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Unit 4, Lesson 2: Ratios and Rates With Fractions

Let's calculate some rates with fractions.

2.1: Number Talk: Division

Find each quotient mentally.

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

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

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

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

2.2: A Train is Traveling at . . .

A train is traveling at a constant speed and goes 7.5 kilometers in 6 minutes. At that rate:

1. How far does the train go in 1 minute?



2. How far does the train go in 100 minutes?

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2.3: 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.

1. Pick one of the questions that was displayed, but don't tell anyone which question you picked. Find the answer to the question.

2. When you and your partner are both done, share the answer you got (do not share the question) and ask your partner to guess which question you answered. If your partner can't guess, explain the process you used to answer the question.

3. Switch with your partner and take a turn guessing the question that your partner answered.

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 a parsec in a year. (A parsec is about 3.26 light years and a light year is the distance light can travel in a year.)

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2.4: Scaling the Mona Lisa

m.openup.org/1/7-4-2-4

In real life, the Mona Lisa measures $2\frac{1}{2}$ feet by $1\frac{3}{4}$ feet. A company that makes office supplies wants to print a scaled copy of the Mona Lisa on the cover of a notebook that measures 11 inches by 9 inches.

1. What size should they use for the scaled copy of the Mona Lisa on the notebook cover?
2. What is the scale factor from the real painting to its copy on the notebook cover?
3. Discuss your thinking with your partner. Did you use the same scale factor? If not, is one more reasonable than the other?

Lesson 2 Summary

There are 12 inches in a 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.

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

$$\frac{11}{2} \div \frac{3}{4} = \frac{22}{3}, \text{ so the person's}$$

pace is $\frac{22}{3}$ minutes per mile.

$$\frac{3}{4} \div \frac{11}{2} = \frac{3}{22}, \text{ so the person's}$$

speed is $\frac{3}{22}$ miles per minute.

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1. A cyclist rode 3.75 miles in 0.3 hours.

a. How fast was she going in miles per hour?

b. At that rate, how long will it take her to go 4.5 miles?

2. A recipe for sparkling grape juice calls for $1\frac{1}{2}$ quarts of sparkling water and $\frac{3}{4}$ quart of grape juice.

a. How much sparkling water would you need to mix with 9 quarts of grape juice?

b. How much grape juice would you need to mix with $\frac{15}{4}$ quarts of sparkling water?

c. How much of each ingredient would you need to make 100 quarts of punch?

3. a. Draw a scaled copy of the circle using a scale factor of 2.

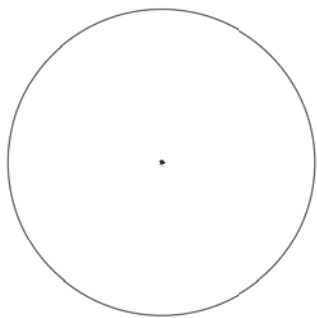
b. How does the circumference of the scaled copy compare to the circumference of the original circle?

c. How does the area of the scaled copy compare to the area of the original circle?

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(from Unit 3, Lesson 10)

4. At a deli counter,

- Someone bought $1\frac{3}{4}$ pounds of ham for \$14.50.
- Someone bought $2\frac{1}{2}$ pounds of turkey for \$26.25.
- Someone bought $\frac{3}{8}$ pounds of roast beef for \$5.50.

Which meat is the least expensive per pound? Which meat is the most expensive per pound? Explain how you know.

5. Jada has a scale map of Kansas that fits on a page in her book. The page is 5 inches by 8 inches. Kansas is about 210 miles by 410 miles. Select **all** scales that could be a scale of the map. (There are 2.54 centimeters in an inch.)

- A. 1 in to 1 mi
- B. 1 cm to 1 km
- C. 1 in to 10 mi
- D. 1 ft to 100 mi
- E. 1 cm to 200 km
- F. 1 in to 100 mi
- G. 1 cm to 1000 km

(from Unit 1, Lesson 11)