

St. Francis Institute of Technology, Mumbai-400 103  
**Department Of Information Technology**

A.Y. 2020-2021  
Class: SE-ITA/B, Semester: III

Subject: **Java Programming Lab**

**Experiment-1:** Java Program to implement principles of OOP using Control and Looping Statements.

**1. Aim:** Write a Java program to demonstrate the following:

**a.** Write a menu driven Java program which will read a number and should implement the following methods :

- i. Factorial()
- ii. Reverse of a Number()
- iii. Test Armstrong()
- iv. Test Palindrome()
- v. Test Prime()
- vi. Fibonacci Series()

**b.** Implement a java program to calculate gross salary & net salary taking the following data.

Input: empno, empname, basic  
Process: DA=70% of basic, HRA=30% of basic, CCA=Rs240/-, PF=10% of basic,  
PT= Rs100/-

**2. Prerequisite:** Knowledge of basics of OOP and Data Types.

**3. Requirements:** Personal Computer (PC), Windows Operating System, Net beans 8.0.

**4. Pre-Experiment Exercise:**

**Theory:**

a) Datatypes:

Type	Description	Default	Size	Example Literals
boolean	true or false	false	1 bit	true, false

byte	twos complement integer	0	8 bits	(none)
char	Unicode character	\u0000	16 bits	'a', '\u0041', '101', '\\', '\"', '\n', 'B'
short	twos complement integer	0	16 bits	(none)
int	twos complement integer	0	32 bits	-2, -1, 0, 1, 2
long	twos complement integer	0	64 bits	-2L, -1L, 0L, 1L, 2L
float	IEEE 754 floating point	0.0	32 bits	1.23e100f, -1.23e-100f, .3f, 3.14F
double	IEEE 754 floating point	0.0	64 bits	1.23456e300d, -1.23456e-300d, 1e1d

- b) **If...else statement:** It checks Boolean condition: *true* or *false*. There are various types of if statement in java.
- i. if statement
  - ii. if-else statement
  - iii. if-else-if ladder
  - iv. nested if statement

- c) **Switch statement:** The Java *switch statement* executes one statement from multiple conditions. It is like if-else-if ladder statement.
- d) **Looping statements:** loops are used to execute a set of instructions/functions repeatedly when some conditions become true. There are three types of loops in java.
  - i. for loop
  - ii. while loop
  - iii. do-while loop
  - iv. for each loop

## 5. Laboratory Exercise

### A. Procedure

- i. Open Net beans for Java.
- ii. Open File and Create New Java Project.
- iii. Inside the Java Project rename give name to your Java Class.
- iv. Click on Finish.
- v. Type the Java Code in the opened class.
- vi. Save the code by pressing Ctrl+S.
- vii. Run the code by pressing Shift+F6.

### B. Program code with comments:

Write and execute your program code to achieve the given aim and attach it **with your own comments with neat indentation.**

## 6. Post-Experiments Exercise

### A. Extended Theory:

- 1. Explain entry controlled loop and exit controlled loop used in Java with example.
- 2. Explain the use of break and continue statement and differentiate between them.

### B. Results/Observations/Program output:

Present the program input/output results and comment on the same.

### C. Questions/Programs:

- 1. Write a Java program that counts number of alphabets, words, digits, special symbols and blank spaces in a given string.
- 2. Write a Java program to count vowels and consonants in a given string.

### D. Conclusion:

- 1. Write what was performed in the experiment/program.
- 2. What is the significance of experiment/program?

3. Mention few applications of what was studied.

## E. References

1. E. Balguruswamy, “Programming with java A primer”, Fifth edition, Tata McGraw Hill Publication.
2. Learn to Master JAVA, from Star EDU solutions , by ScriptDemics.
3. [www.programmingsimplified.com](http://www.programmingsimplified.com)
4. [www.javatpoint.com](http://www.javatpoint.com)

