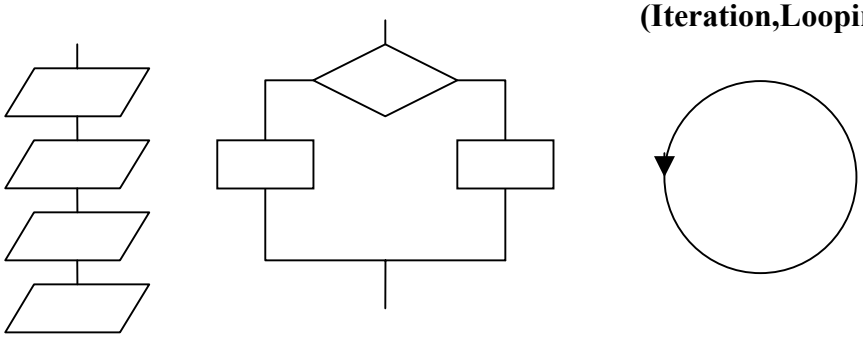
4th March, 2002 CS101-02 Class Notes

1. Sequence **2. Selection** **3. Repetition (Iteration,Looping)**

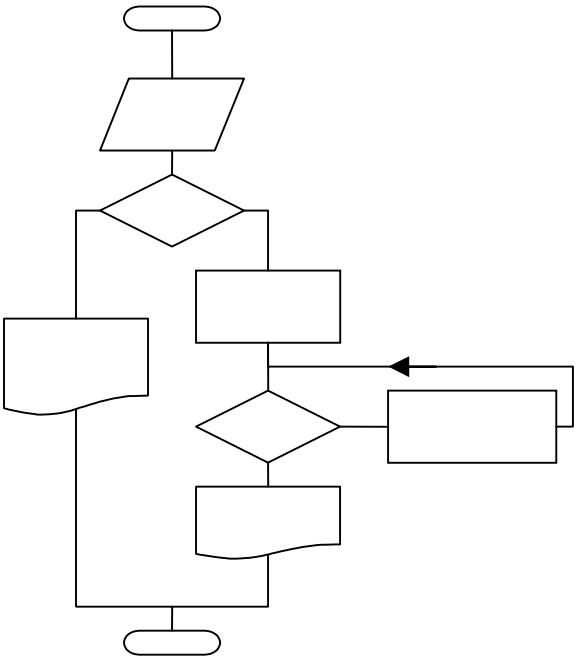


Repetition (Iteratiom, Looping)

Example:

Find summation of numbers from 1 to n (n<0)

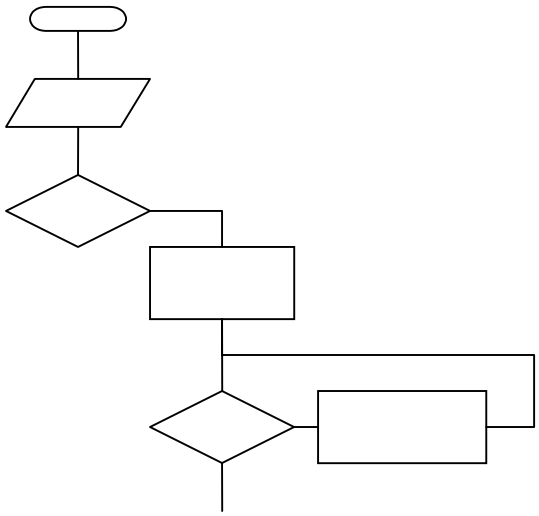
n=3 sum=1+2+3=6



Pseudo code

```
    start
    read (n)
(L1)if (n>0) then
        sum=0
        i=1
        if (i<=n) then
        sum =sum+1
        i=i+1
       go to L1
    end if
    display “sum:” sum
```

Example:



$$sum = \sum_{i=1}^{n} i = 1+2+3+4+....+n$$

```
read n
if (n>0) then
        sum = 0
        i = 1
        if (i <= n) then
                sum = sum+i
                i = i+1
                go to L1
        end if
else
        display
end if
```

