IM 6–8 MATH™ v.III

Unit 1
Scale Drawings

7

Lesson 5

The Size of the Scale Factor

Illustrative Mathematics®

Kendall Hunt

Learning Goal

Let's look at the effects of different scale factors.

Warm-up: Number Talk

Solve each equation mentally.

$16x = 176$

$16x = 8$

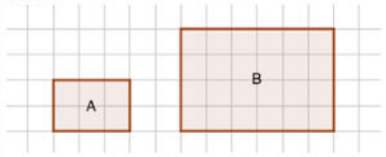
$16x = 1$

$\frac{1}{5}x = 1$

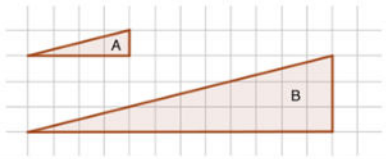
$\frac{2}{5}x = 1$

Scaled Copies

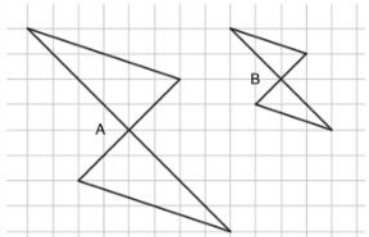
Card 1



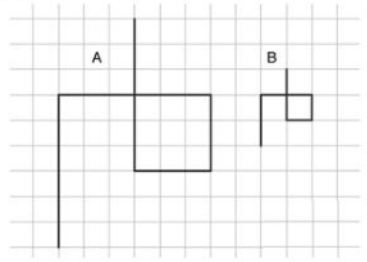
Card 2



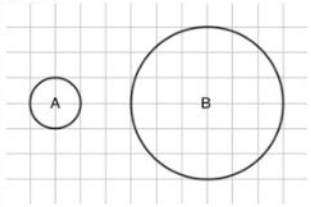
Card 3



Card 4

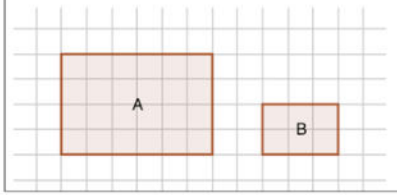


Card 5



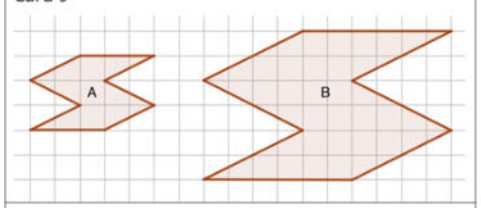
Card 6

Card 7

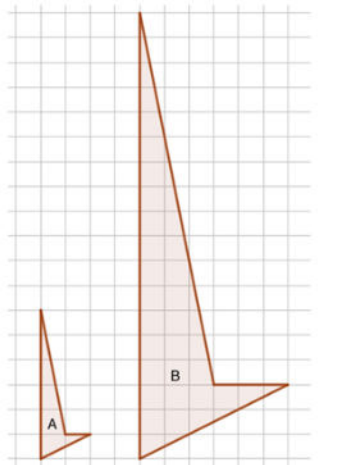


Card 8

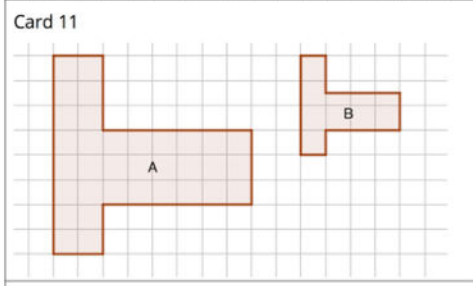
Card 9



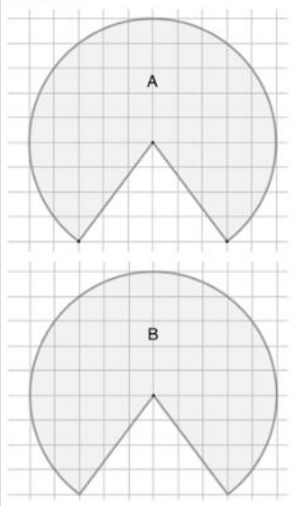
Card 10



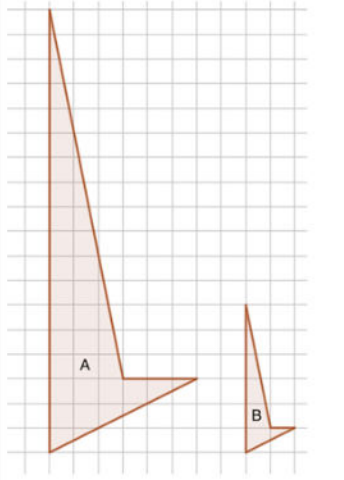
Card 11



Card 12



Card 13



Scaled Copies

Your teacher will give you a set of cards. On each card, Figure A is the original and Figure B is a scaled copy.

