RAJALAKSHMI ENGINEERING COLLEGE
RAJALAKSHMI NAGAR, THANDALAM – 602 105

RAJALAKSHMI
ENGINEERING COLLEGE

CS23333
OBJECT ORIENTED PROGRAMMING USING JAVA LAB

Laboratory Observation Note Book

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Year / Branch / Section : 2nd Year/ AIML / B

Register No. 231501082

Semester : 3nd Semester

Academic Year : 2024-2025

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LAB-01-JAVA ARCHITECTURE, LANGUAGE BASICS

Question 1

Write a program to find whether the given input number is Odd.
If the given number is odd, the program should return 2 else It should return 1.
Note: The number passed to the program can either be negative. positive or zero. Zero should NOT be treated as Odd.

For example:

Input	Result
123	2
456	1

PROGRAM

```
import java.util.Scanner;
public class oddoreven{
public static void main(String[]args){
Scanner s=new Scanner(System.in);
int number=s.nextInt();
if(number%2==0){
System.out.println(1);
}
else{
System.out.println(2);
}
}
}
```

OUTPUT

	Input	Expected	Got	
	123	2	2	
	456	1	1	

Passed all tests!

Question 2

Write a program that returns the last digit of the given number. Last digit is being referred to the least significant digit i.e. the digit in the ones (units) place in the given number.
The last digit should be returned as a positive number.

For example,
if the given number is 197, the last digit is 7
if the given number is -197, the last digit is 7

For example:

Input	Result
197	**7**
-197	**7**

PROGRAM

```
import java.lang.Math;
import java.util.Scanner;
public class LastDigit{
   public static void main(String[]args){
      Scanner s= new Scanner(System.in);
      int a = s.nextInt();
      int lastDigit=Math.abs(a%10);
      System.out.println(lastDigit);
   }
}
```

OUTPUT

	Input	Expected	Got	
	197	7	7	
	-197	7	7	

Passed all tests!

Question **3**

Rohit wants to add the last digits of two given numbers.
For example,
If the given numbers are 267 and 154, the output should be 11.
Below is the explanation:
Last digit of the 267 is 7
Last digit of the 154 is 4
Sum of 7 and 4 = 11
Write a program to help Rohit achieve this for any given two numbers.
Note: Tile sign of the input numbers should be ignored.
i.e.
if the input numbers are 267 and 154, the sum of last two digits should be 11
if the input numbers are 267 and -154, the slim of last two digits should be 11
if the input numbers are -267 and 154, the sum of last two digits should be 11
if the input numbers are -267 and -154, the sum of last two digits should be 11

For example:

Input	Result
267 154	11
267 -154	11
-267 154	11
-267 -154	11

PROGRAM

```
import java.util.Scanner;
import java.lang.Math;
public class number{
   public static void main(String[]agrs){
      Scanner s= new Scanner(System.in);
      int a= s.nextInt();
      int b= s.nextInt();
      System.out.println(Math.abs(a)%10+Math.abs(b)%10);
   }
}
```

OUTPUT

Input	Expected	Got	
	267 154	11	11
	267 -154	11	11
	-267 154	11	11
	-267 -154	11	11

Passed all tests!

LAB-02-FLOW CONTROL STATEMENTS

Question 1

Consider the following sequence:
1st term: 1
2nd term: 1 2 1
3rd term: 1 2 1 3 1 2 1
4th term: 1 2 1 3 1 2 1 4 1 2 1 3 1 2 1
And so on. Write a program that takes as parameter an integer n and prints the nth terms of this sequence.
Example Input: 1
Output: 1
Example Input: 4
Output:
1 2 1 3 1 2 1 4 1 2 1 3 1 2 1

For example:

Input	Result
1	1
2	1 2 1
3	1 2 1 3 1 2 1
4	1 2 1 3 1 2 1 4 1 2 1 3 1 2 1

PROGRAM

```
import java.util.Scanner;
public class SequenceGenerator{
   public static void main(String[]args){
      Scanner S = new Scanner(System.in);
      int n = S.nextInt();
      String term = generateTerm(n);
      System.out.print(term);
   }
   private static String generateTerm(int n){
      if (n==1){
         return "1";
      }
      String prevTerm = generateTerm (n-1);
      StringBuilder currentTerm = new StringBuilder(prevTerm);
      currentTerm.append(" " + n + " ");
      currentTerm.append(prevTerm);
      return currentTerm.toString();
   }
}
```

OUTPUT

	Input	Expected	Got	
	1	1	1	
	2	1 2 1	1 2 1	
	3	1 2 1 3 1 2 1	1 2 1 3 1 2 1	
	4	1 2 1 3 1 2 1 4 1 2 1 3 1 2 1	1 2 1 3 1 2 1 4 1 2 1 3 1 2 1	

Passed all tests!

Question 2

Write a Java program to input a number from user and print it into words using for loop. How to display number in words using loop in Java programming.
Logic to print number in words in Java programming.
Example
Input
1234
Output
One Two Three Four
Input:
16
Output:
one six

For example:

Test	Input	Result
1	45	Four Five
2	13	One Three
3	87	Eight Seven

PROGRAM

```
import java.util.Scanner;
public class NumberToWords {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      int number = scanner.nextInt();
      String[] words = {"Zero", "One", "Two", "Three", "Four", "Five", "Six", "Seven", "Eight", "Nine"};
      if (number < 0) {
         System.out.print("Negative ");
         number = -number;
      }
      if (number == 0) {
         System.out.println(words[0]);
      } else {
         int digits = (int) Math.log10(number) + 1;
         for (int i = digits - 1; i >= 0; i--) {
            int digit = (int) (number / Math.pow(10, i));
            System.out.print(words[digit] + " ");
            number %= (int) Math.pow(10, i);
         }
      }
   }
}
```

OUTPUT

	Test	Input	Expected	Got	
	1	45	Four Five	Four Five	
	2	13	One Three	One Three	
	3	87	Eight Seven	Eight Seven	

Passed all tests!

