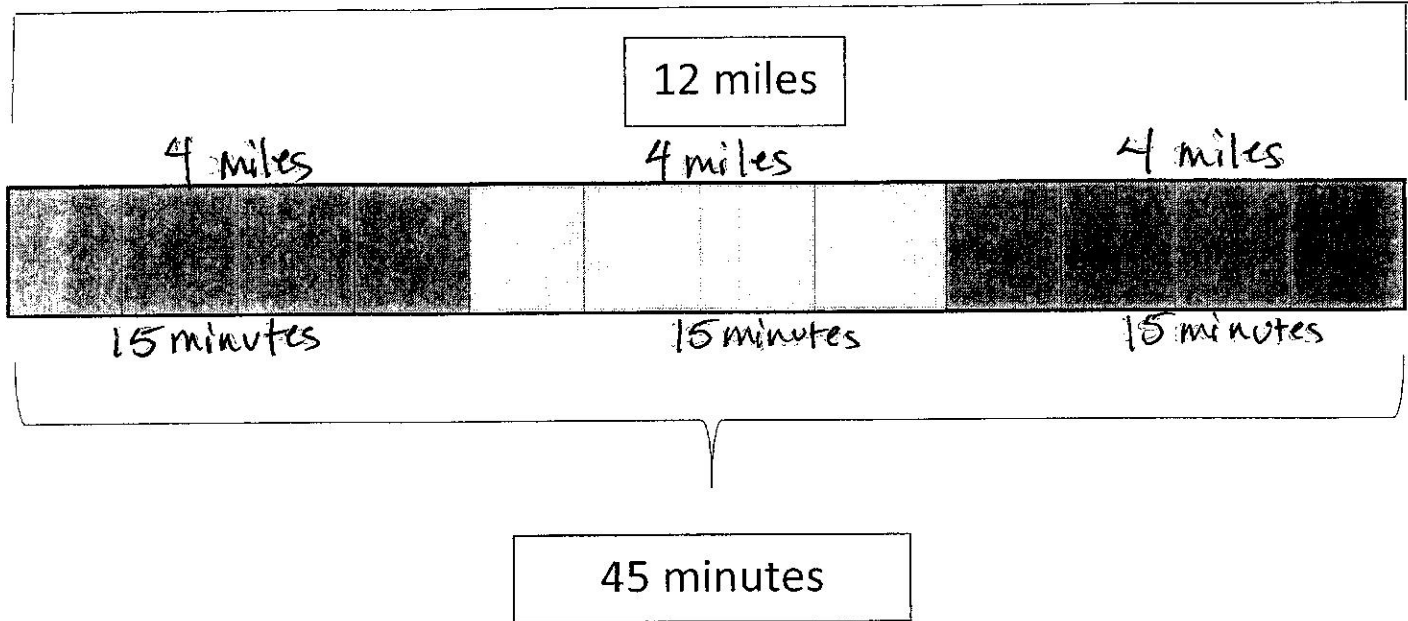


Ratios involving Complex Fractions

1. Jana is training for a triathlon that includes a 112-mile bike ride. Today, she rode her bike 12 miles in 45 minutes. What is Jana's rate in miles per hour?



- a) If Jana biked at a constant rate, how many miles did she bike in the first 15 minutes? 4 miles
- b) At the same rate, how many miles did she bike in the next 15 minutes? 4 miles
- c) At the same rate, how many miles did she bike in the last 15 minutes? 4 miles
- d) How many more minutes would Jana need to bike to total one hour? 15 minutes
- e) At the same rate, how many miles would she bike in that amount of time? 4 miles
- f) Explain how you could find how the number of miles Jana bikes in one hour. Each 15 minute section represents 4 miles. There are 4 - 15 minute sections in an hour, so $4 \cdot 4 = 16$ miles/hour

The number of miles Jana bikes in 1 hour is a unit rate. A unit rate compares two quantities where one of the quantities is 1. A unit rate tells you how many units of the first quantity correspond to one unit of the second quantity.

The units in this problem are miles and hours. The problem tells us that Jana bikes 12 miles in 45 minutes. That's the same thing as 12 miles in $\frac{3}{4}$ hour.

$$\frac{\text{Number of miles}}{\text{Number of hours}} = \frac{12}{\frac{3}{4}}$$

The fraction $\frac{12}{\frac{3}{4}}$ is a **complex fraction**. A complex fraction is a fraction where either the numerator is a fraction, the denominator is a fraction, or both the numerator and the denominator are fractions. You can simplify a complex fraction by dividing, just as you do with whole numbers.

The fraction bar represents division, so you can think of $\frac{6 \text{ miles}}{2 \text{ hours}}$ as $6 \div 2 = 3$ miles per hour.

You can think about $\frac{12 \text{ miles}}{\frac{3}{4} \text{ hour}}$ in the same way.

$$\frac{12}{\frac{3}{4}} = \frac{12}{1} \div \frac{3}{4} \quad \text{which equals } \frac{12}{1} \cdot \frac{4}{3}, \text{ which equals } \frac{48}{3} \text{ or 16 miles per hour.}$$

The unit rate is 16. The number of miles Jana bikes is 16 times the number of hours.

2. On another training ride, Jana bikes 15 miles in 50 minutes. Find the number of miles she bikes in one hour. $\frac{15}{\frac{50}{60}} \quad \frac{15}{\frac{5}{6}} \quad \frac{15 \cdot 6}{1 \cdot 5} \quad \frac{15 \cdot 6}{5} = \frac{90}{5} = 18 \text{ mph}$

3. Oatmeal Raisin Cookies

$\frac{3}{4}$ cup butter	$\frac{3}{2}$ $1\frac{1}{2}$ cups brown sugar	$\frac{3}{4}$ teaspoon cinnamon
2 eggs 1 egg	1 teaspoon vanilla	$\frac{11}{4}$ $2\frac{3}{4}$ cups oats
$\frac{3}{2}$ $1\frac{1}{2}$ cups flour	1 teaspoon baking soda	1 cup raisins

Max's favorite recipe for Oatmeal Raisin Cookies makes 48 cookies. He wants to make some cookies but only has one egg. Max has to adjust the amount of the other ingredients. Using complex fractions find the new measurements for the following ingredients:

a) flour - $\frac{\frac{3}{2}}{\frac{1}{2}} \quad \frac{3}{2} \div \frac{1}{2} \quad \frac{3}{2} \cdot \frac{2}{2} = \frac{3}{1} \text{ c.}$

b) butter - $\frac{\frac{3}{4}}{\frac{2}{2}} \quad \frac{3}{4} \div \frac{2}{2} \quad \frac{3}{4} \cdot \frac{1}{2} = \frac{3}{8} \text{ c.}$

c) oats - $\frac{\frac{11}{4}}{\frac{2}{2}} \quad \frac{11}{4} \div \frac{2}{2} \quad \frac{11}{4} \cdot \frac{1}{2} = \frac{11}{8} \text{ c.}$
or $1\frac{3}{8} \text{ c.}$

d) brown sugar - $\frac{\frac{3}{2}}{\frac{2}{2}} \quad \frac{3}{2} \div \frac{2}{2} \quad \frac{3}{2} \cdot \frac{1}{2} = \frac{3}{4} \text{ c.}$