

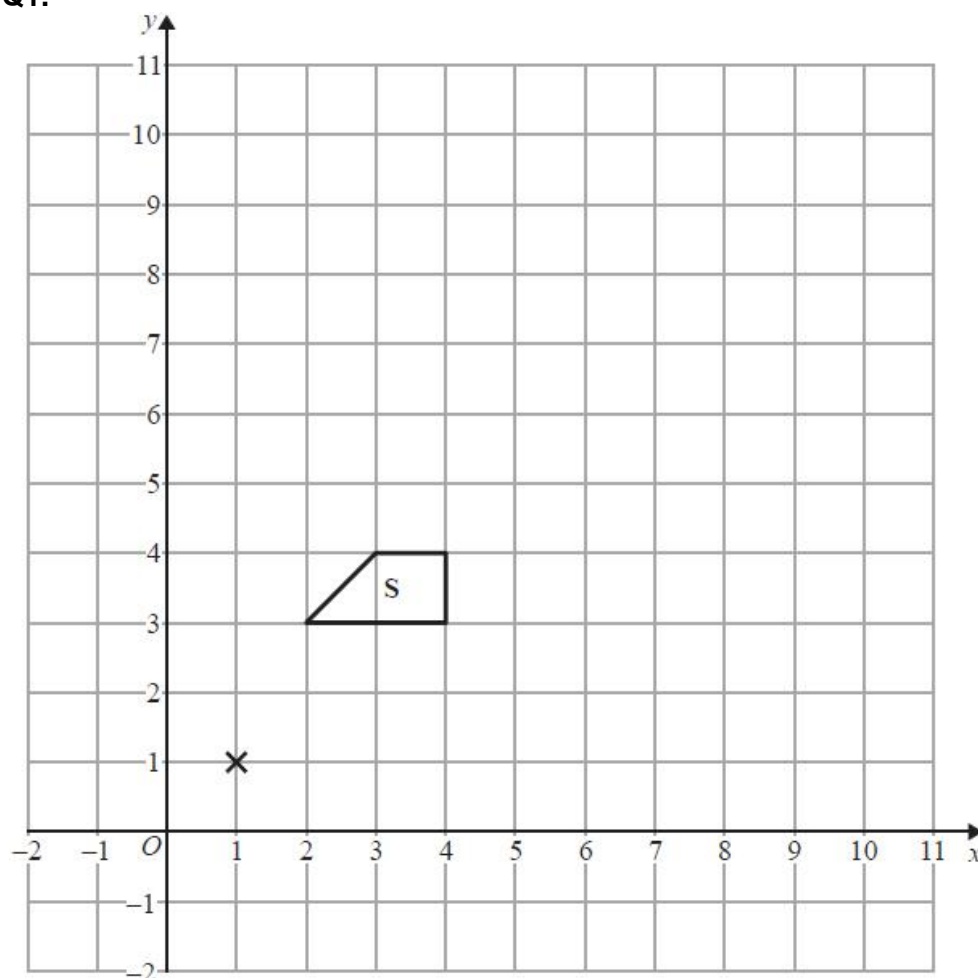


Unit 2 Revision Sheet G Transformations and Vectors Higher

Note: Higher tier students must also revise using the foundation tier revision worksheets as this content can also be assessed on higher tier papers.

Questions

Q1.



(a) Enlarge shape **S**, by scale factor 2, centre (1,1).

Label the new shape **T**.

(2)

