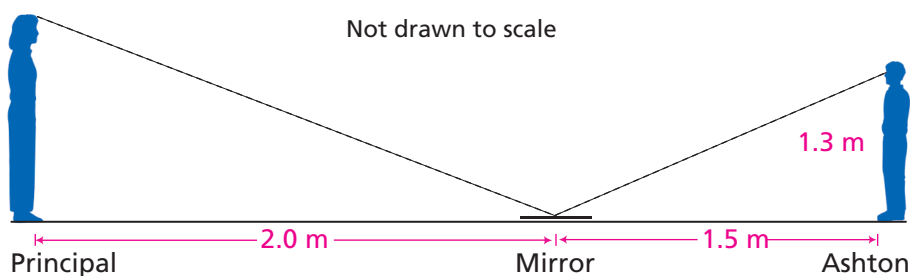


## Applications

1. The Washington Monument is the tallest structure in Washington, D.C. At the same time the monument casts a shadow that is about 500 feet long, a 40-foot flagpole nearby casts a shadow that is about 36 feet long. Make a sketch. Find the approximate height of the monument.
2. Darius uses the shadow method to estimate the height of a flagpole. He finds that a 5-foot stick casts a 4-foot shadow. At the same time, he finds that the flagpole casts a 20-foot shadow. Make a sketch. Use Darius's measurements to estimate the height of the flagpole.

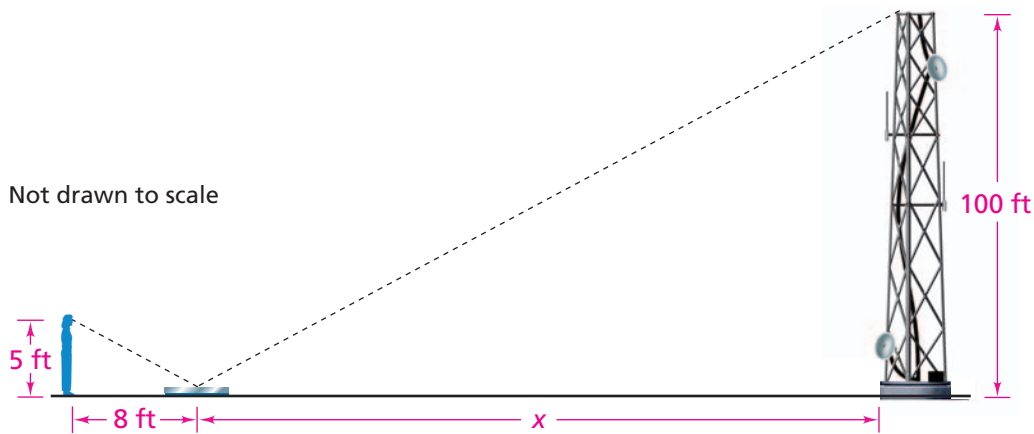


3. The school principal visits Ashton's class one day. The principal asks Ashton to show her what they are learning. Ashton uses the mirror method to estimate the principal's height. This sketch shows the measurements he records.

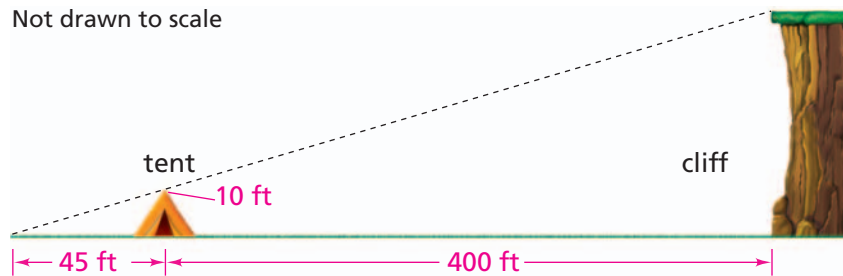


- a. What estimate should Ashton give for the principal's height?
- b. Is your answer to part (a) a reasonable height for an adult?

4. Stacia stands 8 feet from a mirror on the ground. She can see the top of a 100-foot radio tower in the center of the mirror. Her eyes are 5 feet from the ground. How far is the mirror from the base of the tower?



5. Judy lies on the ground 45 feet from her tent. Both the top of the tent and the top of a tall cliff are in her line of sight. Her tent is 10 feet tall. About how high is the cliff?



## Connections

Find the value of  $x$  that makes the fractions equivalent.

