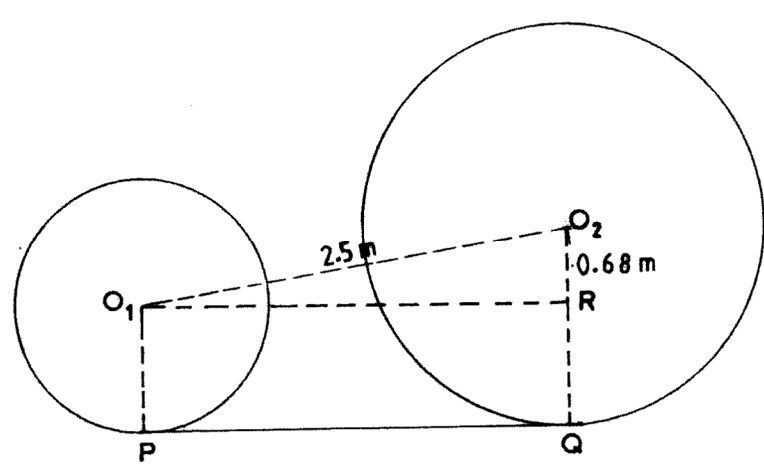
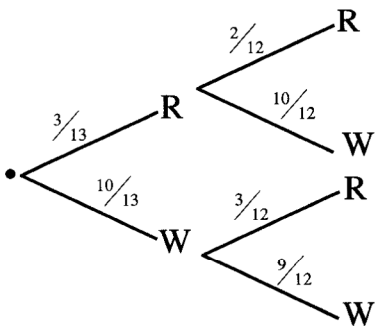
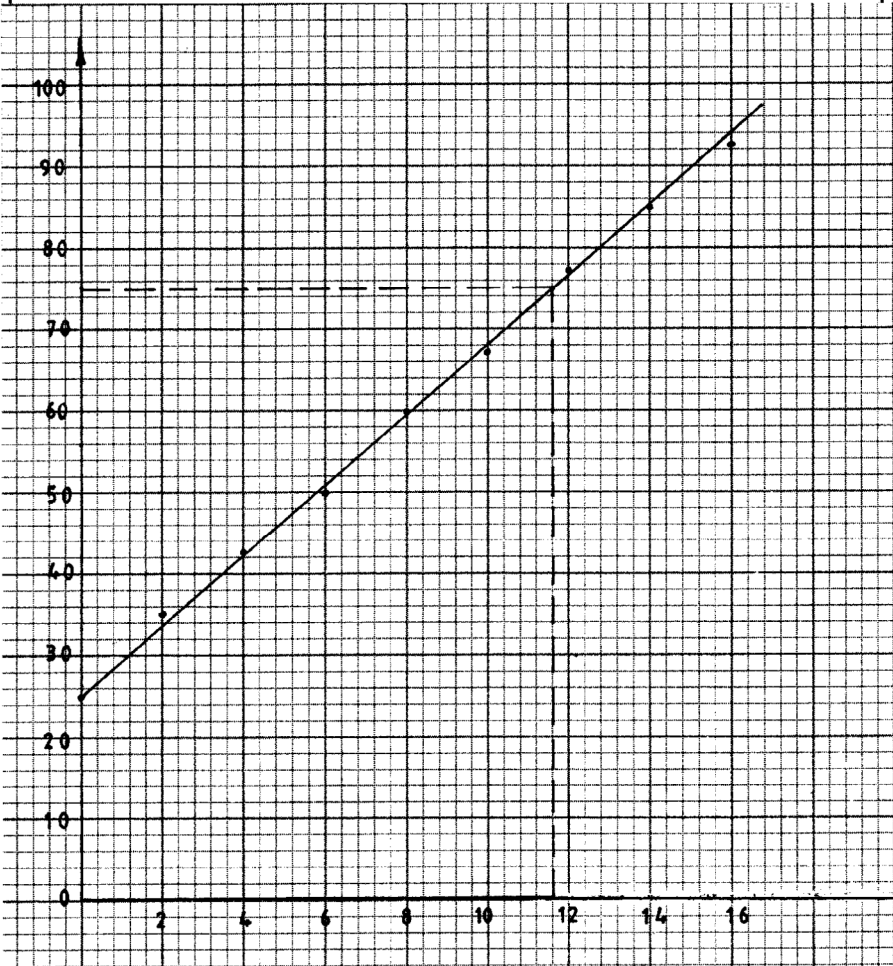


