IM 6–8 MATH™ v.III

Unit 1
Scale Drawings

7

Lesson 6

Scaling and Area

Illustrative Mathematics®

Kendall Hunt

Learning Goal

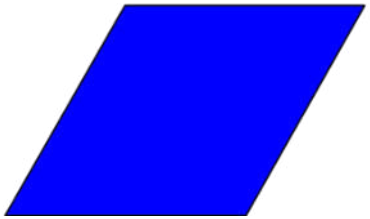
Let's build scaled shapes and investigate their areas.

Scaling a Pattern Block

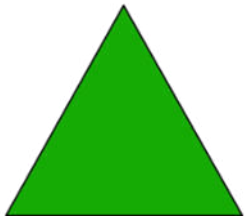
Warm-up

Your teacher will give you some pattern blocks. Work with your group to build the scaled copies described in each question.

A



B



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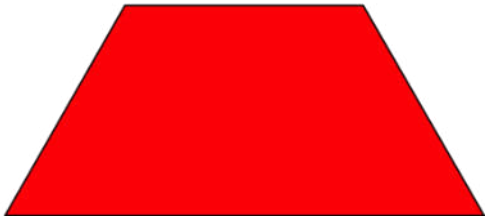
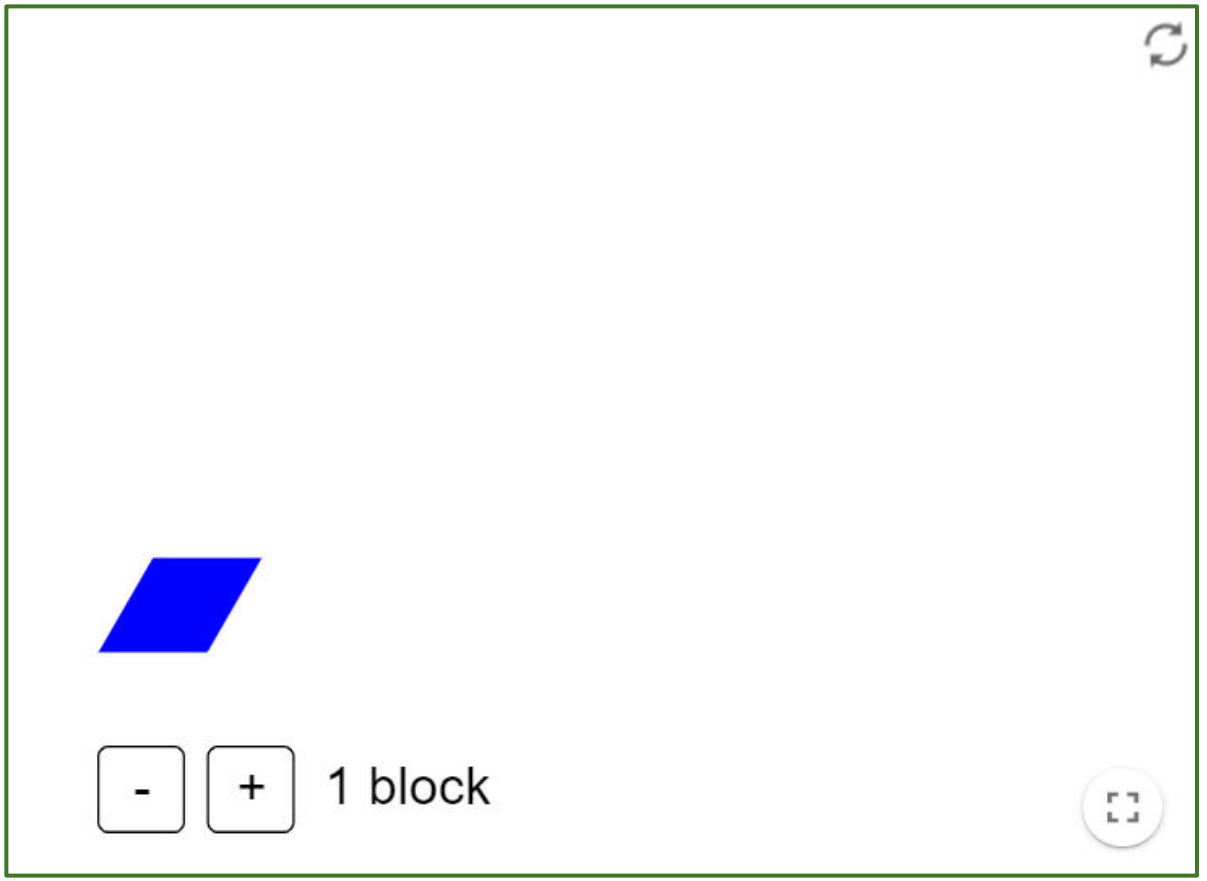