6.  $\frac{5}{2} = \frac{x}{8}$

7.  $\frac{2}{5} = \frac{7}{x}$

8.  $\frac{7}{5} = \frac{28}{x}$

9.  $\frac{7.5}{10} = \frac{3}{x}$

10.  $\frac{1}{7} = \frac{x}{35}$

11.  $\frac{x}{5} = \frac{60}{100}$

12.  $\frac{4}{10} = \frac{x}{5}$

13.  $\frac{3}{3.6} = \frac{x}{6}$

Find the given percent or fraction of the number.

14. 30% of 256

15. 25% of 2,048

16.  $\frac{2}{3}$  of 24

17.  $\frac{5}{6}$  of 90

Write each comparison as a percent.

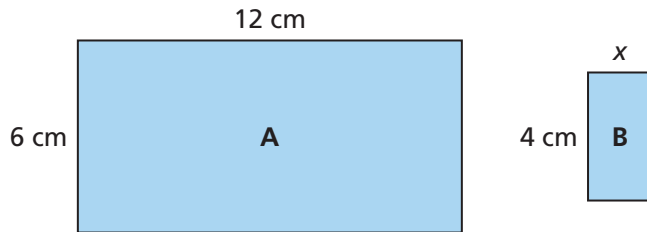
18. 55 out of 100

19. 13 out of 39

20. 2.5 out of 10

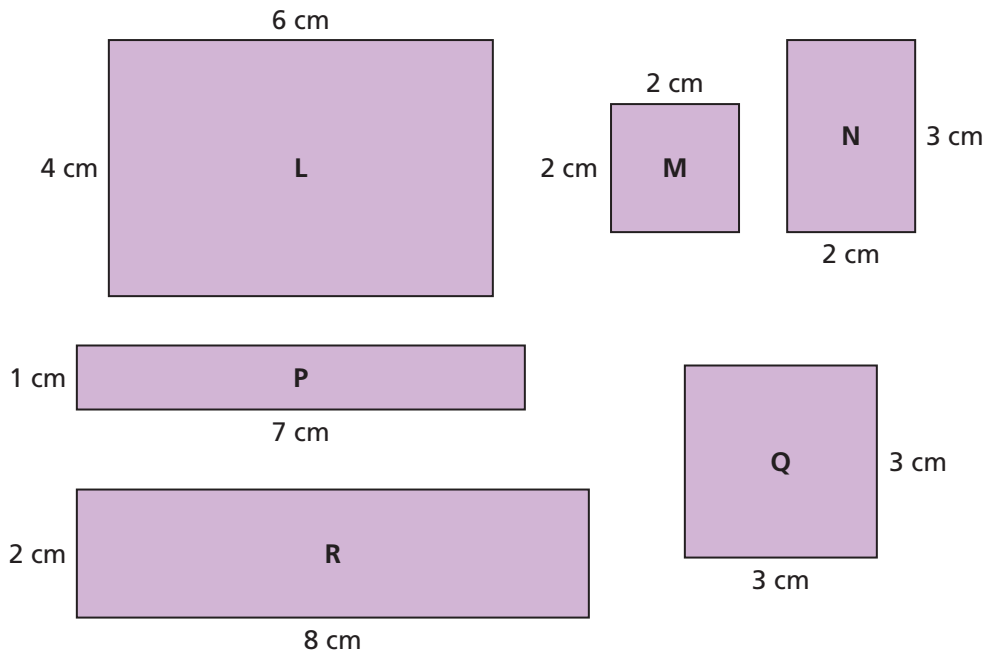
21. 5 out of 100

22. The rectangles below are similar. The figures are not shown at actual size.

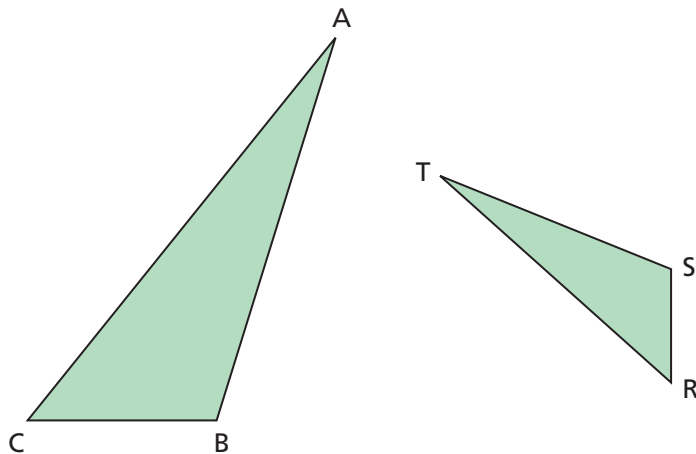


- What is the scale factor from rectangle A to rectangle B?
- Complete the following sentence in two different ways. Use the side lengths of rectangles A and B.  
*The ratio of ■ to ■ is equivalent to the ratio of ■ to ■.*
- What is the value of  $x$ ?
- What is the ratio of the area of rectangle A to the area of rectangle B?

