



Java Programming For Beginners Course 1

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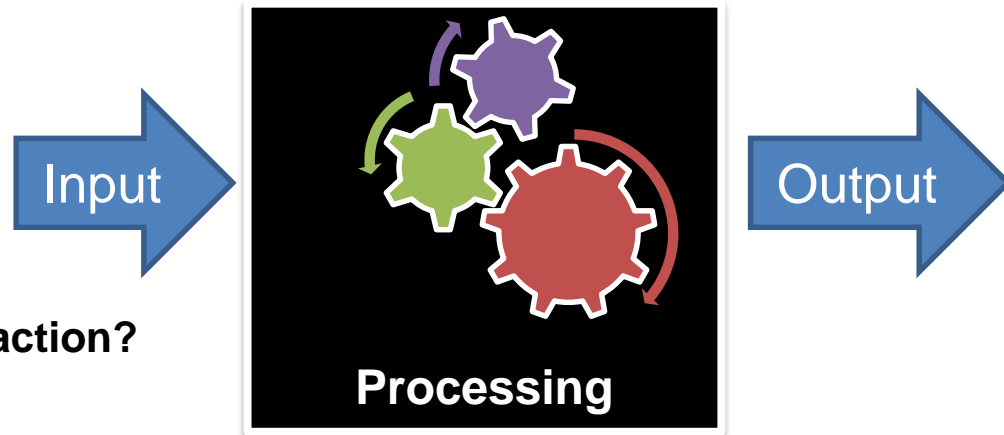
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Java Programming For Beginners
Course 1

What is programming ?

What Is Programming and Program Development Life Cycle ?

- Programming is **a process of problem solving**
- **Step 1: Analyze the problem**
 - Understand the Overall problem
 - Define problem requirements
 - Does program require user interaction?
 - If yes , What Is the Input ?
 - What is the Expected output?
 - Design steps (algorithm) to solve the problem



Algorithm:

Step-by-step problem-solving process

What Is Programming and Program Development Life Cycle ?

- **Step 2: Implement the algorithm**
 - Implement the algorithm in code
 - Verify that the algorithm works
- **Step 3: Maintenance**
 - Use and modify the program if the problem domain changes

If the problem is complex, divide it into sub-problems

Analyze each sub-problem as above

Example

- **Write a program to find the Area of a rectangle**

The area of the Rectangle are given by the following formula:

$$\text{Area} = \text{Rect Length} * \text{Rect Width.}$$

Input :

Rectangle Length , Rectangle Width.

Processing :

Area = Rect Length * Rect Width.

Output :

Print Out The area.

To sum It up.....



Think



Write Code

THANK
YOU!

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How to Install Java ?

- Java SE
- Java EE
- Java ME
- Java SE Advanced & Suite
- Java Embedded
- Java DB
- Web Tier
- Java Card**
- Java TV
- New to Java
- Community
- Java Magazine

Overview

Downloads

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Technologies

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Java SE Downloads



Java Platform (JDK) 9



NetBeans with JDK 8

Java Platform, Standard Edition

Java SE 9

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Your First java Program

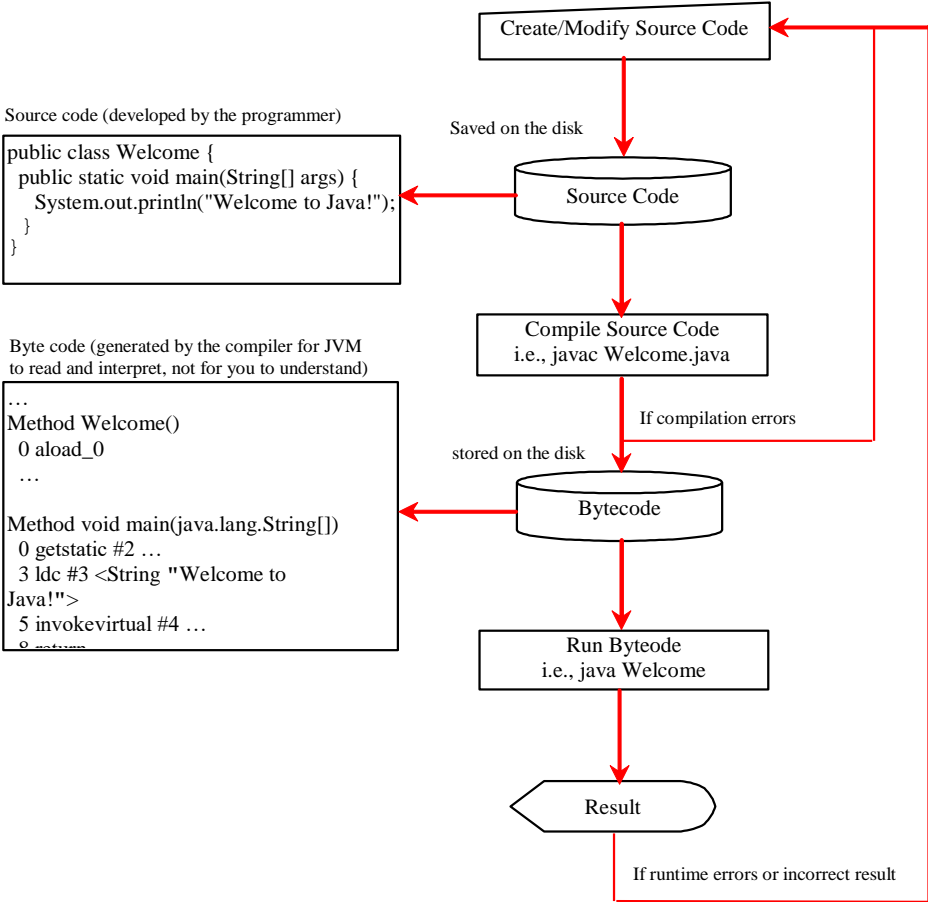
Your First Java Program

```
1 public class Welcome {  
2     public static void main(String[] args) {  
3         // Display message Welcome to Java! on the console  
4         System.out.println("Welcome to Java!");  
5     }  
6 }
```



Welcome to Java!

Processing a Java Program



Programming Errors

- Syntax Errors
 - Detected by the compiler
- Runtime Errors
 - Causes the program to abort
- Logic Errors
 - Produces incorrect result

```
1 public class ShowSyntaxErrors {
2     public static main(String[] args) {
3         System.out.println("Welcome to Java");
4     }
5 }
```

```
1 public class ShowRuntimeErrors {
2     public static void main(String[] args) {
3         System.out.println(1 / 0);
4     }
5 }
```

```
1 public class ShowLogicErrors {
2     public static void main(String[] args) {
3         System.out.println("Celsius 35 is Fahrenheit degree ");
4         System.out.println((9 / 5) * 35 + 32);
5     }
6 }
```


Comments

- We can put comment on our programs using
- `//` to comment a single line
 - `// this program is written by mohamed El desouki`

- `/*`
Multiple Lines
- `*/` to comment multiple lines

```
/* This program is written by Mohamed El Desouki  
On Monday 11/1/2018  
*/
```



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Display Program Output

Interacting With User: Displaying Messages on Screen

- In Java, we use **System.out.print ()** Or **System.out.println ()** To be Display text on The screen

Escape
sequence

Description

<code>\n</code>	Newline. Position the screen cursor at the beginning of the <i>next</i> line.
<code>\t</code>	Horizontal tab. Move the screen cursor to the next tab stop.
<code>\r</code>	Carriage return. Position the screen cursor at the beginning of the <i>current</i> line—do <i>not</i> advance to the next line. Any characters output after the carriage return <i>overwrite</i> the characters previously output on that line.
<code>\\</code>	Backslash. Used to print a backslash character.
<code>\"</code>	Double quote. Used to print a double-quote character. For example, <code>System.out.println("\"in quotes\");</code> displays "in quotes".

