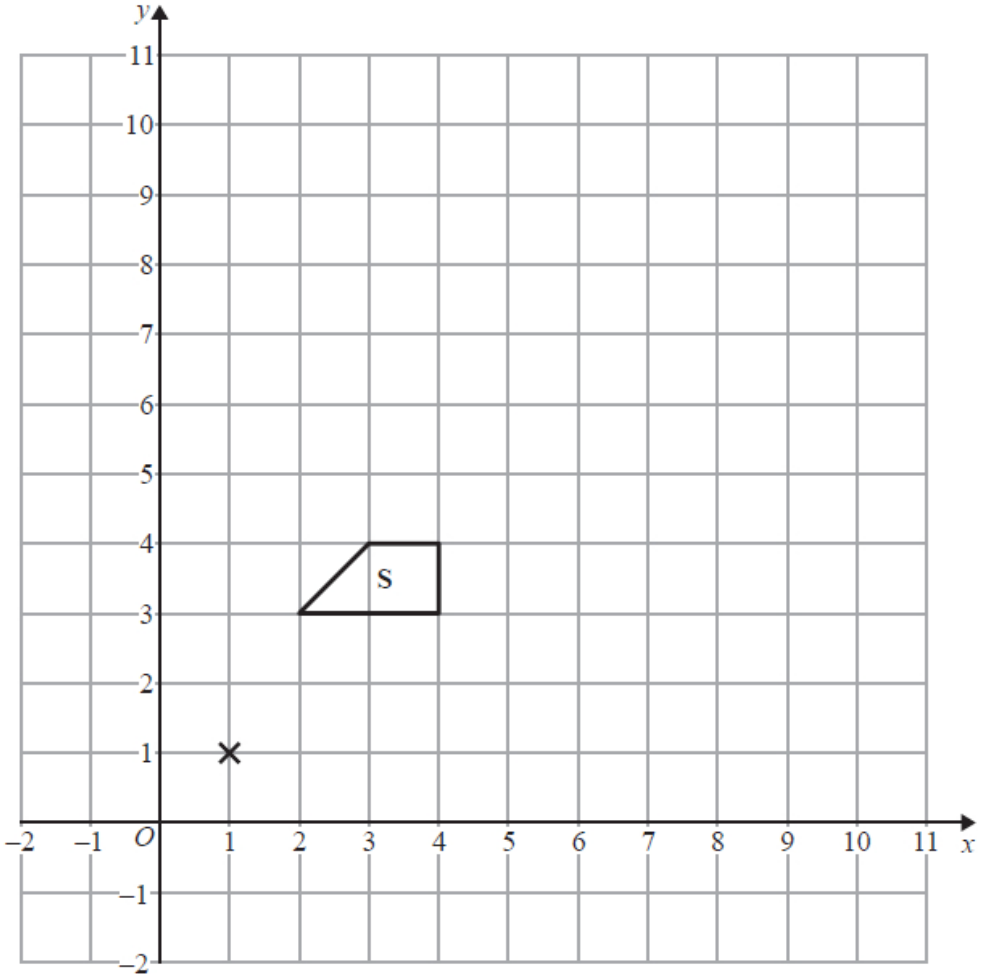
Unit 2 Revision Sheet G Transformations and Vectors Higher

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)

