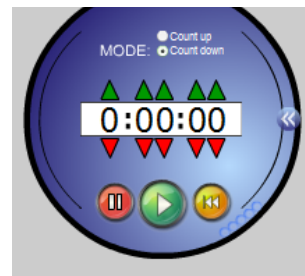


7-4



# Unit Rates with Fractions

Recall that when a [unit rate](#) is written as a fraction, the denominator is 1 unit. To convert a rate to a unit rate, divide each term by the denominator. This process works even if the denominator of the rate is a fraction.

### Example #1

A recipe calls for  $\frac{3}{4}$  c of dry milk powder to make 6 dog biscuits.  
How many cups of milk powder do you need per dog biscuit?

$$\frac{\frac{3}{4} \text{ cups}}{6 \text{ biscuits}} = \frac{3}{4} \div 6 = \frac{3}{4} \times \frac{1}{6} = \frac{1}{8}$$

$\frac{1}{8}$  cup per dog biscuit.

## Got It? #1

Your dog eats  $\frac{7}{8}$  lb of food in 4 meals. How much food does your dog eat per meal?

$$\frac{\frac{7}{8} \text{ lb}}{4 \text{ meals}} = \frac{7}{8} \div 4 = \frac{7}{8} \times \frac{1}{4} = \frac{7}{32} \text{ lb/meal}$$

## Got It? #2

If your dog eats  $\frac{7}{8}$  lb of food in 4 meals, how many meals will it take your dog to eat 1 lb of food?

$$\frac{4 \text{ meals}}{\frac{7}{8} \text{ lbs}} = 4 \div \frac{7}{8} = 4 \times \frac{8}{7} = \frac{32}{7} \text{ meal/lb}$$

It will take  $\frac{32}{7}$  (or 4.6) meals per pound.

## Example #2

Write each rate as a unit rate.

Show work for all.

a.  $\frac{\frac{1}{2} \text{ mi}}{\frac{1}{4} \text{ h}} = \frac{1}{2} \div \frac{1}{4} = \frac{1}{2} \times \frac{4}{1} = 2$   
 $= 2 \text{ mi/hr}$

b.  $\frac{\frac{7}{10} \text{ ft}}{\frac{1}{5} \text{ s}}$

c.  $\frac{\frac{4}{5} \text{ km}}{\frac{2}{3} \text{ min}}$

d.  $\frac{\frac{15}{4} \text{ m}}{\frac{5}{6} \text{ min}}$

### Got It? #3

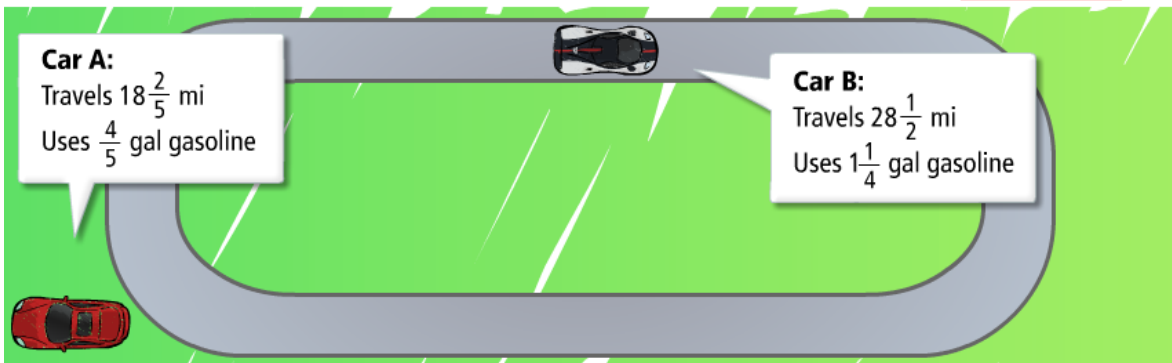
You are planning to build a boat. You have a sample board of the wood that you want to use. The board has an area of  $\frac{1}{3}$  ft<sup>2</sup> and weighs  $\frac{1}{5}$  lb. What is the weight of the wood in pounds per square foot?

