Learning Objective: Students will be able to determine rates from words, tables, and graphs.

Warm Up

$$372\overline{)1202304} \qquad 848\overline{)2236176} \qquad 199\overline{)1069625}$$

$$799\overline{)2340271} \qquad 954\overline{)7559496} \qquad 161\overline{)956179}$$

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Warm Up Answers

$$\begin{array}{r} 3232 \\ 372\overline{)1202304} \end{array}$$

$$\begin{array}{r} 2637 \\ 848\overline{)2236176} \end{array}$$

$$\begin{array}{r} 5375 \\ 199\overline{)1069625} \end{array}$$

$$\begin{array}{r} 2929 \\ 799\overline{)2340271} \end{array}$$

$$\begin{array}{r} 7924 \\ 954\overline{)7559496} \end{array}$$

$$\begin{array}{r} 5939 \\ 161\overline{)956179} \end{array}$$

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Lesson 14.1   January 4 & 5, 2016

Essential Question:

How do rates help you describe real-life problems?

January 4 & 5, 2016

Lesson Objective:

Students will be able to:

determine rates from words, tables, and graphs.

Self-Evaluation Scale

Score	Description
4	I can teach other students how to determine rates from words, tables, and graphs.
3	I can determine rates from words, tables, and graphs.
2	I recognize, but still need help to determine rates from words, tables, and graphs.
1	I do not know how to determine rates from words, tables, and graphs.

Learning Objective: Students will be able to determine rates from words, tables, and graphs.

Activities 1-4

With partners, complete Activities 1 - 4 on pages 305 - 307 of your Record and Practice Journal (Soft Cover)

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A **ratio** is a comparison of two quantities using division.

$$\frac{3}{4}, 3 \text{ to } 4, 3:4$$

A **rate** is a ratio of two quantities with different units.

$$\frac{60 \text{ miles}}{2 \text{ hours}}$$

A rate with a denominator of 1 is called a **unit rate**.

$$\frac{30 \text{ miles}}{1 \text{ hour}}$$

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1 Finding Ratios and Rates

There are 45 males and 60 females in a subway car. The subway car travels 2.5 miles in 5 minutes.

a. Find the ratio of males to females.

$$\frac{\text{males}}{\text{females}} = \frac{45}{60} = \frac{3}{4}$$

⋮ The ratio of males to females is $\frac{3}{4}$.

b. Find the speed of the subway car.

$$2.5 \text{ miles in 5 minutes} = \frac{2.5 \text{ mi}}{5 \text{ min}} = \frac{2.5 \text{ mi} \div 5}{5 \text{ min} \div 5} = \frac{0.5 \text{ mi}}{1 \text{ min}}$$

⋮ The speed is 0.5 mile per minute.

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2 — Finding a Rate from a Ratio Table

The ratio table shows the costs for different amounts of artificial turf. Find the unit rate in dollars per square foot.

Amount (square feet)	25	100	400	1600
Cost (dollars)	100	400	1600	6400

×4 ×4 ×4

×4 ×4 ×4

Use a ratio from the table to find the unit rate.

$$\frac{\text{cost}}{\text{amount}} = \frac{\$100}{25 \text{ ft}^2}$$ Use the first ratio in the table.

$$= \frac{\$4}{1 \text{ ft}^2}$$ Simplify.

So, the unit rate is $4 per square foot.

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A **complex fraction** has at least one fraction in the numerator, denominator, or both. You may need to simplify complex fractions when finding ratios and rates.

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3 Finding a Rate from a Graph

The graph shows the speed of a subway car. Find the speed in miles per minute. Compare the speed to the speed of the subway car in Example 1.

Subway Car Speed

Distance (miles)

$\left(\frac{1}{2}, \frac{1}{4}\right)$

$\left(3, 1\frac{1}{2}\right)$
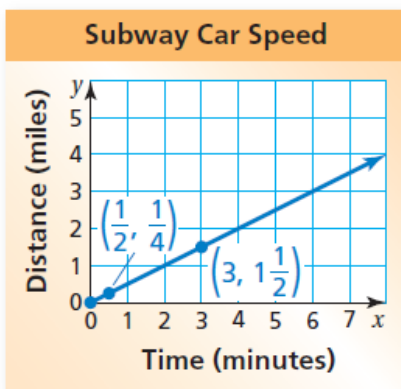
Time (minutes)

Step 1: Choose and interpret a point on the line.

