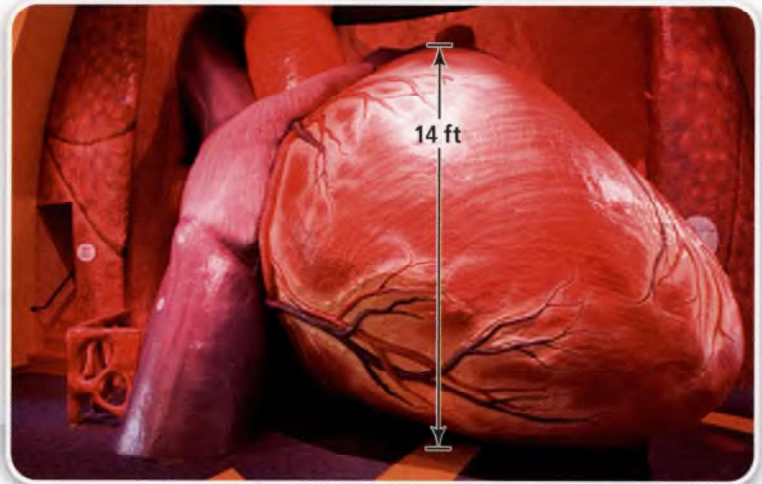


Problem 4 Using Scale Models **STEM**

Science A giant model heart is shown below. The heart is the ideal size for a person who is 170 ft tall. About what size would you expect the heart of a man who is 6 ft tall to be?



Think

Is this problem like ones you have seen?

Yes. Scale model problems are like scale drawing problems, so you can write a proportion like you did to find the height of the building in Problem 2.

$$\frac{\text{height of giant heart}}{\text{height of man's heart}} = \frac{\text{height of giant person}}{\text{height of man}} \quad \text{Write a proportion.}$$

$$\frac{14}{x} = \frac{170}{6} \quad \text{Substitute.}$$

$$14(6) = 170x \quad \text{Cross Products Property}$$

$$0.49 \approx x \quad \text{Divide each side by 170 and simplify.}$$

The size of the man's heart would be about 0.49 ft, or 5.9 in.

- Got It?** 4. A scale model of a building is 6 in. tall. The scale of the model is 1 in. : 50 ft. How tall is the actual building?

Lesson Check

Do you know HOW?

- Photocopies** You use a photocopier to enlarge a drawing of a right triangle with a base of 13 cm and a height of 7 cm. The enlarged triangle has a height of 17.5 cm.
 - What is the base of the enlarged triangle?
 - What is the scale of the enlargement?
- Maps** The scale of a map is 1 cm : 75 km. What is the actual distance between two towns that are 3 cm apart on the map?

Do you UNDERSTAND? **MATHEMATICAL PRACTICES**

- Vocabulary** Suppose $\triangle MNP \sim \triangle RST$. How can you identify corresponding parts?
- Reasoning** Suppose $\triangle ABC \sim \triangle TUV$. Determine whether each pair of measures is equal.
 - the measures of $\angle A$ and $\angle T$
 - the perimeters of the two triangles
 - the ratios of the sides $\frac{BC}{UV}$ and $\frac{AC}{TV}$
- Reasoning** The scale of a map is 1 in. : 100 mi. Is the actual distance between two towns 100 times the map distance between the two towns? Explain.



Practice and Problem-Solving Exercises

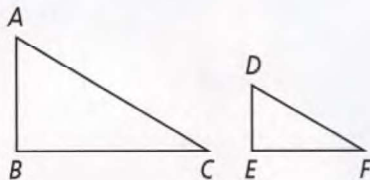


Practice

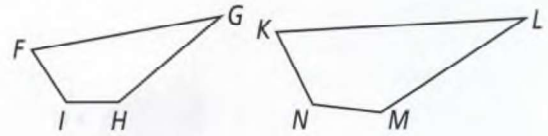
The figures in each pair are similar. Identify the corresponding sides and angles.

See Problem 1.

6. $\triangle ABC \sim \triangle DEF$

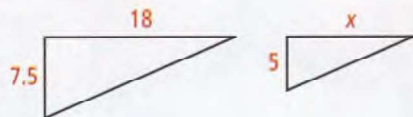


7. $FGHI \sim KLMN$

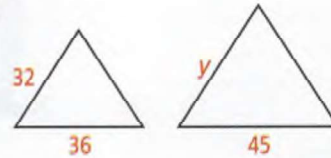


The figures in each pair are similar. Find the missing length.

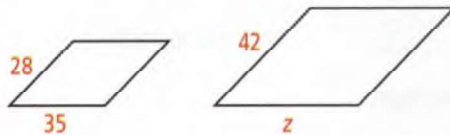
8.



