

Math 140: Chapter 5 Logic

Statements

A statement is a _____ that is either true or false but not both true and false at the same time. Each statement has a _____. It is either True or False.

Examples of statements:

1. Barack Obama was the president of the USA.
2. The number 2 is even and less than 10.
3. Jimmy Fallon was responsible for the development of graph theory.

Examples that are not statements:

1. What is your name?
2. Pick that up.
3. This statement is false. This is an example of a _____.

Compound Statements

A compound statement is a statement that combines statements using logical connectors such as:

Examples of compound statements:

1. If you eat your vegetables, then you get a cookie.
2. Tom is taking MTH 140 or Tom is taking MTH 141.
3. I biked to work and I carried my lunch.

Not a compound statement: Phineas and Ferb TV show was funny.

Symbolic Logic

We use lower case letters to denote simple statements.

Example:

p:

r:

Truth Tables

A truth table is a table that shows all possibilities for the truth values of a statement.

Negation

The negation of a true statement is _____ and the negation of a false statement is _____. (The statement and its negation make up all the possibilities).

Examples – Write the negation of each statement:

- p: My car is a Ford.
- q: Today is not Thursday.

- r: $6x < 0$

- s: $y \geq 19$

Quantifiers

Words such as _____, _____, _____, _____ are called quantifiers.

Note: The word "some" in this context means _____.

Examples of statements with quantifiers - Write the negation of each statement:

1. All cars have airbags.
2. Some cars have antilock brakes.
3. No cars have window stickers.
4. Some cars do not have air conditioning.
5. At least one car has a bumper sticker.

Summary

$p \sim p$

Sets of numbers:

True or False.

1. Every natural number is an integer.
2. There exists an integer that is not a natural number.
3. All irrational numbers are real numbers.
4. Some whole numbers are not rational numbers.
5. Each rational number is a positive number.