For Exercises 23 and 24 on page 87, use the rectangles below. The rectangles are not shown at actual size.

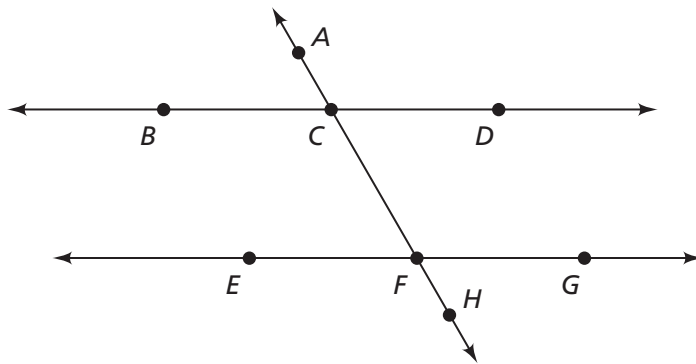


- 23. Multiple Choice** Which pair of rectangles is similar?  
**A.** L and M      **B.** L and Q      **C.** L and N      **D.** P and R
- 24. a.** Find at least one more pair of similar rectangles.  
**b.** For each similar pair, find both the scale factor relating the larger rectangle to the smaller rectangle and the scale factor relating the smaller rectangle to the larger rectangle.  
**c.** For each similar pair, find the ratio of the area of the larger rectangle to the area of the smaller rectangle.
- 25.** The two triangles are similar.



- a.** Find the corresponding vertices.  
**b.** Estimate the scale factor that relates triangle  $ABC$  to triangle  $TSR$ .  
**c.** Estimate the scale factor that relates triangle  $TSR$  to triangle  $ABC$ .  
**d.** Use your result from part (b). Estimate the ratio of the area of triangle  $ABC$  to the area of triangle  $TSR$ .  
**e.** Use the result from part (c). Estimate the ratio of the area of triangle  $TSR$  to the area of triangle  $ABC$ .

26. Parallel lines  $BD$  and  $EG$  are intersected by line  $AH$ . Eight angles are formed by the lines, four around point  $C$  and four around point  $F$ .



- Name every angle that is congruent to (has the same measure as) angle  $ACD$ .
- Name every angle that is congruent to angle  $EFC$ .

For Exercises 27–31, suppose a photographer for a school newspaper takes this picture for a story. The editors want to resize the photo to fit in a specific space of the paper.



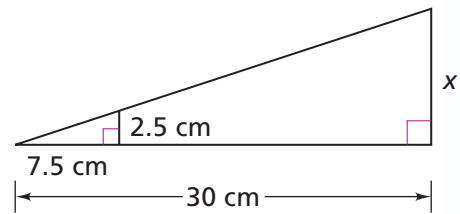
- The original photo is a rectangle that is 4 inches wide and 6 inches high. Can it be changed to a similar rectangle with the given measurements (in inches)?
  - 8 by 12
  - 9 by 11
  - 6 by 9
  - 3 by 4.5
- Suppose that the school copier only has three paper sizes (in inches):  $8\frac{1}{2}$  by 11, 11 by 14, and 11 by 17. You can enlarge or reduce documents by specifying a percent from 50% to 200%. Can you make copies of the photo that fit exactly on any of the three paper sizes?