Using while in the same exercise:

```
read (n)
if (n>0) then
        sum = 0
        i = 1
        while (i<=n)
                sum = sum+i
                i = i+1
        end while
        display “sum:” sum
else
        display “error”
end if
stop
```

JAVA CODES

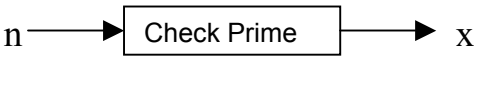
Example:

Write a program that finds summation of numbers from 1 to n

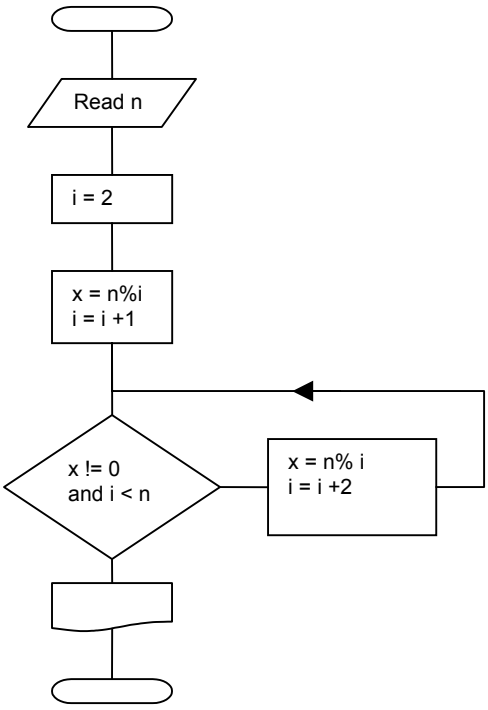
```
import cs1.Keyboard;  //needed for input

 public class findSum
 {
   public static void main(String[ ]args)
   {
     int i, n, sum;
     System.out.println("Enter a positive integer: ");
     n= Keyboard.readInt(); //see p.85
     if(n>0){
        sum=0;
        i=1;
        while(i<=n){ //compound statement
           sum= sum + i;
           i= i + 1;
                } //ends while
        System.out.println("Sum: " + sum);
        }  //ends if
     else
        System.out.println("Error");
    }  //ends main
 }  //ends class
```

Example:

Write a program that tests whether a number is prime or not



$$x = \begin{cases} > 0 \text{ if n is prime} \\ 0 \text{ if n is not prime} \end{cases}$$



n	i	n%i
4	2	0
5	2	1
17	10	7

```
import cs1.Keyboard;

 public class testPrime
 {
   public static void main(String[]args)
   {
     int n, i, x;
     System.out.println("Enter a positive integer:");
     n= Keyboard.readInt();

     i= 2;
     x= n%i;
     i= i+2;

     while(x!=o && i<n) {
          x= n%i;
          i= i+2;
          } //end of while
     if(x!= 0)
       System.out.println(n + "is a prime number");
     else
       System.out.println(n + "is not a prime
number");
   }  //end of class
 }  //end of class
```

Example

Write a program that calculates factorial of a number (n!)

```
import cs1.Keyboard
public class Factorial
```

```
{
  public static void main(String[]args)
  {
    int n;
    System.out.println("Enter the value of n: ");
    n= Keyboard.readInt();
    int nfac,i;
    nfac= 1;
    i= 1;
    while(i<=n) {
       nfac= nfac*i;
       i= i+1;
       } //end of while
    System.out.println("n! = " +nfac);
   }
}
```

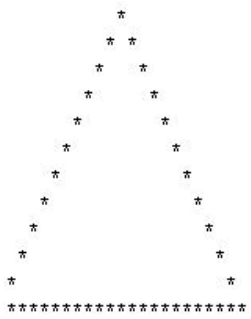
***Note**:* This is not a defensive program. A defensive program should take precautions in case the user may make mistakes.

