



# Ratios and Rates with Fractions

Let's calculate some rates with fractions.

## 8.1 Math Talk: Division

Find each answer mentally.

- How many  $\frac{1}{3}$ s are there in 5?
- What is  $2 \div \frac{1}{3}$ ?
- What is  $\frac{1}{2} \div \frac{1}{3}$ ?
- What is  $2\frac{1}{2} \div \frac{1}{3}$ ?



**8.2****Dividing with or without an Algorithm**

Calculate at least four quotients. Show your reasoning.

1.  $\frac{8}{9} \div 4$

2.  $\frac{9}{12} \div \frac{6}{12}$

3.  $3\frac{1}{3} \div \frac{2}{9}$

4.  $\frac{9}{2} \div \frac{3}{8}$

5.  $1\frac{2}{5} \div 3$

6.  $6\frac{1}{4} \div \frac{10}{3}$





### Are you ready for more?

Suppose you have a quart of grape juice and a quart of milk. You pour 1 cup of the grape juice into the milk and mix it up. Then you pour 1 cup of this mixture back into the grape juice.

Which liquid is more contaminated? Explain how you know. (Note: 1 quart is equal to 4 cups.)

## 8.3

### Comparing Running Speeds

Lin ran  $2\frac{3}{4}$  miles in  $\frac{2}{5}$  of an hour. Noah ran  $8\frac{2}{3}$  miles in  $\frac{4}{3}$  of an hour.

Who ran faster, Noah or Lin? Explain or show your reasoning.



## Are you ready for more?

Nothing can go faster than the speed of light, which is 299,792,458 meters per second. Which of these are possible?

1. Traveling a billion meters in 5 seconds.
2. Traveling a meter in 2.5 nanoseconds. (A nanosecond is a billionth of a second.)
3. Traveling 1 parsec in 1 year. (A parsec is about 3.26 light years, and a light year is the distance light can travel in a year.)

## Lesson 8 Summary

There are 12 inches in 1 foot, so we can say that for every 1 foot, there are 12 inches, or the ratio of feet to inches is 1 : 12. We can find the **unit rates** by dividing the numbers in the ratio:

$$1 \div 12 = \frac{1}{12},$$

so there is  $\frac{1}{12}$  foot per inch.

$$12 \div 1 = 12,$$

so there are 12 inches per foot.

When the numbers in a ratio are fractions, we calculate the unit rates the same way: by dividing the numbers. For example, if someone runs  $\frac{3}{4}$  mile in  $\frac{11}{2}$  minutes, the ratio of minutes to miles is  $\frac{11}{2} : \frac{3}{4}$ .

$$\frac{11}{2} \div \frac{3}{4} = \frac{22}{3},$$

so the person's pace is  $\frac{22}{3}$  minutes per mile.

$$\frac{3}{4} \div \frac{11}{2} = \frac{3}{22},$$

so the person's speed is  $\frac{3}{22}$  mile per minute.