \\ 3000 \\ 2000 \end{pmatrix}$	M_1
$= 650,000 + 405,000 + 250,000$	M_1
$= 1,305,000$	A_1
(ii) $(50 \quad 60 \quad 100)\begin{pmatrix} 3000 \\ 2000 \\ 1000 \end{pmatrix}$	M_1
$= 150,000 + 120,000 + 100,000$	M_1
$= 370,000$	A_1
(d) $1,305,000 + 370,000$	M_1
$= 1,675,000$	A_1
	12

16. (a) $\rightarrow x \geq 0$
$\rightarrow y \geq 0$ } M_1 for both inequalities

	MARK	
$\rightarrow 350,000x + 210,000y \leq 3,360,000$ or $35x + 21y \leq 336$ or $5x + 3y \leq 48$	M1	for any of the equivalent inequalities
$\rightarrow x > y$ or $y < x$	M1	
(b) Drawing line $5x+4y=50$ with correct shading Drawing line $5x+3y=48$ with correct shading. Drawing line $x=y$ with correct shading.	M1 M1 M1	(2,10) (10,0) (0,16) (3,11)
(c) Correct unshaded region	A1	
(d) (6,5) costs $350,000 \times 6 + 210,000 \times 5$ = shs. 3,150,000 (7,4) costs $350,000 \times 7 + 210,000 \times 4$ = shs. 3,290,000	M1	
(6,5) is the best solution or Scania lorry makes 6 trips and Fuso lorry makes 5 trips	A1	
Amount saved is $3,360,000 - 3,150,000$	M1	
= shs. 210,000	A1	
	12	

Qn. 16



17. (a)

x	-4	-3	-2	-1	0	1	2	3	4
x^2	16	9	4	1	0	1	4	9	16
$y=12-x^2$	-4	3	8	11	12	11	8	3	-4

MARK

B_1 for all x^2 row correct.

B_3 for all $y=12-x^2$ row correct.

B_2 for 7 to 8 values correct.

B_1 for 5 to 6 values correct.

B_0 for 4 or less

(b) See graph on Pg.

All 9 points plotted correctly — M_2

Joining all the 9 points using smooth curve — A_1

(c) $x = -3.5 \pm 0.1$ — A_1 (-3.6 to -3.4)

or $x = +3.5 \pm 0.1$ — A_1 (3.4 to 3.6)

(d) Drawing of line $y = 2x+5$ — M_1

(e) $12 - x^2 = 2x + 5$

$\Rightarrow x^2 + 2x - 7 = 0$

Solution is point of intersection of curve $y = 12 - x^2$ and line $y = 2x + 5$.

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(To be fastened together with other answers to paper)

Name Qn. 17(b) Index Number Pg 13

Signature