Question **3**

Write a program that takes as parameter an integer n.
You have to print the number of zeros at the end of the factorial of n.
For example, 3! = 6. The number of zeros are 0. 5! = 120. The number of zeros at the end are 1.
Note: n! < 10^5
Example Input: 3
Output: 0
Example Input: 60
Output: 14
Example Input: 100
Output: 24
Example Input: 1024
Output: 253

For example:

Input	Result
3	0
60	14
100	24
1024	253

PROGRAM

```
import java.io.*;
import java.util.Scanner;
public class progs {
   public static int findTrailingZeros(int n) {
      int count = 0; // Declare and initialize count here
      if (n < 0) {
         return -1;
      }
      for (int i = 5; n / i >= 1; i *= 5) {
         count += n / i; // Use the declared count variable
      }
      return count;
   }
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      int n = sc.nextInt();
      int res = findTrailingZeros(n);
      System.out.println(res);
   }
}
```

OUTPUT

	Input	Expected	Got	
	3	0	0	
	60	14	14	
	100	24	24	
	1024	253	253	

Passed all tests!

LAB-03-ARRAYS

Question **1**

Given an integer array as input, perform the following operations on the array, in the below specified sequence.

1. Find the maximum number in the array.
2. Subtract the maximum number from each element of the array.
3. Multiply the maximum number (found in step 1) to each element of the resultant array.

After the operations are done, return the resultant array.

Example 1:

input1 = 4 (represents the number of elements in the input1 array)
input2 = {1, 5, 6, 9}
Expected Output = {-72, -36, 27, 0}

Explanation:

Step 1: The maximum number in the given array is 9.
Step 2: Subtracting the maximum number 9 from each element of the array:
{(1 - 9), (5 - 9), (6 - 9), (9 - 9)} = {-8, -4, -3, 0}
Step 3: Multiplying the maximum number 9 to each of the resultant array:
{(-8 x 9), (-4 x 9), (3 x 9), (0 x 9)} = {-72, -36, -27, 0}
So, the expected output is the resultant array {-72, -36, -27, 0}.

Example 2:

input1 = 5 (represents the number of elements in the input1 array)
input2 = {10, 87, 63, 42, 2}
Expected Output = {-6699, 0, -2088, -3915, -7395}

Explanation:

Step 1: The maximum number in the given array is 87.
Step 2: Subtracting the maximum number 87 from each element of the array:
{(10 - 87), (87 - 87), (63 - 87), (42 - 87), (2 - 87)} = {-77, 0, -24, -45, -85}
Step 3: Multiplying the maximum number 87 to each of the resultant array:
{(-77 x 87), (0 x 87), (-24 x 87), (-45 x 87), (-85 x 87)} = {-6699, 0, -2088, -3915, -7395}
So, the expected output is the resultant array {-6699, 0, -2088, -3915, -7395}.

Example 3:

input1 = 2 (represents the number of elements in the input1 array)
input2 = {-9, 9}
Expected Output = {-162, 0}

Explanation:

Step 1: The maximum number in the given array is 9.
Step 2: Subtracting the maximum number 9 from each element of the array:

{(-9 - 9), (9 - 9)} = {-18, 0}
Step 3: Multiplying the maximum number 9 to each of the resultant array:
{(-18 x 9), (0 x 9)} = {-162, 0}
So, the expected output is the resultant array {-162, 0}.
Note: The input array will contain not more than 100 elements

For example:

Input	Result
4 1 5 6 9	-72 -36 -27 0
5 10 87 63 42 2	-6699 0 -2088 -3915 -7395
2 -9 9	-162 0

PROGRAM

```
import java.util.Scanner;
public class array{
   public static void main(String[]agrs){
      Scanner scanner=new Scanner(System.in);
      int n=scanner.nextInt();
      int[]arr=new int[n];
      for(int i=0;i<n;i++)
      {
         arr[i]=scanner.nextInt();
      }
      int maximumnumber=arr[0];
      for(int i=1;i<n;i++)
      {
         if(arr[i]>maximumnumber){
            maximumnumber=arr[i];
         }
      }
      for(int i =0;i<n;i++){
         arr[i]=((arr[i]-maximumnumber)*maximumnumber);
      }
      for(int i=0;i<n;i++){
         System.out.printf("%d ",arr[i]);
      }
      System.out.println();
      scanner.close();
      }
   }
```

OUTPUT

Input	Expected	Got
4 1 5 6 9	-72 -36 -27 0	-72 -36 -27 0
5 10 87 63 42 2	-6699 0 -2088 -3915 -7395	-6699 0 -2088 -3915 -7395
2 -9 9	-162 0	-162 0

Passed all tests!

Question **2**

you are expected to return the sum of the longest sequence of POSITIVE numbers in the array.
If there are NO positive numbers in the array, you are expected to return -1.
In this question's scope, the number 0 should be considered as positive.
Note: If there are more than one group of elements in the array having the longest sequence of POSITIVE numbers, you are expected to return the total sum of all those POSITIVE numbers (see example 3 below).

input1 represents the number of elements in the array.
input2 represents the array of integers.

Example 1:
input1 = 16
input2 = {-12, -16, 12, 18, 18, 14, -4, -12, -13, 32, 34, -5, 66, 78, 78, -79}

Expected output = 62

Explanation:
The input array contains four sequences of POSITIVE numbers, i.e. "12, 18, 18, 14", "12", "32, 34", and "66, 78, 78". The first sequence "12, 18, 18, 14" is the longest of the four as it contains 4 elements. Therefore, the expected output = sum of the longest sequence of POSITIVE numbers = 12 + 18 + 18 + 14 = 63.

Example 2:
input1 = 11
input2 = {-22, -24, 16, -1, -17, -19, -37, -25, -19, -93, -61}

Expected output = -1

Explanation:
There are NO positive numbers in the input array. Therefore, the expected output for such cases = -1.

Example 3:
input1 = 16
input2 = {-58, 32, 26, 92, -10, -4, 12, 0, 12, -2, 4, 32, -9, -7, 78, -79}

Expected output = 174

Explanation:
The input array contains four sequences of POSITIVE numbers, i.e. "32, 26, 92", "12, 0, 12", "4, 32", and "78". The first and second sequences "32, 26, 92" and "12, 0, 12" are the longest of the four as they contain 4 elements each. Therefore, the expected output = sum of the longest sequence of POSITIVE numbers = (32 + 26 + 92) + (12 + 0 + 12) = 174.

