



Name: _____

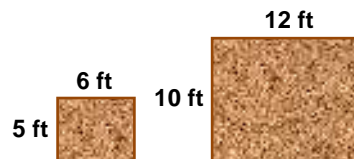
Date: _____

Student Exploration: Perimeters and Areas of Similar Figures

Vocabulary: scale factor, similar

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

Carl is seeding a 5-foot by 6-foot section and a 10-foot by 12-foot section of his backyard.

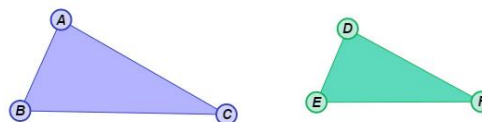


1. He plans to put a fence around each section after it has been seeded. How many times more fencing will he need for the larger section? _____ Why? _____

2. The amount of seed he needs depends on the area to be seeded. How many times more seed will he need for the larger section? _____ Why? _____

Gizmo Warm-up

In the *Perimeters and Areas of Similar Figures* Gizmo, you will compare the perimeters and areas of two **similar** figures. Similar figures have the same shape, but may not be the same size.



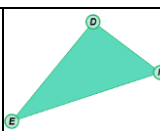
Be sure **Triangle** is selected. Set the **Similarity ratio** to 2.0. (Drag the slider, or select the number in the text field, type in a new value, and hit **Enter**.) Select **Show ruler** to open both rulers. Measure \overline{AB} and \overline{DE} by attaching the ruler's "donuts" to the endpoints.

1. What are the lengths of \overline{AB} and \overline{DE} ? $AB =$ _____ $DE =$ _____

2. Find the ratio of DE to AB . This ratio is the **scale factor**. How does this ratio compare to the similarity ratio? _____

3. Turn off the rulers. Set the **Similarity ratio** to 0.5. How do the sizes of $\triangle DEF$ and $\triangle ABC$ compare when the similarity ratio is less than one? _____



Activity A: Perimeter ratios	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Be sure Triangle is selected. • Check that the Similarity ratio is set to 0.5. 	
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1. Recall that the perimeter of a figure is the distance around the figure.

A. How do you think the perimeters of these triangles compare? _____

B. Use the Gizmo rulers to measure the sides of the triangles. Record the lengths below, and calculate the perimeters.

Perimeter of $\triangle ABC =$ _____ $+$ _____ $+$ _____ $=$ _____

Perimeter of $\triangle DEF =$ _____ $+$ _____ $+$ _____ $=$ _____

C. Find the ratio of the perimeters of the triangles in simplest form. Turn on **Show perimeter info** to check your perimeters and ratio.

$$\frac{\text{Perimeter of } \triangle DEF}{\text{Perimeter of } \triangle ABC} = \frac{\boxed{}}{\boxed{}} = \underline{\hspace{2cm}}$$

D. Experiment with a variety of triangles. Be sure to drag the vertices of both triangles. Find the ratio of the perimeters of $\triangle DEF$ to $\triangle ABC$ in each case.

What is the relationship between each perimeter ratio and the similarity ratio?

2. Select **Quadrilateral** from the **Figure type** dropdown menu. Set the **Similarity ratio** to 1.5. Drag the vertices of the quadrilaterals to create two irregular quadrilaterals.

A. How do you think the perimeters of these quadrilaterals compare? _____

B. Turn on **Show perimeter info**. What are the perimeters of the two figures?

Perimeter of $ABCD =$ _____ Perimeter of $EFGH =$ _____

C. How does the perimeter ratio compare to the similarity ratio? _____

3. Experiment with the other **Figure types** and **Similarity ratios**. For each set of figures, compare the perimeter ratio to the similarity ratio. What is always true about these ratios?



Activity B: Area ratios	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Turn off Show perimeter info. • Select Quadrilateral under Figure type. • Set the Similarity ratio to 2.0. 	
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1. Recall that the area of a figure is the number of square units inside the figure.

- A. How many of the small squares do you think will fit in the large square? _____
- B. Use the Gizmo rulers to measure one side of each square. Record the lengths below, and calculate the areas.

Area of $ABCD = \underline{\hspace{2cm}}^2 = \underline{\hspace{2cm}}$ Area of $EFGH = \underline{\hspace{2cm}}^2 = \underline{\hspace{2cm}}$

- C. Find the ratio of the areas of the squares in simplest form. Select **Show area info** to check your areas and ratio.

$$\frac{\text{Area of } EFGH}{\text{Area of } ABCD} = \frac{\text{[dashed box]}^2}{\text{[dashed box]}^2} = \underline{\hspace{2cm}}$$

- D. Use your work from above to fill in the second cell in the second row below. Then fill in the rest of the second column for the given similarity ratios. Drag the vertices of $ABCD$ to check that each area ratio is true for a variety of quadrilaterals.

Similarity ratio	Area ratio	
2.0		
1.5		
1.2		
0.8		
0.5		
0.2		

- E. How does the area ratio appear to be related to the similarity ratio? _____

- F. Title the last column in the table above "**Square of similarity ratio**". Then fill in the rest of last column with the square of each similarity ratio. What is always true about the area ratio of two similar quadrilaterals and the similarity ratio?

(Activity B continued on next page)



Activity B (continued from previous page)

2. Select **Triangle** from the **Figure type** menu.

A. Fill in the table below for the given similarity ratios. Drag the vertices of $\triangle ABC$ to check that each area ratio is true for a variety of triangles.

Similarity ratio	Area ratio	Square of similarity ratio
2.0		
1.5		
1.2		
0.8		
0.5		
0.2		

B. What is always true about the area ratio of two similar triangles and the similarity ratio? _____

3. Experiment with the other **Figure types** and **Similarity ratios**. For each set of figures, compare the area ratio to the similarity ratio. What is always true about these ratios?

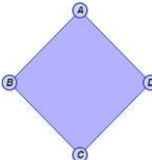
4. The ratio of the perimeters of two similar figures is 4:5.

A. What is the ratio of the areas of the figures? _____ Explain. _____

Check your answer in the Gizmo.

B. Suppose the figures are hexagons, and the area of the larger hexagon is 150 in.^2 . Find the area of the smaller hexagon. Show your work below.



<p>Activity C: Using area ratios</p>	<p><u>Get the Gizmo ready:</u></p> <ul style="list-style-type: none"> Select Quadrilateral from the Figure type dropdown menu. 	
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1. An 18-inch by 24-inch rectangular rug costs \$25. A 27-inch by 36-inch rug costs the same amount per square foot.

A. Are the rugs similar? _____ Explain. _____

B. What is the similarity ratio of the two rugs? _____

C. What is the area ratio of the two rugs? _____



Check your answer in the Gizmo by setting the **Similarity ratio** to the value you calculated above. (Do not try to recreate the exact shapes of the rugs.)

D. Find the cost of the larger rug. Show your work in the space below.

2. Tim is putting the same carpet in two similar rectangular bedrooms. The longest side of the larger bedroom is 20 feet and the longest side of the smaller bedroom is 12 feet.

A. What is the area ratio of the floor of the small bedroom to the floor of the large bedroom? _____ Check your answer in the Gizmo.

B. The area of the smaller bedroom is 108 square feet. Find the *total* amount of carpet Tim needs to buy. Show your work below.