6-4 Algebra: Solving Proportions - Practice and Problem Solving

Solve each proportion.

9. $\dfrac{3}{4} = \dfrac{z}{28}$

Since $4 \times 7 = 28$, multiply the numerator and denominator by 7.

$\dfrac{3}{4} = \dfrac{3 \times 7}{4 \times 7}$

$\qquad = \dfrac{21}{28}$

$z = 21$

11. $\dfrac{4}{x} = \dfrac{16}{28}$

Since $16 \div 4 = 4$, divide the numerator and denominator by 4.

$\dfrac{16}{28} = \dfrac{16 \div 4}{28 \div 4}$

$\qquad = \dfrac{4}{7}$

$x = 7$

13. $\dfrac{h}{8} = \dfrac{6}{16}$

Since $16 \div 2 = 8$, divide the numerator and denominator by 2.

$\dfrac{6}{16} = \dfrac{6 \div 2}{16 \div 2}$

$\qquad = \dfrac{3}{8}$

$h = 3$

15. $\dfrac{21}{35} = \dfrac{3}{r}$

Since $21 \div 7 = 3$, divide the numerator and denominator by 7.

$\dfrac{21}{35} = \dfrac{21 \div 7}{35 \div 7}$

$\qquad = \dfrac{3}{5}$

$r = 5$

17. **HORSES** A Clydesdale drinks about 120 gallons of water every 4 days. At this rate, about how many gallons of water does a Clydesdale drink in 28 days?

Let w be the gallons of water that a Clydesdale drinks in 28 days.

$$\frac{120}{4} = \frac{w}{28}$$

Since $4 \times 7 = 28$, multiply the numerator and denominator by 7.

$$\frac{120}{4} = \frac{120 \times 7}{4 \times 7}$$

$$= \frac{840}{28}$$

$$w = 840$$

A Clydesdale drinks 840 gallons of water in 28 days.

19. **LUNCH** Four students spent $12 on school lunch. At this rate, find the amount 10 students would spend on the same school lunch.

Find the unit rate.

$$\frac{\$12}{4 \text{ students}} = \frac{(\$12) \div 4}{(4 \text{ students}) \div 4}$$

$$= \frac{\$3}{1 \text{ student}}$$

One student spends $3 on lunch. Therefore, 10 students will spend $3 × 10 or $30.

21. **HEALTH** In 10 minutes, a heart can beat 700 times. At this rate, how many minutes will a heart beat 140 times?

Let t be the minutes in which a heart beats 140 times.

$$\frac{10}{700} = \frac{t}{140}$$

Since $700 \div 5 = 140$, divide the numerator and denominator by 5.

$$\frac{10}{700} = \frac{10 \div 5}{700 \div 5}$$

$$= \frac{2}{140}$$

$$t = 2$$

A heart beats 140 times in 2 minutes.

Solve each proportion.

23. $\dfrac{96}{128} = \dfrac{12}{c}$

Since $96 \div 8 = 12$, divide the numerator and denominator by 8.

$$\frac{96}{128} = \frac{96 \div 8}{128 \div 8}$$

$$= \frac{12}{16}$$

$$c = 16$$

25. **SCHOOL** Suppose 8 out of every 20 students are absent from school less than five days a year. Predict how many students would be absent from school less than five days a year in a school system of 40,000 students.

Let a be the number of students out of 40,000 absent from school less than five days in a year.

$$\frac{8}{20} = \frac{a}{40,000}$$

Since $20 \times 2000 = 40,000$, multiply the numerator and denominator by 2000.

$$\frac{8}{20} = \frac{8 \times 2000}{20 \times 2000}$$

$$= \frac{16,000}{40,000}$$

$$a = 16,000$$

16,000 out of 40,000 students would be absent from school less than five days in a year.

27. **YOGA** Liliana takes 4 breaths per 10 seconds during yoga. At this rate, about how many breaths would Liliana take in 2 minutes of yoga?

Let b be the number of breaths Liliana will take in 2 minutes. Convert minutes to seconds.

$$2 \text{ min} = 2 \text{ min} \cdot \frac{60 \text{ s}}{1 \text{ min}}$$

$$= 120 \text{ s}$$

$$\frac{4}{10} = \frac{b}{120}$$

Since $10 \times 12 = 120$, multiply the numerator and denominator by 12.

$$\frac{4}{10} = \frac{4 \times 12}{10 \times 12}$$

$$= \frac{48}{120}$$

$$b = 48$$

Liliana takes 48 breaths in 2 minutes.

29. ANALYZE TABLES There were 340,000 cattle placed on feed in Texas in February, 2005. Write a proportion that could be used to find how many of these cattle were between 700 and 799 pounds. How many of the 340,000 cattle placed on feed were between 700 and 799 pounds?

Cattle Placed on Feed in Texas, February 2005	
Weight Group	**Fraction of Total Cattle**
Less than 600 pounds	$\dfrac{1}{5}$
600-699 pounds	$\dfrac{11}{50}$
700-799 pounds	$\dfrac{2}{5}$
800 pounds	$\dfrac{9}{50}$

Source: National Agriculture Statistics Service

Let x be the number of cattle between 700 and 799 pounds out of 340,000.

$$\frac{2}{5} = \frac{x}{340,000}$$

Since $5 \times 68,000 = 340,000$, multiply the numerator and denominator by 68,000.

$$\frac{2}{5} = \frac{2 \times 68,000}{5 \times 68,000}$$

$$= \frac{136,000}{340,000}$$

$$x = 136,000$$

136,000 cattle out of 340,000 weigh between 700 and 799 pounds.

