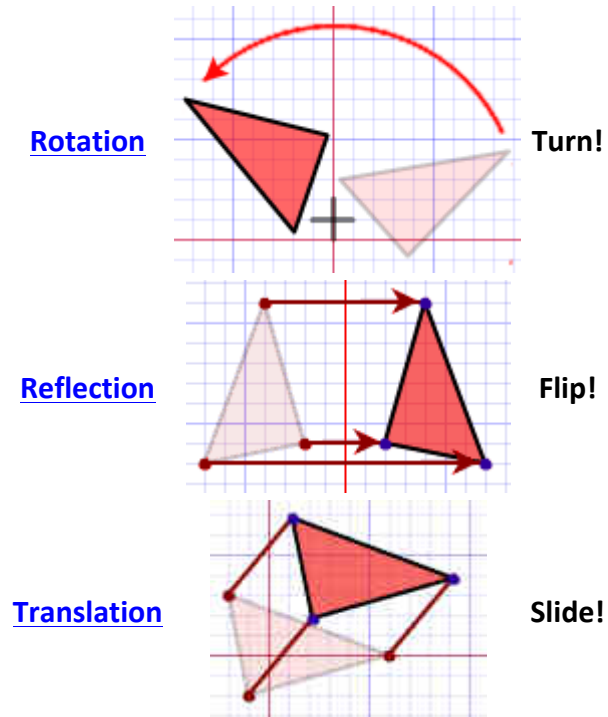


# Transformations

The three main Transformations are:



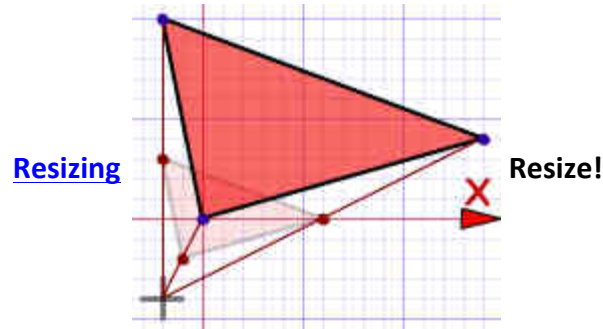
After any of those transformations (turn, flip or slide), the shape still has **the same size, area, angles and line lengths.**



If one shape can become another using Turns, Flips and/or Slides, then the two shapes are called **Congruent**.

## Resizing

The other important Transformation is **Resizing** (also called *dilation*, *contraction*, *compression*, *enlargement* or even *expansion*). The shape becomes bigger or smaller:



If you have to use Resizing to make one shape become another then the shapes are not Congruent, they are **Similar**.

## Congruent or Similar

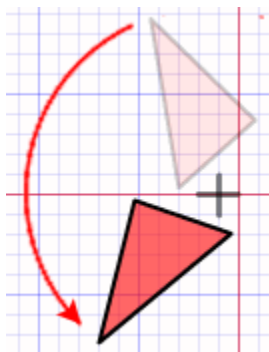
So, if one shape can become another using transformation, the two shapes might be Congruent or just Similar

If you ...	→	Then the shapes are ...
... only Rotate, Reflect and/or Translate	→	<b>Congruent</b>
... need to Resize	→	<b>Similar</b>

## "Rotation" means turning around a center:

The **distance** from the center to any point on the shape stays the same.

Every point makes a **circle** around the center.



Here a triangle is rotated around the point marked with a "+"

# Translation

In Geometry, "Translation" simply means **Moving** ...

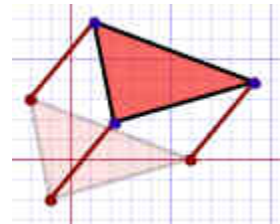
... without rotating, resizing or anything else, **just moving**.

To Translate a shape:

Every point of the shape must move:

- the **same distance**
- in the **same direction**.

To see how this works, try translating different shapes here:



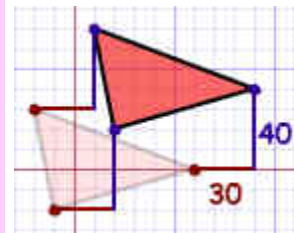
## Writing it Down

Sometimes we just want to write down the translation, without showing it on a graph.

**Example:** if we want to say that the shape gets moved 30 Units in the "X" direction, and 40 Units in the "Y" direction, we can write:

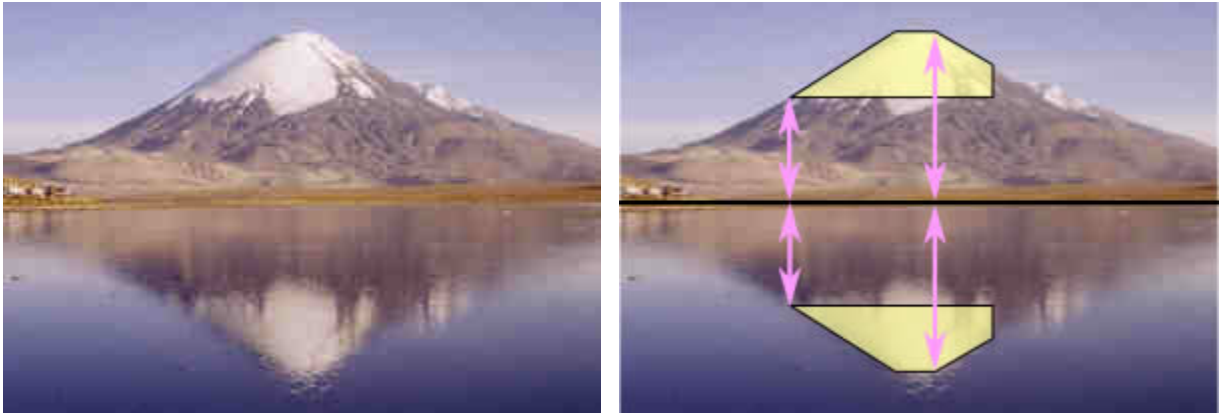
$$(x, y) \rightarrow (x + 30, y + 40)$$

This says "all the x and y coordinates will become x+30 and y+40"



# Reflection

Reflections are everywhere ... in mirrors, glass, and here in a lake.  
... what do you notice ?

