

ASSIGNMENT 1

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Assignment 1

Objective :

To illustrate the use of array for performing various set operations

Outcome :

Students will be able to use various set operations using array for solving problems.

Problem Statement :

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

Write a Python program using functions to compute following: -

- a) List of students who play both cricket and badminton
- b) List of students who play either cricket or badminton but not both
- c) Number of students who play neither cricket nor badminton
- d) Number of students who play cricket and football but not badminton.

(Note- While realizing the group, duplicate entries should be avoided, Do not use SET built-in functions)

Algorithm :

1.Union Function:-

Step 1) start

Step 2) Intilise the list_return as sum of given two list .

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- Step 3) for every i element in first list jump to step4 else s
step6.
 - Step 4) if i is in list 2 jump to step5 else step3.
 - Step 5) Remove i from list_return jump to step 3.
 - Step 6) Return list_return
 - Step 7) exit()

2.Intersection Function:-

- Step 1) start
- Step 2) Intilise the list_return as an empty list .
- Step 3) for every i element in first list jump to step4 else s
step6.
- Step 4) if i is in list 2 jump to step5 else step3.
- Step 5) Append i to list_return jump to step 3.
- Step 6) Return list_return
- Step 7) exit()

3.Difference Function:-

- Step 1) start
- Step 2) Intilise the list_return as copy of first list .
- Step 3) for every i element in intersection of both lists
jump to step4 else step5.
- Step 4) Remove i from list_return jump to step 3.
- Step 5) Return list_return
- Step 6) exit()

4.Difference Function:-

- Step 1) start
- Step 2) Intilise a_b as difference of a from b.
- Step 3) Intilise b_a as difference of b from a.
- Step 4) Return addition of a_b and b_a.
- Step 5) exit()

Program/Code:

```

def union(list1, list2):
    list_return = list1 + list2
    for i in list1:
        if i in list2:
            list_return.remove(i)
    return list_return

def intersection(a, b):
    list_return = []
    for i in a:
        if i in b:
            list_return.append(i)
    return list_return

def difference(a, b):
    list_return = a.copy()
    for i in intersection(a, b):
        list_return.remove(i)
    return list_return

def symmetric_difference(a, b):
    a_b = difference(a, b)
    b_a = difference(b, a)
    return a_b + b_a

cricket = input("Enter The List of student who play cricket : ").split(" ")
badmination = input("Enter The List of student who play badmination : ").split(" ")
football = input("Enter The List of student who play football : ").split(" ")

print("\n")
print("List of students who play either cricket or badminton but not both :")
print(symmetric_difference(cricket, badmination))
print("-----")

print("List of students who play both cricket and badminton :")
print(union(cricket, badmination))
print("-----")

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")

print("Number of students who play neither cricket nor badminton : ",
len(difference(football, union(cricket, badmination))))
print("-----")

print("Number of students who play cricket and football but not badminton : ",
end="")
print(len(difference(intersection(cricket, football), badmination)))
print("-----")

```

Output :

```

Enter The List of student who play cricket : Rahul Kapil Sarang Sachin Nikhil
Enter The List of student who play badmination : Rahul Sagar Sarang Abhi Amol
Enter The List of student who play football : Rahul Kapil Sarang Abhi Varad

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List of students who play either cricket or badminton but not both :

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```

['Kapil', 'Sachin', 'Nikhil', 'Sagar', 'Abhi', 'Amol']
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List of students who play both cricket and badminton :

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```

['Kapil', 'Sachin', 'Nikhil', 'Rahul', 'Sagar', 'Sarang', 'Abhi', 'Amol']
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```

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Number of students who play neither cricket nor badminton : 1
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Number of students who play cricket and football but not badminton : 1
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```

Time Complexity :

sr no.	Function	Frequency Count	Time Complexity
1	Union	$1+(n+1)+n^2+n+1=n^2+2n+3$	$O(n^2)$
2	Intersection	$1+(n+1)+n^2+n+1=n^2+2n+3$	$O(n^2)$
3	difference	$1+(n^2+2n+3)+n+1+n+1=n^2+4n+6$	$O(n^2)$
4	symmetric_difference	$2*(n^2+4n+6)+1=2n^2+8n+13$	$O(n^2)$
5	length	1	$O(1)$
6	print	1	$O(1)$

Total

$$\begin{aligned} &= 1*\text{symmetric_difference}+2*\text{union}+2*\text{difference}+1*\text{intersection}+2*\text{length}+6*\text{print}+3*\text{input}+3*\text{split}() \\ &= 2n^2+8n+13 + 2(n^2+2n+3) + 2(n^2+4n+6) + (n^2+2n+3) + 2*1 + 6*1+3*1+3*1 \\ &= 6n^2+22n+48 \end{aligned}$$

Total Time Complexity:= $O(n^2)$

Conclusion :-

Illustrated the use of array for performing various set operations.