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Day 20 Ratio and Proportion

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| <p>Lesson 3-4</p> <p>Lesson Objectives</p> <ul style="list-style-type: none"> ✓ Find ratios and rates ✓ Solve proportions | <p>NAEP 2005 Strand: Number Properties and Operations: Measurement</p> <p>Topics: Rates and Proportional Reasoning, Measuring Physical Attributes</p> <p>Local Standards:</p> |
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Vocabulary and Key Concepts

Cross Products of a Proportion

If $\frac{a}{b} = \frac{c}{d}$ then $ad = bc$

Example ~~8~~ so $2 \cdot 12 = 3 \cdot 8$
 $24 = 24 \checkmark$

$$\frac{a}{b} = \frac{c}{d}$$

$$a \cdot d = b \cdot c$$

$$\frac{2}{3} = \frac{5}{6}$$

$$2 \cdot 6 = 3 \cdot 5$$

$$12 \neq 15$$

NOT a proportion

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\textcircled{x} 2 lbs : 3 lbs

A ratio is a comparison of 2 #'s by \div with same units.

A rate is Compare 2 #'s by \div w/ different units

\textcircled{x} \$40 / 3 HRS

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ex #1
 A unit rate is a rate with a denominator of one. ~~ex~~ 40 mph
 Unit analysis is you decide which conversion factors will produce the appropriate units (ex #3)

ex unit rate: $\frac{40 \text{ mi}}{1 \text{ hr}}$

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A proportion is an eq. that states 2 ratios are \equiv

In the proportion $\frac{a}{b} = \frac{c}{d}$, the extremes of proportion are $a \cdot d$
 In the proportion $\frac{a}{b} = \frac{c}{d}$, the means of a proportion are $b \cdot c$
 In the proportion $\frac{a}{b} = \frac{c}{d}$, the cross products are $ad = bc$

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Examples

1 Using Unit Rates A brand of grapefruit juice costs \$1.56 for 48 oz. Find the unit rate.

cost \rightarrow \$1.56
 ounces \rightarrow 48 oz
 The unit rate is $\frac{\$1.56}{48 \text{ oz}} = \$0.0325/\text{oz}$ ~~0.0325~~

3¢ per oz
~~0.03¢ per oz~~

unit rate
 ex $\frac{\$150}{6 \text{ HRS}} = \frac{\$25}{1 \text{ HR}}$
 $= \$25 \text{ per hr}$
 OR $\$25/\text{HR}$

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2 Applying Proportions In 2000, Lance Armstrong completed the 3,630-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?

$3630t = 92.5(295)$
 $\frac{3630t}{3630} = \frac{27,287.5}{3630}$
 $t = 7.5 \text{ HRS}$

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unit analysis

6) **Converting Rates** The fastest recorded speed for an eastern gray kangaroo is 40 mi per hour. What is the kangaroo's speed in feet per second?

$40 \frac{\text{mi}}{\text{hr}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ s}}$ Use appropriate conversion factors.

$\frac{211,200 \text{ ft}}{3600 \text{ s}}$ Divide the common units.

$= 58.67 \frac{\text{ft}}{\text{s}}$ Simplify.

The kangaroo's speed is about $59 \frac{\text{ft}}{\text{s}}$.

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Compare and Check

1. Main Street Florist sells two dozen roses for \$24.60. Flowers for You Florist sells six roses for \$7.50. Find the unit rate for each. Which florist has the lower cost per rose?

| | |
|-------------------------|---------------|
| Main St. | Flowers 4 U |
| \$24.60 | \$7.50 |
| roses 24 | 6 roses |
| = \$1.025 | = \$1.25/rose |
| M.S. <u>\$1.03/rose</u> | |

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Quick Check

2. Suppose you walk 2 miles in 35 minutes.

a. Find the average walking speed. Write a rule to describe the distance d you walk as a function of the time t you walk.

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Quick Check

2. Suppose you walk 2 miles in 35 minutes.

b. Use the function to find how far you would walk in an hour.

$\frac{2 \text{ mi}}{35 \text{ min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}}$

$\frac{2 \cdot 60}{35} = \frac{120 \text{ mi}}{35 \text{ hr}} = \frac{3.4 \text{ mi}}{1 \text{ hr}}$

3.4 mph
3.4 mi/hr
3.4 mi per hr

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3. A sleigh travels 0.15 miles per hour. Convert this speed to feet per minute.

$$\begin{array}{l}
 0.15 \text{ mi} \quad | \text{hr} \quad 5280 \text{ Ft} \\
 1 \text{ hr} \quad | \quad 60 \text{ min} \quad | \text{mi} \\
 \\
 = \frac{792 \text{ ft}}{60 \text{ min}} = 13.2 \text{ ft/min}
 \end{array}$$

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① Solving Multi-Step Proportions Solve the proportion.

$$\begin{array}{l}
 \cancel{\frac{z+3}{1} = \frac{-4}{6}} \quad \text{ex} \\
 6(z+3) = 4(z-4) \\
 6z + 18 = 4z - 16 \\
 6z + 18 - 4z = 4z - 16 - 4z \\
 2z + 18 = -16 \\
 2z + 18 - 18 = -16 - 18 \\
 2z = -34 \\
 \frac{2z}{2} = \frac{-34}{2} \\
 z = -17
 \end{array}$$

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4. Solve each proportion.

a. $\frac{x+2}{14} = \frac{8}{10}$ $\frac{7}{14} = \frac{5}{10}$

$$\begin{array}{l}
 10(x+2) = 14 \cdot 8 \\
 10x + 20 = 112 \\
 10x + 20 - 20 = 112 - 20 \\
 10x = 92 \\
 \frac{10x}{10} = \frac{92}{10} \\
 x = 9.2
 \end{array}$$

$\frac{1}{2} = \frac{1}{2} \checkmark$
 $70 = 70 \checkmark$

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4. Solve each proportion.

b. $\frac{y-15}{y+4} = \frac{35}{7}$

$$\begin{array}{l}
 7(y-15) = 35(y+4) \\
 7y - 105 = 35y + 140 \\
 7y - 105 - 35y = 35y + 140 - 35y \\
 -28y - 105 = 140 \\
 -28y - 105 + 105 = 140 + 105 \\
 -28y = 245 \\
 \frac{-28y}{-28} = \frac{245}{-28} \\
 y = -8.75
 \end{array}$$

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4. Solve each proportion.

c. $\frac{3}{w + 6} = \frac{5}{w - 4}$

Text Book page 146:

Solve each proportion.

26. $\frac{x + 3}{4} = \frac{7}{8}$

27. $\frac{a - 5}{5} = \frac{7}{12}$

28. $\frac{8}{9} = \frac{w - 2}{6}$

29. $\frac{1}{c + 3} = \frac{2}{5}$

30. $\frac{8}{b + 10} = \frac{4}{25 - 7}$

31. $\frac{k + 5}{10} = \frac{k - 12}{6}$

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Complete each statement.

32. \$2/lb = ¢/oz

34. 4¢/day = \$ /yr

36. 5 cm/min = m/wcek

Express each rate in miles per hour.

38. 1 mi in 3 min

39. 1 mi in 4 min

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