Homework: Investigation 4B **Name:**

4.07

5. Choose a favorite picture. It might be like Trig, the horse shown here. Dilate the picture by the factor 2 to make a scaled sketch. You do not need to scale all the details from your picture. A rough outline is fine, but be sure to include at least the important ones.

In Exercises 6–9, you can investigate a dilation that has surprising results. Stand in front of a mirror (perhaps a bathroom mirror at home). Trace your image with a bar of soap. Include important features like your eyes, nose, mouth, and chin.

6. Use a ruler. Measure a few of the distances on your mirror picture. How far apart are your eyes? How wide is your mouth? How far is it from your chin to the top of your head?

7. Compare the distances you've measured on the mirror to the actual measurements of your face. Are they the same?

8. How can the concept of dilation help explain your results?

9. Stand in front of the mirror again. Have a friend trace the image of your face. Is the picture the same as the one you traced? Explain.

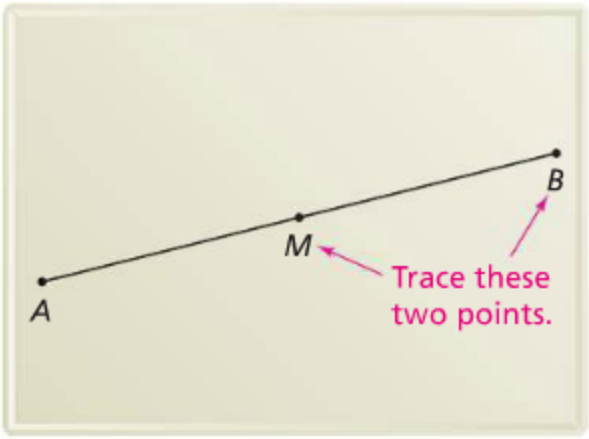
10. **Standardized Test Prep** Suppose you dilate a square by the factor 2. How does the area of the dilated square compare to the area of the original square?

A. It is the same. **B.** It is 2 times greater.

C. It is 4 times greater. **D.** It is 8 times greater.

11. Take It Further Dilating a figure with a pencil and ruler takes plenty of patience. You need to dilate many points to get a good outline of the scaled copy. Geometry software lets you speed up the process.

With geometry software, draw $\overline{AB}$. Construct its midpoint, M. Select points B and M. Use the Trace feature to indicate that you want the software to keep track of the paths of B and M.



a. Move point B around the screen to draw a picture or perhaps sign your name. Compare point B's path to the path traced by point M. Are they the same? How are they related?

Point *A* should stay fixed as you move point *B*.

b. Use the software's segment tool. Draw a polygon on your screen. Move point B along the sides of the polygon. Describe the path traced by point M.

c. As you move point B, trace $\overline{AB}$ as well as points B and M. How does your final picture illustrate the concept of dilation?

Move point *B* fairly quickly. If you move it slowly, the screen fills up with traced segments and the picture is hard to see.

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9. Draw any polygon. Scale it by 2 using the ratio method. Let the center of dilation be as given.

a. outside the polygon **b.** inside the polygon **c.** on the polygon

d. Explain how the location of the center of dilation affects the scaled copy.

10. Draw a polygon. Make a scaled copy that shares a vertex with the original. Use any scale factor you like (other than 1).

11. Draw a polygon. Make a scaled copy that has one side containing the corresponding side of the original.

One side of the copy contains the corresponding side of the original. From this, what can you conclude about the dilation?

12. Julia scaled a polygon three times.

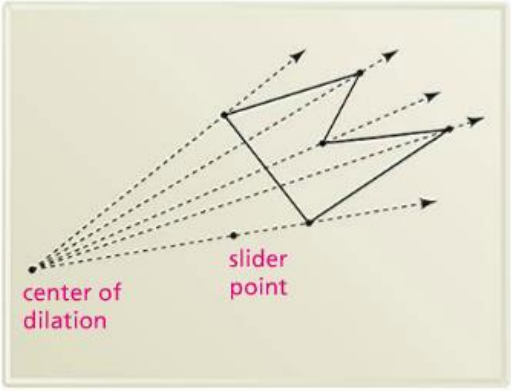
a. The first scaled copy was closer to the center of dilation than the original polygon. What can you say about the scale factor?

b. The second scaled copy was farther from the center of dilation than the original polygon. What can you say about the scale factor?

c. The third scaled copy was the same distance from the center of dilation as the original polygon. What can you say about the scale factor? Be careful!

If you use the parallel method with geometry software, you can make a whole series of different-sized scaled polygons. And you do not have to start from scratch each time. The next exercise describes how to do it.

13. Use geometry software. Construct a polygon and a center of dilation. Construct rays from this center through the polygon's vertices. Then place a point anywhere along one of the rays. This will be a "slider point." It will control the amount of dilation.



Use the slider point as the starting point for the dilated image. With the parallel method, complete a dilated copy of the polygon. When your dilated copy is complete, move the slider point back and forth along its ray. Describe what happens.

14. **Take It Further** With your polygon and its scaled copy from Exercise 13, use the software to calculate the scale factor. This scale factor should update itself automatically as you move the slider point. For what location(s) of the slider point is the scale factor as follows?

a. less than one **b.** greater than one **c.** equal to one

15. **Standardized Test Prep** One figure is made of segments. A second figure is made of segments *and* curved parts. Why is the first figure easier to dilate?

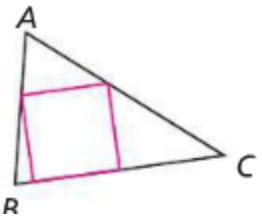
A. You can easily move the center of dilation of the first figure.

B. You only have to dilate the endpoints of the first figure's segments and then connect those points.

C. It is easier to place the center of the dilation inside the first figure.

D. You cannot dilate the curved parts.

16. **Take It Further** Draw $\triangle ABC$ with pencil and paper or geometry software. Your challenge is to construct a square with one side lying on $\overline{BC}$ and the other two vertices on sides $\overline{AB}$ and $\overline{AC}$.



Habits of Mind

Visualize. You can shrink the square, keeping three vertices on the triangle. This should suggest an enlargement dilation that will reveal the construction steps.