

Scale Drawings



Getting the Idea

A **scale drawing** is a representation of an actual object. The **scale** tells how to reduce or enlarge the dimensions of a scale drawing. Scale drawings are similar to and, therefore, proportional to the actual object.

Example 1

Ray went to visit the Great Pyramids. He learned that the base length of each triangular face is about 750 ft. He wants to make a scale drawing of the pyramids using the scale 1 in. = 150 ft. What will be the base length of his scale drawing?

Strategy Use the scale to write a proportion.

Step 1

Write the scale as a ratio.

The scale is 1 in. = 150 ft.

This means that, for each inch of the scale drawing, the actual length is 150 feet.

The ratio is $\frac{1 \text{ in.}}{150 \text{ ft.}}$

Step 2

Write a proportion using the ratio from Step 1.

Let x represent the base length of the scale drawing.

$$\frac{1 \text{ in.}}{150 \text{ ft.}} = \frac{\text{base length of scale drawing}}{\text{base length of actual pyramid}}$$

$$\frac{1}{150} = \frac{x}{750}$$

Step 3

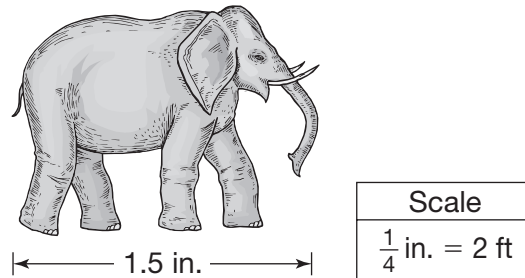
Solve the proportion.

$$\begin{aligned} \frac{1}{150} &= \frac{x}{750} \\ 150 \times x &= 750 \times 1 \\ 150x &= 750 \\ \frac{150x}{150} &= \frac{750}{150} \\ x &= 5 \end{aligned}$$

Solution The base length of Ray's scale drawing will be 5 inches.

Example 2

Loretta made a scale drawing of an elephant. What is the actual length of the elephant?



Strategy Use the scale to write a proportion.

Step 1

Write the scale as a ratio.

The scale is $\frac{1}{4}$ inch = 2 feet.

So the ratio is $\frac{\frac{1}{4} \text{ in.}}{2 \text{ ft}}$.

Step 2

Write a proportion.

Let x represent the actual length of the elephant.

$$\frac{\frac{1}{4} \text{ in.}}{2 \text{ ft}} = \frac{\text{scale drawing length}}{\text{actual length}}$$

$$\frac{\frac{1}{4}}{2} = \frac{1.5}{x}$$

Step 3

Solve the proportion.

$$\frac{\frac{1}{4}}{2} = \frac{1.5}{x}$$

$$\frac{1}{4} \times x = 2 \times 1.5$$

$$\frac{1}{4}x = 3$$

$$4 \times \frac{1}{4}x = 3 \times 4$$

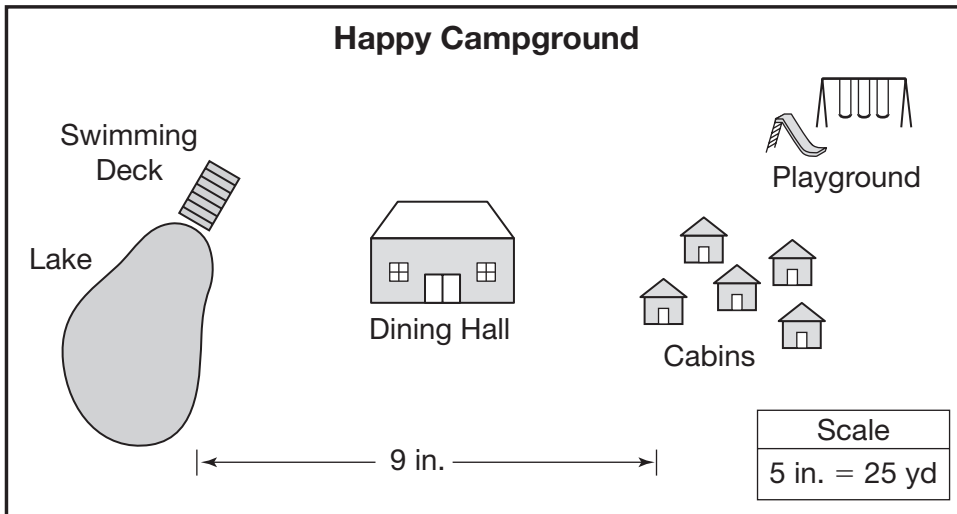
$$x = 12$$

Solution The actual length of the elephant is 12 feet.