1. Sort the cards based on their scale factors. Be prepared to explain your reasoning.
2. Examine cards 10 and 13 more closely. What do you notice about the shapes and sizes of the figures? What do you notice about the scale factors?
3. Examine cards 8 and 12 more closely. What do you notice about the figures? What do you notice about the scale factors?

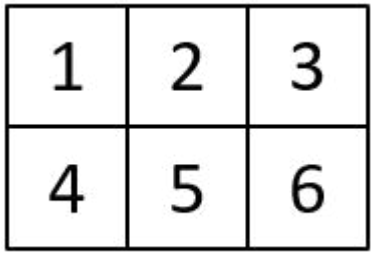
Scaled Copies

- What can we say about the scale factors that produce larger copies? Smaller copies? Same-size copies?
- Some cards had the same pair of figures on them, just in a reversed order (i.e., pairs #1 and 7, #10 and 13). What do you notice about their scale factors?

Scaling a Puzzle

Your teacher will give you 2 pieces of a 6-piece puzzle.

1. If you drew scaled copies of your puzzle pieces using a scale factor of ½ , would they be larger or smaller than the original pieces? How do you know?
2. Create a scaled copy of each puzzle piece on a blank square, with a scale factor of ½ .
3. When everyone in your group is finished, put all 6 of the original puzzle pieces together like this:



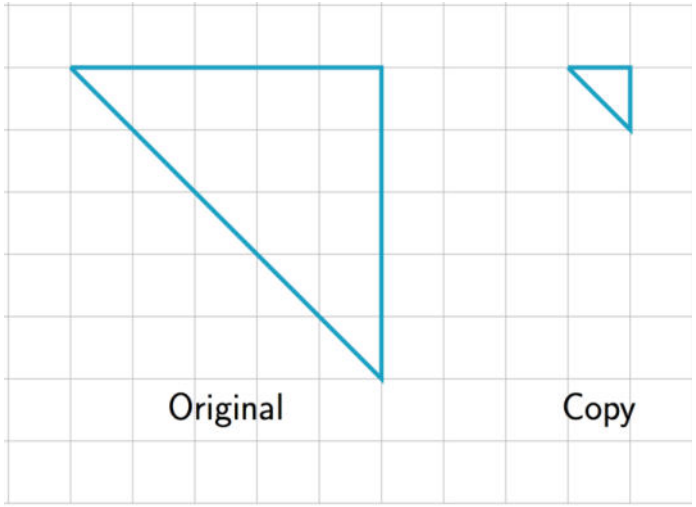
   Next, put all 6 of your scaled copies together. Compare your scaled puzzle with the original puzzle. Which parts seem to be scaled correctly and which seem off? What might have caused those parts to be off?

1. Revise any of the scaled copies that may have been drawn incorrectly.
2. If you were to lose one of the pieces of the original puzzle, but still had the scaled copy, how could you recreate the lost piece?

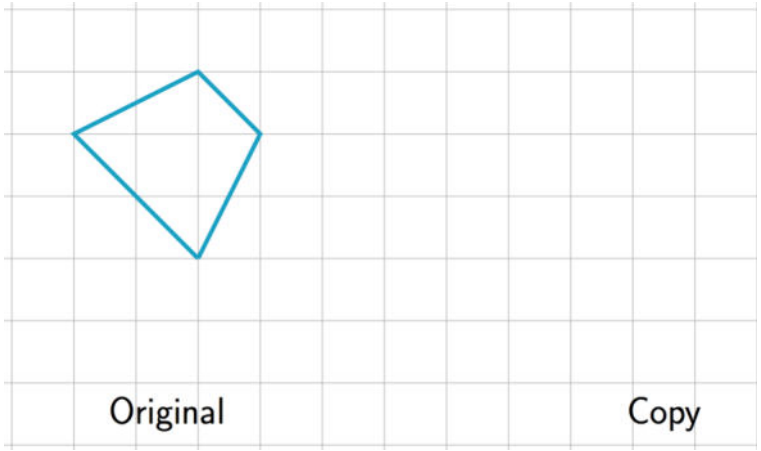
- How is this task more challenging than creating scaled copies of polygons on a grid?
- Besides distances or lengths, what helped you create an accurate copy?
- How did you know or decide which distances to measure?
- Before your drawings were assembled, how did you check if they were correct?

