# ESc101 : Fundamental of Computing

**I Semester 2008-09**

**Lecture 6**

- **While** loop
- **For** loop

## Motivation for LOOPS in a Program

Many computational problems which require performing similar or same tasks a number of times.

**Examples :**

- Print a statement 100 times.
- Print all odd integers upto 1000.
- Print all prime integers upto 10000.

# While Loop

**Syntax :**

```
while(condition)
{
    statement1;
    statement2;
    . . .
    statementk
}
```

# While Loop

**Execution of While loop :**

```
    statement_a;
⇒   while(condition)
    {
        statement1;
        statement2;
        . . .
        statementk
    }
    statement_b;
```

# While Loop

**Execution of While loop :** first the condition is evaluated

```
    statement_a;
⇒   while(condition)
    {
        statement1;
        statement2;
        . . .
        statementk;
    }
    statement_b;
```

## While Loop

**Execution of While loop :** if condition is **False**

```
statement_a;
while(condition)
{
    statement1;
    statement2;
    . . .
    statementk;
}
⇒ statement_b;
```

we exit the loop and IP jumps to statement_b.

## While Loop

**Execution of While loop :** if condition is **true**

```
statement_a;
while(condition)
{
 ⇒ statement1;
    statement2;
    . . .
    statementk;
}
statement_b;
```

the body of the loop is executed.

## While Loop

**Execution of While loop :** if condition is **true**

```
statement_a;
while(condition)
{
    statement1;
⇒   statement2;
    . . .
    statementk;
}
statement_b;
```

the body of the loop is executed.

## While Loop

**Execution of While loop :** if condition is **true**

```
statement_a;
while(condition)
{
    statement1;
    statement2;
    . . .
 ⇒  statementk;
}
statement_b;
```

the body of the loop is executed.

# While Loop

**Execution of While loop :** the condition is checked again

```
    statement_a;
⇒   while(condition)
    {
        statement1;
        statement2;
        . . .
        statementk;
    }
    statement_b;
```

## While Loop

**Execution of While loop :** if condition is **False**

```
statement_a;
while(condition)
{
    statement1;
    statement2;
    . . .
    statementk;
}
⇒ statement_b;
```

we exit the loop and IP jumps to statement_b.

## While Loop

**Execution of While loop :** if condition is **True**

```
statement_a;
while(condition)
{
 ⇒ statement1;
    statement2;
    . . .
    statementk;
}
statement_b;
```

we enter the loop again.

## While Loop

**Execution of While loop :** if condition is **True**

```
statement_a;
while(condition)
{
    statement1;
⇒   statement2;
    . . .
    statementk;
}
statement_b;
```

we execute the body of the loop.

## While Loop

```
statement_A;
while ( condition )
{
    Body
}
statement_B;
```

## While Loop

### How to print a statement 10 times

```
class print10
{   public static void main(String args[])
    {

    while(   ??   )
    {
      System.out.println(‘‘Welcome !’’);

    }
}
```

**Observations :**

1. **?**

2. **??**

# While Loop

## How to print a statement 10 times

```
class print10
{   public static void main(String args[])
    {

    while(   ??   )
    {
      System.out.println(‘‘Welcome !’’);

    }
}
```

**Observations :**

1. The condition must change during an iteration

2. **??**

# While Loop

## How to print a statement 10 times

```
class print10
{   public static void main(String args[])
    {

    while(   ??   )
    {
      System.out.println(‘‘Welcome !’’);

    }
}
```

**Observations :**

1. The condition must change during an iteration
2. The condition must be true for first 10 iteration and then become false.

