Ratios and Rates

Definition of a Ratio

A ratio is a comparison of two quantities that have <u>the same</u> units.

Ways of writing a ratio:

<u>As a fraction</u>	<u>Using a colon (:)</u>	<u>Using the word *to*</u>
$\dfrac{5}{7}$	$5 : 7$	$5 \ to \ 7$

Examples of Word Problems with Ratios

The cost of a new wood floor is $1200 for labor and $4800 for materials. Write the ratio of the cost of the labor to the cost of the materials. Write the ratio in simplest form.

<u>Solution</u>

Write $1200 in the numerator and $4800 in the denominator. Then reduce the ratio to the lowest terms.

$$\frac{\$1200}{\$4800} = \frac{1200 \div 1200}{4800 \div 1200} = \frac{1}{4}$$

A rectangle has a width of 10 inches and a length of 2 feet. Find the ratio of the width to the length. Write the ratio in simplest form.

<u>Solution</u>

Because the given quantities do not have the same units, we will convert 2 feet into inches.

$$2 \ feet = 24 \ inches$$

Now write $10 \ inches$ in the numerator and $24 \ inches$ in the denominator. Then reduce the ratio to the lowest terms.

$$\frac{10 \ inches}{24 \ inches} = \frac{10 \div 2}{24 \div 2} = \frac{5}{12}$$

In a classroom, 7 students are using pencils, and 9 students are using pens. Write the ratio of the students who are using pencils to the total number of students. Write the ratio in simplest form.

Solution

Write $7\ students$ in the numerator and the total of $(7 + 9)\ students$ in the denominator. Then reduce the ratio to the lowest terms if possible.

$$\frac{7\ students}{(7 + 9)\ students} = \frac{7}{16}$$

Write a ratio of the states in United States that start with letter N to the total number of states. Write the ratio in simplest form.

Solution

There are 8 states that start with letter N:

$$Nebraska$$
$$Nevada$$
$$New\ Hampshire$$
$$New\ Jersey$$
$$New\ Mexico$$
$$New\ York$$
$$North\ Carolina$$
$$North\ Dakota$$

Write $8\ states$ in the numerator and the total of $50\ states$ in the denominator. Then reduce the ratio to the lowest terms if possible.

$$\frac{8\ states}{50\ states} = \frac{8 \div 2}{50 \div 2} = \frac{4}{25}$$

Definition of a Rate

A rate is a comparison of two quantities that have <u>different</u> units.

Examples:

$$\frac{50\ miles}{7\ seconds} \qquad \frac{\$5}{3\ cans} \qquad \frac{157\ words}{3\ minutes}$$

Definition of a Unit Rate

A unit rate is a rate in which the number in the denominator is 1.

Examples:

$$\frac{60\ miles}{1\ hour} \qquad \frac{\$20}{1\ ounce} \qquad \frac{\$10,000}{1\ share}$$

Examples of Word Problems with Rates

A vehicle drives 300 $miles$ on 25 $gallons$ of gas. What is the number of miles per gallon of gas?

Solution

$$\frac{300\ mi}{25\ gal} = 12\ \frac{mi}{gal}$$

5 cans of beans cost \$3.50. Find the cost for each can.

Solution

$$\frac{\$3.50}{5\ cans} = 0.70\ \frac{dollars}{can} = 70\ \frac{cents}{can}$$

Write "90 feet in 12 seconds" as a rate in simplest form.

Solution

$$\frac{90\ feet}{12\ seconds} = \frac{90 \div 6\ feet}{12 \div 6\ seconds} = \frac{15\ feet}{2\ seconds}$$