Missing Figure, Factor, or Copy

1. What is the scale factor from the original triangle to its copy? Explain or show your reasoning.



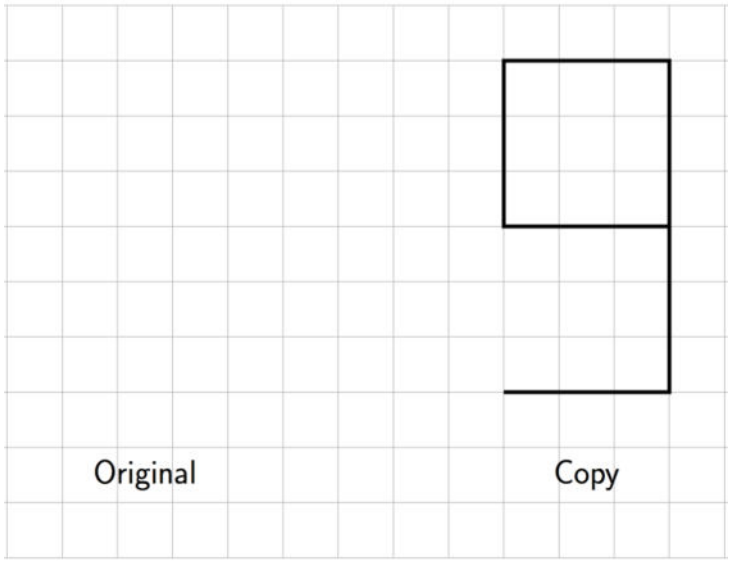
2. The scale factor from the original trapezoid to its copy is 2.
   Draw the scaled copy.



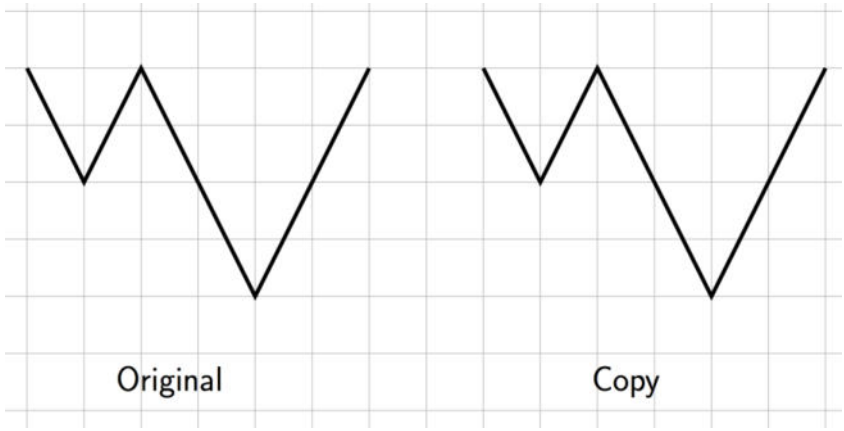
Missing Figure, Factor, or Copy

3. The scale factor from the original figure to its copy is $\frac{3}{2}$.

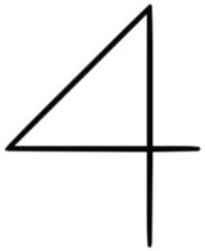
   Draw the original figure



4. What is the scale factor from the original figure to the copy?
   Explain how you know.



5. The scale factor from the original figure to its scaled copy is 3. Draw the scaled copy.



Original

Copy

The Size of the Scale Factor

Lesson Synthesis

- What happens to the copy when it is created with a scale factor greater than 1? Less than 1? Exactly 1?
- How can we reverse the scaling to get back to the original figure when we have a scaled copy?

Learning Targets

- I can describe the effect on a scaled copy when I use a scale factor that is greater than 1, less than 1, or equal to 1.
- I can explain how the scale factor that takes Figure A to its copy Figure B is related to the scale factor that takes Figure B to Figure A.

