

Lesson 6-3

Example 1 Find Actual Measurements

ARCHITECTURE An architect's drawing for a new school building shows the library as 8.4 inches long. The scale on the drawing is 1 inch = 5 feet.

a. What is the length of the actual library?

Let x represent the actual length of the library. Write and solve a proportion.

$$\begin{array}{l} \text{plan width} \rightarrow \frac{1 \text{ inch}}{5 \text{ feet}} = \frac{8.4 \text{ inches}}{x \text{ feet}} \leftarrow \text{plan width} \\ \text{actual width} \rightarrow \frac{1 \text{ inch}}{5 \text{ feet}} = \frac{8.4 \text{ inches}}{x \text{ feet}} \leftarrow \text{actual width} \\ 1 \cdot x = 5 \cdot 8.4 \qquad \text{Find the cross products.} \\ x = 42 \qquad \qquad \qquad \text{Simplify.} \end{array}$$

The actual length of the library is 42 feet.

b. What is the scale factor?

To find the scale factor, write the ratio of 1 inch to 5 feet in simplest form.

$$\frac{1 \text{ inch}}{5 \text{ feet}} = \frac{1 \text{ inch}}{60 \text{ inches}} \quad \text{Convert 5 feet to inches.}$$

The scale factor is $\frac{1}{60}$. That is, each measurement on the architect's drawing is $\frac{1}{60}$ the actual measurement.

Example 2 Determine the Scale

TOYS A certain style of airplane has a wingspan of 24 feet. A toy model of this same style of plane has a wingspan of 6 inches. What is the scale of the model?

Write the ratio of the wingspan of the model to the wingspan of the actual plane. Then solve a proportion in which the wingspan of the model is 1 inch and the actual wingspan is x feet.

$$\begin{array}{l} \text{model length} \rightarrow \frac{6 \text{ inches}}{24 \text{ feet}} = \frac{1 \text{ inch}}{x \text{ feet}} \leftarrow \text{model length} \\ \text{actual length} \rightarrow \frac{6 \text{ inches}}{24 \text{ feet}} = \frac{1 \text{ inch}}{x \text{ feet}} \leftarrow \text{actual length} \\ 6 \cdot x = 24 \cdot 1 \qquad \text{Find the cross products.} \\ 6x = 24 \qquad \qquad \text{Simplify.} \\ \frac{6x}{6} = \frac{24}{6} \qquad \qquad \text{Divide each side by 6.} \\ x = 4 \qquad \qquad \qquad \text{Simplify.} \end{array}$$

So, the scale is 1 inch = 4 feet.

Example 3 Construct a Scale Drawing

GARDENING Heidi is designing a garden that is 16 feet long and 12 feet wide. Make a scale drawing of the garden. Use a scale of 0.25 inches = 4 feet.

Step 1 Find the measurement of the garden's length on the drawing.

Let x represent the length.

$$\begin{array}{l} \text{drawing length} \rightarrow \frac{0.25 \text{ inch}}{4 \text{ feet}} = \frac{x \text{ inches}}{16 \text{ feet}} \leftarrow \text{drawing length} \\ \text{actual length} \rightarrow \frac{0.25 \text{ inch}}{4 \text{ feet}} = \frac{x \text{ inches}}{16 \text{ feet}} \leftarrow \text{actual length} \end{array}$$
$$\begin{array}{l} 0.25 \cdot 16 = 4 \cdot x \\ 4 = 4x \\ 1 = x \end{array}$$

Find the cross products.
Simplify.
Divide each side by 4.

On the drawing, the length is 1 inch.

Step 2 Find the measure of the garden's width on the drawing.

Let w represent the width.

$$\begin{array}{l} \text{drawing length} \rightarrow \frac{0.25 \text{ inch}}{4 \text{ feet}} = \frac{w \text{ inches}}{12 \text{ feet}} \leftarrow \text{drawing length} \\ \text{actual length} \rightarrow \frac{0.25 \text{ inch}}{4 \text{ feet}} = \frac{w \text{ inches}}{12 \text{ feet}} \leftarrow \text{actual length} \end{array}$$
$$\begin{array}{l} 0.25 \cdot 12 = 4 \cdot w \\ 3 = 4w \\ \frac{3}{4} = w \\ 0.75 = w \end{array}$$

Find the cross products.
Simplify.
Divide each side by 4.
Simplify.

On the drawing, the width is 0.75 or $\frac{3}{4}$ inch.

Step 3 Make a scale drawing.

Use $\frac{1}{4}$ -inch grid paper.

Since 1 inch = 4 squares and $\frac{3}{4}$ inch = 3 squares,
draw a rectangle that is 4 squares by 3 squares.

