CLASSIC SET THEORY

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SET: The author of Sets Theory, GEORG CANTOR, defines a set as "the grouping of simple elements of a whole."

Set notation:

Sets are represented with "uppercase" letters (A, B, C, ... X, Y, Z).
Elements separated by commas within braces { }.

EXAMPLE: Express the set that represents the vowels by extension and comprehension:
SOLUTION: SET BY EXTENSION: $A = \{a, e, i, o, u\}$
SET BY COMPREHENSION : $A = \{x / x \in \text{vowel}\}$
The set represented as "A", has vowel elements. The vowels are the elements separated by commas and enclosed with braces { }.

SET MEMBERSHIP (∈ –> is an element of): an element is a member of any set A "if and only if (<=>)" that element is found "inside" A or belongs to A.

NON-MEMBERSHIP (∉ - is not an element of): an element does NOT belong to any set A "if and only if (<=>)" the element is NOT within A.

PROPER SUBSET (⊂): is defined from any two sets. Given any two sets. Given any two sets A and B $\Rightarrow A \subset B \Leftrightarrow$ "all" elements of A belong to B, provided that $A \neq B$.

IMPROPER SUBSET (⊆): is defined from any two sets. Given any wo sets A and B. $\Rightarrow A \subseteq B \Leftrightarrow$ "all" elements of A belong to B.

EXAMPLE: Given two sets $A = \{1,2\} \wedge B = \{1, 2, 3\}$ analyze each question and answer "true" or "false" as the case may be. Justify your answer :

- ¿$1 \in A$? True, since element "1" is within set A or belongs to set A.
- ¿$a \in A$? False, since element "a" is not found within set A or does not belong to set A.
- ¿ $5 \notin B$? True, since element "5" is not actually inside B or does not belong to set B .
- ¿ $1 \wedge 2 \notin A$? False, since elements "1 and 2" are found inside A or belong to A .
- $A \subseteq B \rightarrow$ this statement is TRUE because "ALL" the elements of A are inside B or belong to B .
- $B \subseteq A \rightarrow$ this statement is FALSE because "NOT ALL" the elements of B belong to A, so we say that $B \not\subseteq A$.

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EMPTY SET ($\varnothing$ = { }): is a set that lacks elements.

UNIVERSAL SET (U): is a set that defines a certain situation.

VENN-EULER DIAGRAM: is a graphic representation of the universal set together with the relationships that exist between its subsets.

SETS OPERATIONS:

- **UNION ($A \cup B$):** If A and B are any two sets $\Rightarrow A \cup B = \{x \,/\, x \in A \vee x \in B\}$.
- **INTERSECTION ($A \cap B$):** If A and B are any two sets $\Rightarrow A \cap B = \{x \,/\, x \in A \wedge x \in B\}$.
- **COMPLEMENT (A^c):** If A is any set $\Rightarrow$

$A^c = \{x \mid x \notin A\}$.

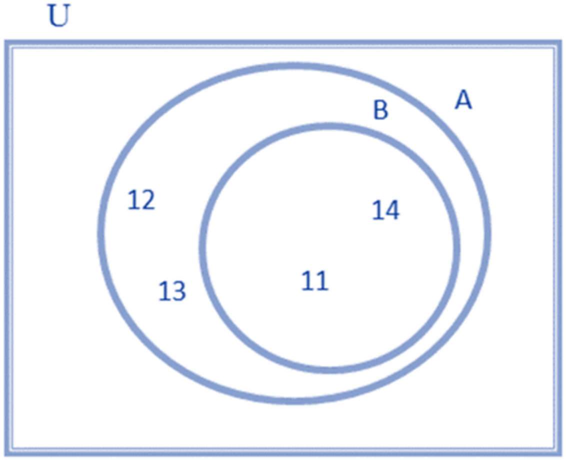
EXAMPLE: Given the sets A={11,12,13,14}, B={11,14} obtain $A \cup B$, $A \cap B$, A^c as well as the Venn-Euler Diagram of sets A and B:

SOLUTION: $A \cup B = A = A = \{11,12,13,14\}$ since $B \subseteq A$

$A \cap B = B = \{11,14\}$ since $B \subseteq A$

$A^c = \{\,\} = \varnothing$ since there are no missing elements to complete the universal set.

The Venn-Euler diagram is :



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