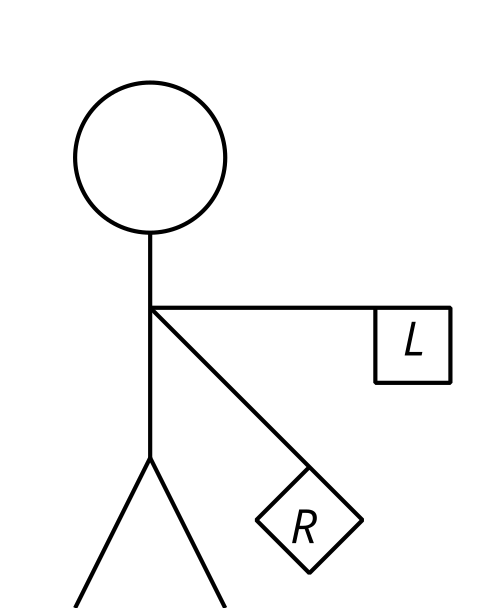
## Lesson 13: Incorporating Rotations

Let's draw some transformations.

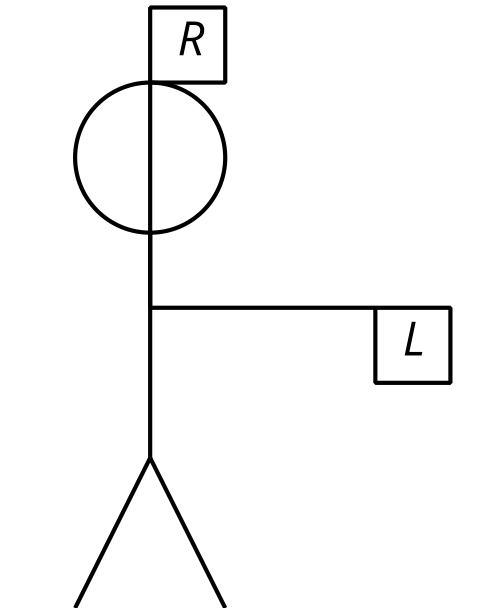
### 13.1: Left to Right

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.