The point $\left(\frac{1}{2}, \frac{1}{4}\right)$ indicates that the subway car travels

$\frac{1}{4}$ mile in $\frac{1}{2}$ minute.

Step 2: Find the speed.

$$\frac{\text{distance traveled}}{\text{elapsed time}} = \frac{\frac{1}{4} \leftarrow \text{miles}}{\frac{1}{2} \leftarrow \text{minutes}}$$

$$= \frac{1}{4} \div \frac{1}{2} \qquad \text{Rewrite the quotient.}$$

$$= \frac{1}{4} \cdot 2 = \frac{1}{2} \qquad \text{Simplify.}$$

∴ The speed of the subway car is $\frac{1}{2}$ mile per minute.

Because $\frac{1}{2}$ mile per minute = 0.5 mile per minute, the speeds of the two subway cars are the same.

Learning Objective: Students will be able to determine rates from words, tables, and graphs.

⋮ 4 Solving a Ratio Problem

You mix $\frac{1}{2}$ cup of yellow paint for every $\frac{3}{4}$ cup of blue paint to make 15 cups of green paint. How much yellow paint and blue paint do you use?

Method 1: The ratio of yellow paint to blue paint is $\frac{1}{2}$ to $\frac{3}{4}$. Use a ratio table to find an equivalent ratio in which the total amount of yellow paint and blue paint is 15 cups.

Yellow (cups)	Blue (cups)	Total (cups)
$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2} + \frac{3}{4} = \frac{5}{4}$
2	3	5
6	9	15

× 4 ⟶ × 4
× 3 ⟶ × 3

⋮ So, you use 6 cups of yellow paint and 9 cups of blue paint.

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Method 2: Use the fraction of the green paint that is made from yellow paint and the fraction of the green paint that is made from blue paint. You use $\dfrac{1}{2}$ cup of yellow paint for every $\dfrac{3}{4}$ cup of blue paint, so the fraction of the green paint that is made from yellow paint is

yellow $\longrightarrow$
green $\longrightarrow$
$$\dfrac{\dfrac{1}{2}}{\dfrac{1}{2}+\dfrac{3}{4}} = \dfrac{\dfrac{1}{2}}{\dfrac{5}{4}} = \dfrac{1}{2}\cdot\dfrac{4}{5} = \dfrac{2}{5}.$$

Similarly, the fraction of the green paint that is made from blue paint is

blue $\longrightarrow$
green $\longrightarrow$
$$\dfrac{\dfrac{3}{4}}{\dfrac{1}{2}+\dfrac{3}{4}} = \dfrac{\dfrac{3}{4}}{\dfrac{5}{4}} = \dfrac{3}{4}\cdot\dfrac{4}{5} = \dfrac{3}{5}.$$

So, you use $\dfrac{2}{5}\cdot 15 = 6$ cups of yellow paint and $\dfrac{3}{5}\cdot 15 = 9$ cups of blue paint.

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Assignment

Complete problems:

8, 10, 20, 22, 24, 26, 28, 30, 32, 34, 36, & 38

on pages 603 - 605 in your Big Ideas Text Book.

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Assignment Answers

8. $28

10. 57 mi

20. $0.80 per can

22. 8.7 m per h

24. 3.6 ft per yr

26. 2.4 million people per year

28. **a.** It costs $122 for 4 tickets.

    b. $30.50 per ticket

    c. $305

30. The 9-pack is the best buy at $2.55 per container.

32. 300 square meters

34. 108 pounds of mulch, 64 pounds of gravel

36. **a.** whole milk

    b. orange juice

38. **a.** 16 cups of red paint, 10 cups of blue paint

    b. $3\frac{1}{5}$ cups of red paint, 2 cups of blue paint, $\frac{4}{5}$ cup of white paint

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Homework

In your Big Ideas Record and Practice Journal page 308.

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