3.4 - Ratio and Proportions

Vocabulary:

- ratio → a comparison of two #'s by division
  $\frac{\$20}{2 \text{ hrs.}}$
- rate
- proportion → states that two ratios are equal to each other
  $\frac{1}{2} = \frac{4}{8}$

Unit rate: $\frac{55 \text{ miles}}{1 \text{ hour}}$

* has a denominator of 1

1 EXAMPLE Another brand of apple juice costs $1.56 for 48 oz. Find the unit rate.

$\frac{\$1.56}{48 oz} \div 48 = \frac{\$0.03}{1 oz}$

5. A 10-oz bottle of shampoo costs $2.40 and a 12-oz bottle costs $2.64. Find the unit rate for each. Which bottle has the lower unit cost?

$\frac{\$2.40}{10\text{oz}} \div 10 = \frac{\$0.24}{1\text{oz}}$

$\frac{\$2.64}{12\text{oz}} \div 12 = \frac{\$0.22}{1\text{oz}}$

2 EXAMPLE In 2000, Lance Armstrong completed the 3630-km Tour de France course in 92.5 hours. Traveling at his average speed, how long would it take Lance Armstrong to ride 295 km?

$$\frac{3{,}630 \text{ km}}{92.5 \text{ hrs.}} = \frac{295 \text{ km}}{x \text{ hrs.}}$$

$$3{,}630x = 92.5 \cdot 295$$

$$\frac{3{,}630x}{3{,}630} = \frac{27{,}287.5}{3{,}630}$$

$$x = 7.51 \text{ hrs.}$$

8. You are riding your bicycle. It takes you 20 minutes to go 5 miles.

a. Find your average speed. Write a rule to describe the ~~distance~~ *d* you cycle as a function of the number of ~~minutes~~ miles *m* you cycle.

time, t

b. How long would it take you to cycle 12 miles?

$t = 4m$

a) $\frac{20 \text{ mins.}}{5 \text{ miles}} \div 5 = \frac{4 \text{ mins.}}{1 \text{ mile}}$

b) $\frac{4 \text{ mins.}}{1 \text{ mile}} \cdot 12 = \frac{48 \text{ min.}}{12 \text{ miles}}$

3 EXAMPLE The fastest recorded speed for an eastern gray kangaroo is 40 mi per hour. What is the kangaroo's speed in feet per second?

$$\frac{40 \text{ miles}}{1 \text{ hr.}} \cdot \frac{5{,}280 \text{ ft.}}{1 \text{ mile}} \cdot \frac{1 \text{ hr.}}{3{,}600 \text{ sec.}} = \frac{211{,}200 \text{ ft.}}{3{,}600 \text{ secs.}} \div 3{,}600 = \boxed{\frac{58.\overline{6} \text{ ft.}}{1 \text{ sec.}}}$$

Complete each statement.

480

13. 8 h = ■ min

1 hr. = 60 min

4 EXAMPLE Solve $\frac{y}{3} = \frac{3}{4}$.

$4 \cdot y = 3 \cdot 3$

$\frac{4y}{4} = \frac{9}{4}$

$y = 2\frac{1}{4}$

$\frac{1}{3} \times \frac{3}{3} = \frac{3}{9}$

Solve each proportion.

16. $\frac{5}{6} \times \frac{c}{9}$

$5 \cdot 9 = 6 \cdot c$

$\frac{45}{6} = \frac{6c}{6}$

$7\frac{3}{6} = c$

$7\frac{1}{2} = c$

17. $\frac{3}{8} \times \frac{x}{30}$

$3 \cdot 30 = 8x$

$\frac{90}{8} = \frac{8x}{8}$

$11\frac{1}{4} = x$

5 EXAMPLE Use cross products to solve the proportion $\frac{w}{4.5} = -\frac{6}{5}$.

$\frac{w}{4.5} \times \frac{-6}{5}$

$5w = -6 \cdot 4.5$

$\frac{5w}{5} = \frac{-27}{5}$

$w = -5\frac{2}{5}$

24. A canary's heart beats 200 times in 12 seconds. Use a proportion to find how many times its heart beats in 42 seconds.

$$\frac{200 \text{ times}}{12 \text{ secs}} = \frac{x \text{ times}}{42 \text{ secs}}$$

$$\frac{12x}{12} = \frac{8,400}{12}$$

$$x = 700 \text{ times}$$

6 EXAMPLE Solve the proportion $\frac{(z+3)}{4} = \frac{(z-4)}{6}$.

$6(z+3) = 4(z-4)$

$6z + 18 = 4z - 16$

$-4z \quad -18 \quad -4z \quad -18$

$\frac{2z}{2} = \frac{-34}{2}$

$z = -17$

30. $\frac{8}{(b+10)} = \frac{4}{(2b-7)}$

$4(b+10) = 8(2b-7)$

$4b + 40 = 16b - 56$

$-4b \quad\quad -4b$

$40 = 12b - 56$

$+56 \quad\quad +56$

$\frac{96}{12} = \frac{12b}{12}$

$8 = b$

Homework: pg.146 #34, 39, 42, 44, 46, 53, 54, 63, 66, 74