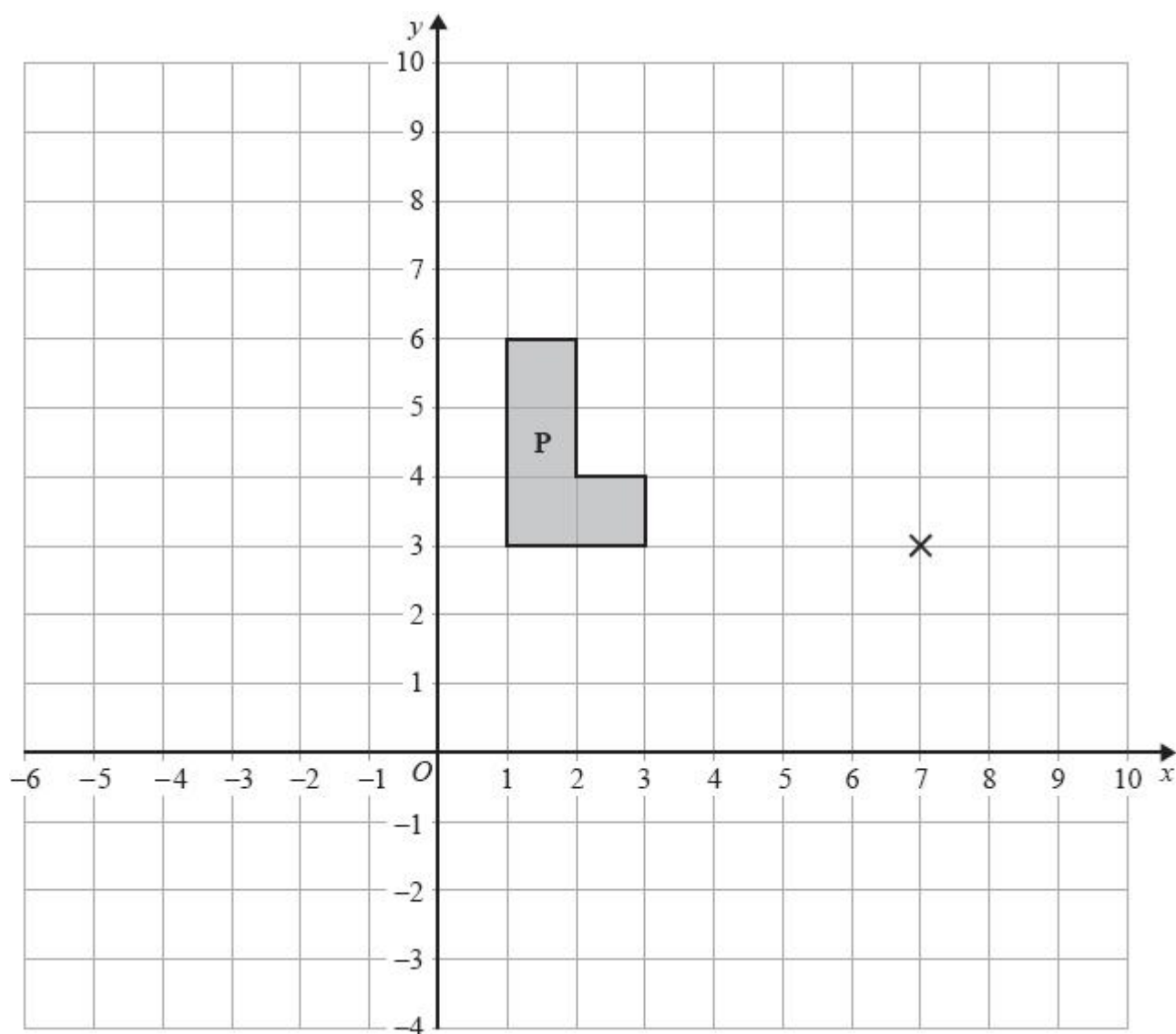
(b) Describe fully the single transformation that maps shape **T** onto shape **S**.

(1)

(Total for question = 3 marks)



Q2.



(a) On the grid, enlarge shape **P** with scale factor 2 and centre (7, 3)

Label the new shape **Q**.

(2)

(b) On the grid, rotate shape **P** through 90° anticlockwise about the point (7, 3)

