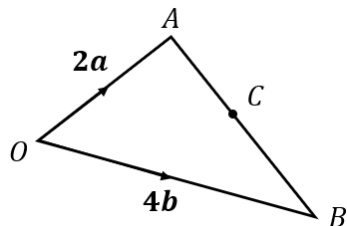# Vectors and Midpoints

(a)

In the triangle OAB, $\overrightarrow{OA} = 2\boldsymbol{a}$ and $\overrightarrow{OB} = 4\boldsymbol{b}$. C is the midpoint of the line AB.
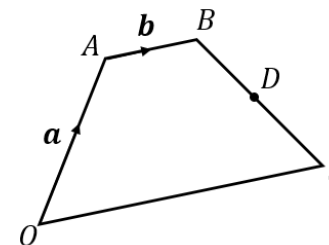

Express the following in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$:

(a) $\overrightarrow{AB}$ (b) $\overrightarrow{BA}$

(c) $\overrightarrow{AC}$ (d) $\overrightarrow{BC}$

(e) $\overrightarrow{OC}$ (f) $\overrightarrow{CO}$

(b)

$OABC$ is a trapezium, where $\overrightarrow{OA} = \boldsymbol{a}$ and $\overrightarrow{AB} = \boldsymbol{b}$. D is the midpoint of BC and $\overrightarrow{OC} = 2\overrightarrow{AB}$.
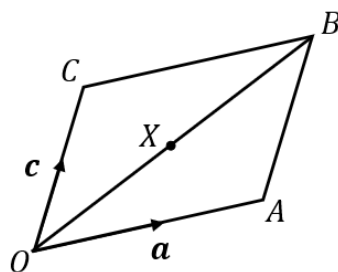

Express the following in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$:

(a) $\overrightarrow{OC}$ (b) $\overrightarrow{CB}$

(c) $\overrightarrow{BC}$ (d) $\overrightarrow{BD}$

(e) $\overrightarrow{AD}$ (f) $\overrightarrow{DO}$

(c)

In the parallelogram $OABC$, $\overrightarrow{OA} = \boldsymbol{a}$ and $\overrightarrow{OC} = \boldsymbol{c}$.
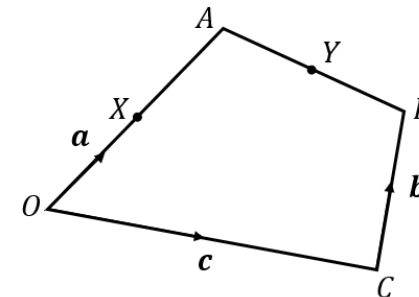X is the midpoint of the line OB.

Express the following in terms of $\boldsymbol{a}$ and $\boldsymbol{c}$:

(a) $\overrightarrow{CB}$ (b) $\overrightarrow{BA}$

(c) $\overrightarrow{OB}$ (d) $\overrightarrow{XB}$

(e) $\overrightarrow{XC}$ (f) $\overrightarrow{AX}$

What do the answers to (e) and (f) tell us about the points C, X and A?

(d)

$OABC$ is a quadrilateral.
$\overrightarrow{OX} = \boldsymbol{a}$, $\overrightarrow{OC} = \boldsymbol{c}$ and $\overrightarrow{CB} = \boldsymbol{b}$.
X is the midpoint of OA and Y is the midpoint of AB.

Express the following in terms of $\boldsymbol{a}, \boldsymbol{b}$ and $\boldsymbol{c}$:

(a) $\overrightarrow{OA}$ (b) $\overrightarrow{OB}$

(c) $\overrightarrow{CA}$ (d) $\overrightarrow{AB}$

(e) $\overrightarrow{AY}$ (f) $\overrightarrow{XY}$

What do the answers to (b) and (f) tell us about vectors $\overrightarrow{OB}$ and $\overrightarrow{XY}$?