Translations, Rotations, Reflections, and Dilations

M7G2.a Demonstrate understanding of translations, dilations, rotations, reflections, and relate symmetry to appropriate transformations.

In geometry, a **transformation** is a way to change the position of a figure.

In some transformations, the figure retains its size and only its position is changed.

Examples of this type of transformation are:
translations, rotations, and reflections

In other transformations, such as **dilations**, the size of the figure will change.

TRANSLATION

TRANSLATION

A **translation** is a transformation that *slides* a figure across a plane or through space.

With translation all points of a figure move the same distance and the same direction.

TRANSLATION

Basically, translation means that a figure has moved.

An easy way to remember what translation means is to remember…

A TRANSLATION IS A CHANGE IN LOCATION.

A translation is usually specified by a direction and a distance.

TRANSLATION

What does a translation look like?

original

image

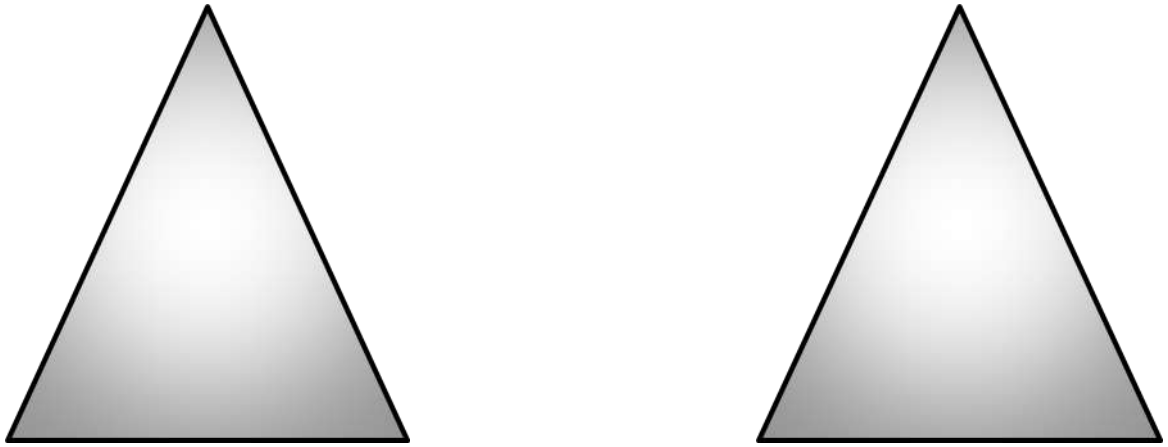
x **y**

Translate from x to y

A TRANSLATION IS A CHANGE IN LOCATION.

TRANSLATION

In the example below triangle A is translated to become triangle B.

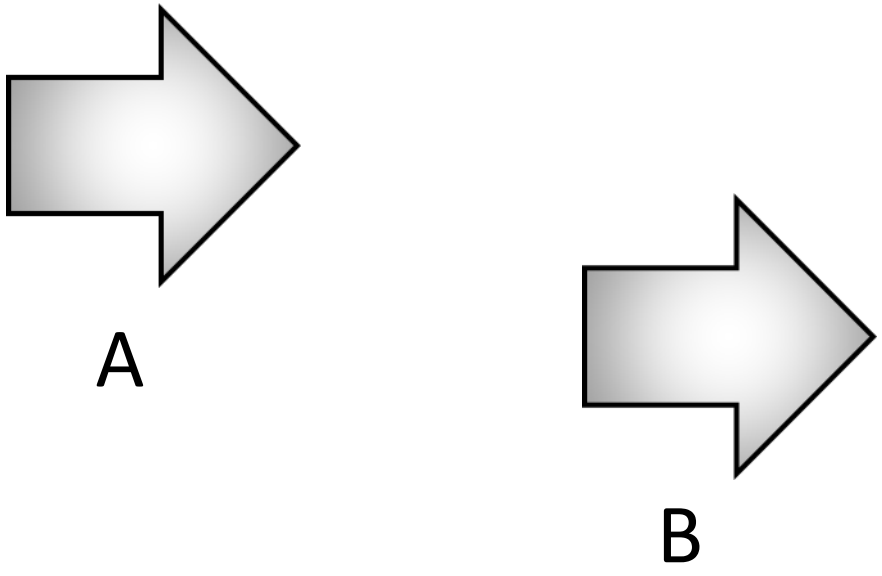


A B

Triangle A is slide directly to the right.

TRANSLATION

In the example below arrow A is translated to become arrow B.



Arrow A is slide down and to the right.

ROTATION

ROTATION

A **rotation** is a transformation that *turns* a figure about (around) a point or a line.

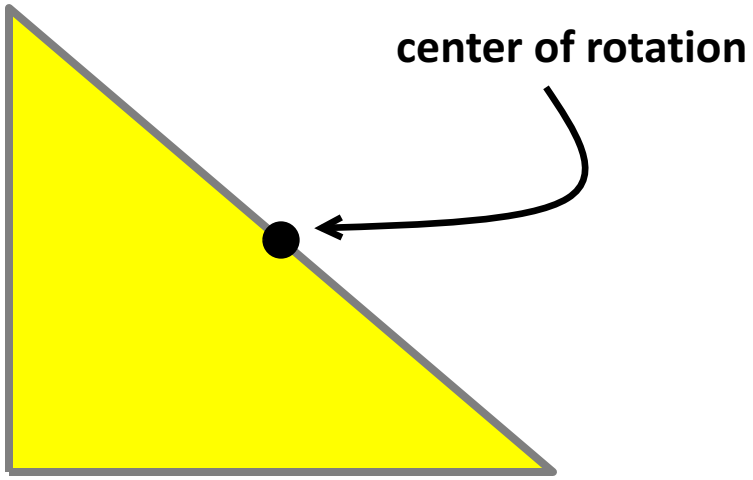
Basically, rotation means to spin a shape.

The point a figure turns around is called the **center of rotation**.

The center of rotation can be on or outside the shape.

ROTATION

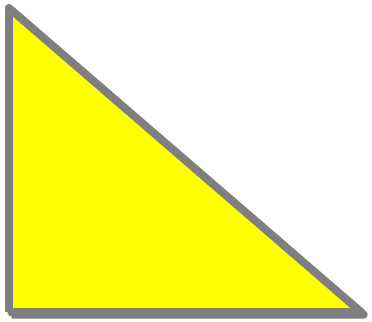
What does a rotation look like?



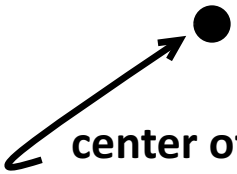
A ROTATION MEANS TO TURN A FIGURE

ROTATION

This is another [illegible]ooks



The triangle was rotated around the point.

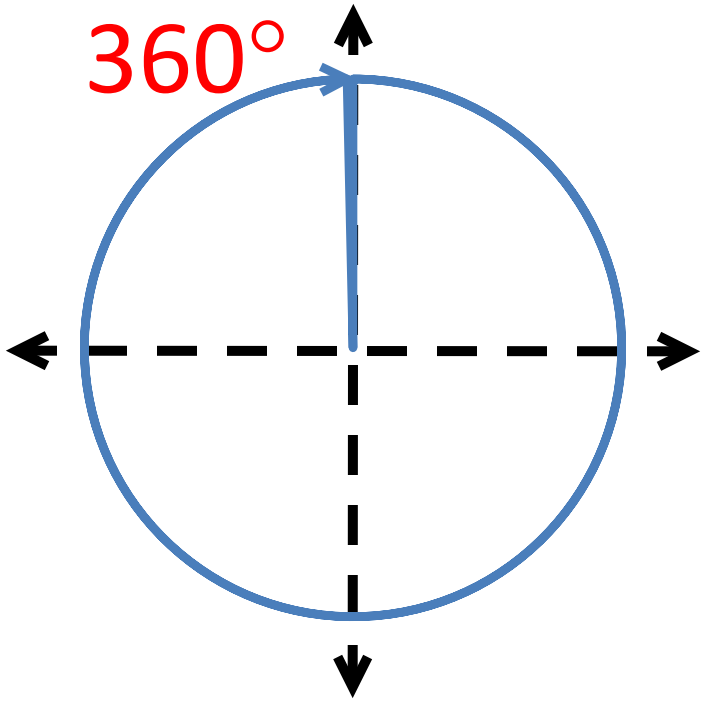


A ROTATION MEANS TO TURN A FIGURE

ROTATION

If a shape spins 360°, how far does it spin?

