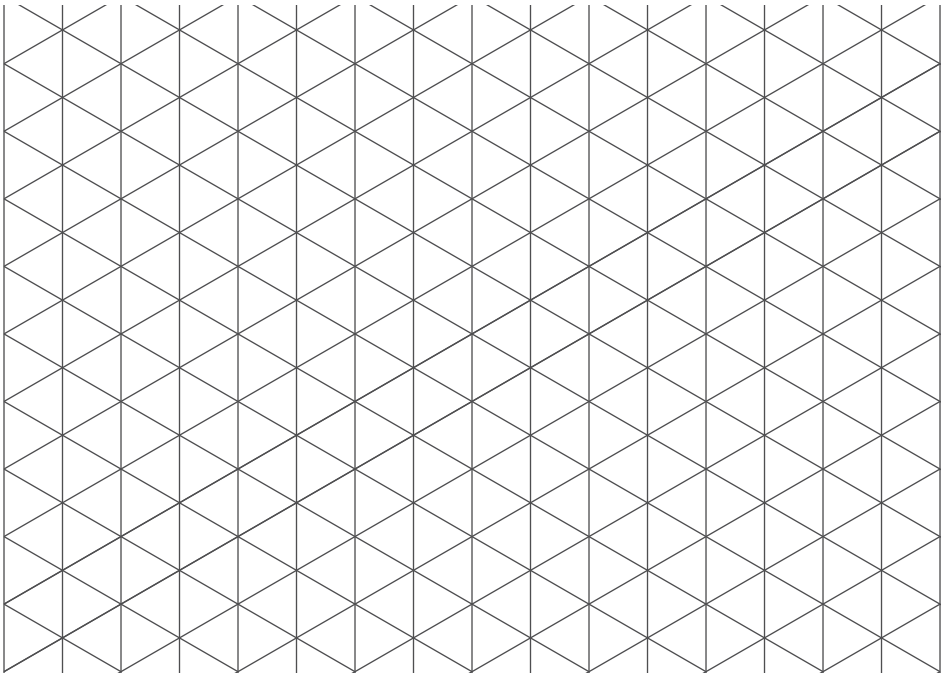
Making the Moves

Let's draw and describe translations, rotations, and reflections.

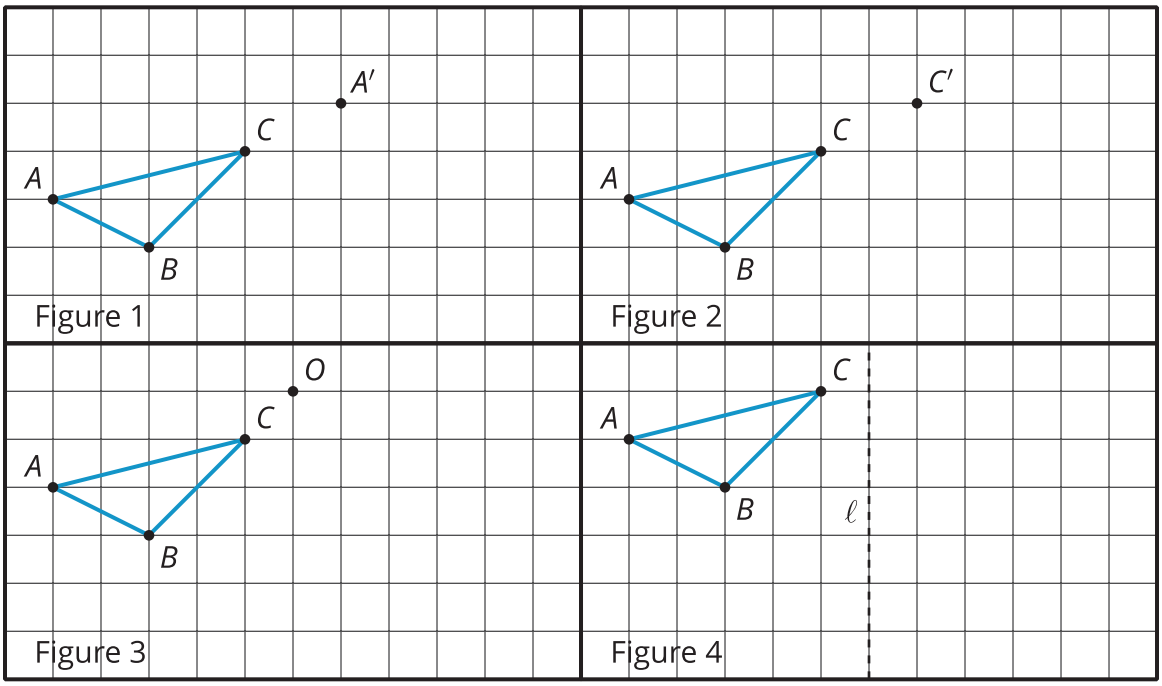
3.1 Notice and Wonder: The Isometric Grid

