

Math Sentences

Definition: Logic is the study of reasoning.

Sentence types:

- 1) **Mathematical Sentence:** A sentence that contains a complete thought and can be judged to be true or false.

Declarative

ex) Tomorrow is Tuesday.
Albany is the capital of New York State.
 $7 > 5$
Spinach is delicious.

- 2) **Non-mathematical sentence:** A sentence that does not state a fact, such as questions, commands, or exclamations.

ex) Do you like math?
Find your book.

- 3) **Phrase:** An expression that is only part of a sentence.

ex) All sides
 $3 + 5$

- 4) **Open sentence:** A sentence that contains a variable.

Truth value can't be determined until you know what replaces the variable.

Variable - A symbol used to represent a number or group of numbers in an expression or an equation.

ex) $x, y, z, t, n \dots$ *it, she, he, we, they*
ex) $b > 5$
she is my friend.
It is on the desk.

Domain or Replacement Set: set from which replacements for the variable are taken

Solution Set or Truth Set: set of all replacements that will change the open sentence into true sentences.

If no replacements from the domain make a true statement, then the solution set is { }.

*empty set
null set
 \emptyset*

ex 1) Open sentence:
 Domain:
 Solution set:

$x - 3 = 5$
 $\{6,7,8,9,10\}$
 $\{8\}$

$x - 3 = 5$
 $\{1,2,3,4,5\}$
 $\{\}$

ex 2) Open sentence:
 Domain:
 Solution set:

$y < 2$
 $\{\text{natural numbers}\}$
 $\{1\}$

$y < 2$
 $\{\text{whole numbers}\}$
 $\{0,1\}$

1) **Statement** (closed sentence): A sentence that can be judged to be true or false.

Negation

Negation: Usually formed by placing the word "not" in the original statement, or taking it out if it is already there.

Symbol: \sim

A statement and its negation always have the opposite truth value.

ex 1) p: Albany is the capital of New York State.

$\sim p$: Albany is not the capital of NY State.

ex 2) q: $10 - 3 = 5$

$10 - 3 \neq 5$

$\sim q$:

ex 3) $\sim(\sim p)$ is p

truth table is a summary of all possible truth values for a statement.

Truth table for negation:

p	$\sim p$
T	F
F	T

p : 3 is prime
 q : 7 is not odd
 r : The sky is blue

Write in symbolic form & give truth value

- | | | |
|--|----------------|---|
| 1) 3 is prime. | p | T |
| 2) The sky is not blue. | $\sim r$ | F |
| 3) <u>It is not the case that</u>
3 is not prime. | $\sim(\sim p)$ | T |