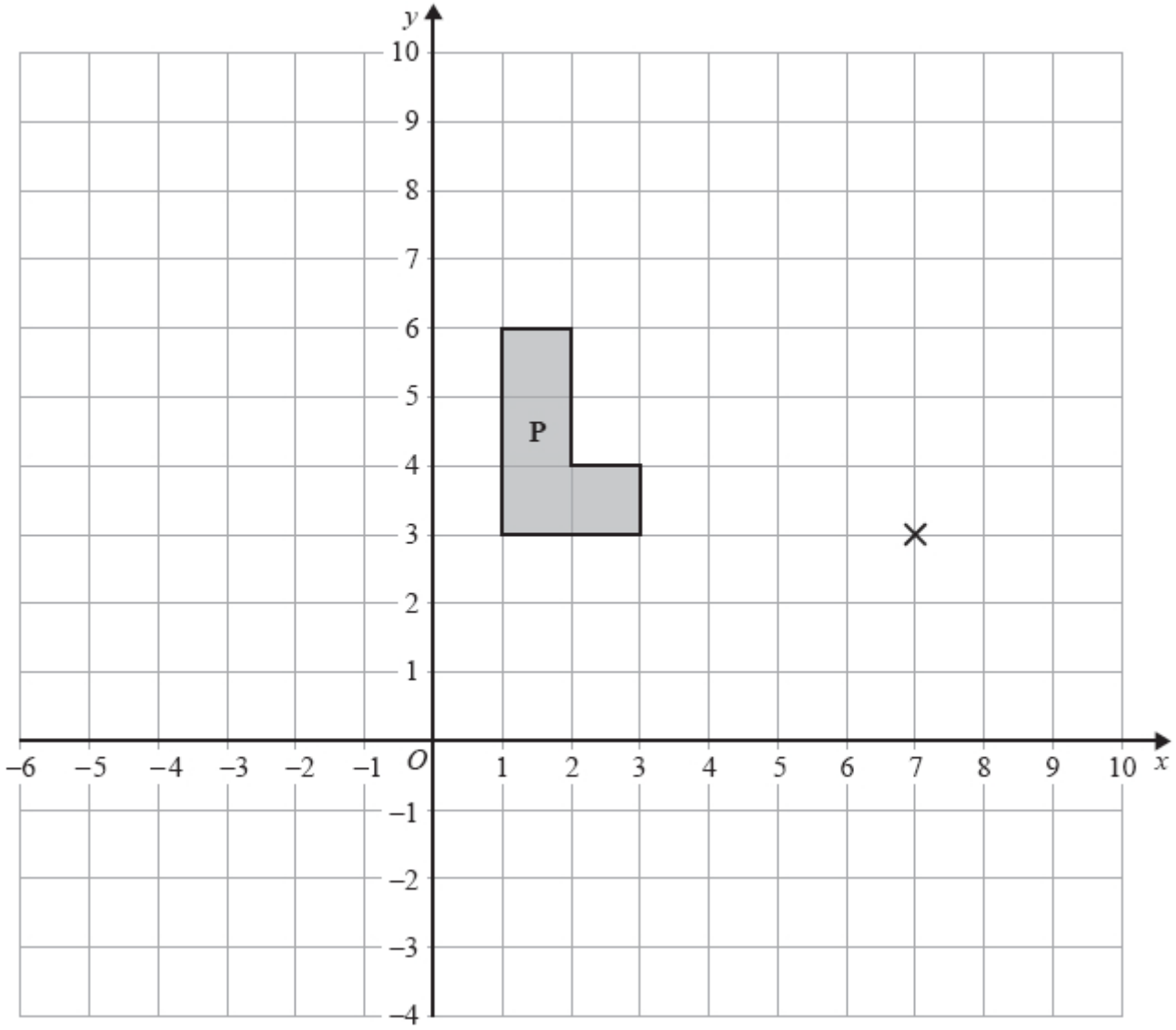
(b) Describe fully the single transformation that maps shape **T** onto shape **S**.

.....

(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**.

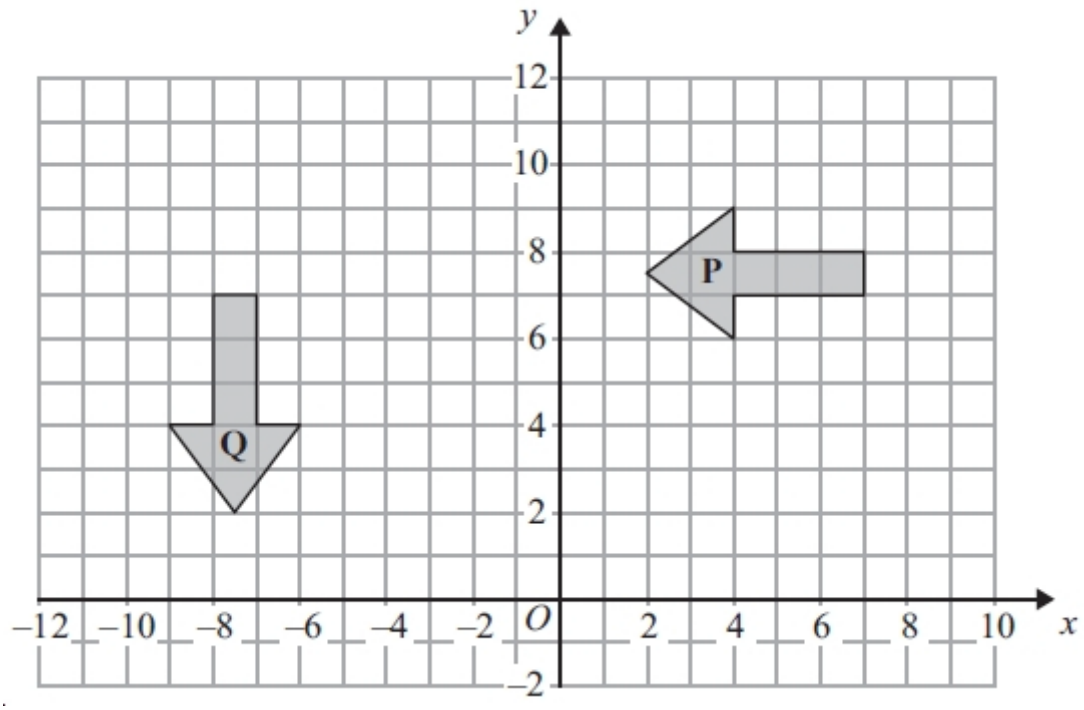
(2)