Scaling a Pattern Block

Warm-up

1. How many blue rhombus blocks does it take to build a scaled copy of Figure A:
   a. Where each side is twice as long?
   b. Where each side is 3 times as long?
   c. Where each side is 4 times as long?
2. How many green triangle blocks does it take to build a scaled copy of Figure B:
   a. Where each side is twice as long?
   b. Where each side is 3 times as long?
   c. Using a scale factor of 4?
3. How many red trapezoid blocks does it take to build a scaled copy of Figure C:
   a. Using a scale factor of 2?
   b. Using a scale factor of 3?
   c. Using a scale factor of 4?

Scaling a Pattern Block



Scaling a Pattern Block

Warm-up

scale factor	number of blocks to build Figure A	number of blocks to build Figure B	number of blocks to build Figure C
1			
2			
3			
4			
5			
10			
s			
$\frac{1}{2}$			

Scaling a Pattern Block

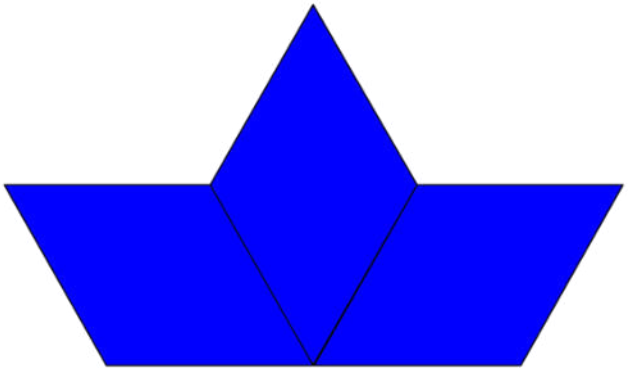
Warm-up

- In the table, how is the number of blocks related to the scale factor? Is there a pattern?
- How many blocks are needed to build scaled copies using scale factors of 5 or 10? How do you know?
- How many blocks are needed to build a scaled copy using any scale factor 8?
- If we want a scaled copy where each side is half as long, how much of a block would it take? How do you know? Does the same rule still apply?

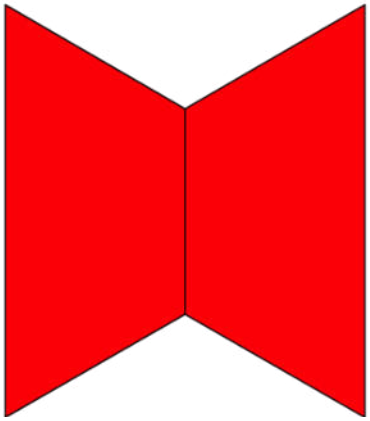
Scaling More Pattern Blocks

Your teacher will assign your group one of these figures.

