Girls Get Curves

Solution Guide for Chapter 7

Here are the solutions for the "Doing the Math" exercises in *Girls Get Curves*!

DTM from p. 114-115

2. Draw the congruent shape resulting from reflecting the G over the indicated line: 

We just imagine that the dotted line is a mirror – how would the reflection look? A little something like this!

Answer: 

3. Draw the congruent shape resulting from rotating the letter L counterclockwise 90° about its center point.

We just take the letter L and imagine putting it on the center of a bicycle wheel, and then rotating that wheel 90 counterclockwise (so the top of the letter goes to the left).

Answer: 

4. Name 5 capital letters that have **reflectional symmetry across a vertical line**.
For a shape to have reflectional symmetry across a vertical line, that means we could draw a vertical line (up and down) through its center, and it would look identical on either side of the dotted line! Those letters are: A, H, I, M, O, T, U, V, W, X, and Y.

Answer: Any 5 of these: A, H, I, M, O, T, U, V, W, X, Y

5. Name 5 capital letters that have **reflectional symmetry across a horizontal line**.
Well, for a shape to have reflectional symmetry across a horizontal line, that means we could draw a horizontal line (side to side) through its center, and it would look identical above and below the dotted line! Those letters are: B, C, D, E, H, I, K, O, X

Answer: Any 5 of these: B, C, D, E, H, I, K, O, X

6. Name 5 capital letters that have **rotational symmetry**.
Well, for a shape to have rotational symmetry, that means we could put its center at the center of a bicycle wheel, rotate the wheel some amount LESS than 360, and the shape would appear to be in the same exact position is was in before. For example, putting "N" at the center of bicycle wheel and rotating it 180 degrees results in the N looking just like it did before (if the "N" is in a font that doesn't have little serifs on it, of course!).

Answer: Any 5 of these: H, I, N, O, S, X, Z

7. Name 2 capital letters that have **rotational symmetry but not reflectional symmetry**.

Okay, we can just look at the above list and see which ones we could NOT put a vertical or horizontal line through and see reflectional symmetry. Hm. "H" and "I" have both vertical AND horizontal symmetry, as does "O" and "X." But N, S, and Z don't have reflectional symmetry at all! And they DO have rotational symmetry.

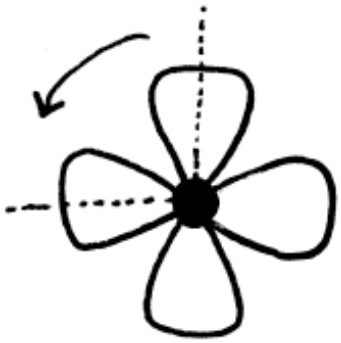
Answer: Any 2 of these: N, S, Z

8. *Some letters look the same when facing a mirror. What kind of symmetry is this? Be specific: Name one of the bolded types of symmetry from the previous four questions.*

Well, if we're looking in a mirror, it's got to be reflectional symmetry of some kind. But is it across a vertical or horizontal line? Imagine holding your book up to a mirror. Which letters look the same? Well, "A" looks the same, but "B" looks backwards! (Try it). So it sure sounds like reflectional symmetry across a vertical line!

Answer: reflectional symmetry across a vertical line

9. Describe the rotational symmetry of a flower with 4 regular petals about its center point by listing the ways we can rotate this flower (in degrees) so that it matches up with the original shape. Only give positive answers less than or equal to 360°. *(Hint: See #1.)*

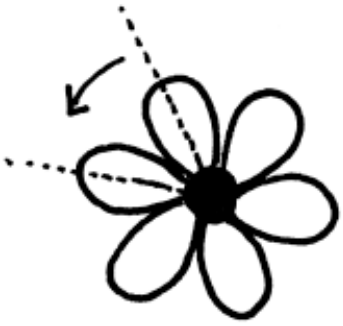


Let's put this flower at the center of a bicycle wheel! Notice that since it has 4 petals, if we rotate the flower $\frac{1}{4}$ of the way around, it matches up with the original shape. What's $\frac{1}{4}$ of 360°? That's just: $\frac{1}{4}\cdot 360° = \frac{360°}{4} = \mathbf{90°}$, of course! And then if we rotate it another 90°, it will line up again (that's a total of a 180° rotation). In fact, no matter how

many times we rotate this shape 90°, it will line up with the original. But for the answer, we just name the rotations less than or equal to 360°.

Answer: 90°, 180°, 270°, 360°

10. Describe the rotational symmetry of a flower with 6 regular petals about its center point by listing the ways we can rotate this flower (in degrees) so that it matches up with the original shape. Only give positive answers less than or equal to 360°.



This is just like the previous problem, but with 6 petals instead of 4. So if we put the center of the flower on a bicycle wheel, and rotate the wheel $\frac{1}{6}$ of the way around, the shape will line up perfectly with the original. And what's $\frac{1}{6}$ of 360°? We just do: $\frac{1}{6}\cdot 360° = \frac{360°}{6} = 60°$. So we could rotate it 60°, or 120°, or 180°, or 210°…we just keep adding 60°! See, any number of 60° rotations will all result in a flower with a matching position as the original. We'll list the rotations less than or equal to 360°.

Answer: 60°, 120°, 180°, 240°, 300°, 360°