Interacting With User: Displaying Messages on Screen

- He said that “Iam From Egypt” but lives in “KSA”
 - `System.out.print(“ He Said That \“Iam From Egypt \” but lives in \“KSA\” “)`
- The Files located in `D:\javaprorg\tryoutput`
 - `System.out.print(“The Files located in D:\javaprorg\tryoutput “)`
- Sunday Monday Tuesday Wednesday Thursday
 - `System.out.print(“Sunday\t Monday \t Tuesday \t Wednesday\t Thursday“)`

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Accepting Input From User
Part 2


```
import java.util.Scanner; // program uses class Scanner
```

```
public class Addition {
```

```
    // main method begins execution of Java application
```

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

```
        // create a Scanner to obtain input from the command window
```

```
        Scanner input = new Scanner(System.in);
```

```
        System.out.print("Enter first integer: "); // prompt
```

```
        int number1 = input.nextInt(); // read first number from user
```

```
        System.out.print("Enter second integer: "); // prompt
```

```
        int number2 = input.nextInt(); // read second number from user
```

```
        int sum = number1 + number2; // add numbers, then store total in sum
```

```
        System.out.printf("Sum is %d\n", sum); // display sum
```

```
    } // end method main
```

```
} // end class Addition
```

Java Data Types

char	Character or small integer.	1byte	signed: -128 to 127 unsigned: 0 to 255
int	Integer.	4bytes	signed: -2147483648 to 2147483647 unsigned: 0 to 4294967295
short int (short)	Short Integer.	2bytes	signed: -32768 to 32767 unsigned: 0 to 65535
long int (long)	Long integer.	4bytes	signed: -2147483648 to 2147483647 unsigned: 0 to 4294967295
bool	Boolean value. It can take one of two values: true or false.	1byte	true or false
float	Floating point number.	4bytes	+/- 3.4e +/- 38 (~7 digits)
double	Double precision floating point number.	8bytes	+/- 1.7e +/- 308 (~15 digits)
long double	Long double precision floating point number.	8bytes	+/- 1.7e +/- 308 (~15 digits)

Interacting With User: Accept Input From User

- A **variable** is a location in the computer's memory where a value can be stored for use by a program.
- All variables must be **declared** with a **name** and a **data type** before they can be used in a program.
- Declaration : **DataType Identifier**

```
int a, b, c;           // Declares three ints, a, b, and c.
int a = 10, b = 10;   // Example of initialization
byte B = 22;          // initializes a byte type variable B.
double pi = 3.14159; // declares and assigns a value of PI.
char a = 'a';         // the char variable a is initialized with value 'a'
```

Example 1

- **Write a program to find the Area of a rectangle**

The area of the Rectangle are given by the following formula:

$$\text{Area} = \text{Rect Length} * \text{Rect Width.}$$

Input :

Rectangle Length , Rectangle Width.

Processing :

Area = Rect Length * Rect Width.

Output :

Print Out The area.

Working With Variable

```
Int length ;  
Int width;  
Int area;
```

```
Scanner input = new Scanner(System.in);
```

```
Length = input.nextInt();
```

```
Width = input.nextInt();
```

```
Area = Length * width ;
```

Length

5

Width

10

area

50

Example 2

- **Write a program to find the perimeter and area of a square**

The perimeter and area of the square are given by the following formulas:

$$\text{perimeter} = \text{Side Length} * 4$$

$$\text{area} = \text{Side Length} * \text{Side Length}$$

Input:

Square Side Length

Processing:

$$\text{perimeter} = \text{Side Length} * 4$$

$$\text{area} = \text{Side Length} * \text{Side Length}$$

Output:

Print Out The Perimeter and Area.

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Arithmetic Operators – Part 2

Arithmetic Operations

Name	Meaning	Example	Result
+	Addition	$34 + 1$	35
-	Subtraction	$34.0 - 0.1$	33.9
*	Multiplication	$300 * 30$	9000
/	Division	$1.0 / 2.0$	0.5
%	Remainder	$20 \% 3$	2

Precedence of arithmetic operations

Operator(s)	Operation(s)	Order of evaluation (precedence)
()	Parentheses	Evaluated first. If the parentheses are nested, the expression in the innermost pair is evaluated first. [<i>Caution:</i> If you have an expression such as $(a + b) * (c - d)$ in which two sets of parentheses are not nested, but appear “on the same level,” the C++ Standard does <i>not</i> specify the order in which these parenthesized subexpressions will be evaluated.]
*, /, %	Multiplication, Division, Modulus	Evaluated second. If there are several, they’re evaluated left to right.
+ -	Addition Subtraction	Evaluated last. If there are several, they’re evaluated left to right.

Precedence of arithmetic operators.

For example, $2 + 3 * 5$ and $(2 + 3) * 5$

both have different meanings

Precedence of arithmetic operations

Example :

Step 1. $y = 2 * 5 * 5 + 3 * 5 + 7;$ (Leftmost multiplication)

$2 * 5$ is 10

Step 2. $y = 10 * 5 + 3 * 5 + 7;$ (Leftmost multiplication)

$10 * 5$ is 50

Step 3. $y = 50 + 3 * 5 + 7;$ (Multiplication before addition)

$3 * 5$ is 15

Step 4. $y = 50 + 15 + 7;$ (Leftmost addition)

$50 + 15$ is 65

Step 5. $y = 65 + 7;$ (Last addition)

$65 + 7$ is 72

Step 6. $y = 72$ (Last operation—place 72 in y)

Precedence of arithmetic operations

- $? = 1 + 2 * (3 + 4)$
 - Evaluated as $1 + (2 * (3+4))$ and the result is **15**
- $? = 5 * 2 + 9 \% 4$
 - Evaluated as $(5*2) + (9 \% 4)$ and the result is **11**
- $? = 5 * 2 \% (7 - 4)$
 - Evaluated as $(5 * 2) \% (7 - 4)$ and the result is **1**

Data Type of an Arithmetic Expression

- Data type of an expression depends on the type of its operands
 - Data type conversion is done by the compiler
- If operators are $*$, $/$, $+$, or $-$, then the type of the result will be:
 - integer, if all operands are integer.
 - » Int A, B;
 - » $A + B \rightarrow$ Integer.
 - float, If at least one operand is float and there is no double
 - » Int A; Float B;
 - » $A + B \rightarrow$ Float.
 - double, if at least one operand is double
 - Int A; Float B; Double C;
 - » $A + B + C \rightarrow$ double.

Increment and Decrement Operators

- Increment operator: **increment variable by 1**

- Pre-increment: `++variable`
- Post-increment: `variable++`

- Decrement operator: **decrement variable by 1**

- Pre-decrement: `--variable`
- Post-decrement: `variable --`

- Examples :