4.4.2 Mathematics Alternative B Paper 2 (122/2)

1.	$= \frac{3.84^2 - \sqrt[3]{110.592}}{0.03885}$ $= \frac{14.7456 - 4.8}{0.03885}$ $= 256$	B1 B1 2	Squaring and cube root
2.	(a) Annual salary in the 7 th year: $= 120\,600 + 2880 \times 6$ $= \text{Ksh}137\,880$ (b) Total earnings for 6 years $S_6 = \frac{6}{2} \{2 \times 120\,600 + 5(2880)\}$ $= \text{Ksh} 766\,800$	M1 A1 M1 A1 4	
3.	$\left(x - \frac{4}{3}\right)\left(x + \frac{1}{2}\right) = 0$ $x^2 - \frac{5}{6}x - \frac{2}{3} = 0$ $6x^2 - 5x - 4 = 0$	M1 A1 3	
4.	$P + \frac{PRT}{100} = 37600$ $P + \frac{P \times 5 \times 3.5}{100} = 37\,600$ $P(1.175) = 37600$ $P = \frac{37600}{1.175}$ $= \text{Ksh} 32\,000$	M1 M1 A1 3	

8.	$\begin{pmatrix} 2 & 0 \\ 0 & -2 \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} 4 \\ -6 \end{pmatrix}$ $2a = 4 \Rightarrow a = 2$ $-2b = -6 \Rightarrow b = 3$ <p>Coordinates of A = (2,3)</p>	M1 M1 A1 3	
9.	<p>(a) $L = C + an$</p> <p>(b) $78\,000 = C + 50a$</p> $85\,200 = C + 70a$ $20a = 7200$ $a = 360$ $C = 78\,000 - 50 \times 360$ $= 60\,000$ $L = 60\,000 + 100 \times 360$ $= 96\,000$	B1 M1 A1 B1 4	For both C and a
10.	$O_2R = 0.8 - 0.12 = 0.68$ $PQ = \sqrt{2.5^2 - 0.68^2}$ $= 2.41$ 	B1 M1 A1 3	

11.	<p>Difference in longitude = $12^\circ + 5 = 17^\circ$</p> <p>Time difference = 17×4</p> <p style="padding-left: 40px;">= 68 minutes</p> <p>Time at R:</p> <p style="padding-left: 40px;">= 2245 h - 1 hr 08 min</p> <p style="padding-left: 40px;">= 2137 h</p> <p style="padding-left: 40px;">= 9.37 pm</p>	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p>	
12.	<p>$4 \tan x = 5$</p> <p>$\tan x = \frac{5}{4} = 1.25$</p> <p>$x = \tan^{-1}(1.25)$</p> <p style="padding-left: 20px;">= 51.34°</p> <p style="padding-left: 20px;">and 231.34°</p>	<p>M1</p> <p>A1</p> <p>B1</p>	
13.	<p>(a)</p>  <p>(b) $P(R + W)$</p> <p style="padding-left: 40px;">$= \frac{3}{13} \times \frac{10}{12} + \frac{10}{13} \times \frac{3}{12}$</p> <p style="padding-left: 40px;">$= \frac{5}{13}$</p>	<p>B1 for 1st branch correct</p> <p>B1 for 2nd branch correct</p> <p>M1</p> <p>A1</p>	

14.	<p>Area</p> $= \frac{1}{2} \times \frac{1}{2} [1 + 21 + 2(3 + 6 + 10 + 15)]$ $= \frac{1}{4} [22 + 2 \times 34]$ $= 22.5$	M1		
		3		
15.	<p>(a) $OP = 2i + 5j$</p> <p>(b) $PQ = \frac{3}{4} \{ (6i + j) - (2i - 5j) \}$</p> $= \frac{3}{4} (4i - 4j)$ $= 3i - 3j$	B1		
		M1		
		A1		
		3		
16.	<p>(a)</p> 	S1	✓ Scale	
		B1	✓ plotting and line of best fit	
<p>(b) Time taken to reach = 75° C = 11.6 min</p>		B1		
		3		

