Lesson 5.1:

Ratios and Rates

5.1 Notes

Get out your spiral notebooks!

Essential Question

What is a ratio, rate, unit rate?

Ratios and **rates** compare two quantities.

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

Example 1:

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.

$\frac{m}{f} = \frac{45}{60} \div 15 = \boxed{\frac{3}{4} \text{ or } 3:4}$

b. Find the speed of the subway car.

$\frac{2.5 \text{ mi} \div 5}{5 \text{ min} \div 5} = \frac{0.5 \text{ mi}}{1 \text{ min}} = \boxed{0.5 \text{ mi/min}}$

Use a unit rate for speed (denominator of 1)

Example 2:

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

$\frac{\$x}{1 \text{ ft}^2}$

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

× 4 × 4 × 4 (above) × 4 × 4 × 4 (below)

Multiplied by the same number across both rows

Choose any pair and turn into a fraction

$\frac{\$100}{25 \text{ ft}^2} = \boxed{\$4/\text{ft}^2}$

Be mindful of the order of units

There are 45 males and 60 females in a subway car.

1. Find the ratio of females to males.

$\frac{60 \div 15}{45 \div 15} = \frac{4}{3}$

2. Find the ratio of females to total passengers.

$\frac{60}{45+60} = \frac{60 \div 5}{105 \div 5} = \frac{12 \div 3}{21 \div 3} = \frac{4}{7}$

3. The ratio table shows the distance that the *International Space Station* travels while orbiting Earth. Find the speed in miles per second.

Time (seconds)	3	6	9	12
Distance (miles)	14.4	28.8	43.2	57.6

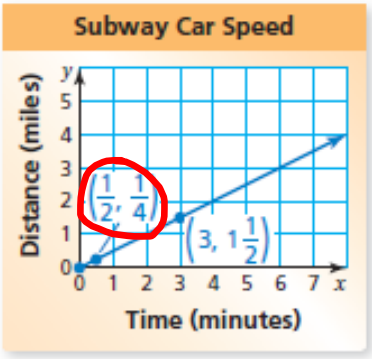
$\frac{14.4 \text{ mi} \div 3}{3 \text{ s} \div 3} = \frac{4.8 \text{ mi}}{1 \text{ s}} \rightarrow 4.8 \text{ mi/s}$

Example 3:

The graph shows the speed of a subway car. Find the speed in miles per minute.

$\frac{\text{mi}}{\text{min}} = \frac{y}{x} = \frac{\frac{1}{4} \text{ mi} \cdot 2}{\frac{1}{2} \text{ min} \cdot 2}$

$\frac{\frac{2}{4} \text{ mi}}{1 \text{ min}} \rightarrow \frac{1}{2} \text{ mi/min}$



Example 4:

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?

Yellow	Blue	Total
$\frac{1}{2} = \frac{2}{4}$ ×4	$\frac{3}{4}$ ×4	$\frac{5}{4}$ ×4
2 ×3	3 ×3	5 ×3
6	9	15

Make all values integers by multiplying by 4

Multiply all values by 3 so that the total is 15

6 c yellow, 9 c blue

4. How much yellow paint and blue paint do you use to make 20 cups of green paint?

Yellow $\frac{1}{2}$ ×4 → 2 ×4 → 8

Blue $\frac{3}{4}$ ×4 → 3 ×4 → 12

Green $\frac{5}{4}$ ×4 → 5 ×4 → 20

8 c yellow, 12 c blue

Example 5:

Find the product. List the units.

$$\frac{8\ \text{lb}}{1} \times \frac{\$3.50}{\text{lb}} = \$28$$

We have "lb" in both the numerator and the denominator, so we can cancel them (just like pre-simplifying) and are left with $.