`++K` , `K++` → **`k= K+1`**

`--K` , `K--` → **`K= K-1`**

Increment and Decrement Operators

- If the value produced by ++ or -- is not used in an expression, it does not matter whether it is a pre or a post increment (or decrement).
- When ++ (or --) is used before the variable name, the computer first increments (or decrements) the value of the variable and then uses its new value to evaluate the expression.
- When ++ (or --) is used after the variable name, the computer uses the current value of the variable to evaluate the expression, and then it increments (or decrements) the value of the variable.
- There is a difference between the following

```
x = 5;  
Print(++x);
```

```
x = 5;  
Print(x++);
```


special assignment statements

- Java has special assignment statements called compound assignments

+= , **-=** , ***=** , **/=** , **%=**

- Example:

x +=5 ; means **x = x + 5 ;**

x *=10 ; means **x = x * 10 ;**

x /=5 ; means **x = x / 5 ;**

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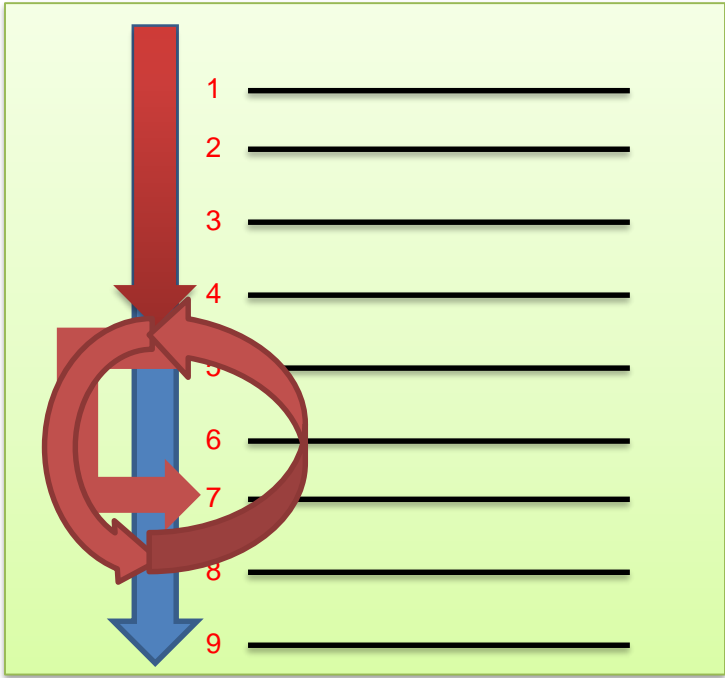
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Selection - IF Statement

Control Statements

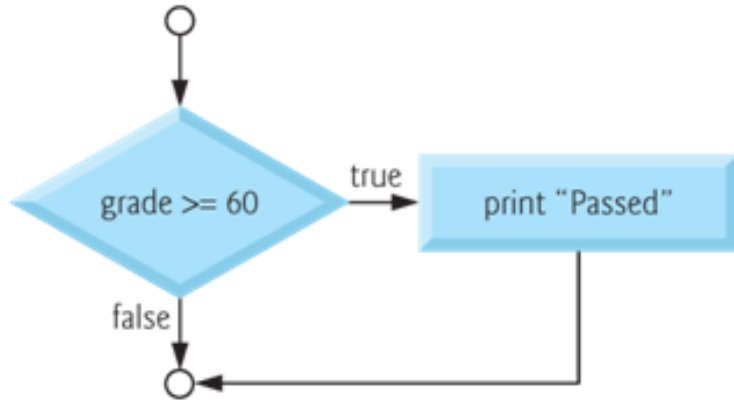
- Normally, statements in a program are executed one after the other in the order in which they're written.
- This is called [sequential execution](#).
- There are control statements enable you to specify that the next statement to be executed may be other than the next one in sequence.
- This is called [transfer of control](#).
- The control statements are categorized in almost two groups:
 - Selection control statements
 - Repetition control statements

Transfer of Control



Selection Statements : **If Statement**

- Selection statements are used to choose among alternative courses of action.
- For example, suppose the passing mark on an exam is 60. The pseudocode statement
 - If student's marks is greater than or equal to 60 Then
Print "Passed"



Flowcharting the single-selection if statement.

In Java, The syntax for the If statement

```
if ( Expression)  
    action statement ;
```

```
if ( Expression)  
{  
    action statement 1 ;  
    action statement 2 ;  
    .  
    .  
    action statement n ;  
}
```

```
if ( grade >= 60 )  
    System.out.println ("Passed");
```

- The Expression can be any valid expression including a relational expression and even arithmetic expression
- In case of using arithmetic expressions , a non-zero value is considered to be true, whereas a **0** is considered to be false

Relational Expression and Relational Operators

- **Relational expression is an expression which compares 2 operands and returns a TRUE or FALSE answer.**

Example : `a >= b` , `a == c` , `a >= 99` , `'A' > 'a'`

- **Relational expressions are used to test the conditions in selection, and looping statements.**

Operator	Means
<code>==</code>	Equal To
<code>!=</code>	Not Equal To
<code><</code>	Less Than
<code><=</code>	Less Than or Equal To
<code>></code>	Greater Than
<code>>=</code>	Greater Than or Equal To

Selection Statements : **If Statement**

Example : write a program that accept an integer from the user and in case this integer is even print out the following message

“This number is even “ .

Selection Statements : **If .. Else Statement**

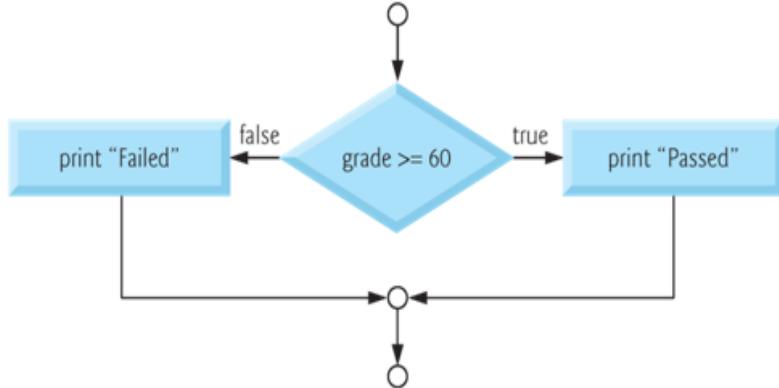
- The IF...Else selection statement allows you to specify that there is a course of actions to be performed when the condition is true and another course of actions will be executed when the condition is false.
- For example, the pseudocode statement

– **If** student's mark is greater than or equal to 60

Print "Passed"

else

Print "Failed"

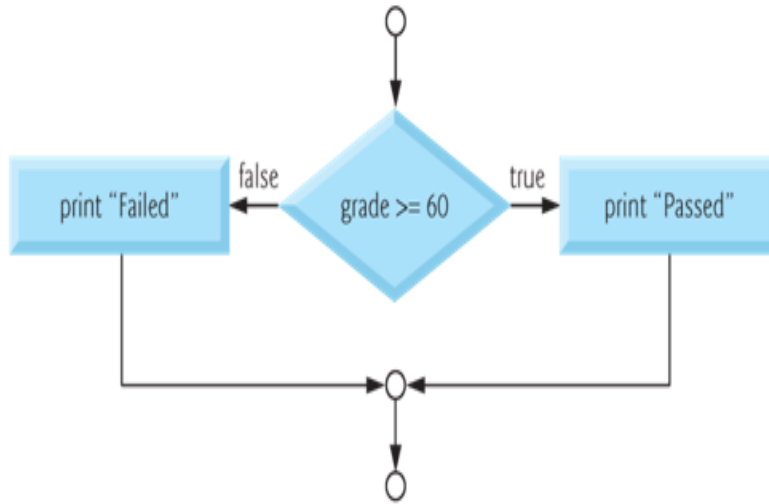


In Java, The syntax for the If...Else statement

```
if ( Expression )
    action statement ;
Else
    action statement ;
```

```
if ( Expression )
{
    action statements 1 ;
    .
    action statement n ;
}
Else
{
    action statements 1 ;
    .
    action statement n ;
}
```

```
if ( grade >= 60 )
    System.out.println("Passed");
Else
    System.out.println("Failed");
```



Selection Statements : **If – else Statement**

Example : write a program that accept an integer from the user and print out whether it is **Positive** or **Negative** number.

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Selection - IF Statement

Nested If

- **Nested If** : means to write an if statement within another if statement.