For example:

Input	Result
16 -12 -16 12 18 18 14 -4 -12 -13 32 34 -5 66 78 78 -79	62
11 -22 -24 -16 -1 -17 -19 -37 -25 -19 -93 -61	-1
16 -58 32 26 92 -10 -4 12 0 12 -2 4 32 -9 -7 78 -79	174

PROGRAM

```
import java.util.Scanner;
public class Longestdigit{
   public static void main(String[]agrs){
      Scanner s=new Scanner(System.in);
      int number=s.nextInt();
      int c=1,countmax=0,temporaryseq=0,sequence=0;
      int count=0;
      int v;
      while(c<number){
         v=s.nextInt();
         if(v>=0){
            countmax=countmax+v;
            temporaryseq++;
         }
         else{
            temporaryseq=0;
            countmax=0;
         }
         if(temporaryseq>sequence){
            sequence=temporaryseq;
            count=countmax;
         }
         else if(temporaryseq==sequence){
            count=count+countmax;
         }
         c++;
      }
      if(count==0){
         System.out.println(-1);
      }
      else{
         System.out.println(count);
      }
   }
```

```
}
```

OUTPUT

Input	Expected	Got
16 -12 -16 12 18 18 14 -4 -12 -13 32 34 -5 66 78 78 -79	62	62
11 -22 -24 -16 -1 -17 -19 -37 -25 -19 -93 -61	-1	-1
16 -58 32 26 92 -10 -4 12 0 12 -2 4 32 -9 -7 78 -79	174	174

Passed all tests!

Question **3**

You are provided with a set of numbers (array of numbers).
You have to generate the sum of specific numbers based on its position in the array set provided to you.
This is explained below:
Example 1:
Let us assume the encoded set of numbers given to you is:
input1:5 and input2: {1, 51, 436, 7860, 41236}
Step 1:
Starting from the 0^{th} index of the array pick up digits as per below:
0^{th} index – pick up the units value of the number (in this case is 1).
1^{st} index - pick up the tens value of the number (in this case it is 5).
2^{nd} index - pick up the hundreds value of the number (in this case it is 4).
3^{rd} index - pick up the thousands value of the number (in this case it is 7).
4^{th} index - pick up the ten thousands value of the number (in this case it is 4).
(Continue this for all the elements of the input array).
The array generated from Step 1 will then be – {1, 5, 4, 7, 4}.
Step 2:
Square each number present in the array generated in Step 1.
{1, 25, 16, 49, 16}
Step 3:
Calculate the sum of all elements of the array generated in Step 2 to get the final result. The result will be = 107.
Note:
1) While picking up a number in Step1, if you observe that the number is smaller than the required position then use 0.
2) In the given function, input1[] is the array of numbers and input2 represents the number of elements in input1.
Example 2:
input1: 5 and input1: {1, 5, 423, 310, 61540}
Step 1:
Generating the new array based on position, we get the below array:
{1, 0, 4, 0, 6}
In this case, the value in input1 at index 1 and 3 is less than the value required to be picked up based on position, so we use a 0.
Step 2:
{1, 0, 16, 0, 36}
Step 3:
The final result = 53.

For example:

Input	**Result**
5 1 51 436 7860 41236	107
5 1 5 423 310 61540	53

PROGRAM

```
import java.util.Scanner;
public class array{
   public static void main(String[]agrs){
      Scanner s = new Scanner(System.in);
      int n =s.nextInt();
      int[] array=new int[n];
      for(int i=0;i<n;i++){
         array[i]=s.nextInt();
      }
      int[]digit=new int[n];
      for(int i=0;i<n;i++){
         int num =array[i];
         if(i==0){
            digit[i]=num%10;
         }
         else if (i==1){
            digit[i]=((num/10)%10);
         }
         else if (i==2){
            digit[i]=((num/100)%10);
         }
         else if (i==3){
            digit[i]=((num/1000)%10);
         }
         else if (i==4){
            digit[i]=((num/10000)%10);
         }
         else{
            digit[i]=0;
         }
      }
      int fin=0;
      for(int digi:digit){
         fin=fin+(digi*digi);
      }
      System.out.println(fin);
   }
}
```

OUTPUT

Input	Expected	Got
5 1 51 436 7860 41236	107	107
5 1 5 423 310 61540	53	53

Passed all tests!

LAB-04-CLASSES AND OBJECTS

Question **1**

Create a class Student with two private attributes, name and roll number. Create three objects by invoking different constructors available in the class Student.
Student()
Student(String name)
Student(String name, int rollno)
Input:
No input
Output:
No-arg constructor is invoked
1 arg constructor is invoked
2 arg constructor is invoked
Name =null , Roll no = 0
Name =Rajalakshmi , Roll no = 0
Name =Lakshmi , Roll no = 101

For example:

Test	Result
1	No-arg constructor is invoked 1 arg constructor is invoked 2 arg constructor is invoked Name =null , Roll no = 0 Name =Rajalakshmi , Roll no = 0 Name =Lakshmi , Roll no = 101

PROGRAM

```
public class stud{
   private String name;
   private  int roll;
   public stud(){
      System.out.println("No-arg constructor is invoked");
      name=null;
      roll=0;

   }
   public stud(String name){
      System.out.println("1 arg constructor is invoked");
      this.name=name;
      roll=0;

   }
   public stud(String name,int roll){
```

```
        System.out.println("2 arg constructor is invoked");
        this.name=name;
        this.roll=roll;

        }

    public static void main (String[]args){
            stud s1=new stud();
            stud s2=new stud("Rajalakshmi");
            stud s3=new stud("Lakshmi",101);
            System.out.println("Name ="+s1.name+" , Roll no = "+s2.roll);
            System.out.println("Name ="+s2.name+" , Roll no = "+s2.roll);
            System.out.println("Name ="+s3.name+" , Roll no = "+s3.roll);
       }
    }
```

OUTPUT

	Test	Expected	Got	
	1	No-arg constructor is invoked 1 arg constructor is invoked 2 arg constructor is invoked Name =null , Roll no = 0 Name =Rajalakshmi , Roll no = 0 Name =Lakshmi , Roll no = 101	No-arg constructor is invoked 1 arg constructor is invoked 2 arg constructor is invoked Name =null , Roll no = 0 Name =Rajalakshmi , Roll no = 0 Name =Lakshmi , Roll no = 101	

Passed all tests!

