## Unit 6 Lesson 11: Perpendicular Lines in the Plane

### 1 Revisiting Transformations (Warm up)

#### Student Task Statement

The image shows quadrilateral $ABCD$.



Apply the transformation rule $\left(x,y\right)\rightarrow \left(-y,x\right)$ to quadrilateral $ABCD$. What is the effect of the transformation rule?

#### Activity Synthesis



### 2 Make a Conjecture

#### Student Task Statement

1. Complete the table with the slope of each segment from the warm-up.

| *
 | * original figure slope
 | * image slope
 | * product
 |
| --- | --- | --- | --- |
| * $AB$
 | *
 | *
 | *
 |
| * $BC$
 | *
 | *
 | *
 |
| * $CD$
 | *
 | *
 | *
 |
| * $DA$
 | *
 | *
 | *
 |

1. The image in the warm-up is a 90-degree rotation of the original figure, so each line in the original figure is perpendicular to the corresponding line in the image. Use your slope calculations to make a conjecture about slopes of perpendicular lines.

### 3 Prove It

#### Student Task Statement

Let’s prove our conjecture about slopes of perpendicular lines for the case where the lines pass through the origin.

1. Find the slope of a line passing through the point $\left(a,b\right)$ and the origin. Assume the line is not horizontal or vertical.
2. Suppose the line is rotated using the transformation rule $\left(x,y\right)\rightarrow \left(-y,x\right)$. Find the coordinates of the images of the points $\left(a,b\right)$ and the origin.
3. How does the original line relate to the image?
4. Find the slope of the image.
5. Compare your slopes. What did you just prove?

#### Activity Synthesis



#### Images for Activity Synthesis





© CC BY 2019 by Illustrative Mathematics®