**Homework**  
**Help**  **Online**  
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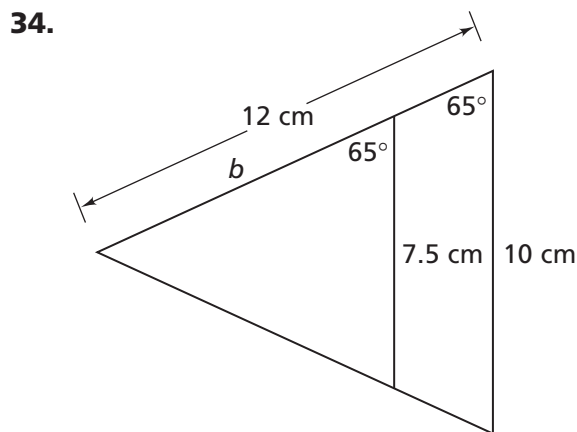
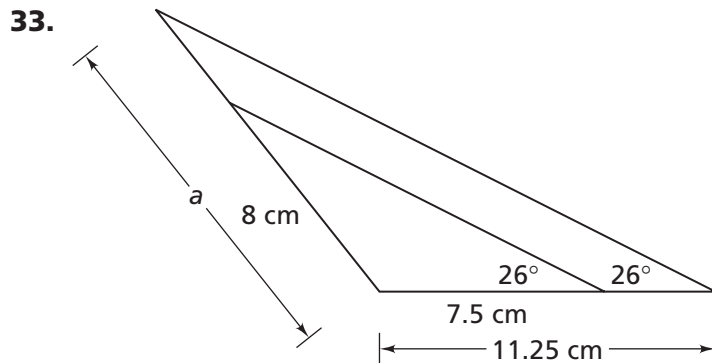
For: Help with Exercise 27  
Web Code: ane-2527

- 29.** How can you use the copy machine to reduce the photo to a copy whose length and width are 25% of the original dimensions? How does the area of the new copy relate to the area of the original photo? (**Hint:** The machine accepts only factors from 50% to 200%.)
- 30.** How can you use the copy machine to reduce the photo to a copy whose length and width are 12.5% of the original dimensions? 36% of the original dimensions? How does the area of the reduced figure compare to the area of the original in each case?
- 31.** What is the greatest enlargement of the photo that will fit on paper that is 11 inches by 17 inches?
- 32. Multiple Choice** What is the correct value for  $x$ ?  
The figure is not shown at actual size.

- A.** 3 cm                      **B.** 10 cm  
**C.** 12 cm                    **D.** 90 cm

