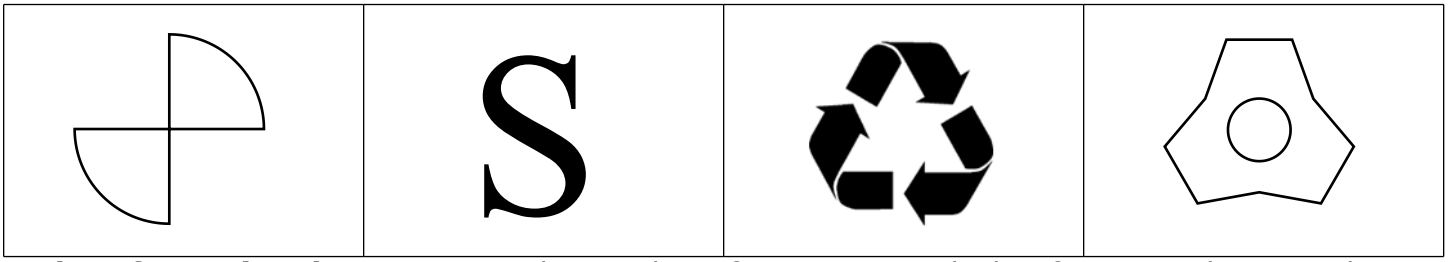
Name:_____ Date:_____ Period:_____ Score:_____

Rotational Symmetry

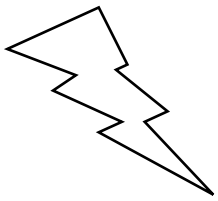
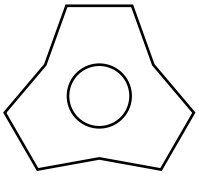
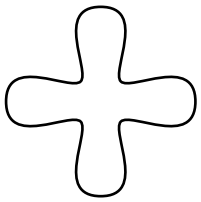
Symmetry: Symmetry is the property of a shape that allows it to be carried onto itself either by by reflection, or rotation.

The second kind of symmetry is called rotational symmetry. Rotational symmetry occurs when a figure can be carried onto itself by turning it around a center point. Here are some examples…

Rotational Symmetry: A figure in the plane has rotational symmetry if and only if the figure can be mapped onto itself by a rotation about a point through any angle between 0° and 360°.

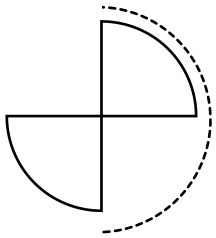
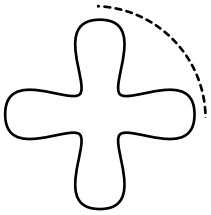
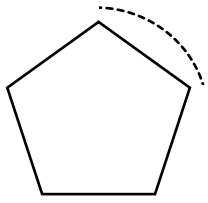


Order of Rotational Symmetry: The number of positions in which a figure can be carried onto itself is called the order of rotational symmetry (or simply rotation order).

order 1	order 2	order 3	order 4
 (No rotational symmetry)			

As you can see a rotational order of 1 actually means the figure has no rotational symmetry. This is because in order to carry the figure onto itself you must rotate it 360°, and because 360° is not BETWEEN 0° and 360° the figure does not have rotational symmetry. That makes sense visually because the shape of the lightning bolt can only appear as it does above in one and only one position.

Angle of rotation symmetry. Another way to describe rotational symmetry is by determining the angle of rotation symmetry. In other words, how many degrees (or radians) around the circle you have to rotate a figure so that it is carried onto itself.

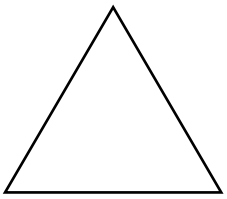
180º rotation	90º rotation	120º rotation	72º rotation
			

You will explore the relationship between rotational order, and the angle of rotational symmetry necessary to carry a figure onto itself as you practice.

Name:_____ Date:_____ Period:_____ Score:_____

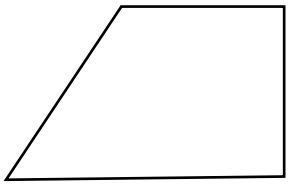
Directions: For each of the figures below, decide if the figure has rotational symmetry by circling yes or no.

1



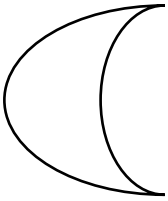
Yes NO

2



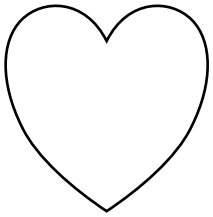
Yes NO

3



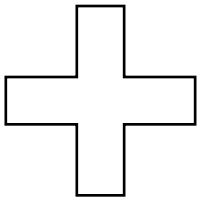
Yes NO

4



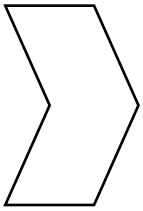
Yes NO

5



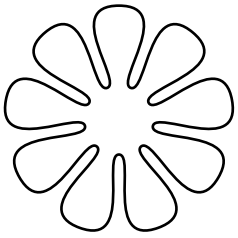
Yes NO

6



Yes NO

7



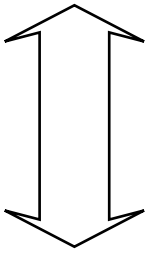
Yes NO

8

Yes NO

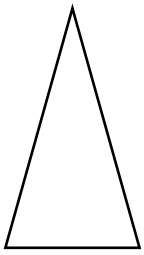
Directions: for each of the figures below write the order of rotational symmetry. If the figure has no rotational symmetry write "no rotational symmetry" next to the figure.

