

7-7 Study Guide and Intervention

Scale Drawings and Models

Scale Models A **scale model** or a **scale drawing** is an object or drawing with lengths proportional to the object it represents. The **scale** of a model or drawing is the ratio of the length of the model or drawing to the actual length of the object being modeled or drawn.

Example **MAPS** The scale on the map shown is 0.75 inches : 6 miles. Find the actual distance from Pineham to Menlo Fields.

Use a ruler. The distance between Pineham and Menlo Fields is about 1.25 inches.

Method 1: Write and solve a proportion.

Let x represent the distance between cities.

$$\frac{0.75 \text{ in.}}{6 \text{ mi}} = \frac{1.25 \text{ in.}}{x \text{ mi}} \quad \begin{array}{l} \leftarrow \text{map} \\ \leftarrow \text{actual} \end{array}$$

$$0.75 \cdot x = 6 \cdot 1.25 \quad \text{Cross Products Property}$$

$$x = 10 \quad \text{Simplify.}$$

Method 2: Write and solve an equation.

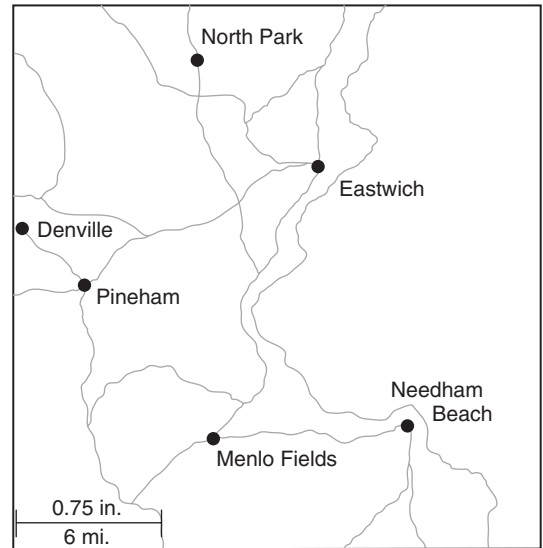
Let a = actual distance and m = map distance in inches. Write the scale as $\frac{6 \text{ mi}}{0.75 \text{ in.}}$, which is $6 \div 0.75$ or 8 miles per inch.

$$a = 8 \cdot m \quad \text{Write an equation.}$$

$$= 8 \cdot 1.25 \quad m = 1.25 \text{ in.}$$

$$= 10 \quad \text{Solve.}$$

The distance between Pineham and Menlo Fields is 10 miles.



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Exercises

Use the map above and a customary ruler to find the actual distance between each pair of cities. Measure to the nearest sixteenth of an inch.

1. Eastwich and Needham Beach
2. North Park and Menlo Fields
3. North Park and Eastwich
4. Denville and Pineham
5. Pineham and Eastwich

7-7 Study Guide and Intervention *(continued)***Scale Drawings and Models**

Use Scale Factors The **scale factor** of a drawing or scale model is the scale written as a unitless ratio in simplest form. Scale factors are always written so that the model length in the ratio comes first.

Example **SCALE MODEL** A doll house that is 15 inches tall is a scale model of a real house with a height of 20 feet.

a. What is the scale of the model?

To find the scale, write the ratio of a model length to an actual length.

$$\frac{\text{model length}}{\text{actual length}} = \frac{15 \text{ in.}}{20 \text{ ft}} \text{ or } \frac{3 \text{ in.}}{4 \text{ ft}}$$

The scale of the model is 3 in.:4 ft

b. How many times as tall as the actual house is the model?

Multiply the scale factor of the model by a conversion factor that relates inches to feet to obtain a unitless ratio.

$$\frac{3 \text{ in.}}{4 \text{ ft}} = \frac{3 \text{ in.}}{4 \text{ ft}} \cdot \frac{1 \text{ ft}}{12 \text{ in.}} = \frac{3}{48} \text{ or } \frac{1}{16}$$

The scale factor is 1:16. That is, the model is $\frac{1}{16}$ as tall as the actual house.

Exercises

- 1. MODEL TRAIN** The length of a model train is 18 inches. It is a scale model of a train that is 48 feet long. Find the scale factor.
- 2. ART** An artist in Portland, Oregon, makes bronze sculptures of dogs. The ratio of the height of a sculpture to the actual height of the dog is 2:3. If the height of the sculpture is 14 inches, find the height of the dog.
- 3. BRIDGES** The span of the Benjamin Franklin suspension bridge in Philadelphia, Pennsylvania, is 1750 feet. A model of the bridge has a span of 42 inches. What is the ratio of the span of the model to the span of the actual Benjamin Franklin Bridge?