Question **2**

Create a Class Mobile with the attributes listed below,
private String manufacturer;
private String operating_system;
public String color;
private int cost;
Define a Parameterized constructor to initialize the above instance variables.
Define getter and setter methods for the attributes above.
for example : setter method for manufacturer is
void setManufacturer(String manufacturer){
this.manufacturer= manufacturer;
}
String getManufacturer(){
 return manufacturer;}
Display the object details by overriding the toString() method.

For example:

Test	Result
1	manufacturer = Redmi operating_system = Andriod color = Blue cost = 34000

PROGRAM

```
public class mobile{
   private String man;
   private String os;
   public String clr;
   private int cost;
   public mobile(String man,String os,String clr,int cost){
      this.man=man;
      this.os=os;
      this.clr=clr;
      this.cost=cost;
      }
      public String toString(){
         return "manufacturer = "+man+"\n"+"operating_system = "+os+"\n"+"color = "+ clr+"\n"+"cost =
       "+cost;
      }
      public static void main(String[]args){
         mobile mobile=new mobile("Redmi","Andriod","Blue",34000);
         System.out.println(mobile);
      }
}
```

OUTPUT

Test	Expected	Got
1	manufacturer = Redmi operating_system = Andriod color = Blue cost = 34000	manufacturer = Redmi operating_system = Andriod color = Blue cost = 34000

Passed all tests!

Question **3**

Create a class called "Circle" with a radius attribute. You can access and modify this attribute using getter and setter methods. Calculate the area and circumference of the circle.
Area of Circle = πr^2
Circumference = $2\pi r$
Input:
2
Output:
Area = 12.57
Circumference = 12.57

For example:

Test	Input	Result
1	4	Area = 50.27 Circumference = 25.13

PROGRAM

```
import java.io.*;
import java.util.Scanner;
class Circle
{
   private double radius;
   public Circle(double radius){
      // set the instance variable radius
     this.radius =radius;
        }
   public void setRadius(double radius){
      // set the radius
     this.radius=radius;

   }
   public double getRadius()    {
      // return the radius
     return radius;

   }
   public double calculateArea()  { // complete the below statement
     return Math.PI*radius*radius;

   }
   public double calculateCircumference()    {
      // complete the statement
     return  2*Math.PI*radius;
   }
}
class prog{
```

```
    public static void main(String[] args)  {
        int r;
        Scanner sc= new Scanner(System.in);
        r=sc.nextInt();
        Circle c= new Circle(r);
        System.out.println("Area = "+String.format("%.2f", c.calculateArea()));
        // invoke the calculatecircumference method
        System.out.println("Circumference = "+String.format("%.2f" , c.calculateCircumference()));

        sc.close();
    }
}
```

OUTPUT

Test	Input	Expected	Got
1	4	Area = 50.27 Circumference = 25.13	Area = 50.27 Circumference = 25.13
2	6	Area = 113.10 Circumference = 37.70	Area = 113.10 Circumference = 37.70
3	2	Area = 12.57 Circumference = 12.57	Area = 12.57 Circumference = 12.57

Passed all tests!

LAB-05-INHERITANCE

Question **1**

Create a class Mobile with constructor and a method basicMobile().
Create a subclass CameraMobile which extends Mobile class , with constructor and a method newFeature().
Create a subclass AndroidMobile which extends CameraMobile, with constructor and a method androidMobile().
display the details of the Android Mobile class by creating the instance. .

```
class Mobile{

}
class CameraMobile  extends Mobile {
}
class AndroidMobile extends CameraMobile {
}
```

expected output:

```
Basic Mobile is Manufactured
Camera Mobile is Manufactured
Android Mobile is Manufactured
Camera Mobile with 5MG px
Touch Screen Mobile is Manufactured
```

For example:

Result
Basic Mobile is Manufactured Camera Mobile is Manufactured Android Mobile is Manufactured Camera Mobile with 5MG px Touch Screen Mobile is Manufactured

PROGRAM

```
class mob{
   mob(){
      System.out.println("Basic Mobile is Manufactured");
   }
   void  basmob(){
      System.out.println("Basic Mobile is Manufactured");
   }
}
class cam extends mob{
   cam(){
      super();
      System.out.println("Camera Mobile is Manufactured");
   }
   void newm(){
```

```
            System.out.println("Camera Mobile with 5MG px");
        }
    }
    class and extends cam{
        and(){
        super();
        System.out.println("Android Mobile is Manufactured");
        }
        void andmob(){
            System.out.println("Touch Screen Mobile is Manufactured");
        }
        }
    public class Main{
        public static void main(String[]args){
            and andmob=new and();
            andmob.newm();
            andmob.andmob();
        }

    }
```

OUTPUT

Expected	Got
Basic Mobile is Manufactured Camera Mobile is Manufactured Android Mobile is Manufactured Camera Mobile with 5MG px Touch Screen Mobile is Manufactured	Basic Mobile is Manufactured Camera Mobile is Manufactured Android Mobile is Manufactured Camera Mobile with 5MG px Touch Screen Mobile is Manufactured

Passed all tests!

Question **2**

Create a class known as "BankAccount" with methods called deposit() and withdraw().
Create a subclass called SavingsAccount that overrides the withdraw() method to prevent withdrawals if the account balance falls below one hundred.