All the way around



This is called **one full turn**.

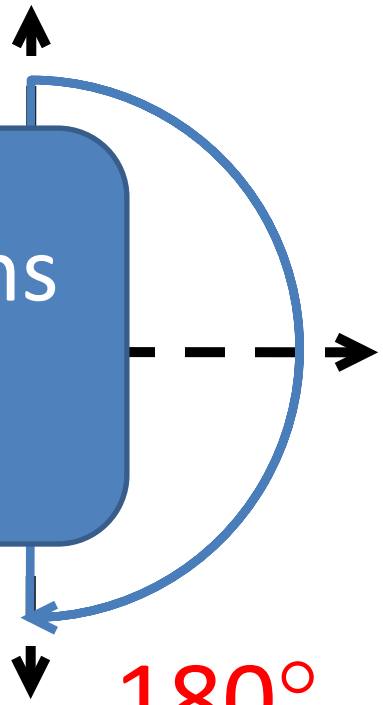
ROTATION

If a shape spins 180°, how far does

H

way around

Rotating a shape 180° turns a shape upside down.

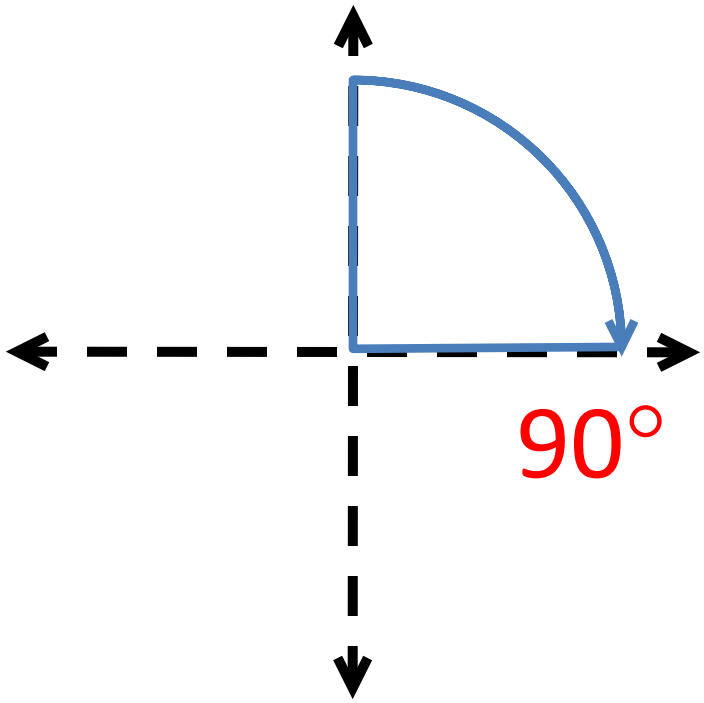


This is called a **½ turn**.

ROTATION

If a shape spins 90°, how far does it spin?

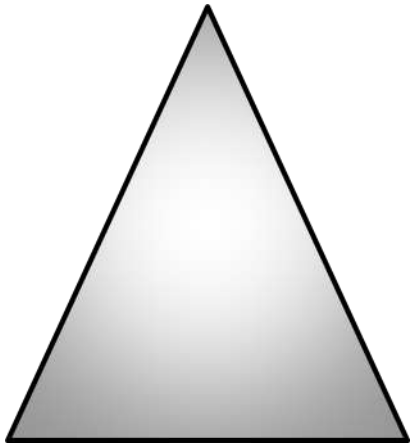
One-quarter of the way around



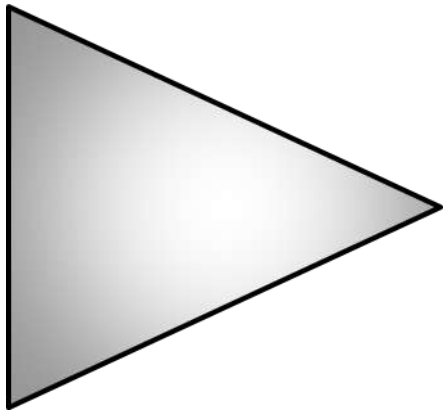
This is called a **¼ turn**.

ROTATION

Describe how the triangle A was transformed to make triangle B



A

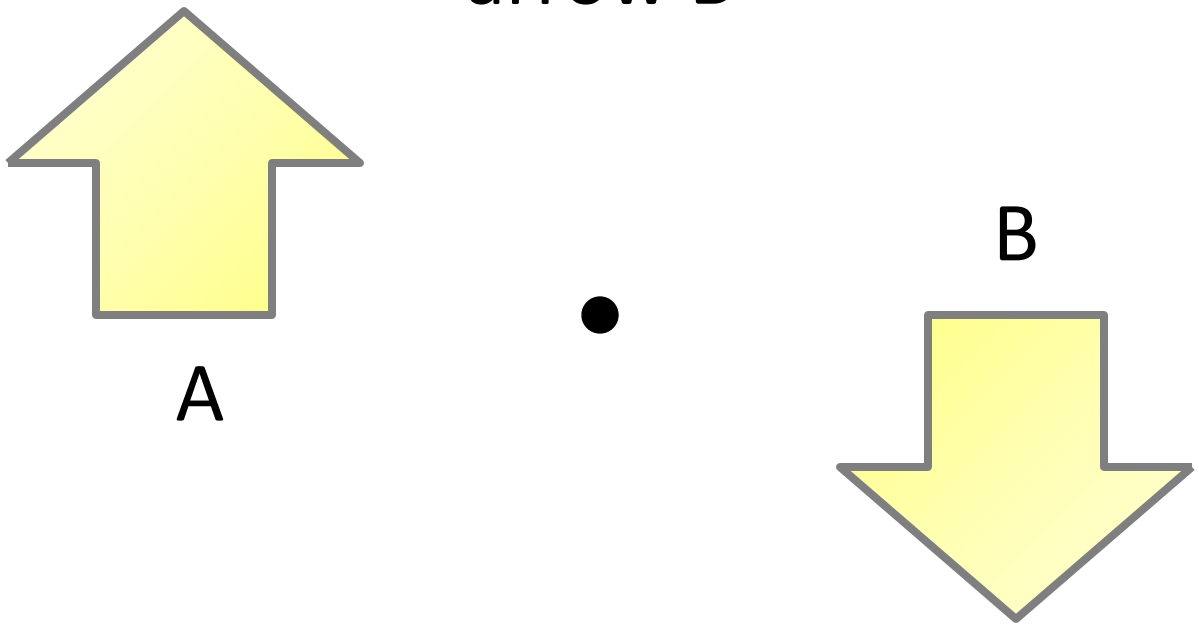


B

Triangle A was **rotated** right 90°

ROTATION

Describe how the arrow A was transformed to make arrow B



Arrow A was **rotated** right 180°

ROTATION

When some shapes are rotated they create a special situation called **rotational symmetry**.

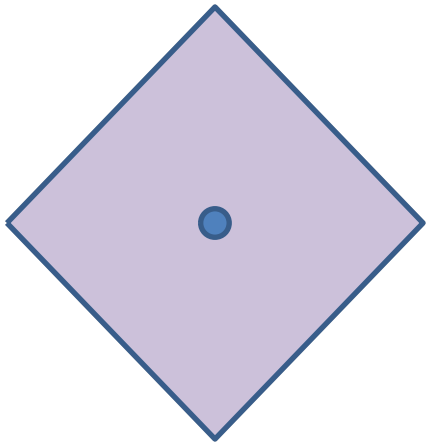
to spin a shape

the exact same

ROTATIONAL SYMMETRY

A shape has rotational symmetry if, after you rotate less than one full turn, it is the same as the original shape.

Here is an example…



90°

As this shape is rotated 360°, is it ever the same before the shape returns to its original direction?

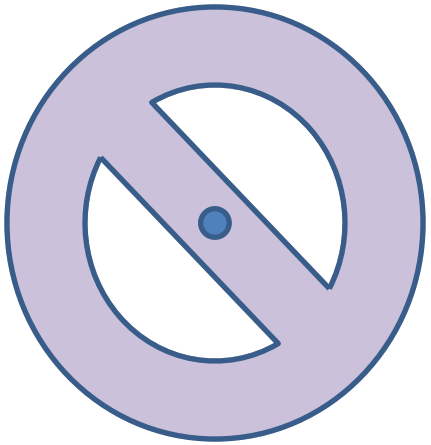
Yes, when it is rotated 90° it is the same as it was in the beginning.

