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 $1\frac{1}{16}$ or 1.0625 inches.

Method 1: Write and solve a proportion.
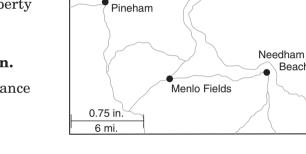
Let x represent the distance between cities.

$\dfrac{0.75 \text{ in.}}{6 \text{ mi}} = \dfrac{1.0625 \text{ in.}}{x \text{ mi}}$ ⟵ map
⟵ actual

$0.75 \cdot x = 6 \cdot 1.0625$ Cross Products Property

$\quad\quad x = 8.5$ Simplify.

Method 2: Write and solve an equation.

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

$a = 8 \cdot m$ Write an equation.

$\;= 8 \cdot 1.0625$ $m = 1.0625$ in.

$\;= 8.5$ Solve.

The distance between Pineham and Menlo Fields is 8.5 miles.

(map showing North Park, Eastwich, Denville, Pineham, Needham Beach, Menlo Fields; scale bar 0.75 in. / 6 mi.)

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 **12 miles**

2. North Park and Menlo Fields **16 miles**

3. North Park and Eastwich **6.5 miles**

4. Denville and Pineham **3.5 miles**

5. Pineham and Eastwich **11 miles**

Lesson 7-7

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. **1:32**

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. **21 in.**

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 scale factor of the model to the span of the actual Benjamin Franklin Bridge? **$\frac{1}{500}$**