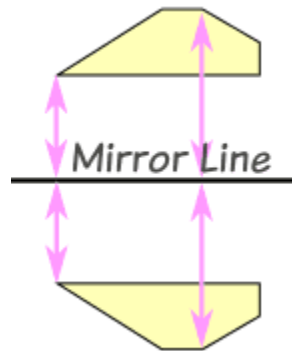


Every point is the same distance from the central line !

... and ...

The reflection has the same size as the original image

The central line is called the **Mirror Line** ...





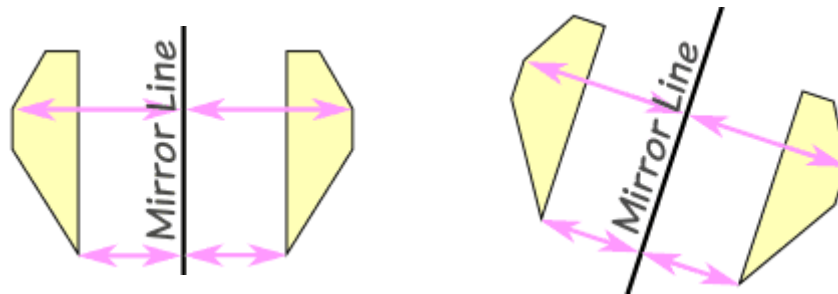
## Can A Mirror Line Be Vertical?

Yes.

Here my dog "Flame" shows a Vertical Mirror Line (with a bit of photo magic)

In fact Mirror Lines can be in **any direction**.

Imagine turning the photo at the top in different directions ...  
... the **reflected image** is always the same size, it just **faces the other way**:

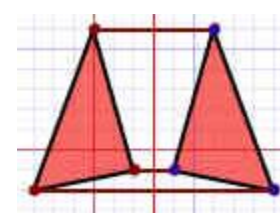
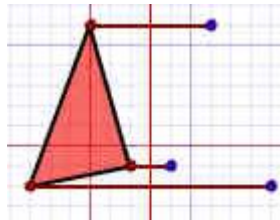
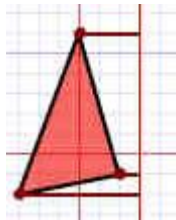


A reflection is a **flip** over a line

## How Do I Do It Myself?

Just approach it step-by-step. For **each corner** of the shape:

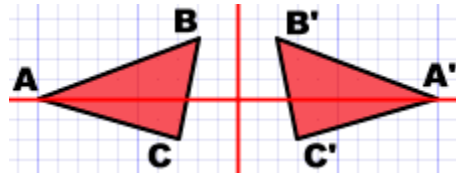
1. Measure from the point to the mirror line (must hit the mirror line at a right angle)
2. Measure the same distance again on the other side and place a dot.
3. Then connect the new dots up!



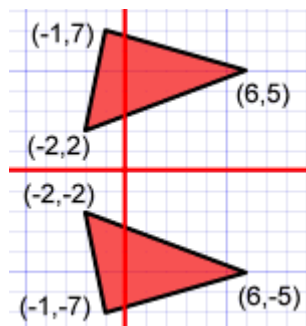
## Labels

It is common to label each corner with letters, and to use a little dash (called a **Prime**) to mark each corner of the reflected image.

Here the original is **ABC** and the reflected image is **A'B'C'**



## Some Tricks

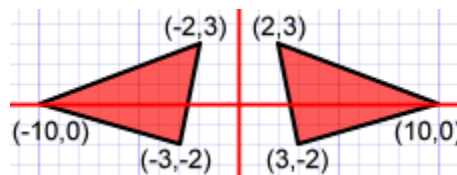


**X-Axis**

If the mirror line is the x-axis, just change each  $(x,y)$  into  $(x,-y)$

**Y-Axis**

If the mirror line is the y-axis, just change each  $(x,y)$  into  $(-x,y)$

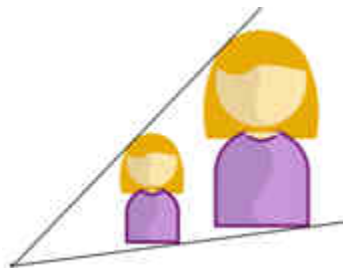


## Fold the Paper

And if all else fails, just fold your sheet of paper along the mirror line and then hold it up to the light !

# Resizing

When you resize a shape it gets bigger or smaller.



... but it still looks *similar*:

- all angles stay the same
- relative sizes are the same (for example the face and body are still in proportion)

Note: here we call it **resizing**, but other people call it **dilation, contraction, compression, enlargement** or even **expansion**! Same idea, just different names.)

To resize, just do this for *every* corner:

- draw a line from the central point to the corner
- increase (or decrease) the length of that line
- put a dot at the new point

Then just connect the dots for the resized shape!

