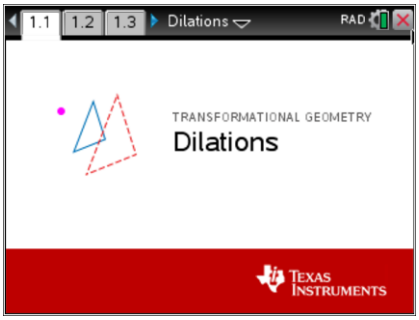
Dilations Lesson 2: Perimeters & Areas

Student Activity

Name _____

Class _____

In this lesson, you will investigate the relationship between the perimeters and areas of dilated triangles and their ratios.
Open the document: *Dilations.tns.*



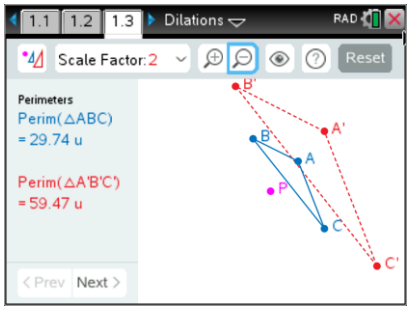
PLAY INVESTIGATE EXPLORE DISCOVER

It is important that the Dilations Tour be done before any Dilations lessons.

Move to page 1.3.

On the handheld, press ctrl ▶ and ctrl ◀ to navigate through the pages of the lesson.
On the iPad®, select the page thumbnail in the page sorter panel.

1. a. Press menu to open the menu on the handheld.
(On the iPad, tap on the wrench icon to open the menu.)
Press 1 (1: Templates) then 2 (2: Perimeters & Areas).
b. Dilate ΔABC about point P with a Scale Factor of 2 (or D). Zoom in (+) or out (−) as needed. Observe.
Record the *Original* perimeters (*first perimeters displayed*) in the first row of the table below.
Discuss in your groups the meaning of the 'perimeter of a triangle.'



2. a. Investigate perimeters by grabbing and moving each of the three vertices of ΔABC to create different shaped triangles. Try to make one of the perimeters a whole number. Record the data.
b. Move point P and record the perimeters in the table.

Scale Factor = 2	Perimeter (ΔABC)	Perimeter ($\Delta A'B'C'$)
Original		
Figure 1		
Figure 2		

3. Make a **conjecture** about the perimeters of a triangle and its image under a dilation about a point. (A ***conjecture*** is an opinion or conclusion based upon what is observed.)

4. Reset the page (Reset or ctrl followed by del). Change the scale factor to 3 by pressing Scale Factor: 2 (×) and use the directional arrows (▲ ▼ ◀ ▶) on the touchpad to select the

Scale Factor 3, then press ⊡ or enter.

Dilate ΔABC with the scale factor chosen (or D). Zoom in (+) or out (−) as needed. Advance to the 'Areas' data by pressing Next ( ) (right parenthesis key).

Observe. Record the *Original* areas (*first areas displayed*) in the first row of the following table.

5. a. Investigate areas by grabbing and moving each of the three vertices of ΔABC to create different shaped triangles. Record the area data. Discuss in your groups the meaning of the 'area' of a triangle.

   b. Move point P and record the areas in the table.

Scale Factor = 3	Area (ΔABC)	Area ($\Delta A'B'C'$)
Original		
Figure 1		
Figure 2		

6. Make a conjecture about the areas of a triangle and its image under a dilation about a point.

7. Reset the page (Reset or ctrl followed by del). To validate the conjectures, change the scale factor to 4 by pressing Scale Factor: 2 (×) and use the directional arrows (▲ ▼ ◀ ▶) on the touchpad to select Scale Factor 4, then press ⊡ or enter.

   Dilate ΔABC about point P with a Scale Factor of 4 (or D).

   Zoom in (+) or out (−) as needed.

   Advance to the 'Ratio of Perimeters' ('Perim $(\Delta A'B'C')$ / Perim (ΔABC)') data by pressing Next ( ) . Observe. Record the *Original* ratios of the perimeters (*first ratios displayed*) in the table on the next page.

8. a. Investigate the Ratios of Perimeters by grabbing and moving each of the three vertices of ΔABC to create different shaped triangles. Record the ratios of the perimeters for each triangle in the table.

   b. Move point P and record the ratios of the perimeters in the table.

   c. Advance to the 'Ratio of Areas' ('Area $(\Delta A'B'C')$ / Area (ΔABC)' data by pressing Next ( ) twice. Record the Original ratios of the areas (*first ratios displayed*) in the table on the next page.

d. Investigate the ratios of the areas by grabbing and moving each of the three vertices of ΔABC to create different shaped triangles. Move point P as well.

Record the ratios of the areas for each triangle in the table below.

Scale Factor = 4	$\frac{Perim(\Delta A'B'C')}{Perim(\Delta ABC)}$	$\frac{Area(\Delta A'B'C')}{Area(\Delta ABC)}$
Original		
Figure 1		
Figure 2		
Figure 3		

9. Reset the page (Reset or ctrl followed by del). Repeat the earlier investigation for the ratios of perimeters and areas but using a different scale factor than 2 or 4. If working with a partner or in a group, each person should choose a different scale factor. If working on your own, use a scale factor of 1/2.

To change the scale factor, press Scale Factor: 2 (×) and use the directional arrows (▲ ▼ ◀ ▶) on the touchpad to select the scale factor, then press ☜ or enter.

Dilate ΔABC with the scale factor chosen (or D). Zoom in (+) or out (−) as needed.

a. Create different triangles as before by grabbing and moving vertices and point P. Record the ratios of the perimeters and the ratios of the areas for three different figures. Use the Next (}) and Prev ({) buttons to access the desired data.

b. Record the scale factor here: **Scale Factor =** _____ and the ratios in the table below.

	$\frac{Perim(\Delta A'B'C')}{Perim(\Delta ABC)}$	$\frac{Area(\Delta A'B'C')}{Area(\Delta ABC)}$
Figure 1		
Figure 2		
Figure 3		

If the ratios are expressed as decimals, also write the ratios as their fraction equivalents.
Based upon the entries in the table, write at least two conjectures about what you have observed.
Compare your results with your classmates.

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10. Advance to the 'Scale Factor' data by pressing Next ( ). What do you notice on this page? How does this compare with your conjectures? Discuss in your groups.

11. Suppose that ΔDEF were dilated about point P with a scale factor of 5.

a. $\frac{Perim(\Delta D'E'F')}{Perim(\Delta DEF)} = \_\_\_\_\_$

b. $\frac{Area(\Delta D'E'F')}{Area(\Delta DEF)} = \_\_\_\_\_$

c. $\frac{Perim(\Delta DEF)}{Perim(\Delta D'E'F')} = \_\_\_\_\_$

12. Suppose that ΔDEF were dilated about point P with a scale factor of $\frac{1}{3}$.

a. $\frac{Perim(\Delta D'E'F')}{Perim(\Delta DEF)} = \_\_\_\_\_$

b. $\frac{Area(\Delta D'E'F')}{Area(\Delta DEF)} = \_\_\_\_\_$

c. $\frac{Perim(\Delta DEF)}{Perim(\Delta D'E'F')} = \_\_\_\_\_$

13. What is the relationship between the ratios of the perimeters and the scale factor of dilated images? Explain your answer.

14. What is the relationship between the ratios of the areas and the scale factor of dilated images? Explain your answer.