Scaling a Rectangle

Cool-down

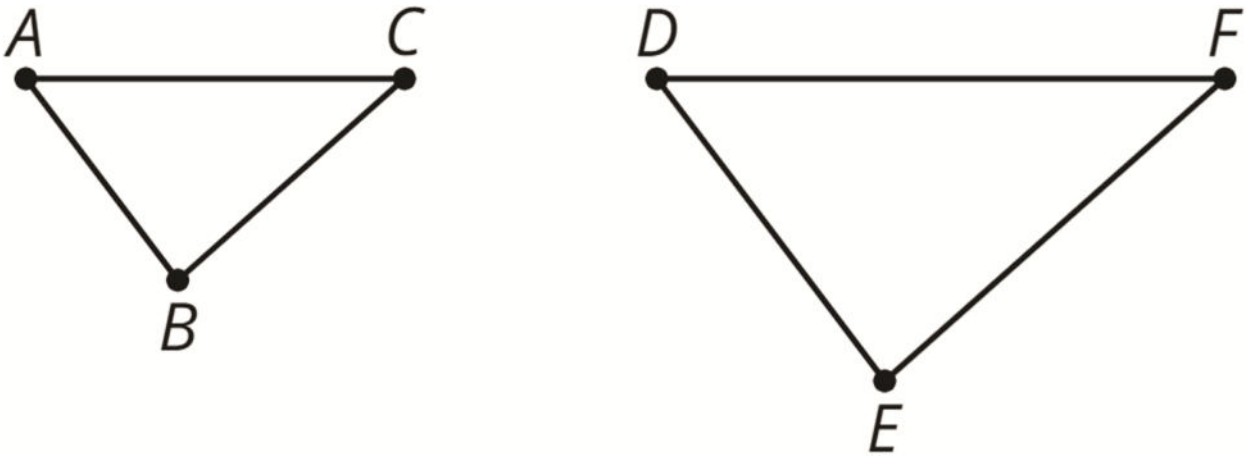
A rectangle that is 2 inches by 3 inches has been scaled by a factor of 7.

1. What are the side lengths of the scaled copy?
2. Suppose you want to scale the copy back to its original size. What scale factor should you use?

corresponding

When part of an original figure matches up with part of a copy, we call them corresponding parts. These could be points, segments, angles, or distances.

For example, point *B* in the first triangle corresponds to point *E* in the second triangle. Segment *AC* corresponds to segment *DF*.



reciprocal

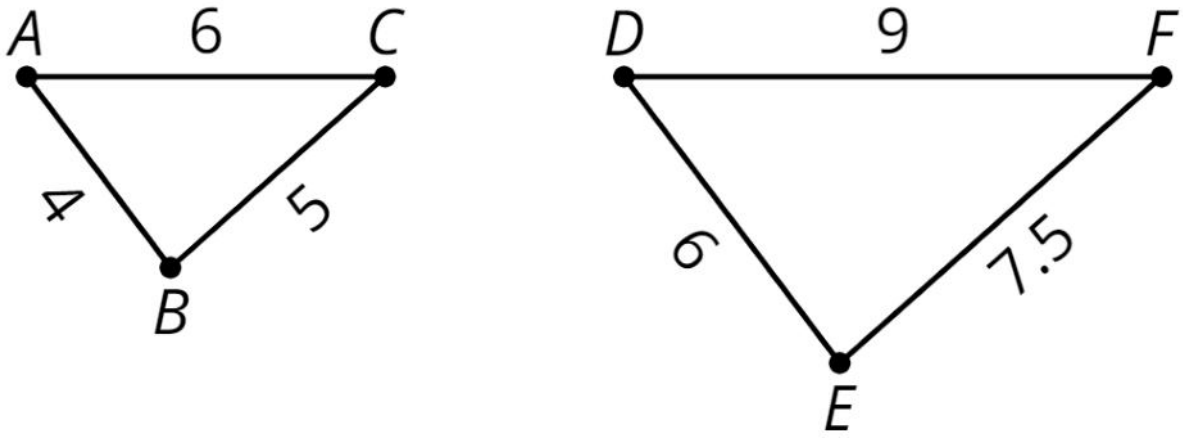
Dividing 1 by a number gives the reciprocal of that number.

For example, the reciprocal of 12 is $\frac{1}{12}$, and the reciprocal of $\frac{2}{5}$ is $\frac{5}{2}$.

scale factor

To create a scaled copy, we multiply all the lengths in the original figure by the same number. This number is called the scale factor.

In this example, the scale factor is 1.5, because 4 • (1.5) = 6, 5 • (1.5) = 7.5 and 6 • (1.5) = 9.



scaled copy

A scaled copy is a copy of an figure where every length in the original figure is multiplied by the same number.

For example, triangle *DEF* is a scaled copy of triangle *ABC*. Each side length on triangle *ABC* was multiplied by 1.5 to get the corresponding side length on triangle *DEF*.