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* Assignment No. 1 *

AIM - Implementation of set theory problem (cricket, Badminton and football).

OBJECTIVES:-

- To understand the concept of lists in python
- To explore the concept of set theory.

PROBLEM STATEMENT:-

In second year computer engineering group A students play cricket, group B students play badminton and group C students play football.

Write a python program using function to compute following:-

- a) list of students who play both cricket and badminton.
- b) Number of students who play neither cricket nor badminton.
- c) list of student who play either cricket or badminton but not both.
- d) Number of students who play cricket & football but no badminton.

(Note:- while realizing the group, duplicate entries should be avoided, Do not use Set built in functions)

OUTCOMES:-

Use algorithms on various linear data structures using sequential organisation to solve real life problems.

THEORY:-

set theory is the branch of mathematical logic that studies sets. which can be informally described as a collection into a set. set theory, as a branch of mathematics is mostly concerned with those that are relevant to mathematics as whole.

Set theory is used to introduce students to logical operations (NOT, AND, OR) and semantic or rule description of set. which may be useful when learning computer programming, since boolean logic is used in various programming languages. likewise, set and other collection, like objects, such as multisets and lists, are common datatypes in computer science and programming.

A set is denoted by any capital Alphabetical letter.

eg:-

$$A = \{1, 2, 3, 4, 5, \dots\}$$

$$\text{OR } A = \{x : x = n, n \in \mathbb{N}\}$$

* Types of sets.

① Empty set or Null set:

It has no element present in it.

eg:- $A = \{\}$

$$A = \emptyset$$

② Finite set.

It has limited number of elements.

eg:- $A = \{1, 2, 3, 4\}$

Infinite set -

It has an infinite number of elements.

eg):- $A = \{1, 2, 3, 4, \dots\}$.

4) Equal set:-

Two sets which have same elements.

eg):- $A = \{1, 2, 3\}$ & $B = \{1, 2, 3\}$

$\therefore \text{Set } A = \text{Set } B.$

5) Subsets:-

A set (A) is said to be subset of B if each element of A is also an element of B.

eg):- $A = \{1, 2\}$ & $B = \{1, 2, 3, 4\}$.

then $A \subseteq B$.

6) Universal set:-

A set which consists of all elements of other sets present in a Venn diagram.

eg):- $A = \{1, 2\}$, $B = \{2, 3\}$ & $U = \{1, 2, 3\}$

then 'U' is an universal set.

Operations on set -

Union of set (U):

If two sets A and B are given, then the union of A and B is equal to the set that contains all the elements present in set A and B. It is represented as.

$$A \cup B = \{x : x \in A \text{ or } x \in B\}.$$

Intersection of set (n).

If two sets A and B are given, then the intersection of A and B is the subset of universal set U, which

Consist of elements common to both A and B.
It is denoted by the symbol ' \cap ' It is represented by .

$$(A \cap B) = \{x : x \in A \text{ or } x \in B\}$$

3) Difference of sets : (-)

If there are two sets A and B, then the difference of two set A and set B is equal to the set which consist of element present in A not in B. It is represented $(A - B)$.

$$\text{eg!} : A = \{1, 2, 3, 4, 5, 6, 7\}$$

$$B = \{6, 7, 4\}$$

$$\text{then } (A - B) = \{1, 2, 3, 4, 5\}$$

$$(A - B) = (A \cap B)'$$

4) Complement of set :-

If U is a universal set and X is any subset of U then Complement of X is the set of all element of X

$$X' = \{a : a \in U \text{ and } a \notin A\}$$

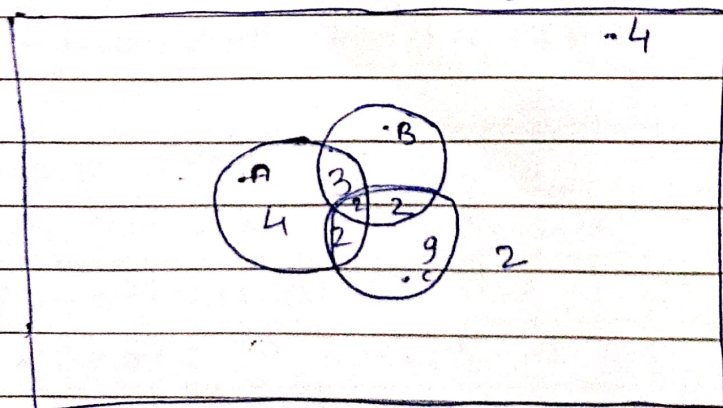
Examples :-

Set A = Students who plays cricket.

Set B = Students who plays Badminton

Set C = Students who plays football

Set U = universal set.



(5)

- No. of students playing only cricket = 4
- No. of student playing only Badminton = 6
- No. of student playing only football = 9
- No. of student playing Cricket and Badminton = 3
- No. of student playing Badminton and football = 2
- No. of student playing cricket and football = 2
- No. of student All three sports = 2
- No. of student All students of class = 30.

Algorithm of programs:-

- step 1: start
 - step 2: Define a list of class SE
 - step 3: Define particular function for dividing & displaying students who plays which sports.
 - step 4: take input as a number of student in class SE.
 - step 5: Define different list like cricket, football, cricket.
 - step 6: perform set operations.
 - step 7: Display.
 - ① list of student play both cricket, badminton
 - ② list of student who plays either cricket or badminton but not both.
 - ③ list of student who plays no sports.
 - ④ Number of students playing cricket, football but not Badminton.
 - step 8: Exit.
- CONCLUSION:- Thus, we have studied the set theory, set operation and the lists in python and applied the logic to write a program performing the given tasks.
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