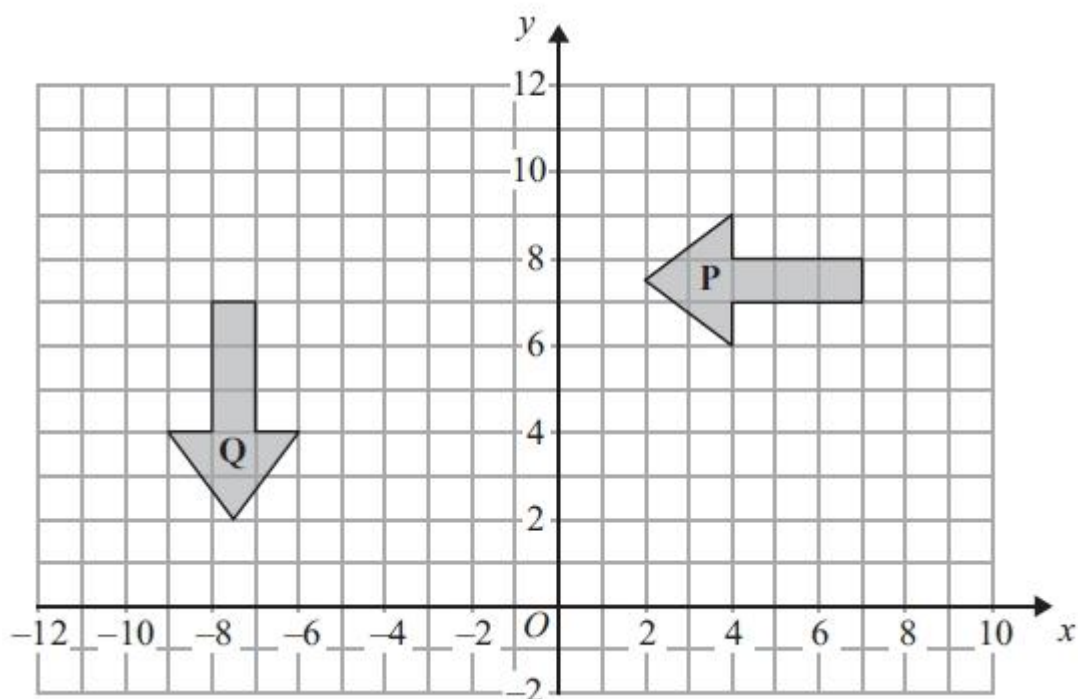
Label the new shape **R**.

(2)

(Total for question = 4 marks)



Q3.



(a) Describe fully the single transformation that maps shape **P** onto shape **Q**.

(3)

(b) On the grid, translate shape **P** by the vector $\begin{pmatrix} -6 \\ 2 \end{pmatrix}$.
Label the new shape **R**.

(2)

(Total for question = 5 marks)

Q4.

Here are two vectors.

$$\vec{AB} = \begin{pmatrix} 6 \\ -9 \end{pmatrix} \quad \vec{CB} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

Find the magnitude of \vec{AC}

(Total for question = 3 marks)



Q5.

The diagram shows parallelogram $ABCD$.

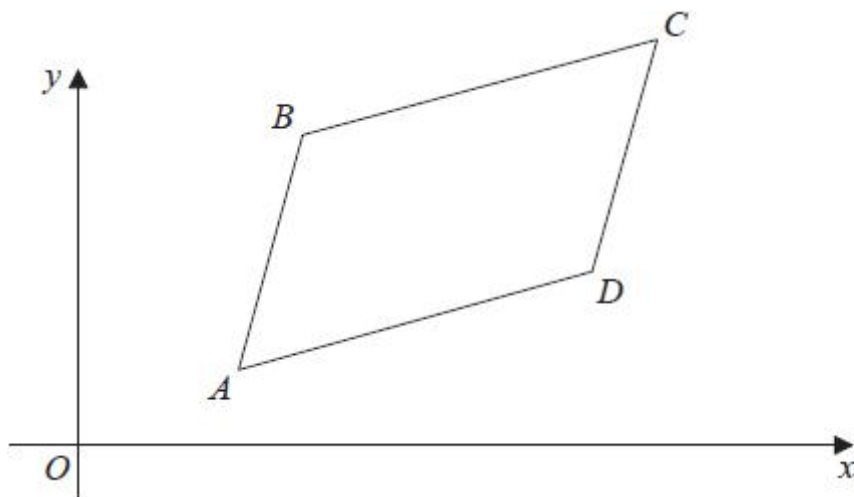


Diagram **NOT**
accurately drawn

$$\vec{AB} = \begin{pmatrix} 2 \\ 7 \end{pmatrix} \quad \vec{AC} = \begin{pmatrix} 10 \\ 11 \end{pmatrix}$$

The point B has coordinates $(5, 8)$

(a) Work out the coordinates of the point C .

(3)

The point E has coordinates $(63, 211)$

(b) Use a vector method to prove that ABE is a straight line.

(2)

(Total for question = 5 marks)



Q6.

The diagram shows triangle ABD.