17.	<p>(a) (i) A:B = 3:4</p> <p>B:C = 1:2 \Rightarrow B:C = 4:8</p> <p>\therefore A:B:C = 3:4:8</p> <p>(ii) $\frac{3}{15} \times 20$</p> <p>= 4 litres</p> <p>(b) (i) Cost of production per litre</p> <p>= $\frac{80 \times 3 + 84 \times 4 + 90 \times 8}{15}$</p> <p>= Ksh 86.4</p> <p>(ii) Selling price of 1 litre for a 25% profit:</p> <p>= $86.4 \times \frac{125}{100}$</p> <p>= Ksh 108</p> <p>(c) In 1h machines P and Q blend</p> <p>$\frac{14000}{7} + \frac{12000}{5}$</p> <p>= 2000 + 2400 = 4400 litres</p> <p>Time taken to blend 550000 litres</p> <p>= $\frac{550000}{4400}$</p> <p>= 125 hours</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	
		10	

18.	<p>(a) (i) Full squares = 37</p> <p>Part squares = 27</p> <p>Total area = $37 + \frac{27}{2}$</p> <p style="padding-left: 40px;">= 50.5 cm²</p> <p>(ii) area in km²</p> <p style="padding-left: 40px;">= $\frac{50.5 \times 50000 \times 50000}{1000 \times 1000 \times 100 \times 100}$</p> <p style="padding-left: 40px;">= 12.625 km²</p> <p>(b) (i) Number of 5 ha parcels:</p> <p style="padding-left: 40px;">= $\frac{12.625 \times 1000 \times 1000}{5 \times 100 \times 100}$</p> <p