Batch: A3 Roll No.: 1911034

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 and calculate total marks and 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:

Classes in our package Engineering:

Class: Student
Method: public student input ();
Variables: String name, int roll, m1, m2, m3, total;

Class: Marks
Methods: public static void sort(), public static void display()
Variables: int i , j;

Class in the main program that imports the package:

Class: Exp09
Methods: public static void main(String args[])
Variables: int i,n; Vector <student >vec()

Note: The vector in main, is of type student which means all its objects belong to class Student imported from the package

Implementation details:

Code of Package:

Student.java :

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

public class Student
{
String name;
int roll , m1,m2,m3,total;


public Student input()
{
String name1;
int roll1 , ma,mb,mc;
Student obj = new Student();
System.out.println("Enter the roll number of the student");
Scanner sc = new Scanner(System.in);
roll1 = sc.nextInt();
obj.roll = roll1;
System.out.println("Enter the name of the student");
name1 = sc.next();
```

```
obj.name = name1;
System.out.println("Enter the marks in subject1");
ma = sc.nextInt();
obj.m1 = ma;
System.out.println("Enter the marks in subject2");
mb = sc.nextInt();
obj.m2 = mb;
System.out.println("Enter the marks in subject3");
mc = sc.nextInt();
obj.m3 = mc;
System.out.println("----------------------");
return obj;

}

}
```

Marks.java

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

public class Marks

{
public static void Sort (Vector<Student>v, int n)
{
Scanner sc = new Scanner(System.in);
int i,j;
Student temp = new Student();
for(i=0;i<n;i++)
{
v.elementAt(i).total = v.elementAt(i).m1 + v.elementAt(i).m2
+v.elementAt(i).m3;
}

for(i=0;i<n;i++)
{
for(j=0;j<n-i-1;j++)
{
if(v.elementAt(j).total>v.elementAt(j+1).total)
{
temp = v.elementAt(j);
```

```
v.set(j,v.elementAt(j+1));
v.set(j+1,temp);

}
}
}
}

public static void Display (Vector<Student>v,int n)
{
int i;
System.out.println("The student details displayed in the sorted order of
marks are as follows:");
for(i=0;i<n;i++)
{
System.out.println("Roll no.:"+v.elementAt(i).roll);
System.out.println("Name:"+v.elementAt(i).name);
System.out.println("Marks in 1st subject:"+v.elementAt(i).m1);
System.out.println("Marks in 2nd subject:"+v.elementAt(i).m2);
System.out.println("Marks in 3rd subject:"+v.elementAt(i).m3);
System.out.println("Total:"+v.elementAt(i).total);
System.out.println("-------------------------------------");

}

}

}
```

Code of Main Program:

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

class Exp09{
  public static void main(String[] args) {
    int i,n;
    Scanner sc = new Scanner(System.in);
    Vector<Student>vec = new Vector <Student>();
    System.out.println("Enter the total number of students");
    n = sc.nextInt();
    for(i=0;i<n;i++)
    {
      Student obj = new Student();
```

```
      obj = obj.input();
      vec.add(i,obj);
    }

    Marks.Sort(vec,n);/*calling the static sort method*/
    Marks.Display(vec,n);

  }
}
```

Output:

```
C:\Users\arvin\Desktop\Exp09>java Exp09
Enter the total number of students
3
Enter the roll number of the student
101
Enter the name of the student
Aditi
Enter the marks in subject1
10
Enter the marks in subject2
11
Enter the marks in subject3
12
----------------------
Enter the roll number of the student
102
Enter the name of the student
Ashwini
Enter the marks in subject1
40
Enter the marks in subject2
41
Enter the marks in subject3
12
----------------------
Enter the roll number of the student
103
Enter the name of the student
Arvind
Enter the marks in subject1
5
Enter the marks in subject2
11
Enter the marks in subject3
9
```

```
----------------------
Enter the roll number of the student
104
Enter the name of the student
Astha
Enter the marks in subject1
15
Enter the marks in subject2
22
Enter the marks in subject3
25
----------------------
Enter the roll number of the student
105
Enter the name of the student
Samiksha
Enter the marks in subject1
15
Enter the marks in subject2
18
Enter the marks in subject3
21
```

```
----------------------
The student details displayed in the sorted order of marks are as follows:
Roll no.:102
Name:Ashwini
Marks in 1st subject:15
Marks in 2nd subject:13
Marks in 3rd subject:22
Total:50
-------------------------------------
Roll no.:105
Name:Samiksha
Marks in 1st subject:15
Marks in 2nd subject:18
Marks in 3rd subject:21
Total:54
-------------------------------------
Roll no.:103
Name:Arvind
Marks in 1st subject:18
Marks in 2nd subject:23
Marks in 3rd subject:21
Total:62
-------------------------------------
Roll no.:104
Name:Astha
Marks in 1st subject:15
Marks in 2nd subject:22
Marks in 3rd subject:25
Total:62
-------------------------------------
Roll no.:101
Name:Aditi
Marks in 1st subject:19
Marks in 2nd subject:21
Marks in 3rd subject:23
Total:63
-------------------------------------

C:\Users\arvin\Desktop\Exp09>
```

Conclusion: In this experiment, we have learnt how to implement packages in Java, how to store various classes as a part of a package and import them into another class file , and how to use the classes of the package into the class file where we have imported.

The package must be stored with a ‘package’ keyword, followed by the name of the package . The class file that uses the package should use the ‘import’ keyword to import the package.

Post Lab Descriptive Questions

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

Packages in java provide a namespace for organizing related classes and interfaces together. We use package to avoid naming conflicts and to write better code. The packages in java can be divided into two types :

1. Built in packages (eg java.util , java.io)
2. User defined packages.

The packages in java are significant in order to

a. prevent naming conflicts,
b. to control access,
c. to make searching/locating and usage of classes, interfaces, enumerations and annotations easier, etc.

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

No, we will have to import the sub packages explicitly. Importing a package only imports the classes present in the package. It does not import any of the classes present in the sub-package.

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