

CS19001: Programming and Data Structures Laboratory

DRC, SD, SB, CSE, IIT Kharagpur

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Loops and Iterations

Conditional Loops

while (*expression*) *statement*

Ex1: **while** (x<1000) x++;

or

```
while (x<1000)
{
    x++;
    y=y + 50;
}
```

Conditional Loops contd.

do – while loops

Ex 2.

```
do
{
    x++;
} while (x<1000);
```

Conditional Loops Contd.

for statements

for (**expression1**; **expression2**; **expression3**)

statement

expression1 – initial value of loop index

expression2 – condition

expression3 – index modifier

expression1;

while (**expression2**)

{

statement

expression3;

}

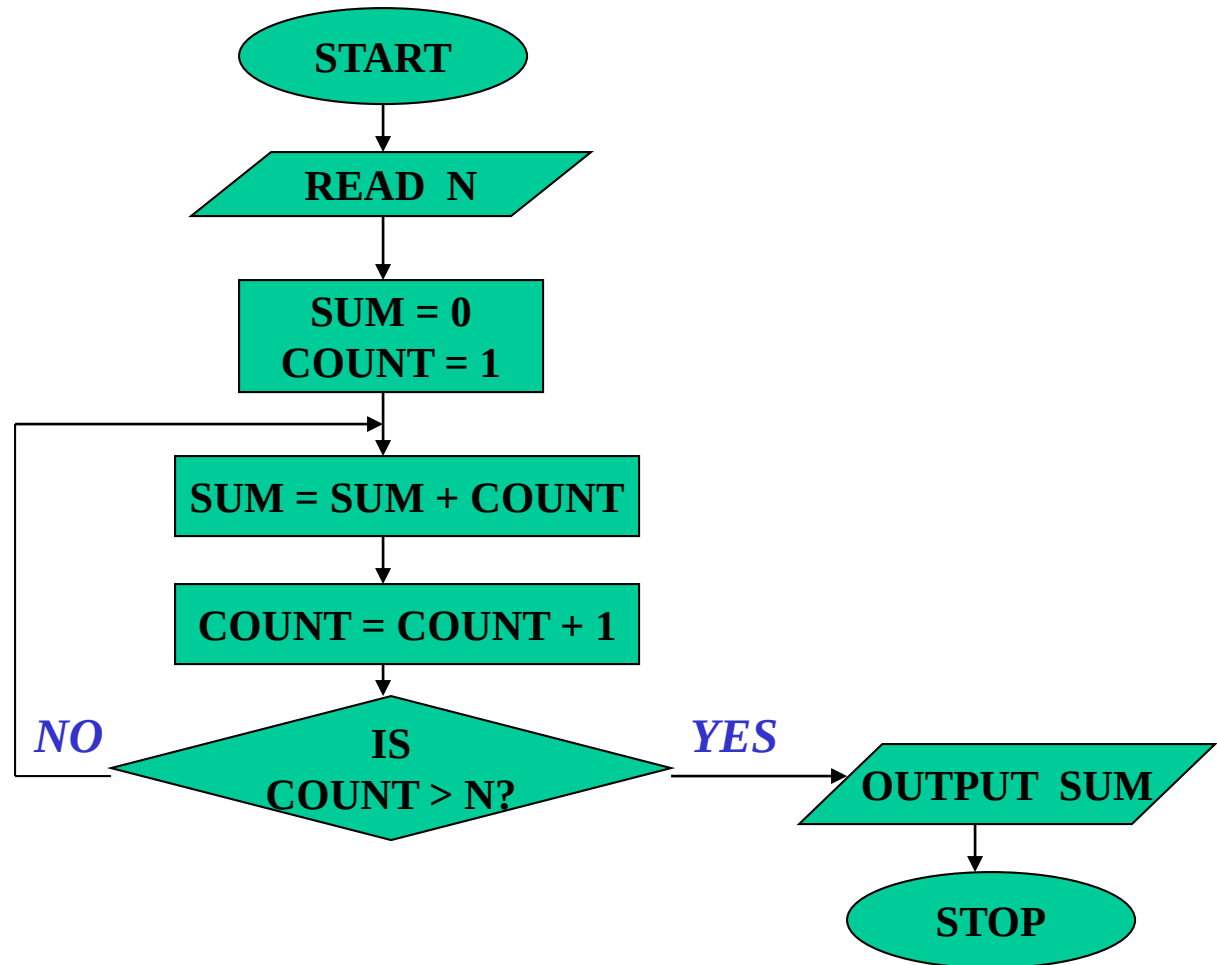
for and while

```
float pow(float x, unsigned exp)
{
    float result=1.0;
    int i;
    i=0;
    while (i < exp)
    {
        result = result * x;
        i++;
    }
    // print result;
}
```

for and while

```
float pow(float x, unsigned exp)
{
    float result=1.0;
    int i;
    for (i=0; (i < exp); i++)
    {
        result = result * x;
    }
    // print result;
}
```