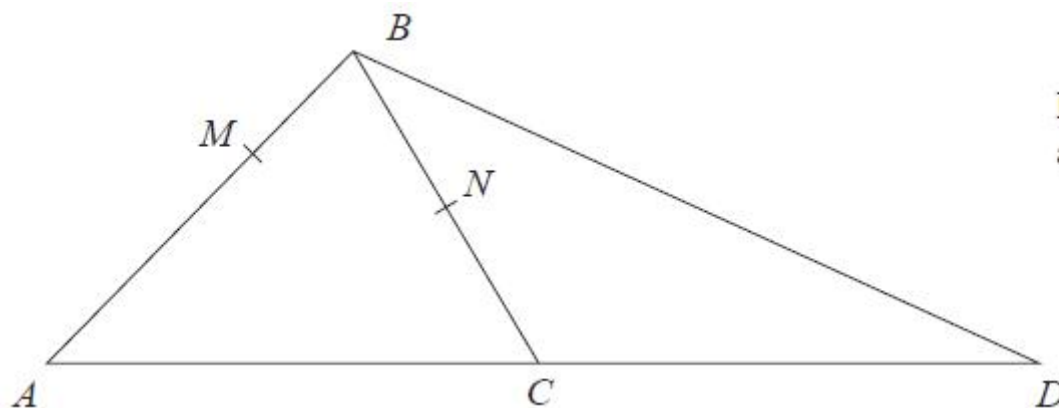


Diagram **NOT**
accurately drawn

N is the midpoint of BC .

C is the midpoint of AD .

M is the point on AB such that $AM : MB = 3 : 1$

$$\vec{AB} = \mathbf{p} \text{ and } \vec{AC} = \mathbf{q}$$

(a) Express, in terms of \mathbf{p} and \mathbf{q} ,

(i) \vec{BD}

(ii) \vec{MN}

(3)

(b) State, giving reasons, two different geometric facts relating MN and BD .

(2)

(Total for question = 5 marks)

Q7.

OAB is a triangle.

$$\vec{OA} = \mathbf{a} \quad \vec{OB} = \mathbf{b}$$

The point C lies on OA such that $OC : CA = 1 : 2$

The point D lies on OB such that $OD : DB = 1 : 2$

Using a vector method, prove that $ABDC$ is a trapezium.

(Total for question = 3 marks)



Q8.

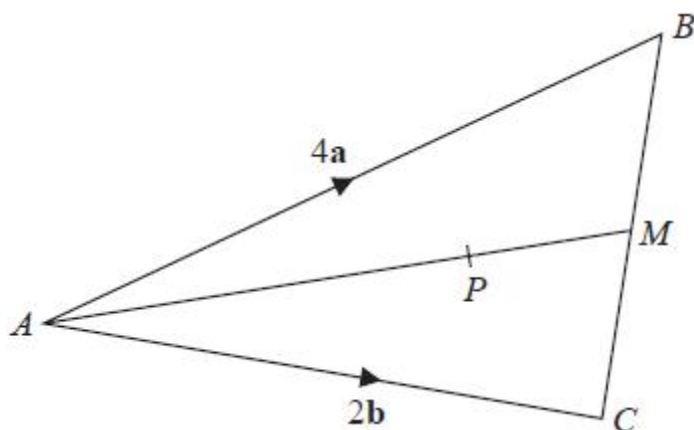


Diagram **NOT**
accurately drawn

ABC is a triangle.
The midpoint of BC is M .
 P is a point on AM .

$$\vec{AB} = 4\mathbf{a}$$

$$\vec{AC} = 2\mathbf{b}$$

$$\vec{AP} = \frac{3}{2}\mathbf{a} + \frac{3}{4}\mathbf{b}$$

Find the ratio $AP : PM$

(Total for question = 3 marks)



Mark Scheme

Q1.

Ques	Working	Answer	Mark	Notes
a		Vertices at (3,5)(7,5)(7,7)(5,7)	2	B2 If not B2 then B1 for correct size shape in wrong position but correct orientation or 3 correct coordinates, or for enlargement SF3 centre (1,1)
b		<u>Enlargement</u> SF <u>0.5</u> , centre <u>(1,1)</u>	1	B1 Single transformations only
Total 3 marks				

Q2.

