Unit 3, Lesson 8

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.