(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.

$$\overrightarrow{AB} = \begin{pmatrix} 6 \\ -9 \end{pmatrix} \qquad \overrightarrow{CB} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

Find the magnitude of $\overrightarrow{AC}$

.....

(Total for question = 3 marks)

Q5.

The diagram shows parallelogram *ABCD*.

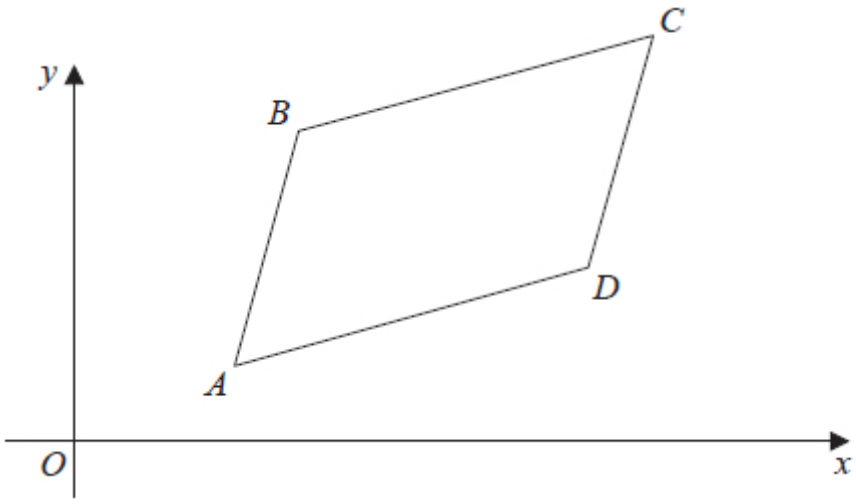


Diagram **NOT** accurately drawn

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

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.

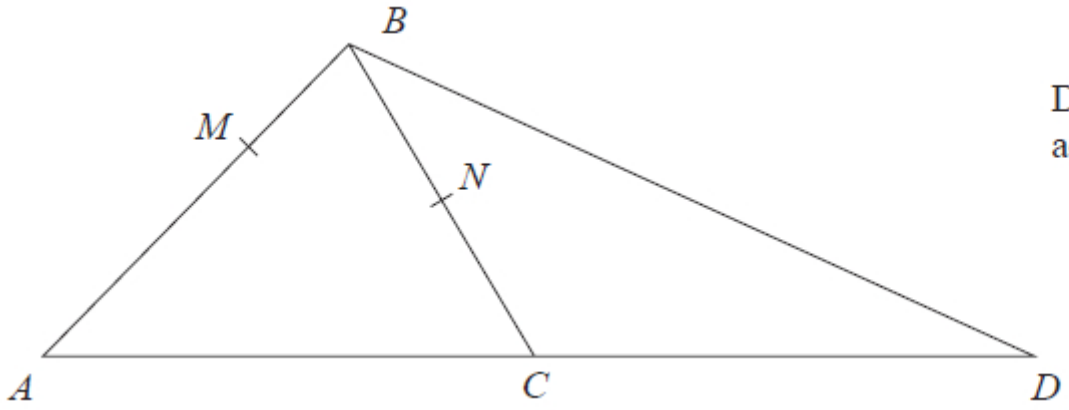


Diagram **NOT** accurately drawn

N is the midpoint of *BC*.
C is the midpoint of *AD*.
M is the point on *AB* such that *AM* : *MB* = 3 : 1

$\overrightarrow{AB} = \mathbf{p}$ and $\overrightarrow{AC} = \mathbf{q}$

(a) Express, in terms of **p** and **q**,

(i) $\overrightarrow{BD}$

.....

(ii) $\overrightarrow{MN}$

.....

(3)

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

(2)

(Total for question = 5 marks)

Q7.

OAB is a triangle.

