Math 140: Tuesday, Nov 5th, Day 18 Notes

Agenda for Tuseday, Nov 5th, 2024

Start new unit: Sets and Logic !!! **1**

Coming up

- ! Online HW 11 due today
- Priority registration for Spring 2025 is open!

Sets

What is a set? A set is a collection of _____ objects called _____ of the set.

Example 1. Let $A =$ The set of all whole numbers between 1 and 6.

- Word description: The set of all whole numbers between 1 and 6.
- Listing method: _____
- Set-builder notation:

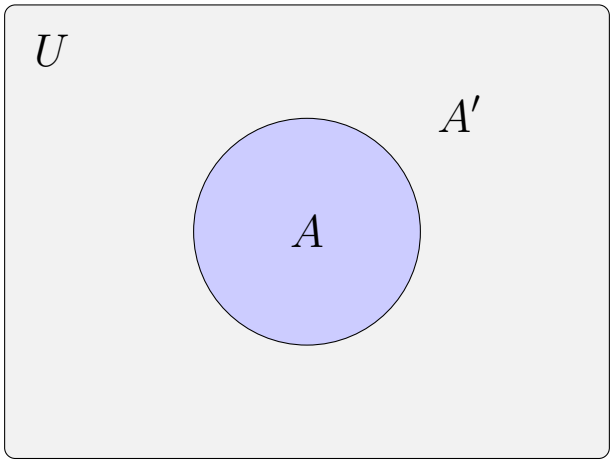
The set with no elements is called the empty set and it is denoted

To specify that an element belongs to a set we write

Cardinality: The number of elements in a set is called the _____ number, or cardinality, of the set.
Symbol: $|A|$

Universal set: In set theory, the universe of discourse is called the Universal Set, typically designated with the letter U.

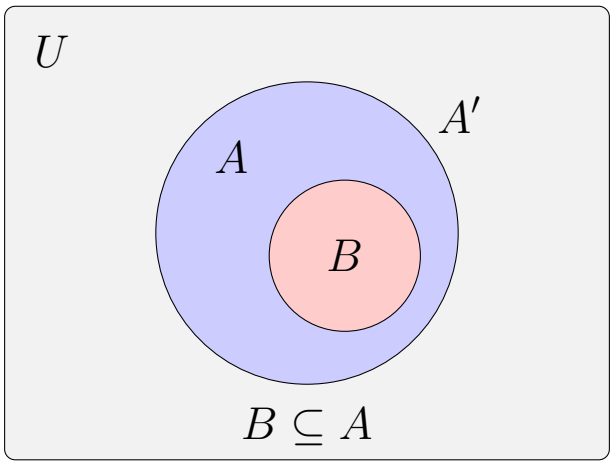
Venn Diagrams: Venn diagrams were developed by the logician John Venn (1834 – 1923). In these diagrams, the universal set is represented by a _____ and other sets of interest within the universal set are depicted as _____ regions.



Complement of a set: The complement of a set A contains everything that is NOT in the set A. The complement is notated _____ or _____.

Example 2. Example: Let $A = \{2, 4, 6\}$ and $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ Find A'.

Subset: Set A is a subset of set B if every element of A is also an element of B. In symbols this is written as _____.



Example 3. Fill in the blank with $\subseteq$ to make a true statement.

1. $\{a, b, c\}$ ___ $\{a, c, d\}$
2. $\{1, 2, 3, 4\}$ ___ $\{1, 2, 3, 4, 5, 6\}$

Difference of Sets: The difference of sets A and B, written _____ is the set of elements belonging to set A and not to set B.

Example 4. Find $A - B$ if $A = \{1, 2, 3\}$ and $B = \{2, 3, 4\}$

Intersection: The intersection of sets A and B, written _____ is the set of elements common to both A and B.

Union: The union of sets A and B, written _____ is the set of elements belonging to either of the sets.
This is the "inclusive or". It means one or the other or both.

Example 5. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{1, 3, 5, 7, 9\}$
$B = \{2, 4, 6\}$
$C = \{1, 2, 3\}$
Find the following:

a) $A \cap C$

b) $A - C$

c) $A \cup B$

d) $B \cap B'$

e) $C \cap \emptyset$

f) $C \cup \emptyset$

g) $(A \cup B) \cap C$

h) $(B \cup A)'$

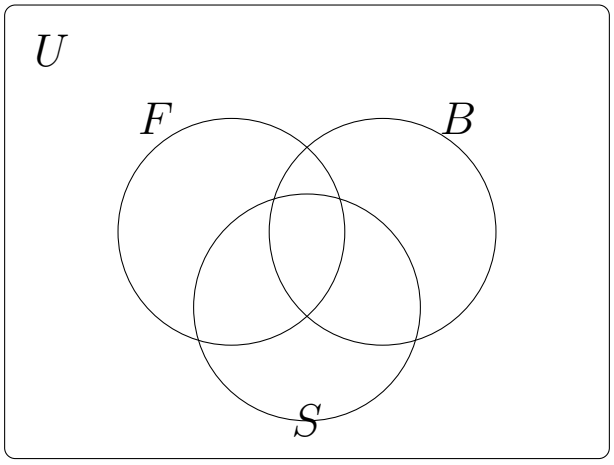
Examples with Venn Diagram

1. Draw a Venn Diagram to represent the set $(A \cap B)'$
2. Draw a Venn Diagram to represent $(A \cup B) \cap C$

Example with 3 Venn Diagrams

Example 6. Suppose that a group of 140 people were questioned about particular sports that they watch regularly and the following information was produced.

- 93 like watching football
- 70 like watching baseball
- 40 like watching soccer
- 40 like watching football and baseball
- 25 like watching baseball and soccer
- 28 like watching football and soccer
- 20 like watching all three



Questions:

a. How many people like watching only football?

b. How many people don't like watching any of these sports?