Q	Working	Answer	Mark	Notes
(a)		Vertices at (-5, 3) (-5, 9) (-3, 9) (-3, 5) (-1, 5) (-1, 3)	2	B2 If not B2 then award B1 for shape of correct size and orientation in incorrect position or 4 out of 6 vertices correct
(b)		Vertices at (7, -1) (7, -3) (4, -3) (4, -2) (6, -2) (6, -1)	2	B2 If not B2 then award B1 for correct orientation but incorrect position or B1 for rotation 90°clockwise about (7, 3)
Total 4 marks				



Q3.

Question Number	Working	Answer	Mark	Notes
(a)		Rotation 90° or quarter turn anticlock wise (0,0) or O or origin	3	B1 B1 accept 90° or – 270° B1 Award B0 (no marks) if the response is not a SINGLE transformation
(b)		Shape in correct position	2	B2 B1 for translation 6 units left or 2 units up
				Total 5 marks

Q4.

Question	Working	Answer	Mark	Notes
				M2 for $\sqrt{5^2 + (-12)^2}$ or $\sqrt{(-5)^2 + 12^2}$ or $\sqrt{5^2 + 12^2}$ If not M2 then M1 for $\begin{pmatrix} 6 \\ -9 \end{pmatrix} - \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ or $\begin{pmatrix} 6 \\ -9 \end{pmatrix} + \begin{pmatrix} -1 \\ -3 \end{pmatrix} (= \begin{pmatrix} 5 \\ -12 \end{pmatrix})$ or or $\begin{pmatrix} 1 \\ 3 \end{pmatrix} - \begin{pmatrix} 6 \\ -9 \end{pmatrix}$ or $\begin{pmatrix} 1 \\ 3 \end{pmatrix} + \begin{pmatrix} -6 \\ 9 \end{pmatrix} (= \begin{pmatrix} -5 \\ 12 \end{pmatrix})$
		13	3	A1
				Total 3 marks



Q5.

Question	Working	Answer	Mark	Notes
a	$(\overrightarrow{BC} =) \begin{pmatrix} -2 \\ -7 \end{pmatrix} + \begin{pmatrix} 10 \\ 11 \end{pmatrix} = \begin{pmatrix} 8 \\ 4 \end{pmatrix}$ $\begin{pmatrix} 5 \\ 8 \end{pmatrix} + \begin{pmatrix} 8 \\ 4 \end{pmatrix}$ or $\begin{pmatrix} 10 \\ 11 \end{pmatrix} + \begin{pmatrix} 3 \\ 1 \end{pmatrix}$	(13, 12)	3	M1 or coordinates (5 – 2, 8 – 7) (= (3, 1)) assigned to A (may be seen in vector form) or (13, y) or (x, 12) given as coordinates for C M1 for coordinates (5 – 2 + 10, 8 – 7 + 11) assigned to C A1



b	<p>e.g. $\begin{pmatrix} 63 \\ 211 \end{pmatrix} - \begin{pmatrix} 5 \\ 8 \end{pmatrix} = \begin{pmatrix} 58 \\ 203 \end{pmatrix}$</p> <p>with</p> <p>e.g. “58” $\div 2 (=29)$ and “203” $\div 7 (=29)$</p> <p>OR</p> <p>e.g. $\begin{pmatrix} 63 \\ 211 \end{pmatrix} - \begin{pmatrix} 3 \\ 1 \end{pmatrix} = \begin{pmatrix} 60 \\ 210 \end{pmatrix}$</p> <p>with</p> <p>e.g. “60” $\div 2 (=30)$ and “210” $\div 7 (=30)$</p>	Proof	2	<p>M1 may work with <i>A</i> and <i>E</i>, in which case may need to fit for method mark from (a)</p> <p>A1 proof with justification eg. $\overrightarrow{BE} = 29 \begin{pmatrix} 2 \\ 7 \end{pmatrix}$ (or $\overrightarrow{AE} = 30 \begin{pmatrix} 2 \\ 7 \end{pmatrix}$) with <i>ABE</i> is a straight line or $210 \div 60 = 3.5$ and $7 \div 2 = 3.5$ so <i>ABE</i> is a straight line</p>
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Q6.