Example : write a program that accept an integer number from the user ,
in case the number is Positive , check and print out whether it is Even or Odd number.

```
int main()
{
int number;
System.out.println("Please Enter any number ");
Number = input.nextInt();

if ( number >=0)
    if (number % 2 == 0)
        System.out.println(" This is an Even number ");
    else
        System.out.println("This is an Odd number");
}
```

IF – Else IF statement

- For example, write a program that ask the user to Enter 2 numbers and print out whether they are equal or there is one which is greater than the other.

```
main()
{
    int num1, num2;
    System.out.println("Enter Number 1 , Number2 ");
    Num1= input.nextInt();

    Num2= input.nextInt();

    if ( num1 == num2 )
        System.out.println ("Both Are Equal ");
    else if (num1 > num2 )
        System.out.println("Number 1 is greater than number 2 ");
    else
        System.out.println ("Number 2 is greater than number 1 ");
}
```


IF – Else IF

- For example, the following code will print
 - **A** for exam grades greater than or equal to **90**,
 - **B** for grades greater than or equal to **80**,
 - **C** for grades greater than or equal to **70**,
 - **D** for grades greater than or equal to **60**, and
 - **F** for all other grades.

```
- if ( grade >= 90 )
    System.out.println( "A" ) ;
else if ( grade >= 80 )
    System.out.println( "B" );
else if ( grade >= 70 )
    System.out.println("C");
else if ( grade >= 60 )
    System.out.println("D");
else
    System.out.println("F" ) ;
```

Combining more than one condition

- To combine more than one condition we use the logical operators.

Operator	Means	Description
&&	And	The Expression Value Is true If and Only IF both Conditions are true
 	OR	The Expression Value Is true If one Condition Is True

Example : check whether num1 is between 0 and 100

```
IF ( num1 >= 0 && num1 <=100 )
    System.out.println ("The Number Is between 1 and 100") ;
Else
    System.out.println( " The Number Is Larger Than 100");
```

Combining more than one condition

Example, print out the student grade according to the following formulas:

- **A** for exam marks greater than or equal **90** and less than or **equal 100** ,
- **B** for exam marks greater than or equal **80** and less than **90** ,
- **C** for exam marks than or equal to **70** and less than **80** ,
- **D** for exam marks than or equal to **60**, and less than **70** ,
- **F** for all other marks.

```
- if ( marks >= 90      && marks <= 100)
    System.out.println ( "A" );
else if (marks >= 80 && marks <90 )
    System.out.println ( "B");
else if (marks >= 70 && marks <80 )
    System.out.println ( "C");
else if (marks >= 60 && marks <70 )
    System.out.println ( "D");
else
    System.out.println ( "F\n" ) ;
```

Example : A company insures its Employees in the following cases:

- Employee is married.
- Employee is an Single male above 30 years of age.
- Employee is an Single female above 25 years of age.

– Conditions :

1. Marital status = 'M'; **OR**
2. Marital Status ='S' and Sex='M' and Age >30 **OR**
3. Marital Status ='S' and Sex='F' and Age >25

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Selection – Switch Statement
Part 2

Selection statements: Switch Statement.

The switch control statement allows us to make a decision from the number of choices

```
Switch (Expression )
```

```
{
```

```
case constant 1 :
```

```
    Action statements;
```

```
    break ;
```

```
case constant 2 :
```

```
    Action statements;
```

```
    break ;
```

```
case constant 3 :
```

```
    Action statements;
```

```
    break ;
```

```
default :
```

```
    Action statements;
```

```
}
```

Expression It could be an integer
Switch (10.0);

```
Switch (10);
```

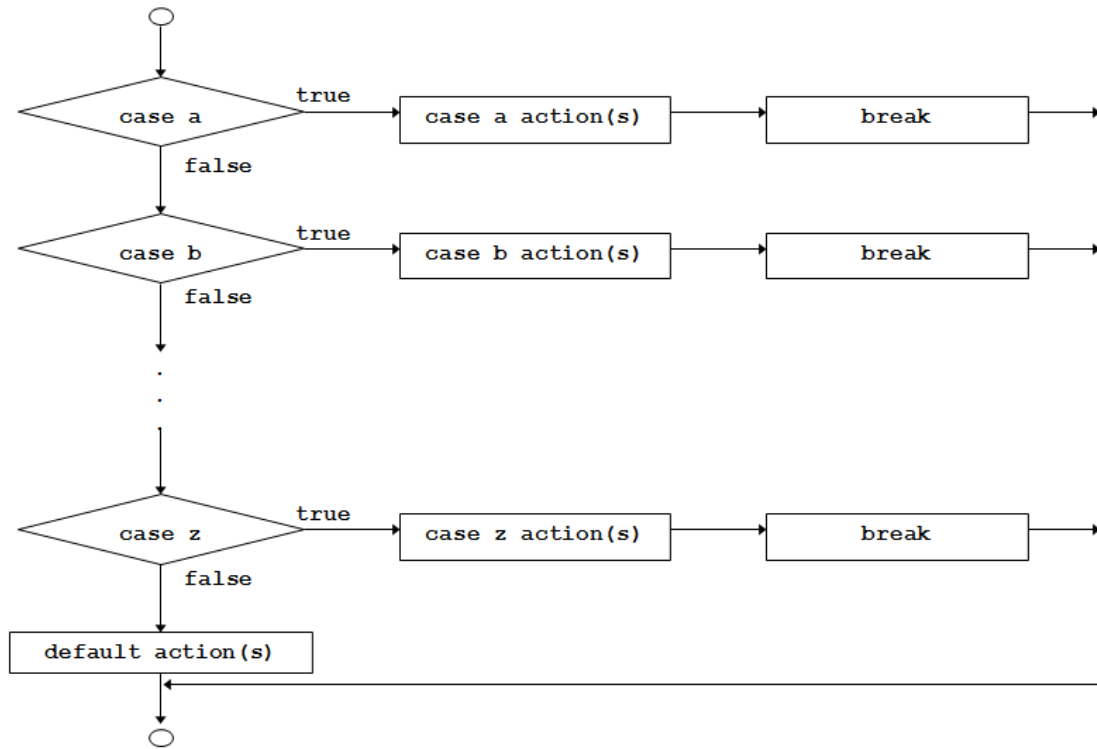
```
Int i ;
```

```
Switch (i);
```

```
switch ( 23 + 45 % 4 * k )
```

```
Case >= 50;
```

```
Case a+ b;
```

1. The switch Statement

```
1 public static void main (String[] args)
2 {
3     //Declaration section
4     Scanner read = new Scanner (System.in);
5     char grade;
6     String message;
7     //input section
8     grade = read.next().charAt(0);
9     //processing section
10    switch (grade)
11    {
12        case 'A': message = "Excellent";
13                break;
14        case 'B': message = "Very Good";
15                break;
16        case 'C': message = "Good";
17                break;
18        case 'D': message = "Fair";
19                break;
20        case 'F': message = "Failed";
21                break;
22        default: message = "The grade is invalid";
23    } //end switch
24    //output section
25    System.out.println (message);
26 } //end main
```

```
if (grade == 'A')
    message = "Excellent";
Else if (grade == 'B')
    message = "Very Good";
else if (grade == 'C')
    message = "Good";
else if (grade == 'D')
    message = "Fair";
else if (grade == 'F')
    message = "Fail";
else message = "The grade is invalid";
System.out.println (message);
```

Write a program that displays the following menu, then acts accordingly:

Enter your choice:

- 1. Add two numbers*
- 2. Get the Subtract of two number*
- 3. Get the square of a number*

The program should give an error message for invalid inputs.

```

public static void main (String[] args)
{
    Scanner read = new Scanner (System.in);
    int choice, num1, num2, result = -1;
    String message = "Invalid input";
    System.out.println ("Enter your choice.");
    System.out.println ("1. Add two numbers");
    System.out.println ("2. Get the double of a positive number");
    System.out.println ("3. Get the square of a number");
    choice = read.nextInt();
    //processing section
    switch (choice)
    {
        case 1: System.out.println ("Enter two positive integers"); //prompt
                num1 = read.nextInt();
                num2 = read.nextInt();
                result = num1 + num2; // the value of result is no more equal to -1
                break;
        case 2: System.out.println ("Enter a positive integer"); //prompt
                num1 = read.nextInt();
                num2 = read.nextInt();
                result = num1 - num2;
                break;
        case 3: System.out.println ("Enter an integer"); //prompt
                num1 = read.nextInt();
                result = num1 * num1; // the value of result is no more equal to -1
                break;
        default: message = "Invalid value of choice"; //no change to "result" → result=-1
    } //end switch
}

