SET THEORY

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SET THEORY

- Set – unordered collection of particular objects
- Elements – objects
- Example

  A={1, 2, 3, 4, 5, 9, 10}
  - **A** is the set
  - Elements identified within braces

SET THEORY

- Symbol $\in$
  - Object is an element of a set
  - $a \in S \Rightarrow$ a is an element of S
  - $a, b \in S \Rightarrow$ a and b are elements of S
- Symbol $\notin$
  - Element **not** in a set
  - $a \notin S \Rightarrow$ a is not an element within S

Subset

- Every element belongs to another set
- Use symbols $\supset$ or $\subset$ depending on syntax
  - $V \subset T$ means V is subset of T
  - $T \supset V$ means V is contained in T
- If one element exists in V that is not in T, then V is not a subset
  - $V \not\subset T$

PROPER SUBSET

- At least one element of a set exists which is not an element of another set
- If $S \subset T$ and $S \neq T$ then S is a proper subset of T

SET THEORY SYNTAX

- If set S = {a, b, c}, then $a \in S$ is correct form – means a is an element of the set S
- $\{a\} \in S$ is incorrect since braces indicate a set and a is only an element
- {a} can be a subset of S then it is proper to state $\{a\} \subset S$

SET THEORY SYNTAX

- Can represent a set of elements in one set from another set
- S = {x ∈ T | x has the property p}
- Example:

  N is a set of natural numbers where

  x + 2 = 7

  S = {x ∈ N | x + 2 = 7}

SET THEORY SYNTAX

- Example: set that contains all even natural numbers

  E = {x ∈ N | x is even}

Then,

E = {2, 4, 6, 8, …}

Also can be written as

E = {2n | n ∈ N}

- Null set – empty set
  - Designated as ∅
  - ∅ is subset of all sets
- Universal Set
  - Consists of all elements of interest
  - Designated as U

UNION OF SETS

- Set consisting of elements from 2 or more sets
- Shown as

  $A \cup B$

Whose elements are

  $\{x \mid x \in A \text{ or } x \in B\}$

- Boolean OR

- Example:

  A = {0, 2, 3, 5, 7, 9, 11}

and

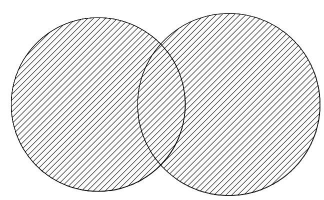
  B = {1, 2, 4, 6, 7, 9, 11}

then

C = A ∪ B

  = {0, 1, 2, 3, 4, 5, 6, 7, 9, 11}

UNION OF



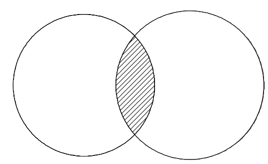
- Venn Diagram:

- Conjoint
  - If 2 sets have at least one common element
- Disjoint
  - If no common element exists in the two sets

INTERSECTION OF SETS

- Denoted as: $C = A \cap B$
  - Elements: $\{x \mid x \in A \text{ and } x \in B\}$
- Boolean AND operation
- Example:

A = {0, 2, 3, 5, 7, 8, 9, 11}
and
B = {1, 2, 4, 6, 7, 9, 11}
then
C = $A \cap B$ = {2, 7, 9, 11}



COMPLEMENT OF A SET

- Elements from the universal set that are not a subset
- Designated as A^c or comp (A)
- Example: if

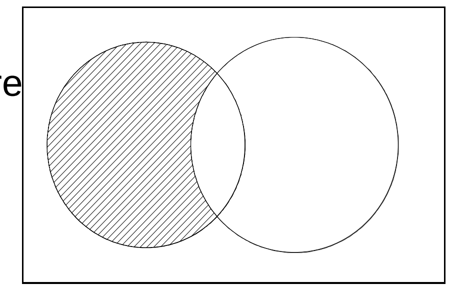
U = {all male and female students at FSU}
then the subset
A = {all male students at FSU}
then
comp (A) = {all female students at FSU}

A\B

- A minus B
- New set consists of elements in A that are not in B or

  $\{x \mid x \in A \text{ and } x \notin B\}$
- Example: from previous data,

  C = A\B = {0, 3, 5, 8}



DISTRIBUTIVE LAW

- Sets follow distributive law:

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

and

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

DISTRIBUTIVE LAW