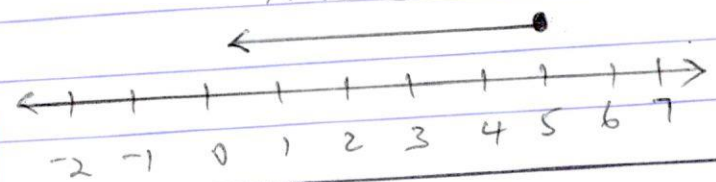
MARKING GUIDE FOR PEAS

MOCK EXAMINATIONS

456/1 MATHEMATICS PAPER ONE

SET ONE

SOLUTION	MARK	COMMENT
1. (i) $9 * -5 = 9^2 - 3 \times (-5)^2$	M1	
$= 81 - (3 \times 25)$		
$= 81 - 75$		
$= 6$	A1	
(ii) $6 * 2 = 6^2 - 3 \times 2^2$	M1✓	M1✓ for this (6)
$= 36 - 3 \times 4$		
$= 36 - 12$		
$= 24$	A1	
	04	
2. $3(2x-1) \leq 5x+2$	M1	correct opening of brac.
$6x - 3 \leq 5x + 2$	M1	collecting like terms
$6x - 5x \leq 2 + 3$	A1	
$x \leq 5$		
	B1	
	04	
3. $2x^2 - 4x - 30 = 0$		or:
$2x^2 - 10x + 6x - 30 = 0$	B1	$2x^2 + 6x - 10x - 30 = 0$
$2x(x-5) + 6(x-5) = 0$		$2x(x+3) - 10(x+3) = 0$
$(2x+6)(x-5) = 0$	M1	$(2x-10)(x+3) = 0$
either $2x+6=0$ or $x-5=0$		
$x = -3$ $\quad x = 5$	A1A1	A1 for each correct one
	04	
4. $P^{-1} = \frac{1}{\det . P} \times \text{adj. } P$		
$\det . P = (-4 \times 1) - (-3 \times 2)$	M1	
$= -4 + 6$		
$= 2$.	A1	
$P^{-1} = \frac{1}{2}\begin{pmatrix} 1 & 3 \\ & \end{pmatrix}$	M1✓	M1✓ for this (2)

	MARK	
5. $\frac{(x-1)}{3} - \frac{(3-2x)}{5} = \frac{x}{2}$		
$30\cdot\frac{(x-1)}{3} - 30\frac{(3-2x)}{5} = 30\cdot\frac{x}{2}$		M1 for multiplying through by 30 or equivalent.
$10(x-1) - 6(3-2x) = 15x$	M1	
$10x - 10 - 18 + 12x = 15x$	M1	M1 for opening brackets correctly.
$10x + 12x - 15x = 10 + 18$	M1	for collecting like terms
$7x = 28$		
$x = 4$	A1	
	04	
6. a) $\{567 \quad 657 \quad 756$ $576 \quad 675 \quad 765\}$	B2	
b) $E = \{576, 756\}$	M1	
$P(E) = \frac{n(E)}{n(S)} = \frac{2}{6}$		2/6 seen scores M1 A1
$= \frac{1}{3}$	A1	
	04	
7. $\begin{pmatrix}4 & -1\\3 & 2\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} = \begin{pmatrix}9\\4\end{pmatrix}$	B1	
$\begin{pmatrix}2 & 1\\-3 & 4\end{pmatrix}\begin{pmatrix}4 & -1\\3 & 2\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} = \begin{pmatrix}2 & 1\\-3 & 4\end{pmatrix}\begin{pmatrix}9\\4\end{pmatrix}$	M1	Accept inverse method.
$\begin{pmatrix}11 & 0\\0 & 11\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} = \begin{pmatrix}22\\-11\end{pmatrix}$	M1	
$11x = 22, \quad 11y = -11$ $x = 2 \quad y = -1$	A1	for both correct
	04	
8. $P^2 = \frac{a-5b}{b-c}$	M1	for squaring both side
$P^2(b-c) = a-5b$		

