5.9 Scale
Drawings and
Scale Model
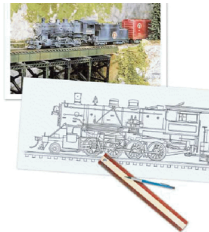
p. 308      3-19-18

Apr 8-9:27 AM

scale model: a proportional 3-D model of an object

scale drawing: a proportional 2-D drawing of an object.

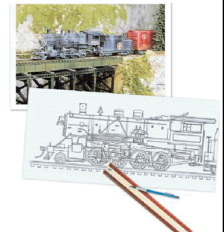scale factor: a ratio used to enlarge or reduce similar figures

Apr 8-9:28 AM

This HO gauge model train is a *scale model* of a historic train. A **scale model** is a proportional model of a three-dimensional object. Its dimensions are related to the dimensions of the actual object by a ratio called the **scale factor.** The scale factor of an HO gauge model train is $\frac{1}{87}$.

This means that each dimension of the model is $\frac{1}{87}$ of the corresponding dimension of the actual train.

Apr 22-2:53 PM

A **scale** is the ratio between two sets of measurements. Scales can use the same units or different units. The photograph shows a *scale drawing* of the model train.

A **scale drawing** is a proportional drawing of an object. Both scale drawings and scale models can be smaller or larger than the objects they represent.

Apr 22-2:53 PM

**Caution!**
A scale factor is always the ratio of the model's dimensions to the actual object's dimensions.

✳scale factor = $\frac{model}{actual}$

**Identify the scale factor.**

|  | Room | Blueprint |
|---|---|---|
| → Length (in.) | 144 | 18 |
| → Width (in.) | 108 | 13.5 |

blueprint length
room length

1 to 8

$$\frac{18 \div 18}{144 \div 18} = \frac{1}{8}$$

$$\frac{13.5}{108} = \frac{1}{8}$$

Apr 8-9:35 AM

**Identify the scale factor.**

|  | Model Aircraft | Blueprint |
|---|---|---|
| Length (in.) | 12 | 2 |
| Wing span (in.) | 18 | 3 |

blueprint length
aircraft length

$$\frac{2}{12} = \frac{1}{6} \qquad \frac{3}{18} = \frac{1}{6}$$

1 to 6

Apr 22-2:53 PM

1

A photograph was enlarged and made into a poster. The poster is 20.5 inches by 36 inches.

The scale factor is $\frac{5}{1}$. Find the size of the photograph.

*Think:* $\frac{\text{poster}}{\text{photo}} = \frac{5}{1}$

*Find the length*                    *Find the width*

$l = 7.2$                            $w = 4.1$

$$\frac{5}{1} = \frac{20.5}{w}$$

$$5w = 20.5$$
$$w = 4.1 \text{ in}$$

$$\frac{5}{1} = \frac{36}{\ell}$$

$$5\ell = 36$$
$$\ell = 7.2 \text{ in}$$

Apr 22-2:55 PM

Mary's father made her a dollhouse which was modeled after the blueprint of their home. The blueprint is 24 inches by 45 inches. The scale factor is $\frac{1.5}{1}$. Find the size of the dollhouse.

*Think:* $\frac{\text{dollhouse}}{\text{blueprint}} = \frac{1.5}{1}$

*Find the length*                    *Find the width*

$l = 67.5$                            $w = 36$

$$\frac{1.5}{1} = \frac{w}{24}$$

$$w = 36 \text{ in}$$

$$\frac{1.5}{1} = \frac{x}{45}$$

$$x = 67.5 \text{ in}$$

Apr 22-2:55 PM

On a road map, the distance between Pittsburgh and Philadelphia is 7.5 inches. What is the actual distance between the cities if the map scale is 1.5 inches = 60 miles?

Let *d* be the actual distance between the cities.

$$\frac{1.5 \text{ in}}{60 \text{ mi}} = \frac{7.5 \text{ in}}{x}$$

$$1.5x = 450$$
$$x = 300 \text{ mi}$$

Apr 22-2:55 PM

On a road map, the distance between Dallas and Houston is 7 inches. What is the actual distance between the cities if the map scale is 1 inch = 50 kilometers?

Let *d* be the actual distance between the cities.

$$\frac{1 \text{ in}}{50 \text{ km}} = \frac{7 \text{ in}}{x}$$

$$x = 350 \text{ km}$$

Apr 22-2:56 PM

**Identify the scale factor.**

**1.**

|            | Statue of Liberty | Model |
|------------|-------------------|-------|
| Height (in.) | 1,824           | 8     |

1 to 228

$$\frac{8}{1,824} = \frac{1}{228}$$

**2.** On a scale drawing, a kitchen wall is 6 inches long. The scale factor is $\frac{1}{24}$. What is the length of the actual wall?

144 in

$$\frac{1}{24} = \frac{6}{x} \qquad x = 144 \text{ in.}$$

Apr 22-2:56 PM

**3.** On a road map, the distance from Green Bay to Chicago is 11 cm. What is the actual distance between the cities if the map scale is 3 cm = 90 km?

$$\frac{11 \text{ cm}}{x} = \frac{3 \text{ cm}}{90 \text{ km}}$$

330 Km

$$3x = 990$$
$$x = 330 \text{ km}$$

Apr 22-2:56 PM