

5-2 Rates

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A **rate** is a ratio that compares two quantities measured in different units.

A **unit rate** is a rate whose denominator is 1. To change a rate to a unit rate, divide both the numerator and denominator by the denominator.

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Find the rate.

A Ferris wheel revolves 35 times in 105 minutes. How many minutes does 1 revolution take?

$\frac{105 \text{ minutes}}{35 \text{ revolutions}}$ ← *rate* Write a rate that compares minutes and revolutions.

$\frac{105 \text{ minutes} \div 35}{35 \text{ revolutions} \div 35}$ Divide the numerator and denominator by 35.

$\frac{3 \text{ minutes}}{1 \text{ revolution}}$ ← *unit rate* Simplify.

The Ferris wheel revolves 1 time in 3 minutes.

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Find the rate.

Sue walks 6 yards and passes 24 security lights set along the sidewalk. How many security lights does she pass in 1 yard?

$\frac{24 \text{ lights}}{6 \text{ yards}}$ Rate

$\frac{4 \text{ lights}}{1 \text{ yd}}$ Unit Rate

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Find the rate.

A dog walks 696 steps in 12 minutes. How many steps does the dog take in 1 minute?

$$\frac{696 \text{ steps}}{12 \text{ min.}} = \frac{58 \text{ steps}}{1 \text{ min.}}$$

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Find the rate.

To make 12 smoothies, Henry needs 30 cups of ice. How many cups of ice does he need for one smoothie?

$$\frac{30 \text{ c}}{12 \text{ Smoothie}} = \frac{2.5 \text{ c}}{1 \text{ Smoothie}}$$

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Danielle is cycling 68 miles as a fundraising commitment. She wants to complete her ride in 4 hours. What should be her average speed in miles per hour?

$$\frac{68 \text{ mi}}{4 \text{ hrs.}} = \frac{17 \text{ mi}}{1 \text{ hr.}} \text{ mph}$$

An average rate of speed is the ratio of distance traveled to time. The ratio is a rate because the units in the numerator and denominator are different.

Time

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Rhett is a pilot and needs to fly 1191 miles to the next city. He wants to complete his flight in 3 hours. What should be his average speed in miles per hour?

$$\frac{1191 \text{ mi}}{3 \text{ hr}} = \frac{397 \text{ mi}}{1 \text{ hr.}}$$

An average rate of speed is the ratio of distance traveled to time. The ratio is a rate because the units in the numerator and denominator are different.

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A unit price is the price of one unit of an item. The unit used depends on how the item is sold. The table shows some examples.

Type of Item	Example of Units
Liquid	Ounces, quarts, gallons, liters
Solid	Ounces, pounds, grams, kilograms
Any item	Bottle, container, carton

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A 12-ounce sports drink costs \$0.99, and a 16-ounce sports drink costs \$1.19. Which size is the best buy?

Size	Price
12 ounces	\$0.99
16 ounces	\$1.19

$$\begin{aligned} \frac{\$0.99}{12 \text{ oz}} &= \frac{\$0.08}{1 \text{ oz}} \\ \frac{\$1.19}{16 \text{ oz}} &= \frac{\$0.07}{1 \text{ oz}} \end{aligned}$$

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A 1.5 gallon container of milk costs \$4.02, and a 3.5 gallon container of milk costs \$8.75. Which size is the best buy?

Size	Price
1.5 gal	\$4.02
3.5 gal	\$8.75

$$\begin{aligned} \frac{\$4.02}{1.5 \text{ gal}} &= \frac{\$2.68}{1 \text{ gal}} \\ \frac{\$8.75}{3.5 \text{ gal}} &= \frac{\$2.50}{1 \text{ gal}} \end{aligned}$$

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- Ian earned \$96 babysitting for 12 hours. How much did he earn each hour? $\frac{\$96}{12 \text{ hrs.}} = \frac{\$8}{1 \text{ hr.}}$
- It takes Mia 49 minutes to complete 14 homework problems. On average, how long did it take to solve each problem? $\frac{49 \text{ min}}{14 \text{ prob}} = \frac{3.5 \text{ min}}{1 \text{ prob}}$
- Seth's family plans to drive 220 miles to their vacation spot. They would like to complete the drive in 4 hours. What should their average speed be in miles per hour? $\frac{220 \text{ mi}}{4 \text{ hr.}} = \frac{55 \text{ mi}}{1 \text{ hr.}}$
- Abby can buy a 7-pound bag of dry cat food for \$7.40, or she can purchase a 3-pound bag for \$5.38. Which size is the best buy?

$$\begin{aligned} \frac{\$7.40}{7 \text{ lb}} &= \frac{\$1.06}{1 \text{ lb}} \\ \frac{\$5.38}{3 \text{ lb}} &= \frac{\$1.79}{1 \text{ lb}} \end{aligned}$$

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