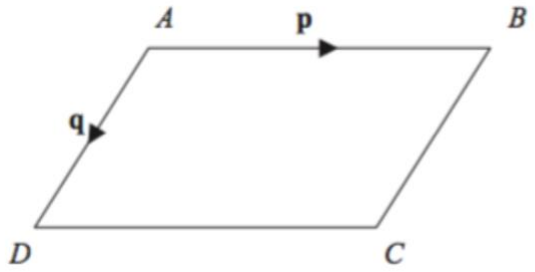


Diagram **NOT** accurately drawn

$ABCD$ is a parallelogram.

AB is parallel to DC. AD is parallel to BC.

$\overrightarrow{AB} = \mathbf{p}$ $\overrightarrow{AD} = \mathbf{q}$

Express $\overrightarrow{BD}$ in terms of $\mathbf{p}$ and $\mathbf{q}$.

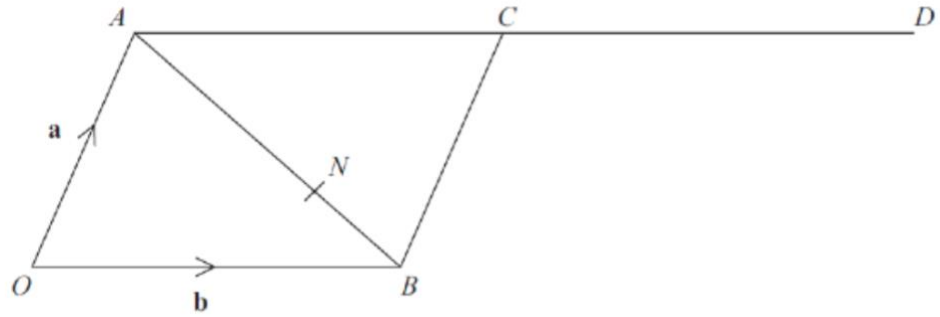


Diagram **NOT** accurately drawn

$\overrightarrow{OA} = a$ and $\overrightarrow{OB} = b$ D is the point such that $\overrightarrow{AC} = \overrightarrow{CD}$.

The point N divides AB in the ratio 2 : 1.

Write an expression for $\overrightarrow{ON}$ in terms of **a** and **b**.

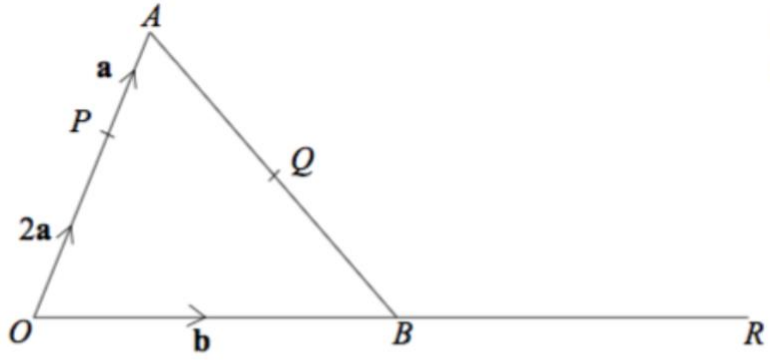


Diagram **NOT** accurately drawn

OAB is a triangle. B is the midpoint of OR. Q is the midpoint of AB.

$\overrightarrow{OP} = 2\mathbf{a}$ $\overrightarrow{PA} = \mathbf{a}$ $\overrightarrow{OB} = \mathbf{b}$ $\overrightarrow{PR} = 4\overrightarrow{PQ}$

The length of PQ is 3 cm.

(c) Find the length of PR.

