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6-3 Proportions - Practice and Problem Solving

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

7. 16 points scored in 4 games; 48 points scored in 8 games

Find the unit rates.

$$\frac{16 \text{ points}}{4 \text{ games}} = \frac{(16 \text{ points}) \div 4}{(4 \text{ games}) \div 4}$$

$$= \frac{4 \text{ points}}{1 \text{ game}}$$

$$\frac{48 \text{ points}}{8 \text{ games}} = \frac{(48 \text{ points}) \div 8}{(8 \text{ games}) \div 8}$$

$$= \frac{6 \text{ points}}{1 \text{ game}}$$

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

9. $3 for 6 bagels; $9 for 24 bagels

Find the unit rates.

$$\frac{\$3}{6 \text{ bagels}} = \frac{(\$3) \div 6}{(6 \text{ bagels}) \div 6}$$

$$= \frac{\$0.50}{1 \text{ bagel}}$$

$$\frac{\$9}{24 \text{ bagels}} = \frac{(\$9) \div 24}{(24 \text{ bagels}) \div 24}$$

$$\approx \frac{\$0.38}{1 \text{ bagel}}$$

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

11. 15 computers for 45 students; 45 computers for 135 students

$$\frac{15 \text{ computers}}{45 \text{ students}} = \frac{(15 \text{ computers}) \cdot 3}{(45 \text{ students}) \cdot 3}$$

$$= \frac{45 \text{ computers}}{135 \text{ students}}$$

The ratios are equivalent.

$$\frac{15 \text{ computers}}{45 \text{ students}} = \frac{45 \text{ computers}}{135 \text{ students}}$$

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13. 16 out of 28 students own pets; 240 out of 560 students own pets

$$\frac{16 \text{ students}}{28 \text{ students}} = \frac{(16 \text{ students}) \cdot 20}{(28 \text{ students}) \cdot 20}$$

$$= \frac{320 \text{ students}}{560 \text{ students}}$$

$$\frac{320 \text{ students}}{560 \text{ students}} \neq \frac{240 \text{ students}}{560 \text{ students}}$$

The ratios are not proportional.

15. **SURVEY** One school survey showed that 3 out of 5 students buy their lunch. Another survey showed that 12 out of 19 students buy their lunch. Are these results proportional? Explain.

No; sample answer: By looking for equivalent fractions, you notice that 3×4 results in 12, the numerator of the second fraction, however 5×4, or 20 is not the denominator of the second fraction.

BASEBALL Refer to the table below. Determine if each pair of players made proportionally the same number of hits. Explain.

Mark Teixeira	Texas Rangers	48	12
Brad Eldred	Pittsburgh Pirates	66	20
Hideki Matsui	New York Yankees	60	16
Eric Bruntlett	Houston Astros	56	14
Ramon Santiago	Detroit Tigers	33	10

Source: Major League Baseball

17. Hideki Matsui and Mark Teixeira

Find the unit rate for Hideki Matsui.

$$\frac{60 \text{ at bats}}{16 \text{ hits}} = \frac{(60 \text{ at bats}) \div 4}{(16 \text{ hits}) \div 4}$$

$$= \frac{15 \text{ at bats}}{4 \text{ hit}}$$

Find the unit rate for Mark Teixeira.

$$\frac{48 \text{ at bats}}{12 \text{ hits}} = \frac{(48 \text{ at bats}) \div 12}{(12 \text{ hits}) \div 12}$$

$$= \frac{4 \text{ at bats}}{1 \text{ hit}}$$

The unit rate for both the players is not the same. The two players have not made proportionally the same number of hits.

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19. **ANALYZE TABLES** Of the players listed in the table above, did the player who made the most hits have the best record? Explain.