$\overrightarrow{OA} = \mathbf{a}$ $\overrightarrow{OB} = \mathbf{b}$

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.

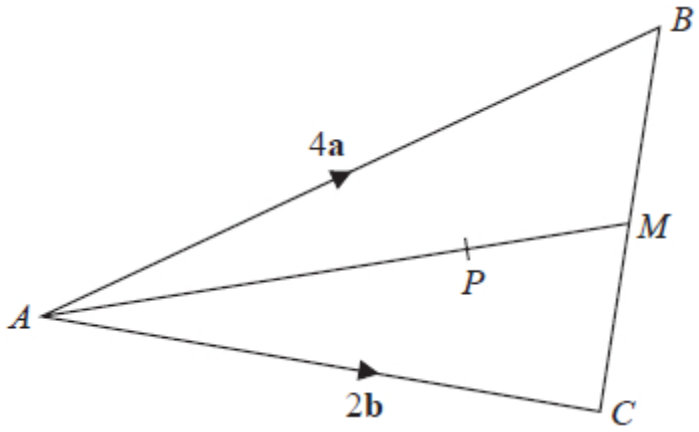


Diagram **NOT** accurately drawn

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

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

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

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

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		Enlargement SF 0.5, centre (1,1)	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 $\begin{pmatrix}6\\-9\end{pmatrix}+\begin{pmatrix}-1\\-3\end{pmatrix}\left(=\begin{pmatrix}5\\-12\end{pmatrix}\right)$ **or** or $\begin{pmatrix}1\\3\end{pmatrix}-\begin{pmatrix}6\\-9\end{pmatrix}$ or $\begin{pmatrix}1\\3\end{pmatrix}+\begin{pmatrix}-6\\9\end{pmatrix}\left(=\begin{pmatrix}-5\\12\end{pmatrix}\right)$
		13	3	A1
				Total 3 marks

Q5.

Question	Working	Answer	Mark	Notes
a	$\left(\overrightarrow{BC} = \right)\begin{pmatrix}-2\\-7\end{pmatrix}+\begin{pmatrix}10\\11\end{pmatrix}\left(=\begin{pmatrix}8\\4\end{pmatrix}\right)$	(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
	$\begin{pmatrix}5\\8\end{pmatrix}+"\begin{pmatrix}8\\4\end{pmatrix}"$ **or** $\begin{pmatrix}10\\11\end{pmatrix}+"\begin{pmatrix}3\\1\end{pmatrix}"$			M1 for coordinates (5 – 2 + 10, 8 – 7 + 11) assigned to C
				A1

b	e.g. $\begin{pmatrix}63\\211\end{pmatrix}-\begin{pmatrix}5\\8\end{pmatrix}\left(=\begin{pmatrix}58\\203\end{pmatrix}\right)$ **with** e.g. "58" ÷ 2 (=29) **and** "203" ÷ 7 (=29) **OR** e.g. $\begin{pmatrix}63\\211\end{pmatrix}-\begin{pmatrix}3\\1\end{pmatrix}\left(=\begin{pmatrix}60\\210\end{pmatrix}\right)$ **with** e.g. "60" ÷ 2 (=30) **and** "210" ÷ 7 (=30)	Proof	2	M1	may work with A and E, in which case may need to ft for method mark from (a)
				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 ABE is a straight line **or** 210 ÷ 60 = 3.5 and 7 ÷ 2 = 3.5 so ABE is a straight line

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 $\overrightarrow{DC} = \frac{1}{3}(\mathbf{a} - \mathbf{b})$oe			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 $\overrightarrow{MA}$
	$(AP:PM=)\left\lvert\frac{3}{2}\mathbf{a}+\frac{3}{4}\mathbf{b}\right\rvert:\left\lvert\frac{1}{2}\mathbf{a}+\frac{1}{4}\mathbf{b}\right\rvert$ oe $(AP:AM=)\left\lvert\frac{3}{2}\mathbf{a}+\frac{3}{4}\mathbf{b}\right\rvert:\lvert 2\mathbf{a}+\mathbf{b}\rvert(=3:4)$ oe $(AM:PM=)\lvert 2\mathbf{a}+\mathbf{b}\rvert:\left\lvert\frac{1}{2}\mathbf{a}+\frac{1}{4}\mathbf{b}\right\rvert(=4:1)$ oe $AP=3PM$ oe eg $\frac{3}{2}\mathbf{a}+\frac{3}{4}\mathbf{b}=3(\frac{1}{2}\mathbf{a}+\frac{1}{4}\mathbf{b})$ 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