9. (i) $a + 20^\circ = 60^\circ$ M1
$a = 40^\circ$ A1

(ii) $\angle AOC = 360 - 120^\circ$ M1
$= 240^\circ$ A1

04

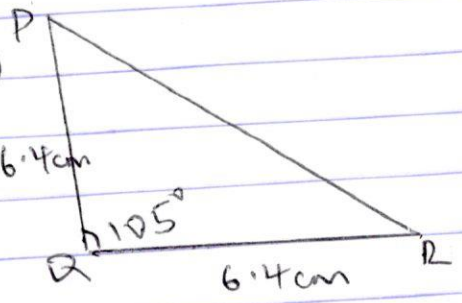
10. $\vec{MM'} = \vec{MO} + \vec{OM'}$ M1
$= \begin{pmatrix} -5 \\ -12 \end{pmatrix} + \begin{pmatrix} -3 \\ 8 \end{pmatrix}$
$= \begin{pmatrix} -8 \\ -4 \end{pmatrix}$
$\vec{ME} = \frac{1}{4}\vec{MM'}$
$\vec{OE} = \vec{OM} + \vec{ME}$
$= \begin{pmatrix} 5 \\ 12 \end{pmatrix} + \frac{1}{4}\begin{pmatrix} -8 \\ -4 \end{pmatrix}$ M1√ M1√ for $\begin{pmatrix} -8 \\ -4 \end{pmatrix}$.
$= \begin{pmatrix} 5 \\ 12 \end{pmatrix} + \begin{pmatrix} -2 \\ -1 \end{pmatrix} = \begin{pmatrix} 3 \\ 11 \end{pmatrix}$
E (3, 11) A1

04

11. a)

CLASS	f	x	d	fd	F
40–44	5	42	−15	−75	5
45–49	7	47	−10	−70	12
50–54	12	52	−5	−60	24
55–59	5	57	0	0	29
60–64	4	62	5	20	33
65–69	4	67	10	40	37
70–74	3	72	15	45	40
	40			$\Sigma fd = -100$	

M1 for all F correct
M1 for all x correct
M1 for all d correct
M1 for all fd correct
A1 for $\Sigma fd = -100$

