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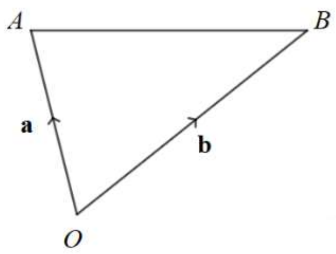
A LEVEL MATHS

(61) Vector Geometry

WORKING AT D/E

(1) The diagram below shows the triangle OAB.

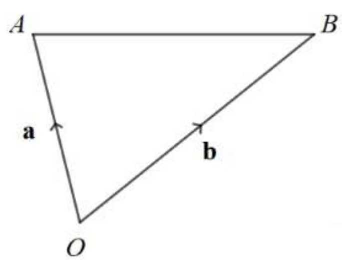


(a) Write down $\overrightarrow{OA}$ and $\overrightarrow{OB}$ in terms of **a** and **b**.

(b) Hence, find $\overrightarrow{AB}$ in terms of **a** and **b**.

The point X lies on AB such that $AX:XB$ is 1:2

(c) Mark the point X on the diagram below.



(d) Show that $\overrightarrow{OX} = \frac{2}{3}\mathbf{a} + \frac{1}{3}\mathbf{b}$

The point Y lies on OB such that $OY:YB$ is 1:2

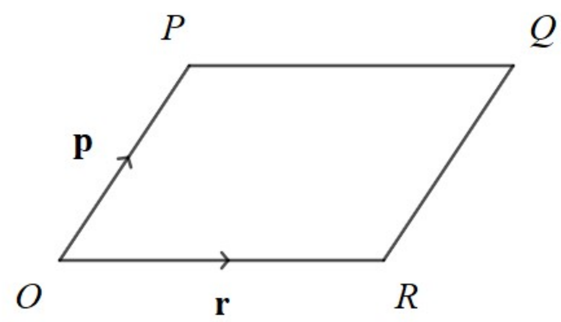
(e) Prove, using vectors, that $\overrightarrow{OA}$ and $\overrightarrow{YX}$ are parallel.

The point Z lies on OA such that $\overrightarrow{YZ}$ and $\overrightarrow{AB}$ are parallel.

(f) Find $\overrightarrow{OZ}$.

WORKING AT B/C

(1) The diagram below shows the parallelogram $OPQR$.



(a) Write down $\overrightarrow{OQ}$ in terms of **p** and **r**.

Point X is the midpoint of the line OP of and point Y is the midpoint of the line RQ.

(b) Prove, using vectors that $\overrightarrow{PQ}$ and $\overrightarrow{YX}$ are the same.

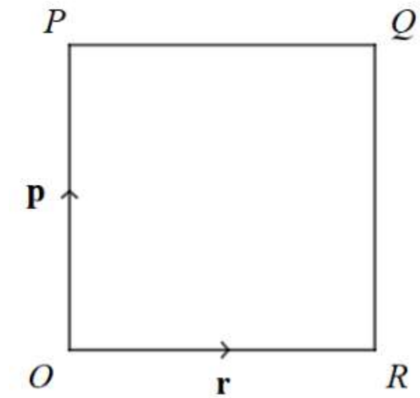
(c) Z is the midpoint of the line OQ. Use vectors to show that Z is also the midpoint of the line PR.

Given further, that $\mathbf{p} = 2\mathbf{i} + 6\mathbf{j}$, $\mathbf{r} = q\mathbf{i}$, where q is a constant, and that the area of the parallelogram is 45 units,

(d) Find the exact value of q.

WORKING AT A*/A

(1) The diagram below shows the square $OPQR$.



The point X lies on OR such that $OX:XR$ is 1:3

The point Y lies on RQ such that $RY:YQ$ is 3:1

The point Z is the midpoint of the line OP

(a) Using vectors, find the ratio $ZQ:XY$

Given further that $\overrightarrow{OZ} = 4\mathbf{j}$,

(b) Find $|\overrightarrow{OR}|$ as a simplified surd.

(c) Write down the angle $\overrightarrow{OR}$ makes with $\overrightarrow{OZ}$