



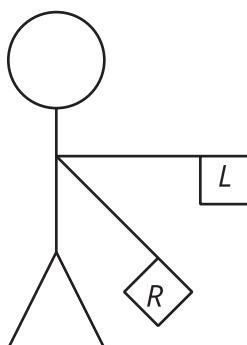
# Incorporating Rotations

Let's draw some transformations.

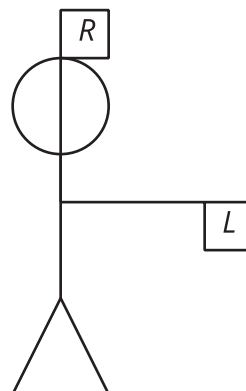
## 13.1 Left to Right

Flag semaphore is a way to use flags to signal messages. The diagrams show how to signal the letters Z and J in the semaphore alphabet. For each, precisely describe a rotation that would take the left-hand flag (L) to the right-hand flag (R).

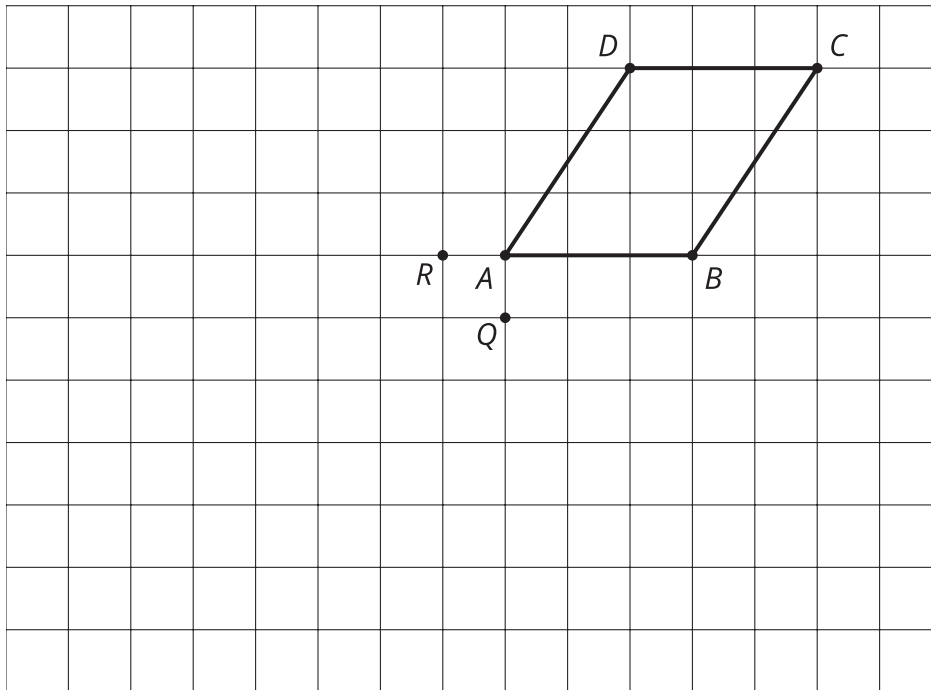
**Z**



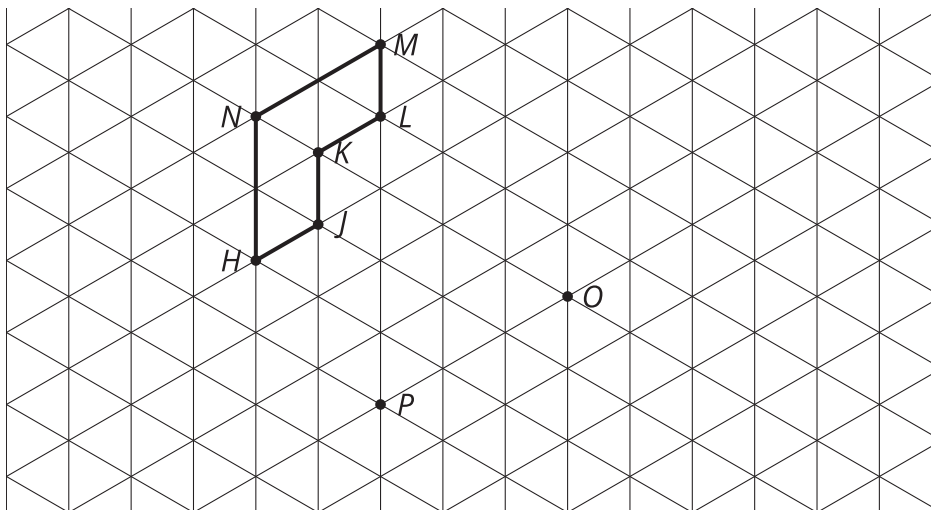
**J**



## 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  $P$ .

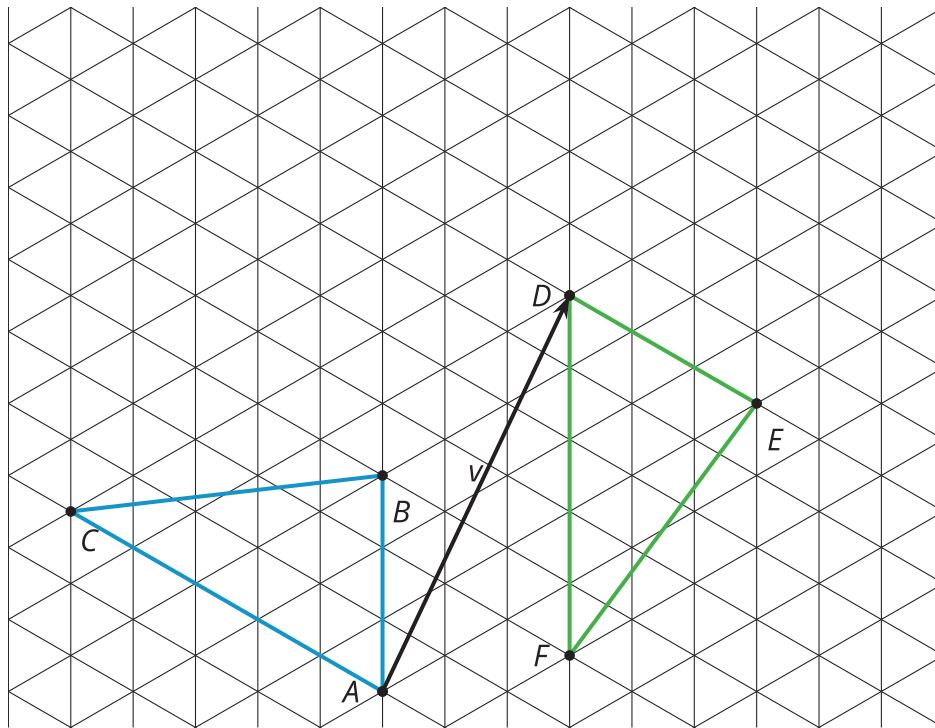


