National University of Computer and Emerging Sciences



**Software Design and Architecture Lab**

Lab Manual 01

| Course Instructor | Mam Hina Iqbal |
| --- | --- |
| Lab Instructor (s) | Samiya Akhter |
| Section | BSE-4C |
| Semester | Spring 2023 |

Department of Computer Science

FAST-NU, Lahore, Pakistan

## 

**Recap: (OOP)**

**Objectives:**

1. Java Variables
2. Java Data types
3. Java strings
4. Java Type Casting
5. Java Operators
6. Java Conditions statements
7. Java Conditions
8. Java loops
9. Java arrays
10. Java objects
11. Java Methods
12. Java Classes
13. Java Inherence and Polymorphism

**Task 1:**

Write a Java program to takes the user for a distance (in meters) and the time was taken (as three numbers: hours, minutes, seconds), and display the speed, in meters per second, kilometers per hour and miles per hour (hint: 1 mile = 1609 meters).

**Test Data**Input distance in meters: 2500  
Input hour: 5  
Input minutes: 56  
Input seconds: 23  
**Expected Output*:***Your speed in meters/second is 0.11691531  
Your speed in km/h is 0.42089513  
Your speed in miles/h is 0.26158804

**Task 2:**

Write a program in Java to display the multiplication table of a given integer.

Test Data  
Input the number (Table to be calculated): Input number of terms: 5  
**Expected Output*:***

5 X 0 = 0

5 X 1 = 5

5 X 2 = 10

5 X 3 = 15

5 X 4 = 20

5 X 5 = 25

**Task 3:**

Write a Java program to display Pascal's triangle.

Test Data  
Input number of rows: 5  
Expected Output*:*

Input number of rows: 5

1

1 1

1 2 1

1 3 3 1

1 4 6 4 1

**Task 4:**

Write a Java program to print all sub-arrays with 0 sum present in a given array of integers

Example:  
Input :  
nums1 = { 1, 3, -7, 3, 2, 3, 1, -3, -2, -2 }  
nums2 = { 1, 2, -3, 4, 5, 6 }  
nums3= { 1, 2, -2, 3, 4, 5, 6 }  
Output:  
Sub-arrays with 0 sum : [1, 3, -7, 3]  
Sub-arrays with 0 sum : [3, -7, 3, 2, 3, 1, -3, -2]  
  
Sub-arrays with 0 sum : [1, 2, -3]  
Sub-arrays with 0 sum : [2, -2]

**Task 5:**

Write a Java program to check whether a given string ends with the contents of another string.

**Sample Output:**

"Python Exercises" ends with "se"? false

"Python Exercise" ends with "se"? true

**Task 6:**

Write a Java method to display the first 50 pentagonal numbers.   
Note: A pentagonal number is a figurate number that extends the concept of triangular and square numbers to the pentagon, but, unlike the first two, the patterns involved in the construction of pentagonal numbers are not rotationally symmetrical.  
**Expected Output:**

1 5 12 22 35 51 70 92 117 145

176 210 247 287 330 376 425 477 532 590

651 715 782 852 925 1001 1080 1162 1247 1335

1426 1520 1617 1717 1820 1926 2035 2147 2262 2380

2501 2625 2752 2882 3015 3151 3290 3432 3577 3725

**Task 7:**

Write a program that would print the information (name, year of joining, salary, address) of three employees by creating a class named 'Employee'. The output should be as follows:  
Name        Year of joining        Address  
Robert            1994                64C- Walls Streat  
Sam                2000                68D- Walls Streat  
John                1999                26B- Walls Streat

**Task 8**

Write a program by creating an 'Employee' **class** having the following methods and print the final salary.  
1 - 'getInfo()' which takes the salary, number of hours of work per day of employee as parameter  
2 - 'AddSal()' which adds $10 to salary of the employee if it is less than $500.  
3 - 'AddWork()' which adds $5 to salary of employee if the number of hours of work per day is more than 6 hours.

**Task 9:**

All the banks operating in Pakistan are controlled by SBP. SBP has set a well-defined guideline (e.g., minimum interest rate, minimum balance allowed, maximum withdrawal limit etc.) which all banks must follow. For example, suppose SBP has set minimum interest rate applicable to a saving bank account to be 4% annually; however, banks are free to use 4% interest rate or to set any rates above it.  
  
Write a java program to implement bank functionality in the above scenario and demonstrate the **dynamic polymorphism** concept. Note: Create few classes namely Customer, Account, SBP (Base Class) and few derived classes (MCB, BOP etc.). Assume and implement required member variables and **Functions in each class.**  
  
**Hint:**  
Class Customer  
{  
//Personal Details ...  
// Few functions ...  
}  
Class Account  
{  
// Account Detail ...  
// Few functions ...  
}  
Class SBP  
{  
Customer c; //hasA relationship  
Account a; //hasA relationship  
..  
Public double GetInterestRate() { }  
Public double GetWithdrawalLimit() { }  
}  
Class MCB: public SBP  
{  
//Use SBP functionality or define own functionality.  
}  
Class BOP: public SBP  
{  
//Use SBP functionality or define own functionality.  
}

**Task 10:**

1. **Will the code compile successfully? If yes, what will be the output of the program?**

class A {

void m1(A a) {

System.out.println("m1 method in class A");

}

}

class B extends A {

public void m1(A a) {

System.out.println("m1 method in class B");

}

}

public class Test {

public static void main (String [] args){

A a = new A ();

a.m1(a);

a.m1(new B ());

B b = new B ();

b.m1(null);

a = b;

a.m1(null);

a.m1(new A ());

}

}

1. **Identify the errors in the following code.**

class A {

void m1(String x){

System.out.println("One");

}

}

class B extends A {

}

public class Test{

public static void main (String [] args) {

A a = new B ();

a.m1(new A ());

}

}

1. **What is the output of the below program if no errors.**

class A {

void m1(Object obj) {

System.out.println("One");

}

}

class B extends A {

void m1(Object obj) {

super.m1(null);

System.out.println("Two");

}

void m2(Object obj) {

System.out.println("Three");

this.m1(null);

}

}

public class Test {

public static void main (String [] args) {

A a = new B ();

a.m1(new A ());

B b = new B ();

b.m2(new B ());

}

}

**Good Luck 😊**