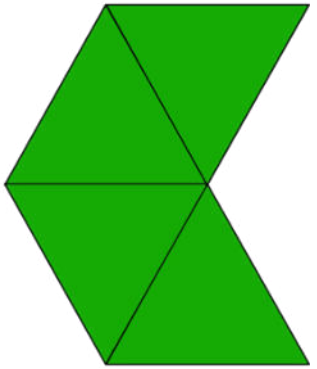
D



E



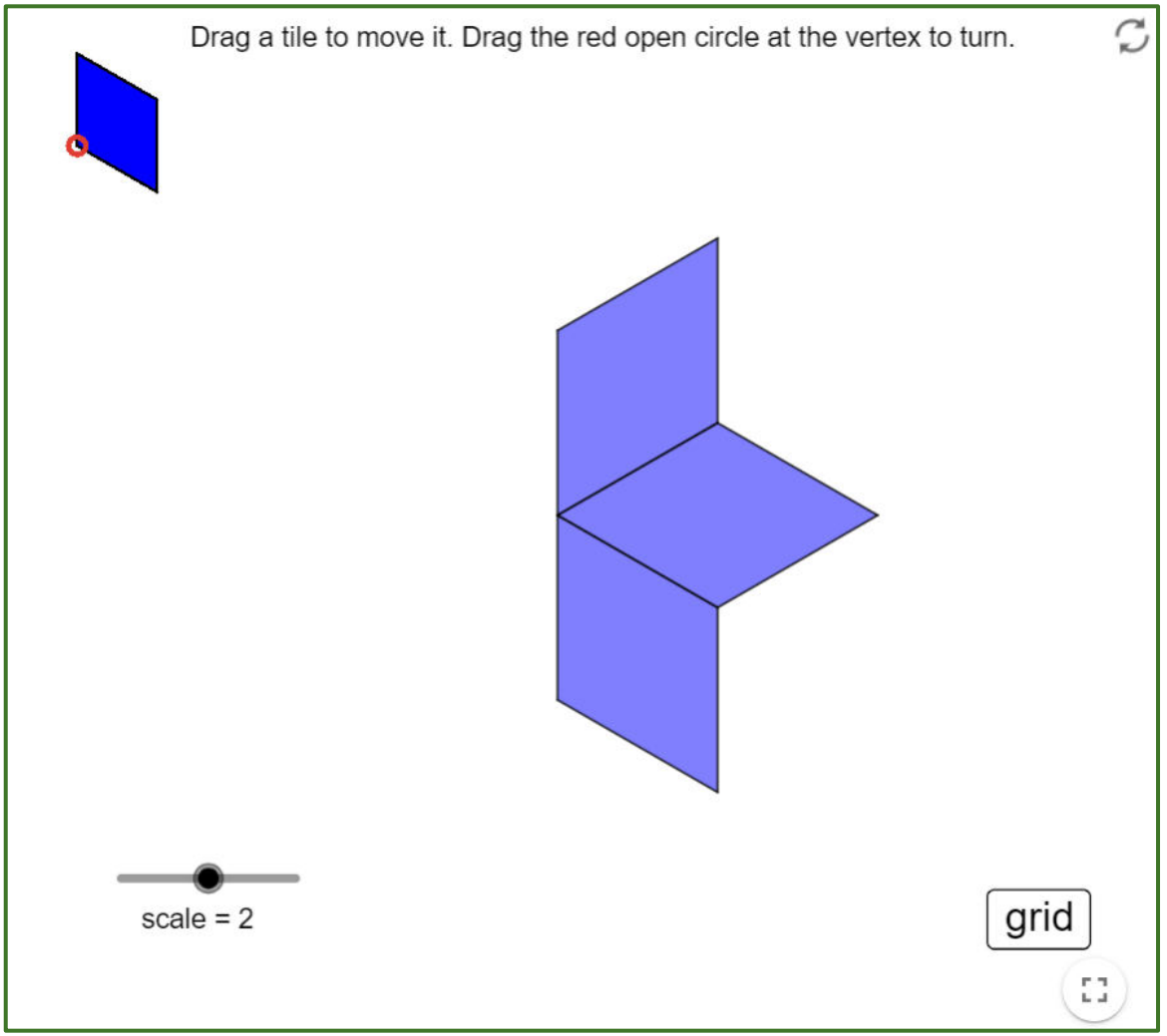
F



Scaling More Pattern Blocks

1. Build a scaled copy of your assigned shape using a scale factor of 2. Use the same shape blocks as in the original figure. How many blocks did it take?
2. Your classmate thinks that the scaled copies in the previous problem will each take 4 blocks to build. Do you agree or disagree? Explain you reasoning.
3. Start building a scaled copy of your assigned figure using a scale factor of 3. Stop when you can tell for sure how many blocks it would take. Record your answer.
4. How many blocks would it take to build scaled copies of your figure using scale factors 4, 5, and 6? Explain or show your reasoning.
5. How is the pattern in this activity the same as the pattern you saw in the previous activity? How is it different?