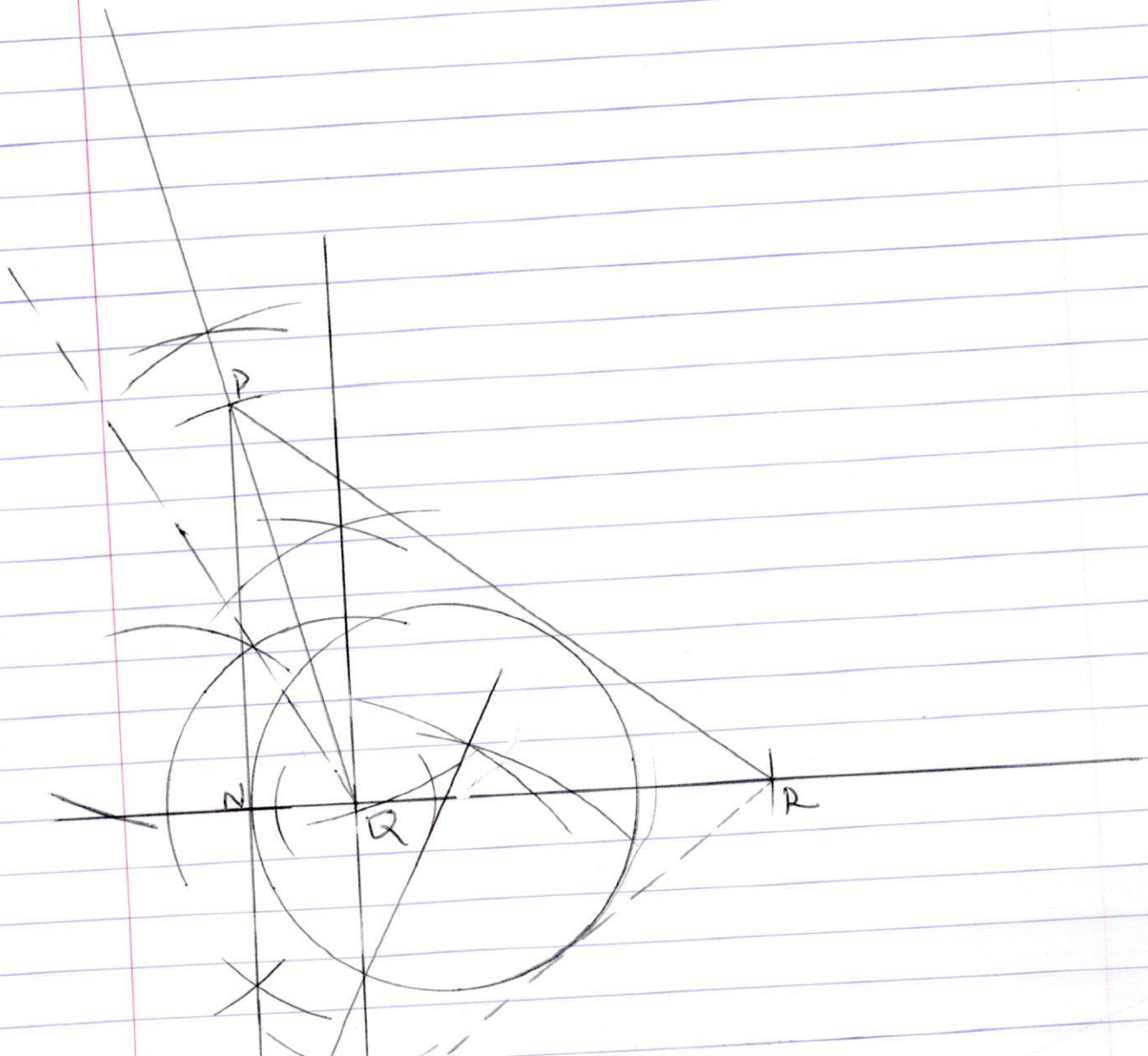
	MARKS	
$= 57 - 2.5$		
$= 54.5$	A1	
b) (i) Labelling both axes correctly	B1	
All points plotted correctly	M1	
Smooth curve drawn	A1	
Correct lines for locating the median.	M1	
(ii) Reading off the median as 53.5 ± 0.5	A1	(53 to 54)
Graph is on Pg 6	12	
12. a) 	B1	for correct sketch including $\angle Q = 105°$, $\overline{PQ} = \overline{QR} = 6.4$ cm. Correct construction without sketch earns B1.
90° constructed at Q	M1	
60° constructed at Q	M1	
105° constructed at Q	M1	bisecting 30°.
$\overline{QR} = 6.4$ cm $\pm$ 0.2 cm	M1	(6.2 to 6.6) cm
$\overline{PQ} = 6.4$ cm $\pm$ 0.2 cm	M1	(6.2 to 6.6) cm
(ii) $\overline{PR} = 10.0$ cm $\pm$ 0.2 cm	A1	(9.8 to 10.2) cm
$\angle PRQ = 38° \pm 1°$	A1	(37° to 39°)

