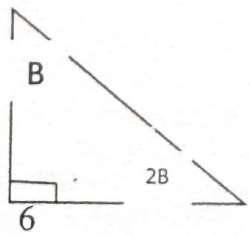
JINJA JOINT EXAMINATIONS BOARD

MATHEMATICS MARKING GUIDE 456/1 2022

QN	SOLUTION	MARKS	COMMENT
Q1	$\frac{1}{4x} = \frac{5}{6x} - 7$ $L.C.M = 24x$ $6 = 5(4) - 7(24x)$ $6 = 20 - 168x$ $168x = 14$ $x = \frac{14}{168}$ or $x = \frac{1}{12}$	M1 M1 M1 A1	
		04	
Q2	$\sqrt{2^x x 5^{2x} \div 2^{-x}}$ $\sqrt{2^{2x} x 5^{2x}}$ $\sqrt{10^{2x}}$ 10^x	M1 M1 M1 A1	
		04	
Q3	$a^2 - b^2 = (a+b)(a-b)$ $2557^2 - 2547^2$ $=(2547+2547)(2547-2547)$ $=5(04(10)$ $=51040$	M1 M1 M1 A1	
		04	20
Q4	$2(2-x) < 4x - 9 < x + 11$ $2(2-x) < 4x-9$ $\quad 4x-9 < x+11$ $4-2x < 4x-9$ $\quad 3x < 20$ $13 < 6x$ $\quad 6x < 40$ $= 13 < 6x < 40$ $2\frac{1}{6} < x < 6\frac{2}{3}$ $(x ; x = 2,3,4,5,6)$	M1 M1 A1 A1	For both For both For Integral inequality For integral value
Q5	Let centre of enlargement be (x,y) $\begin{pmatrix} x \\ y \end{pmatrix} - \begin{pmatrix} 4 \\ 6 \end{pmatrix} = 3\left[\begin{pmatrix} x \\ y \end{pmatrix} - \begin{pmatrix} 0 \\ 2 \end{pmatrix}\right]$ $\begin{pmatrix} x-4 \\ y-6 \end{pmatrix} = \begin{pmatrix} 3x \\ 3y-6 \end{pmatrix}$	M1 M1	

	$x-4=3x$ and $y-6=3y-6$ $2x=-4$ and $2y=0$ $x=-2$ *and* $y=0$ *centre* $(-2,0)$	M1 A1	For both
Q6	$2x=2x^2$ $=2x^2-2x=0$ $2x(x-1)=0$ $2x=0$ or $x-1=0$ $x=0$ $x=1$	M1 M1 M1 A1	
Q7	Let exterior angle be B Interior angle is 5B $B+5B=180^0$ $6B=180_0$ $B=30^0$ **No of sides** $=360^0/30^0$ $=12$	 M1 A1 M1 A1	
		04	
Q8	Mass f cf (a) 40-44 3 3 45-49 8 11 50-54 17 28 55-54 10 38 60-64 2 40 Median class is 50-54 (b) median $49.5+(\frac{40/2-11}{17})5$ $=49.5+45/17$ $=52.147$ $=52.15$	B1 B1 M1 A1	For … c.f Stating accept 49.5-54.5
		04	
Q9	 $B+2B=90^0$; $3B=90^0$ $0=30^0$ Length of ladder $=\frac{6}{\cos 60°}$ $=12$	 M1 A1 M1 A1	

Q10	S.S =(67,68,76,78,86,87) E=(78,87) P(E) = 2/6 or 1/3	B1 B1 M1 A1
Q11	(a) Let the numbers be x and y x^2-y^2 =39 .....(i) x-y =3 .....(ii) from (i) x^2-y^2 =(x+y)(x-y)-39 3(x+y) =39 x+y =13 .....(iii) (ii) +(iii) 2x =16 x= 8 Puting x = 8 into (ii) 8-y = 3 8-3 = y y = 5	04 M1 M1 M1 M1 A1 A1
	(b) Now: Man 4n, 4n-8; Son n, n-8; Prodoct 220 (4n-8)(n-8) =220 $4n^2$ -8n-32n+64 =220 $4n^2$ -40n-156 =0 n^2 -10n -39=0 n^2-13n+13n-39=0 n(n-13)+3(n-13)=0 (n-13)(n+3) =0 n-13=0 or n+3=0 n=13 n= -3 n=13 sons age is 13years	B1 B1 M1 M1forming Q.E M1 factorizing A1
		12

12 a)

Weight	tally	frequency	x	fx	Cf
145-149	//	2	147	294	2
150-154	/////	5	152	760	7
155-159	///// ////	9	157	1413	16
160-164	///// /////	10	162	1620	26
165-169	///// //	7	167	1169	33
170-174	/////	5	172	860	38
175-179	//	2	177	354	40
		$\sum f = 40$		$\sum fx = 6470$	

