TRANSLATION, REFLECTION

TRANSLATION

1 Find the image point when:

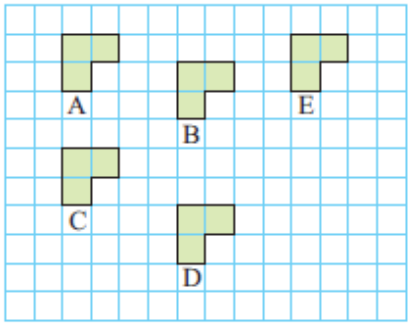
a $(2, -1)$ is translated through $\begin{pmatrix}3\\4\end{pmatrix}$ **b** $(5, 2)$ is translated through $\begin{pmatrix}-1\\4\end{pmatrix}$.

2 If $(3, -2)$ is translated to $(3, 1)$, what is the translation vector?

3 What point has image $(-3, 2)$ under the translation $\begin{pmatrix}-3\\1\end{pmatrix}$?

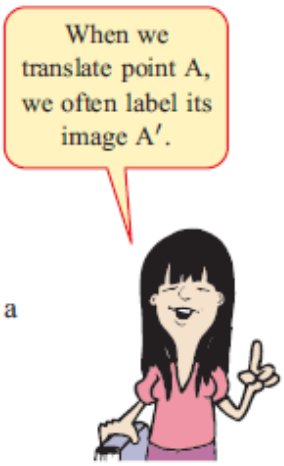
4 Find the translation vector which maps:

a A onto E **b** E onto A
c A onto C **d** C onto A
e B onto E **f** D onto E
g E onto C **h** E onto D
i D onto B **j** A onto D.



5 Triangle ABC has vertices $A(-1, 3)$, $B(4, 1)$ and $C(0, -2)$.

a Draw triangle ABC on a set of axes.
b Translate the figure by the translation vector $\begin{pmatrix}4\\-2\end{pmatrix}$.
c State the coordinates of the image vertices A', B' and C'.
d Through what distance has each point moved?



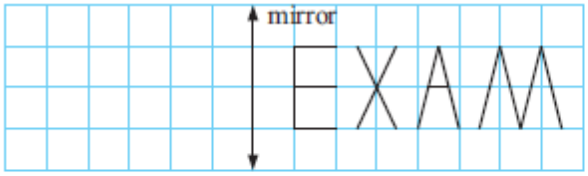
6 What single transformation is equivalent to a translation of $\begin{pmatrix}2\\1\end{pmatrix}$ followed by a translation of $\begin{pmatrix}3\\4\end{pmatrix}$?

7 Find the equation of the image line when:

a $y = 2x + 3$ is translated $\begin{pmatrix}-1\\2\end{pmatrix}$ **b** $y = \frac{1}{3}x + 2$ is translated $\begin{pmatrix}3\\0\end{pmatrix}$
c $y = -x + 2$ is translated $\begin{pmatrix}2\\3\end{pmatrix}$ **d** $y = -\frac{1}{2}x$ is translated $\begin{pmatrix}-2\\-5\end{pmatrix}$.

REFLECTION

1 Copy and reflect in the given line:



2 Find, by graphical means, the image of the point $(4, -1)$ under a reflection in:

a the x-axis **b** the y-axis **c** the line $y = x$ **d** the line $y = -x$.

3 Find, by graphical means, the image of the point $(-1, -3)$ under a reflection in:

a the y-axis **b** the line $y = -x$ **c** the line $x = 2$ **d** the line $y = -1$

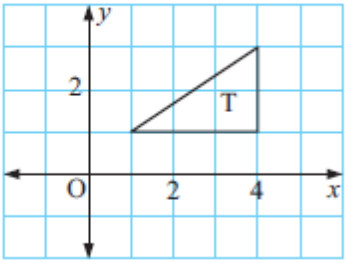
e the x-axis **f** the line $x = -3$ **g** the line $y = x$ **h** the line $y = 2$.

4 Copy the graph given. Reflect T in:

a the y-axis and label it U

b the line $y = -1$ and label it V

c the line $y = -x$ and label it W.



5 Find the image of:

a $(2, 3)$ under a reflection in the x-axis followed by a translation of $\begin{pmatrix} -1 \\ 2 \end{pmatrix}$

b $(4, -1)$ under a reflection in $y = -x$ followed by a translation of $\begin{pmatrix} 4 \\ 3 \end{pmatrix}$

c $(-1, 5)$ under a reflection in the y-axis followed by a reflection in the x-axis followed by a translation of $\begin{pmatrix} 2 \\ -4 \end{pmatrix}$

d $(3, -2)$ under a reflection in $y = x$ followed by a translation of $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$

e $(4, 3)$ under a translation of $\begin{pmatrix} 1 \\ -4 \end{pmatrix}$ followed by a reflection in the x-axis.

6 Find the image of the line $y = -x + 3$ when it is reflected in the line $y = -1$.

7 Construct a set of coordinate axes with x and y ranging from -5 to 5.

a Draw the lines $y = x$ and $y = -x$.

b Draw triangle T with vertices $(1, 1)$, $(3, 1)$ and $(2, 2)$.

c **i** Reflect T in the x-axis and label its image U.

ii Reflect U in the line $y = -x$ and label its image V.

iii Describe fully the single transformation which maps T onto V directly.

d **i** Reflect T in the line $y = x$ and label it G.

ii Reflect G in the line $y = -x$ and label it H.

iii Describe fully the single transformation that maps T onto H directly.