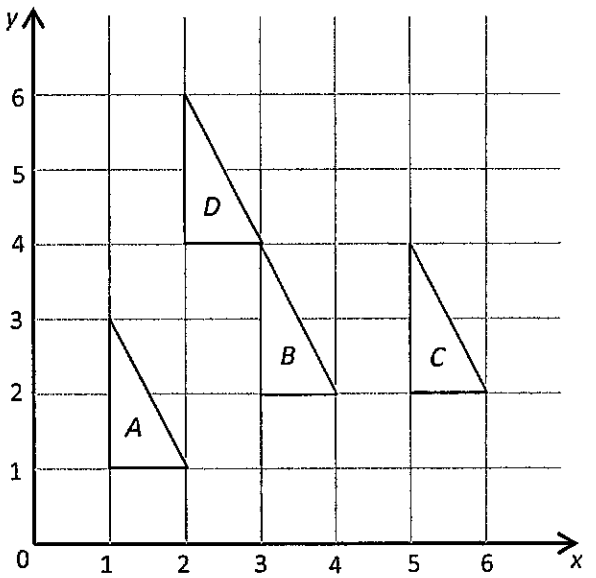
Transformations:

Geometrical transformations change the positions, or sizes, of shapes on a plane in particular ways. You will learn about four basic ways of changing the position and size of shapes: **translation, reflection, rotation** and **enlargement.**

All of these transformations, except enlargement, keep a shape congruent with itself.

Translation

Translation is the movement of a shape from one place to another without reflecting it or rotating it. It is sometimes called a **glide**, since the shape seems to glide from one place to another. Every point in the shape moves in the same direction and through the same distance.



We describe such changes in position using vectors.
In such a vector, the move from one point to another is represented by the combination of a horizontal shift and a vertical shift.

In the figure to the left:

The vector describing the translation from A to B is (2, 1)

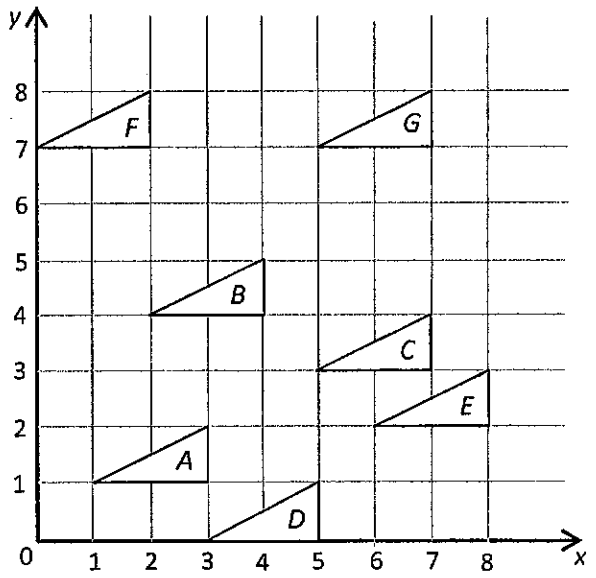
The vector describing the translation from B to C is (2, 0)

The vector describing the translation from C to D is (-3, 2)

The vector describing the translation from D to A is (-1, -3)

Notice
The first number describes the horizontal movement
The second number describes the vertical movement.

Practice Problems:



1. Describe the following translations with vectors in the figure to the left:

a. *A* to *B*	**b.** *A* to *F*	**c.** *B* to *D*	**d.** *B* to *C*
e. *C* to *B*	**f.** *C* to *E*	**g.** *D* to *B*	**h.** *D* to *A*
i. *E* to *G*	**j.** *E* to *F*	**k.** *F* to *B*	**l.** *F* to *G*
m. *G* to *C*	**n.** *G* to *B*		

2. a. Draw a triangle with coordinates A(1, 1), B(2, 1) and C(1, 3).
b. Draw the image ABC after a translation with vector (2, 3). Label this P.
c. Draw the image ABC after a translation with vector (-1, 2). Label this Q.
d. Draw the image ABC after a translation with vector (3, -2). Label this R.
e. Draw the image ABC after a translation with vector (-2, -4). Label this S.