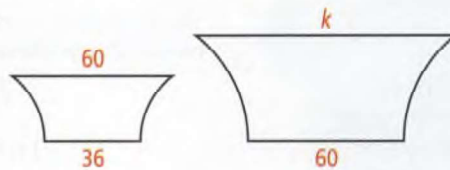
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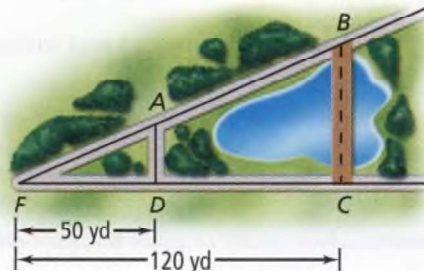
10.



11.



12. **Bridges** In the diagram of the park, $\triangle ADF \sim \triangle BCF$. The crosswalk at point A is about 20 yd long. A bridge across the pond will be built, from point B to point C. What will the length of the bridge be?



See Problem 2.

The scale of a map is 1 cm : 15 km. Find the actual distance corresponding to each map distance.

See Problem 3.

13. 2.5 cm

14. 0.2 cm

15. 15 cm

16. 4.6 cm

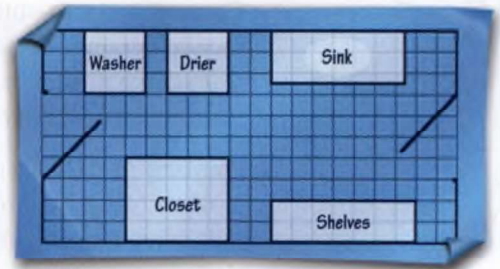
17. **Movies** A professional model-maker is building a giant scale model of a house fly to be used in a science fiction film. An actual fly is about 0.2 in. long with a wingspan of about 0.5 in. The model fly for the movie will be 27 ft long. What will its wingspan be?

See Problem 4.

18. **Maps** Abbottsville and Broken Branch are 175 mi apart. On a map, the distance between the two towns is 2.5 in. What is the scale of the map?

B Apply STEM

Architecture An architect is using the blueprint below to remodel a laundry room. The side length of each grid square represents 12 in.

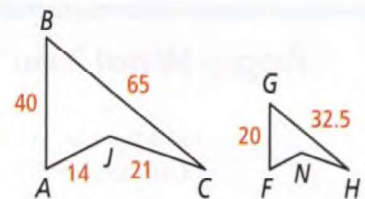


19. Find the actual length and width of the sink.
20. Find the total length and width of the actual room.
21. Will it be possible to wheel a laundry cart that is $3\frac{1}{2}$ ft wide through the room from the doorway at the left to the doorway at the right?

22. **Model Rockets** A particular model rocket kit uses the scale 1 : 144. The actual rocket is 168 ft tall. How tall will the model rocket be when completed?

23. **Error Analysis** The two figures at the right are similar. A student uses the proportion $\frac{BC}{CJ} = \frac{GH}{FN}$ to find FN .

- a. What mistake did the student make?
- b. What proportion should the student have used instead?



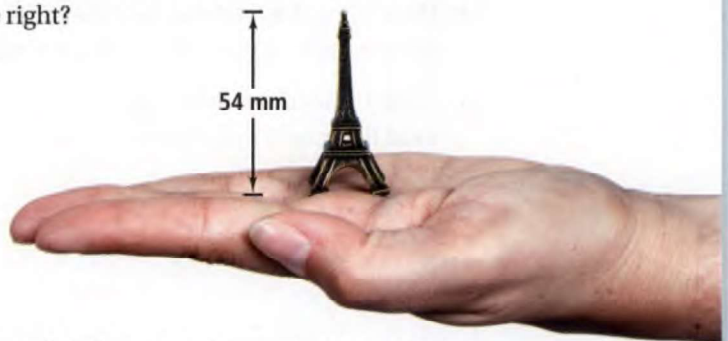
24. **Think About a Plan** An interior designer sketches a design for a rectangular rug. The dimensions of the sketch are 4 in. by 7.5 in. The dimensions of the actual rug will be ten times the dimensions of the drawing, so the scale of the drawing is 1 : 10. How many times the area of the sketch is the area of the actual rug?

- Which figures in the problem are similar? What are their dimensions?
- How can proportions help you find the dimensions of the actual rug?

25. **Trucks** A model of a tractor-trailer is shaped like a rectangular prism and has a width of 2 in., a length of 9 in., and a height of 4 in. The scale of the model is 1 : 34. How many times the volume of the model is the volume of the actual tractor-trailer?

26. **Eiffel Tower** The height of the Eiffel Tower is 324 m. Which scale was used to make the model of the Eiffel Tower shown at the right?

- A 1 mm : 0.9 m
- B 1 mm : 6 m
- C 1 mm : 30 m
- D 1 mm : 324 m



27. **Writing** Are all squares similar? Explain your answer.

28. **Reasoning** A boat maker wanted to build a canoe 6 ft long and $2\frac{1}{2}$ ft wide but decided that those dimensions were too small. The boat maker wants to add 2 ft to both the length and the width but also wants to keep the canoe the same shape. Explain why this will not work.