### 13.3 Translate, Rotate, Reflect

Mai suspects triangle  $ABC$  is congruent to triangle  $DEF$ . She thinks these steps will work to show that 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?

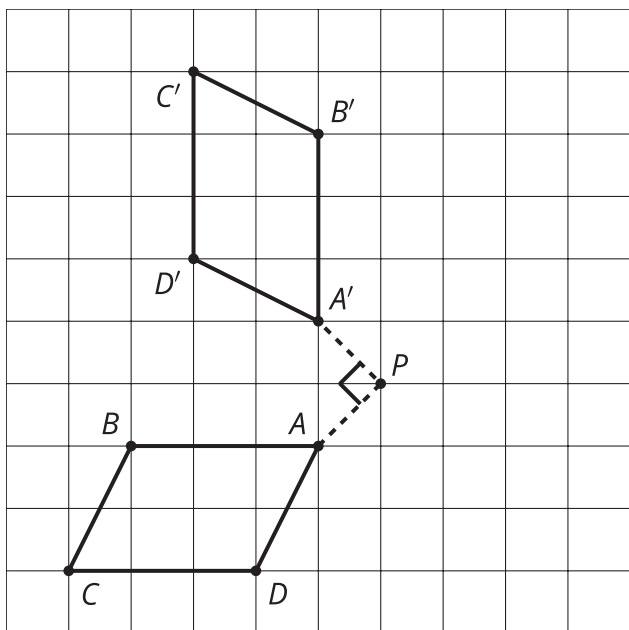
Mai's first 2 steps could be combined into a single rotation.

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

## Lesson 13 Summary

The three 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 three things: the center, the direction, and the angle.

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



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

