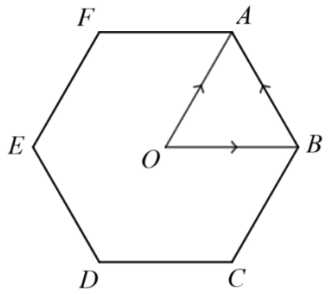
Vectors (Geometric) www.m4ths.com

(1) The diagram below shows the regular hexagon $ABCDEF$ with centre O.

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



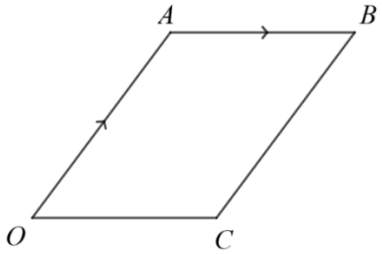
Find the following vectors in terms of **a** and **b** in their simplest form!

(a) $\overrightarrow{AO}$ (b) $\overrightarrow{AB}$ (c) $\overrightarrow{DA}$ (d) $\overrightarrow{BF}$

(e) $\overrightarrow{EC}$ (f) $\overrightarrow{CE}$ (g) $\overrightarrow{BE}$ (h) $\overrightarrow{CF}$

(2) The diagram below shows the parallelogram $OABC$.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{AB} = \mathbf{b}$

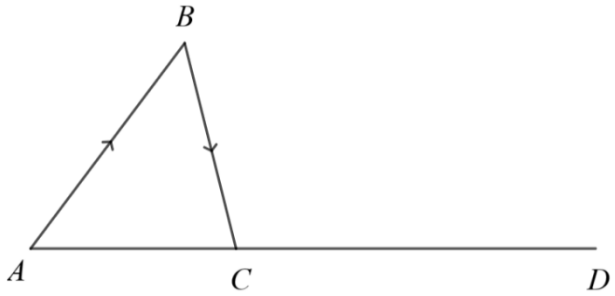


(a) Find the vectors $\overrightarrow{OB}$

(b) X is the midpoint of OA and Y is the midpoint of AB. Prove that $\overrightarrow{XY}$ is parallel to $\overrightarrow{OB}$.

(3) The diagram below shows a triangle ABC

$\overrightarrow{AB} = \mathbf{p}$ and $\overrightarrow{BC} = \mathbf{2q}$



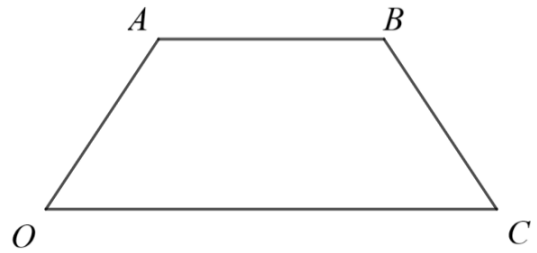
(a) The line ACD is a straight line and $CD = 2AC$.

Show that $\overrightarrow{BD} = 2(\mathbf{p}+\mathbf{3q})$

(b) The point X lies on AB such that $AX:XB = 1:3$ and the point Y lies on BC such that $BY:YC = 3:1$. Show that $\overrightarrow{XY}$ is parallel to $\overrightarrow{CD}$

(4) The diagram below shows the trapezium $OABC$ where $OC = 2AB$

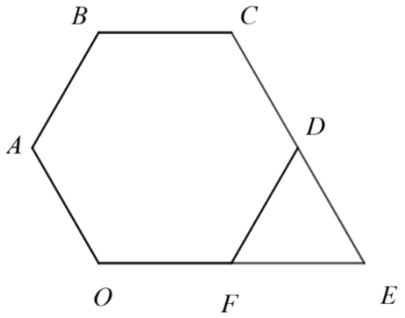
$\overrightarrow{OA} = \mathbf{2p} + \mathbf{3q}$ and $\overrightarrow{AB} = \mathbf{5p}$



X is the midpoint of BC.

Find $\overrightarrow{XO}$ in its simplest form.

(5) The diagram below shows a regular hexagon and an equilateral triangle. The lines OFE and CDE are straight lines.



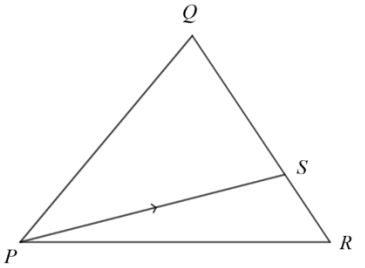
$\overrightarrow{OA} = \mathbf{p}$ and $\overrightarrow{OF} = \mathbf{q}$

The point X is the midpoint of AB and the point Y is the midpoint of FD.

(a) Prove that the point E, X and Y are collinear.

(b) Find the ratio $EX:XY$

(6) The diagram below shows the triangle PQR. The point S lies on QR such that $QS:SR = 2:1$



$\overrightarrow{QS} = \mathbf{2m}$ and $\overrightarrow{QP} = 5\mathbf{n}$

Find an expression for $\overrightarrow{PR}$ in terms of $\mathbf{m}$ and $\mathbf{n}$