For Statement: The *for statement* is a repetition statement that executes the body of a loop a specific number of times.	

for (initialization; condition; update) {
statement;
_____;
_____;
__;
}
	Example:
	
	for (nfac= 1; i<=n; i= i+1)
	nfac= nfac*i

Questions and Answers:

Q1. *Write a java program that draws this empty triangle.*



A1.

```
class Star
{

	public static void main(String args[])
	{
		for(int s=1;s<=10;s++)
			System.out.print(" ");
		for(int a=1;a<2;a++)
			System.out.print("*");
		System.out.println();
		int row=2;
		while(row<=11)
		{
			for(int b=1;b<=11-row;b++)
				System.out.print(" ");
			System.out.print("*");
			for(int c=1;c<=2*row-3;c++)
				System.out.print(" ");
			System.out.print("*");
			System.out.println();
			row++;
		}
		for(int d=1;d<=22;d++)
			System.out.print("*");
		System.out.println();

	}
}
```

Q2. *Design and implement an application which determines prime factorization of a positive integer (Last term lab assigment).*

A2.

```
import cs1.Keyboard;
class Primefac
{
	public static void main(String args[])
	{
		int counter,num;
		System.out.println("Enter a number:");
		num=Keyboard.readInt();
		while(num!=-1)
		{
```

```
                int divisor=2;
                System.out.println("Prime\tExponent");
                System.out.println("=====\t========");
                while(num!=1)
                {
                        counter=0;
                        while(num%divisor==0)
                        {
                                num/=divisor;
                                counter++;
                                if(num%divisor!=0)
                                System.out.println(divisor+"\t"+counter);
                        }
                        divisor++;
                }
                        System.out.println("Enter -1 to quit, enter a number to
continue");
                        num=Keyboard.readInt();


            }
    }
}
```

Q3. *Create a program to solve e^x = x^0/0! + x^1/1! + x^2/2! + x^3/3! +.....+ x^10/10! (x must be difned by the user)*

A3.

```
import cs1.Keyboard;

public class e
{
   public static void main (String[] args)
   {
      double a=0, x, n=0, m=0, p, r=1, g=1, t=1;
      System.out.println ("Please enter the x value:" );
      x = Keyboard.readInt ();

      m= Math.pow (x,1);
      while (a <= 10)
         {
            while (g <= r)
               {
                  t=t*g;
                  g++;
               }
            p = Math.pow (x,n)/t;
            m=m+p;
            r++;
```

```
            a++;
            n++;
        }
      System.out.println("The result= "+m);
   }
}
```

Q4. *Write a program to find;*
one internal angle,
number of the diagonals,
sum of the internal angles of the polygon.
(The number of the sides of polygon is entered by the user.)

A4.

```
import cs1.Keyboard;
class Polygon
{

        public static void main(String args[])
        {
                System.out.println("Enter number of the sides of polygon: ");
                int side=Keyboard.readInt();
                double angle=(side-2)*180;
                double intern=angle/side;
                int diagonal=(side*(side-3))/2;
                System.out.println("The sum of the internal angles of the polygon
is "+angle+" degree");
                System.out.println("One internal angle is "+intern+" degree");
                System.out.println("Number of the diagonals is "+diagonal);
                System.out.println();
        }

}
```

Q5. *Design and implement an application that calculate the factorization of the number when the user enter a number. The program must stop when the user entered the value less than zero.*

A5.

```
import cs1.Keyboard;
public class Fac
```

```
{
  public static void main(String[]args)
  {
    int n;
    System.out.println("Enter the value of n: ");
    n= Keyboard.readInt();

    while(n>0){
      int i,nfac;
      for(i=1,nfac=1; i<=n; i++){
          nfac= nfac*i;
          }
      System.out.println(" n! = " +nfac);
      System.out.println("Enter the value of n: ");
      n= Keyboard.readInt();
      }
  }
}
```