Code-01

i) Exceptions
ii) Error vs Exceptions
iii) Exception Handling
iv) Try, Catch, and Finally block

Code:

Modification 1:

```
package labtest;
public class LabTest {
   public static void main(String[] args) {

      int num1=12;
      int num2=0;
      int[] a=new int[3];
      //int a;                     //Redefiniton Error
      try{
         a[3]=10;                  //ArrayIndexOutOfBoundsException
         int div=num1/num2;        //ArithmeticException
      }
      catch(ArithmeticException ar){
         System.out.println("Number cannot be devided by zero!"); //Exception handled
      }
      catch(ArrayIndexOutOfBoundsException ai){
         System.out.println("Cannot access the array-index; out of bound!");//Exception handled
      }
      finally{
         System.out.println("Exception handled!");
      }
   }

}
```

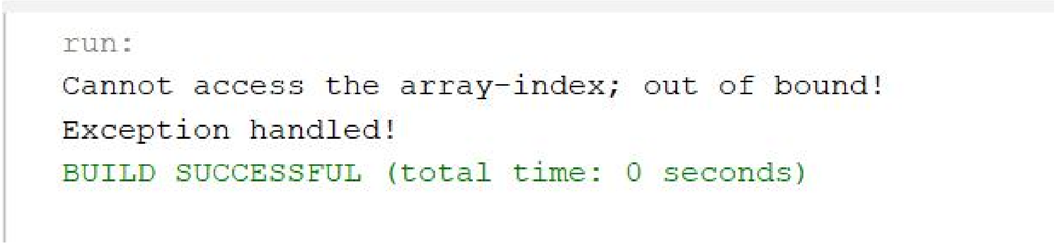
Modification 2:

```
package labtest;
public class LabTest {
   public static void main(String[] args) {

      int num1=12;
      int num2=0;
      int[] a=new int[3];
      //int a;                     //Redefiniton Error
      try{
        // a[3]=10;                  //ArrayIndexOutOfBoundsException
         int div=num1/num2;        //ArithmeticException
      }
      catch(ArithmeticException ar){
         System.out.println("Number cannot be devided by zero!"); //Exception handled
      }
      catch(ArrayIndexOutOfBoundsException ai){
         System.out.println("Cannot access the array-index; out of bound!");//Exception handled
      }
      finally{
         System.out.println("Exception handled!");
      }
   }

}
```

Modification 3:

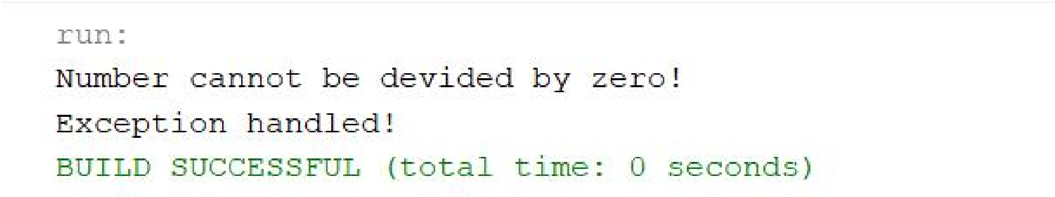
```
package labtest;
public class LabTest {
   public static void main(String[] args) {

      int num1=12;
      int num2=0;
      int[] a=new int[3];
      int a;             //Redefiniton Error
      try{
        // a[3]=10;          //ArrayIndexOutOfBoundsException
         int div=num1/num2;     //ArithmeticException
      }
      catch(ArithmeticException ar){
         System.out.println("Number cannot be devided by zero!"); //Exception handled
      }
      catch(ArrayIndexOutOfBoundsException ai){
         System.out.println("Cannot access the array-index; out of bound!");//Exception handled
      }
      finally{
         System.out.println("Exception handled!");
      }
   }

}
```

Output:



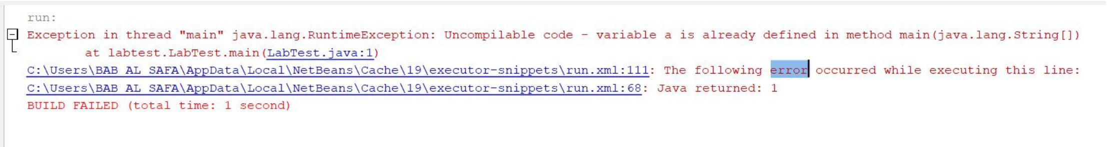
```
run:
Cannot access the array-index; out of bound!
Exception handled!
BUILD SUCCESSFUL (total time: 0 seconds)
```

