Vector Proof – Collinear Points
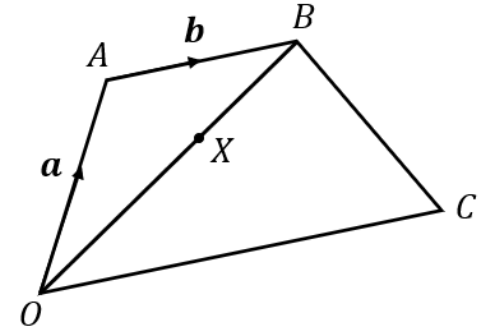
(a)

$OACB$ is a parallelogram. $\overrightarrow{OA} = 3\boldsymbol{a}$ and $\overrightarrow{AC} = 3\boldsymbol{b}$. Y is the midpoint of OB and X divides the line OC in the ratio $1 : 2$. Show that the points A, X and Y are collinear.
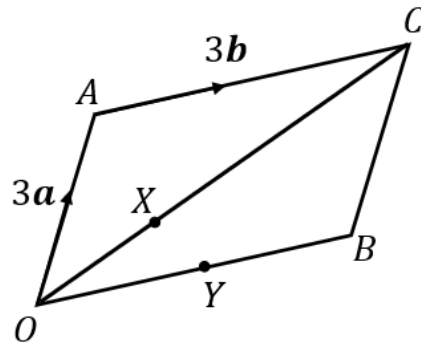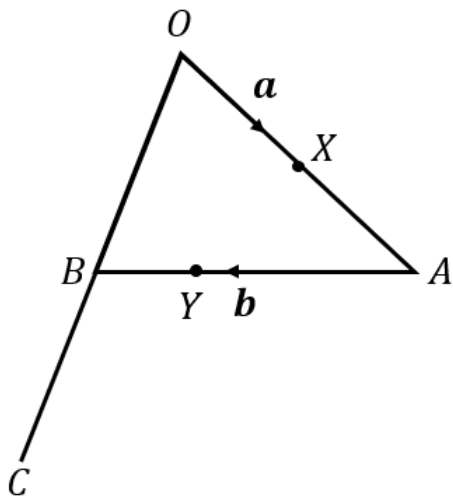

(b)

$OACB$ is a trapezium. $\overrightarrow{OA} = \boldsymbol{a}$ and $\overrightarrow{AB} = \boldsymbol{b}$. $\overrightarrow{OC} = 3\overrightarrow{AB}$ and X divides the line OB in the ratio $3 : 1$. Show that the points A, X and C are collinear.

(c)

In the triangle OAB, $\overrightarrow{OX} = \boldsymbol{a}$ and $\overrightarrow{AB} = \boldsymbol{b}$. X is the midpoint of OA and the point Y divides the line AB in the ratio $2 : 1$.
$\overrightarrow{OB} = \overrightarrow{BC}$. Show that the points X, Y and C are collinear.

(d)

$\overrightarrow{OA} = 4\boldsymbol{a} - \boldsymbol{b}$, $\overrightarrow{AB} = \boldsymbol{a} + 2\boldsymbol{b}$ and $\overrightarrow{OC} = \boldsymbol{a} + \boldsymbol{b}$. $\overrightarrow{AB} = \overrightarrow{BD}$. The point X divides the line AC in the ratio $6 : 1$. Show that O, X and D are collinear.