# 1 - 1

# Variables and Expressions

# Converting expressions

*Given the following verbal expressions, convert them into algebraic expressions*

1) eight more than a number

2) seven less than the product of a number and four.

*Given the following algebraic expressions, convert them into verbal expressions*

1) $4m^3$

2) $c^2 + 21d$

# 1 - 2

# Order of Operations

**P**arenthesis

**E**xponents

**M**ultiplication } *Do whichever operation comes first when completing the problem. (as if you were reading from left to right)*

**D**ivision }

**A**ddition } *Do whichever operation comes first when completing the problem. (as if you were reading from left to right)*

**S**ubtraction }

*Use Order of Operations to simplify the following:*

1) $(15 - 9) + 3 \cdot 4$

2) $3^2 - 4(6 - 3 \cdot 3)$

**EVALUATE (Find the value of the algebraic expression below)**

** When replacing a variable with a number, ALWAYS use parenthesis around the number*

$a = 2, b = -3, c = -1$

1) $ab - c^2$

2) $cba - 2b^2$

# 1 - 3

# Open Sentences

# TERMINOLOGY

***Open Sentenc***e - an equation with zero, one, or more possible solutions

***Replacement Set*** - a set of numbers that could be possible solutions. You use these numbers to replace the variable in the equation to check to see if the number is a solution.

***Solution Set*** - a set of numbers that contains all possible solutions

**Example:**

*Use the replacement set and the open sentence to find the solution set.*

1) Replacement: {3, 4, 5, 6, 7}
   Open Sentence: $6m + 7 = 37$

2) Replacement Set: {0, 1, 2, 3}
   Open Sentence: $-2x + 4 > 0$

# 1 - 4

# Identity and Equality Properties

# IDENTITIES

| | | |
|---|---|---|
| Additive Identity | ---> | $a + 0 = a$ |
| Multiplicative Identity | ---> | $a \cdot 1 = a$ |
| Multiplicative Prop of Zero | ---> | $a \cdot 0 = 0$ |
| Multiplicative Inverse (reciprocal) | ---> | $a \cdot \frac{1}{a} = 1$ |

# PROPERTIES

| | | |
|---|---|---|
| Reflexive Property | ---> | a = a |
| Symmetric Property | ---> | If a = b, then b = a |
| Transitive Property | ---> | If a = b and b = c, then a = c |
| Substitution Property | ---> | If a = b then a maybe replaced by b |

# 1 - 5

# Distributive Property

# Distributive Property

$$a(b + c) = a(b) + a(c)$$

Examples:

$3(x + 3) = 3x + 9$

$x(y - 2) = xy - 2x$

$4x(3y + 2) = 12xy + 8x$

**SAMPLE**

$$5(7 + 8)$$

PEMDAS

$$5(15)$$

$$75$$

Dist. Prop.

$$5(7) + 5(8)$$

$$35 + 40$$

$$75$$

# EXAMPLE

Using Distribution for Multiplication

1) 4(43)

2) 6(112)

3) 12(1234)

# 1 - 6

# Commutative and Associative Properties

**COMMUTATIVE** - The order in which you add or multiply ***two numbers*** does not change the result

$$a + b = b + a$$

$$a \cdot b = b \cdot a$$

**ASSOCIATIVE** - The order in which you add or multiply three or more numbers does not change the result.

$$(a + b) + c = a + (b + c)$$

$$(a \cdot b) \cdot c = a \cdot (b \cdot c)$$

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# Logical Reasoning and Counterexamples

## Conditional Statement

A statement typically written in "If / Then" form.

**Hypothesis** - *The "If" part of a Conditional Statement*

**Conclusion** - *The "Then" part of a Conditional Statement*

## Example

If _____, then _____
(Hypothesis) (Conclusion)

## Deductive Reasoning

A process that uses facts, rules, definitions or properties to reach a valid conclusion.

### EXAMPLE

*Determine if the conclusion in the statement below is valid, using Deductive Reasoning.*

**1) If one number is odd and another is even, then their sum is odd.**

## Counterexample

An example that proves a conclusion in a conditional statement is false.

## EXAMPLE

*Determine if the conclusion in the statement below is valid, using Deductive Reasoning. If the conclusion is not true, provide a **counterexample**.*

**1) If a number x is squared, then $x^2 > x$.**

# 1 - 8

# Number System

**Real Numbers**

- Any number we use in this class

**Rational**

- Any number that can be written as a fraction.

**Example**

$0.4,\ -10,\ 0,\ \frac{3}{4}$

**Irrational**

- Any non-repeating, infinite decimal

**Example**

$0.35924.....,\ \sqrt{5},\ \pi$

## 3 Types of Rational Numbers

**Integer** - Any positive or negative number whose denominator is zero.

**.....-3, -2, -1, 0, 1, 2, 3.....**

**Whole** - Any positive integer. Includes zero.

**0, 1, 2, 3.....**

**Natural** - Any Whole number, NOT including zero.

**1, 2, 3.....**

# EXAMPLES

*Classify the following:*

**1) 4**

**2) 2/5**

**3) -6**

**4) $\sqrt{7}$**

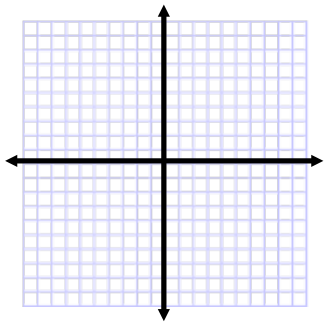
# 1 - 9

# Functions and Graphs

# TERMINOLOGY

**Function** - Exactly one output (y - value) for every input (x - value)

**Coordinate Plane** - Formed by the intersection of two number lines, the horizontal axis (x - axis) and vertical axis (y - axis)



**Ordered Pair** - The location of a Point on the Coordinate plane. (x, y) represents its location

**Origin** - point where x - axis and y-axis intersect. Written as an ordered pair as (0, 0)

# TERMINOLOGY

**Domain** - refers to the input (x - values) of a function

**Range** - refers to the output (y - values) of a function

**Discrete Function** - A graph that consists of points that are not connected.

**Continuous Function** - A function represented by a straight line or smooth curve.

**Independent Variables** - Information that relates to the input (x - value)

**Dependent Variables** - Information that relates to the output (y - value)

# EXAMPLE

*Using the provided ordered pairs, find the following*:

**(1, 2), (3, -4), (-1, 5), (-4, -5)**

**1) Domain**

**2) Range**

**3) State whether the function is Discrete or Continuous**

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