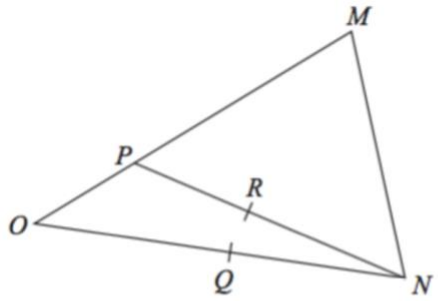


Diagram **NOT** accurately drawn

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

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

Use a vector method to prove that QR is parallel to OP

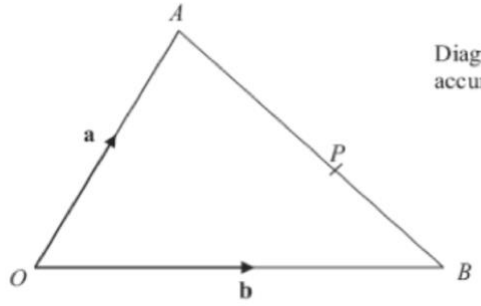


Diagram **NOT** accurately drawn

OAB is a triangle. $\overrightarrow{OA} = \mathbf{a}$ $\overrightarrow{OB} = \mathbf{b}$

P is the point on AB such that $AP : PB = 3 : 2$

Show that $\overrightarrow{OP} = x(2\mathbf{a} + 3\mathbf{b})$ where x is a fraction to be found.

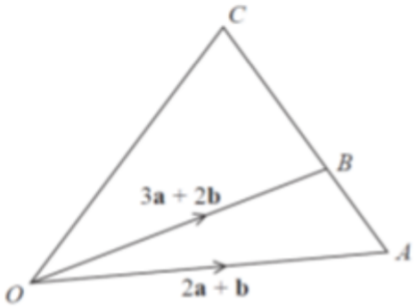


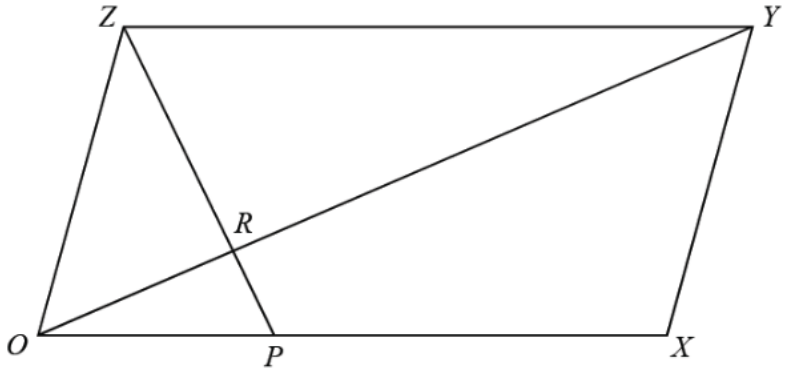
Diagram **NOT** accurately drawn

ABC is a straight line. $AB : BC = 2 : 5$

$\overrightarrow{OA} =$ **2a + b** $\overrightarrow{OB} =$ **3a + 2b**

Express $\overrightarrow{OC}$ in terms of **a** and **b**. Give your answer in its simplest form.

OXYZ is a parallelogram.

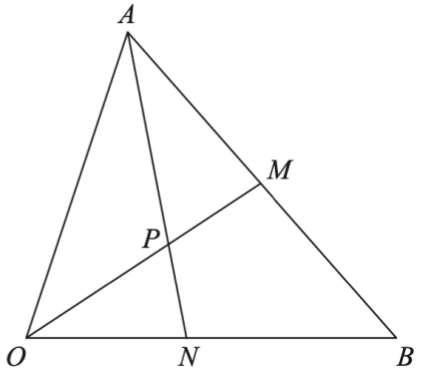


$\overrightarrow{OX} = \mathbf{a}$

$\overrightarrow{OY} = \mathbf{b}$

P is the point on *OX* such that $OP : PX = 1 : 2$
R is the point on *OY* such that $OR : RY = 1 : 3$

Work out, in its simplest form, the ratio $ZP : ZR$
You must show all your working.



OAB is a triangle.
OPM and *APN* are straight lines.
M is the midpoint of *AB*.

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

$OP : PM = 3 : 2$

Work out the ratio $ON : NB$