So this shape is said to have **rotational symmetry**.

ROTATIONAL SYMMETRY

A shape has rotational symmetry if, after you rotate less than one full turn, it is the same as the original shape.

Here is another example…



180°

As this shape is rotated 360°, is it ever the same before the shape returns to its original direction?

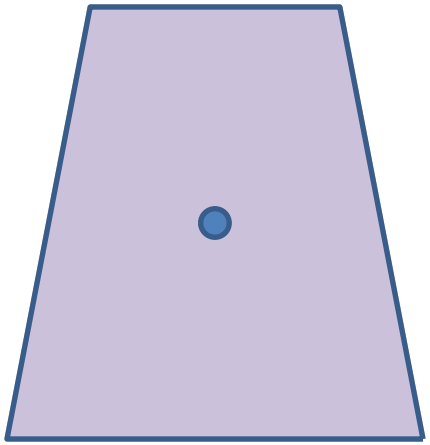
Yes, when it is rotated 180° it is the same as it was in the beginning.

So this shape is said to have **rotational symmetry**.

ROTATIONAL SYMMETRY

A shape has rotational symmetry if, after you rotate less than one full turn, it is the same as the original shape.

Here is another example…



As this shape is rotated 360°, is it ever the same before the shape returns to its original direction?

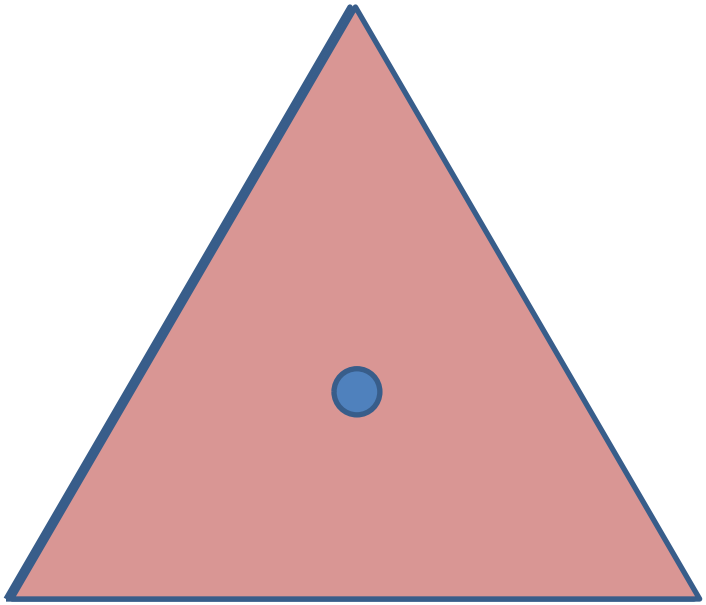
No, when it is rotated 360° it is never the same.

So this shape does NOT have **rotational symmetry**.

ROTATION SYMMETRY

Does this shape have rotational symmetry?

Yes, when the shape is rotated 120° it is the same. Since 120 ° is less than 360°, this shape HAS rotational symmetry

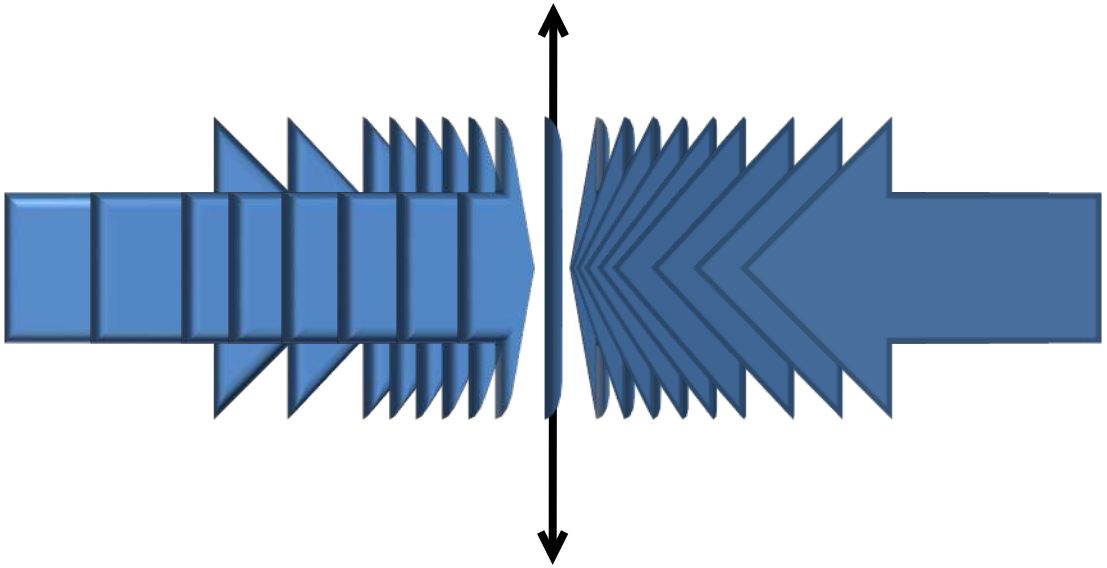


120°


REFLECTION

REFLECTION

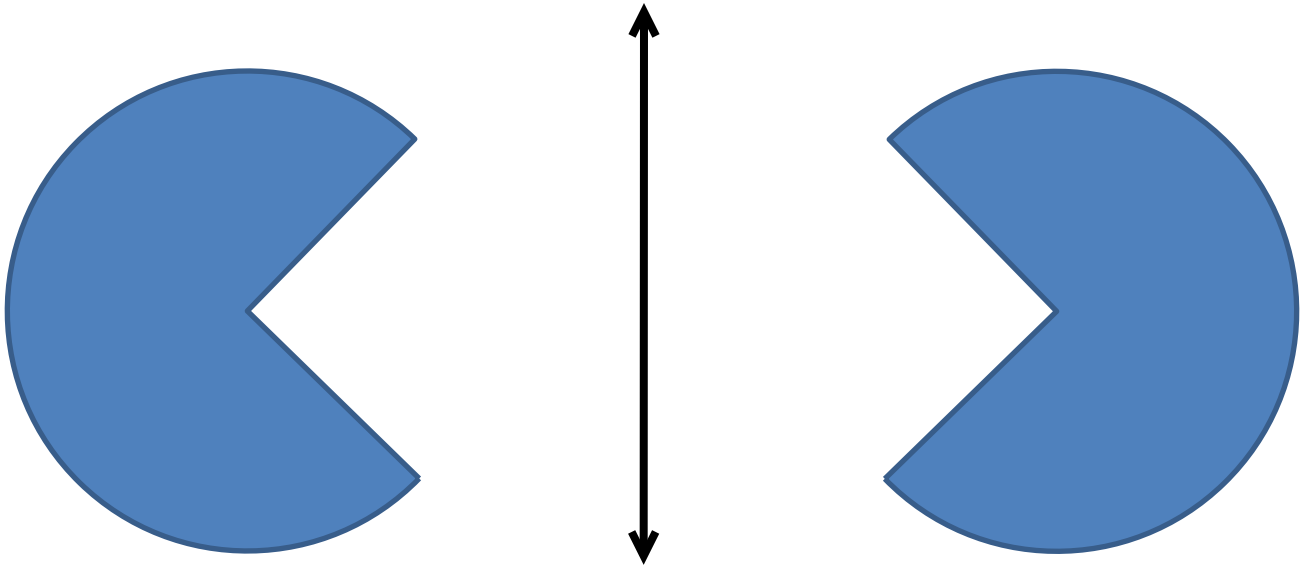
A **reflection** is a transformation that *flips* a figure across a line.



A REFLECTION IS FLIPPED OVER A LINE.

