Batch: D2 **Roll No.:16010122323**

Experiment / assignment / tutorial No. 9

Grade: AA / AB / BB / BC / CC / CD /DD

Signature of the Staff In-charge with date

TITLE :Java Packages

AIM: Create a Package Engineering which has two classes as Student and Marks. Accept (n) student detail like roll_no, Subject_name, Student_name,caluculate total marks in the class Student Write display () method to display details and sort () method to sort the students records as per increasing order of the total marks. The function sort must be statically defined to invoke it without referring any object. Both the functions write in the Marks class.

Create a main class which will use package display all the records of the student in the increasing order of the their total marks.

Expected OUTCOME of Experiment:

CO4: Explore the interface, exceptions, multithreading, packages.

Books/ Journals/ Websites referred:

1. Ralph Bravaco , Shai Simoson , "Java Programing From the Group Up" Tata McGraw-Hill.

2.Grady Booch, Object Oriented Analysis and Design .

Pre Lab/ Prior Concepts:

Java Packages:

A package in Java is a group of similar types of classes, interfaces, and sub-packages. They can be categorized into two categories, the built-in package (java, lang, util, awt, javax, swing, net, io, sql et), and user-defined package.

They are used for the following tasks –

- To prevent the naming conflicts which can occur between the classes.
- Make the searching and locating of classes or enumerations or annotations much easier.
- Provide access control to the classes.
- Used for data encapsulation.

Advantages of Java Package:

- A Java package is mainly used for the categorization of classes and interfaces so that we can maintain them easily.
- They always provide access protection
- Used to bundle classes and interface.
- With the help of packages, we can reuse the existing code
- By using package, we can easily locate the classes related to it.
- Also, remove the naming collision.

Built-in Packages in Java

Built-in is a part of Java API and it offers a variety of packages are –

lang – Automatically imported and it contains language support classes.
io – Contains classes for input and output operations.
util – Contains utility classes for implementing data structures.
applet – This package contains classes that create applets.
awt – Contain classes that implement compounds for GUI.
net – This package contains classes that support networking operations.

User-defined Packages in Java

```
1.  package First;
2.
3.  public class MyClass
4.  {
5.  public void getNames(String name)
6.  {
7.  System.out.println(name);
8.  }
9.
10. }
```

```
1.  package First;
2.  import First.MyClass;
3.  public class MyClass1 {
4.  public static void main(String args[])
5.  {
6.  // Initializing the String variable with a value
7.  String name = "Welcome";
8.  // Creating an instance of class MyClass in the package.
9.  MyClass obj = new MyClass();
```

```
10.     obj.getNames(name);
11.     }
12.     }
```

.

Class Diagram:

CLASS NAME	**MAIN**
VARIABLES NAME	+name: String +n: int +rno: int +eng: int +math: int +sci: int +total_marks : int
METHODS	+main (): void

CLASS NAME	**Student**
VARIABLES NAME	+Student_name: String + roll_no:int +English: int +Maths:int +Science:int +total_marks:int +e:int +m:int +s:int

METHODS	+cal(int , int): int +Student (int, int, int, int ,String):
CLASS NAME	**Marks**
VARIABLES NAME	+Student_name : String + roll_no:int +English: int +Maths:int +Science:int +total_marks:int +n:int
METHODS	+sort (int , int, int , int, String , int , int):void +display():void

Algorithm:

Step 1: Create a package 'Engineering' having two classes: Student and Marks

Step 2: Class Student –

a.) cal Function: Calculates total marks and returns it

Class Marks -

a.) sort Function: Sorts student information according to total marks obtained. If i+1 th student (marks) < i th student(marks) swap (continue process till n-1 iteration).

b.) display function: Displays student information

Step 3 Create MAIN class and import package 'Engineering

Step 4: In main function accept number of students and their information.

Step 5: Store information of students in different arrays.