Fig 1.1: Output for modification 1.



```
run:
Number cannot be devided by zero!
Exception handled!
BUILD SUCCESSFUL (total time: 0 seconds)
```

Fig 1.2: Output for modification 2.



```
run:
Exception in thread "main" java.lang.RuntimeException: Uncompilable code - variable a is already defined in method main(java.lang.String[])
        at labtest.LabTest.main(LabTest.java:1)
C:\Users\BAB AL SAFA\AppData\Local\NetBeans\Cache\19\executor-snippets\run.xml:111: The following error occurred while executing this line:
C:\Users\BAB AL SAFA\AppData\Local\NetBeans\Cache\19\executor-snippets\run.xml:68: Java returned: 1
BUILD FAILED (total time: 1 second)
```

Fig 1.3: Output for modification 3.

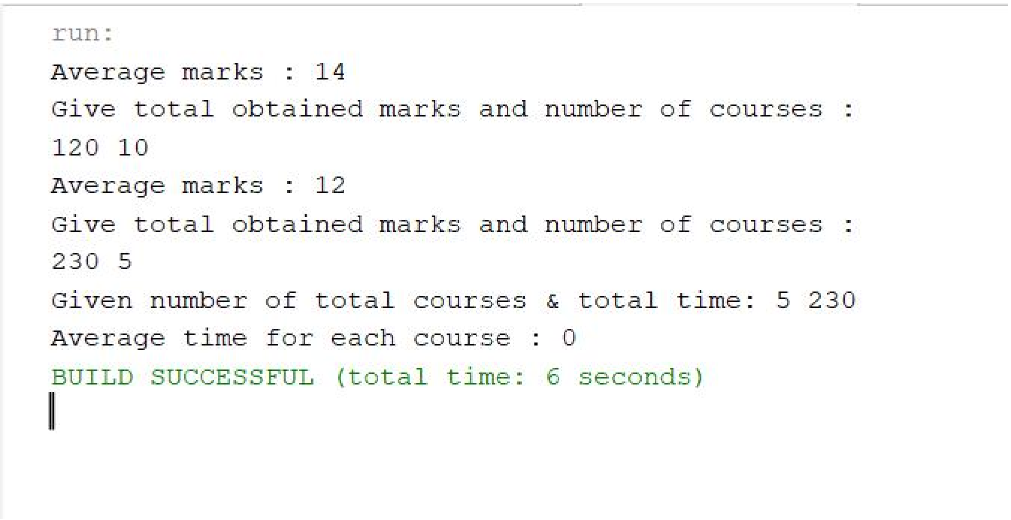
Code-02

i) Encapsulation
ii) Polymrphism
iii) Inheritance
iv) Abstraction

Code:

```
package labtest;

import java.util.Scanner;
class Student{                          //Encapsulation
    private int totalMarks;
    private int totalCourses;
    private int avgMarks;

    /*
    All the methods are exaples of Abstraction
    */

    public Student(int totalMarks, int totalCourses) {
        this.totalMarks = totalMarks;
        this.totalCourses = totalCourses;
    }

    public Student() {                          //Polymorphism: Constructor overloading

        System.out.println("Give total obtained marks and number of courses : ");
        Scanner input = new Scanner(System.in);
        this.totalMarks = input.nextInt();
        this.totalCourses = input.nextInt();
    }

    public void display(){
        System.out.println("Average marks : " + (totalMarks/totalCourses));
    }


}

class TimeDist extends Student{                          //Inheritance
    private int totalTime;
    private int totalCourses;

    public TimeDist(int totalCourses, int totalTime) {
        this.totalTime = totalTime;
        this.totalCourses = totalCourses;

        System.out.println("Given number of total courses & total time: " + totalTime +" "+totalCourses);
    }


    public void display(){
        System.out.println("Average time for each course : " + (totalTime/totalCourses));
//Polymorphism: Function overriding
    }

}

public class LabTest {
    public static void main(String[] args) {
        Student s1 = new Student(140,10);
        s1.display();

        Student s2 = new Student();
        s2.display();

        TimeDist t1 = new TimeDist(230,5);
        t1.display();


    }

}
```

<u>Output:</u>



```
run:
Average marks : 14
Give total obtained marks and number of courses :
120 10
Average marks : 12
Give total obtained marks and number of courses :
230 5
Given number of total courses & total time: 5 230
Average time for each course : 0
BUILD SUCCESSFUL (total time: 6 seconds)
```

Fig 2.1: Output on console.