# Lesson 14: Similarity

## Classwork

### Example 1

We said that for a figure $A$ in the plane, it must be true that $A \sim A$. Describe why this must be true.

### Example 2

We said that for figures $A$ and $B$ in the plane so that $A \sim B$, then it must be true that $B \sim A$. Describe why this must be true.

### Example 3

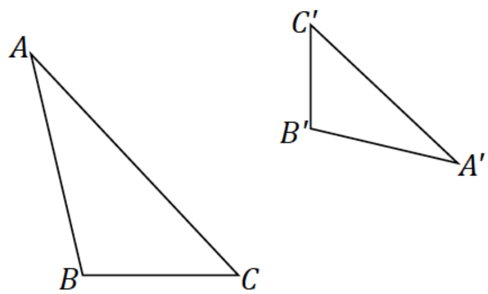
Based on the definition of *similar,* how would you show that any two circles are similar?

## Example 4

Suppose $\triangle ABC \leftrightarrow \triangle DEF$ and under this correspondence, corresponding angles are equal and corresponding sides are proportional. Does this guarantee that $\triangle ABC$ and $\triangle DEF$ are similar?

## Example 5

a. In the diagram below, $\triangle ABC \sim \triangle A'B'C'$. Describe a similarity transformation that maps $\triangle ABC$ to $\triangle A'B'C'$.




b. Joel says the sequence must require a dilation and three rigid motions, but Sharon is sure there is a similarity composed of just a dilation and just two rigid motions. Who is right?

**Lesson Summary**

Similarity is reflexive because a figure is similar to itself.

Similarity is symmetric because once a similarity transformation is determined to take a figure to another, there are inverse transformations that will take the figure back to the original.

## Problem Set

1. If you are given any two congruent triangles, describe a sequence of basic rigid motions that will take one to the other.

2. If you are given two similar triangles that are not congruent triangles, describe a sequence of dilations and basic rigid motions that will take one to the other.

3. Given two line segments, $\overline{AB}$ and $\overline{CD}$, of different lengths, answer the following questions.
   a. It is always possible to find a similarity transformation that maps $\overline{AB}$ to $\overline{CD}$ sending $A$ to $C$ and $B$ to $D$. Describe one such similarity transformation.
   b. If you are given that $\overline{AB}$ and $\overline{CD}$ are not parallel, are not congruent, do not share any points, and do not lie in the same line, what is the least number of transformations needed in a sequence to map $\overline{AB}$ to $\overline{CD}$? Which transformations make this work?
   c. If you performed a similarity transformation that instead takes $A$ to $D$ and $B$ to $C$, either describe what mistake was made in the similarity transformation, or describe what additional transformation is needed to fix the error so that $A$ maps to $C$ and $B$ maps to $D$.

4. We claim that similarity is transitive, i.e., that if $A$, $B$, and $C$ are figures in the plane such that $A \sim B$ and $B \sim C$, then $A \sim C$. Describe why this must be true.

5. Given two line segments, $\overline{AB}$ and $\overline{CD}$, of different lengths, we have seen that it is always possible to find a similarity transformation that maps $\overline{AB}$ to $\overline{CD}$, sending $A$ to $C$ and $B$ to $D$ with one rotation and one dilation. Can you do this with one reflection and one dilation?

6. Given two triangles, $\triangle ABC \sim \triangle DEF$, is it always possible to rotate $\triangle ABC$ so that the sides of $\triangle ABC$ are parallel to the corresponding sides in $\triangle DEF$; i.e., $\overline{AB} \parallel \overline{DE}$, etc.?