

Part I (due Friday, September 4 at the beginning of class)

Set Builder Notation (to fill in on page 3 of the Mathematical Statements: Negation and Truth Sets handout): we use curly brackets to denote sets, e.g., $\{1, 2, 3, 4\}$ is the set containing the numbers 1, 2, 3, and 4. We use colons to mean “such that” inside a set, e.g., $\{x \in \mathbb{Z} : x \geq 4\}$ is the set of all integers that are greater than or equal to 4.

We’ve been exploring statements and using them to build new statements using implications and negations. We can also put statements together to build new statements in ways that are similar to putting numbers together with arithmetic. Let P and Q be mathematical statements.

- The mathematical statement “ P and Q ” is called a **conjunction**. Notation: $P \wedge Q$.
- The mathematical statement “ P or Q ” is called a **disjunction**. Notation: $P \vee Q$.

We’ll explore these logical combinations more in class and in questions below.

Part II: Exercises (for presenting Friday, September 4)

Examples 2–5 on the purple Mathematical Statements: Negation and Truth Sets handout from Wednesday.

Part III: Problems (due Friday, September 4, at the beginning of class)

1. Suppose you have a deck of cards in which each card has a letter on one side and a number on the other. Your friend draws four cards and puts them on the table in front of you. The face-up sides show C, 3, 8, and E. Which cards would you need to flip over to verify the truth value of the statement “If one side of a card is a vowel, then the number on the other side is odd” for the set of four cards on the table? Fully explain your answer.
2. Form the negation of each of the following statements without just writing “it is not the case that” before the statement or “is false” after the statement—in other words, write the negation in a way that would be reasonable for a statement you might want to prove. For each statement, decide its truth value and the truth value of its negation and explain why those are the truth values.
 - (a) All mammals have hair.
 - (b) All rational numbers are natural numbers.
 - (c) There is a real number whose square is not positive.
 - (d) Every quadrilateral is a trapezoid.
 - (e) Some pentagons have two right angles.
 - (f) Someone in this class has a cat.

mini-Celebration of Learning Friday

- Statements: explain why something is or is not a statement, give your own examples, discuss truth value of a statement
- Negations: negate a given statement
- Conditional statements: convert to an if-then version, determine if two conditional statements are equivalent and explain why