

Aim: What are proportions and proportional relationships?

Date _____

Do now: In your own words, what is a proportion?

Proportion: A proportion states that 2 ratios are equivalent. It is usually written in one of the following forms:

$$a:b=c:d \quad \text{or} \quad \frac{a}{b} = \frac{c}{d}$$

There are two ways to solve a proportion

Equivalent Ratios/Fractions (SOMETIMES works)	Algebraic Cross Products (ALWAYS works)
$\frac{3}{5} = \frac{x}{15}$ $\frac{3 \times 3}{5 \times 3} = \frac{x}{15}$ $x = 9$	$\frac{3}{5} = \frac{x}{15}$ $\frac{5x}{5} = \frac{45}{5}$ $x = 9$ <p>We will use this method</p>

Solve for the variable:

1. ~~$$\frac{3}{8} = \frac{x}{24}$$~~

$$\frac{8x}{8} = \frac{72}{8}$$

$$x = 9$$

2. ~~$$\frac{x}{20} = \frac{6}{8}$$~~

$$\frac{8x}{8} = \frac{120}{8}$$

$$x = 15$$

3. ~~$$\frac{4}{6} = \frac{x}{15}$$~~

$$\frac{6x}{6} = \frac{60}{6}$$

$$x = 10$$

4. ~~$$\frac{12}{x} = \frac{4}{3}$$~~

$$\frac{4x}{4} = \frac{36}{4}$$

$$x = 9$$

$$5. \frac{1}{3} = \frac{9}{b}$$

$$\frac{1}{4}b = \frac{4 \cdot 9}{1 \cdot 3} = \frac{36}{3}$$

$$\frac{1}{4}b = 12 \quad (4)$$

$$b = 48$$

$$6. \frac{2}{a} = \frac{4}{(a-7)}$$

$$4a = 2a - 7$$

$$\frac{-2a}{-2a} = \frac{-7}{-2a}$$

$$\frac{2a}{2} = \frac{-7}{2}$$

$$a = -\frac{7}{2} \text{ or } -3\frac{1}{2}$$

$$7. \frac{7}{(b+5)} = \frac{10}{5}$$

$$10(b+5) = 35$$

$$10b + 50 = 35$$

$$10b = -15$$

$$b = -1.5$$

$$8. \frac{5}{6} = \frac{(7n+9)}{9}$$

$$6(7n+9) = 45$$

$$42n + 54 = 45$$

$$42n = -9$$

$$n = \frac{-9}{42} = \frac{-3}{14}$$

★ Two ratios are equivalent/proportional if their cross-products are equal or if they reduce to the same fraction.

Are the following relationships proportional/equivalent or non-proportional/non-equivalent?

$$(1) \frac{2}{6} = \frac{3}{12} \text{ or } \frac{1}{3} = \frac{1}{4}$$

No

$$(2) \frac{2}{9} = \frac{6}{27}$$

YES

$$\frac{2}{9} = \frac{2}{9}$$

3) One theater charged you \$5.00 for two boxes of popcorn. Another theater charged you \$7.50 for three boxes.

$$\frac{5}{2} = \frac{7.50}{3}$$

Yes, proportional

(They will have same unit rate)

4) On the first day it took 3.5 hours to drive 175 miles. On the next day it took 5 hours to drive 200 miles.

$$\frac{175 \text{ mi}}{3.5 \text{ h}} = \frac{200 \text{ mi}}{5 \text{ h}}$$

No, not proportional
(We would have to \div to compare unit rates)

5) Tim painted 150 square feet in 2 hours. John painted 200 square feet in 4 hours.

$$\frac{150 \text{ sq. ft}}{2 \text{ h}} = \frac{200 \text{ sq. ft}}{4 \text{ h}}$$

No, not proportional
(We would have to \div to compare unit rates)

Take-Away

1.) How can you tell whether two ratios form a proportion?

Cross-products should be \equiv or Unit rates reduce to same #'s

2.) Name two ways to find a missing variable in a proportion.

Equivalent ratios and Cross products

3.) Which one does not belong: $\frac{4}{10}$ $\frac{2}{5}$ $\frac{3}{5}$ $\frac{6}{15}$

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

* Doesn't belong