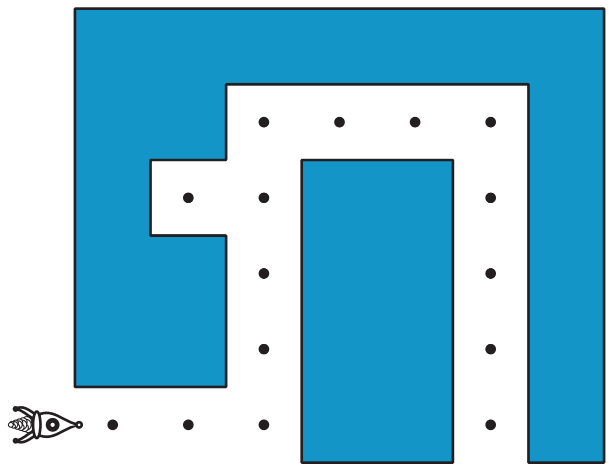
Practicing Point-by-Point Transformations

Let's figure out some transformations.

18.1 Obstacles

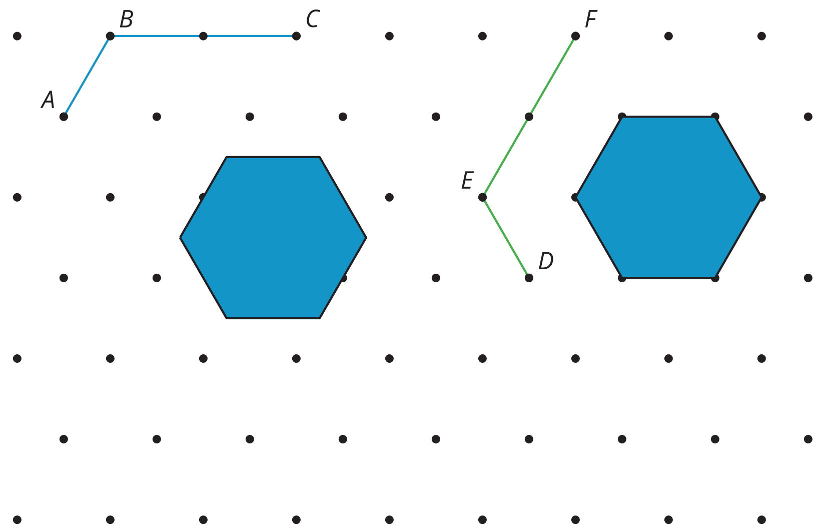
Describe the transformations needed to get through the maze.



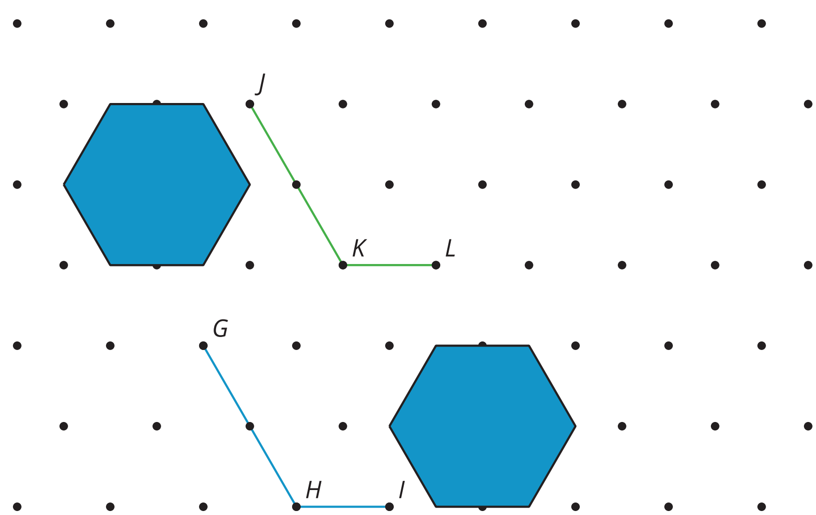
18.2 Obstacle Course

For each diagram, find a sequence of translations and rotations that take the original figure to the image so that if done physically, the figure would not touch any of the solid obstacles and would not leave the diagram. Test your sequence by drawing the image of each step.