```

- When the same action is to be taken for several case labels, then we may write the program as follows:

```
public static void main (String[] args)
{
    //Declaration section
    Scanner read = new Scanner (System.in);
    char letter;
    String vowel = "This is a vowel";
    //input section
    letter = read.next().charAt(0);
    //processing section
    switch (letter)
    {
        case 'a':
        case 'e':
        case 'o':
        case 'i':
        case 'u': System.out.println (vowel);
                break;
        default: System.out.println ("This is not a vowel");
    } //end switch
} //end main
```

This is equivalent to:

```
if (letter=='a') || (letter=='e') ||
(letter=='o') || (letter=='i') ||
(letter=='u')
    System.out.println (vowel);
```

switch vs. nested if

- The `switch` statement is an elegant way to apply multiple selections. It is less confusing.
- However, the programmer is forced sometimes to use the nested `if`. Examples of such cases include:
 - If the selection involves a **range of values**.
 - Example: `if (score >= 60) && (score < 70)`
 - If the selector's type is `double` or `float`.
 - Example: `if (salary == 5000.25)`

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Java Programming For Beginners
Course 1

Repeation – While Loop

Control Statements : Repetition statements

- Some times we need to repeat a specific course of actions either a specified number of times or until a particular condition is being satisfied.
- For example :
 - To calculate the Average grade for 10 students ,
 - To calculate the bonus for 10 employees or
 - To sum the input numbers from the user as long as he/she enters positive numbers.
- There are three methods by way of which we can repeat a part of a program. They are:
 - **(a) Using a while statement**
 - **(b) Using a do-while statement**
 - **(C) Using a for statement**

Opening Problem

Problem:

```
System.out.println("Welcome to Java!");
```

```
System.out.println("Welcome to Java!");
```

```
int count = 0;
```

```
while (count < 100) {
```

```
    System.out.println("Welcome to Java");
```

```
    count++;
```

```
}
```

```
...
```

```
System.out.println("Welcome to Java!");
```

```
System.out.println("Welcome to Java!");
```

```
System.out.println("Welcome to Java!");
```

1- The While Loop

While (continuation condition)

```
{
```

```
Action statement 1 ;
```

```
Action statement 2 ;
```

```
·
```

```
·
```

```
Action statement n ;
```

```
}
```

```
initialise loop counter ;
```

```
while ( test loop counter using a condition )
```

```
{
```

```
do this ;
```

```
and this ;
```

```
increment loop counter ;
```

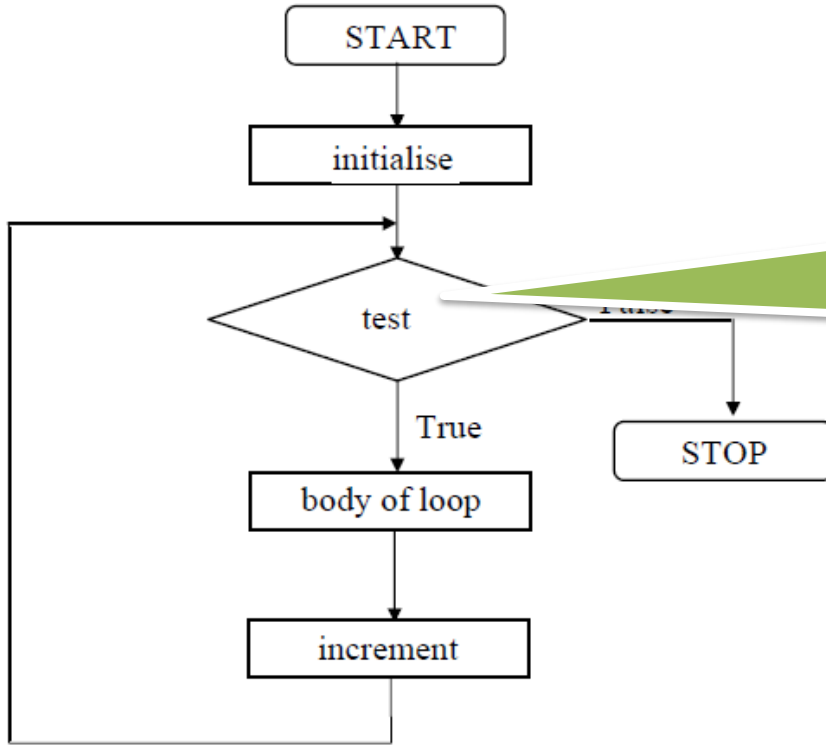
```
}
```

1- loop counter is any numeric variable (int , float ,.....).

2- when using a counter , the while loop is called counter–controlled loop.

3- The initial value of the loop counter is up to you,

but you have to increment it to avoid endless loops.



The condition being tested may be relational, logical or even numeric expression :

while (i <= 10)

while (i >= 10 && j <= 15)

While (3) , While (3 + 5)

- **Example** : Write a program that calculates and prints out the Average grade for 6 students .

```
int counter = 1;
int grade=0 , sum=0;
while (counter <=6)
{
System.out.printf(" Enter grade for student no %d" , counter);
grade = input.nextInt();
sum += grade;
counter ++;
}
System.out.printf(" Average Grade is %f" , sum/counter );
```

- **Example** : Write a program that calculates and prints out the Average grade for 5 students or ends the program by entering -1.

```
int grade=0, counter =1, sum=0;  
System.out.println(" Enter 5 grades or -1 To Exit ");  
while (counter <=5 && grade !=-1)  
{  
grade = input.nextInt();  
sum += grade;  
counter ++;  
}  
  
System.out.printf(" The sum of grades is %d",sum);
```

Write a program that randomly generates an integer between 0 and 100, inclusive. The program prompts the user to enter a number continuously until the number matches the randomly generated number. For each user input, the program tells the user whether the input is too low or too high, so the user can choose the next input intelligently. Here is a sample run:

```
// -----  
int number = (int)(Math.random() * 101);  
  
Scanner input = new Scanner(System.in);  
System.out.println("Guess a magic number between 0 and 100");  
  
int guess = -1;  
while (guess != number) {  
    // Prompt the user to guess the number  
    System.out.print("\nEnter your guess: ");  
    guess = input.nextInt();  
  
    if (guess == number)  
        System.out.println("Yes, the number is " + number);  
    else if (guess > number)  
        System.out.println("Your guess is too high");  
    else  
        System.out.println("Your guess is too low");  
} // End of loop
```

or

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Java Programming For Beginners
Course 1

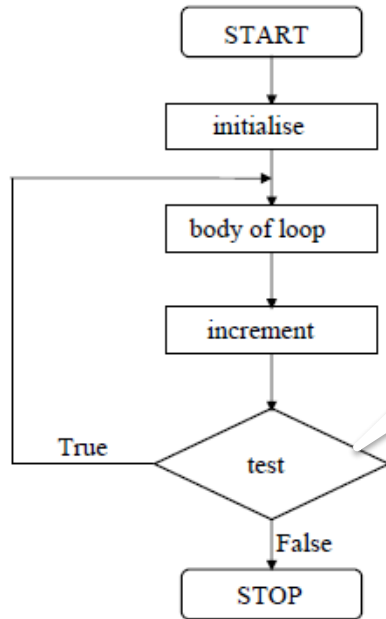
Repeation – do..while Loop

2- The do-while Loop

```
do
{
    this ;
    and this ;
    and this ;
    and this ;
} while ( this condition is true ) ;
```

```
while ( this condition is true )
{
    this ;
    and this ;
    and this ;
    and this ;
}
```