B1 –weight
B1- freg
M1- x
M1 –fx
A1= $\sum fx = 6470$
B1-$\sum f = 40$

b(i) mean weight = $\frac{\sum fx}{\sum f} = \frac{6470}{40}$ M1

$= 161.75$ A1

(ii) median weight

$= 159.5 + \frac{(40/2 - 16)}{10} 5$ M1

$= 159.5 + 20/10$

$= 161.5$ A1

(iii) modal weight

$= 159.5 + (1/(1+3))\ 5$ M1

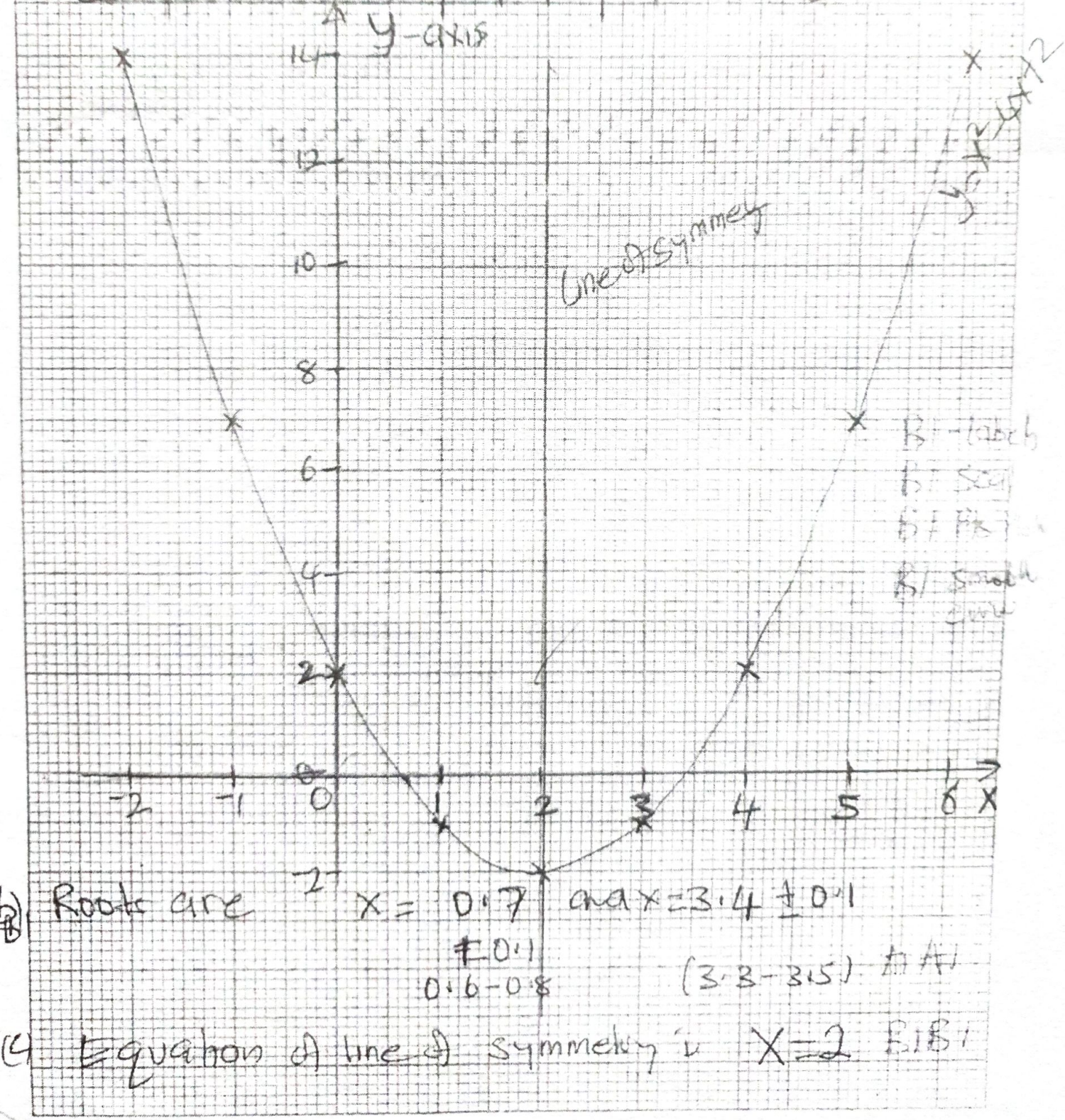
$= 159.5 + 5/4$

$= 160.75$ A1

Q.13

(a)

x	-2	-1	0	1	2	3	4	5	6
x^2	4	1	0	1	4	9	16	25	36
$-4x$	8	4	0	-4	-8	-12	-16	-20	-24
$+2$	+2	+2	+2	+2	+2	+2	+2	+2	+2
y	14	7	2	-1	-2	-1	2	7	14



