## Lesson 13: Incorporating Rotations

Let's draw some transformations.

### 13.1: Left to Right

The semaphore alphabet is a way to use flags to signal messages. Here's how to signal the letters Z and J. For each, precisely describe a rotation that would take the left hand flag to the right hand flag.

Z



J



### 13.2: Turning on a Grid



1. Rotate $ABCD$ 90 degrees clockwise around $Q$.
2. Rotate $ABCD$ 180 degrees around $R$.
3. Rotate $HJKLMN$ 120 degrees clockwise around $O$.
4. Rotate $HJKLMN$ 60 degrees counterclockwise around $P$.



### 13.3: Translate, Rotate, Reflect

Mai suspects triangle $ABC$ is congruent to triangle $DEF$. She thinks these steps will work to show there is a rigid transformation from $ABC$ to $DEF$.

* Translate by directed line segment $v$.
* Rotate the image \_\_\_\_ degrees clockwise around point $D$.
* Reflect that image over line $DE$.

Draw each image and determine the angle of rotation needed for these steps to take $ABC$ to $DEF$.



#### Are you ready for more?

Mai’s first 2 steps could be combined into a single rotation.

1. Find the center and angle of this rotation.
2. Describe a general procedure for finding a center of rotation.

### Lesson 13 Summary

The 3 rigid motions are reflect, translate, and rotate. Each of these rigid motions can be applied to any figure to create an image that is congruent. To do a rotation, we need to know 3 things: the center, the direction, and the angle.

Rotate $ABCD$ 90 degrees clockwise around point $P$.



Rotate $EFG$ 120 degrees counterclockwise around point $C$.





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