Batch: A4 Roll No.:16010122083

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 details like roll_no, Subject_name, Student_name,calculate 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 to any object**. Both the functions are written in the Marks class.

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

Expected OUTCOME of Experiment:

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

Books/ Journals/ Websites referred:

1. Ralph Bravaco , Shai Simoson , “Java Programming 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 interfaces.
- With the help of packages, we can reuse the existing code
- By using the 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. }
```

.

Algorithm:

1. Start
2. Import the Engineering package which has the Student and Marks classes
3. Create object of Student class and call getDetails()
4. Do following operations:
   - ❖ Accept name of subjects
   - ❖ Accept number of students
   - ❖ Accept student details like name, roll no, marks.
   - ❖ Calculate total marks for every student
   - ❖ Create an object for each student and add it to a vector
5. Sort the student objects as per the total marks
6. Use display() method which displays all students' details in sorted order
7. Exit

Implementation details:

Student.java

```
package Engineering;

import java.util.*;
public class Student
{
    public String student_name;
    public int roll_no;
    public int[] all_marks;
    public String[] subjects;
    public int totalMarks;
    public Vector<Student> student_details=new Vector<Student>();
    public void SetNumberOfSubjects(int numSubjects)
    {
           subjects= new String[numSubjects];
           all_marks=new int[numSubjects];
    }
    public Student()
    {
    }
    public Student(String student_name, int roll_no,int[] all_marks, String[] subjects, int
totalMarks)
    {
        this.student_name = student_name;
        this.roll_no = roll_no;
        this.all_marks = all_marks;
        this.subjects = subjects;
        this.totalMarks = totalMarks;
    }
    public int calculate_total(int[] all_marks)
    {
        totalMarks = 0;
        for (int i = 0; i < all_marks.length; i++)
        {
            totalMarks += all_marks[i];
        }
        return totalMarks;
    }
    public void getDetails()
    {
        Scanner sc=new Scanner(System.in);
        System.out.println("Enter the number of subjects");
        int numSubjects=sc.nextInt();
        SetNumberOfSubjects(numSubjects);
        System.out.println("Enter "+numSubjects+" names of the Subjects Below:");
        for(int i=0;i<numSubjects;i++)
        {
            subjects[i] = sc.next();
        }
    }    }
```

Marks.java

```
package Engineering;

import java.util.*;
public class Marks
{
    Student s;
    public Marks(Student s)
    {
        s = this.s;
    }
    public static void sort(Student s)
    {
        Collections.sort(s.student_details, new sortTotal());
    }
    public static void display(Student s)
    {
        System.out.println("\nName\t\tRoll No.\tTotal Marks\n");
        for (int i = 0; i < s.student_details.size(); i++)
        {
            System.out.print(s.student_details.get(i).student_name + "\t\t");
            System.out.print(s.student_details.get(i).roll_no + "\t\t");
            System.out.print(s.student_details.get(i).totalMarks + "\n");
        }
    }
}
class sortTotal implements Comparator<Student>
{
    public int compare(Student st1, Student st2)
    {
        return st1.totalMarks - st2.totalMarks;
    }
}
```

Main.java

```
import Engineering.Marks;
import Engineering.Student;

public class Main
{
    public static void main(String args[]) {
        Student s = new Student();
        s.getDetails();
        Marks.sort(s);
        Marks.display(s);
    }
}
```

Output:

```
Enter the number of subjects: 3
English
Science
Maths

Enter the number of students: 5

Student 1 Details:
Name: Minav
Roll No: 83
Marks in each subject:
Enter marks in English :85
Enter marks in Science :98
Enter marks in Maths :78

Student 2 Details:
Name: Yashank
Roll No: 89
Marks in each subject:
Enter marks in English :87
Enter marks in Science :89
Enter marks in Maths :85

Student 3 Details:
Name: Rahil
Roll No: 88
Marks in each subject:
Enter marks in English :98
Enter marks in Science :97
Enter marks in Maths :96

Student 4 Details:
Name: Romil
Roll No: 97
Marks in each subject:
Enter marks in English :95
Enter marks in Science :94
Enter marks in Maths :96

Student 5 Details:
Name: David
Roll No: 178
Marks in each subject:
Enter marks in English :85
Enter marks in Science :84
Enter marks in Maths :83

Name            Roll No.        Total Marks

David           178             252
Minav           83              261
Yashank         89              261
Romil           97              285
Rahil           88              291
PS C:\Desktop\SY\Programs\SchoolSystem>
```

Conclusion: We learned how to the concept of Package and implement by making our own packages.

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

Post Lab Descriptive Questions

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

A java package is a group of similar types of classes, interfaces and sub-packages. Package in java can be categorized in two form, built-in package and user-defined package.

Following are the advantages of using packages in Java :

- Programmers can define their own packages to bundle a group of classes/interfaces, etc.
- It is a good practice to group related classes implemented by you so that a programmer can easily determine that the classes, interfaces, enumerations, and annotations are related.
- 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
- It is also easier to locate the related classes.

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

No, you will have to import the sub-packages explicitly. An import declaration which ends with a package name and .* imports all public classes/interfaces/annotations of the package only and nothing else. If you need classes from the child package too, you have to import them separately. If an import declaration contains a specific class, only that class will be imported. If the import declaration contains a specific class plus .* (it's a static import, must be in the form of import static…), then all static fields and methods will be imported from that class and nothing more.