For example:

Result
Create a Bank Account object (A/c No. BA1234) with initial balance of $500: Deposit $1000 into account BA1234: New balance after depositing $1000: $1500.0 Withdraw $600 from account BA1234: New balance after withdrawing $600: $900.0 Create a SavingsAccount object (A/c No. SA1000) with initial balance of $300: Try to withdraw $250 from SA1000! Minimum balance of $100 required! Balance after trying to withdraw $250: $300.0

PROGRAM

```
class BankAccount {
   private String accountNumber;
   private double balance;
   public BankAccount(String accountNumber,double balance){
      this.accountNumber=accountNumber;
      this.balance=balance;
   }
   public void deposit(double amount) {
    balance+=amount;
   }
   public void withdraw(double amount) {
      if (balance >= amount) {
         balance -= amount;
      } else {
         // Print a message if the balance is insufficient
         System.out.println("Insufficient balance");
      }
   }
   public double getBalance() {
      return balance;
   }
   public String getAccountNumber(){
      return accountNumber;
   }
}
class SavingsAccount extends BankAccount {
   public SavingsAccount(String accountNumber, double balance) {
```

```
        super(accountNumber,balance);
    }
    public void withdraw(double amount) {
        if (getBalance() - amount < 100) {
            System.out.println("Minimum balance of $100 required!");
        } else {
            super.withdraw(amount);
        }
    }
}
public class Main {
    public static void main(String[] args) {
        System.out.println("Create a Bank Account object (A/c No. BA1234) with initial balance of $500:");
        BankAccount BA1234 = new BankAccount("BA1234", 500);
        System.out.println("Deposit $1000 into account BA1234:");
       BA1234.deposit(1000);
       System.out.println("New balance after depositing $1000: $"+BA1234.getBalance());
        System.out.println("Withdraw $600 from account BA1234:");
      BA1234.withdraw(600);
        System.out.println("New balance after withdrawing $600: $" + BA1234.getBalance());
        System.out.println("Create a SavingsAccount object (A/c No. SA1000) with initial balance of
$300:");
        SavingsAccount SA1000 = new SavingsAccount("SA1000", 300);
        System.out.println("Try to withdraw $250 from SA1000!");
        SA1000.withdraw(250);
        System.out.println("Balance after trying to withdraw $250: $" + SA1000.getBalance());
    }
```

OUTPUT

Expected	**Got**
Create a Bank Account object (A/c No. BA1234) with initial balance of $500: Deposit $1000 into account BA1234: New balance after depositing $1000: $1500.0 Withdraw $600 from account BA1234: New balance after withdrawing $600: $900.0 Create a SavingsAccount object (A/c No. SA1000) with initial balance of $300: Try to withdraw $250 from SA1000! Minimum balance of $100 required! Balance after trying to withdraw $250: $300.0	Create a Bank Account object (A/c No. BA1234) with initial balance of $500: Deposit $1000 into account BA1234: New balance after depositing $1000: $1500.0 Withdraw $600 from account BA1234: New balance after withdrawing $600: $900.0 Create a SavingsAccount object (A/c No. SA1000) with initial balance of $300: Try to withdraw $250 from SA1000! Minimum balance of $100 required! Balance after trying to withdraw $250: $300.0

Passed all tests!

Question **3**

create a class called College with attribute String name, constructor to initialize the name attribute , a method called Admitted(). Create a subclass called CSE that extends Student class, with department attribute , Course() method to sub class. Print the details of the Student.
College:
String collegeName;
public College() { }
public admitted() { }
Student:
String studentName;
String department;
public Student(String collegeName, String studentName,String depart) { }
public toString()

Expected Output:

A student admitted in REC
CollegeName : REC
StudentName : Venkatesh
Department : CSE

For example:

Result
A student admitted in REC CollegeName : REC StudentName : Venkatesh Department : CSE

PROGRAM

```
class College
{
public   String collegeName;
public College(String collegeName) {
   this.collegeName=collegeName;
   }
public void admitted() {
   System.out.println("A student admitted in "+collegeName);
}
}
class Student extends College{
String studentName;
String department;
```

```
public Student(String collegeName, String studentName,String department) {
  super(collegeName);
  this.studentName=studentName;
  this.department=department;
}
public String toString(){
   return "CollegeName : "+collegeName+"\n"+"StudentName : "+studentName+"\n"+"Department :
"+department;
}
}
public class Main {
public static void main (String[] args) {
      Student  s1 = new Student("REC","Venkatesh","CSE");
       s1.admitted();
      System.out.println(s1.toString());
}
}
```

OUTPUT

Expected	Got
A student admitted in REC CollegeName : REC StudentName : Venkatesh Department : CSE	A student admitted in REC CollegeName : REC StudentName : Venkatesh Department : CSE

Passed all tests!

LAB-06-STRING, STRINGBUFFER

Question **1**

Given 2 strings input1 & input2.
- Concatenate both the strings.
- Remove duplicate alphabets & white spaces.
- Arrange the alphabets in descending order.

Assumption 1:
There will either be alphabets, white spaces or null in both the inputs.
Assumption 2:
Both inputs will be in lower case.
Example 1:
Input 1: apple
Input 2: orange
Output: rponlgea
Example 2:
Input 1: fruits
Input 2: are good
Output: utsroigfeda
Example 3:
Input 1: ""
Input 2: ""
Output: null

For example:

Test	Input	Result
1	apple orange	rponlgea
2	fruits are good	utsroigfeda

PROGRAM

```
import java.util.*;
public class HelloWorld {
   public static void main(String[] args) {
      Scanner scan = new Scanner(System.in);
      String a = scan.nextLine();
      String b = scan.nextLine();
      StringBuffer ab = new StringBuffer();
      if(a.trim().isEmpty() && b.trim().isEmpty()){
         System.out.print("null");
      }
      else{
      for(int i = 0;i < a.length();i++){
```

```
            if (a.charAt(i) != ' ') {
                ab.append(Character.toString(a.charAt(i)));
            }
        }
        for(int i = 0;i < b.length();i++){
            if (b.charAt(i) != ' '){
                ab.append(Character.toString(b.charAt(i)));
            }
        }
        char[] d = ab.toString().toCharArray();
        Arrays.sort(d);
        for(int i = d.length - 1;i >= 1;i--){
            if(d[i] != d[i-1])
            System.out.print(d[i]);
        }
        System.out.print(d[0]);
        }

    }
}
```

OUTPUT

Test	Input	Expected	Got
1	apple orange	rponlgea	rponlgea
2	fruits are good	utsroigfeda	utsroigfeda
3		null	null

Passed all tests!

Question **2**

Given a String input1, which contains many number of words separated by : and each word contains exactly two lower case alphabets, generate an output based upon the below 2 cases.
Note:
1. All the characters in input 1 are lowercase alphabets.
2. input 1 will always contain more than one word separated by :
3. Output should be returned in uppercase.

