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Section: S02 **Assignment 4: Problem solving using Iterative statements**

Aim: To learn python programming using looping statements by forming expressions and statements involving reading and printing the data appropriately for the given specification.

Solve the following problems using Python (CO1, K3, 1.3.1, 1.4.1, 13.3.1):

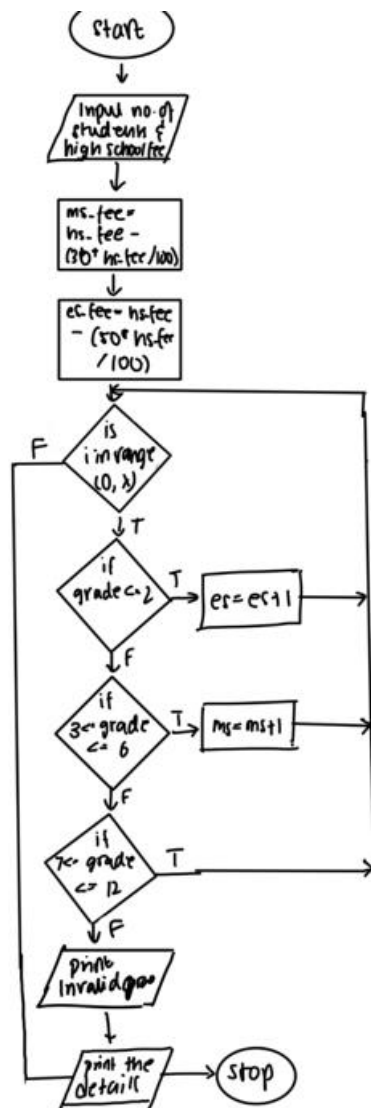
Question 1: In a school, a total of X students are enrolled. Y students are in the elementary grade (below 2nd grade), Z students are in middle school (grades 3 to 6), and the remaining students are in high school (grade 6 to 12). The fees for students are categorized as follows: (Consider total student strength as ≤ 10)

- * For high school students, the annual fee is Rs. XYZ.
- * For middle school students, the annual fee is 30% less than the high school students pay
- * For elementary grade students, the annual fee is 50% less than high school students pay

Calculate the student count in each category and annual fee for elementary grade students, middle school students, high school students.

- a. Identify the inputs required to solve the problem.
- b. Devise a solution and represent the same using flowchart and pseudocode.
- c. Develop a program to compute student count in each category and annual fee for elementary grade students, middle school students, high school students (Hint: use appropriate looping statements).

Flowchart:



Source code:

```

x=int(input("Enter the number of students"))
hs_fee=float(input("Enter the fee for high school students"))
ms_fee=hs_fee-(30*hs_fee/100)
es_fee=hs_fee-(50*ms_fee/100)
es=hs=ms=0
for i in range(0,x):
    grade=int(input("Enter Grade"))
    if(grade<=2):
        es=es+1

```

```

elif(grade>=3 and grade<=6):
    ms=ms+1
elif(grade>=7 and grade<=12):
    hs=hs+1
else:
    print("Enter valid grade")
    break

print("Number of elementary school students : ",es)
print("Number of middle school students : ",ms)
print("Number of high school students : ",hs)
print("Fee for elementary school students : ",es_fee)
print("Fee for middle school students : ",ms_fee)
print("Fee for high school students : ",hs_fee)

```

Output:

```

Enter the number of students 9
Enter the fee for high school students 100000
Enter Grade 1
Enter Grade 5
Enter Grade 7
Enter Grade 3
Enter Grade 2
Enter Grade 10
Enter Grade 11
Enter Grade 9
Enter Grade 12
Number of elementary school students:  2
Number of middle school students:  2
Number of high school students:  5
Fee for elementary school students:  50000.0
Fee for middle school students:  70000.0
Fee for high school students:  100000.0
|

```

Question 2: In an organization, there is a secret number locker to safeguard confidential files. The rule to open the secret number locker follows a 2 step verification model.

Step-1. In step 1 The entered number is defined as the sum of nth power of each digit to a n digit number is equal to that number. and Maximum chances to try

the secret key are 3 times. If the user successfully completes step 1, then move on to step 2.

Step-2: The user has to enter two numbers and check if two numbers are prime pairs or prime twins. Twin primes are two prime numbers that have a difference of 2 between them. Twin primes are also known as prime pairs or prime twins. If the user successfully completed step 2, then “Locker opened successfully...” must be displayed. The maximum chances to try the secret key in step 2 are two times.

Write the pseudocode for implementing the above scenario and print the result.

- a. Identify the inputs required to solve the problem.
- b. Devise a solution and represent the same using flowchart and pseudocode.
- c. Develop a program to open a secret locker based on a two-step verification process. (Hint: use appropriate looping statements.)