31. **OPEN ENDED** One rate of a proportion is $\dfrac{9}{n}$. Select two other rates to form the proportion, one that can be solved using equivalent fractions and the other that can be solved with unit rates. Then solve the proportion using each method.

Sample answer:
Equivalent fractions:
$$\frac{18}{20} = \frac{9}{n}$$
Divide the numerator and the denominator by 2.
$$\frac{18}{20} = \frac{18 \div 2}{20 \div 2}$$
$$= \frac{9}{10}$$
$$n = 10$$
Unit rates:
$$\frac{18}{6} = \frac{9}{n}$$
Find the unit rate.
$$\frac{18}{6} = \frac{18 \div 6}{6 \div 6}$$
$$= \frac{3}{1}$$
Since 3 × 3 = 9, multiply the numerator and the denominator by 3.
$$\frac{3}{1} = \frac{3 \times 3}{1 \times 3}$$
$$= \frac{9}{3}$$
$$n = 3$$

33. REASONING Tell whether the following statement is sometimes, always, or never true. Explain.
In a proportion, if the numerator of the first ratio is greater than the denominator of the first ratio, then the numerator of the second ratio is greater than the denominator of the second ratio.

Always; In order for the ratios to form a proportion they must be equivalent fractions, therefore reducing to the same fraction.

35. **WRITING IN MATH** Jonah can run 3 laps in 24 minutes. At the same rate, about how many laps can Jonah run in 50 minutes? Explain your reasoning.

Let x be the number of laps that Jonah can run in 50 min.
$$\frac{3 \text{ laps}}{24 \text{ min}} = \frac{x \text{ laps}}{50 \text{ min}}$$
Since 24 × 2 ≈ 50, multiply 3 by 2 to get an estimate of 6 laps.

37. **SHORT RESPONSE** Student Council sells bottled water at the cheerleading competition. They sold 3 cases in 20 minutes. If they continue selling bottled water at this rate, how many cases of bottled water would they sell in 3 hours?

Convert hours to minutes.

$$3\text{ h} = 3\text{ h} \cdot \frac{60\text{ min}}{1\text{ h}}$$
$$= 180\text{ min}$$

Let n cases be sold in 3 hours (180 min.).

$$\frac{3}{20} = \frac{n}{180}$$

Since $20 \times 9 = 180$, multiply the numerator and the denominator by 9.

$$\frac{3}{20} = \frac{3 \times 9}{20 \times 9}$$
$$= \frac{27}{180}$$
$$n = 27$$

27 cases of bottled water will be sold in 3 hours.

Determine if the quantities in each pair of rates are proportional. Explain your reasoning and express each proportional relationship as a proportion.

39. $36 for 4 baseball hats; $56 for 7 baseball hats

Find the unit rates.

$$\frac{\$36}{4\text{ baseball hats}} = \frac{(\$36) \div 4}{(4\text{ baseball hats}) \div 4}$$
$$= \frac{\$9}{1\text{ baseball hat}}$$

$$\frac{\$56}{7\text{ baseball hats}} = \frac{(\$56) \div 7}{(7\text{ baseball hats}) \div 7}$$
$$= \frac{\$8}{1\text{ baseball hat}}$$

The unit rates are not the same. Therefore, the rates are not proportional.

41. **TUTORS** A math tutor charges $30 for 2 hours. Use the ratio table to determine how much she charges for 5 hours.
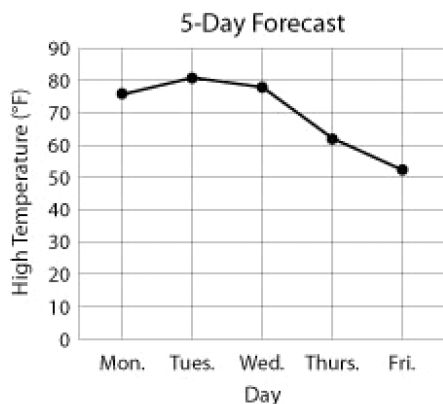
Cost	30		■
Number of Hours	2		5

$$\div 2 \quad \times 5$$

Cost	30	15	75
Number of Hours	2	1	5

$$\div 2 \quad \times 5$$

The teacher charges $75 for 5 hours.

WEATHER Refer to the table at the right.

5-Day Forecast	
Day	**High Temperature (°F)**
Monday	76
Tuesday	81
Wednesday	78
Thursday	62
Friday	53

43. Make a line graph of the data.

45. **PREREQUISITE SKILL** The Sears Tower in Chicago has 30 stories more than the Aon Centre in Chicago. Together, both buildings have 190 stories. Find the number of stories in each building. Use the *guess and check* strategy.

Let the Aon Centre have x stories. Then the Sears Tower has $x + 30$ stories.

$$x + (x + 30) = 190$$
$$2x + 30 = 190$$
$$2x = 160$$
$$x = 80$$
$$x + 30 = 110$$

The Aon Centre has 80 stories and the Sears Tower has 110 stories.