style="padding-left: 40px;">= 252.5</p> <p style="padding-left: 40px;">Number of equal parcels = 252</p> <p>(ii) Remainder in hectares:</p> <p style="padding-left: 40px;">= 0.5 × 5</p> <p style="padding-left: 40px;">= 2.5 ha</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>10</p>	<p>conversion</p>
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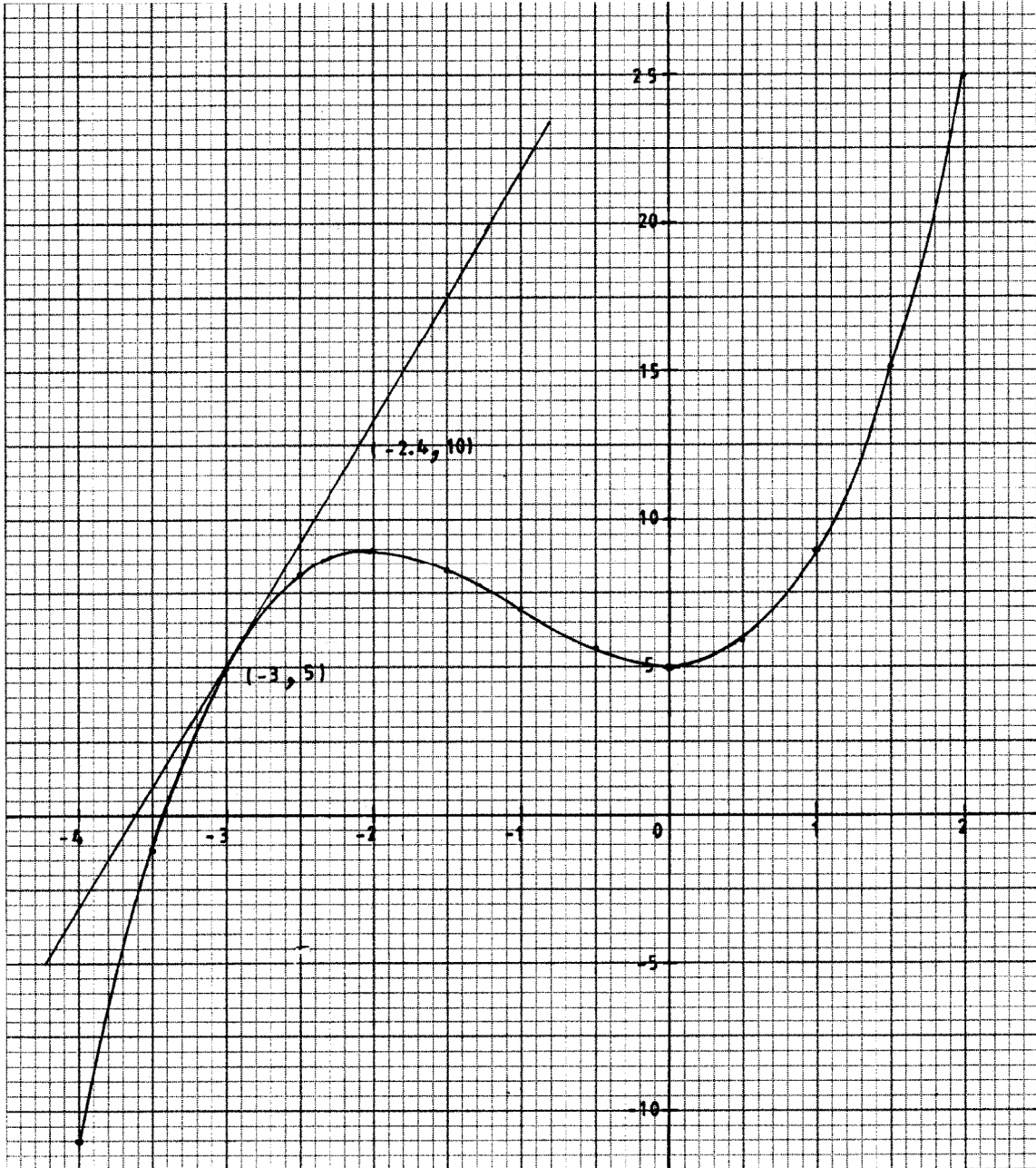
19.	<p>(a) Size of angle CTD = 33°</p> <p>- Angle in alternate segment</p> <p>(b) $(x + 4.1) 4.1 = 7^2$</p> $4.1x + 4.1^2 = 49$ $4.1x = 32.19$ $x = 7.851219512$ ≈ 7.9 <p>(c) (i) $\frac{\sin \theta}{7} = \frac{\sin 33}{4.1}$</p> $\sin \theta = \frac{7 \sin 33}{4.1}$ $= 0.9299$ <p>$\therefore \theta = 68^\circ$</p> <p>obtuse angle = $180^\circ - 68^\circ = 112^\circ$</p> <p>(ii) $\angle ACT = 180^\circ - 112^\circ = 68^\circ$</p> $\angle ATC = 180^\circ - (68 + 33) = 79^\circ$ $\angle ABC = 180^\circ - 79^\circ = 101^\circ$	<p>B1</p> <p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p> <p>B1</p>	
		10	

20. (a)

x	-4	-3.5	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2
y	-11			8.1		8.4	7		5		9		25

B2 Allow B1 for 4 √

(b)