After e a
mirro

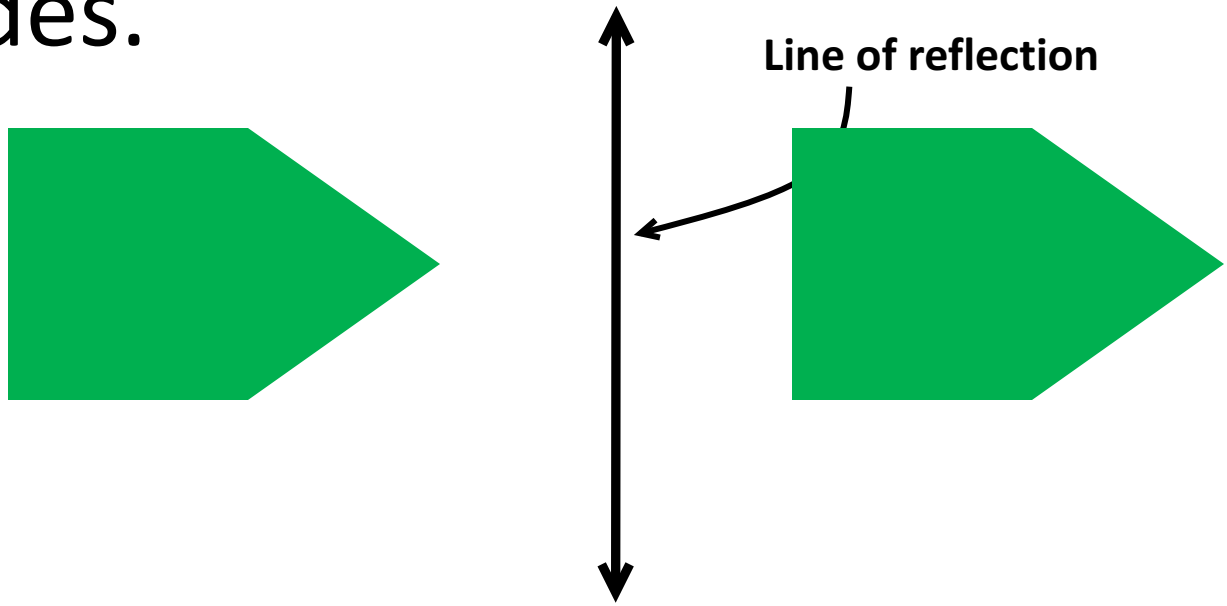
Remember, it is the same, but it is backwards



A REFLECTION IS FLIPPED OVER A LINE.

REFLECTION

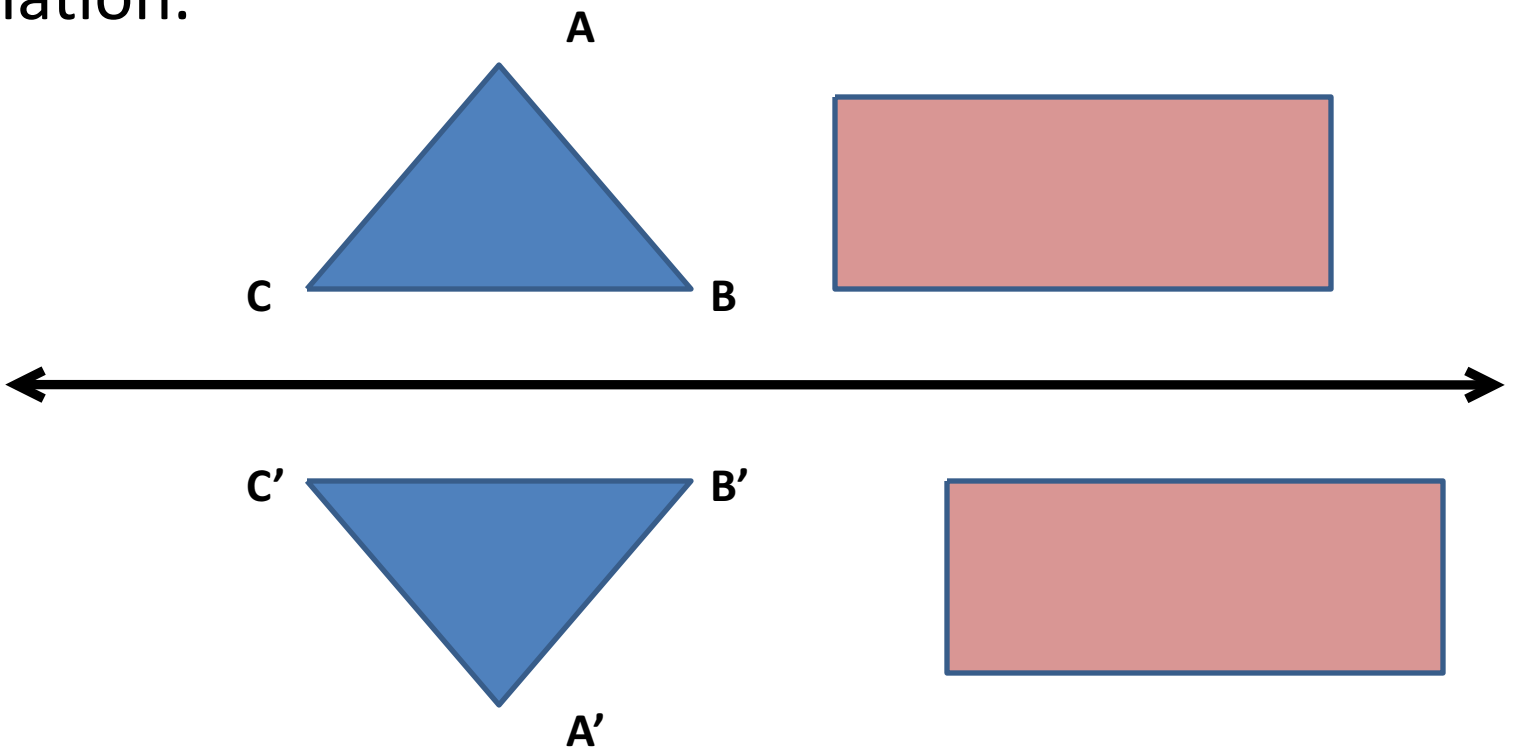
Notice, the reflection is exactly the same shape but facing the opposite direction on both sides.



A REFLECTION IS FLIPPED OVER A LINE.

REFLECTION

Determine if each set of figures shows a reflection or a translation.



A REFLECTION IS FLIPPED OVER A LINE.

REFLECTION

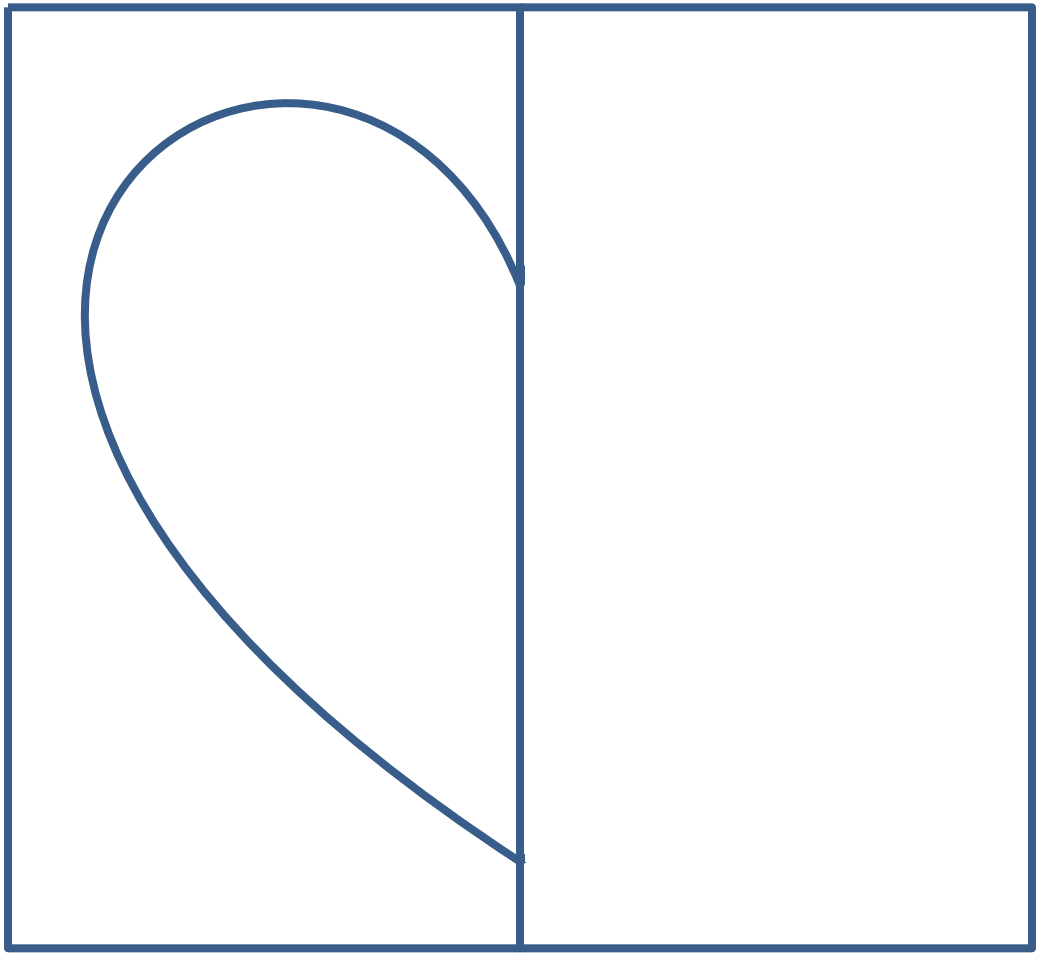
Sometimes, a figure has **reflectional symmetry**.