A map is a type of scale drawing. You can use the scale on a map to find real-world distances, or use the scale to make an accurate map.

Example 3

The poster of Happy Campground shows the distance between the lake and the cabins.



What is the actual distance between the lake and the cabins?

Strategy Use the scale to write a proportion.

Step 1

Write the scale as a ratio.

The scale is 5 inches = 25 yards.

So, the ratio is $\frac{5 \text{ in.}}{25 \text{ yd}}$.

Step 2

Write a proportion.

Let x represent the actual distance.

$$\frac{5 \text{ in.}}{25 \text{ yd}} = \frac{\text{scale drawing distance}}{\text{actual distance}}$$

$$\frac{5}{25} = \frac{9}{x}$$

Step 3

Solve the proportion.

$$\frac{5}{25} = \frac{9}{x}$$

$$5 \times x = 25 \times 9$$

$$5x = 225$$

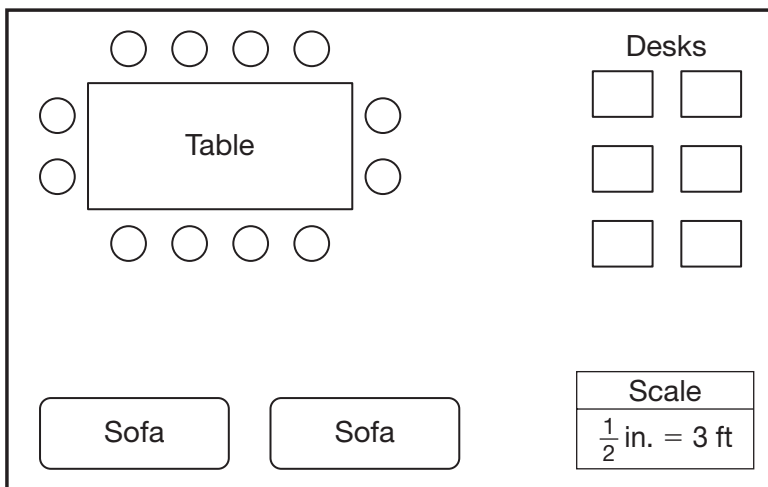
$$\frac{5x}{5} = \frac{225}{5}$$

$$x = 45$$

Solution The actual distance between the cabins and the lake is 45 yards.

Example 4

Drake made the scale drawing below of the lounge at a recreation center.



What is the actual area of the lounge?

Strategy Find the actual length and width of the lounge.

Step 1

Measure the length and width of the scale drawing.

The drawing is 4 inches long and 2.5 inches wide.

Step 2

Write a ratio of the scale.

The scale is $\frac{1}{2}$ inch = 3 feet.

So, the ratio is $\frac{\frac{1}{2} \text{ in.}}{3 \text{ ft}}$.

Step 3

Write and solve a proportion to find the actual length.

Let x represent the actual length of the lounge.

$$\frac{\frac{1}{2} \text{ in.}}{3 \text{ ft}} = \frac{\text{scale drawing length}}{\text{actual length}}$$

$$\frac{\frac{1}{2}}{3} = \frac{4}{x}$$

$$\frac{1}{2} \times x = 3 \times 4$$

$$\frac{1}{2}x = 12$$

$$2 \times \frac{1}{2}x = 12 \times 2$$

$$x = 24$$

The actual length of the lounge is 24 feet.

Step 4

Write and solve a proportion to find the actual width.

