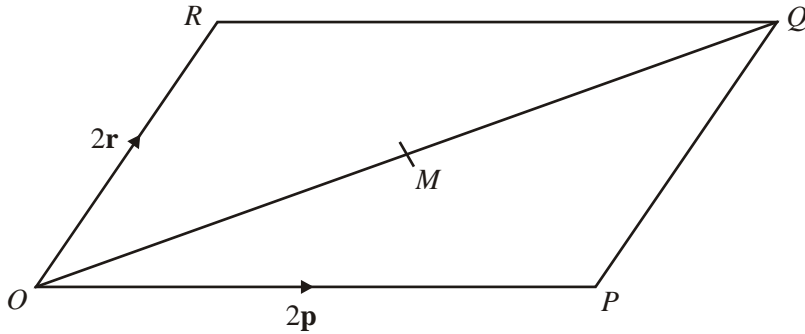


1. $OPQR$ is a parallelogram.
 M is the mid-point of the diagonal OQ .

$\vec{OP} = 2\mathbf{p}$ and $\vec{OR} = 2\mathbf{r}$



- (a) Express \vec{OM} in terms of \mathbf{p} and \mathbf{r} .

.....

Answer $\vec{OM} =$ (1)

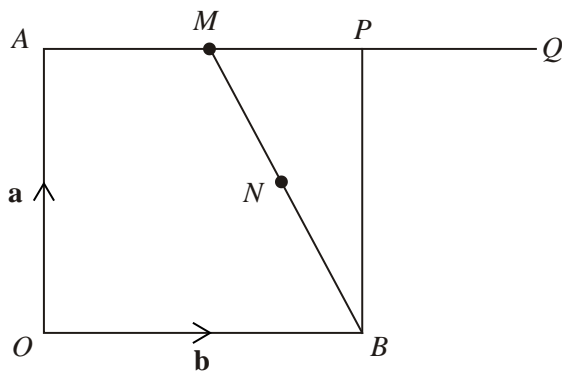
- (b) Use vectors to prove that M is also the mid-point of PR .

.....

(3)
 (Total 4 marks)

2. The diagram shows a square $OAPB$.
 M is the mid-point of AP .
 N is the mid-point of BM .
 AP is extended to Q where $AQ = 1\frac{1}{2} AP$

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



Write these vectors in terms of \mathbf{a} and \mathbf{b} .
 Give your answers in their simplest form.

- (i) \vec{OQ}

.....

Answer

(1)

- (ii) \vec{BM}

.....

Answer

(1)

- (iii) \vec{BN}

.....

Answer

(1)

- (iv) \vec{ON}

.....

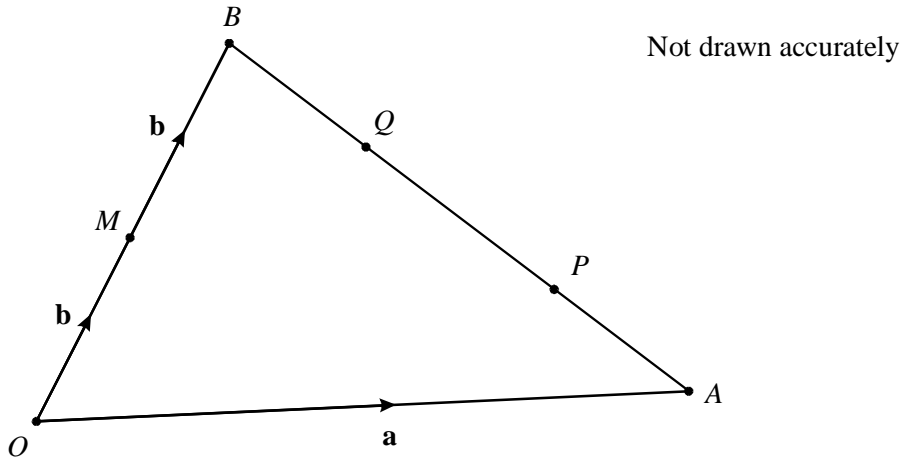
.....

Answer

(2)

(Total 5 marks)

3.



OAB is a triangle where M is the mid-point of OB .

P and Q are points on AB such that $AP = PQ = QB$.

$\vec{OA} = \mathbf{a}$ and $\vec{OB} = 2\mathbf{b}$

(a) Find, in terms of \mathbf{a} and \mathbf{b} , expressions for

(i) \vec{BA}

.....

Answer

(1)

(ii) \vec{MQ}

.....

Answer

(2)

(iii) \vec{OP}

.....