This means that it can be folded along a line of reflection within itself so that the two halves of the figure match exactly, point by point.

Basically, if you can fold a shape in half and it matches up exactly, it has **reflectional symmetry.**

REFLECTIONAL SYMMETRY

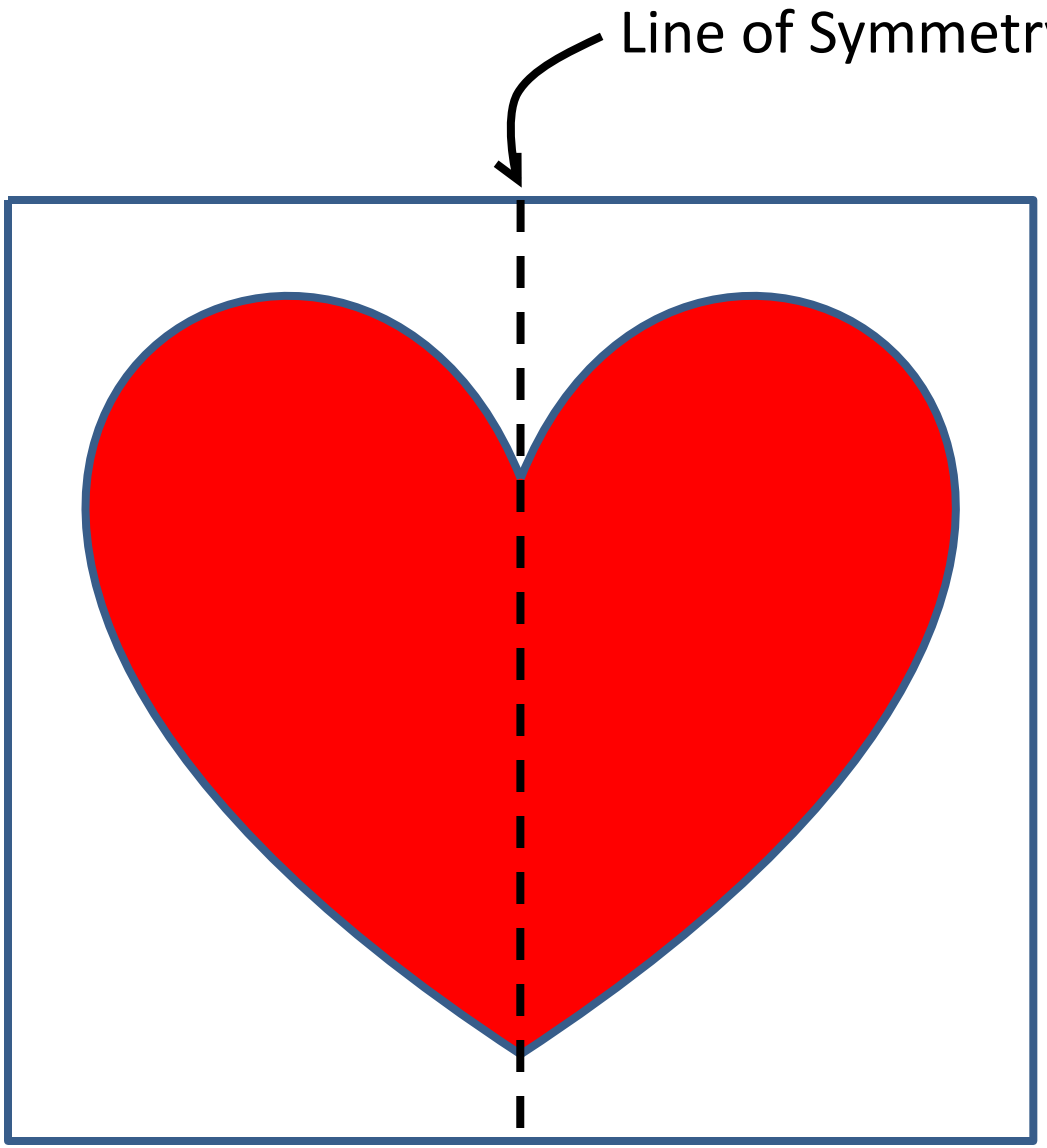
An easy way to understand reflectional symmetry is to think about folding.



What happens when you fold the piece of paper?

What happens when you fold the piece of paper, drawing half of a heart, and then cutting it out?

REFLECTIONAL SYMMETRY



Reflectional Symmetry

The line of reflection means that a shape in a figure with reflectional symmetry is called a **line of symmetry**.

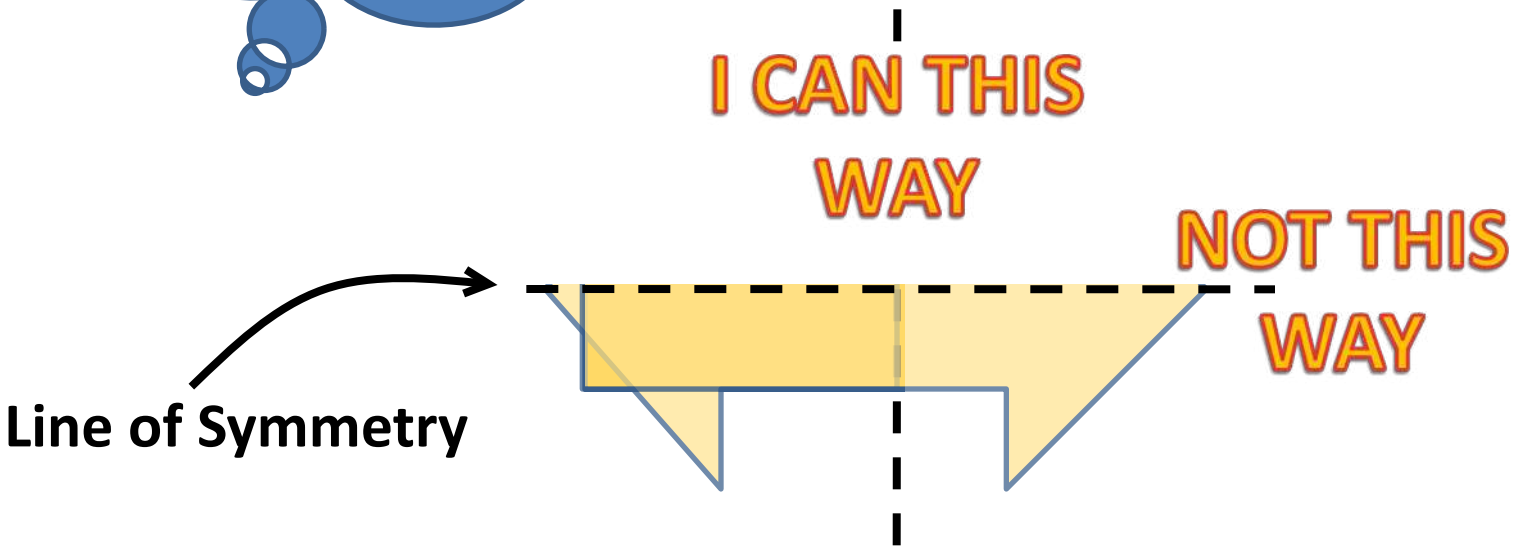
REFLECTIONAL SYMMETRY

The line created by the fold is the line of symmetry.

A shape can have more than one line of symmetry.

