

[Pre Class Notes- Logical Diagrams, Venn Diagrams and Sets]

SET:

A **set** is a collection of things. Absolutely anything can be considered a set. Eg-

(a)Your favorite clothes, (b)A coin collection, (c)The items in a store, (d)The English alphabet

(e)Even numbers

- a. A set 'A' which has only a finite number of elements is called a **finite set**. The number of elements in a finite set is denoted by $n(A)$.
- b. A **universal set** is the set containing all the elements under consideration.
- c. The empty set or Null set ϕ is the set which has no elements.
- d. **Subset:** Let A & B be 2 sets. If every member of set A is a member of set B, then set A is called a subset of B. It is represented by $A \subset B$. Two equal set are subset of each other.
- e. **Super Set:** If A is a subset of B, then B is Known as the super set of A & we write $B \supseteq A$

f. Union of set:

Union of two or more sets is another set that contains everything contained in the previous sets. Union is designated by the symbol U. If A and B are sets then $A \cup B$ represents the union of A and B.

Eg- $A=\{1,2,3,4,5\}$ $B=\{5,7,9,11,13\}$, $A \cup B = \{1,2,3,4,5,7,9,11,13\}$

g. Intersection of set:

If A & B are sets, then the intersection of A & B, denoted by $A \cap B$, is the set of all elements which belongs to both A & B

Eg- intersection of set of prime numbers & set of even numbers is a set having only one element, which is 2, i.e = $\{2\}$

h. Difference of Set:

If A & B are sets, the difference of A & B, written as $A - B$, is the set of all those elements of A which do not belongs to B.

Note $A - B = A - A \cap B$.

Venn diagram:-

A Venn-Diagram is a diagrammatic representation of data. It consists of two or more circles overlapping each other. Each circle independently represents a group of data, and the overlapping part of the circles represents data that is common for the circles forming the overlap.

Steps in Making the Venn-diagram

First draw the rectangle which is known as Universal set. The Universal set is a set represented by a square or a rectangle and subsets of the Universal set are shown as circles inside the rectangle. Universal set is a set which contain all the objects of its subset as well as of itself. It is represented by U or E.

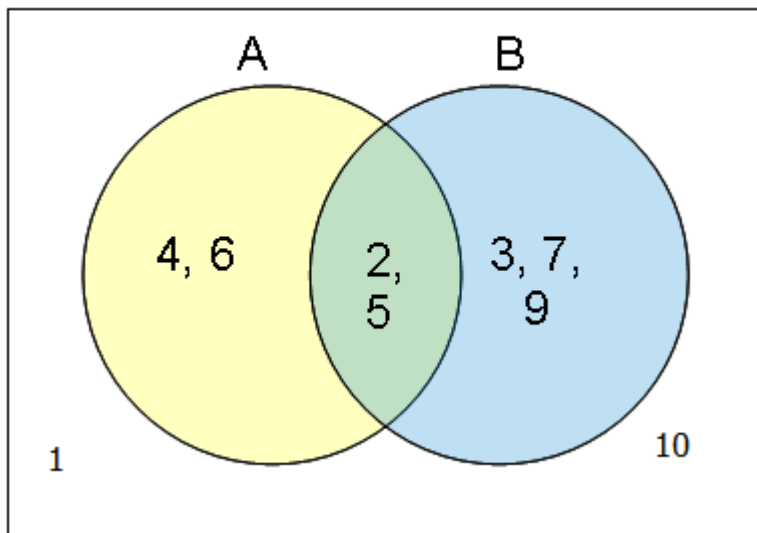
Eg-The relationship between the following sets can be represented in Venn-Diagram as shown :-

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$$A = \{2, 4, 5, 6\}, B = \{2, 3, 5, 7, 9\}$$

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$



Venn-Diagram

Here “U” is the universal set represented by rectangle where as “A” and “B” are the subsets represented by overlapping circles.

