

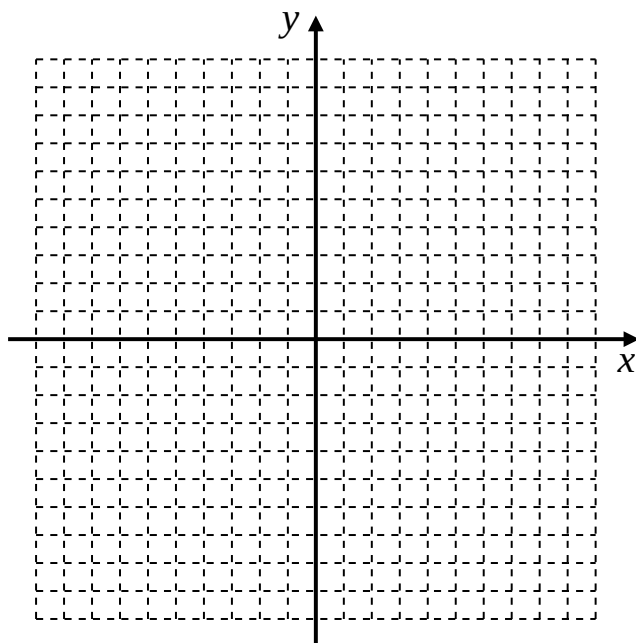
Lesson 2

GCSE Mathematics Transformation Geometry

2.1 T1 Translation

A **translation** is the first of the four **transformations** to be studied.

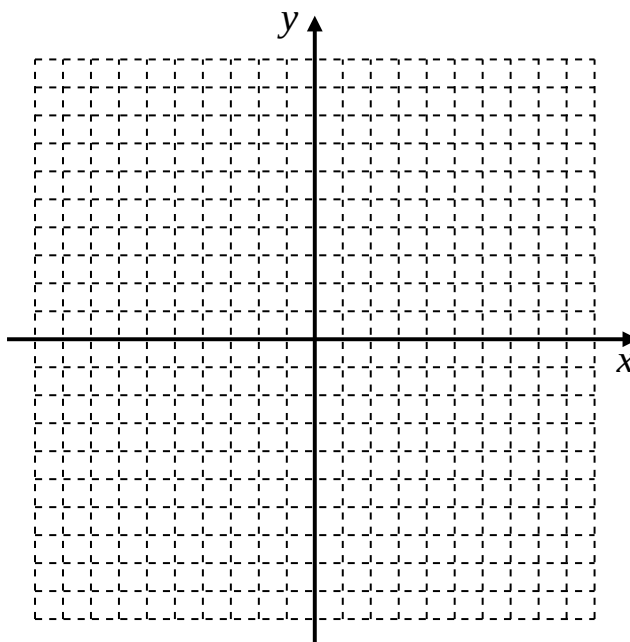
2.2 Example



- (i) Plot the KITE with vertices;
 $K(-7, -9)$, $I(1, -5)$, $T(1, -1)$, $E(-3, -1)$
- (ii) The KITE has mirror symmetry.
On your diagram draw in the line of mirror symmetry.
- (iii) What is the equation of this line of mirror symmetry ?
- (iv) Translate the KITE by the vector; $\begin{pmatrix} 5 \\ 9 \end{pmatrix}$
- (v) What is the equation of the translated KITE's line of mirror symmetry ?
- (vi) What can you say, geometrically, about the lines of symmetry of the original KITE and the translated KITE ?
- (vii) Are the original KITE and the translated KITE congruent ?

2.3 Exercise

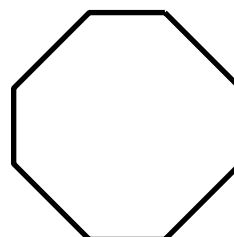
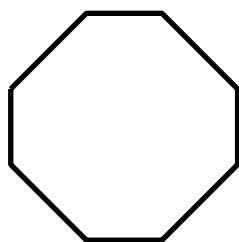
Question 1



