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 $2\frac{1}{2} \div \frac{1}{3}$?

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.