Let y represent the actual width of the lounge.

$$\frac{\frac{1}{2} \text{ in.}}{3 \text{ ft}} = \frac{\text{scale drawing width}}{\text{actual width}}$$

$$\frac{\frac{1}{2}}{3} = \frac{2.5}{y}$$

$$\frac{1}{2} \times y = 3 \times 2.5$$

$$\frac{1}{2}y = 7.5$$

$$2 \times \frac{1}{2}y = 7.5 \times 2$$

$$y = 15$$

The actual width of the lounge is 15 feet.

Step 5

Find the area of the lounge.

$$\text{Area} = \text{length} \times \text{width}$$

$$= 24 \text{ ft} \times 15 \text{ ft}$$

$$= 360 \text{ ft}^2$$

Solution The actual area of the lounge is 360 ft^2 .

**Coached Example**

Two cities are 420 miles apart. Kerri wants to draw a map that has a scale of $\frac{1}{2}$ inch = 50 miles. How far apart should Kerri draw the two cities on the map?

The scale is _____ inch = _____ miles.

Write a ratio of the scale as a fraction. _____

Let x represent the scale drawing distance.

Write a proportion to find the scale drawing distance. _____

Solve the proportion.

The scale drawing distance is _____ inches.

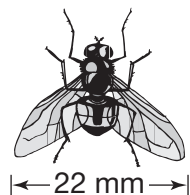
Kerri should draw the two cities _____ apart on the map.



Lesson Practice

Choose the correct answer.

1. Travis made a scale drawing of a horsefly. What is the actual wingspan of the horsefly?



Scale
4 mm = 1 cm

- A. 4.4 cm
 B. 5.0 cm
 C. 5.5 cm
 D. 6.4 cm
2. The scale of a map is $1\frac{1}{4}$ inches = 100 miles. On that map, two cities are $4\frac{1}{8}$ inches apart. What is the actual distance between the cities?
- A. 275 mi
 B. 330 mi
 C. 375 mi
 D. 412.5 mi
3. The scale on a map is 3 centimeters = 25 kilometers. Two rivers on the map are located 8.1 centimeters apart. What is the actual distance between the two rivers?
- A. 62.5 km
 B. 67.5 km
 C. 68.75 km
 D. 75 km

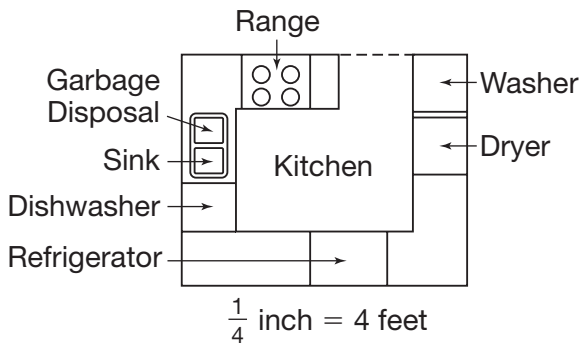
4. Asia made a scale drawing of her bedroom using a scale of 0.5 centimeter = 1 meter. The actual length of her bedroom is 4.5 meters. What is the length of Asia's bedroom on the scale drawing?

- A. 2.25 cm
 B. 2.5 cm
 C. 4.5 cm
 D. 5.0 cm

5. The length between consecutive bases on a major league baseball diamond is 90 feet. Alvin wants to make a scale drawing of a baseball field. If the bases are $2\frac{1}{2}$ inches apart on his scale drawing, what is Alvin's scale?

- A. 1 in. = 2.5 ft
 B. 1 in. = 3 ft
 C. 1 in. = 30 ft
 D. 1 in. = 36 ft

6. The length of the kitchen floor on the scale drawing is $1\frac{1}{2}$ inches.



What is the actual length of the kitchen floor?

- A. 16 ft C. 24 ft
 B. 22 ft D. 28 ft

7. Two fields of a state park are 1,200 meters from each other. On a map, the two fields are 8 centimeters apart. What scale is the map using?