Answer

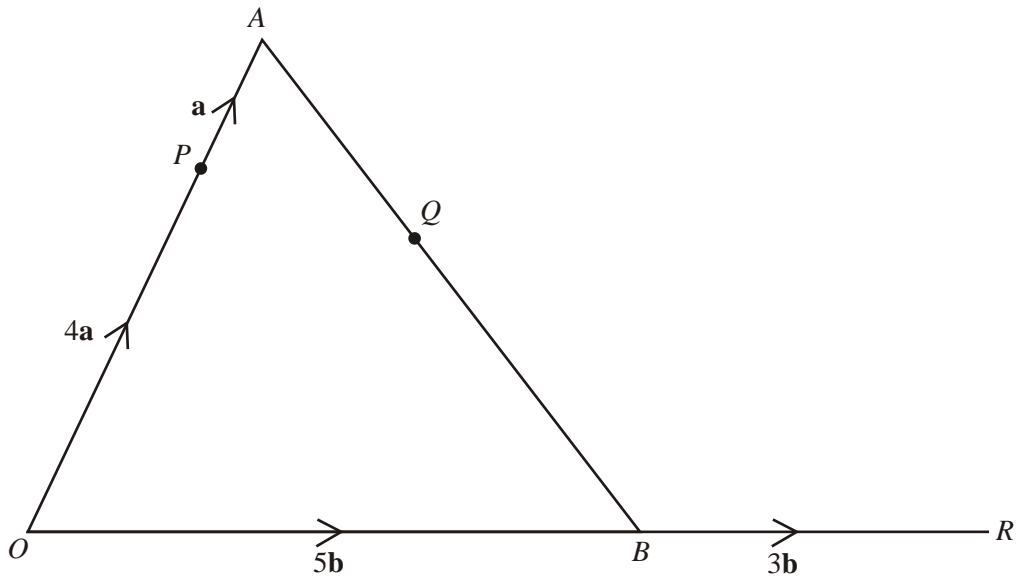
(2)

(b) What can you deduce about quadrilateral $OMQP$?
 Give a reason for your answer.

.....

(2)
 (Total 7 marks)

4. In the diagram $\vec{OP} = 4\mathbf{a}$, $\vec{PA} = \mathbf{a}$, $\vec{OB} = 5\mathbf{b}$, $\vec{BR} = 3\mathbf{b}$ and $\vec{AQ} = \frac{2}{5} \vec{AB}$



Not drawn accurately

(a) Find, in terms of \mathbf{a} and \mathbf{b} , simplifying your answers,

(i) \vec{AB}

.....

Answer

(1)

(ii) \vec{PQ}

.....

Answer

(2)

(b) Show clearly that points P , Q and R lie on a straight line.

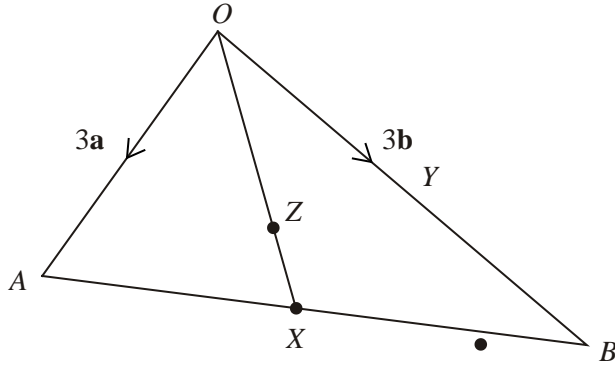
.....

(3)

(Total 6 marks)

5. OAB is a triangle.
 X is the midpoint of AB .
 Y is the midpoint of OB .
 Z is the point on OX such that $OZ : ZX = 2 : 1$

$\vec{OA} = 3\mathbf{a}, \vec{OB} = 3\mathbf{b}$



(a) Find, in terms of \mathbf{a} and \mathbf{b} , the vectors

(i) \vec{AY}

.....

Answer

(1)

(ii) \vec{OX}

.....

Answer

(2)

(iii) \vec{AZ}

.....

Answer

(2)

(b) A, Z and Y are on a straight line.

Find the ratio $AZ : ZY$

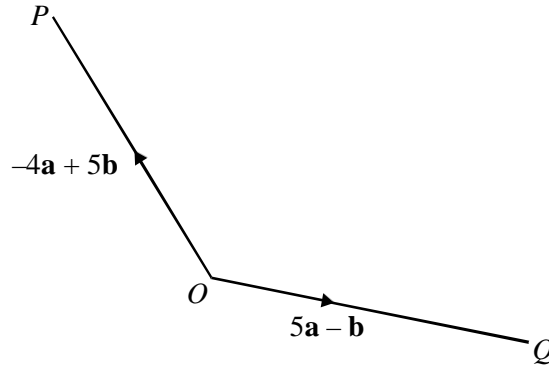
.....

Answer

(2)

(Total 7 marks)

6. $\vec{OP} = -4\mathbf{a} + 5\mathbf{b}$ and $\vec{OQ} = 5\mathbf{a} - \mathbf{b}$.



R is a point on \vec{PQ} such that $PR : RQ = 1 : 2$.

(a) Express \vec{OR} in terms of \mathbf{a} and \mathbf{b} .

.....

Answer

(3)

(b) $\vec{PS} = \mathbf{a} + 4\mathbf{b}$

Express \vec{OS} in terms of \mathbf{a} and \mathbf{b} .

.....

Answer

(2)

(c) What **two** facts do \vec{OR} and \vec{OS} indicate about the points O, R and S?

Give a reason for each of your answers.

.....

(2)

(Total 7 marks)