2- The do-while Loop



The condition being tested may be relational, logical or even numeric expression :

while (i <= 10)

while (i >= 10 && j <= 15)

While (3) , While (3 + 5)

2- The do-While Loop

- **Example** : Write a program that calculates and prints out the Average grade for 6 students .

```
int counter = 1;
int grade=0 , sum=0;
do
{
System.out.println("Enter grade for student no "+ counter);
Grade= input.nextInt();
sum += grade;
counter ++;
}
while (counter <=6) ;

System.out.println(" Average Grade is “ + sum/counter );
```

```
int option ;
int num1=20 , num2=10;
do {
    System.out.println("Select an option from the MENU");
    System.out.println("1. Sum 2 numbers");
    System.out.println("2. Subtract 2 numbers");
    System.out.println("3. Divide 2 Numbers");
    System.out.println("0. Exit");
    option = input.nextInt();
    switch(option) {

        case 1 :
            System.out.println("sum of the 2 numbers is " + (num1+num2));
            break;
        case 2 :
            System.out.println("subtract of the 2 numbers is " + (num1-num2));
            break;
        case 3 :
            System.out.println("Divide of the 2 numbers is " +( num1/num2));
            break;
        case 0 :
            System.out.println("Good bye");
            break;
        default:
            System.out.println("Invalid Option");
            break;
    }
}while( option !=0 ) ;
```

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Repeation – For Loop

3- The For Loop.

- For Loop is probably the most popular looping instruction.

- general form of **for statement is**

```
for ( initialise counter ; test counter ; increment counter )  
{  
    do this ;  
    and this ;  
    and this ;  
}
```

- **The for allows us to specify three things about a loop in a single line:**

- (a) Setting a loop counter to an initial value.
- (b) testing the loop counter to detect whether its value reached the number of repetitions desired.
- (c) increasing the value of loop counter each time the program segment
within the loop has been executed.

3- The For Loop.

- **Example** : Write a program that calculates and prints out the Average grade for 6 students .

```
int grade=0, sum=0;
for (int counter =1 ; counter <=6 ; counter ++)
{
System.out.println("Enter Grade ");
Grade = input.nextInt();
sum += grade;
}
System.out.println ("The Average grades is “ +( sum/6));
```

```
int counter = 1;
int grade=0 , sum=0;
while (counter <=6)
{
System.out.println("Enter grade");
grade = Input.nextInt();
sum += grade;
counter ++;
}
System.out.println ("Average Grade is “ + (sum/6 );
```

3- The For Loop.

- **Example** : Write a program that prints out numbers from 0 to 10;

```
for (int i= 0 ; i <=10 ; i++)  
    System.out.println ( i );
```

- **Example** : Write a program that prints out numbers from 0 to 10 in descending order;

```
for (int i = 10 ; i >=0 ; i-- )  
    System.out.println ( i);
```

- **Example** : Write a program that prints out the even numbers from 2 to 20;

```
for (int i = 2 ; i <=20 ; i+=2 )  
    System.out.println (i);
```

3- The For Loop.

- **Example** : Write a program that accepts 10 numbers from the user and prints out the sum of even numbers and the sum of odd numbers.

```
int i = 1 ;  
for ( ; i <= 10 ; i + + )  
    System.out.println ( i);
```

```
int i = 1 ;  
for ( ; i <= 10 ; )  
{  
    System.out.println ( i);  
    i ++;  
}
```

```
int i ;  
for ( i = 0 ; i++ < 10 ; )  
    System.out.println ( i);
```

```
int i ;  
for ( i = 0 ; ++ i < 10 ; )  
    System.out.println ( i);
```

3- The For Loop.

- **Example** : Write a program that calculates the Factorial for any given positive number.

Ex : **Factorial (5) = 5 * 4 * 3 * 2 * 1**

```
int number, factorial=1;
System.out.println ( "Enter a positive number");
Number = input.nextInt();
if (number < 0 )
System.out.println ( " Enter Positive Numbers only" );
else
for (int i= 1 ; i <=number ; i++)
    factorial = factorial * i;
System.out.println ( " Factorial = " + factorial);
```


Nested Loops

- **Example** : Write a program that calculates the Factorial for numbers from 1 to 10;

```
for ( int number=1; number<=10 ; number++)  
{  
    for ( int i= 1 ; i <=number ; i++)  
    {  
        factorial = factorial * i ;  
    }  
    System.out.println ( " Factorial = “ + factorial);  
}
```

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Java Programming For Beginners
Course 1

Repeation – Break & continue
Statements

THE `break` STATEMENT

- The `break` statement is typically used To exit early from a loop (`for`, `while`, `do...while`)
- After the `break` statement, the remaining of the statements inside the loop are skipped. Then, execution continues starting at the first statement after the loop.

```
1  int num=0, counter = -1, sum = 0; //initialize the accumulator sum
2  while (counter <=5)              //num is used as a sentinel
3  {
4      System.out.println ("Enter a positive integer"); //prompt
5      num = read.nextInt();
6      if (num < 0)
7      {
8          System.out.println ("Negative numbers are not allowed");
9          break;
10     } //end if
11     sum =sum + num;
12     Counter ++;
13 } // end while
System.out.println ("Sum = " + sum);
```

THE continue STATEMENT

- The `continue` statement may be used in all loop statements (`for`, `while`, `do...while`)
- The `continue` statement skips the remaining statements inside the loop; and `proceeds with the next iteration`, if any.

```
1  int num=0, counter = -1, sum = 0; //initialize the accumulator sum
2  while (counter <=5)              //num is used as a sentinel
3  {
4      System.out.println ("Enter a positive integer"); //prompt
5      num = read.nextInt();
6      if (num < 0)
7      {
8          System.out.println ("Negative numbers are not allowed");
9          continue;
10     } //end if
11     sum =sum + num;
12     Counter ++;
13 } // end while
System.out.println ("Sum = " + sum);
```

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Java Programming For Beginners
Course 1

Revision on
Conditional and loop statements

2. ANALYSIS

INPUT & OUTPUT

Saudi Airlines permit each passenger to hold one bag. The maximum weight allowed for the bag depends on the class of the passenger which is: 30 Kg for First class ('F'), 25 Kg for Business ('B') and 20 Kg for Economy ('E'). If the weight of the bag exceeds the allowed one, the passenger should pay 10 SR for each Kg.



Write a program that calculates the excess baggage charge for the passenger. All input data should be read by the user. Solve the problem using the switch statement.

Charge depends on?

Passenger Class	PassClass (Given)	Allowed Weight (Given)
First Class	'F'	30 Kg
Business Class	'B'	25 Kg
Economy Class	'E'	20 Kg

2. ANALYSIS

➤ INPUT

❖ For a specific passenger, we want to know:

- Passenger's Class → Entered by the user.
- Baggage Weight → Entered by the user.