Program 1:

```
// Program to implement diff. functions through switch case
/**
 * i. Factorial()
ii. Reverse of a Number()
iii. Test Armstrong()
iv. Test Palindrome()
v. Test Prime()
vi. Fibonacci Series()
*/
package Exp1;
import java.util.Scanner;
public class Exp1_1
{
    public static void main(String args[])
    {
        Scanner sc=new Scanner(System.in);
        int ch,n;
        do {

            System.out.println("\nMENU ");
            System.out.println("1. Factorial of number ");
            System.out.println("2. Find Reverse ");
            System.out.println("3. Check whether number is Angstrom ");
            System.out.println("4. Check whether number is Palindrome ");
            System.out.println("5. Check whether number is Prime or not");
            System.out.println("6. Fibonacci Series ");
            System.out.println("7. EXIT ");
            System.out.println("Enter your choice: ");
            ch=sc.nextInt();

            switch(ch)
            {
                case 1: //To find factorial
                {
                    System.out.println(" Enter the no whose factorial is to be
calculated: ");
                    n=sc.nextInt();
                    int fact=1;
```

```

        while(n>0)
        {
            fact=n*fact;
            n--;
        }
        System.out.println("Factorial is "+fact);
        break;
    }
    case 2: //To reverse a number
    {
        System.out.println(" Enter the number: ");
        n=sc.nextInt();
        int reversed = 0;
        while(n != 0) {
            int digit = n % 10;
            reversed = reversed * 10 + digit;
            n /= 10;
        }
        System.out.println("Reversed Number: " + reversed);
        break;
    }
    case 3: //To check Angstrom
    {
        System.out.println(" Enter number to check whether Angstrom:");
        n=sc.nextInt();
        int num=n,r,sum=0;
        while(num!=0)
        {
            r=num%10;
            sum=sum+(r*r*r);
            num/=10;
        }
        if(n==sum)
        System.out.println("Number is Angstrom. ");
        else
        System.out.println("Number is not Angstrom. ");
        break;
    }
}

```

```
        case 4: //To check palindrome
        {
            System.out.println(" Enter number to check whether
palindrome: ");
            n=sc.nextInt();
            int num=n,r,sum=0;
            while(num!=0)
            {
                r=num%10;
                sum=(sum*10)+r;
                num/=10;
            }
            if(n==sum)
                System.out.println("Number is Palindrome. ");
            else
                System.out.println("Number is not Palindrome. ");
            break;
        }
        case 5: //To check Prime number
        {
            System.out.println(" Enter the number as prime or not ");
            n=sc.nextInt();
            int flag=0;
            for(int i=2;i<n;i++)
            {
                if(n%i==0)
                {
                    flag=1;
                    break;
                }
            }
            if(flag==1)
                System.out.println("Number is not prime ");
            else
                System.out.println("Number is prime ");
            break;
        }
        case 6: //To display n elements of Fibonacci series
        {
```

```
        System.out.println(" Enter the no of elements of fibonacci  
series to show: ");  
        n=sc.nextInt();  
        int a=0,b=1,c;  
        System.out.println("0\t1\t");  
        for(int i=1; i<=n; i++)  
        {  
            c=a+b;  
            System.out.println(c+"\t");  
            b=c;  
            a=b;  
        }  
        break;  
    }  
    case 7:{ //To Exit  
        System.out.println("Exitting.");  
    }  
    default:  
        System.out.println("INVALID CHOICE");  
    }  
} while (ch!=7);  
sc.close();  
}
```

Output:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

D:\College\JAVA\Experiments\Exp1>javac Exp1_1.java

D:\College\JAVA\Experiments\Exp1>java Exp1_1

MENU
1. Factorial of number
2. Find Reverse
3. Check whether number is Angstrom
4. Check whether number is Palindrome
5. Check whether number is Prime or not
6. Fibonacci Series
7. EXIT
Enter your choice:
1
Enter the no whose factorial is to be calculated:
5
Factorial is 120

MENU
1. Factorial of number
2. Find Reverse
3. Check whether number is Angstrom
4. Check whether number is Palindrome
5. Check whether number is Prime or not
6. Fibonacci Series
7. EXIT
Enter your choice:
2
Enter the number:
123
Reversed Number: 321
```

PROBLEMS

OUTPUT

DEBUG CONSOLE

TERMINAL

---

MENU

1. Factorial of number
2. Find Reverse
3. Check whether number is Angstrom
4. Check whether number is Palindrome
5. Check whether number is Prime or not
6. Fibonacci Series
7. EXIT

Enter your choice:

3

Enter number to check whether Angstrom:

153

Number is Angstrom.

MENU

1. Factorial of number
2. Find Reverse
3. Check whether number is Angstrom
4. Check whether number is Palindrome
5. Check whether number is Prime or not
6. Fibonacci Series
7. EXIT

Enter your choice:

4

Enter number to check whether palindrome:

121

Number is Palindrome.

MENU

1. Factorial of number
2. Find Reverse
3. Check whether number is Angstrom
4. Check whether number is Palindrome
5. Check whether number is Prime or not
6. Fibonacci Series
7. EXIT

PROBLEMS    OUTPUT    DEBUG CONSOLE    **TERMINAL**

---

Enter your choice:

5

Enter the number as prime or not

13

Number is prime

MENU

1. Factorial of number
2. Find Reverse
3. Check whether number is Angstrom
4. Check whether number is Palindrome
5. Check whether number is Prime or not
6. Fibonacci Series
7. EXIT

Enter your choice:

6

Enter the no of elements of fibonacci series to show:

6

0            1

1

2

4

8

16

32

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

**MENU**

1. Factorial of number
2. Find Reverse
3. Check whether number is Angstrom
4. Check whether number is Palindrome
5. Check whether number is Prime or not
6. Fibonacci Series
7. EXIT

Enter your choice:

7

Exitting.

D:\College\JAVA\Experiments\Exp1> █

## Program 2:

```
/*
 * Implement a java program to calculate gross salary & net salary taking the
following data.
Input: empno, empname, basic
Process:DA=70% of basic,HRA=30% of basic,CCA=Rs240/-,PF=10% of basic, PT= Rs100/-
*/
package Exp1;
import java.util.Scanner;
public class Exp1_2
{
    public int employeid;
    public String empname;
    public double basicsalary,HRA,DA,GS,PF,CCA=240, PT=100, incometax,netsalary;
    public void read()
    {
        Scanner scan= new Scanner(System.in);
        System.out.println("Enter the employee id");//taking all the inputs from
the user
        employeid=scan.nextInt();
        System.out.println("Enter the employee name");
        empname=scan.next();
        System.out.println("Enter the basic salary of an employee");
        basicsalary=scan.nextDouble();
        scan.close();
    }
    public void calculate() //calculating all the parameters
    {
        HRA=(30*basicsalary)/100;
        DA=(70*basicsalary)/100;
        PF =(10*basicsalary)/100;
        GS=basicsalary+DA+HRA+PF+PT+CCA;
        incometax=(30*GS)/100;
        netsalary=GS-incometax;
    }
    public void display() //displaying the calculating parameters
    {
        System.out.println("Employeeid : "+employeid);
```

```
System.out.println("Employename : "+empname);
System.out.println("Employee basic salary : "+basicsalary);
System.out.println("HRA : "+HRA);
System.out.println("DA : "+DA);
System.out.println("PF : "+PF);
System.out.println("CCA : "+CCA);
System.out.println("PT : "+PT);
System.out.println("Gross Salary : "+GS);
System.out.println("Income tax : "+incometax);
System.out.println("net salary : "+netsalary);

}

public static void main(String args[])
{
    Exp1_2 employeobj=new Exp1_2();
    employeobj.read(); //calling read function
    employeobj.calculate();
    employeobj.display(); //calling display function
}
}
```

Output:

PROBLEMS    OUTPUT    DEBUG CONSOLE    **TERMINAL**

```
D:\College\JAVA\Experiments\Exp1>javac Exp1_2.java

D:\College\JAVA\Experiments\Exp1>java Exp1_2
Enter the employee id
1234
Enter the employee name
Yash
Enter the basic salary of an employee
20000
Employeeid : 1234
Employename : Yash
Employee basic salary : 20000.0
HRA : 6000.0
DA : 14000.0
PF : 2000.0
CCA : 240.0
PT : 100.0
Gross Salary : 42340.0
Income tax : 12702.0
net salary : 29638.0
```

```
D:\College\JAVA\Experiments\Exp1>
```

## Questions

### Question 1:

```
/**  
 * Write a Java program that counts number of alphabets, words, digits, special  
symbols and blank spaces in a given string.  
 */  
  
package Exp1;  
  
import java.util.Scanner;  
public class O1 {  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
        System.out.println("Enter a string: ");  
  
        String s = scanner.nextLine();  
        count(s);  
  
        scanner.close();  
    }  
  
    public static void count(String str){  
  
        char [] ch = str.toCharArray();  
        int letter=0, space = 0, digit = 0, other = 0, word=0;  
  
        //To count number of words in a string by splitting the string at " "  
        String[] words = str.split(" ");  
        word = words.length;  
  
        //To count the other parameters  
        for (char c : ch) {  
            if (Character.isLetter(c)) {  
                letter ++;  
            }  
            else if(Character.isDigit(c)){  
                digit ++;  
            }  
        }  
    }  
}
```