What do you notice? What do you wonder?

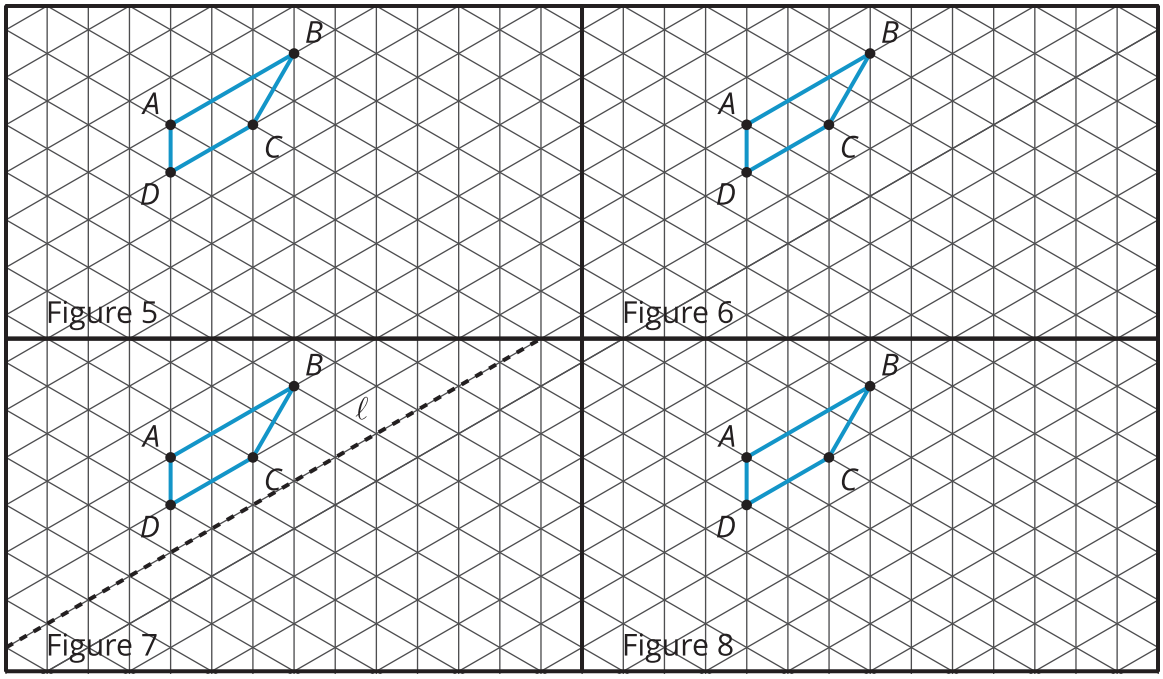


3.2 Image Information

Your teacher will give you tracing paper to carry out the moves specified. Use A', B', C', and D' to indicate vertices in the new figure that correspond to the points A, B, C, and D in the original figure.



1. In Figure 1, translate triangle ABC so that A goes to A'.
2. In Figure 2, translate triangle ABC so that C goes to C'.
3. In Figure 3, rotate triangle ABC 90° counterclockwise using center O.
4. In Figure 4, reflect triangle ABC using line ℓ.



5. In Figure 5, rotate quadrilateral $ABCD$ 60° counterclockwise using center B.
6. In Figure 6, rotate quadrilateral $ABCD$ 60° clockwise using center C.
7. In Figure 7, reflect quadrilateral $ABCD$ using line ℓ.
8. In Figure 8, translate quadrilateral $ABCD$ so that A goes to C.