Source code:

```
f=0
```

```
for i in range(3):
```

```
    x=input("Enter step 1 number:")
```

```
    n=len(x)
```

```
    x=int(x)
```

```
    num=x
```

```
    s=0
```

```
    while x:
```

```
        dig=x%10
```

```
        s+=(dig**n)
```

```
        x=x//10
```

```
    if s==num:
```

```
        print("Verified Step 1")
```

```
        f=1
```

```
        break
```

```
    else:
```

```
print("Not verified")
if f:
    fx1,fx2=1,1
    for i in range(2):
        x1=int(input("Enter number"))
        x2=int(input("Enter next number"))
        if abs(x1-x2)==2:
            for k in range(2,x1//2+1):
                if(x1%k==0):
                    fx1=0
                    break
            for k in range(2,x2//2+1):
                if x2%k==0:
                    fx2=0
                    break
            if fx1 and fx2:
                print("Locker opened successfully")
                break
            else:
                print("Locker not opened")
        else:
            print("Difference is not 2")
```

Output:

```
Enter step 1 number:134
Not verified
Enter step 1 number:14
Not verified
Enter step 1 number:153
Verified Step 1
Enter number45
Enter next number49
Difference is not 2
Enter number3
Enter next number5
Locker opened successfully
> |
```

Additional problems using iterative statements for practice:

Question 1: Find the sum of N numbers. If N=5, then Sum=1+2+3+4+5=15

Algorithm: Step 1: Start

Step 2: Input the number

Step 3: Initialize variable sum to 0

Step 4: Run a for loop such that variable i iterates from 1 to n

Step 5: sum=sum+i

Step 6: Display the sum

Step 7: Stop

Source code:

```
n=int(input("Enter the number"))
```

```
sum=0
```

```
for i in range(1,n+1):
```

```
    sum=sum+i
```

```
print("The sum is ",sum)
```

Output:

```
RESTART: Z:/ex4_a2.py
Enter the number 5
The sum is 15
```

Question 2: Find the factorial of a given +ve integer.

Source code:

```
n=int(input("Enter the number"))
f=1
for i in range(1,n+1):
    f=f*i
print("The factorial is : ",f)
```

Output:

```
type "help", "copyright",
= RESTART: Z:/ex4_a2.py
Enter the number 5
The factorial is : 120
|
```

Question 3: Reverse the digits of a given number. Ex: Input: 1562, Output: 2651.

Source Code:

```
n=int(input("Enter the number"))
l=len(str(n))
d=0
for i in range(0,l):
    r=n%10
    d=d+r*(10**(l-1))
    n=n//10
    l=l-1
```

```
print("The reverse of the number is : ",d)
```

Output:

```
Type "help", "copyright", "credits" or  
= RESTART: Z:/ex4_a3.py  
Enter the number 1562  
The reverse of the number is : 2651  
|
```

Question 4: Find the sum of the digits of a given number.

Source code:

```
n=int(input("Enter the number"))
```

```
l=len(str(n))
```

```
s=0
```

```
for i in range(0,l):
```

```
    s=s+(n%10)
```

```
    n=n//10
```

```
print("The sum is : ",s)
```

Output:

```
Enter the number 1234  
1234  
The sum is : 10  
> |
```

Question 5: Check whether a number is palindrome or not. Ex: 12321 is palindrome number. The reversal of 12321 = 12321

Source Code:


```

n=int(input("Enter the number"))
s=0
a=n
l=len(str(n))
for i in range(0,l):
    r=n%10
    s=s+(r*(10**(l-1)))
    n=n//10
    l=l-1
if(a==s):
    print("It is a palindrome number")
else:
    print("It is not a palindrome number")

```

Output:

```

Enter the number 12321
It is a palindrome number

=====

Enter the number 12345
It is not a palindrome number
|

```

Question 6: Print the Fibonacci series up to N numbers. Ex: Fibonacci Series =
0 1 1 2 3 5 8 13 21

Source Code:

```

n=int(input("Enter the number of terms"))
n1,n2=0,1
count=0
if n==1:

```

```

        print("Fibonacci sequence upto ",n, ":")
        print(n1)
    else:
        print("Fibonacci sequence:")
        while count<n:
            print(n1)
            nth=n1+n2
            n1=n2
            n2=nth
            count+=1

```

Output:

```

Enter the number of terms 5
Fibonacci sequence:
0
1
1
2
3

```

Question 7: Take integer inputs from user until he/she presses ‘Q’. Print average and product of all numbers

Source code:

```

print("Start entering numbers")
sum=0
c=0
print("Press q when you are done inputting")
while 1:

```

```

num=input()
if num== 'q':
    break
c=c+1
sum=sum+int(num)
print("Average ",sum/c)
print("Sum",sum)

```

Output:

```

Start entering numbers
Press q when you are done inputting
2
3
4
5
6
q
Average 4.0
Sum 20
|

```

Question 8:

(a) Display the pattern:

```

*
**
***
****
*****

```

Source code:

```

for i in range(1,6):
    print('*'*i)

```

Output:

```
= RESTART: Z:\ex4_81.py
*
**
***
****
*****
|
```

(b) Display the pattern:

```
*****
****
***
**
*
```

Source code:

```
for i in range(5,0,-1):
    print("*"*i)
```

Output:

```
= RESTART: Z:/ex4_82.py
*****
****
***
**
*
|
```

Learning outcome:

1. Reading inputs / Printing the result
2. Using appropriate datatypes for the given input
3. Variable assignment
4. Converting the formula into python expressions

Result: Thus I learnt to implement simples problems in Python and solve the same using looping statements.