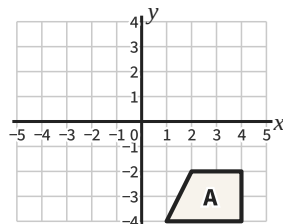


1 Translating shapes

- a) Translate A by $\begin{pmatrix} -5 \\ 5 \end{pmatrix}$.
Write down the vertices of the image.
- b) Write the column vector that translates the image back onto A.

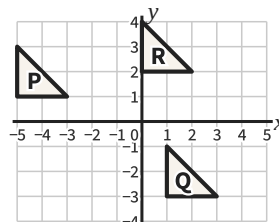


a) $(-4, 1), (-1, 1), (-1, 3), (-3, 3)$

b) $\begin{pmatrix} 5 \\ -5 \end{pmatrix}$

2 Describing translations

- a) Write the column vector that translates P onto Q.
- b) Leo says $\begin{pmatrix} 5 \\ -1 \end{pmatrix}$ translates Q onto R. Explain his mistake.



a) $\begin{pmatrix} 6 \\ -4 \end{pmatrix}$ b) he swapped the numbers: $\begin{pmatrix} -1 \\ 5 \end{pmatrix}$

3 Calculating with vectors

- $\mathbf{a} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$
- a) Work out $3\mathbf{a} - 2\mathbf{b}$.
- b) $\mathbf{a} + k\mathbf{b} = \begin{pmatrix} 10 \\ 2 \end{pmatrix}$. Find k .

a) $\begin{pmatrix} -6 \\ 15 \end{pmatrix} - \begin{pmatrix} 8 \\ -2 \end{pmatrix} = \begin{pmatrix} -14 \\ 17 \end{pmatrix}$

b) $-2 + 4k = 10$ and $5 - k = 2$, so $k = 3$

4 Vectors: magnitude

- a) $\mathbf{a} = \begin{pmatrix} 7 \\ 2 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -1 \\ -4 \end{pmatrix}$. Work out the magnitude of $\mathbf{a} - \mathbf{b}$.
- b) Work out the magnitude of $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$. Give your answer as a surd in its simplest form.

a) $\mathbf{a} - \mathbf{b} = \begin{pmatrix} 8 \\ 6 \end{pmatrix}$, $\sqrt{64 + 36} = 10$

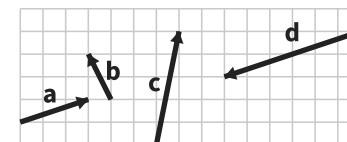
b) $\sqrt{20} = 2\sqrt{5}$

Vectors

revision mat answers

5 Vectors on a grid

- a) Write $\mathbf{d}$ in terms of $\mathbf{a}$.
- b) Write $\mathbf{c}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.



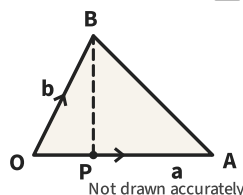
a) $\mathbf{d} = \begin{pmatrix} -6 \\ -2 \end{pmatrix} = -2\mathbf{a}$

b) $\mathbf{c} = \begin{pmatrix} 1 \\ 5 \end{pmatrix} = \mathbf{a} + 2\mathbf{b}$

6 Vector paths

OA = $\mathbf{a}$ and OB = $\mathbf{b}$. P is on OA so that OP : PA = 1 : 2.

- a) Write BA in terms of $\mathbf{a}$ and $\mathbf{b}$.
- b) Write PB in terms of $\mathbf{a}$ and $\mathbf{b}$.



a) $\mathbf{BA} = \mathbf{a} - \mathbf{b}$

b) $\mathbf{PB} = -\frac{1}{3}\mathbf{a} + \mathbf{b}$

7 Parallel vectors

- a) Which two of these are parallel to $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$?
- $\begin{pmatrix} -6 \\ 9 \end{pmatrix}$ $\begin{pmatrix} 4 \\ 6 \end{pmatrix}$ $\begin{pmatrix} -4 \\ -6 \end{pmatrix}$ $\begin{pmatrix} 6 \\ 4 \end{pmatrix}$
- b) $\mathbf{a} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$. Show that $2\mathbf{a} + \mathbf{b}$ is parallel to $\begin{pmatrix} 8 \\ 10 \end{pmatrix}$.

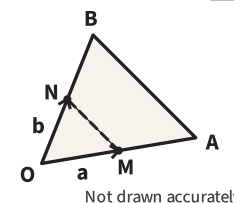
a) $\begin{pmatrix} 4 \\ 6 \end{pmatrix} = 2 \times \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and $\begin{pmatrix} -4 \\ -6 \end{pmatrix} = -2 \times \begin{pmatrix} 2 \\ 3 \end{pmatrix}$

b) $2\mathbf{a} + \mathbf{b} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$ and $\begin{pmatrix} 8 \\ 10 \end{pmatrix} = 2 \times \begin{pmatrix} 4 \\ 5 \end{pmatrix}$

8 Vector proof

OA = $\mathbf{a}$ and OB = $\mathbf{b}$. M is the midpoint of OA and N is the midpoint of OB.

- a) Write MN in terms of $\mathbf{a}$ and $\mathbf{b}$.
- b) Prove that MN is parallel to AB and half its length.



a) $\mathbf{MN} = \frac{1}{2}\mathbf{b} - \frac{1}{2}\mathbf{a}$

b) $\mathbf{AB} = \mathbf{b} - \mathbf{a}$, so $\mathbf{MN} = \frac{1}{2}\mathbf{AB}$