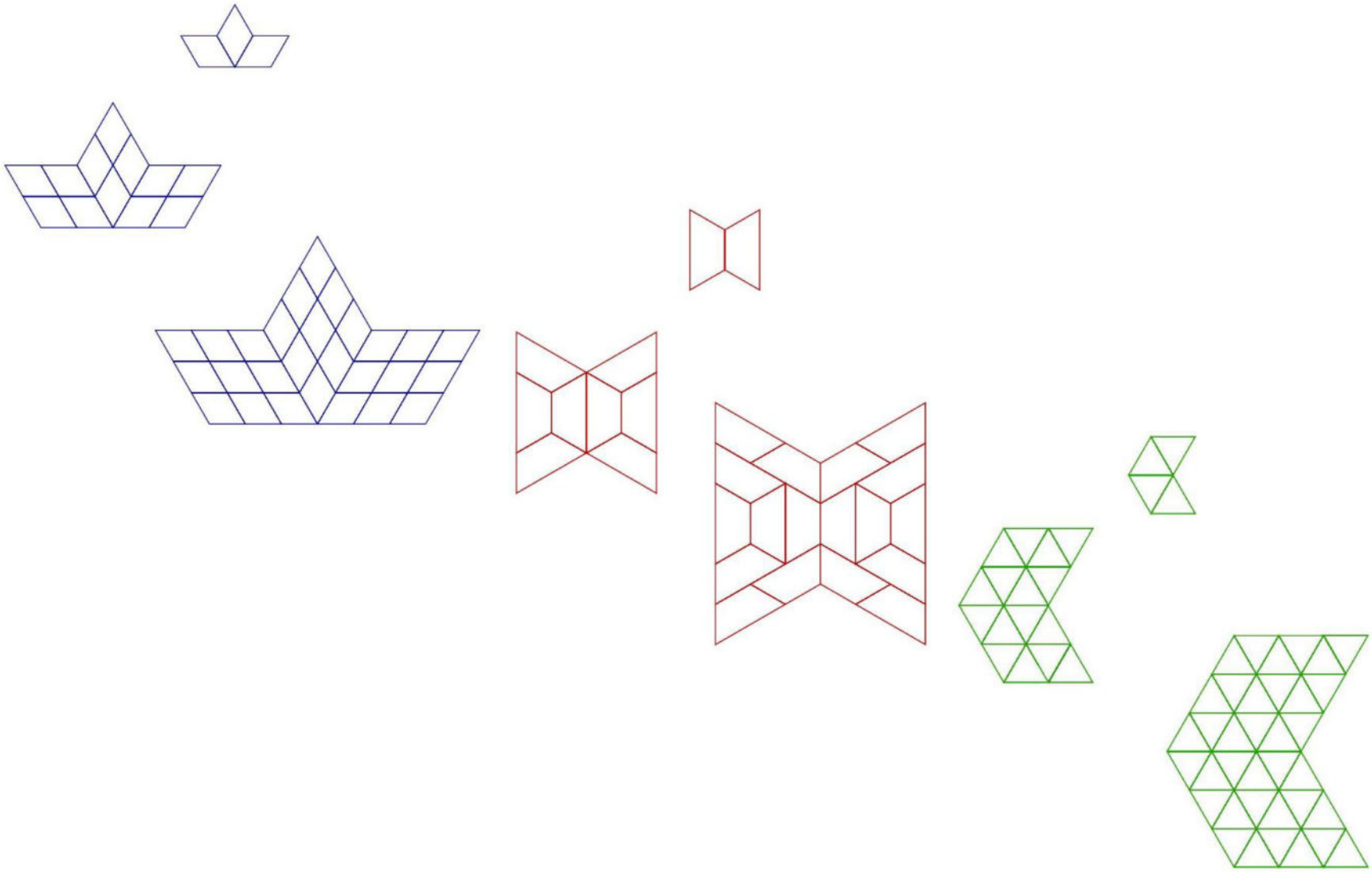
Scaling More Pattern Blocks



Scaling More Pattern Blocks

scale factor	number of blocks to build Figure D	number of blocks to build Figure E	number of blocks to build Figure F
1	3	2	4
2			
3			
4			
5			
6			
s			

Scaling More Pattern Blocks



Scaling More Pattern Blocks

- How does the pattern for the number of blocks in this activity compare to the pattern in the previous activity? Are they related? How?
- For each figure, how many blocks does it take to build a copy using any scale factor 8?

Area of Scaled Parallelograms and Triangles

1. Your teacher will give you a figure with measurements in centimeters. What is the area of your figure? How do you know?
2. Work with your partner to draw scaled copies of your figure, using each scale factor in the table. Complete the table with the measurements of your scaled copies.
3. Compare your results with a group that worked with a different figure.
   What is the same about your answers?
   What is different?
4. If you drew scaled copies of your figure with the following scale factors, what would their areas be? Discuss your thinking. If you disagree, work to reach an agreement.
   Be prepared to explain your reasoning.

scale factor	base (cm)	height (cm)	area (cm^2)