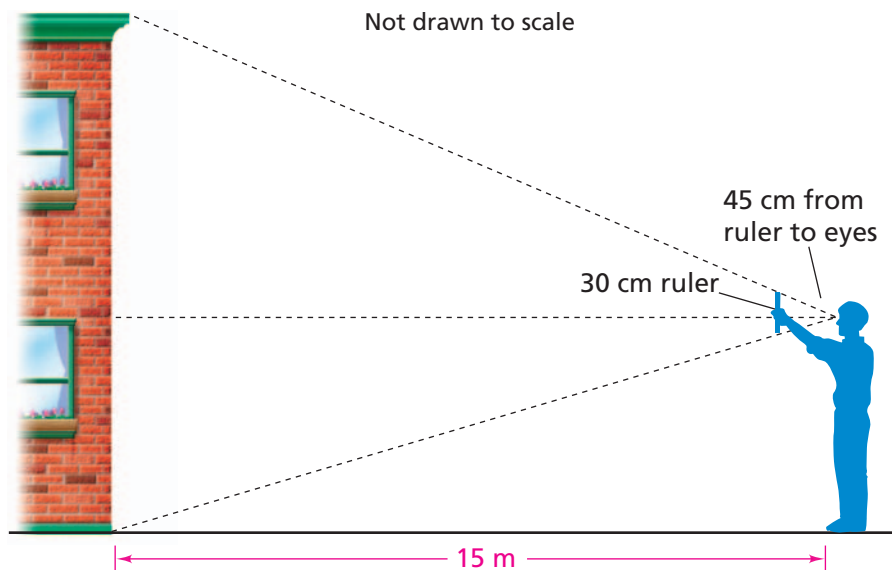


**For Exercises 33–34, find each missing measure. The figures are not shown at actual size.**



## Extensions

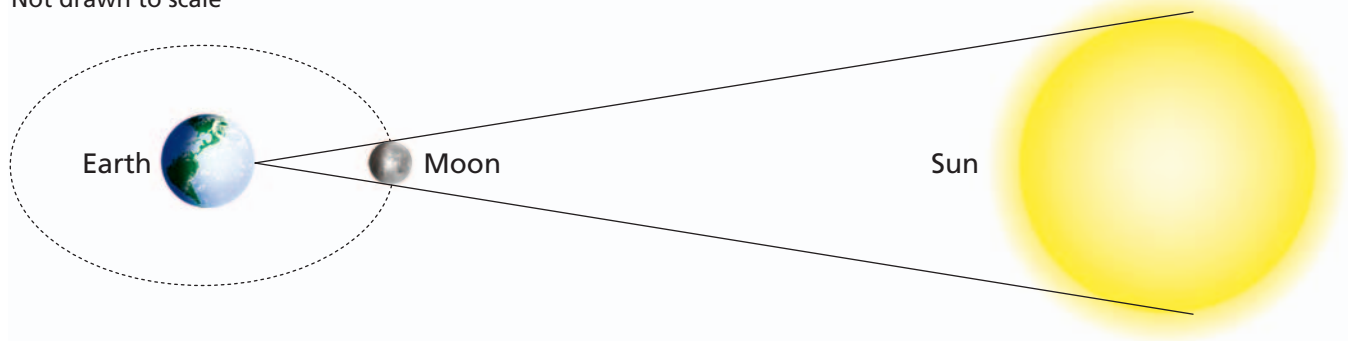
- 35.** Use the mirror method, the shadow method, or another method involving similar triangles to find the height of a telephone pole, a light pole, a tall tree, or a tall building in your town. Explain your method.
- 36.** Tang thinks he has found a way to use similar triangles to find the height of the building. He stands 15 meters from a building and holds a 30-centimeter ruler in front of his eyes. The ruler is 45 centimeters from his eyes. He can see the top and bottom of the building as he looks above and below the ruler.



- a.** Do you see any similar triangles in the diagram that can help Tang find the height of the building?
- b.** How tall is the building?

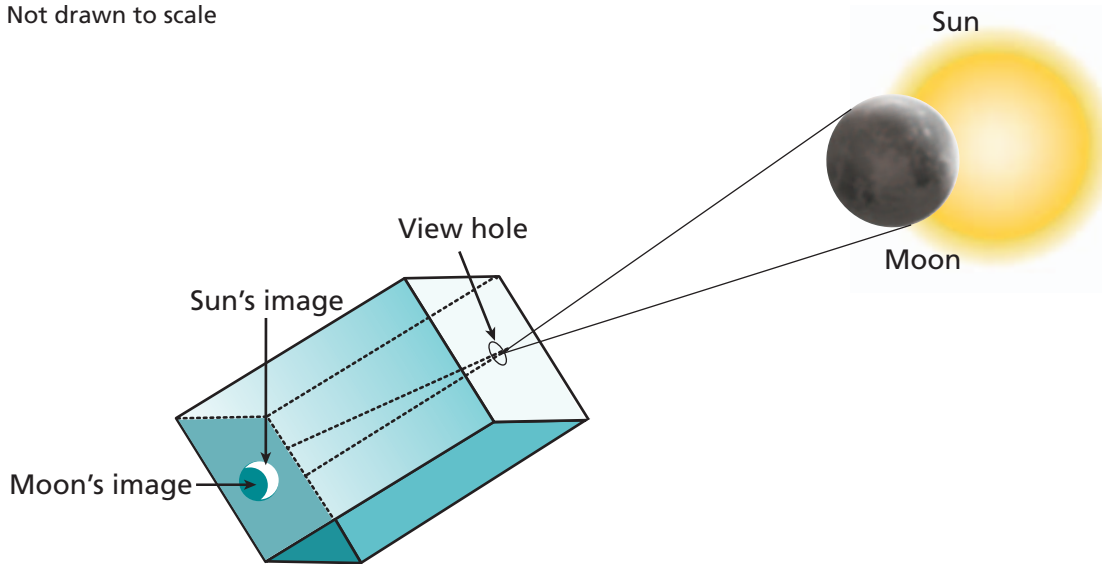
- 37.** In an annular eclipse (a kind of solar eclipse), the moon moves between Earth and the sun, blocking part of the sun's light for a few minutes. Around 240 B.C., a scientist used eclipses to estimate the distances between Earth, the moon, and the sun.

Not drawn to scale



In 1994, there was an annular eclipse. A class constructed a viewing box like the one shown.

Not drawn to scale



During the eclipse, the image of the moon almost completely covered the sun. The moon's shadow and the ring of light surrounding it appeared on the bottom of the viewing box. The moon's image was 1 meter from the view hole, and its diameter was 0.9 centimeter. The actual diameter of the moon is about 3,500 kilometers. Estimate the distance to the moon at the time of the eclipse.



- 38.** Some evening when you see a full moon, go outside with a friend and use a coin to exactly block the image of the moon.
- a.** How far from your eyes do you have to hold the coin? Can you hold it yourself or does your friend have to hold it for you?
  - b.** The diameter of the moon is about 2,160 miles. The distance from the Earth to the moon is about 238,000 miles. Use these numbers, the diameter of your coin, and similar triangles to find the distance you have to hold the coin from your eye to just block the moon. How does the distance you find compare to the distance you measured in part (a)?

