Order of Operations

- When evaluating an expression, we must follow certain rules. 'BEDMAS' is an acronym that tells us the _____ in which to do the operations.
- There are different ways of representing each of the above operations in an equation.

Brackets:

Exponents:

Division:

Multiplication:

BEDMAS:

→ **BRACKETS**

→ **EXPONENTS** (OR ROOT OF A NUMBER)

→ **DIVISION/MULTIPLICATION** - left to right

→ **ADDITION/SUBTRACTION** - left to right

Fractions

- When a whole unit is divided into equal parts, we call the parts fractions of a whole.
- In a fraction, the number on the "top" is called the "numerator". The number on the "bottom" is called the "denominator".

Proper Fractions

a fraction whose numerator is less than greater than the denominator, ie) value is less than 1

Improper Fractions

a fraction whose numerator is or equal to the denominator, ie) value is greater than or equal to 1

Mixed Numbers

In general, a mixed number is a sum of a whole number and a fractional part of a whole.

Basic Properties

1) $\frac{a}{1} = a$ 2) $\frac{0}{a} = 0$ 3) $\frac{a}{a} = 1$

Changing from Mixed to Improper

Step 1) Multiply the whole number by the denominator and add the numerator

Step 2) Keep the same denominator

Changing from Improper to Mixed

Step 1) Divide the numerator by the denominator to obtain the whole number

Step 2) Multiply the whole number by the denominator to determine the number of parts you have left

Step 3) Create your mixed number using the same denominator

Simplifying Fractions

To **reduce** a fraction to its **lowest terms**, divide the numerator and denominator by the Greatest Common Factor: the largest number that divides evenly into both the numerator and denominator.

Multiplying and Dividing Fractions

1. Check – All Fractions must be in Proper or Improper form (not Mixed Numbers)
2. IF DIVISION: Flip Only the Fraction *to the Right of the Division Sign* then Change the Sign to Multiply
3. Multiply the top numbers (the numerators) then multiply the bottom numbers (the denominators).
4. Simplify Fraction to Lowest Terms (If improper fraction, must change back to mixed)

Adding and Subtracting Fractions

1. Check – All Fractions must be in Proper or Improper form (not Mixed Numbers)
2. Find the Common Denominator
3. Change the Fractions to Equivalent Fractions with the Same Denominator
4. Add/Subtract the Top Numbers (NOT the Bottom Numbers)
5. Simplify Fraction to Lowest Terms

Percents and Decimals

Numbers can be represented as fractions, decimals or percents.

- To change a decimal (or ordinary number) to a percent, multiply by _____ and add the _____

- To change a percent to a decimal, divide by _____ and remove the _____

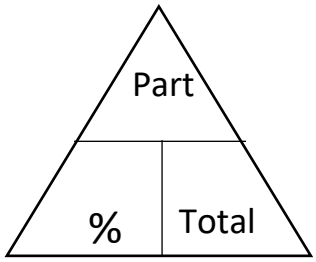
- To change a fraction to a percent, _____ the numerator by the denominator then multiply by 100

- To change a percent to a fraction, put the percent over _____ then _____ the fraction

Percent Problems – Portion, Rate, Base

There are three types of percent problems that you are going to have to solve: finding the part/portion (or the new), whole/base (or the original), and the percent/rate.

Percentage problems usually work off of some version of the sentence: "(this) **IS** (some **percentage**) **OF** (that)"



$$\%\ \textbf{inc/dec} = \frac{\boldsymbol{difference}}{\boldsymbol{original}} \times \mathbf{100}\%$$

Class Example) Solve each of the following problems; round your answers to the nearest *tenth*, when necessary.

1) Joe receives a monthly salary of $2870. His annual salary is raised by 6%. What is his new annual salary?

2) A quality control inspector found that 1.6% of computers inspected were defective. If 2 computers were found to be defective, how many were inspected?

3) 75% of the students in computing programs have taken algebra. If there are 76 students in the computing programs, how many of them have taken algebra?

4) A program has 1500 lines of code and 2% needs to be debugged. If it takes you 10 mins to debug each line, how long will it take you to debug the program?

5) The interest on a $500 loan is $90. What is the rate of interest?

6) In a college election, the winning candidate got 2030 votes (which totaled 58% of the total vote). How many students voted?

7) 1600 people took the Pepsi/Coke challenge. 55% of those challenged preferred coke. How many selected Pepsi?

8) You correctly answered 24 out of 40 problems. What is your percent score?

9) A saleswoman has a commission rate of 3.5%. To earn $280, how much must she sell?

10) A normal resting heart rate for adults is 80 beat per minute (bpm) ± 25%. What is considered the 'normal range' of an adult heart rate?

11) Ann scored 95 marks at the last Mathematics exam. She scored 76 marks this time. By what was the percentage decrease in her score?

12) Computer Depot is having a sale on network cable. The original price is $2.50/ft and the current sale price is $1.97/ft. What percent discount was given?

13) The value of my home increased from $282 000 to $312 000. What percent increase is this?

Evaluating Algebraic Expressions

We use **substitution** to evaluate an algebraic expression and then solve with Order of Operations (BEDMAS). To evaluate an expression, replace the letters with given numbers; then do the arithmetic.

Simplifying Algebraic Expressions

We can collect **like terms** within an algebraic expression. Like terms only differ by their numeric coefficient. The variable base and exponent of the term are identical.

EG) Like Terms: "3x and 6x" and "$4xy^2$ and $-5xy^2$" and Unlike Terms: "$2x^2$ and $3x$" and "$2x^3$ and $18x^3$"

Like terms can be combined into one term by combining coefficients: $ax + bx = (a+b)x$

The Distributive Property

Often we need to use the **distributive property** to first get rid of any brackets in the algebraic expression, before collecting **like terms**.

Distributive Property: $a(x + y) = ax + ay$ Note: $-a(x + y) = -ax - ay$

Every time the distributive property is applied, a set of brackets can be dropped. It is often a good idea to simplify by collecting like terms at each step.

Multiplication and Division of Algebraic Expressions

When multiplying and dividing algebraic expressions, we will utilize the **laws of exponents** studied in a previous lesson.

Recall: $a^m a^n = a^{m+n}$ $\frac{a^m}{a^n} = a^{m-n}$ $(a^m)^n = a^{m \times n}$

Remember these rules only apply when doing operations on powers with the **same base**.

Multiplication by a polynomial

To multiply a polynomial by another polynomial, multiply each term of the first polynomial by each term in the second polynomial. Then combine like terms where possible.

Division by a polynomial

We will not cover this as it is not commonly used