

PATTERNS IN GEOMETRY

Patterns in geometry refer to shapes and their measures.

- Shapes can be **congruent** to one another. Shapes can also be manipulated to form similar shapes.
- **Transformations** are operations that are performed on shapes that move a shape to a different location. The types of transformations are reflection, rotation, dilation and translation.
 - With a **reflection**, a figure is reflected, or flipped, in a line so that the new figure is a mirror image on the other side of the line.
 - A **rotation** rotates, or turns, a shape to make a new figure.

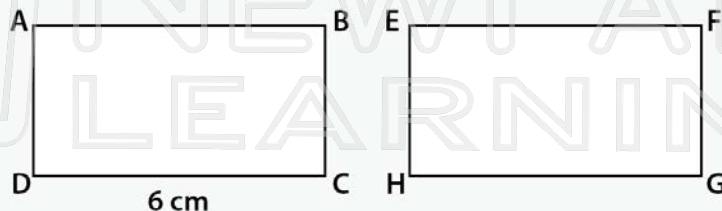


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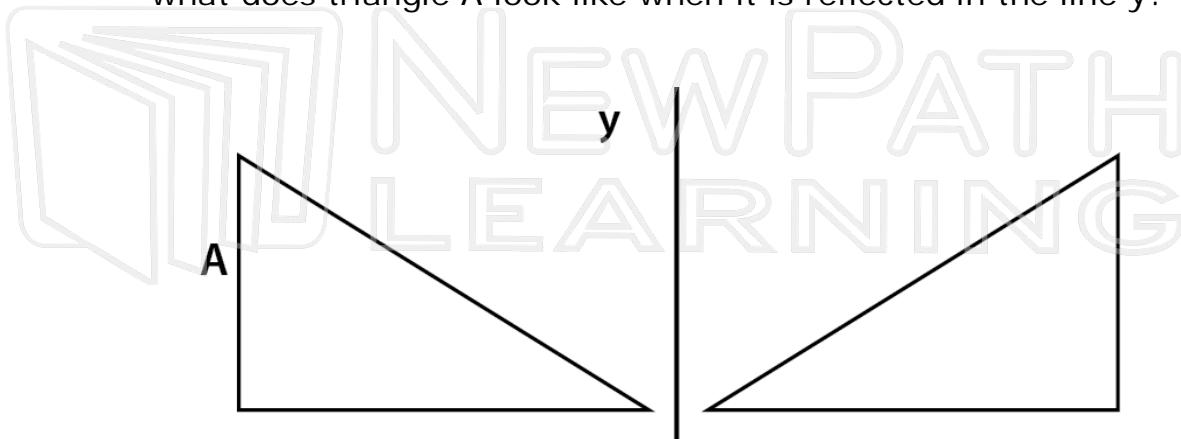
Patterns in geometry are useful in many ways.

- **Congruent** figures have the same size and shape. If one shape is congruent to another, all the sides and angles will be equal. For example, what is the length of side GH if the rectangles are congruent?



Since the rectangles are congruent, the sides are equal, $GH = 6$ cm.

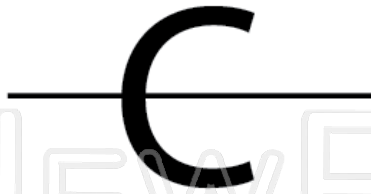
- Transformations also use patterns in geometry. A **reflection** of a shape in a line reflects, or flips the shape so that the new figure is a mirror image of the shape on the other side of the line. For example, what does triangle A look like when it is reflected in the line y ?




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- A **translation** moves or shifts a shape based on a rule. The rule applies to the x and y coordinates of the shape. For example, if a shape is translated $x, y \rightarrow (x + 4, y - 2)$ that means that the x coordinate is increased by 4 and the y coordinate is decreased by 2. When this is done for each coordinate of a shape, a new figure is produced in a new location.
- **Lines of symmetry** break a shape into two pieces that are mirror images. Lines of symmetry can be vertical, horizontal, diagonal or any way that breaks a shape into two mirror images. Lines of symmetry can also be used for letters or words. For example, what kind of symmetry does the letter C have?



The letter C has horizontal line symmetry because when a horizontal line crosses it, it is broken into two pieces that are mirror images. Rotational symmetry is when a figure is congruent to itself after being rotated 180° or less.

- **Tessellations** are made with the transformations of reflection, rotation and translation. The figure below is an example of a



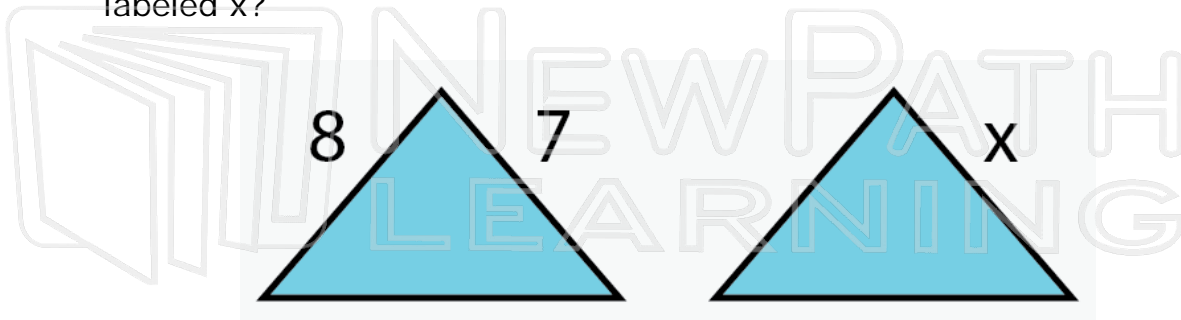
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Try This!

1. The two triangles shown are **congruent**. What is measure of the side labeled x ?



2. V

3. H

4. V



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$(-1), (6, 8)$, after a **translation** of $(x, y) \rightarrow (x - 4, y - 3)$?

