![Pearson Edexcel]

Midpoints and vectors

A LEVEL LINKS **Scheme of work:** 5a. Definitions, magnitude/direction, addition and scalar multiplication

Practice questions

1

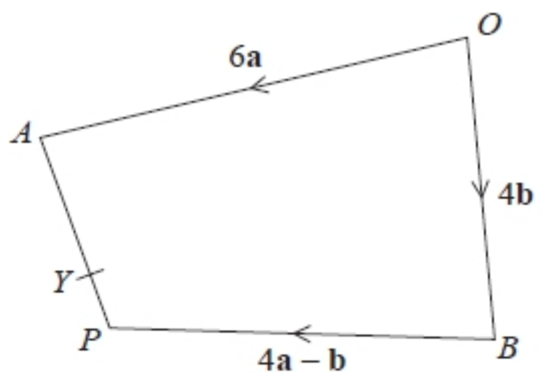


Diagram **NOT** accurately drawn

OBPA is a quadrilateral.

$\overrightarrow{OA} = 6\mathbf{a}$

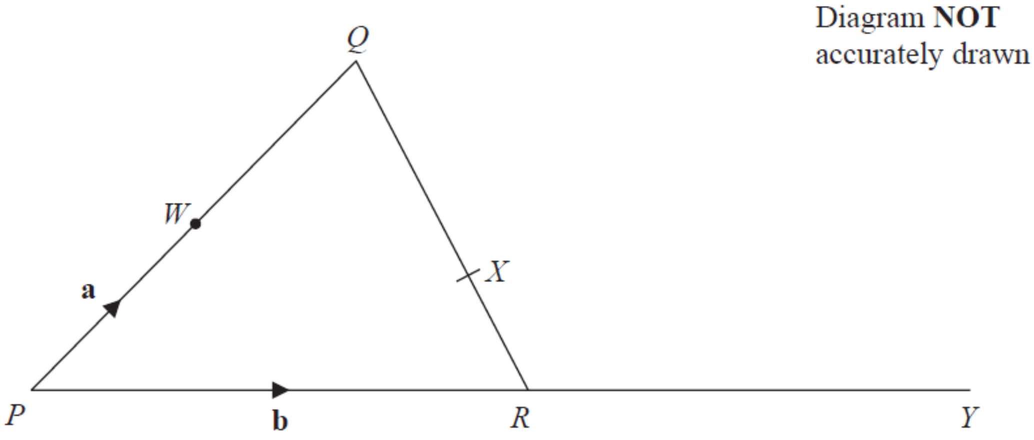
$\overrightarrow{OB} = 4\mathbf{b}$

$\overrightarrow{BP} = 4\mathbf{a} - \mathbf{b}$

Y is the point on *AP* such that $AY : YP = 2 : 1$

Show that $\overrightarrow{OY}$ is parallel to the vector $7\mathbf{a} + 3\mathbf{b}$

2



PQR is a triangle.
The midpoint of *PQ* is *W*.
X is the point on *QR* such that *QX* : *XR* = 2 : 1
PRY is a straight line.

$\overrightarrow{PW} = \mathbf{a}$ $\overrightarrow{PR} = \mathbf{b}$

(*a*) Find, in terms of **a** and **b**,

(i) $\overrightarrow{QR}$

....

(ii) $\overrightarrow{QX}$

....

(iii) $\overrightarrow{WX}$

....

R is the midpoint of the straight line *PRY*.

(*b*) Use a vector method to show that *WXY* is a straight line.

3

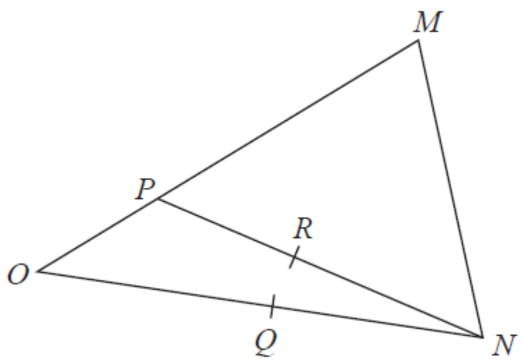


Diagram **NOT** accurately drawn

OMN is a triangle.

P is the point on *OM* such that $OP = \frac{1}{4}OM$

Q is the midpoint of *ON*
R is the midpoint of *PN*

$\overrightarrow{OP} = \mathbf{p}$ $\overrightarrow{OQ} = \mathbf{q}$

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

(i) $\overrightarrow{MN}$

....

(ii) $\overrightarrow{PR}$

....

(*b*) Use a vector method to prove that *QR* is parallel to *OP*.

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Answers

1 $\frac{2}{3}$ (7**a** + 3**b**)

M1 for correct vector for $\overrightarrow{OY}$, or $\overrightarrow{AP}$

eg ($\overrightarrow{OY}$) = $\overrightarrow{OA}$ + $\overrightarrow{AY}$, or $\overrightarrow{OY}$ = $\overrightarrow{OA}$ + $\frac{2}{3}\overrightarrow{AP}$ may include terms in a and b, eg. 6a + $\overrightarrow{AY}$, 4b + 4a – b + $\overrightarrow{PY}$ or $\overrightarrow{AP}$ = $\overrightarrow{AO}$ + $\overrightarrow{OB}$ + $\overrightarrow{BP}$ or –6a + 4b + 4a – b or – 2a + 3b

M1 for ($\overrightarrow{AY}$) = $\frac{2}{3}\overrightarrow{AP}$ or ⅔(–6a + 4b + 4a – b) or ⅔(–2a + 3b)

or ($\overrightarrow{PY}$ = $\frac{1}{3}$ $\overrightarrow{PA}$ or ⅓(– 4a + b – 4b + 6a) or ⅓(2a – 3b)

M1 for correct expression for $\overrightarrow{OY}$ in terms of a and b, eg $\frac{14}{3}$a + 2b

C1 for $\frac{2}{3}$(7a + 3b) and "$\overrightarrow{OY}$ is parallel to the vector 7a +3b" oe

2 (a)(i) **b** – 2**a**

(ii) $\frac{2}{3}$**b** – $\frac{4}{3}$**a**

(iii) $\frac{2}{3}$**b** – $\frac{1}{3}$**a**

(b) $\overrightarrow{WY}$ = – **a** + 2**b** oe **or** $\overrightarrow{XY}$ = $\frac{2}{3}$ (– **a** + 2**b**) oe

Conclusion using correct vectors eg. $\overrightarrow{WY}$ = 2**b** – **a** $\overrightarrow{XY}$ = $\frac{2}{3}$ (– **a** + 2**b**)

$\overrightarrow{XY}$ = $\frac{2}{3}$ $\overrightarrow{WY}$

3 (a)(i) 2**q** – 4**p**

(ii) **q** – $\frac{1}{2}$**p** oe

(b) Must be shown (one method shown only)

($\overrightarrow{QR}$ =) –**q** + **p** + **q** – $\frac{1}{2}$**p** or $\frac{1}{2}$**p** oe

$(\overrightarrow{QR} =)$ $\frac{1}{2}$**p and** $\overrightarrow{QR} = 0.5\overrightarrow{OP}$ or
$(\overrightarrow{QR} =)$ $\frac{1}{2}$**p and** $\overrightarrow{OP} = 2\overrightarrow{QR}$