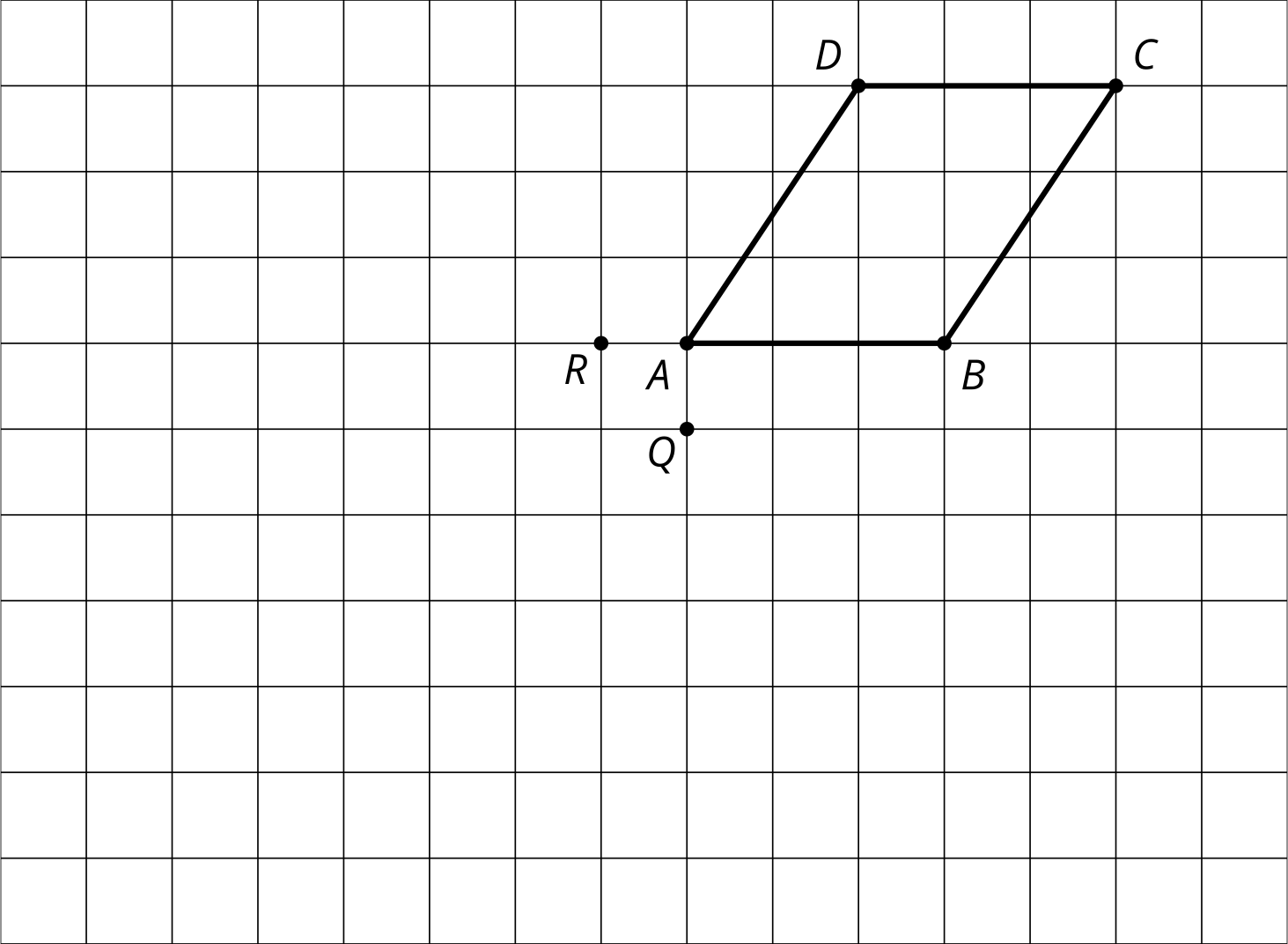
Z



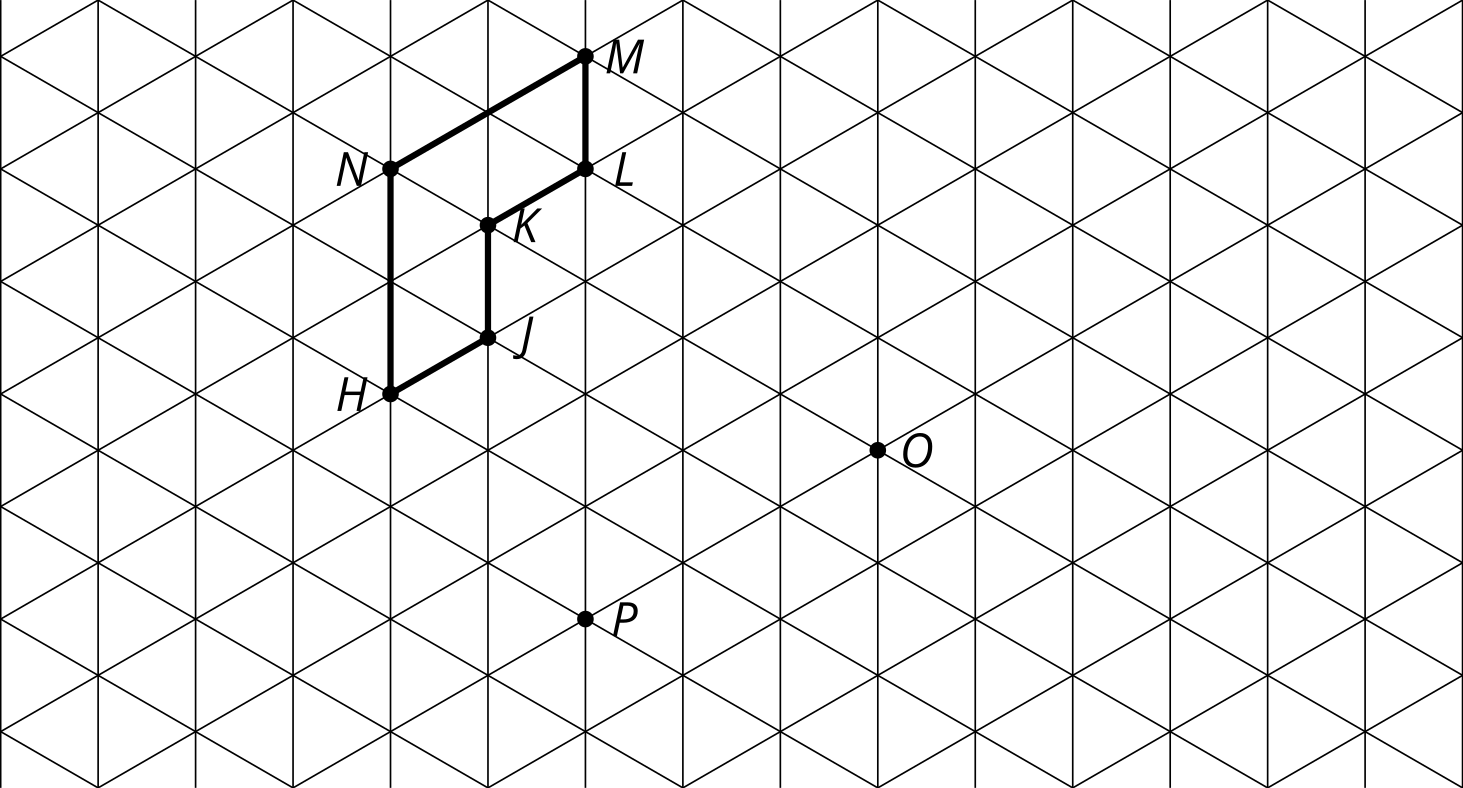
J



### 13.2: Turning on a Grid



1. Rotate  90 degrees clockwise around .
2. Rotate 180 degrees around .
3. Rotate 120 degrees clockwise around .
4. Rotate 60 degrees counterclockwise around .