➤ OUTPUT

○ Charge to excess weight:

- $\text{Excess weight} = \text{Actual Weight} - \text{Allowed Weight}$ (*depending on his class*)
- $\text{Charge} = \text{Excess Weight} * 10 \text{ SR}$

5. CODE (1)

```
1 // import necessary libraries
2 import java.util.*;
3 public class passenger
4 {
5     // instantiate Scanner object
6     static Scanner read = new Scanner(System.in);
7     public static void main (String[] args)
8     {
9         // Declaration section
10        char passClass; // passenger's class
11        double bagWeight; // passenger's bag weight
12        double excessWeight = 0.0; // passenger's excess weight
13        double charge = -1.0; // charge on excess weight
14        // Input section
15        System.out.print ("Please enter passenger's class");
16        passClass = read.next().charAt(0); // read passenger's class
17        System.out.print ("Please enter passenger's baggage weight");
18        bagWeight = read.nextDouble(); // read baggage weight
19        // Processing section: charge depends on passClass
20        switch (passClass)
21        {
22            case 'F': excessWeight = bagWeight - 30;
23                    break;
```

5. CODE (2)

```
19 // Processing section: charge depends on passClass
20 switch (passClass)
21 {
22     case 'F': if (bagWeight > 30)
23                 excessWeight = bagWeight - 30;
24                 break;
25     case 'B': if (bagWeight > 25)
26                 excessWeight = bagWeight - 25;
27                 break;
28     case 'E': if (bagWeight > 20)
29                 excessWeight = bagWeight - 20;
30                 break;
31 } //end switch
32 charge = excessWeight * 10;
33 // Output Section
    System.out.printf ("Charge = %5f", charge);
} //end main
} //end class
```

5. CODE (3)

WITH USER INPUT VALIDATION

```
19 // Processing section: charge depends on passClass
20 switch (passClass)
21 {
22     case 'f':
23     case 'F': if (bagWeight > 30)          {excessWeight = bagWeight -
24 30;
25
26
27
28
29     case 'b':
29     case 'B': if (bagWeight > 25)          {excessWeight = bagWeight -
30 25;
31
32
33
34
35     case 'e':
35     case 'E': if (bagWeight > 20)          {excessWeight = bagWeight -
36 20;
37
38
39
40
41     charge = excessWeight * 10;}
42
43     break;
44     default: System.out.println ("Invalid passenger class");
45 } //end switch
46 // Output Section
```

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Java Programming For Beginners
Course 1

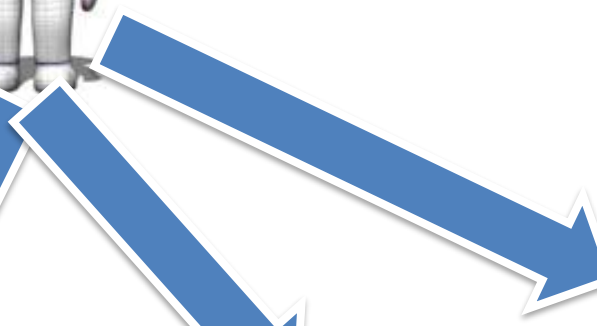
Functions (Methods) – Part 1

Functions - Methods

- Most computer programs that solve real-world problems include hundreds and even thousands of lines.
- Experience has shown that the best way to develop and maintain a large program is to construct it from smaller pieces or **modules**, each of which is more manageable than the original program.
- **A Function** : is a self-contained block of statements that perform a specific task.
- Using a **function** is something like hiring a person to do a **specific job** for you.

In Real Life

In Programming



Task 1

Function ()



Task 2

Function ()



Task 3

Function ()



Task 4

Function ()

Why to use Functions ?

- **Functions** allows to write more manageable units of code.
- Writing functions **avoids rewriting** the same code over and over.
- Easy **maintenance** for programs.

Important Tips

- 1- **Don't** try to cram the entire logic in one function. It is a very bad style of programming.
- 2- **Instead**, break a program into small units and write functions for each of these isolated subdivisions.
- 3- **Don't** hesitate to write functions that are called only once.

Calculate and print out The sum and the Average of 3 student marks.



Task 1

`Get_Marks()`



Task 2

`Calc_sum()`



Task 3

`Calc_Average()`



Task 4

`Print_out()`

Functions

Function Definition

```
return-value-type function-name( parameter-list )  
{  
  Lines of code to be  
  executed  
  
  ...  
  (Body)  
}
```

return-value- Type:

Is the data type for the returned value from the function to the calling program. It is **Mandatory**, if no returned value expected , we use keyword **Void**.

Parameter-List : Is a list of data values supplied from the calling program as input to the function. It is **Optional**

2- Invoking Function (From The main())

```
Function name ( Actual Parameter- List );
```

Function Types

1. Built in Functions (Ready Made).

- For Example : Math Functions Like

```
int abs (int number) ;
```

```
double pow (double base, double exponent) ;
```

```
Double floor (double number);
```

```
Double sqrt (double number);
```

Java Programming For Beginners
Course 1

Functions (Methods) – Part 2

User-Defined Functions

- Value-returning functions: have a return type
 - Return a value of a specific data type using the `return` statement
 - the returned value can be used in one of the following scenarios:
 - **Save the value for further calculation**
Int result;
Result = sum (x , y);
 - **Use the value in some calculation**
Result = sum(x , y) /2;
 - **Print the value**
System.out.println (sum(x , y)) ;
- Void functions: do not have a return type
 - *Do not* use a `return` statement to return a value

```
public class methodOneParameter
{
    public static void main(String[] args)
    {
        System.out.println ("Start of Program"); //output line #1
        drawLine(); //method calling
        System.out.println("Welcome to the First lecture in Functions");
        drawLine(); //method calling
        System.out.println ("End of Program");
    } //end of main
    //method definition: This method draws a line
    public static void drawLine( )
    {
        int i;
        for (i=0; i < 10; i++)
            System.out.print ("*");
            System.out.println();
        } //end of drawLine
    } //end of class
```

```
public class methodOneParameter
{
    public static void main(String[] args)
    {
        System.out.println ("Start of Program"); //output line #1
        drawLine('*'); //method calling
        System.out.println("Welcome to the First lecture in Functions");
        drawLine('#'); //method calling
        System.out.println ("End of Program");
    } //end of main
    //method definition: This method draws a line
    public static void drawLine( char ch)
    {
        int i;
        for (i=0; i < 10; i++)
            System.out.print (ch);
            System.out.println();
        } //end of drawLine
    } //end of class
```

```
public class methodOneParameter
{
    public static void main(String[] args)
    {
        System.out.println ("Start of Program"); //output line #1
        drawLine('*',15); //method calling
        System.out.println("Welcome to the First lecture in Functions");
        drawLine('#',20); //method calling
        System.out.println ("End of Program");
    } //end of main
    //method definition: This method draws a line
    public static void drawLine(char ch , integer length )
    {
        int i;
        for (i=0; i < length; i++)
            System.out.print (ch);
            System.out.println();
        } //end of drawLine
    } //end of class
```

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Java Programming For Beginners
Course 1

Functions (Methods) – Part 3

For Example : write a program that ask the user to Enter 3 integer numbers and print out their sum and Average.

```
int main ()
{
int n1 , n2 , n3 ;
System.out.println("Please Enter 3 integer numbers “ );
n1= input.nextInt();
n2= input.nextInt();
n3= input.nextInt();
System.out.println(" The sum of the 3 number is “ || sum (n1, n2,n3) );
System.out.println(" The average of the 3 number is " || average (n1, n2,n3) );
}
Public static int sum (int num1 , int num2, int num3)
{
return num1+num2+num3;
}

Public static double average (int num1, int num2, int num3 )
{
return sum (num1 , num2 , num3)/3 ;
}
```

Scope of a variable

scope is the context within a program in which a variable is valid and can be used.

- **Local variable**: declared within a function (or block)
- can be accessible only within the function or from declaration to the end of the block.
- Within nested blocks if no variable with same name exists.

```
int sum (int x , int y )
```

```
{
```

```
int result ;
```

Local

```
result = x + y;
```

```
return result;
```

```
}
```

```
int main ( )
```

```
{
```

```
{
```

```
int x ;
```

Local

```
}
```

```
}
```


Scope of a variable

Global variable: declared outside of every function definition.