$\overline{PR}$ = 10.0 cm

$\angle PRQ$ = 38°

$\overline{PS}$ = 12.1 cm

Radius = 3.0 cm



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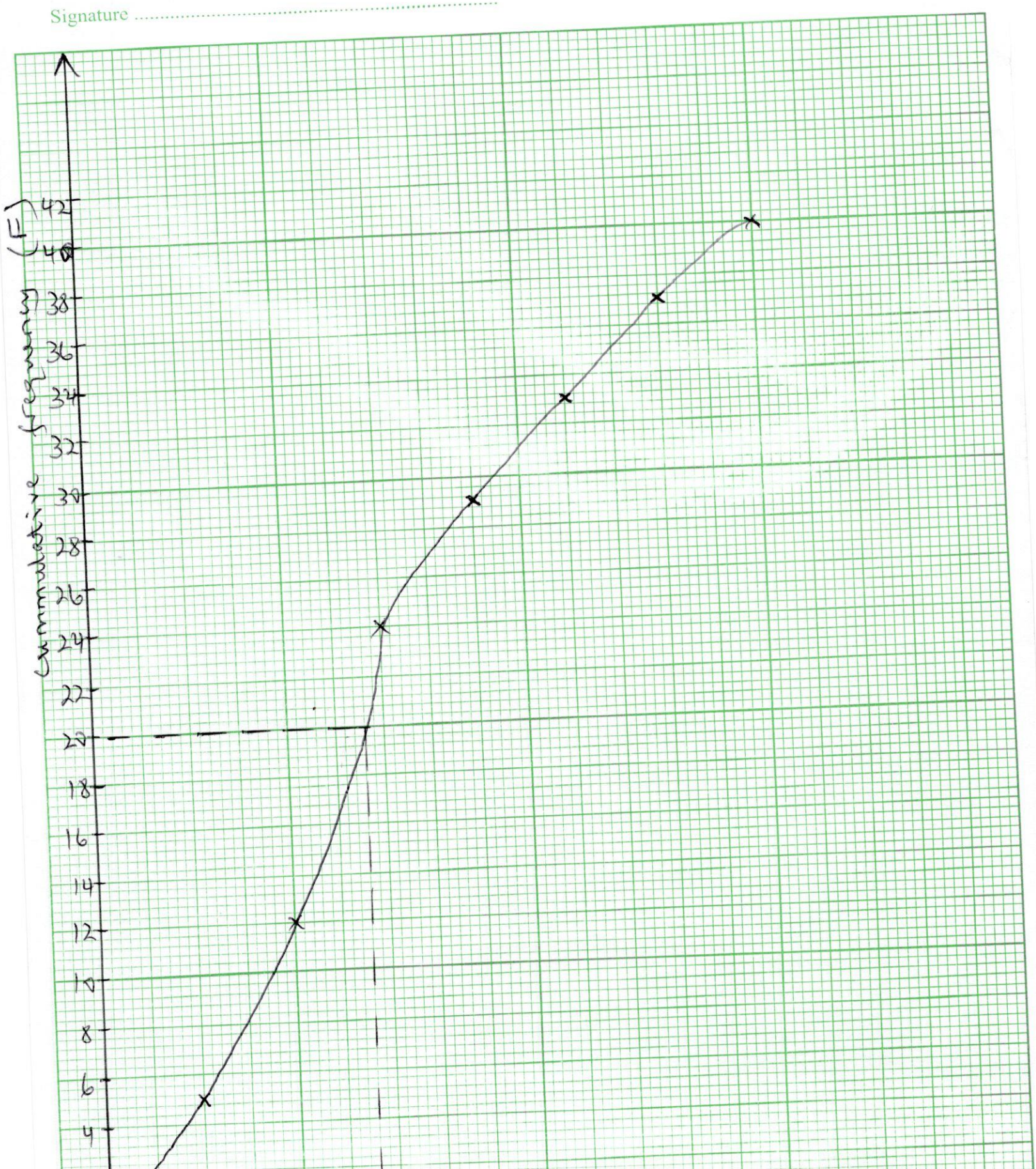
(To be fastened together with other answers to paper)

Name ..... Qn. 11 (b) .....

Index Number ..... Pg 6 .....

Signature .....



13. a) Image = M.O.T. × object

$\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}\begin{pmatrix} 1 & 3 & 3 & 1 \\ 2 & 2 & 0 & 0 \end{pmatrix}$ M1

$\begin{pmatrix} 2 & 6 & 6 & 2 \\ 4 & 4 & 0 & 0 \end{pmatrix}$ A1 for correct matrix

$K'(3,4)$ $L'(6,4)$ $M'(6,0)$ $N'(3,0)$ A_2 for all correct.

(b) $\begin{pmatrix} a & c \\ b & d \end{pmatrix}\begin{pmatrix} 2 & 6 & 6 & 2 \\ 4 & 4 & 0 & 0 \end{pmatrix} = \begin{pmatrix} 14 & 18 & 6 & 2 \\ 4 & 4 & 0 & 0 \end{pmatrix}$ M1

$6a = 6$ M1 Accept equivalent equations.

$a = 1$

$2a + 4c = 14$ M1

$2 + 4c = 14$

$4c = 12$

$c = 3$

$6b = 0$ M1

$b = 0$

$2b + 4d = 4$ M1

$4d = 4$

$d = 1$

$\begin{pmatrix} a & c \\ b & d \end{pmatrix} = \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}$ A1

(c) $BA = \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$ or equiv. M1

$= \begin{pmatrix} 2 & 6 \\ 0 & 2 \end{pmatrix}$ A1

12

MARK

$5x - 2y = 23$

$15 - 2y = 23$

$-2y = 8$

$y = -4$ A1

b) (i) $PQ = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}\begin{pmatrix} 2 & -1 \\ -3 & 2 \end{pmatrix}$ M1

