NUMERICAL PROPORTIONS

- **Numerical proportions** compare two numbers. The numbers can have the same units such as a ratio or the numbers can have different units such as rates. A proportion is usually in the form of $a:b$ or $a/b$.

- **Ratios** are used to compare objects, wins and losses, sides of a figure to its area and many more.

- **Rates** are used to compare miles per hour, words per minute, price per pound and many others. A **unit rate** is when the denominator of a proportion is one. Miles per hour is an example of a unit rate. When comparing different unit rates, a better buy decision can be made.

- **A proportion equation** is used when one ratio or rate is known and only part of another ratio or rate is known.

- There are 4 parts to a proportion and it can be solved when 3 of the 4 parts are known.

- Proportion equations can be used only when comparing equal proportions. Proportion equations can be used to make dimensional analysis in regards to photo enlargement, room dimensions, etc.

How to use numerical proportions:

- **A ratio** is used to compare items with the same unit.
  **For example**, if School A won 18 out of 24 games, the ratio of winning games to total games would be $3/4$. To compare this to School B that won 36 out of 48 games, the ratio would have to be found. The ratio of winning games to total games for School B is also $3/4$. Therefore both schools have the same ratio of winning games to total games.
Another example: If there are 10 cats and 5 dogs in a neighborhood, the ratio of cats to dogs is 10:5 or 10/5 or 10 to 5.

- A rate is used to compare items with different units. For example, if Renee drove 135 miles in 3 hours, her average speed would be 45 miles per hour.

- A unit rate is used to determine what a rate would be in one hour, one pound, one ounce etc. When comparing two products, the unit rate can be used to determine the better buy or cheaper price.

Example: Which is the better buy?

$1.99 for a half dozen apples or $2.49 for a dozen apples

\[
\begin{align*}
1.99 &= x \\
2.49 &= x
\end{align*}
\]

This is the better buy.

- The proportion equation is used to compare items and is used when one ratio or rate is known and only part of another ratio or rate is known. There are 4 parts to a proportion and it can be solved when 3 of the 4 parts are known.

For example, Jim can read 6 pages in 5 minutes. How long will it take him to read a book with 150 pages?

\[
\begin{align*}
6 \text{ pages} &= 150 \text{ pages} \\
(5)(150) &= 6x \\
750 &= 6x \\
125 &= x
\end{align*}
\]

or about 2 hours

- With proportional equations, it is very important that the correct units are lined up in order to find the correct result.
Try This!

What is the ratio of wins to losses for the Hawks if they won 12 games and lost 4 games?

If Brian got paid $52 after working 8 hours, what is his hourly rate?

What is a better buy: a 4 lb. bag of peanuts for $2.59 or a 10 lb. bag of peanuts for $5.99?

A recipe for lemonade needs 10 lemons to serve 15 people. If 36 people are coming to a party, how many lemons are needed to make lemonade?

A photograph is 8" x 10" length by width. If the photographer wants to enlarge the picture to have a length of 20", what will the width be?