

8-6 Scale Drawings and Maps

Learn to read and use map scales and scale drawings.

8-6 Scale Drawings and Maps

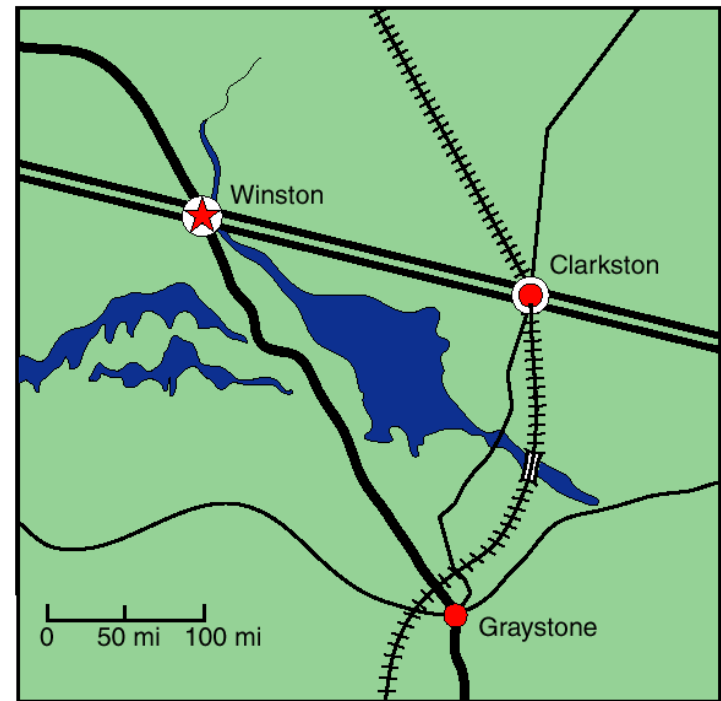
Vocabulary

scale drawing

scale

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The map shown is a *scale drawing*. A **scale drawing** is a drawing of a real object that is proportionally smaller or larger than the real object. In other words, measurements on a scale drawing are in proportion to the measurements of the real object.



A **scale** is a ratio between two sets of measurements. In the map above, the scale is 1 in:100 mi. This ratio means that 1 inch on the map represents 100 miles.

8-6 Solving Equations

- 1. Write down the problem**
- 2. Isolate the variable by doing the inverse operation on both sides- starting with the variable side**
- 3. Draw the answer line**
- 4. Cross out with a 1 on variable side**
- 5. Drop down the variable**
- 6. Solve**
- 7. Check with a STAR**



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Additional Example 1: Finding Actual Distances

The scale on a map is 4 in: 1 mi. On the map, the distance between two towns is 20 in.

What is the actual distance?

$$\frac{4 \text{ in.}}{1 \text{ mi}} = \frac{20 \text{ in.}}{x \text{ mi}}$$

*Write a proportion using the scale.
Let x be the actual number of miles between the two towns.*

$$1 \cdot 20 = 4 \cdot x$$

The cross products are equal.

$$20 = 4x$$

x is multiplied by 4.

$$\frac{20}{4} = \frac{4x}{4}$$

Divide both sides by 4 to undo multiplication.

$$5 = x$$

The actual distance between the two towns is 5 miles.

Helpful Hint

In Additional Example 1, think “4 inches is 1 mile, so 20 inches is how many miles?” This approach will help you set up proportions in similar problems.

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Try This: Example 1

The scale on a map is 3 in: 1 mi. On the map, the distance between two cities is 18 in. What is the actual distance?

$$\frac{3 \text{ in.}}{1 \text{ mi}} = \frac{18 \text{ in.}}{x \text{ mi}}$$

*Write a proportion using the scale.
Let x be the actual number of miles between the two cities.*

$$1 \cdot 18 = 3 \cdot x$$

The cross products are equal.

$$18 = 3x$$

x is multiplied by 3.

$$\frac{18}{3} = \frac{3x}{3}$$

Divide both sides by 3 to undo multiplication.

$$6 = x$$

The actual distance between the two cities is 6 miles.

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Additional Example 2A: Astronomy Application

A. If a drawing of the planets were made using the scale 1 in:30 million km, the distance from Mars to Jupiter on the drawing would be about 18.3 in. What is the actual distance between Mars to Jupiter?

$$\frac{1 \text{ in.}}{30 \text{ million km}} = \frac{18.3 \text{ in.}}{x \text{ million km}}$$

Write a proportion. Let x be the actual distance from Mars to Jupiter.

$$30 \cdot 18.3 = 1 \cdot x$$

The cross products are equal.

$$549 = x$$

The actual distance from Mars to Jupiter is about 549 million km.

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Additional Example 2B: Astronomy Application

B. The actual distance from Earth to Mars is about 78 million kilometers. How far apart should Earth and Mars be drawn?

$$\frac{1 \text{ in.}}{30 \text{ million km}} = \frac{x \text{ in.}}{78 \text{ million km}}$$

$$30 \cdot x = 1 \cdot 78$$

$$30x = 78$$

$$\frac{30x}{30} = \frac{78}{30}$$

$$x = 2\frac{3}{5}$$

Write a proportion. Let x be the distance from Earth to Mars on the drawing.

The cross products are equal. x is multiplied by 30.

Divide both sides by 30 to undo multiplication.

Earth and Mars should be drawn $2\frac{3}{5}$ inches apart.

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Try This: Additional Example 2A

A. If a drawing of the planets were made using the scale 1 in.:15 million km, the distance from Mars to Venus on the drawing would be about 8 in. What is the actual distance from Mars to Venus?

$$\frac{1 \text{ in.}}{15 \text{ million km}} = \frac{8 \text{ in.}}{x \text{ million km}}$$

Write a proportion. Let x be the distance from Mars to Venus.

$$15 \cdot 8 = 1 \cdot x$$

The cross products are equal.

$$120 = x$$

The actual distance from Mars to Venus is about 120 million km.

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Try This: Example 2B

B. The distance from Earth to the Sun is about 150 million kilometers. How far apart should Earth and the Sun be drawn?

$$\frac{1 \text{ in.}}{15 \text{ mil km}} = \frac{x \text{ in.}}{150 \text{ mil km}}$$

$$15 \cdot x = 1 \cdot 150$$

$$15x = 150$$

$$\frac{15x}{15} = \frac{150}{15}$$

$$x = 10$$

Write a proportion. Let x be the distance from Earth to the Sun on the drawing.

The cross products are equal. x is multiplied by 15.

Divide both sides by 15 to undo multiplication.

Earth and the Sun should be drawn 10 inches apart.

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Lesson Quiz

On a map of the Great Lakes, 2 cm = 45 km. Find the actual distance of the following, given their distances on the map.

- 1. Detroit to Cleveland = 12 cm 270 km**
- 2. Duluth to Nipigon = 20 cm 450 km**
- 3. Buffalo to Syracuse = 10 cm 225 km**
- 4. Sault Ste. Marie to Toronto = 33 cm 742.5 km**