$= \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ A1

(ii) $\begin{pmatrix} 2 & -1 \\ -3 & 2 \end{pmatrix}\begin{pmatrix} a & c \\ b & d \end{pmatrix} = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$ M1

$\begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}\begin{pmatrix} 2 & -1 \\ -3 & 2 \end{pmatrix}\begin{pmatrix} a & c \\ b & d \end{pmatrix} = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}\begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$ M1M1

$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} a & c \\ b & d \end{pmatrix} = \begin{pmatrix} 7 & 4 \\ 12 & 7 \end{pmatrix}$ M1

$\begin{pmatrix} a & c \\ b & d \end{pmatrix} = \begin{pmatrix} 7 & 4 \\ 12 & 7 \end{pmatrix}$ A1

Alt.

$\begin{pmatrix} 2 & -1 \\ -3 & 2 \end{pmatrix}\begin{pmatrix} a & c \\ b & d \end{pmatrix} = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$ M1

$2a - b = 2$

$-3a + 2b = 3$ M1

$\Rightarrow 4a - 2b = 4$

$-3a + 2b = 3$

$a = 7$

$2a - b = 2$

$14 - b = 2$

$b = 12$

$2c - d = 1$ M1

$-3c + 2d = 2$

$\Rightarrow 4c - 2d = 2$

$-3c + 2d = 2$

$\begin{pmatrix} a & c \\ b & d \end{pmatrix} = \begin{pmatrix} 7 & 4 \\ 12 & 7 \end{pmatrix}$ — A1

12

15.

(i)

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
x^2	25	16	9	4	1	0	1	4	9	16	25
-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8
y	17	8	1	-4	-7	-8	-7	-4	1	8	17

B1 for all correct
B1 for all correct
B_2 for all correct
B_1 for 9–10 correct.

(ii) Labelling both axes correctly — B1

Plotting all points correctly — M1

Reasonably smooth curve drawn through all points — A1

b) Drawing line $y = 3x - 4$ — M1 A1

c) Solving for $x^2 - 3x - 4 = 0$ means $x^2 - 8 = 3x - 4$ — M1

<u>or</u>

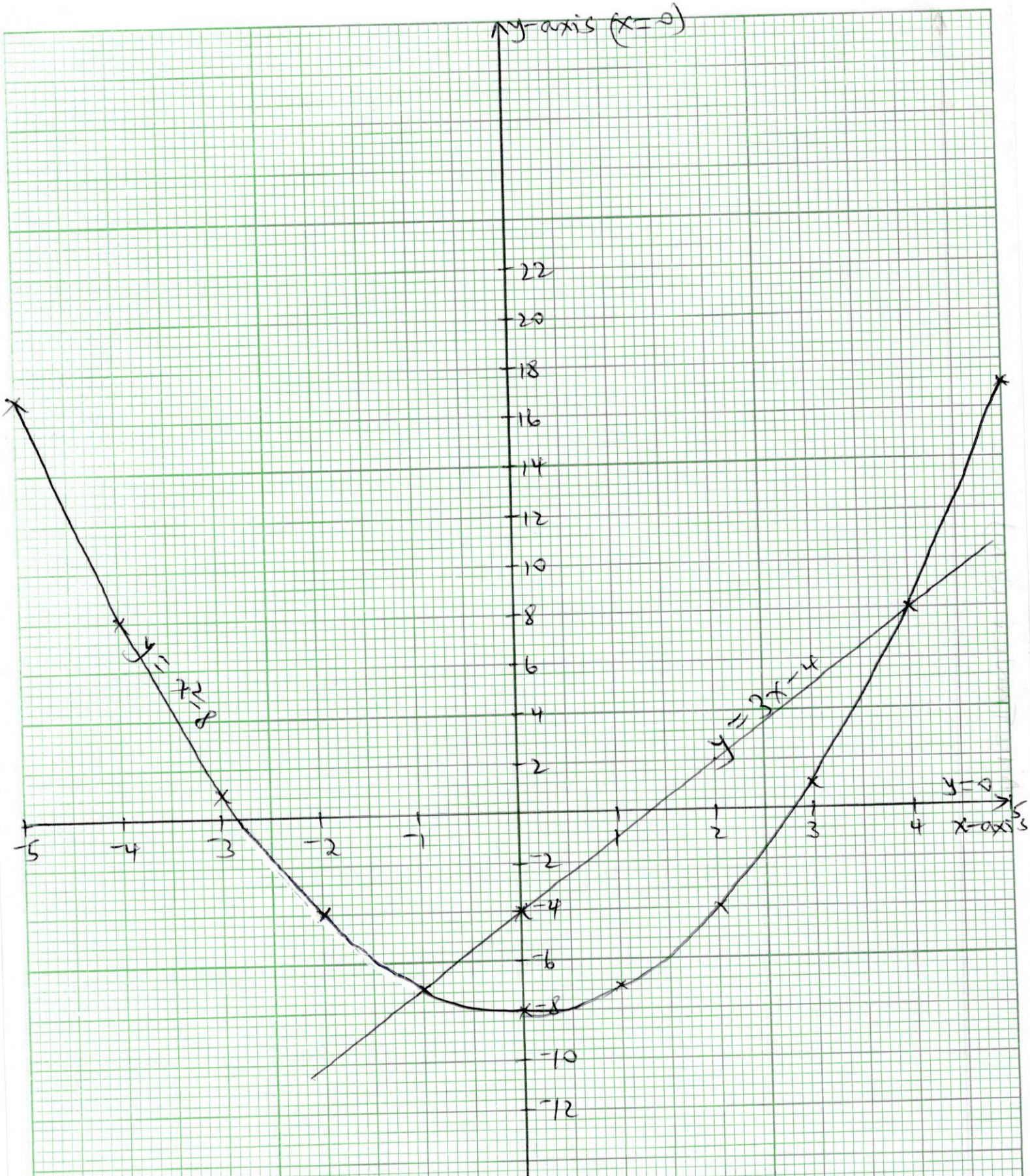
Solution lies on intersection of curve $y = x^2 - 8$ and the line $y = 3x - 4$