S1

P1

C1

(c) (i) $\frac{20.5 - 5.9}{1.8 - 0.5} = 11.23$

M1
A1

(ii) tangent line at $x = -3$

B1

gradient : $\frac{10 - 5}{-2.4 - -3} =$
 $= 8.3$

M1
A1

10

21.	<p>(a) (i) $(x - 1)(x - 8) = 4.56$</p> $x^2 - 9x + 8 = 4.56$ $x^2 - 9x + 3.44 = 0$ <p>(ii) $x^2 - \frac{9}{2}x + \left(\frac{9}{2}\right)^2 = \left(\frac{9}{2}\right)^2 - 3.44$</p> $\left(x - \frac{9}{2}\right)^2 = \frac{81}{4} - 3.44$ $\left(x - \frac{9}{2}\right) = \sqrt{16.81}$ $x = 4.5 \pm 4.1$ $= 8.6 \text{ or } 0.4$ $x = 8.6 \text{ m}$ <p>Length of pavement = $8.6 - 1 = 7.6 \text{ m}$</p> <p>Width of pavement = $8.6 - 8 = 0.6 \text{ m}$</p> <p>(b) No. of $0.4 \text{ m} \times 0.3$ tiles</p> $\frac{7.6 \times 0.6}{0.4 \times 0.3}$ $= 38$	<p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>10</p>	
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22.	<p>(a) (i) $\text{Ksh. } 4\,000\,000 \times (1.2)^3$</p> <p style="padding-left: 40px;">$= \text{Ksh } 6\,912\,000$</p> <p>(ii) $4\,000\,000 \times (1.2)^3 \times (1.15)^2$</p> <p style="padding-left: 40px;">$= \text{Ksh } 9\,141\,120$</p> <p>(b) (i) $\frac{7\,125\,000 \times 100}{95}$</p> <p style="padding-left: 40px;">$= \text{Ksh } 7\,500\,000$</p> <p>(ii) $9\,141\,120 \times \left(1 - \frac{r}{100}\right)^2 = 7\,500\,000$</p> <p style="padding-left: 40px;">$\left(1 - \frac{r}{100}\right)^2 = \frac{7\,500\,000}{9\,141\,120} = 0.82$</p> <p style="padding-left: 40px;">$1 - \frac{r}{100} = 0.91$</p> <p style="padding-left: 40px;">$\frac{r}{100} = 1 - 0.91 = 0.09$</p> <p style="padding-left: 40px;">$r = 9\%$</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p>	
		10	

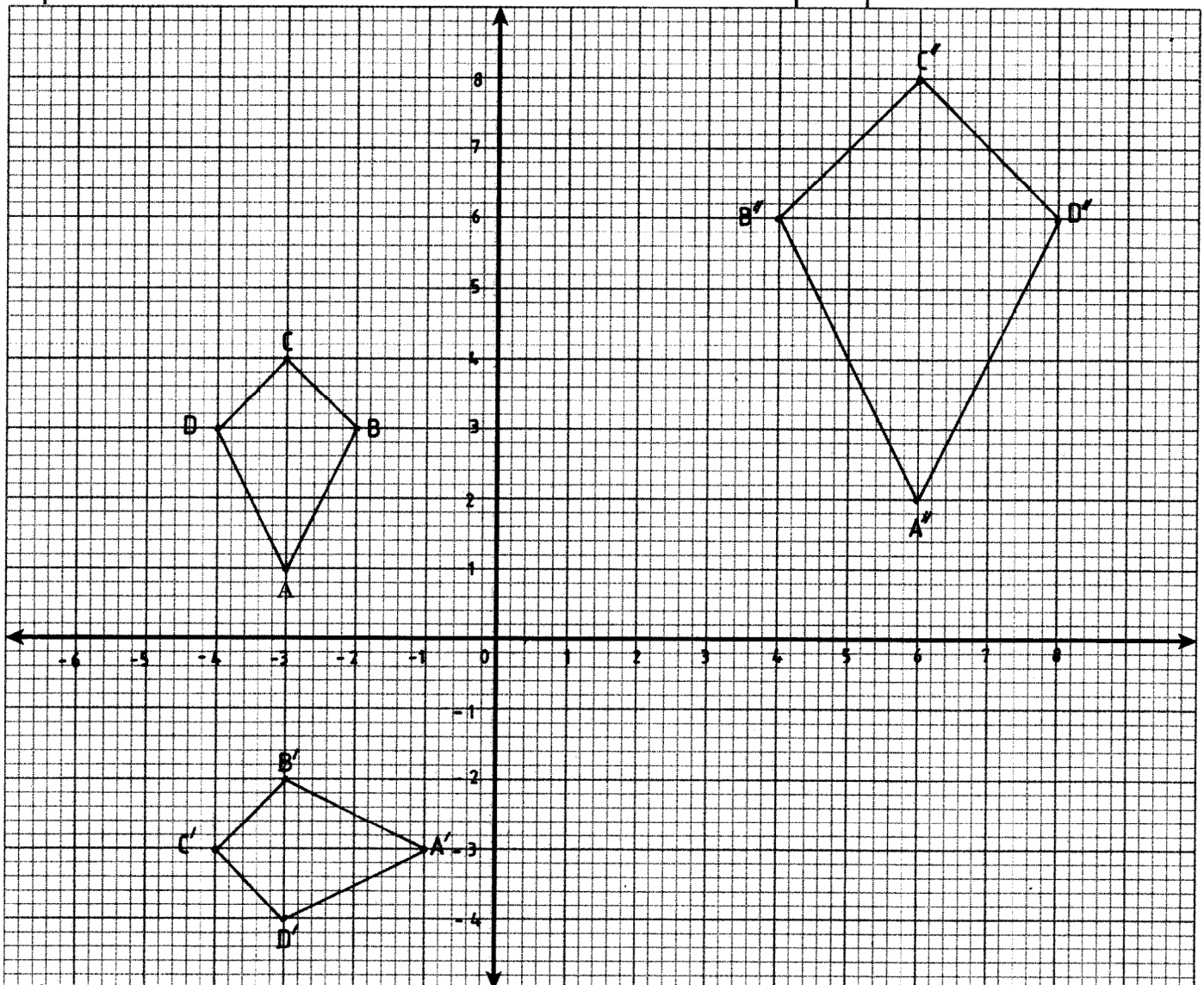
23.