Case 1:
Check whether the two alphabets are same.
If yes, then take one alphabet from it and add it to the output.
Example 1:
input1 = ww:ii:pp:rr:oo
output = WIPRO
Explanation:
word1 is ww, both are same hence take w
word2 is ii, both are same hence take i
word3 is pp, both are same hence take p
word4 is rr, both are same hence take r
word5 is oo, both are same hence take o
Hence the output is WIPRO
Case 2:
If the two alphabets are not same, then find the position value of them and find maximum value – minimum value.
Take the alphabet which comes at this (maximum value - minimum value) position in the alphabet series.
Example 2"
input1 = zx:za:ee
output = BYE
Explanation
word1 is zx, both are not same alphabets
position value of z is 26
position value of x is 24
max – min will be 26 – 24 = 2
Alphabet which comes in 2nd position is b
Word2 is za, both are not same alphabets
position value of z is 26
position value of a is 1
max – min will be 26 – 1 = 25
Alphabet which comes in 25th position is y
word3 is ee, both are same hence take e
Hence the output is BYE

For example:

Input	**Result**
ww:ii:pp:rr:oo	WIPRO
zx:za:ee	BYE

PROGRAM

```
import java.util.*;
class diff{
   char different(char a, char b){
      if ((int)a != (int)b)
         return (char)((int)'a' + ((int)a-(int)b) - 1);
      return a;
      }
}
public class Main{
   public static void main(String[] args){
      Scanner scan = new Scanner(System.in);
      diff z = new diff();
      String q = scan.nextLine();
      StringBuffer ans = new StringBuffer();
      StringBuffer temp = new StringBuffer();
      for(int i = 0;i < q.length();i++){
         if(q.charAt(i) == ':'){
            temp.append(" ");
         }
         else{
            temp.append(Character.toString(q.charAt(i)));
         }
      }
      String h = temp.toString();
      for(int i = 0;i < temp.length();i++){
         if(i%3 == 0){
            ans.append(Character.toString(z.different(h.charAt(i),h.charAt(i+1))));
         }
      }
      System.out.print(ans.toString().toUpperCase());
   }
}
```

OUTPUT

Input	Expected	Got
ww:ii:pp:rr:oo	WIPRO	WIPRO
zx:za:ee	BYE	BYE

Passed all tests!

Question **3**

You are provided a string of words and a 2-digit number. The two digits of the number represent the two words that are to be processed.
For example:
If the string is "Today is a Nice Day" and the 2-digit number is 41, then you are expected to process the 4th word ("Nice") and the 1st word ("Today").
The processing of each word is to be done as follows:
Extract the Middle-to-Begin part: Starting from the middle of the word, extract the characters till the beginning of the word.
Extract the Middle-to-End part: Starting from the middle of the word, extract the characters till the end of the word.
If the word to be processed is "Nice":
Its Middle-to-Begin part will be "iN".
Its Middle-to-End part will be "ce".
So, merged together these two parts would form "iNce".
Similarly, if the word to be processed is "Today":
Its Middle-to-Begin part will be "doT".
Its Middle-to-End part will be "day".
So, merged together these two parts would form "doTday".
Note: Note that the middle letter 'd' is part of both the extracted parts. So, for words whose length is odd, the middle letter should be included in both the extracted parts.
Expected output:
The expected output is a string containing both the processed words separated by a space "iNce doTday"
Example 1:
input1 = "Today is a Nice Day"
input2 = 41
output = "iNce doTday"
Example 2:
input1 = "Fruits like Mango and Apple are common but Grapes are rare"
input2 = 39
output = "naMngo arGpes"
Note: The input string input1 will contain only alphabets and a single space character separating each word in the string.
Note: The input string input1 will NOT contain any other special characters.
Note: The input number input2 will always be a 2-digit number (>=11 and <=99). One of its digits will never be 0. Both the digits of the number will always point to a valid word in the input1 string.

For example:

Input	**Result**
Today is a Nice Day 41	iNce doTday
Fruits like Mango and Apple are common but Grapes are rare 39	naMngo arGpes

PROGRAM

```
import java.util.*;
public class mix{
   public static void main(String[] args){
      Scanner scan = new Scanner(System.in);
      String g = scan.nextLine();
      int n = scan.nextInt(),ones,flag = 0;
      StringBuffer temp = new StringBuffer();
      StringBuffer temp1 = new StringBuffer();
      int space = 0;
      while (n > 0){
          ones = (n %10) - 1;
          for(int i = 0; i < g.length();i++){
             if (g.charAt(i) == ' '){
                space = space + 1;
             }
             else if(space == ones && flag == 0){
                  temp.append(Character.toString(g.charAt(i)));
             }
             else if(space == ones && flag == 1){
                  temp1.append(Character.toString(g.charAt(i)));
             }
          }
          space = 0 ;
          flag = 1;
          n = n /10;
      }
      rew m = new rew();
      System.out.println(m.r(temp1.toString()) + " " + m.r(temp.toString()));
   }
}
class rew{
   String r(String a){
      int le = a.length(),n,q;
      StringBuffer temp3 = new StringBuffer();
      if(le % 2 == 1){
         n = ((int)(le/2));
         q = ((int)(le/2));
      }
      else{
         n = ((int)(le/2)) - 1;
         q = ((int)(le/2));
      }
      for(int i  = n;i >= 0;i--){
            temp3.append(Character.toString(a.charAt(i)));
         }
      for(int i  = q;i < le;i++){
         temp3.append(Character.toString(a.charAt(i)));
      }
```

```
            return temp3.toString();
        }
    }
```

OUTPUT

Input	Expected	Got
Today is a Nice Day 41	iNce doTday	iNce doTday
Fruits like Mango and Apple are common but Grapes are rare 39	naMngo arGpes	naMngo arGpes

Passed all tests!

LAB-07-INTERFACES

Question **1**

Create interfaces shown below.
interface Sports {
public void setHomeTeam(String name);
public void setVisitingTeam(String name);
}
interface Football extends Sports {
public void homeTeamScored(int points);
public void visitingTeamScored(int points);}
create a class College that implements the Football interface and provides the necessary functionality to the abstract methods.
sample Input:
Rajalakshmi
Saveetha
22
21
Output:
Rajalakshmi 22 scored
Saveetha 21 scored
Rajalakshmi is the Winner!