Eg Out of 70 students who appeared for a test in Math and English, 54 passed at least in one subject. If 40 passed in English, and 50 passed in Math, draw a Venn diagram and find

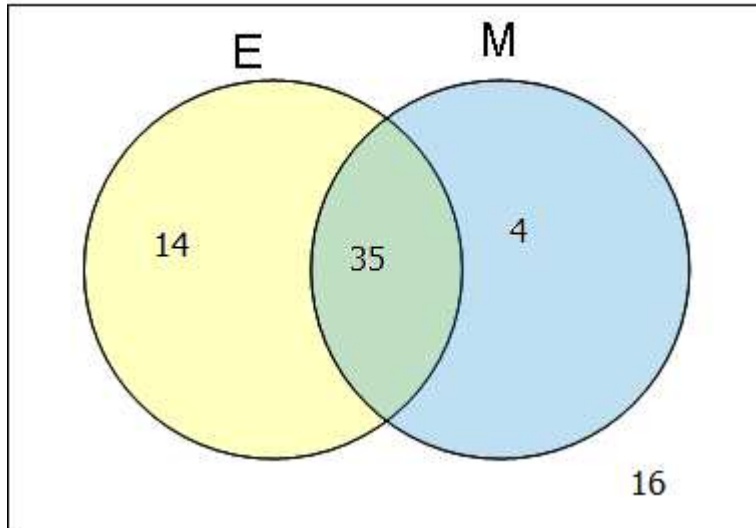
- How many passed in both the subjects
- How many passed in only Maths.

Sol :

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Let the set of students who appeared for the tests = "U".

U = total students = 70



Let the set of students who passed in Math be "M".

Let the set of students who passed in English be "E".

$$n(U) = 70, n(M \cup E) = 54, n(M) = 50, n(E) = 40$$

$$\text{Therefore, } n(M \cap E) = n(M) + n(E) - n(M \cup E)$$

$$= 50 + 40 - 54 = 36$$

$$\text{Therefore } n(M - E), \text{ that is, } n(\text{Only Math}) = n(M) - n(M \cap E)$$

$$= 50 - 36 = 14$$

Syllogism:-

Syllogism is a word given by the Greeks. It means inference or deduction. Syllogism is actually a problem of mediate inference. In mediate inference conclusion is drawn from two given statements, For example, if two statements are given: "All birds are beautiful"& "All beautiful objects are precious" then a conclusion could be drawn that "All birds are precious". This is a case of syllogism or mediate inference, because conclusion is drawn from two propositions.

Format of question:

:In each of the questions, two statements are given followed by two conclusions numbered I and II. You have to study the two statements& then decide whether, from those two statements

- If only I follows
- If only II follows
- If neither I nor II follows
- If both I and II follows

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Statement: Some snakes are birds
 All cats are birds

Conclusion: Some cats are snakes
 Some birds are snakes

Theoretical Background:

- a. **Universal proposition:** It either fully includes the subject or fully excludes it. Eg- all boys are cute. Or no box is squared shape. Usually universal proposition begins with 'ALL', 'EVERY', 'ANY', etc or 'NO', 'NONE', etc. Universal positive proposition is denoted by A while Universal negative proposition is denoted by E
- b. **Particular proposition:** It partially includes or excludes the subject while making a statement. Eg- some boys are cute, or some bases are not circular. Usually particular proposition have relational clauses like ' SOME', 'MANY', 'QUITE A FEW', etc Particular POSITIVE proposition is denoted by the letter I, while a particular negative proposition is denoted by letter 'O' .

Method to solve Syllogism:

Step 1: Properly align the given sentences. ie the two proposition in two given statements always have at least one common term.eg-

Statement: Some snakes are birds
 All cats are birds

Here birds are common in two statements, so proposition should be written in such a way, that the common term is the predicate of the first proposition & the subject of the second.

Note- If common term is either a subject in both the sentences or a predicate in both the sentences, In such cases we have to convert one of the sentences , a question may arise here as to which of the two statements to chose for conversion. For this remember the rule, IEA, that is given a pair of to be aligned sentences, the priority should be given, while converting , to I type statement, to E type statement, & then to A type statement, in that order, hence if in the given pair one sentence is of type I & the other of type A, then the sentence of type I should be converted.

Step -2Draw Conclusions.

Make use of bellow table to draw conclusion

- a. A + A = A
- b. A + E = E
- c. E + A = O*
- d. E + I = O*
- e. I + A = I
- f. I + E = O

O* means, that conclusion or inference is of type O, but its format is exactly opposite the format, that subject of inference is the predicate of the second statement, & predicate of the inference is the subject of the first sentences.

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