Objective   Scale and Scale Drawings

Warm-Up

1. These bugs are not drawn to scale. What does that mean?

2. Is it possible that the leftmost bug is the smallest bug in real life? Explain your reasoning.

Square Drawings

The rectangle given, Rectangle A, is a square—all of its sides are the same length. Each side has a length of 4 units.

1. Draw a new square, Square B, which has side lengths that are 50% the length of square A's side lengths.

2. Write each ratio to compare Square B to Square A in fraction form and as a percent. Describe the meaning of each ratio.
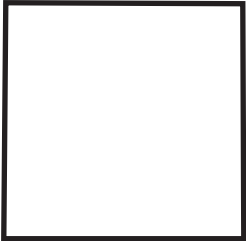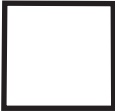
a. Determine the ratio of corresponding side lengths for each side of the Squares.

b. Determine the ratio of the Square perimeters.

Scales, Scale Factors, and Scale Drawings

A scale is a ratio that compares two measures. The ratios that you wrote to compare the measures of the squares are scales. When you multiply a measure by a scale to produce a reduced or enlarged measure, the scale is called a scale factor. You can multiply each of Square A's lengths by the scale factor 1 : 2, or 50%, or $\frac{1}{2}$, to produce the side lengths for Square B.

WORKED EXAMPLE

Square A

4 units

Square B

2 units

side length $\longrightarrow$ 4 units $\times$ 1 : 2, or $\frac{1}{2}$, or 50% = 2 units $\longleftarrow$ side length

$\uparrow$

scale,
scale factor

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1. What scale factor is used to produce Square A's lengths, given Square B's lengths? Explain your reasoning.

2. Draw a square, Square C, whose side lengths are 150% of Square B's side lengths.

3. What scale factor is used to produce:
a. Square C's lengths given Square B's lengths?

**b. Square B's lengths given Squaree C's lengths?**

c. Square C's lengths given Squaree A's lengths?

4. Compare the perimeters of Squares A, B, and C. How did the scale factors affect the perimeters? Explain your reasoning.

A **scale drawing** is a representation of a real object or place that is in proportion to the real object or place it represents. The purpose of a scale drawing is to represent either a very large or very small object. The scales on scale drawings often use different units of measure.
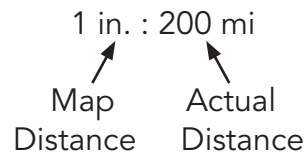

WORKED EXAMPLE

The scale of a drawing might be written as:

$$1 \text{ cm} : 4 \text{ ft}$$

Drawing Length   Actual Length
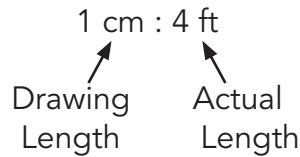
This scale means that every 1 centimeter of length in the drawing represents 4 feet of the length of the actual object.

The scale of a map might look like this:

$$1 \text{ in.} : 200 \text{ mi}$$

Map Distance   Actual Distance

This scale means that every 1 inch of distance on the map represents 200 miles of actual distance

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5. Study the worked example. What scale factor is used to produce:

a. the drawing length given the actual length?

b. the map distance given the actual distance?
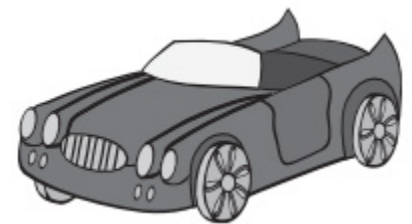
6. Write a sentence to describe the meaning of each.

a. A scale on a map is 1 in. : 2 mi.

b. A scale on a drawing is 1 cm : 4 cm.

c. A scale on a drawing is 2 in. : 1 in.

d. A scale on a drawing is 1 cm : 1 cm.

7. The scale factor for a model car is 1 : 24. What does this mean?

8. The scale factor for a model train is 1 : 87. What does this mean?

LESSON 4.5a
# Pound for Pound, Inch for Inch

Objective Scale and Scale Drawings

Stretch

You may have seen the star Betelgeuse (BEETLE juice) in the night sky. It is a red giant star, which has a radius of 821.3 million kilometers. By comparison, our Sun has a radius of 0.5 million kilometers.

Suppose the circle shown represents our Sun. How big would the model of Betelgeuse be if you drew it to scale?
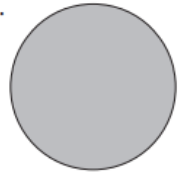
Review

1. Determine each percent increase or decrease.

    a. Original: $340 New: $34   b. Original: 75 New: 225

2. Solve each proportion.

    a. $\frac{4}{x} = 9$ b. $\frac{7.5}{26} = \frac{75}{P}$

3. Graph each inequality on a number line.

    a. $x > 7$ b. $-12 \le x$