

~ Unit Rates ~

A **RATE** is a ratio that relates two different units.

A **UNIT RATE** is when the input unit is 1.

Example: Ms. Walksalot walks $\frac{1}{2}$ a mile per $\frac{1}{4}$ hour. How far does she walk per 1 hour?

Rate given in problem	$\frac{1}{2}$	$\frac{1}{4}$	Unit rate
Miles	1	$1\frac{1}{2}$	
Hour	0	$\frac{1}{2}$	1

tip! to solving unit rate problems: Use a model! **Double number lines** and **tape diagrams** make the problem easy-peasy! Also, you should look for **patterns** in the numbers!

Example 1: Andrew the butcher charges \$2.50 per 1/5 pound of gourmet pork. What is the unit rate (price per 1 pound)?

Price	0	\$2.50	\$5.00	\$7.50	\$10.00	\$12.50
Pounds	0	1/5	2/5	3/5	4/5	1

Example 2: Mikayla runs $1\frac{1}{2}$ miles in $\frac{2}{10}$ of an hour. How far can she run in 1 hour?

Miles	0	$1\frac{1}{2}$	3	$4\frac{1}{2}$	6	$7\frac{1}{2}$
Hours	0	2/10	4/10	6/10	8/10	1

YOU Try!! Using a model, find the unit rate to solve each problem below. Problem #1 is started for you.

1) Joshua read $\frac{1}{6}$ of his book in $\frac{1}{3}$ hour. At this rate, how much of his book will he read in an entire hour?

He can read $\frac{2}{3}$ of his book per 1 hour.

Book	0	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{3}{6}$
Hours	0	$\frac{1}{3}$	$\frac{2}{3}$	1

2) Katy needs $\frac{1}{8}$ cups of sugar to make $\frac{1}{4}$ of her cookie recipe. How much sugar does she need to make the entire recipe?

Challenge!!
3) Dino jogs $\frac{1}{2}$ mile in $\frac{2}{5}$ of an hour. At this rate, how far can he jog in 1 hour?

~ Unit Rates with Complex Fractions ~

"Complex fractions" are not as scary as they sound! A complex fraction is just a fraction that has another fraction in its numerator or denominator (or both). Complex fractions **must be simplified**. To do this, simply remember that a fraction is just another way of writing a **DIVISION** problem! So, just **divide** the numerator by the denominator to simplify a complex fraction.

For instance: To simplify this, just work out $\frac{1\frac{1}{2}}{4\div\frac{2}{3}}$

$$\frac{1\frac{1}{2}}{4\div\frac{2}{3}} = \frac{\frac{3}{2}}{4\cdot\frac{3}{2}} = \frac{3}{20}$$

→ Now, let's examine familiar problems, this time using **division**!

Example: Ms. Walksalot walks $\frac{1}{2}$ a mile per $\frac{1}{4}$ hour. How far does she walk per 1 hour?

$$\frac{1\frac{1}{2}}{4} = \frac{1\frac{1}{2}}{2\frac{1}{2}} = \frac{1\frac{4}{4}}{2\frac{1}{2}} = \frac{2\text{ miles}}{1\frac{1}{2}\text{ hour}}$$

So, Ms. Walksalot walks 2 miles per 1 hour!

Tip! The unit for our unit rate must be placed in the denominator of the fraction!!

Example 1: Andrew the butcher charges \$2.50 per 1/5 pound of gourmet pork. What is the unit rate (price per 1 pound)?

$$\frac{\$2.50}{\frac{1}{5}\text{ lb}} = \frac{12.5}{2} = 2 \rightarrow \$25.00 = \$12.50$$

So, the gourmet pork is \$12.50 per 1 pound.

Example 2: Mikayla runs $1\frac{1}{2}$ miles in $\frac{2}{10}$ of an hour. How far can she run in 1 hour?

$$\frac{1\frac{1}{2}\text{ miles}}{\frac{2}{10}\text{ hour}} = \frac{1\frac{2}{2}}{2\frac{10}{2}} = \frac{3\frac{10}{2}}{4\frac{2}{2}} = 7\frac{1}{2}$$

So, Mikayla runs $7\frac{1}{2}$ miles per 1 hour.

YOU Try!! Using division, find the unit rate to solve each problem below.

- 1) Joshua read $\frac{1}{6}$ of his book in $\frac{1}{3}$ hour. At this rate, how much of his book will he read in an entire hour?
- 2) Katy needs $\frac{1}{8}$ cups of sugar to make $\frac{1}{4}$ of her cookie recipe. How much sugar does she need to make the entire recipe?
- 3) **Challenge!!** Dino jogs $\frac{1}{2}$ mile in $\frac{2}{5}$ of an hour. At this rate, how far can he jog in 1 hour?

He can read $\frac{2}{3}$ of a book (or $\frac{1}{2}$) in 1 hour.