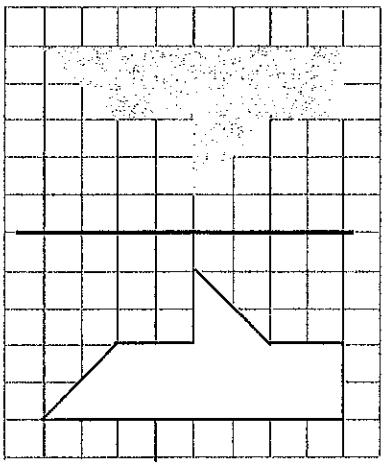
3. Using the diagram from question 2, write the translation vector that moves:

a. *P* to *Q*	**b.** *Q* to *R*	**c.** *R* to *S*	**d.** *S* to *P*
e. *R* to *P*	**f.** *S* to *Q*	**g.** *R* to *Q*	**h.** *P* to *S*

Reflection

Reflection is the movement of a shape so that it becomes a mirror image of itself.

For example:

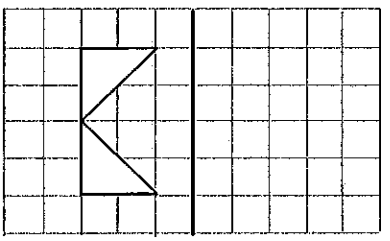


Notice the reflection of each point in the original shape is perpendicular to the mirror line. So if you fold the whole diagram along the mirror line, any object point will coincide with its reflection.

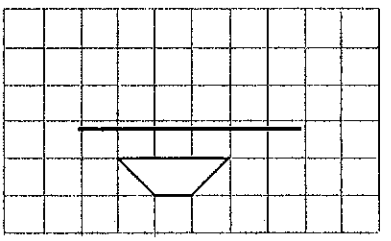
Practice Problems:

Draw the reflection of each figure in the given mirror line.

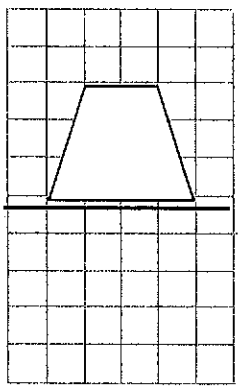
a.



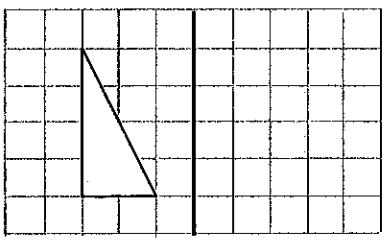
b.



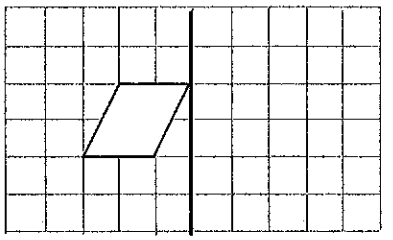
c.



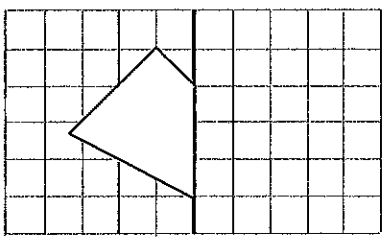
d.



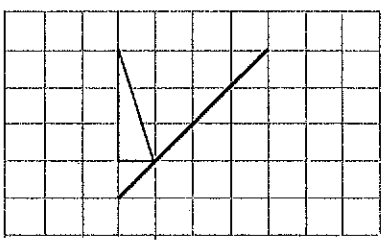
e.



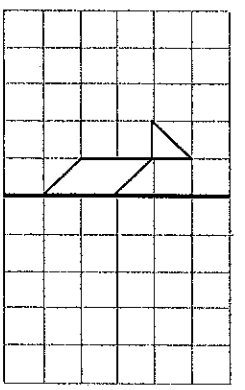
f.



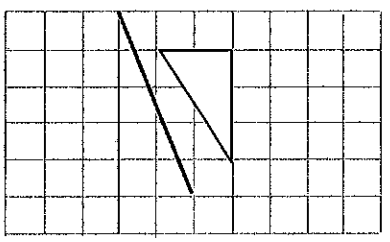
g.



h.



i.



j.