- A. 1 cm = 120 m
 B. 1 cm = 130 m
 C. 1 cm = 150 m
 D. 1 cm = 160 m

8. Bella made a drawing of her rectangular bedroom with the scale of 1 inch = 3 feet. The drawing was 6 inches long by 4 inches wide.

- A. What are the dimensions of Bella's room? Show your work.

- B. What is the actual area of Bella's room? Show your work.

9. A map of several bicycle trails uses a scale of $2 \text{ cm} = 5 \text{ km}$. The actual lengths of three trails are given. How long is each trail on the map? Circle each correct number of centimeters.

12.5 km:	2.5	cm	25 km:	5	cm	67.5 km:	13.5	cm
	5			10			27	
	31.25			62.5			168.75	

10. A scale drawing uses a scale of $\frac{1}{4}$ inch = 4 feet. Draw a line from each actual size to the corresponding scale size.

- | | |
|------------|----------------------|
| A. 6 ft ● | ● $1\frac{3}{4}$ in. |
| B. 28 ft ● | ● $1\frac{1}{2}$ in. |
| C. 24 ft ● | ● $\frac{3}{8}$ in. |
| D. 14 ft ● | ● $\frac{7}{8}$ in. |

11. A golf course uses markers in the tee box of each golf hole to show a scale map of the hole. The markers have a scale of $1 \text{ in.} = 14 \text{ yd}$. Which is an accurate marker-distance combination? Circle all that apply.

- A. 215 in. = 3,010 yd
- B. 15 in. = 210 yd
- C. $39\frac{1}{4}$ in. = 550 yd
- D. $23\frac{1}{2}$ in. = 329 yd
- E. 10 in. = 160 yd
- F. 154 in. = 11 yd
- G. $30\frac{1}{2}$ in. = 427 yd

12. A state map uses a scale of 1 inch = 25 miles. Select True or False for each statement.

- A. 465 miles is equivalent to 18.6 inches on the map. True False
- B. 1,000 miles is equivalent to 4 inches on the map. True False
- C. 15 miles is equivalent to 375 inches on the map. True False
- D. 225 miles is equivalent to 9 inches on the map. True False

13. Two students each made a map of the school library using a different scale. An actual size and scale size is given for each map. Circle each correct scale.

15-ft long bookshelf = 3 cm

9-ft long sofa = 1.5 cm

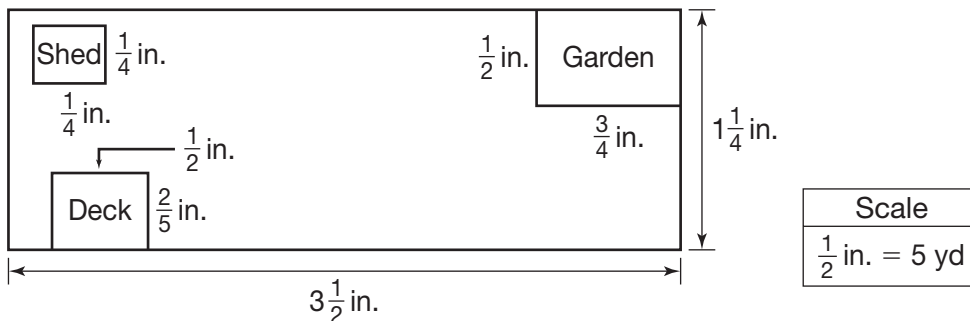
Scale:

5 ft = 1 cm
3 ft = 1 cm
1 ft = 5 cm

Scale:

3 ft = 1 cm
6 ft = 1 cm
8 ft = 1 cm

14. The map shows a scale drawing of Wilson's backyard. Circle every item whose actual size is shown.



- A. Shed: $2\frac{1}{2}$ yd by $2\frac{1}{2}$ yd
- B. Garden: 5 yd by $2\frac{1}{2}$ yd
- C. Deck: 4 yd by 5 yd
- D. Backyard: $12\frac{1}{2}$ yd by $17\frac{1}{2}$ yd
- E. Area of shed: $6\frac{1}{4}$ yd²
- F. Area of garden: $37\frac{1}{2}$ yd²