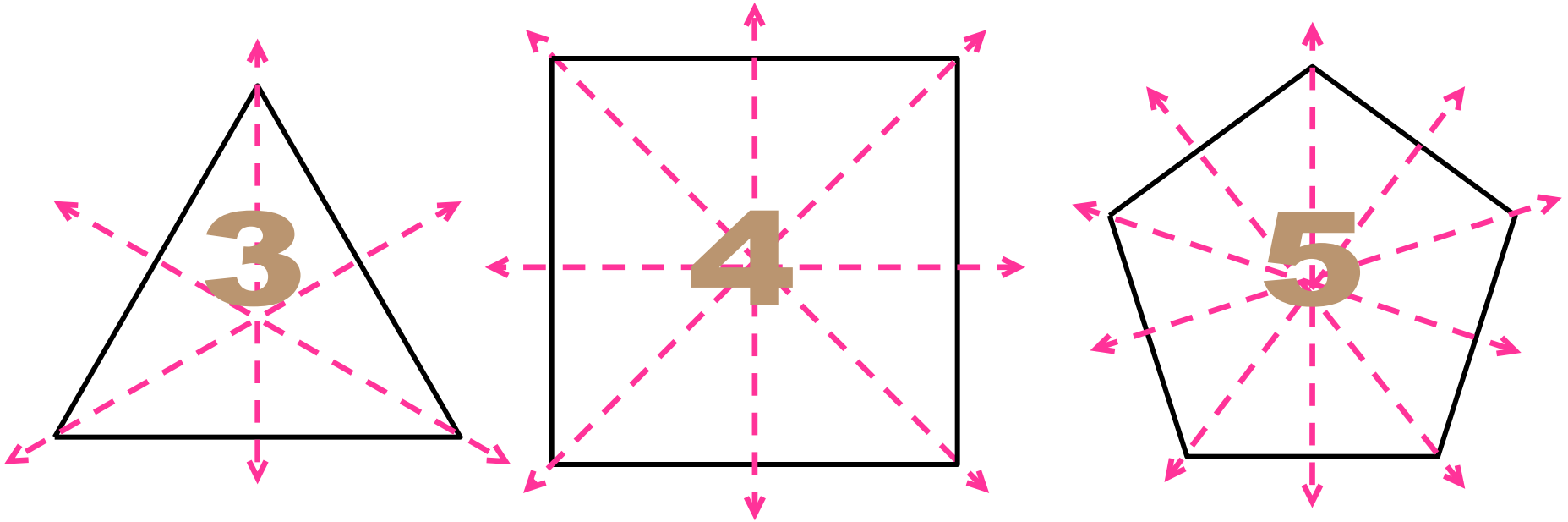
How many lines of symmetry for this shape?

How can I fold this shape so that it matches exactly?



REFLECTIONAL SYMMETRY

How many lines of symmetry does each shape have?

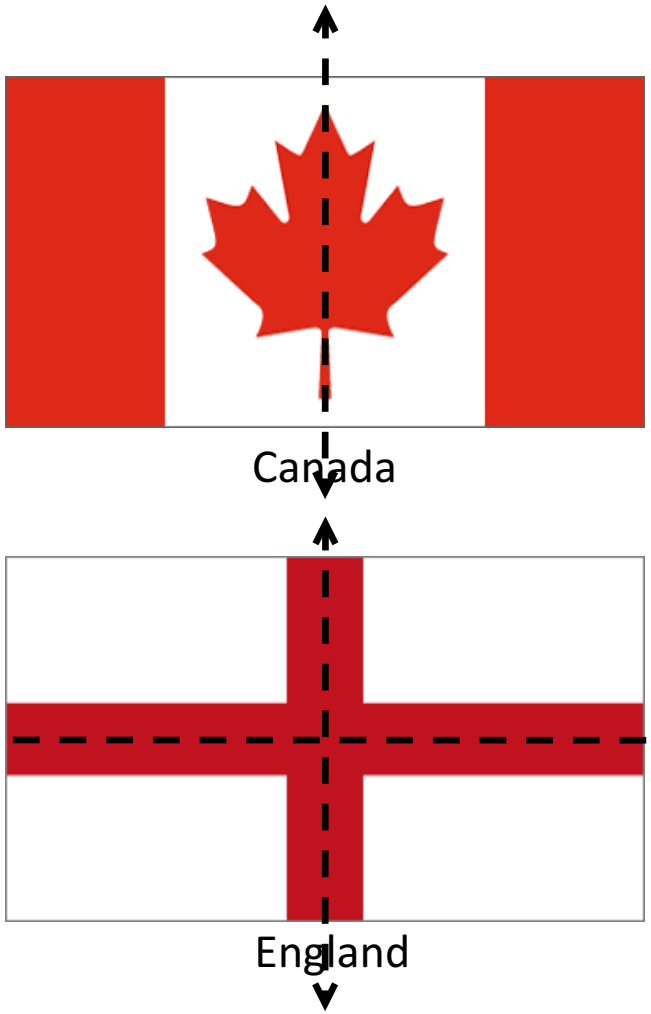


Do you see a pattern?

REFLECTIONAL SYMMETRY

Which of these flags have reflectional symmetry?

United States of America



Canada

England

Mexico

CONCLUSION

We just discussed three types of transformations.

See if you can match the action with the appropriate transformation.

FLIP ⟶ REFLECTION

SLIDE ⟶ TRANSLATION

TURN ⟶ ROTATION

Translation, Rotation, and Reflection all change the position of a shape, while the size remains the same.

The fourth transformation that we are going to discuss is called **dilation**.

DILATION

Dilation changes the size of the shape without changing the shape.

When you go to the eye doctor, they dilate you eyes. Let's try it by turning off the lights.

When you enlarge a photograph or use a copy machine to reduce a map, you are making dilations.

DILATION

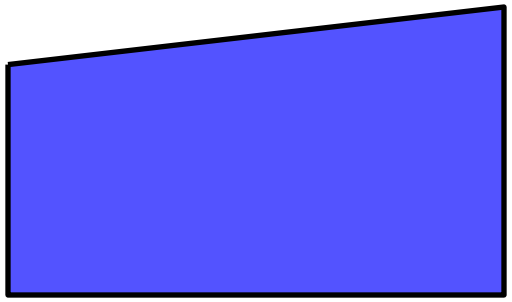
Enlarge means to make a shape bigger.

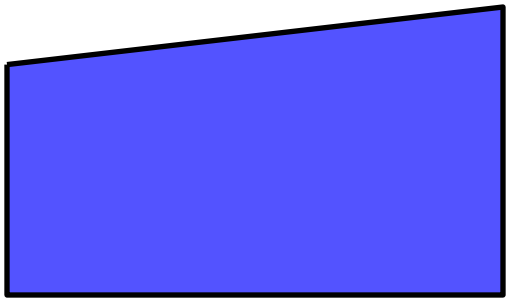
Reduce means to make a shape smaller.

The **scale factor** tells you how much something is enlarged or reduced.

DILATION

Notice each time the shape transforms the shape stays the same and only the size changes.