$$\frac{\frac{1}{5} \text{ lbs}}{\frac{1}{3} \text{ ft}^2}$$

$$= \frac{1}{5} \div \frac{1}{3} = \frac{1}{5} \times \frac{3}{1} = \frac{3}{5} \frac{\text{lbs}}{\text{ft}^2}$$

### Example #3

You are running a fuel economy study. Which car can travel the greater distance on 1 gal of gasoline?



**Car A:**  
Travels  $18\frac{2}{5}$  mi  
Uses  $\frac{4}{5}$  gal gasoline

**Car B:**  
Travels  $28\frac{1}{2}$  mi  
Uses  $1\frac{1}{4}$  gal gasoline

Find the unit rate of miles per gallon for each car. The car with the greater unit rate is the car that can travel the greater distance on 1 gal of gasoline.

Car A travels  $18\frac{2}{5}$  mi, or  $\frac{92}{5}$  mi.

$$\begin{aligned} \frac{\frac{92}{5} \text{ mi}}{\frac{4}{5} \text{ gal}} &= \frac{\frac{92}{5} \div \frac{4}{5} \text{ mi}}{1 \text{ gal}} \\ &= \frac{\frac{92}{\cancel{5}^1} \times \frac{\cancel{5}^1}{4} \text{ mi}}{1 \text{ gal}} \\ &= \frac{23 \text{ mi}}{1 \text{ gal}} \\ &= 23 \text{ mi/gal} \end{aligned}$$

Car B travels  $28\frac{1}{2}$  mi, or  $\frac{57}{2}$  mi.

$$\begin{aligned} \frac{\frac{57}{2} \text{ mi}}{\frac{5}{4} \text{ gal}} &= \frac{\frac{57}{2} \div \frac{5}{4} \text{ mi}}{1 \text{ gal}} \\ &= \frac{\frac{57}{\cancel{2}^1} \times \frac{\cancel{4}^2}{5} \text{ mi}}{1 \text{ gal}} \\ &= \frac{114 \text{ mi}}{5} \\ &= \frac{114}{5} \text{ mi/gal} \\ &= 22\frac{4}{5} \text{ mi/gal} \end{aligned}$$

Car A can travel a greater distance on 1 gal of gas.



## Got It? #4

You ran  $3\frac{1}{2}$  mi in  $\frac{3}{4}$  h. Your friend ran  $1\frac{2}{5}$  mi in  $\frac{1}{3}$  h. Which of you ran faster? Explain.

Show work for each + compare.

You

Your friend

# PRACTICE

1. A craft project requires  $\frac{5}{6}$  yard of ribbon to make 4 refrigerator magnets. How many inches of ribbon are needed for each magnet?

inches

2. If it takes  $\frac{5}{6}$  yard of ribbon to make 4 magnets, how many complete magnets can be made with  $\frac{2}{3}$  yard of ribbon?

magnets

3. Machine A packs  $4\frac{1}{4}$  cartons in  $\frac{1}{5}$  hour. Machine B packs  $4\frac{3}{5}$  cartons in  $\frac{1}{4}$  hour. Which machine packs faster? How many cartons per hour can the faster machine pack?

Machine:

Unit Rate:

4. **Writing** How do you convert a rate to a unit rate?

5. **Error Analysis** An elevator has a floor area of  $38 \text{ ft}^2$  and holds a load of 3,500 lb. The engineer writes this equation to find the number of pounds per square foot.

$$\frac{\frac{3500}{1}}{\frac{38}{1}} = \frac{\frac{3500}{1} \cdot \frac{38}{1}}{1} = \frac{133,000}{1} \text{ lb/ft}^2$$

Explain his error and write the correct pounds per square foot.

