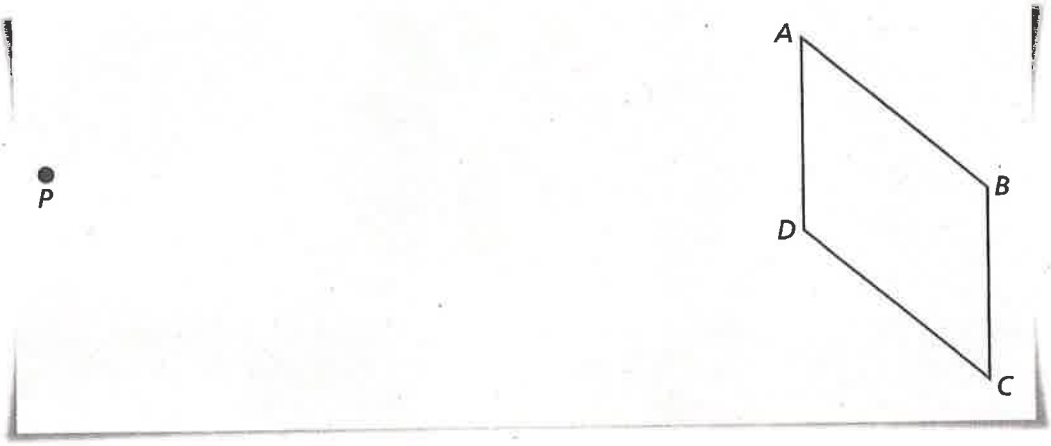
Applications

For Exercises 1 and 2, use the drawing at the right, which shows a person standing next to a ranger's outlook tower.

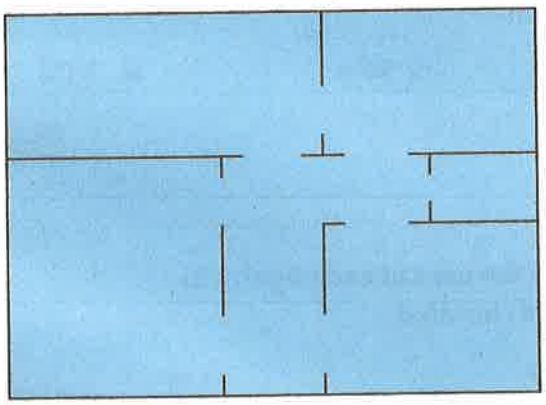
1. Find the approximate height of the tower if the person is
   - **a.** 6 feet tall
   - **b.** 5 feet 6 inches tall
2. Find the approximate height of the person if the tower is
   - **a.** 28 feet tall
   - **b.** 36 feet tall
3. Copy square *ABCD* and anchor point *P* onto a sheet of paper. Use the rubber-band method to enlarge the figure. Then, answer parts (a)–(e) below.

   - **a.** How do the side lengths of the original figure compare to the side lengths of the image?
   - **b.** How does the perimeter of the original figure compare to the perimeter of the image?
   - **c.** How do the angle measures of the original figure compare to the angle measures of the image?
   - **d.** How does the area of the original figure compare to the area of the image? How many copies of the original figure would it take to cover the image?
   - **e.** How does the distance between each point in the original figure and *P* compare to the corresponding distances in the image?

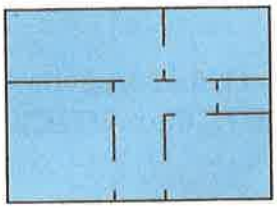
4. Copy parallelogram *ABCD* and anchor point *P* onto a sheet of paper. Use the rubber-band method to enlarge the figure. Then, answer parts (a)–(e) from Exercise 3 for your diagram.



5. The diagram on the left is the floor plan for a model house. The diagram on the right is a scale drawing of the floor plan. The scale drawing was made by reducing the original on a copy machine.



Original



Reduced Image

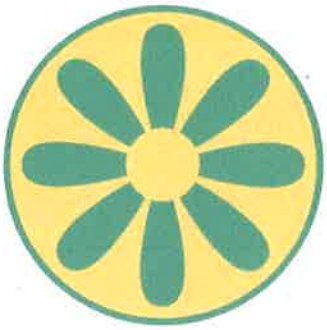
a. Estimate the copier size factor used. Give your answer as a percent.

b. How do the segment lengths in the original plan compare to the corresponding segment lengths in the reduced image?

c. Compare the area of the entire original floor plan to the area of the entire reduced image. Then, do the same with one room in the plan. Is the relationship between the areas of the rooms the same as the relationship between the areas of the whole plans? Explain.

d. The scale on the original plan is 1 inch = 1 foot. This means that 1 inch on the floor plan represents 1 foot on the model house. What is the scale on the reduced plan?

6. Multiple Choice Suppose you reduce the design below with a copy machine. Which of the following can be the image?



A. 

B. 

C. 

D. 

7. Suppose you copy a drawing of a polygon using the given size factor. How will the side lengths, angle measures, and perimeter of the image compare to those of the original?

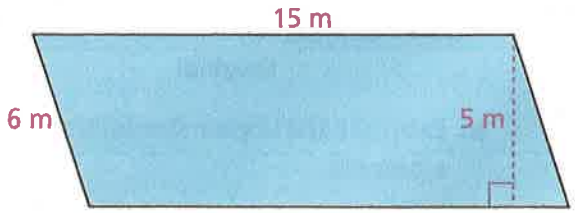
a. 200% **b.** 150% **c.** 50% **d.** 75%

Connections

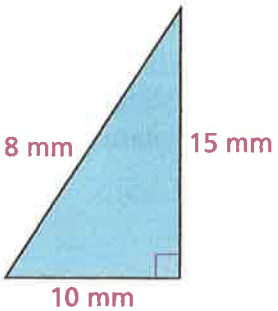
For Exercises 8–11, find the perimeter and the area of each figure. In Exercises 10 and 11, the measurements are rounded.