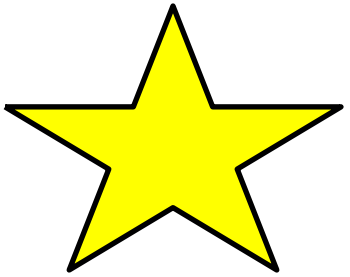


25000%

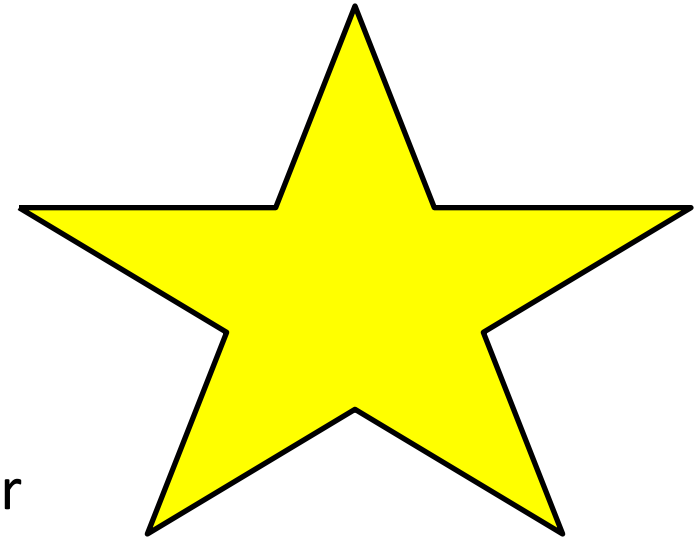
ERNEIDAURGEE

DILATION

Look at the pictures below



Dilate the image with a scale factor of 75%



Dilate the image with a scale factor of 150%

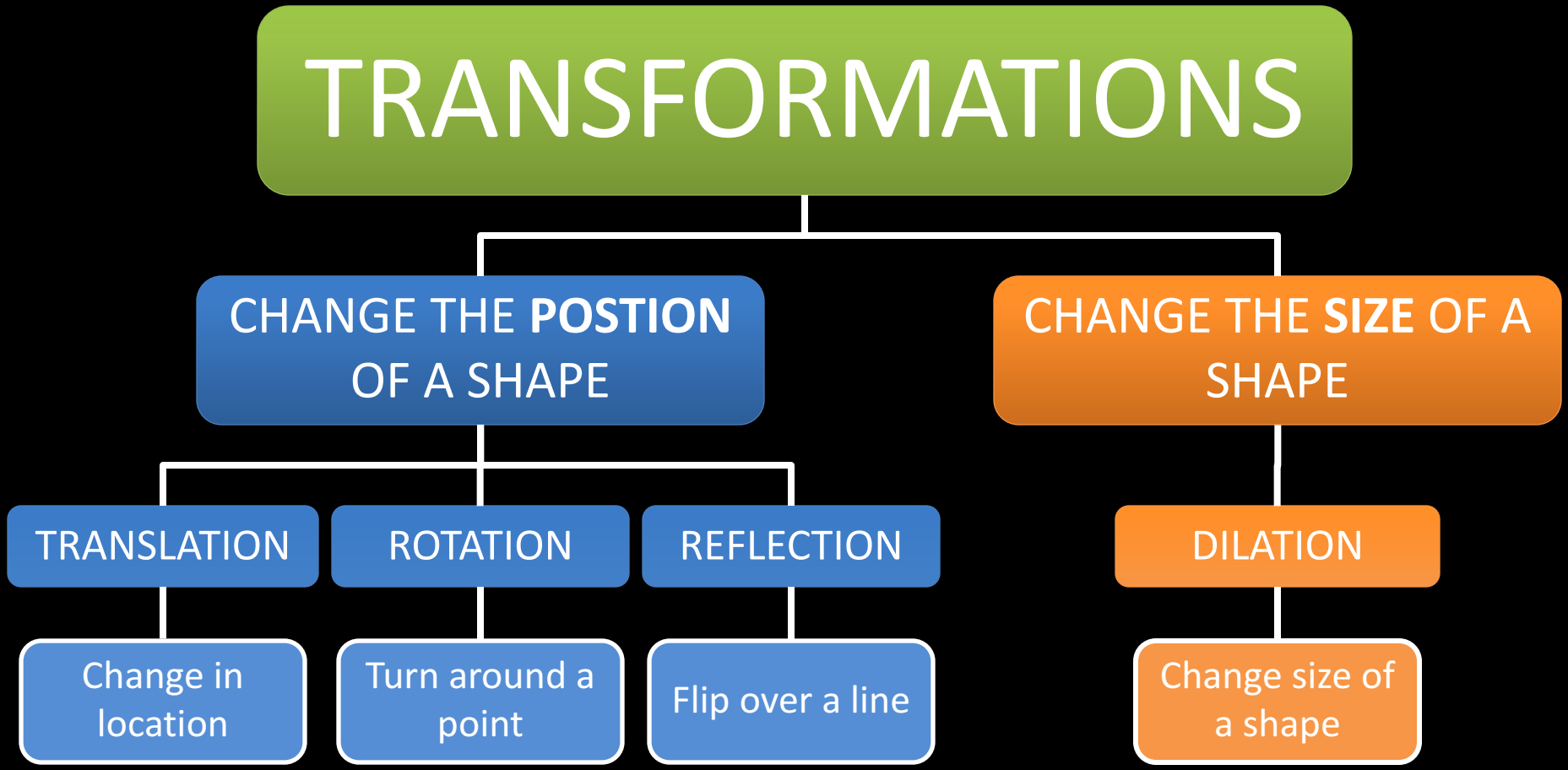
DILATION

Look at the pictures below

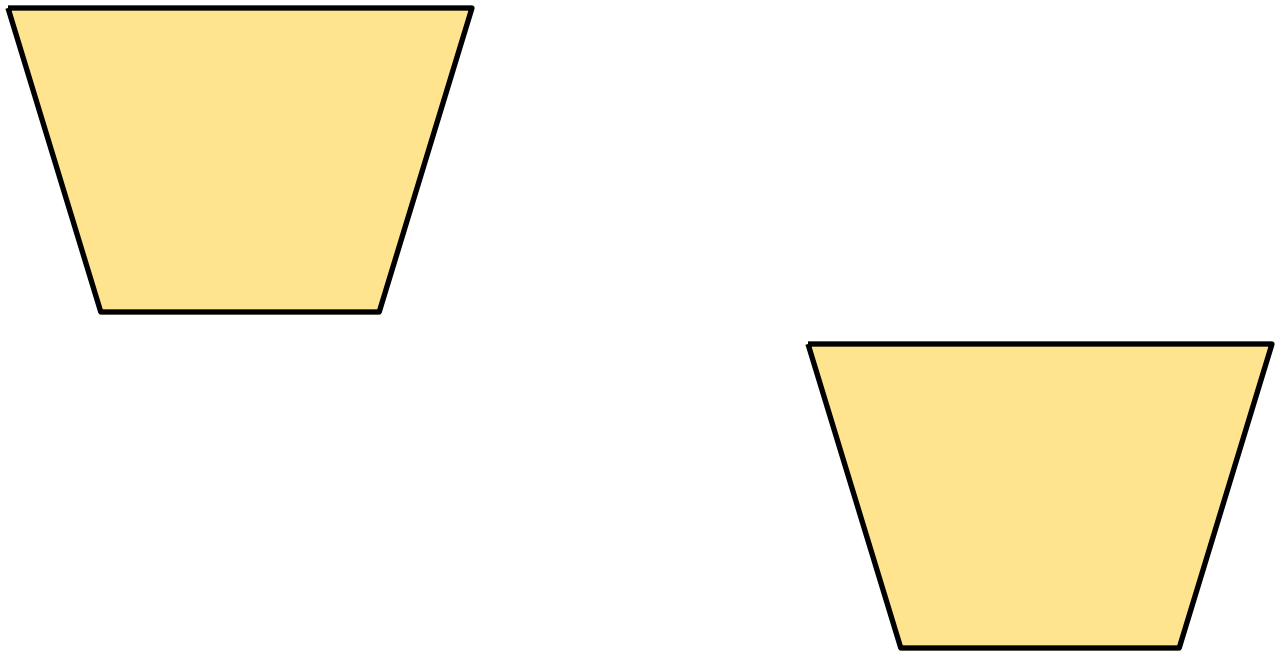
Dilate the image with a scale factor of 100%

Why is a dilation of 75% smaller, a dilation of 150% bigger, and a dilation of 100% the same?