Step 6: call cal function and calculate total marks

Step 7: call sort function and then display the information using display function

Implementation details:

CLASS MARKS:

```
package Engineering;

import java.util.*;


public class Marks
{
   public void display(int roll_no[], int English[], int Maths[], int Science[], String
   Student_name[], int total_marks[], int n)
   {
      for (int i=0;i<n;i++)
      {
         System.out.println(Student_name[i] + "\t\t\t" + roll_no[i] + "\t\t\t" + English[i] + "\t\t\t" +
Maths[i] + "\t\t\t" + Science[i] + "\t\t\t" + total_marks[i]);
      }
   }


   public static void sort(int roll_no[], int English[], int Maths[], int Science[], String
   Student_name[], int total_marks[], int n)
   {
      for(int i=n-1;i>0;i--)
      {
         for(int j=0;j<i;j++)
         {
            if (total_marks[j]>total_marks[j+1])
            {
               int t1 = total_marks[j];
```

```
                int t2= roll_no[j];
                int t3= English[j];
                int t4= Maths[j];
                int t5 = Science[j];
                String t6= Student_name[j];
                total_marks[j]=total_marks[j+1];
                roll_no[j] = roll_no[j+1];
                English[j] = English[j+1];
                Maths[j] = Maths[j+1];
                Science[j] = Science[j+1];
                Student_name[j] = Student_name[j+1];
                total_marks[j+1]=t1;
                roll_no[j+1] = t2;
                English[j+1] = t3;
                Maths[j+1] = t4;
                Science[j+1] = t5;
                Student_name[j+1] = t6;
            }
        }
    }
  }
}
```

MAIN CLASS:

```
package Engineering;
import java.util.*;
```

```
public class MAIN
{
    public static void main(String[] args)
    {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter the number of students: ");
        int n = sc.nextInt();
        int rno[] = new int[n];
        int total_marks[] = new int[n];
        int eng[] = new int[n];
        int maths[] = new int[n];
        int sci[] = new int[n];
        String name[] = new String[n];
        System.out.println("\t\t\t\t\tEnter the details of Student");

        for (int i=0; i<n;i++)
        {
            System.out.println("Enter roll no.");
            rno[i] = sc.nextInt();
            System.out.println("Enter marks in english");
            eng[i] = sc.nextInt();
            System.out.println("Enter marks in maths");
            maths[i] = sc.nextInt();
            System.out.println("Enter marks in science");
            sci[i] = sc.nextInt();
            System.out.println("Enter name of the student");
            name[i] = sc.next();
```

```
            System.out.println("\n");
        }

        Marks obj1 = new Marks();
        System.out.println("Name\t\t\tRoll no.\t\tEnglish\t\t\tMaths\t\t\tScience\t\t\tTotal marks");
        Student obj2 = new Student(rno, eng, maths, sci, name);

        for (int i=0;i<n;i++)
        {
            total_marks[i] = obj2.cal(eng[i], maths[i], sci[i]);
        }

        Marks.sort(rno, eng, maths, sci, name, total_marks,n);
        obj1.display(rno, eng, maths, sci, name, total_marks,n);
    }
}
```

Output:

```
Enter the number of students:
3
                                    Enter the details of Student
Enter roll no.
193
Enter marks in english
88
Enter marks in maths
90
Enter marks in science
93
Enter name of the student
Jake


Enter roll no.
194
Enter marks in english
89
Enter marks in maths
95
Enter marks in science
96
Enter name of the student
Amy


Enter roll no.
195
Enter marks in english
86
Enter marks in maths
92
Enter marks in science
93
Enter name of the student
Ray


Name                Roll no.            English             Maths               Science             Total marks
Jake                193                 88                  90                  93                  271
Ray                 195                 86                  92                  93                  271
Amy                 194                 89                  95                  96                  280
```

Conclusion:

The concept of packages is understood.

Date: _____ **Signature of faculty in-charge**

Post Lab Descriptive Questions

Q.1 What are Java Packages? What's the significance of packages?

Packages are used in Java in order to prevent naming conflicts, to control access, to make searching/locating and usage of classes, interfaces, enumerations and annotations easier, etc.

A **Package** can be defined as a grouping of related types (classes, interfaces, enumerations and annotations) providing access protection and namespace management.

Since the package creates a new namespace there won't be any name conflicts with names in other packages. Using packages, it is easier to provide access control and it is also easier to locate the related classes.

Q.2 **Does Importing a package imports its sub-packages as well in Java?**

In java, when a package is imported, its sub-packages aren't imported and the developer needs to import them separately if required.
For example, if a developer imports a package university.*, all classes in the package named university are loaded but no classes from the sub-package are loaded. To load the classes from its sub-package (say department), the developer has to import it explicitly as follows: *Import university.department.**