8.

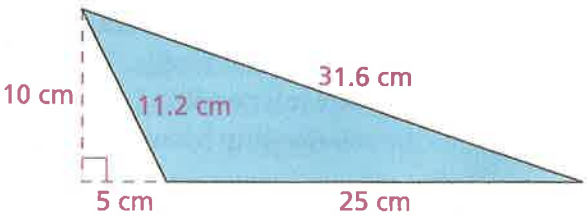
9.



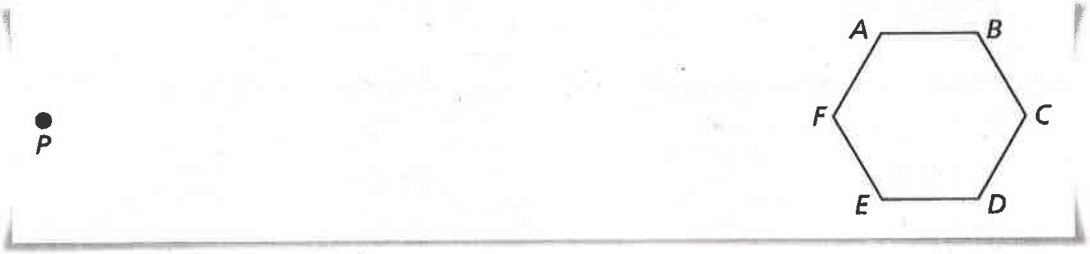
10.



11.



12. Copy hexagon *ABCDEF* and anchor point *P* onto a sheet of paper. Make an enlargement of the hexagon using your two-band stretcher.



a. How do the side lengths of the two hexagons compare?

b. How do the angles of the hexagons compare?

c. How do the areas of the hexagons compare?

d. How do the perimeters of the hexagons compare?

13. Find the given percent of each number. Show your work.

a. 25% of 120

b. 80% of 120

c. 120% of 80

d. 70% of 150

e. 150% of 200

f. 200% of 150

14. Multiple Choice What is the 5% sales tax on a $14.00 compact disc?

A. $0.07

B. $ 0.70

C. $7.00

D. $70.00

15. Multiple Choice What is the 15% service tip on a $25.50 dinner in a restaurant?

F. $1.70

G. $ 3.83

H. $5.10

J. $38.25

16. Multiple Choice What is the 28% tax on a $600,000 cash prize?

A. $16,800 **B.** $ 21,429

C. $168,000 **D.** $214,290

17. Multiple Choice What is the 7.65% Social Security/Medicare tax on a paycheck of $430?

F. $3.29 **G.** $5.62

H. $32.90 **J.** $60.13

18. One angle measure is given for each of the parallelograms below.

- Find the measure of the other three angles in the parallelogram.
- List all pairs of supplementary angles in the diagram. Then, classify each angle as *acute, right,* or *obtuse.*
- For each parallelogram, find the measures of the angles formed by extending two adjacent sides through their common vertex.

a.

b.

19. While shopping for sneakers, Ling finds two pairs she likes. One pair costs $55 and the other costs $165. She makes the following statements about the prices.

"The expensive sneakers cost $110 more than the cheaper sneakers."

"The cost of the expensive sneakers is 300% of the cost of the cheaper sneakers."

"The cheaper sneakers are $\frac{1}{3}$ the cost of the expensive sneakers."

a. Are all her statements accurate? Explain.

b. How are the comparison methods Ling uses like the methods you use to compare the sizes and shapes of similar figures?

c. Which statements are appropriate for comparing the size and shape of an image to the original figure? Explain.

Extensions

20. A movie projector that is 6 feet away from a large screen shows a rectangular picture that is 3 feet wide and 2 feet high.

a. Suppose the projector is moved to a point 12 feet from the screen. What size will the picture be (width, height, and area)?

b. Suppose the projector is moved to a point 9 feet from the screen. What size will the picture be (width, height, and area)?

21. Amy's friend gave her a picture from Field Day. The picture is 3 in. by 2 in. Amy has a picture frame that is 6 in. by 4 in. She wants the photo to fit in the frame exactly. What percent enlargement does she need to make?

22. Make a three-band stretcher by tying three rubber bands together. Use this stretcher to enlarge the "Super Sleuth" drawing from Problem 1.1.

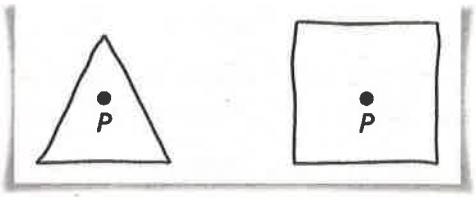
a. How does the shape of the image compare to the shape of the original figure?

b. How do the lengths of the segments in the two figures compare?

c. How do the areas of the two figures compare?

d. How do the distances from P compare?

23. Suppose you enlarge some triangles and squares with a two-band stretcher. You use an anchor point inside the original figure, as shown in the sketches below.



a. In each case, how do the shape and position of the image compare to the shape and position of the original?

b. What relationships do you expect to find among the side lengths, angle measures, perimeters, and areas of the figures, and the distances from *P*?

c. Test your ideas with larger copies of the given shapes. Make sure the shortest distance from the anchor point to any side of a shape is at least one band length.

24. Suppose you make a stretcher with two different-sized rubber bands. Suppose the band attached to the anchor point is twice as long as the band attached to the pencil.

a. If you used the stretcher to enlarge polygons, what relationships would you expect to find among the side lengths, angle measures, perimeters, and areas of the figures?

b. Test your ideas with copies of some basic geometric shapes.