Section 1.3: Symbolic Logic

What is symbolic logic?

SYMBOLIC LOGIC IS USED TO EXPRESS COMPOUND STATEMENTS WHICH ARE MODIFIED AND COMBINED SIMPLE STATEMENTS. SYMBOLS ARE USED TO REPRESENT CONNECTORS & STATEMENTS.

Compound Statement Connectors/Modifiers

The Negation ("NOT")

SYMBOL: $\sim$, $\neg$

The Conjunction ("AND / BUT")

SYMBOL: $\wedge$

The Disjunction ("OR")

SYMBOL: $\vee$

The Conditional/Implication "IF - THEN"

SYMBOL: $\longrightarrow$

The Biconditional : "IF AND ONLY IF"

SYMBOL: $\longleftrightarrow$

Examples: Write a sentence given each simple statement using symbolic logic.

Let P = She is a math major. Let Q = She wants to be a teacher.

1. $P \wedge \sim Q$
2. $Q \rightarrow \sim P$
3. $\sim P \vee \sim Q$

① SHE IS A MATH MAJOR AND SHE DOES NOT WANT TO BE A TEACHER.

② IF SHE WANTS TO BE A TEACHER, THEN SHE IS NOT A MATH MAJOR.

③ SHE IS NOT A MATH MAJOR, OR SHE DOES NOT WANT TO BE A TEACHER.

Examples: Write each compound statement in symbolic logic.

1. Today is Friday and I am not going to class.

$P \wedge \sim Q$

2. If it does not snow, then classes will be held.

$\sim P \rightarrow Q$

3. If you are not late, then we will not wait for you.

$\sim P \rightarrow \sim Q$

Examples: Let m = This person is a male. a = This person is over age 20. c = This person likes math.

Write a compound statement for each .

1. ~ m ∨ ~c

THIS PERSON IS NOT MALE OR THIS PERSON DOES NOT LIKE MATH.

2. a ∧ (c ∨ m)

THIS PERSON IS OVER AGE 20 AND EITHER LIKES MATH OR IS MALE.

3. ~ (a ∨ c)

THIS PERSON IS NEITHER OVER AGE 20 NOR LIKES MATH.

Write a symbolic logic equivalent for each sentence.

1. The is person is neither over age 20 nor likes math.

$\sim (a \vee c)$

2. The person is female, likes math, and is over age 20.

$\sim m \wedge c \wedge a$

3. This person is either male or over age 20, but not both.

$(m \vee a) \wedge \sim (m \wedge a)$