```
        else if(Character.isSpaceChar(c)){
            space++;
        }
        else{
            other++;
        }
    }
    //Displaying all the parameters
    System.out.println("String analysis: ");
    System.out.println("WORDS: " + word);
    System.out.println("LETTER: " + letter);
    System.out.println("DIGIT: " + digit);
    System.out.println("SPACE: " + space);
    System.out.println("OTHER CHARACTERS: " + other);
}
}
```

Output:

The screenshot shows a terminal window with the following interface elements at the top:

- PROBLEMS
- OUTPUT
- DEBUG CONSOLE
- TERMINAL** (highlighted)

The terminal window displays the following command and its output:

```
D:\College\JAVA\Experiments\Exp1>javac Q1.java
D:\College\JAVA\Experiments\Exp1>java Q1
Enter a string:
Hello World This is 1234@ @#$%
String analysis:
WORDS: 6
LETTER: 16
DIGIT: 4
SPACE: 5
OTHER CHARACTERS: 4
```

Question 2:

```
/*
 * Write a Java program to count vowels and consonants in a given string.
 */

package Exp1;

import java.util.Scanner;
public class Q2 {
    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter a string:");
        String str = scanner.nextLine();
        count(str.toLowerCase());
        scanner.close();
    }

    public static void count(String str){

        int cCount =0, vCount=0;
        for (char c : str.toCharArray()) {
            //To count for vowels
            if(c=='a' || c=='e' || c=='i' || c=='o' || c=='u'){
                vCount++;
            }
            //To count for consonants
            else if(c>='a' && c<='z'){
                cCount++;
            }
        }
        //Displaying result
        System.out.println("Number of vowels: " + vCount);
        System.out.println("Number of consonants: " + cCount);

    }
}
```

Output:

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
D:\College\JAVA\Experiments\Exp1>javac Q2.java
```

```
D:\College\JAVA\Experiments\Exp1>java Q2
```

```
Enter a string:
```

```
Hello My name is yash
```

```
Number of vowels: 6
```

```
Number of consonants: 11
```

```
D:\College\JAVA\Experiments\Exp1>
```

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## 6) Post Experiment Exercise :-

### A) Extended Theory

Explain entry controlled loop and exit controlled loop used in java with example.

Entry controlled loop controls entry to the loop & this is why it is referred as entry controlled loop. An entry controlled loop checks the condition at the time of entry & if the condition or expression becomes true the control transfers into the body of the loop.

Eg:-

```
int count = 100;
while (count < 50)
    System.out.println("Value of count");
```

```
int count
for (count = 100; count < 50
     count++) {
    System.out.println(count);
```

~~System.out.println(count);~~

In both code snippets value of count is 100 & condition is count < 50, which is checked first, hence there is no output.

Exit controlled loop, controls exit of the loop, this is why it is referred as exit controlled loop & an exit controlled loop checks the condition for exit & if given condition for exit is evaluated to be true, control will exit.

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from the loop body or else control will enter again into the loop body for example of controlled loop is do-while loop

Eg

```
int count = 100;
do {
```

```
    System.out.println( count++ );
} while( count < 50 )
```

Output :-

100

In this code snippet value of count is 100 & first the condition is count < 50 which is false yet the loop body will be executed first then condition will be checked after that. Hence the output of the program is 100.

- 2] Explain the use of break & continue statement & differentiate between them.

Key	Break	Continue
Functionality	Break statement mainly used to terminate the enclosing loop such as while, for or switch wherever break is declared.	Continue statement mainly skips the rest of the loop wherever continue is declared & execute the next iteration.

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Execution flow	Break statement mainly resumes the control of the program to the end of loop & made execution flow outside the loop.	Continue statement resumes the control of the program to next iteration of the loop enclosing continue & made execution flows inside the loop again.
Usage	As mentioned break is used for the termination of enclosing loop.	On other hand continue causes early execution of next iteration of the enclosing loop.
Compatibility	Break statement can be used & is compatible with 'label', 'switch'.	We can't use continue statements with switch label as it is not compatible with them.
Causes	It causes early termination of the loop.	It causes early execution of next iteration.

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## D. Conclusion :-

In this experiment we have studied fundamentals of the Java programming language. We have studied different keywords in Java and have written programs to implement them.

Java has significant advantage not only as a commercial language but also as a teaching language.

It allows us to learn the various Object Oriented Programming fundamentals with great ease. Java itself embodies many best practices like in design patterns in its library.

Due to its efficient syntax and high security Java language has a variety of applications ranging from web development to big data technologies.