For example:

Test	Input	Result
1	Rajalakshmi Saveetha 22 21	Rajalakshmi 22 scored Saveetha 21 scored Rajalakshmi is the winner!

PROGRAM

```
import java.util.Scanner;
interface Sports {
    void setHomeTeam(String name);
    void setVisitingTeam(String name);
}
interface Football extends Sports {
    void homeTeamScored(int points);
    void visitingTeamScored(int points);
}
class College implements Football {
    private String homeTeam;
    private String visitingTeam;
    private int homeTeamPoints = 0;
    private int visitingTeamPoints = 0;
    public void setHomeTeam(String name) {
```

```
        this.homeTeam = name;
    }
    public void setVisitingTeam(String name) {
        this.visitingTeam = name;
    }
    public void homeTeamScored(int points) {
        homeTeamPoints += points;
        System.out.println(homeTeam + " " + points + " scored");
    }
    public void visitingTeamScored(int points) {
        visitingTeamPoints += points;
        System.out.println(visitingTeam + " " + points + " scored");
    }
    public void winningTeam() {
        if (homeTeamPoints > visitingTeamPoints) {
            System.out.println(homeTeam + " is the winner!");
        } else if (homeTeamPoints < visitingTeamPoints) {
            System.out.println(visitingTeam + " is the winner!");
        } else {
            System.out.println("It's a tie match.");
        }
    }
}
public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        String hname = sc.nextLine();
        String vteam = sc.nextLine();
        College match = new College();
    }
}
```

OUTPUT

Test	Input	Expected	Got
1	Rajalakshmi Saveetha 22 21	Rajalakshmi 22 scored Saveetha 21 scored Rajalakshmi is the winner!	Rajalakshmi 22 scored Saveetha 21 scored Rajalakshmi is the winner!
2	Anna Balaji 21 21	Anna 21 scored Balaji 21 scored It's a tie match.	Anna 21 scored Balaji 21 scored It's a tie match.
3	SRM VIT 20 21	SRM 20 scored VIT 21 scored VIT is the winner!	SRM 20 scored VIT 21 scored VIT is the winner!

Passed all tests!

Question **2**

create an interface Playable with a method play() that takes no arguments and returns void. Create three classes Football, Volleyball, and Basketball that implement the Playable interface and override the play() method to play the respective sports.

```
interface Playable {
    void play();
}
class Football implements Playable {
    String name;
    public Football(String name){
        this.name=name;
    }
  public void play() {
    System.out.println(name+" is Playing football");
   }
}
```

Similarly, create Volleyball and Basketball classes.

Sample output:

Sadhvin is Playing football
Sanjay is Playing volleyball
Sruthi is Playing basketball

For example:

Test	Input	Result
1	Sadhvin Sanjay Sruthi	Sadhvin is Playing football Sanjay is Playing volleyball Sruthi is Playing basketball
2	Vijay Arun Balaji	Vijay is Playing football Arun is Playing volleyball Balaji is Playing basketball

PROGRAM

```
import java.util.Scanner;
interface Playable {
    void play();
}
class Football implements Playable {
    String name;
    public Football(String name) {
        this.name = name;
    }
    public void play() {
        System.out.println(name + " is Playing football");
    }
}
```

```
class Volleyball implements Playable {
    String name;
    public Volleyball(String name) {
        this.name = name;
    }
    public void play() {
        System.out.println(name + " is Playing volleyball");
    }
}
class Basketball implements Playable {
    String name;
    public Basketball(String name) {
        this.name = name;
    }
    public void play() {
        System.out.println(name + " is Playing basketball");
    }
}
public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        String footballPlayerName = scanner.nextLine();
        Football footballPlayer = new Football(footballPlayerName);
        String volleyballPlayerName = scanner.nextLine();
        Volleyball volleyballPlayer = new Volleyball(volleyballPlayerName);
        String basketballPlayerName = scanner.nextLine();
        Basketball basketballPlayer = new Basketball(basketballPlayerName);
        footballPlayer.play();
        volleyballPlayer.play();
        basketballPlayer.play();
        scanner.close();
    }
}
```

OUTPUT

Test	Input	Expected	Got
1	Sadhvin Sanjay Sruthi	Sadhvin is Playing football Sanjay is Playing volleyball Sruthi is Playing basketball	Sadhvin is Playing football Sanjay is Playing volleyball Sruthi is Playing basketball
2	Vijay Arun Balaji	Vijay is Playing football Arun is Playing volleyball Balaji is Playing basketball	Vijay is Playing football Arun is Playing volleyball Balaji is Playing basketball

Passed all tests!

Question **3**

RBI issues all national banks to collect interest on all customer loans.
Create an RBI interface with a variable String parentBank="RBI" and abstract method rateOfInterest().
RBI interface has two more methods default and static method.
default void policyNote() {
System.out.println("RBI has a new Policy issued in 2023.");
}
static void regulations(){
System.out.println("RBI has updated new regulations on 2024.");
}
Create two subclasses SBI and Karur which implements the RBI interface.
Provide the necessary code for the abstract method in two sub-classes.
Sample Input/Output:
RBI has a new Policy issued in 2023
RBI has updated new regulations in 2024.
SBI rate of interest: 7.6 per annum.
Karur rate of interest: 7.4 per annum.

For example:

Test	Result
1	RBI has a new Policy issued in 2023 RBI has updated new regulations in 2024. SBI rate of interest: 7.6 per annum. Karur rate of interest: 7.4 per annum.