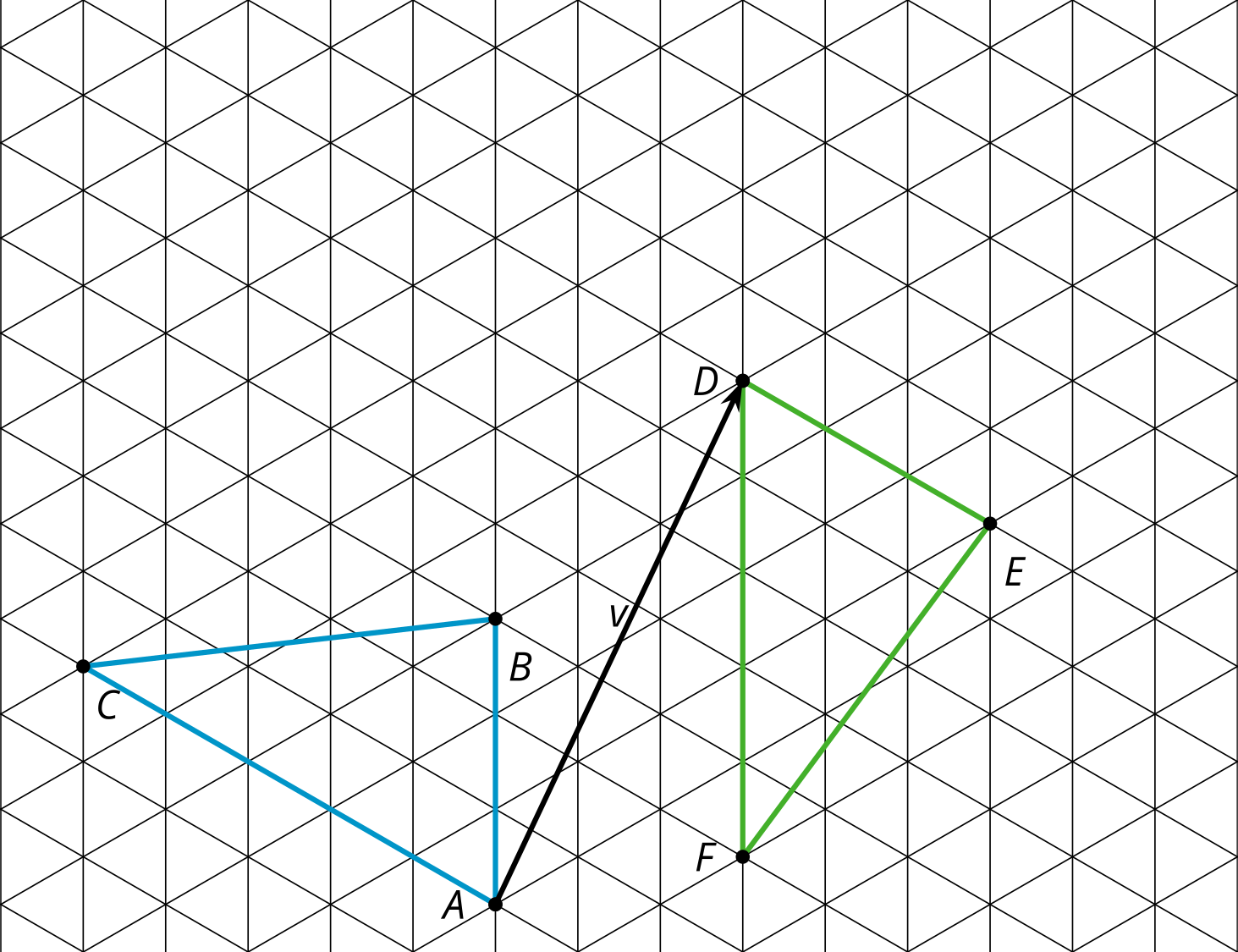


### 13.3: Translate, Rotate, Reflect

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

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

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



#### Are you ready for more?

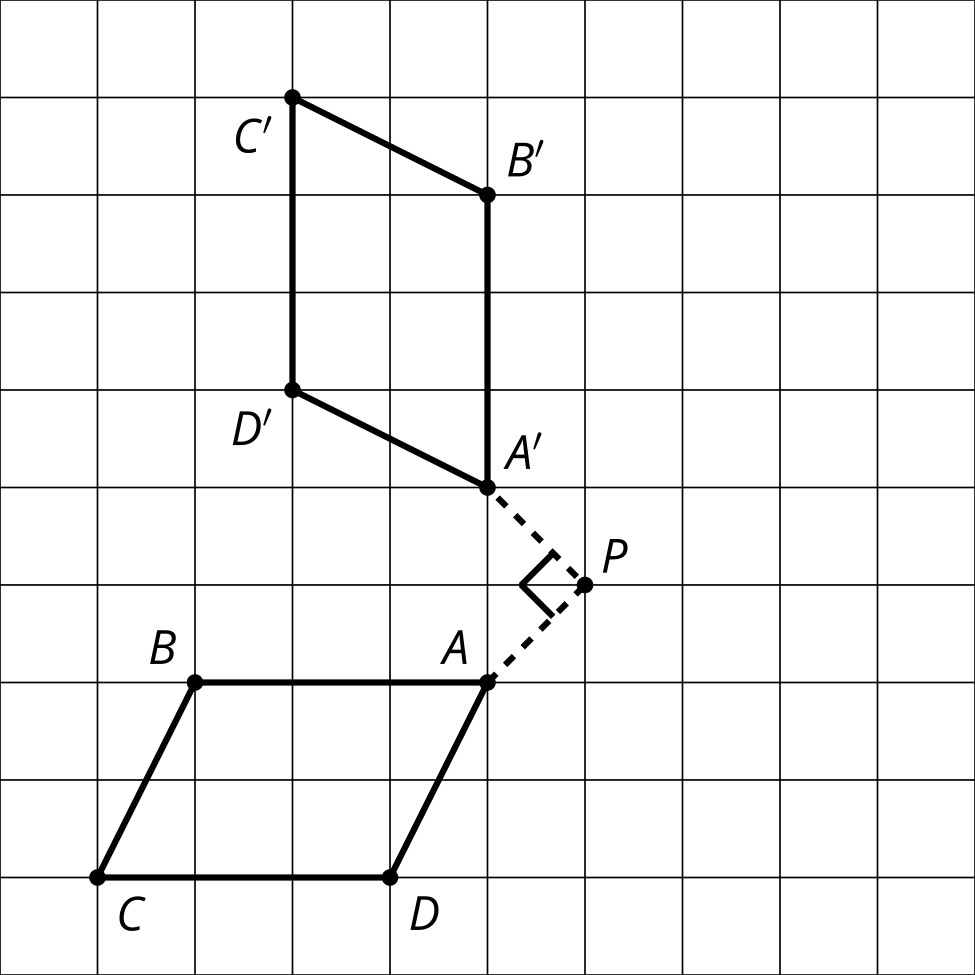
Mai’s first 2 steps could be combined into a single rotation.