$x = -1$ — A1

or $x = 4$ — A1

12

Qn. 15.


y-axis (x=0)
22
20
18
16
14
12
10
8
6
4
2
-2
-4
-6
-8
-10
-12
-5
-4
-3
-2
-1
2
3
4
x-axis
y=0
y = 3x - 4
y = x² + 7x + 8

	MARKS	
Adding together gives;		
$2a = 14$	M1	
$a = 7$	A1	
$a + b = 10$		
$7 + b = 10$		
$b = 3$	A1	
b) let cost of 1 kg of rice be x/=		
let cost of 1 kg of posho be y/=		
$3x + 2y = 10,000$	M1	
$2x + 3y = 9,500$	M1	
$9x + 6y = 30,000$ }	M1	
$4x + 6y = 19,000$ }		
$5x = 11,000$	M1	
$x = 2,200$/=	A1	
$3x + 2y = 10,000$		
$6,600 + 2y = 10,000$	M1	
$2y = 3400$		
$y = 1700$	A1	
	12	
17. a) → $50x + 75y \geq 600$ }	M1	for any one of the equivalent inequalities
$2x + 3y \geq 24$ }		
→ $40,000x + 50,000y \leq 600,000$ }	M1	for any of the inequalities
$4x + 5y \leq 60$ }		

	MARKS	
(b) Drawing line $2x+3y=24$ with correct shading	M_1	(0,8), (6,4), (12,0)
Drawing line $4x+5y=60$ with correct shading	M_1	(0,12), (5,8), (10,4), (15,0)
Drawing line $y=x$ with correct shading	M_1	
Drawing line $x=7$ with correct shading	M_1	
Correct unshaded region	A_1	
(c) (5,5) costs 200,000+250,000 = 450,000 | =	M_1	
(6,4) costs 240,000+200,000 = 440,000 | =		
(6,5) costs 240,000+250,000 = 490,000 | =		
(6,6) costs 240,000+300,000 = 540,000 | =		
(7,4) costs 280,000+200,000 = 480,000 | =		
(7,5) costs 280,000+250,000 = 530,000 | =		
(7,6) costs 280,000+300,000 = 580,000 | =		
(6,4) is best solution	A_1	
or: Truck A makes 6 trips and Truck B makes 4 trips		
Amount saved = 600,000 − 440,000 = shs. 160,000	A_1	
	12	

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Pg 13

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Signature .....