Q	Working	Answer	Mark	Notes	
(a)(i)		$2\mathbf{q} - \mathbf{p}$	1	B1	
(a)(ii)	$\overrightarrow{MB} = \frac{1}{4}\mathbf{p}$ or $\overrightarrow{BM} = -\frac{1}{4}\mathbf{p}$ $\overrightarrow{BN} = \frac{1}{2}(\mathbf{p} - \mathbf{q})$ or $\overrightarrow{NB} = -\frac{1}{2}(\mathbf{p} - \mathbf{q})$	$\frac{1}{2}\mathbf{q} - \frac{1}{4}\mathbf{p}$	2	M1 A1	For correctly giving \overrightarrow{MB} or \overrightarrow{BM} or \overrightarrow{BN} or \overrightarrow{NB}
(b)		MN is parallel to BD	2	A1	With suitable reasons
		$BD = 4 \times MN$		A1	With suitable reasons
					Total 5 marks

Q7.

Q	Working	Answer	Mark	Notes	
	$\overrightarrow{AB} = -\mathbf{a} + \mathbf{b}$ or $\overrightarrow{BA} = \mathbf{a} - \mathbf{b}$			M1	Correct diagram (condone missing vector labels or arrows – with C on line segment OA and D on line segment OB) OR for finding \overrightarrow{AB} or \overrightarrow{BA} - may be seen as part of later working
	$\overrightarrow{CD} = \frac{1}{3}(-\mathbf{a} + \mathbf{b})$ or $\overrightarrow{DC} = \frac{1}{3}(\mathbf{a} - \mathbf{b})$			M1	Method to find \overrightarrow{CD} or \overrightarrow{DC}
		Correct vectors and conclusion including <u>parallel</u> and <u>trapezium</u>	3	A1	eg \overrightarrow{AB} (AB) and \overrightarrow{CD} (CD) are parallel therefore $ABDC$ is a trapezium
					Total 3 marks



Q8.

Question	Working	Answer	Mark	Notes
	$\overrightarrow{PM} =$ $-\frac{3}{2}\mathbf{a} - \frac{3}{4}\mathbf{b} + 4\mathbf{a} + \frac{1}{2}(2\mathbf{b} - 4\mathbf{a}) \left(= \frac{1}{2}\mathbf{a} + \frac{1}{4}\mathbf{b} \right)$ $\overrightarrow{AM} = 4\mathbf{a} + \frac{1}{2}(2\mathbf{b} - 4\mathbf{a}) (= 2\mathbf{a} + \mathbf{b})$ $\overrightarrow{AM} = 2\mathbf{b} + \frac{1}{2}(4\mathbf{a} - 2\mathbf{b}) (= 2\mathbf{a} + \mathbf{b})$ $\overrightarrow{MA} = \frac{1}{2}(2\mathbf{b} - 4\mathbf{a}) - 2\mathbf{b} (= -2\mathbf{a} - \mathbf{b})$ $\overrightarrow{MA} = \frac{1}{2}(4\mathbf{a} - 2\mathbf{b}) - 4\mathbf{a} (= -2\mathbf{a} - \mathbf{b})$		3	M1 for finding \overrightarrow{PM} or \overrightarrow{AM} or \overrightarrow{MA}
	$(AP : PM) = \left \frac{3}{2}\mathbf{a} + \frac{3}{4}\mathbf{b} \right : \left \frac{1}{2}\mathbf{a} + \frac{1}{4}\mathbf{b} \right $ oe $(AP : AM) = \left \frac{3}{2}\mathbf{a} + \frac{3}{4}\mathbf{b} \right : 2\mathbf{a} + \mathbf{b} (= 3 : 4)$ oe $(AM : PM) = 2\mathbf{a} + \mathbf{b} : \left \frac{1}{2}\mathbf{a} + \frac{1}{4}\mathbf{b} \right (= 4 : 1)$ oe $AP = 3PM$ oe eg $\frac{3}{2}\mathbf{a} + \frac{3}{4}\mathbf{b} = 3\left(\frac{1}{2}\mathbf{a} + \frac{1}{4}\mathbf{b}\right)$ oe $AM = \frac{4}{3}AP$ oe $AM = 4PM$ oe			M1 For use of a correct ratio or fraction linking AP and PM or AP and AM or AM and PM (in either order) vectors must be in form $p\mathbf{a} + q\mathbf{b}$
		3 : 1		A1
				Total 3 marks