No, Brad Eldred and Ramon Santiago tied with the best record of $\frac{3.3 \text{ at bats}}{1 \text{ hit}}$, but Brad Eldred had more hits than Ramon Santiago.
The unit rate for Brad Eldred was

$$\frac{66 \text{ at bats}}{20 \text{ hits}} = \frac{(66 \text{ at bats}) \div 2}{(20 \text{ hits}) \div 2}$$
$$\approx \frac{33 \text{ at bats}}{10 \text{ hit}} = \frac{3.3 \text{ at bats}}{1 \text{ hit}}.$$

The unit rate for Ramon Santiago was

$$\frac{33 \text{ at bats}}{10 \text{ hits}} = \frac{(33 \text{ at bats})}{(10 \text{ hits})}$$
$$= \frac{3.3 \text{ at bats}}{1 \text{ hit}}.$$

21. **SAVINGS** Rosalinda saved \$35 in 5 weeks. Her sister saved \$56 in 56 days. Did each sister save proportionally the same amount of money? Explain.

$$5 \text{ weeks} = 5 \text{ weeks} \cdot \frac{7 \text{ days}}{1 \text{week}}$$
$$= 35 \text{ days}$$

Find the unit rate for Rosalinda.

$$\frac{\$35}{1 \text{ week}} = \frac{\$35}{35 \text{ days}}$$
$$= \frac{\$1}{1 \text{ day}}$$

Find the unit rate for her sister.

$$\frac{\$56}{56 \text{ days}} = \frac{\$1}{1 \text{ day}}$$

The unit rates are the same. Therefore, the sisters saved proportionally the same amount of money.

CHALLENGE Use the following information to verify each proportion. Justify your response.
To verify a proportion, you can use cross products. If the product of the *means* equals the product of the *extremes*, then the two ratios form a proportion. In a proportion, the top left and bottom right numbers are the extremes. The top right and bottom left numbers are the means. In the proportion in Exercise 22, the numbers 5 and 9 are the means and the numbers 3 and 15 are the extremes.

23. $\frac{2}{7} = \frac{5}{21}$

No; Sample answer: the product of the means is 7 × 5, or 35. The product of the extremes is 2 × 21, or 42. Since the products are not equal, the ratios do not form a proportion.

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25. $\frac{4}{9} = \frac{12}{27}$

Yes; Sample answer: the product of the means is 9×12, or 108. The product of the extremes is 4×27, or 108. Since the products are equal, the ratios form a proportion.

27. The ratio of girls to boys in the junior high band is 3 to 4. Which of these shows possible numbers of the girls and boys in the band?

A 30 girls, 44 boys
B 27 girls, 36 boys
C 22 girls, 28 boys
D 36 girls, 50 boys

Check A

$\frac{30}{44} = \frac{30 \div 10}{44 \div 10}$

$= \frac{3}{4.4}$

$\frac{3}{4.4} \neq \frac{3}{4}$

Check B

$\frac{27}{36} = \frac{27 \div 9}{36 \div 9}$

$= \frac{3}{4}$

Check C

$\frac{22}{28} = \frac{22 \div 7}{28 \div 7}$

$\approx \frac{3.1}{4}$

$\frac{3.1}{4} \neq \frac{3}{4}$

Check D

$\frac{36}{50} = \frac{30 \div 12}{50 \div 12}$

$\approx \frac{3}{4.2}$

$\frac{3}{4.2} \neq \frac{3}{4}$

The answer is B.

29. **SHOPPING** Walter purchased 2 CDs for $26. Use a ratio table to find how much he would pay for 6 CDs.

	÷2		×6
Number of CDs	2	1	6
Dollars Paid	$26	$13	$78
	÷2		×6

Walter will have to pay $78 for 6 CDs.

Find the prime factorization of each number.

31. 15

$15 = 3 \times 5$

33. 102

$102 = 2 \times 3 \times 17$

PREREQUISITE SKILL Write each rate as a unit rate.

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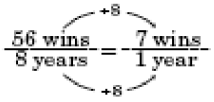
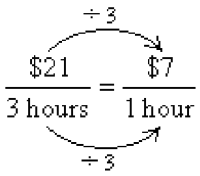
35. 56 wins in 8 years



or 7 wins per year

37. $21 for 3 hours



$7 per hour