**Ratios**: You can compare different groups by using ratios. A ratio is a comparison of two quantities using division. Ratios can be written to compare a part to a part, a part to the whole, or the whole to a part.

A ratio can be written in 3 ways: $\frac{29}{12}$ 29 to 12 29:12 These are all read as "twenty-nine to twelve"

Example: Animals at the Vet

| | |
|---|---|
| Cats | 5 |
| Dogs | 7 |
| Rabbits | 2 |

What is the ratio of cats to rabbits? **5 to 2**

What is the ratio of cats to total animals? **5 to 14**

**Equivalent ratios**: Equivalent ratios are ratios that name the same comparison. You can find an equivalent ratio by multiplying or dividing both terms in a ratio by the same number.

Example: $\frac{5}{10} = \frac{1}{2} = \frac{10}{20}$

**Rate**: A rate compares two quantities that have different units of measure. Suppose a 2-liter bottle of soda costs $ 1.98:

Rate: $\frac{\text{price}}{\text{number of liters}} = \frac{\$\ 1.98}{2 \text{ liters}} =$ $ 1.98 for 2 liters

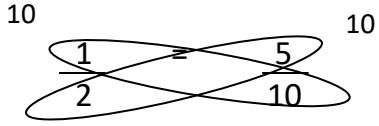
**Unit Rate**: When the comparison is to one unit, the rate is called a unit rate. Divide both terms by the second term to find the unit rate.

Unit Rate: $\frac{\$\ 1.98}{2 \text{ liters}} = \frac{\$\ 1.98 \div 2}{2 \div 2} = \frac{\$\ 0.99}{1}$ = $ 0.99 for 1 liter

To find the best deal: Find the unit rates of the items you are comparing and the item with the lowest unit rate is the best deal.

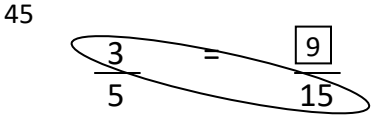
**Proportion**: A proportion is an equation that shows two equivalent ratios. You can use the "butterfly method" to see if a set of ratios forms a proportion or not. You can cross multiply and divide to find missing numbers in proportions.

Butterfly method




These two DO form a proportion because their cross-products are equal.

Cross multiply and divide




45 ÷ 5 = 9, so the missing number is 9. You can check by using the butterfly method

**Helpful videos:**

https://www.khanacademy.org/math/pre-algebra/pre-algebra-ratios-rates/pre-algebra-ratios-intro/v/ratios-intro

https://www.khanacademy.org/math/pre-algebra/pre-algebra-ratios-rates/pre-algebra-rates/v/finding-unit-rates