1. Take ABC to DEF.



2. Take GHI to JKL.



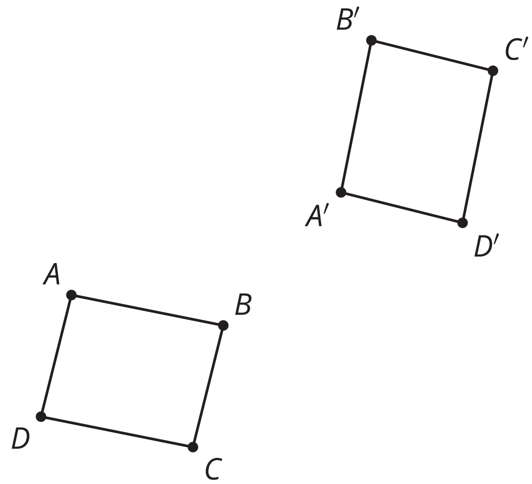
Are you ready for more?

Create your own obstacle course with an original figure, an image, and at least one obstacle. Make sure it is possible to solve. Challenge a partner to solve your obstacle course.

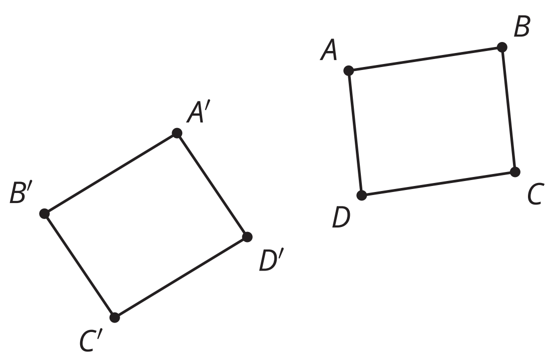
18.3 Point by Point

For each question, describe a sequence of translations, rotations, and reflections that will take parallelogram $ABCD$ to parallelogram $A'B'C'D'$.

1.



2.

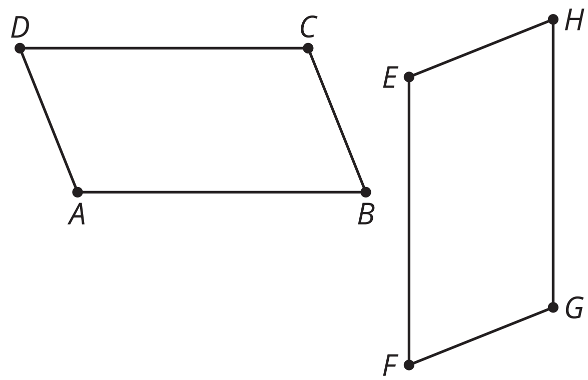


Are you ready for more?

In this unit, we have been focusing on rigid transformations in two dimensions. By thinking carefully about precise definitions, we can extend many of these ideas into three dimensions. How could you define rotations, reflections, and translations in three dimensions?

Lesson 18 Summary

Sometimes it's not hard to figure out a transformation that takes all the points of one figure directly to all the points of its image. Here, it looks like there is a 90-degree rotation that will take figure $ABCD$ to figure $EFGH$. It is not obvious where the center of rotation would be though.



Instead, we could describe the transformation in two steps. First, translate figure $ABCD$ by the directed line segment AE. Next, rotate the image of $ABCD$ clockwise by angle $B'EF$ using center E. It looks like this is a 90-degree rotation, but we can be sure the rotation will work if we use the labels to define the rotation instead of an angle measure. This method of matching up one point at a time until the whole figure has been taken to the image will work for any transformation, including ones in which it's hard to see a single transformation from one figure to the other.