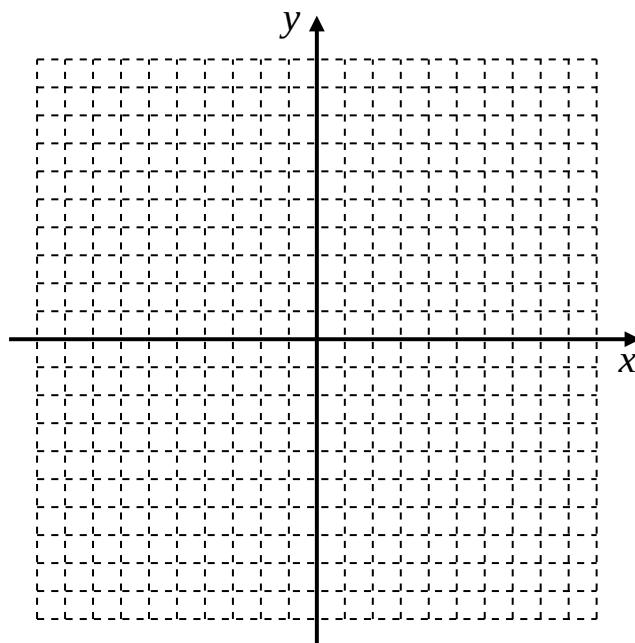
- (i) Plot the PARALLELOGRAM with vertices;
 $G(-9, -6)$, $R(-5, -6)$, $A(-1, 2)$, $M(-5, 2)$
- (ii) The PARALLELOGRAM does not have mirror symmetry.
It does have rotational symmetry of order 2.
About what point does it have rotational symmetry ?
- (iii) Translate the PARALLELOGRAM by the vector $\begin{pmatrix} 9 \\ 5 \end{pmatrix}$

Question 2

Use a cm ruler to help you write down a vector that translates the octagon on the left onto that on the right.



Question 3

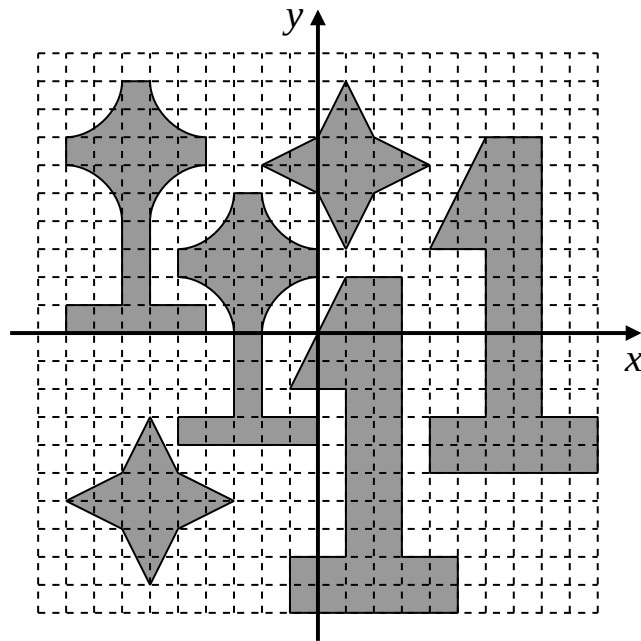


- (i) Plot the RHOMBUS with vertices;
 $R(2, -6)$, $H(2, -1)$, $O(-2, -4)$, $M(-2, -9)$
- (ii) The RHOMBUS has two lines of mirror symmetry.
On your diagram draw in the lines of mirror symmetry.
- (iii) What are the equations of these lines of mirror symmetry ?
- (iv) Translate the RHOMBUS by the vector; $\begin{pmatrix} -3 \\ 9 \end{pmatrix}$
- (v) What are the equations of the translated RHOMBUS's two lines of mirror symmetry ?
- (vi) Does the RHOMBUS have rotational symmetry ?
If so, of what order ?

Question 4

Draw a shape which
has rotational symmetry
of order 3 and no mirror
symmetry.

Question 5



- (i) Write down the vector that translates the STAR, to the right and up, and onto its congruent twin.

- (ii) Write down the vector that translates the ONE, to the left and down, and onto its congruent twin.

- (iii) Write down the vector that translates the CELTIC CROSS to the right and down and onto its congruent twin.

Question 6

- (i) Translate the point (4, 7) by $\begin{pmatrix} 5 \\ 3 \end{pmatrix}$

- (ii) Translate the point (24, 33) by $\begin{pmatrix} 21 \\ 37 \end{pmatrix}$

Question 7

- (i) Translate the point $(-8, 3)$ by $\begin{pmatrix} 11 \\ -7 \end{pmatrix}$
- (ii) Translate the point $(8.7, 6.3)$ by $\begin{pmatrix} 12.2 \\ -3.7 \end{pmatrix}$

Question 8

- (i) What vector will translate the point $(5, 1)$ onto the point $(7, 11)$?
- (ii) What vector will translate the point $(4, 13)$ onto the point $(-7, 8)$?