$$(a) (i) \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} A & B & C & D \\ -3 & -2 & -3 & -4 \\ 1 & 3 & 4 & 3 \end{pmatrix} = \begin{pmatrix} A' & B' & C' & D' \\ -1 & -3 & -4 & -3 \\ -3 & -2 & -3 & -4 \end{pmatrix}$$

M1

Coordinates: A'(-1,-3), B'(-3,-2), C'(-4,-3), D'(-3,-4)

A1



(ii) Object ABCD drawn

Image A'B'C'D' drawn

B1

B1

$$(b) (i) \begin{pmatrix} 0 & -2 \\ -2 & 0 \end{pmatrix} \begin{pmatrix} A' & B' & C' & D' \\ -1 & -3 & -4 & -3 \\ -3 & -2 & -3 & -4 \end{pmatrix} = \begin{pmatrix} A'' & B'' & C'' & D'' \\ 6 & 4 & 6 & 8 \\ 2 & 6 & 8 & 6 \end{pmatrix}$$

M1

Coordinates: A''(6,2), B''(4,6), C''(6,8), D''(8,6)

A1

(ii) image A''B''C''D'' drawn

B1

$$(iii) \begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 6 & 4 & 6 & 8 \\ 2 & 6 & 8 & 6 \end{pmatrix} = \begin{pmatrix} -3 & -2 & -3 & -4 \\ 1 & 3 & 4 & 3 \end{pmatrix}$$

M1

$$a = \frac{-1}{2}, b = 0, c = 0, d = \frac{1}{2}$$

M1

$$\text{Matrix} \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} -\frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix}$$

A1

10

24. (a)

Masses (kg)	f	Mid-point	fx	d = x - 38	fd	fd ²
26 - 30	9	28	252	-10	-90	900
31 - 35	13	33	429	-5	-65	325
36 - 40	20	38	760	0	0	0
41 - 45	15	43	645	5	75	375
46 - 50	6	48	288	10	60	600
51 - 55	2	53	106	15	30	450
	Σ = 65		Σfx = 2480		Σfd = 10	Σfd ² = 2650

Mid points column

B1

fx column

B1

$$\text{Mean} = \frac{\sum fx}{\sum f} = \frac{2480}{65} = 38.15$$

M1

A1

(b) (i) variance:

$$\begin{aligned} & \frac{\sum fd^2}{\sum d} - \left(\frac{\sum fd}{\sum f} \right)^2 \\ &= \frac{2650}{65} - \left(\frac{10}{65} \right)^2 \\ &= 40.769 - 0.02367 \\ &= 40.75 \end{aligned}$$

B1

B1

B1

M1

A1

d = x - 38 column
fd
fd²

(ii) Standard deviation

$$= \sqrt{40.75} = 6.38$$

B1

10