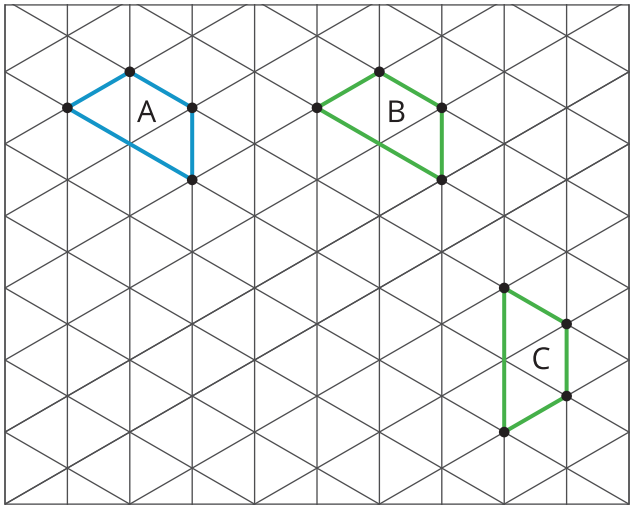
Are you ready for more?

The effects of each move can be "undone" by using another move. For example, to undo the effect of translating 3 units to the right, we could translate 3 units to the left. What move undoes each of the following moves?

1. Translate 3 units up
2. Translate 1 unit up and 1 unit to the left
3. Rotate 30° clockwise around a point P
4. Reflect across a line ℓ

3.3 A to B to C

Here are some figures on an isometric grid.



1. Name a transformation that takes Figure A to Figure B.

2. Name a transformation that takes Figure B to Figure C.

3. What is one **sequence of transformations** that takes Figure A to Figure C? Explain how you know.

Are you ready for more?

Experiment with some other ways to take Figure A to Figure C. For example, can you do it with . . .

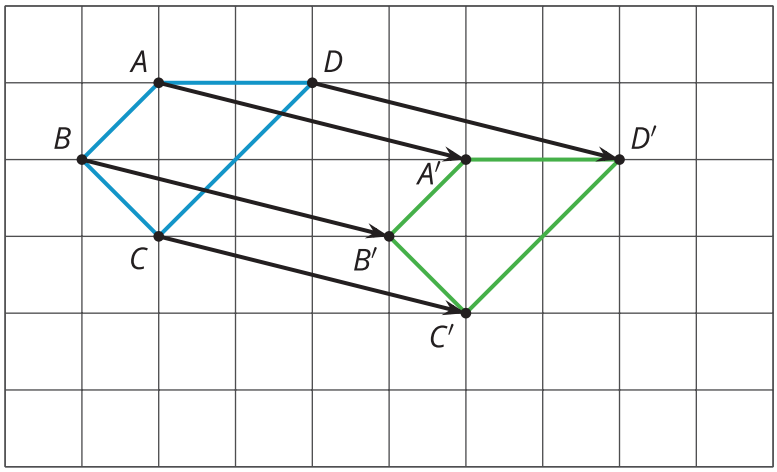
- No rotations?
- No reflections?
- No translations?

Lesson 3 Summary

A **transformation** is a translation, rotation, reflection, or dilation, or a combination of these. An **image** is the result of a transformation. To distinguish an original figure from its image, points in the image are sometimes labeled with the same letters as the original figure, but with the symbol $'$ attached, as in A' (pronounced "A prime").

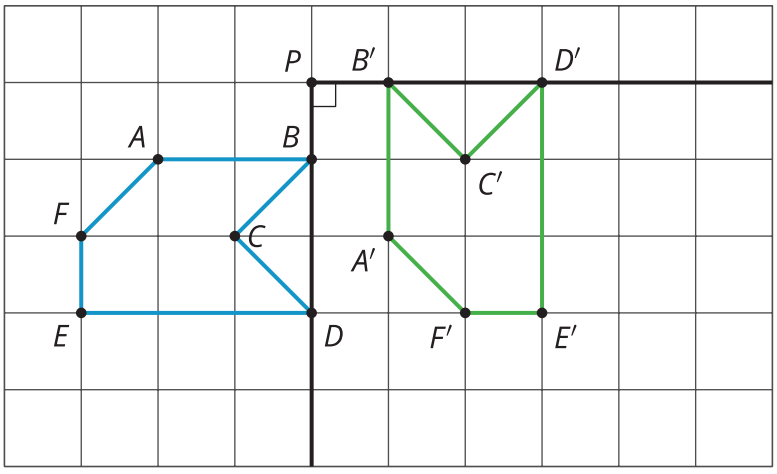
- A translation can be described by two points. If a translation moves point A to point A', it moves the entire figure the same distance and direction as the distance and direction from A to A'. The distance and direction of a translation can be shown by an arrow.