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

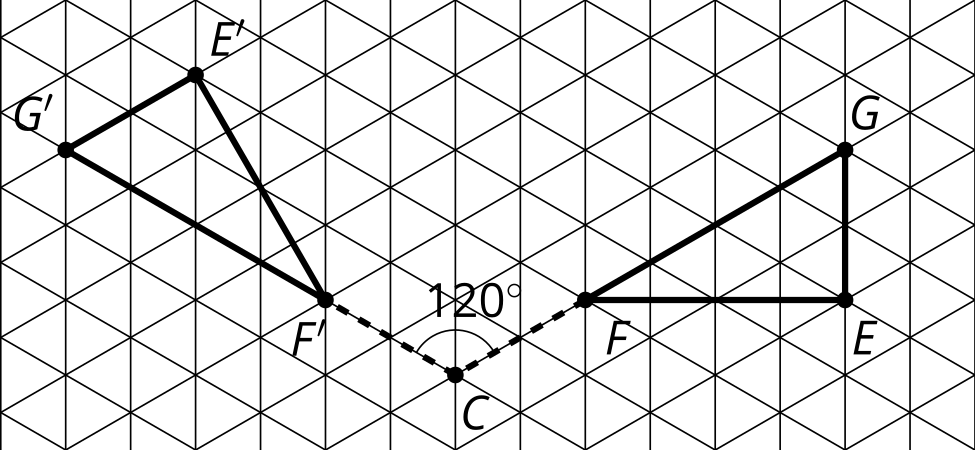
### Lesson 13 Summary

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 90 degrees clockwise around point .



Rotate 120 degrees counterclockwise around point .





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