(b) Roots are $x = 0.7 \pm 0.1$ and $x = 3.4 \pm 0.1$

± 0.1

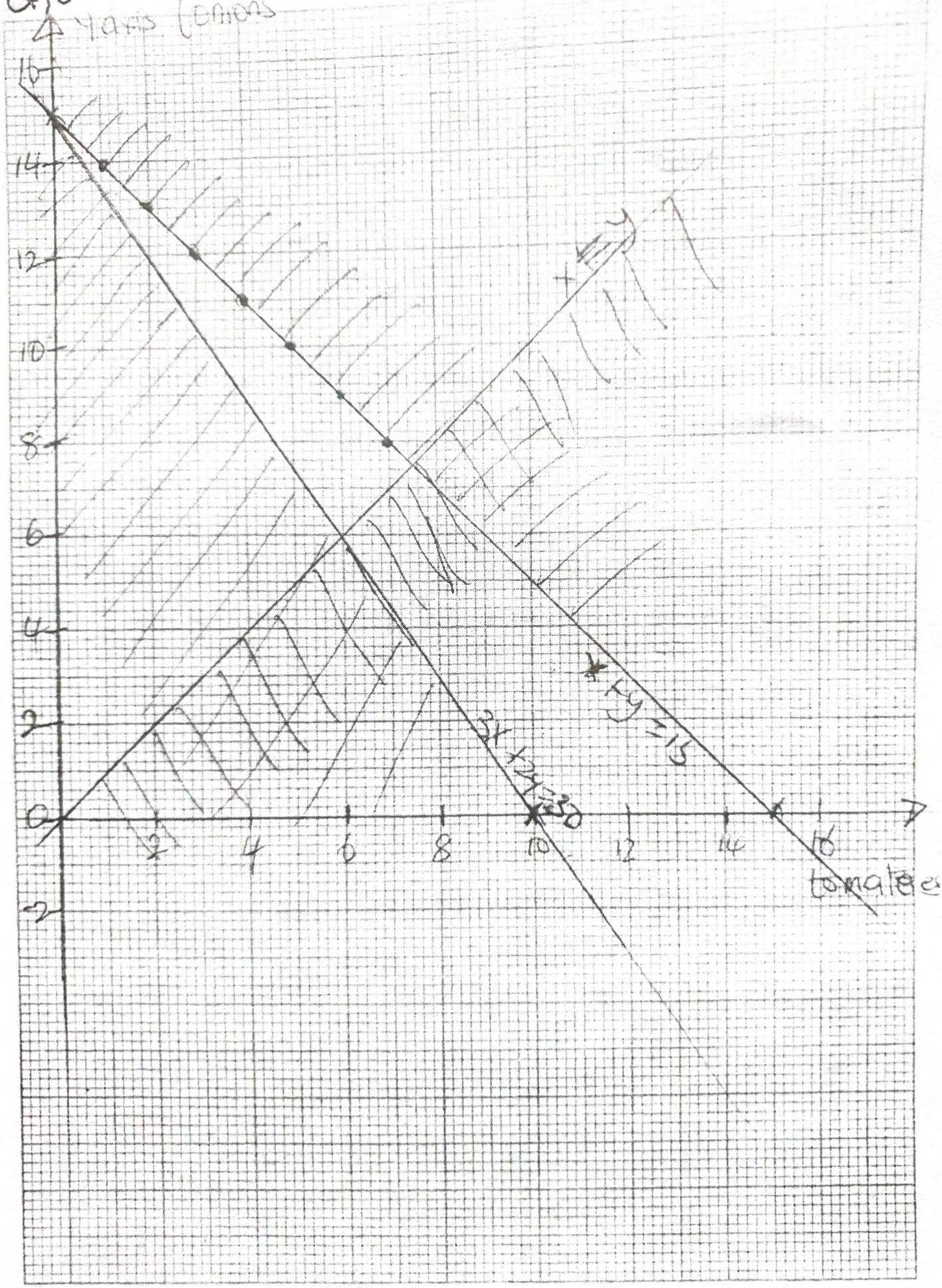
0.6 - 0.8 (3.3 - 3.5)