9



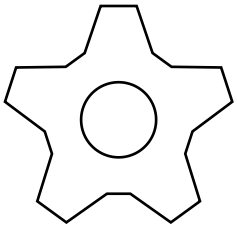
Order: _____

10



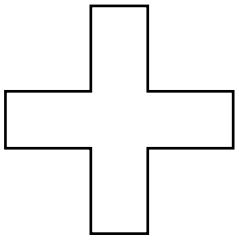
Order: _____

11



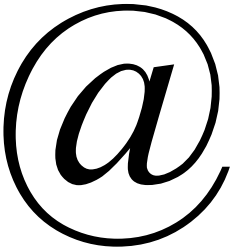
Order: _____

12



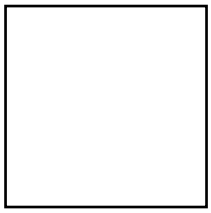
Order: _____

13



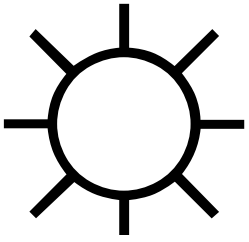
Order: _____

14



Order: _____

15

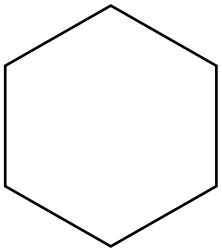


Order: _____

16

Order: _____

17

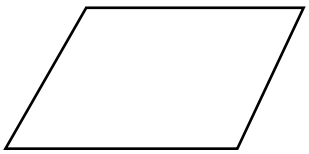


Order: _____

18

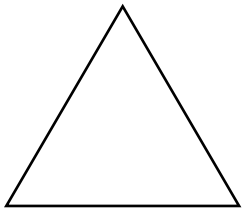
Order: _____

19



Order: _____

20

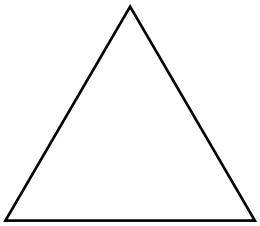


Order: _____

Name:_____ Date:_____ Period:_____ Score:_____

Directions: For each regular polygon, record the number of sides the polygon has, and the rotational order of the polygon.