- Can be accessed from any function that has no local variables with the same name. In case the function has a local variable with the same name as the global variable ,

```
static Int z ;
```

```
int main ( )
```

```
{
```

```
{
```

```
}
```

```
}
```

```
int sum (int x , int y )
```

```
{
```

```
}
```

GLOBAL

Scope of a variable

```
Static int x = 100 ;
```

```
int main ( )
```

```
{
```

```
int x = 10;
```

```
{
```

```
int z , x ;
```

```
z=100;
```

```
y=100;
```

```
x= 250;
```

```
System.out.println(" inner block " << x ;
```

```
}
```

```
}
```



THANK
YOU!

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Java Programming For Beginners
Course 1

Functions (Methods) – Part 4

Method Overloading

➤ Method Overloading:

Defining several methods within a `class` with the same name. As long as every Method has a different signature

➤ Method Signature:

The signature of a method consists of the following:

- Method name
- Formal parameter list

Note that the method type is not part of its signature.

➤ Examples:

- `public int Sum(int x, int y)`
- `public int Sum(int x, int y , int z)`
- `public double Sum(double x, double y, double z)`
- `public int Sum(int x, double y)`
- `public int Sum(double y, int x)`

- The following methods are **incorrectly** overloaded; the compiler generates an error:
- **Example (1):** The following methods are **incorrectly** overloaded because they have the same method name and same formal parameter lists:

- `public void methodABC (int x, double y)`
- `public int methodABC (int x, double y)`



- **Example (2):** Changing the names of the formal parameters, does not allow overloading of the previous counter-example:

- `public void methodABC (int x, double y)`
- `public int methodABC (int num1, double num2)`



- **Counter-example (3):** Adding the modifier `static` does not allow overloading of the previous example:

- `public static void methodABC (int x, double y)`
- `public int methodABC (int num1, double num2)`



Note that the method type and modifiers are not part of the overloading rules

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ARRAY DECLARATION

SYNTAX

```
dataType[ ] arrayName = new datatype [intExp];
```

- In Java, an array is an object that must be instantiated using the **new** operator.
- **arrayName** is the reference variable.
- **dataType** is the data type of the array; which is the same type of all elements in the array.
- **intExp** is any expression that evaluates to a positive **int** type.
- **intExp** represents the size of the array: this is the number of elements in the array.

ARRAY DECLARATION

EXAMPLES

- Consider the following array declaration:

```
int[] num = new int [5];
```

- From the above statement:

- `num` is the array name
- `num` consists of 5 elements
- The type of the elements is `int`

- The memory layout will be as follows:

- As shown, the **array name** points to the first element in the array.
- The five elements of the array are **adjacent** in the memory.

Address	Value
<code>num</code> →	0
	0
	0
	0
	0

ARRAY DECLARATION

USING CONSTANTS AS SIZES

```
final int ARRAY_SIZE = 5;  
int[] num = new int [ARRAY_SIZE];  
double[ ] num = new double[ARRAY_SIZE];  
char[ ] x = new char[ARRAY_SIZE];  
boolean[ ] flags = new boolean[ARRAY_SIZE];
```

➤ The size of the array must be of type **int**.

3. ARRAY DECLARATION

3.3 USING EXPRESSIONS AS SIZES

```
1 final int ARRAY_SIZE = 5;  
2 int[] num = new int[ARRAY_SIZE*5];  
➤ has the same effect as:
```

```
1 int[] num = new int[25];
```

- The expression may be in terms of an `int` variable rather than a constant:

```
1 int i = 8;  
2 int[] num = new int[i*2-1];  
➤ has the same effect as:
```

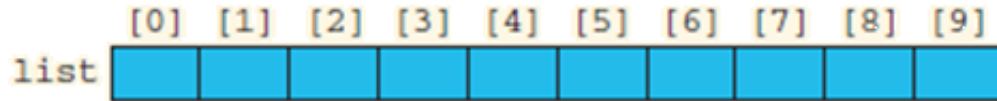
```
1 int[] num = new int[15];
```

Arrays

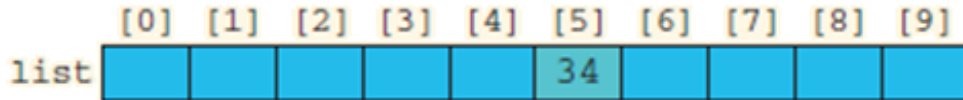
- Accessing array Elements

Arrayname [element index].

- Example: `int list[10];`



`list[5] = 34;`



`System.out.println(list [5];`

Array Initialization

- Consider the declaration

```
int list[10]; //array of size 10
```

- After declaring the array you can use the For .. Loop to initialize it with values submitted by the user.
- Using *for* loops to access array elements:

```
for (int i = 0; i < 10; i++)  
    //process list[i]
```

- Example:

```
for (int i = 0; i < 10; i++)  
    cin >> list[i];
```

- **Example** : Write a program that ask the user to enter 10 Employee salaries and store them , then add a bonus of 10 % for each employee and print out the average salary value.

Array Initialization

- Arrays can be initialized during declaration
 - In this case, it is not necessary to specify the size of the array
 - Size determined by the number of initial values in the braces
- Example 1: `int Items [] = {12, 32, 16, 23, 45};`
- Example 2: `int items [10] = { 0};`
- Example 3: `int items [10] = {5, 7, 10};`

Array Initialization

```
int Arr1[5];
```

```
int Arr2 [5];
```

```
Arr1 = Arr2 ;
```



Array as a Parameter to Function

- Arrays are passed by reference only
- The symbol & is *not* used when declaring an array as a formal parameter
- The size of the array is usually passed as a parameter to the function.

```
Float calc_Average ( Float marks [ ], int size )  
{  
    float sum =0 ;  
  
    for (int I =0 ; I <size ; I ++)  
        Sum += marks [ I ] ;  
  
    return sum / size;  
}
```

- We may add keyword **const** before array name to
Prevent the function from modifying the array elements.

```
Float calc_Average ( const Float marks [ ], int size )
```

- **Example** : Write a program that uses a function to search for an item within an array.

```
bool find_Item( int list[ ], int searcheditem , int size)
{
    int indx;
    bool found = false;

    for ( indx = 0 ; indx < size ; indx++)
        if (list[indx] == searcheditem)
            {
                found =true ;
                break ;
            }
    return found;
}
```

Two Dimensional Array

- Used when data is provided in a table form.
- For Example , to store 4 Marks for 6 students.

	M 1	M2	M3	M4
Student 1				
Student 2				
Student 3				
Student 4				
Student 5				
Student 6				

- Two dimensional Array declaration

Datatype *ArrayName* [Rows] [Columns] ;

Example :

Float marks [6] [4] ;

marks [4][2]= 20 ;

	0	1	2	3
0				
1				
2				
3				
4			20	
5				

Two dimensional Array Initialization

- Consider the declaration

```
float marks[6][4];
```

- After declaring the array you can use the For .. Loop to initialize it with values submitted by the user.
- Using 2 nested *for* loops to access array elements:

```
for (int row = 0; row < 6; row++)  
    for (int col = 0; col < 4; col++)  
        cin >> marks[ row ][col];
```

Two dimensional Array Initialization

- Two dimensional Arrays can be initialized during declaration
- Example 1:

```
float marks [4] [3] = {{20, 30, 35},  
                       {40, 45, 65},  
                       {60, 65, 75},  
                       {80, 65, 45}};
```

- **Example** : Write a program that build a matrix of 5 rows and 3 columns . As the use to enter the values for all the matrix items , print out the **sum of all matrix items** and print out the **sum of the diagonal items**.

Two dimensional Array as a Parameter to Function

when declaring a two-dimensional array as a formal parameter, you can omit the size of the first dimension, but not the second; that is, you must specify the number of columns.

```
void printMatrix( int matrix[ ][4], int Rows)
{
    int row, col;
    for (row = 0; row < Rows ; row++)
    {
        for (col = 0; col < 4; col++)
            System.out.println( setw(5) << matrix [row]
[col] );
    }
    System.out.println(“\n” ;
}
```