(c) Equation of line of symmetry is $x = -2$

QN	SOLUTION	MARKS	COMMENT
Q14 (a)	$C = A^2 - \frac{1}{2}B$		
	$A^2 = \begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix}$	M1	
	$= \begin{bmatrix} 1 & -3 \\ 0 & 4 \end{bmatrix}$	A1	
	$\frac{1}{2}B = \frac{1}{2}\begin{bmatrix} 2 & -4 \\ 4 & 6 \end{bmatrix}$	M1	
	$= \begin{bmatrix} 1 & -2 \\ 2 & 3 \end{bmatrix}$	A1	
	$C = \begin{bmatrix} 1 & -3 \\ 0 & 4 \end{bmatrix} - \begin{bmatrix} 1 & -2 \\ 2 & 3 \end{bmatrix}$	M1	
	$= \begin{bmatrix} 0 & -1 \\ -2 & 1 \end{bmatrix}$	A1	
(b)	$3x - 4y = 2$ $6x + y = 13$		
	$\begin{bmatrix} 3 & -4 \\ 6 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 13 \end{bmatrix}$	M1	
	$\begin{bmatrix} 1 & 4 \\ -6 & 3 \end{bmatrix} \begin{bmatrix} 3 & -4 \\ 6 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 & 4 \\ -6 & 3 \end{bmatrix} \begin{bmatrix} 2 \\ 13 \end{bmatrix}$	M1	
	$\begin{bmatrix} 27 & 0 \\ 0 & 27 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 54 \\ 27 \end{bmatrix}$	M1	
	$\begin{bmatrix} 27x \\ 27y \end{bmatrix} = \begin{bmatrix} 54 \\ 27 \end{bmatrix}$	M1	
	$27x = 54 \quad x = 2$ $27y = 27 \quad y = 1$	A1 A1	

Q15	a) $< ABO = 30^0$ $< ABC = 60^0$ $< AOC = 2X60^0$ $= 120^0$ Arc length AC $= \frac{120^0}{360^0} \times 3.142 \times 6 \times 2$ $= 12.568$ cm $< OCA = \frac{1}{2}(60^0) = 30^0$ $\frac{AC}{\sin 120^0} = \frac{6}{\sin 30^0}$ $= 10.392$ Perimeter $= 12.568 + 10.392$ $= 22.960$ $= 23.0$ cm b) (i) let $< DAT = 20$ $= 20+0+20+20^0 = 180^0$ $50 = 160$ $0 = 32^0$ $:< DAT = 2x32$ $= 64$ (ii) $< ADC = 180^0 - (64+32^0)$ $= 180^0 - 96$ $= 84^0$ $< ABC = 180^0 - 84^0$ $= 96^0$	B1 B1 M1 M1 M1 A1 M1 A1 A1 M1 M1 A1
		12
Q16 a)	$x + y \leq 15$ .....(1) $30000x + 2000y \geq 30000$.....(2) Or $3x + 2y \geq 30$ $x \leq y$ or $y \leq x$ .....(3)	B1 B1 B1
b)	Drawing line $x + y = 15$ and shading(8,7), (10,5) or (5,10) Drawing line $3x + 2y = 30$ and shading (10,0), (0,15), (6,6) Drawing line $x = y$ and shading (0,0) or (5,5) Correct unshaded region	B1 B1 B1 B1
c)	Point of interest are (3,12), (4,11) ,(5,10) ,(6,9) ,(7,8) Maximum amount is at (7,8) i.e. 7kg of tomatoes and 8kg of onions amount spent $(7 \times 3000) + (8 \times 2000)$ $= 21000 + 16000$ =sh37,000	B1 B1 B1 M1 A1

Q.16


Yams (onions
16
14
12
10
8
6
4
2
0
2
4
6
8
10
12
14
16
tomatoes
x+y=15
3x+2y=30

Q17		
(a)	Matrix $\begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$	
	Determinant = (2x1)- (1x1)	M1
	= 2 -1	
	=1	A1
	Inverse = $\begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$	A1
(b)	O'P'Q'R O P Q R	
	$\begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$ $\begin{bmatrix} 0 & 6 & 8 & 2 \\ 0 & 3 & 7 & 4 \end{bmatrix}$ $\begin{bmatrix} 0 & 3 & 1 & -2 \\ 0 & 0 & 6 & 6 \end{bmatrix}$	M1 A1
(c)	0(0,0) P (3,0) Q(1,6) R(-2, 6)	A1
(d)	Correct diagram with correct scale	B1 B1
	Area of OPQR	
	=3X6	M1
	= 18 square unit	A1
	Determinant of matrix is 1	
	Area scale factor 1	
	Area of O'P'Q'R IS 1X 18	M1
	=18 sq unit	A1
		12

Q·17