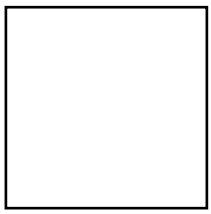
1 equilateral triangle



Sides:_____

Rotation Order: _____

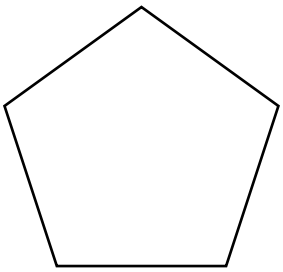
2 square



Sides:_____

Rotation Order: _____

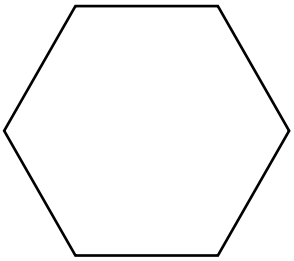
3 regular pentagon



Sides:_____

Rotation Order: _____

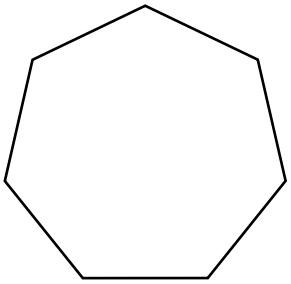
4 regular hexagon



Sides:_____

Rotation Order: _____

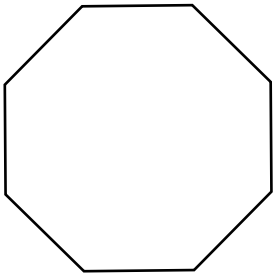
5 regular heptagon



Sides:_____

Rotation Order: _____

6 regular octagon

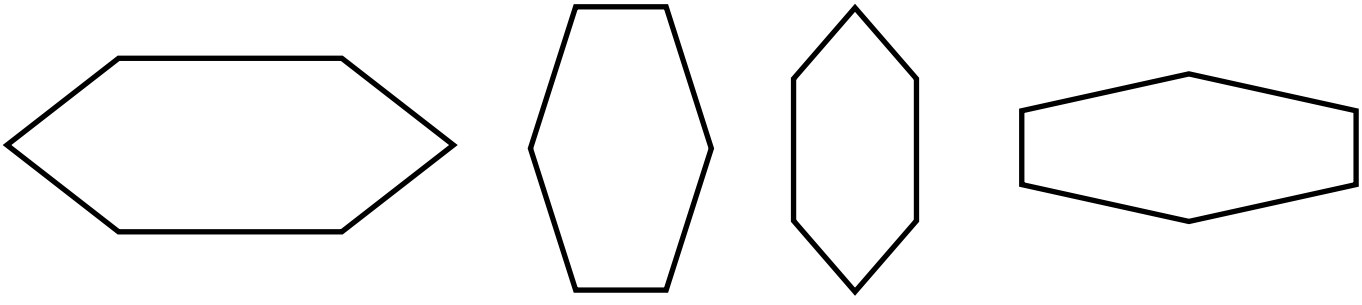


Sides:_____

Rotation Order: _____

7. What is the relationship between the number of sides of a regular polygon and its rotational order?

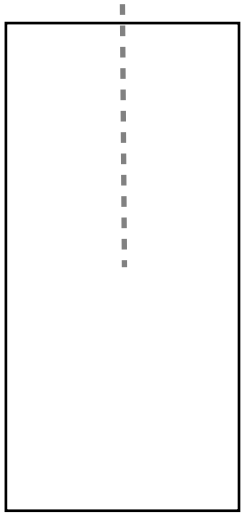
8. A regular hexagon has a rotational order of 6. Draw a hexagon that has a rotational order of only 2 in the space below.



Name:_____ Date:_____ Period:_____ Score:_____

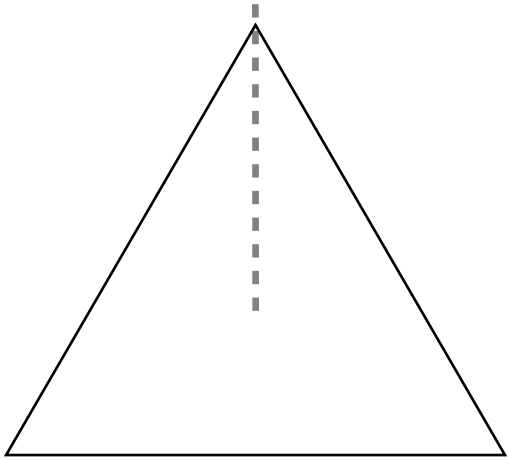
Directions: Trace each figure below and the dotted line onto patty paper or tracing paper. Then rotate the figure so that it is carried onto itself. Measure the angle of rotation by measuring the angle between the dotted line and the traced dotted line with a protractor. (Depending on the size of your protractor you may need to extend the dotted lines.) Record the rotation angle and the rotation order of the shape.

1



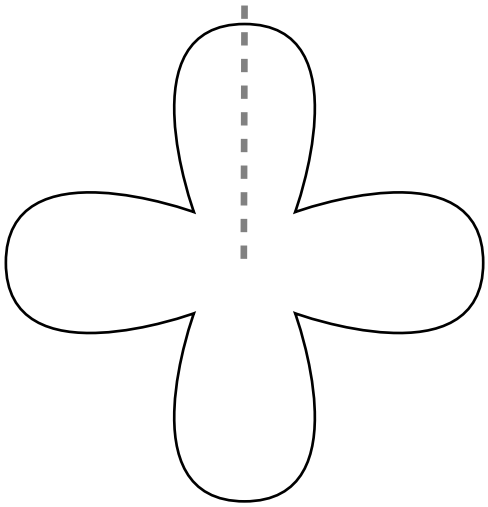
Rotational Order: _____ Degrees: _____

2



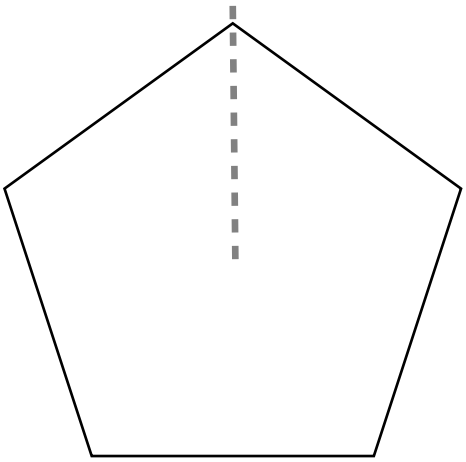
Rotational Order: _____ Degrees: _____

3



Rotational Order: _____ Degrees: _____

4



Rotational Order: _____ Degrees: _____

5. For each of the figures above, divide the rotational order into 360° (Rotational Order / 360°). What do you notice?

Name:_____ Date:_____ Period:_____ Score:_____

6. A figure has a rotational order of 6. What is the minimum number of degrees the figure must be rotated to map it on top of itself? How did you figure it out?

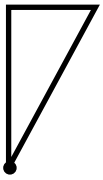
7. A figure has a rotational order of 11. What is the minimum number of degrees the figure must be rotated to map it on top of itself?

Directions: Each figure below has rotational symmetry and a center point of rotation but is incomplete. Using patty paper or tracing paper, draw the rest of the figure so that it has the indicated rotational order.

8 Order 2

9 Order 4

10 Order 3



11 Order 6

7 Draw a figure that has a rotational order of 2.

7 Draw a figure that has a rotational order of 3.