1			
2			
3			
$\frac{1}{2}$			
$\frac{1}{3}$			

scale factor	area (cm^2)
5	
$\frac{3}{5}$	

- What did you notice when you compared your answers with another group that worked with the other figure?
- How did you find the scaled areas for scale factors of 5 and $\frac{3}{5}$?
- How is the process for finding scaled area here the same as and different than that in the previous activities with pattern blocks?

- If all the dimensions of a scaled copy are twice as long as in the original shape, will the area of the scaled copy be twice as large?
- Why not?
- If the scale factor is 5, how many times larger will the scaled copy's area be?

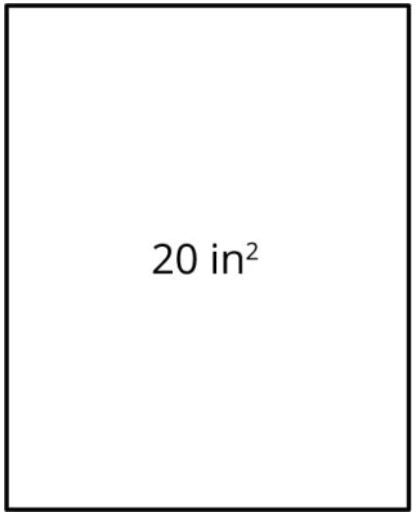
Learning Targets

I can describe how the area of a scaled copy is related to the area of the original figure and the scale factor that was used.

Enlarged Areas

Cool-down

1. Lin has a drawing with an area of 20 in^2. If she increases all the sides by a scale factor of 4, what will the new area be?



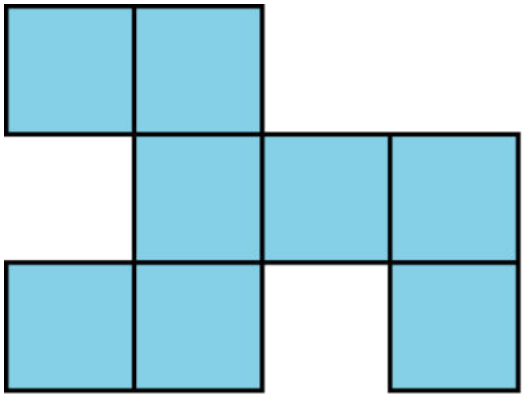
2. Noah enlarged a photograph by a scale factor of 6. The area of the enlarged photo is how many times as large as the area of the original?

area

Area is the number of square units that cover a two-dimensional region, without any gaps or overlaps.