  For example, here is a translation of quadrilateral $ABCD$ that moves A to A'.



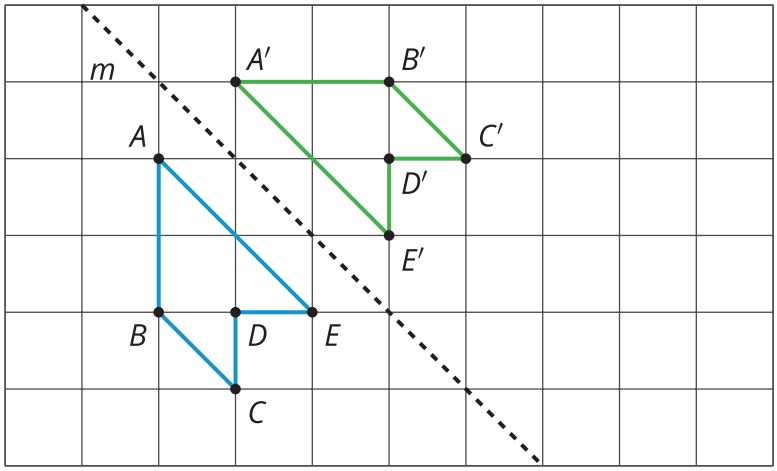
- A rotation can be described by an angle and a center. The direction of the angle can be clockwise or counterclockwise.

  For example, hexagon $ABCDEF$ is rotated $90°$ counterclockwise using center P.



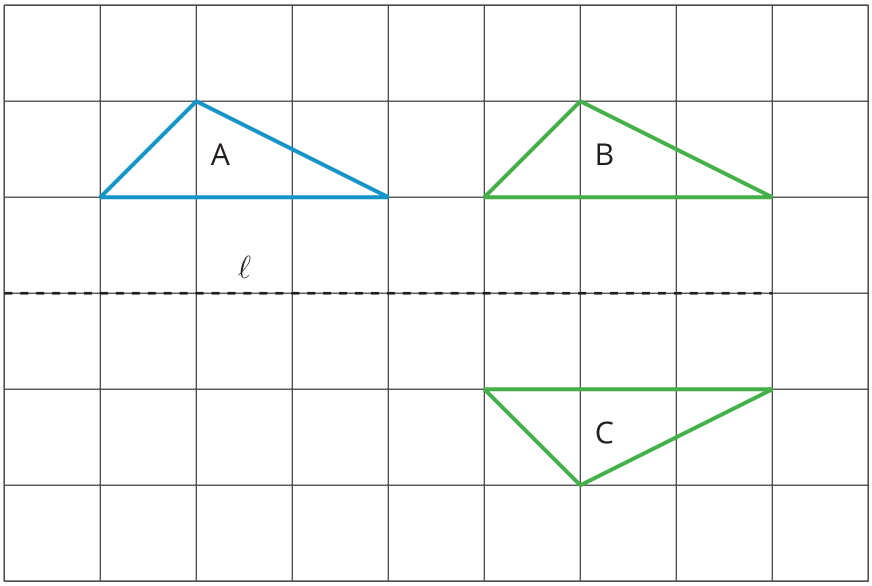
- A reflection can be described by a line of reflection (the "mirror"). Each point is reflected directly across the line so that it is just as far from the mirror line, but is on the opposite side.

  For example, pentagon $ABCDE$ is reflected across line m.



When we do one or more moves in a row, we often call that a **sequence of transformations**. For example, a sequence of transformations taking Triangle A to Triangle C is to translate Triangle A 4 units to the right, then reflect over line ℓ.

There may be more than one way to describe or perform a transformation that results in the same image. For example, another sequence of transformations that would take Triangle A to Triangle C would be to reflect over line ℓ, then translate Triangle A′ 4 units to the right.



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