Ratios

A **ratio** is a comparison of two quantities. Ratios can be written in several ways. 7 to 5, 7:5, and $\dfrac{7}{5}$ name the same ratio.

12 inches = 1 foot
3 feet = 1 yard
36 inches = 1 yard

Additional Example 1: Writing Ratios in Simplest Form

Write the ratio 15 bikes to 9 skateboards in simplest form.

$$\frac{\text{bikes}}{\text{skateboards}} = \frac{15}{9}$$

Write the ratio as a fraction.

$$= \frac{15 \div 3}{9 \div 3} = \frac{5}{3}$$

Simplify.

The ratio of bikes to skateboards is $\frac{5}{3}$, 5:3, or 5 to 3.

Check It Out! Example 1

Write the ratio 24 shirts to 9 jeans in simplest form.

$$\frac{\text{shirts}}{\text{jeans}} = \frac{24}{9}$$ *Write the ratio as a fraction.*

$$= \frac{24 \div 3}{9 \div 3} = \frac{8}{3}$$ *Simplify.*

The ratio of shirts to jeans is $\frac{8}{3}$, 8:3, or 8 to 3.

Practice

- 15 cows to 25 sheep

- 24 cars to 18 trucks

- 30 Knives to 27 spoons

When simplifying ratios based on measurements, write the quantities with the same units, if possible.

Additional Example 2: Writing Ratios Based on Measurement

Write the ratio 3 yards to 12 feet in simplest form.

First convert yards to feet.

3 yards = 3 ● 3 feet   *There are 3 feet in each yard.*

       = 9 feet   *Multiply.*

Now write the ratio.

$$\frac{3 \text{ yards}}{12 \text{ feet}} = \frac{9 \text{ feet}}{12 \text{ feet}} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4} \qquad \textit{Simplify.}$$

The ratio is $\frac{3}{4}$, 3:4, or 3 to 4.

Check It Out! Example 2

Write the ratio 36 inches to 4 feet in simplest form.

First convert feet to inches.

4 feet = 4 ● 12 inches   *There are 12 inches in each foot.*

= 48 inches   *Multiply.*

Now write the ratio.

$$\frac{36 \text{ inches}}{4 \text{ feet}} = \frac{36 \text{ inches}}{48 \text{ inches}} = \frac{36 \div 12}{48 \div 12} = \frac{3}{4}$$ *Simplify.*

The ratio is $\frac{3}{4}$, 3:4, or 3 to 4.

Practice

- 4 feet to 24 inches

- 3 yards to 12 feet

- 2 yards to 20 inches

Notes

Ratios that make the same comparison are **<u>equivalent ratios</u>**. Equivalent ratios represent the same point on the number line. To check whether two ratios are equivalent, you can write both in simplest form.

Additional Example 3: Determining Whether Two Ratios Are Equivalent

Simplify to tell whether the ratios are equivalent.

A. $\dfrac{3}{27}$ and $\dfrac{2}{18}$

$$\dfrac{3}{27} = \dfrac{3 \div 3}{27 \div 3} = \dfrac{1}{9}$$

$$\dfrac{2}{18} = \dfrac{2 \div 2}{18 \div 2} = \dfrac{1}{9}$$

Since $\dfrac{1}{9} = \dfrac{1}{9}$, the ratios are equivalent.

B. $\dfrac{12}{15}$ and $\dfrac{27}{36}$

$$\dfrac{12}{15} = \dfrac{12 \div 3}{15 \div 3} = \dfrac{4}{5}$$

$$\dfrac{27}{36} = \dfrac{27 \div 9}{36 \div 9} = \dfrac{3}{4}$$

Since $\dfrac{4}{5} \neq \dfrac{3}{4}$, the ratios are *not* equivalent.

Practice

$$\frac{13}{39} \; and \; \frac{16}{48}$$

$$\frac{21}{49} \; and \; \frac{28}{56}$$

Write each ratio in simplest form.

1. 22 tigers to 44 lions $\dfrac{1}{2}$

2. 5 feet to 14 inches $\dfrac{30}{7}$

Find a ratios that is equivalent to each given ratio.

3. $\dfrac{4}{15}$ Possible answer: $\dfrac{8}{30}, \dfrac{12}{45}$

4. $\dfrac{7}{21}$ Possible answer: $\dfrac{1}{3}, \dfrac{14}{42}$

Lesson Quiz: Part II

Simplify to tell whether the ratios are equivalent.

5. $\dfrac{16}{10}$ and $\dfrac{32}{20}$ $\quad\dfrac{8}{5}=\dfrac{8}{5}$; yes

6. $\dfrac{36}{24}$ and $\dfrac{28}{18}$ $\quad\dfrac{3}{2}\neq\dfrac{14}{9}$; no

7. Kate poured 8 oz of juice from a 64 oz bottle. Brian poured 16 oz of juice from a 128 oz bottle. Are the ratios of poured juice to starting amount of juice equivalent?

$\dfrac{8}{64}$ and $\dfrac{16}{128}$; yes, both equal $\dfrac{1}{8}$