Example 3: *Sum of first N natural numbers*



for statement

Write C code to compute the sum of first n natural numbers

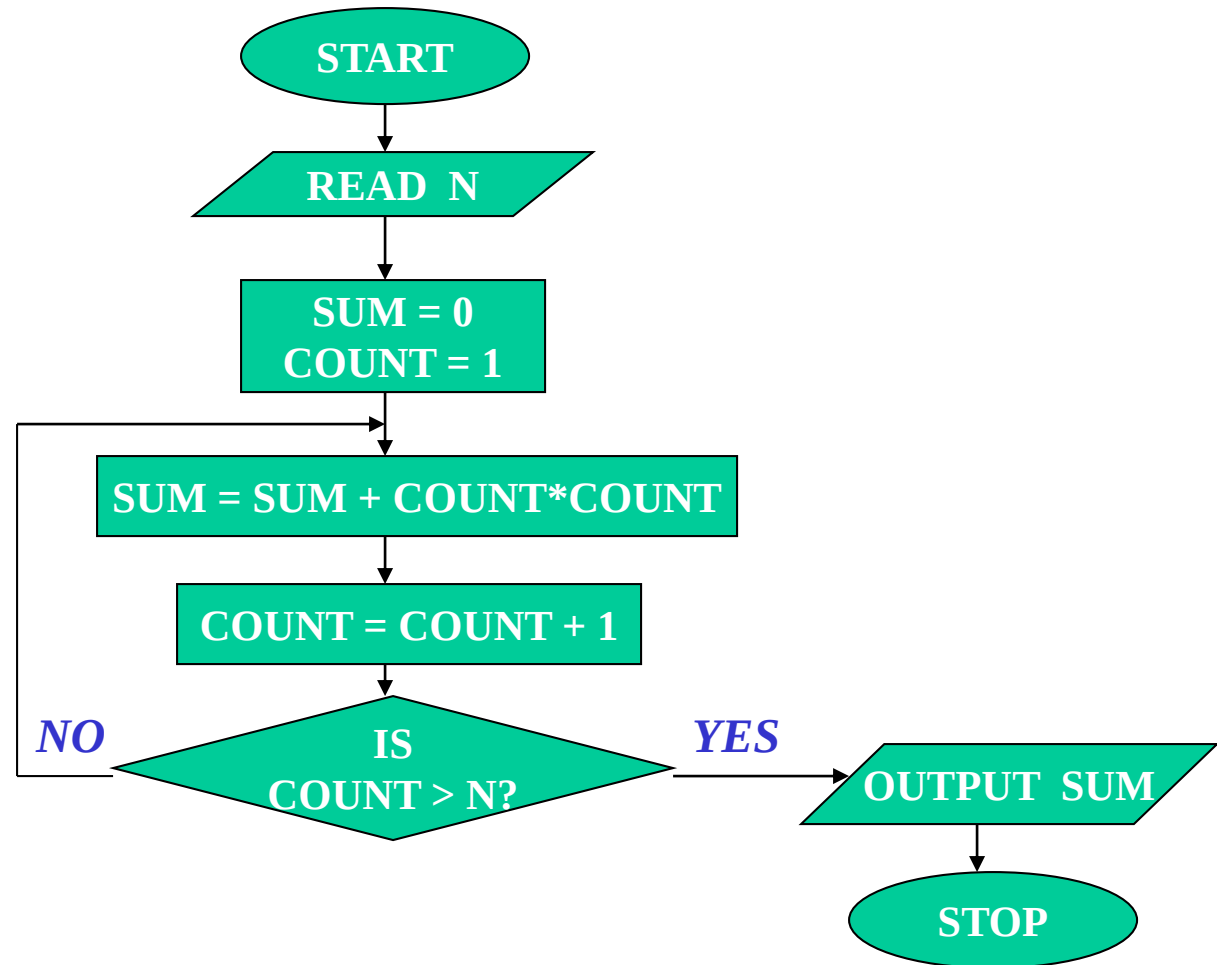
```
int i = 0, sum = 0, n = 10;    // n = 10
```

```
// n can be read from keyboard by "scanf"
```

```
for (i = 0; i <= 10; ++i) // i <= n
```

```
    sum = sum + i;
```

Example 4: Write C code to compute the sum of squares of first n natural numbers. $SUM = 1^2 + 2^2 + 3^2 + \dots + N^2$



Example 5

Write a C program to compute the following series (infinite series) up to n terms

$$e^x = 1 + x + x^2/2! + x^3/3! + x^4/4! + \dots$$

Hint: Derive each term of the series from its predecessor term.

Read (x, n); TERM = 1; SUM = 0; COUNT = 1;

SUM = SUM + TERM;

TERM = TERM * x/COUNT;

COUNT = COUNT + 1;

Check COUNT

Similar series ---

$$\cos(x) = 1 - x^2/2! + x^4/4! - x^6/6! + \dots$$

$$\sin(x) = x - x^3/3! + x^5/5! - x^7/7! + \dots$$

Programming Assignments

Complete and submit during lab

Assignment 1

Write C code to compute the following sum

$SUM = 1.3 + 2.5 + 3.7 + 4.9 + \dots$ Up to n terms.

Read n from keyboard.

Print the input, the value of n and the result, SUM.

Assignment 2

Write a C program to compute the following series (infinite series) **without reading the value of n**, where **n** is the number of terms.

$$\sin(x) = x - x^3/3! + x^5/5! - x^7/7! + \dots; \text{ where } x \text{ is in radian.}$$

Hint: Go on adding, and stop when the magnitude of the difference of two consecutive terms is < 0.00001

Read the value of x from keyboard and print both input and output.

(Hint: Derive each term of the series from its predecessor term)

Use “for” loop. Don’t use function. Don’t compute factorial.

Assignment 3

Write a C program to print all the **twin prime pairs** within a given range.

A pair of prime numbers of the form $(2n + 1)$ and $(2n + 3)$, are called twin prime pairs. For example $(41, 43)$ is twin prime pair.

There are 8 such pairs in the range of 1 to 100 and 35 such pairs in the range of 1 to 1000.

Print all the twin primes in the range of 1 to 500

Assignment 4

Write a C program which reads a number n and prints whether the given number is perfect or not.

A number is said to be perfect if it is equal to the sum of all its factors including 1 (and obviously excluding itself).

For Example,

$$6 = 1 + 2 + 3,$$

$28 = 1 + 2 + 4 + 7 + 14$ are perfect and

12 (factors = 1, 2, 3, 4, 6) is not perfect.

Thank You