## While Loop

### How to print a statement 10 times

```
class print10
{   public static void main(String args[])
    {

    while(   ??   )
    {
      System.out.println(‘‘Welcome !’’);

    }
}
```

**Idea :** keep a counter

## While Loop

### How to print a statement 10 times

```
class print10
{   public static void main(String args[])
    {

    while(   ??   )
    {
      System.out.println(‘‘Welcome !’’);
      counter = counter + 1;
    }
}
```

**Idea :** keep a counter

## While Loop

### How to print a statement 10 times

```
class print10
{   public static void main(String args[])
    {
    int counter; counter = 1;
    while(counter <=10)
    {
      System.out.println(‘‘Welcome !’’);
      counter = counter + 1;
    }
}
```

**Idea :** keep a counter

## II : For Loop

## For Loop

```
stmt_A;
⇒ for (   stmt_1 ; condition   ;   stmt_2 )
  {
        Body
  }

  stmt_B;
```

## Execution of For Loop

as first step, stmt_1 is executed

```
stmt_A;

for (⇒stmt_1 ; condition   ;    stmt_2 )
 {
        Body
 }

 stmt_B;
```

## Execution of For Loop

now the condition is evaluated.

```
stmt_A;

for (    stmt_1 ; condition ;    stmt_2 )
 {
        Body
 }

 stmt_B;
```

## Execution of For Loop

if condition is **false**, IP goes to stmt_B.

```
stmt_A;
for (   stmt_1 ; condition  ;   stmt_2 )
 {
        Body
 }
⇒  stmt_B;
```

## Execution of For Loop

if condition is **true**, enter the Body.

```
stmt_A;

for (    stmt_1 ; condition  ;    stmt_2 )
 {
   ⇒
          Body

 }

 stmt_B;
```

## Execution of For Loop

execute the Body completely.

```
stmt_A;

for (    stmt_1 ;   condition ;     stmt_2 )
 {
        Body
 ⇒
 }

 stmt_B;
```

## Execution of For Loop

then execute stmt_2.(one cycle/iteration is completed)

```
stmt_A;

for (    stmt_1 ;  condition  ;⇒stmt_2 )
 {
        Body
 }

 stmt_B;
```

## Execution of For Loop

evaluate the condition again.

```
stmt_A;

for (    stmt_1 ; condition ;    stmt_2 )
 {
        Body
 }

 stmt_B;
```

## Execution of For Loop

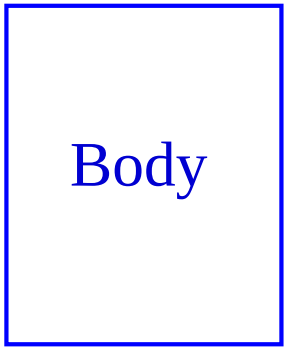
if condition is **false**, IP goes to stmt_B.

```
stmt_A;
for (   stmt_1 ; condition  ;   stmt_2 )
 {
        Body
 }
⇒  stmt_B;
```

## Execution of For Loop

if condition is **true**, enter the Body.

```
stmt_A;

for (    stmt_1 ; condition  ;    stmt_2 )
 {
   ⇒
```

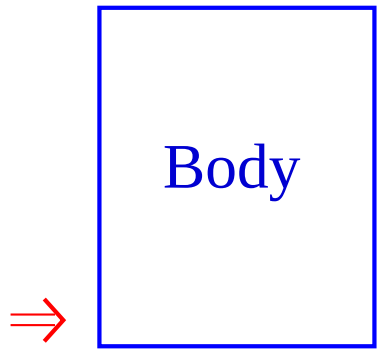



```
 }

 stmt_B;
```

## Execution of For Loop

execute the Body completely.

```
stmt_A;

for (    stmt_1 ;   condition ;     stmt_2 )
 {
```




```
 }

 stmt_B;
```

## Execution of For Loop

then execute stmt_2.(second cycle/iteration is completed)

```
stmt_A;

for (    stmt_1 ;  condition  ;⇒stmt_2 )
 {
        Body

 }

 stmt_B;
```

## Execution of For Loop

now the condition is evaluated.

```
stmt_A;

for (    stmt_1 ; condition ;    stmt_2 )
 {
        Body
 }

 stmt_B;
```

# Equivalence between For loop and While loop

```
stmt_A;
for ( stmt_1 ; condition ; stmt_2 )
{
        Body
}
stmt_B;
```

```
stmt_A;
stmt_1;
while( condition )
{
        Body
        stmt_2;
}
stmt_B;
```

## Homework

Write programs using for and while loop which can execute the following tasks :

1. For an arithmetic progression with first term a and common difference d, print first 10 terms.
2. For a geometric progression with first term a and common ratio r, print first 15 terms.

a,d,r may be declared as variables of type `int`.