For example, the area of region A is 8 square units.

The area of the shaded region of B is $\frac{1}{2}$ square unit.



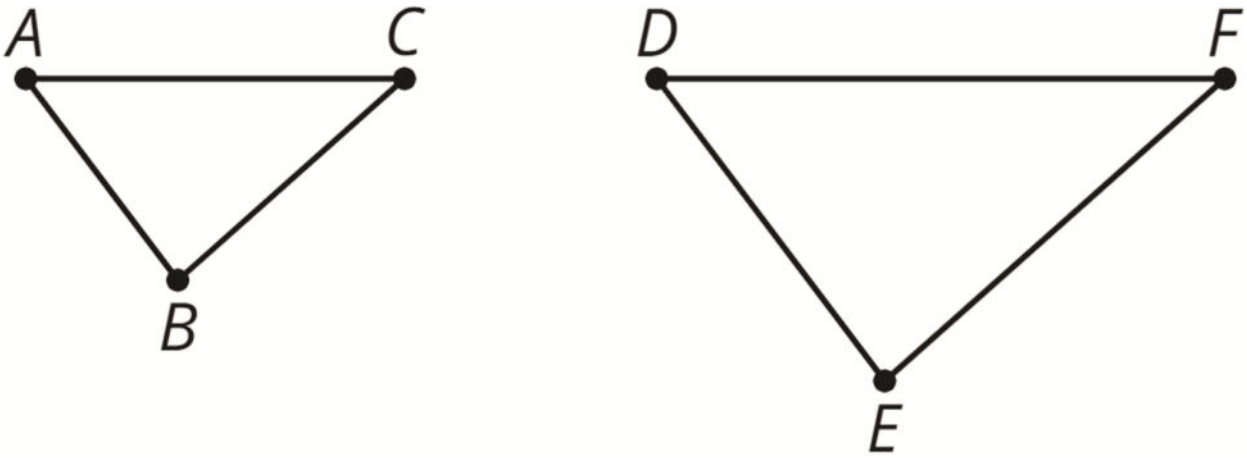
A

B

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

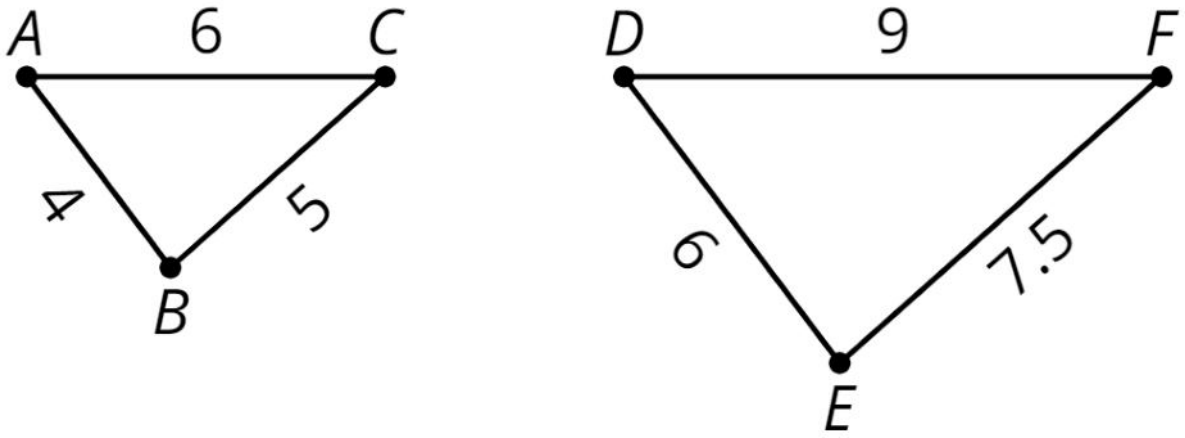
Dividing 1 by a number gives the reciprocal of that number.

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*.