Lets try to make sense of all of this

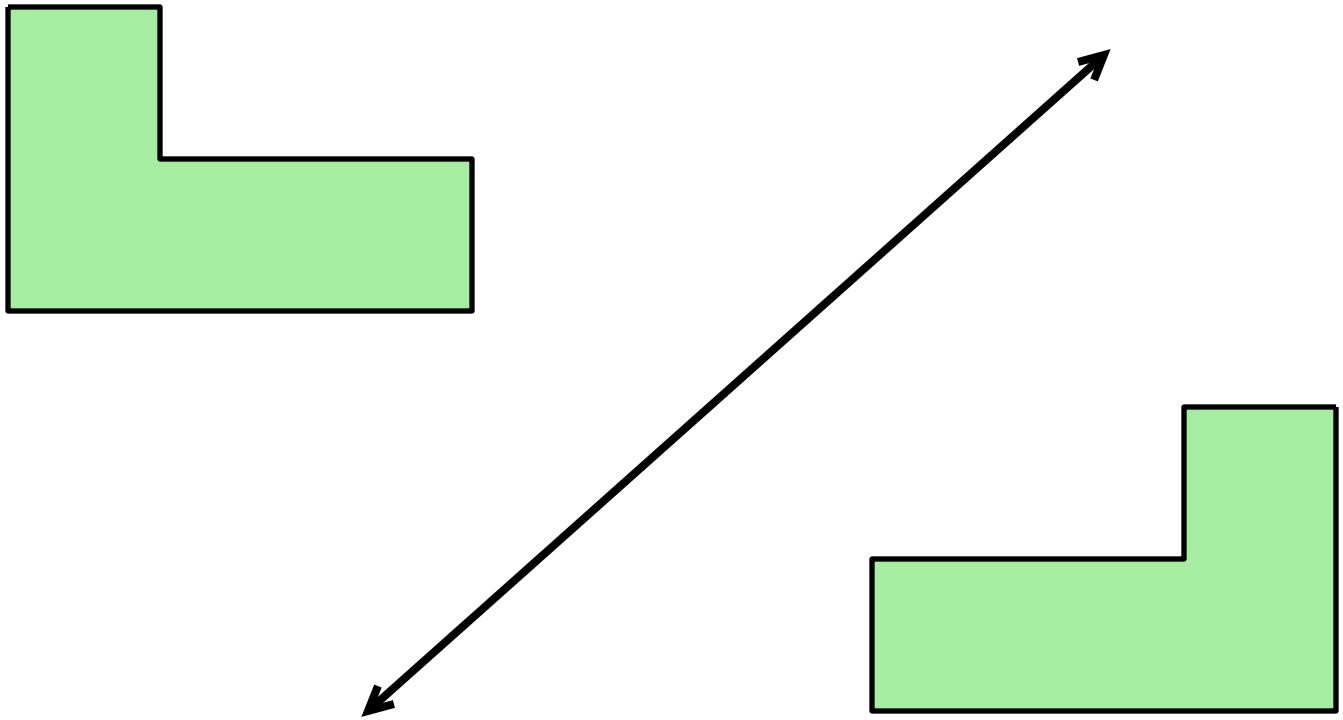


See if you can identify the transformation that created the new shapes



TRANSLATION

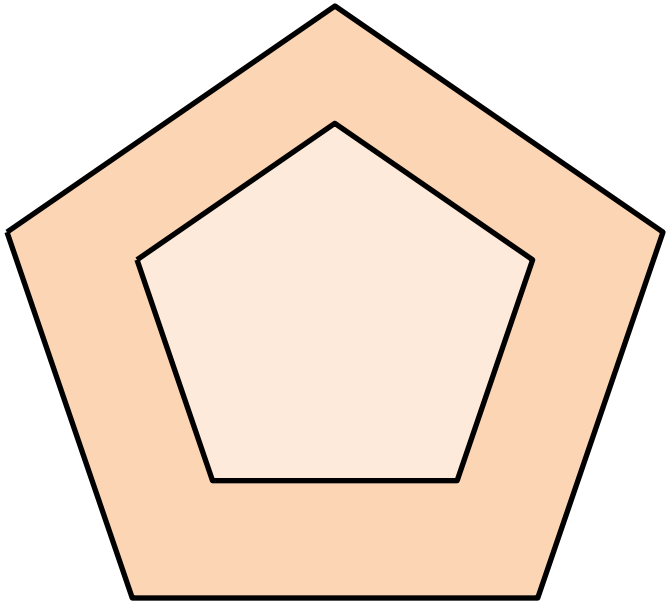
See if you can identify the transformation that created the new shapes



Where is the line of reflection?

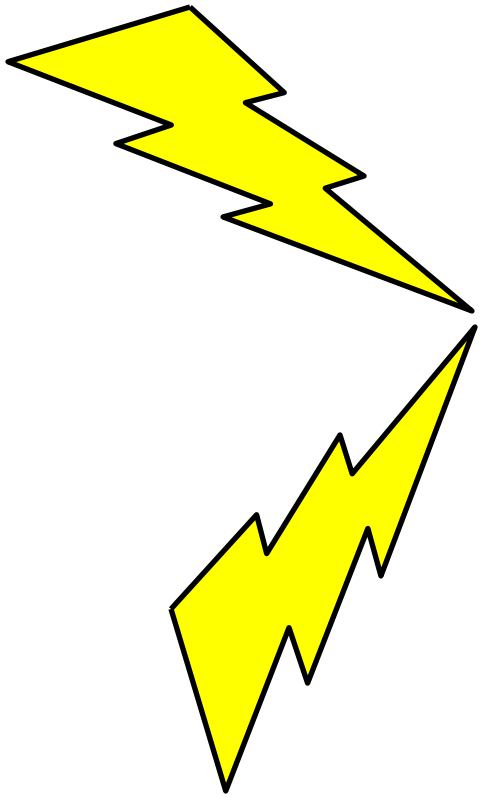
REFLECTION

See if you can identify the transformation that created the new shapes



DILATION

See if you can identify the transformation that created the new shapes



ROTATION

See if you can identify the transformation in these pictures?

REFLECTION

See if you can identify the transformation in these pictures?

ROTATION

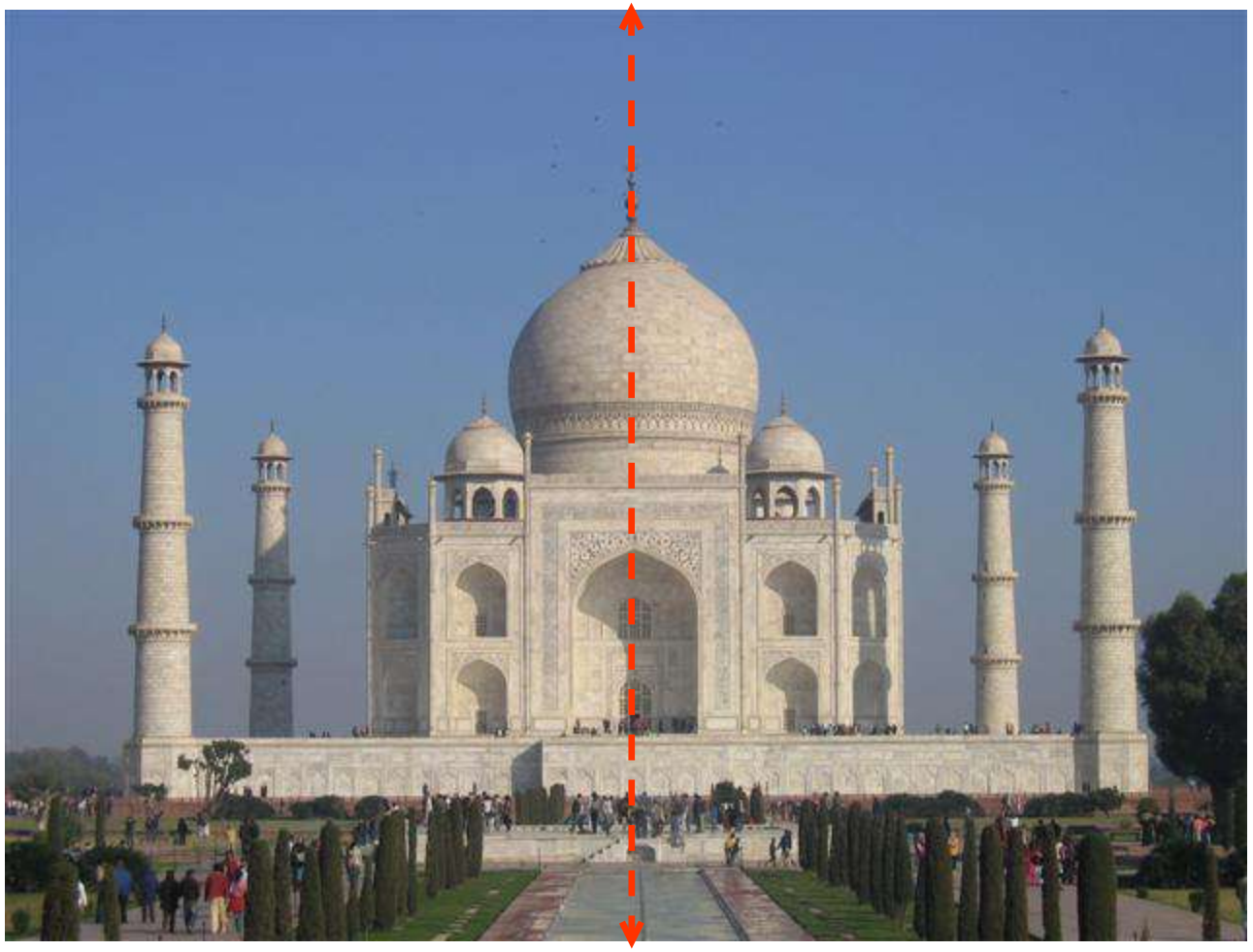
See if you can identify the transformation in these pictures?

TRANSLATION

See if you can identify the transformation in these pictures?

DILATION

See if you can identify the transformation in these pictures?



REFLECTION