6.6 Scale Drawings

Goal: Use proportions with scale drawings.

Vocabulary

Scale drawing:

Scale model:

Scale:

Example 1 *Using a Scale Drawing*

On a map, the distance between two cities is 3 inches. What is the actual distance (in miles) between the two cities if the map's scale is 1 in. : 125 mi?

3in.

Solution

Let x represent the actual distance (in miles) between the two cities. The ratio of the map distance between the two cities to the actual distance x is equal to the scale of the map. Write and solve a proportion using this relationship.

$\frac{1\text{in.}}{125\text{mi}} = \frac{3\text{in.}}{x}$ ← Map distance ← Actual distance

$x = 125 \cdot 3$ Cross products property

$x = 375$ Multiply.

Answer: The actual distance is 375 miles

Checkpoint

1. On a map, the distance between two cities is 4 inches. What is the actual distance (in miles) between the two cities if the map's scale is 1 in. : 80 mi?

$\frac{1\text{in} \cdot 4}{80\text{miles} \cdot 4} = \frac{4\text{in.}}{x}$

320 miles

Example 2 ***Finding the Scale of a Drawing***

Architecture In a scale drawing, a wall is 2 inches long. The actual wall is 12 feet long. Find the scale of the drawing.

Solution

Write a ratio using corresponding side lengths of the scale drawing and the actual wall. Then simplify the ratio so that the numerator is 1.

$\frac{2 \text{ in.}}{12 \text{ ft}}$ ← Length of wall in scale drawing
← Length of actual wall

2in | 12ft.

$\frac{2 \text{ in.}}{12 \text{ ft}} \div 2 = \frac{1 \text{ in.}}{6 \text{ ft.}}$ Simplify. 1in : 6ft.

Answer: The drawing's scale is 1in to 6 ft.

The scale of a scale drawing or scale model can be written without units if the measurements have the same unit. For example, the scale 1 cm : 2 m can be written without units as follows.

1 cm : 2 m — Scale with units
↓
$\frac{1 \text{ cm}}{2 \text{ m}}$
↓
$\frac{1 \text{ cm}}{200 \text{ cm}}$
↓
1 : 200 — Scale without units

Example 3 ***Finding a Dimension of a Scale Model***

A model of the Sears Tower in Chicago has a scale of 1 : 103. The height of the Sears Tower's observation deck is about 412 meters. Find the height of the observation deck of the model.

actual

Solution

Write a proportion using the scale.

$\frac{1}{103} = \frac{x \text{ m.}}{412 \text{ m.}}$ ← Dimension of model
← Dimension of Sears Tower

$412 = 103x$ Cross products property

$4 = x$ Divide each side by 103

Answer: The height of the model's observation deck is 4 meters.

Checkpoint

2. The height of one antenna on the Sears Tower is about 521.1 meters. Find the height of the antenna on the model to the nearest tenth of a meter.

model → $\frac{1}{103} = \frac{x}{521.1 \text{ meter}}$ ← actual

$\frac{521.1}{103} = \frac{103x}{103}$

5.1 meters = x