NAME_____

Module 11 **Transformation of Shapes**
Lesson 2 **Rotations**

Challenge Problems 11.2

Set 1

1. A regular decagon is rotated about its center. Find all the angles of rotation for which the decagon will look like the original figure.

Set 2

1. Use the point (1, 4) to show that a rotation of 180° about the origin is the same as a reflection across the x-axis followed by a reflection across the y-axis.

Possible Answers

Set 1

1. A decagon has 10 sides and 10 angles, and 360° divided by 10 is 36°. The decagon rotates onto itself every 36° for a total of ten times to get back to its original position. The angles of rotation are 36°, 72°, 108°, 144°, 180°, 216°, 252°, 288°, 324°, and 360°.

Set 2

1. To reflect over the *x*-axis, take the opposite of the *y*-coordinate. To reflect over the *y*-axis, take the opposite of the *x*-coordinate. Both coordinates are the opposite of what they were originally, which is the motion rule for rotating a figure 180° about the origin.

$$\text{Reflect over } x\text{: } (a, b) \rightarrow (a, -b)$$
$$(1, 4) \rightarrow (1, -4)$$
$$\text{Reflect over } y\text{: } (a, b) \rightarrow (-a, b)$$
$$(1, -4) \rightarrow (-1, -4)$$
$$\text{Rotate } 180°\text{: } (1, 4) \rightarrow (-1, -4)$$