PROGRAM

```
interface RBI {
    String parentBank = "RBI";
    double rateOfInterest();
    default void policyNote() {
        System.out.println("RBI has a new Policy issued in 2023");
    }
    static void regulations() {
        System.out.println("RBI has updated new regulations in 2024.");
    }
}
class SBI implements RBI {
    public double rateOfInterest() {
        return 7.6;
    }
}
class Karur implements RBI {
    public double rateOfInterest() {
        return 7.4;
    }
```

```
}
public class Main {
    public static void main(String[] args) {
        RBI rbi = new SBI();
        rbi.policyNote();
        RBI.regulations();
        SBI sbi = new SBI();
        System.out.println("SBI rate of interest: " + sbi.rateOfInterest() + " per annum.");
        Karur karur = new Karur();
        System.out.println("Karur rate of interest: " + karur.rateOfInterest() + " per annum.");
    }
}
```

OUTPUT

Test	Expected	Got
1	RBI has a new Policy issued in 2023 RBI has updated new regulations in 2024. SBI rate of interest: 7.6 per annum. Karur rate of interest: 7.4 per annum.	RBI has a new Policy issued in 2023 RBI has updated new regulations in 2024. SBI rate of interest: 7.6 per annum. Karur rate of interest: 7.4 per annum.

Passed all tests!

LAB-08 - POLYMORPHISM, ABSTRACT CLASSES, FINAL KEY...

Question **1**

1. **Final Variable:**
   - Once a variable is declared final, its value cannot be changed after it is initialized.
   - It must be initialized when it is declared or in the constructor if it's not initialized at declaration.
   - It can be used to define constants

```
final int MAX_SPEED = 120;  // Constant value, cannot be changed
```

2. **Final Method:**
   - A method declared final cannot be overridden by subclasses.
   - It is used to prevent modification of the method's behavior in derived classes.

```
public final void display() {
   System.out.println("This is a final method.");
}
```

3. **Final Class:**
   - A class declared as final cannot be subclassed (i.e., no other class can inherit from it).
   - It is used to prevent a class from being extended and modified.
   - public final class Vehicle {
     // class code
     }

Given a Java Program that contains the bug in it, your task is to clear the bug to the output. you should delete any piece of code.

For example:

Test	Result
1	The maximum speed is: 120 km/h This is a subclass of FinalExample.

PROGRAM

```
class FinalExample {
   int maxSpeed = 120;
   public void displayMaxSpeed() {
         System.out.println("The maximum speed is: " + maxSpeed + " km/h");
   }
}
class SubClass extends FinalExample {
   public void displayMaxSpeed() {
      System.out.println("The maximum speed is :" + maxSpeed + " km/h");
   }
   public void showDetails(){
      System.out.println("This is a subclass of FinalExample.");
   }
}
class prog {
   public static void main(String[] args) {
```

```
        FinalExample obj = new FinalExample();
        obj.displayMaxSpeed();
        SubClass subObj = new SubClass();
        subObj.showDetails();
    }
}
```

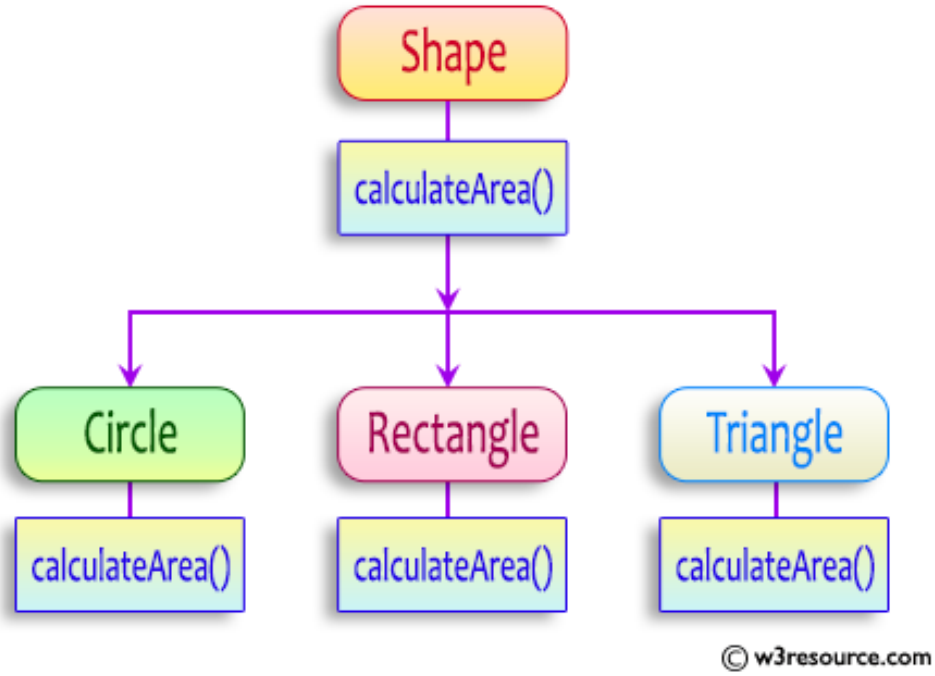
OUTPUT

Test	Expected	Got
1	The maximum speed is: 120 km/h This is a subclass of FinalExample.	The maximum speed is: 120 km/h This is a subclass of FinalExample.

Passed all tests!

Question **2**

Create a base class Shape with a method called calculateArea(). Create three subclasses: Circle, Rectangle, and Triangle. Override the calculateArea() method in each subclass to calculate and return the shape's area.
In the given exercise, here is a simple diagram illustrating polymorphism implementation:




```
abstract class Shape {
   public abstract double calculateArea() ;
   }
}
System.out.printf("Area of a Triangle :%.2f%n",((0.5)*base*height));  // use this statement
```

sample Input :
4 // radius of the circle to calculate area PI*r*r
5 // length of the rectangle
6 // breadth of the rectangle to calculate the area of a rectangle
4 // base of the triangle
3 // height of the triangle

OUTPUT:

Area of a circle :50.27
Area of a Rectangle :30.00
Area of a Triangle :6.00

For example:

Test	Input	Result
1	4 5 6 4 3	Area of a circle: 50.27 Area of a Rectangle: 30.00 Area of a Triangle: 6.00
2	7 4.5 6.5 2.4 3.6	Area of a circle: 153.94 Area of a Rectangle: 29.25 Area of a Triangle: 4.32

PROGRAM

```
import java.util.Scanner;
abstract class Shape {
   public abstract double calculateArea();
}
class Circle extends Shape {
   private double radius;
   public Circle(double radius) {
      this.radius = radius;
   }
   public double calculateArea() {
      return Math.PI * radius * radius; // Area of circle: πr²
   }
}
class Rectangle extends Shape {
   private double length;
   private double breadth;
   public Rectangle(double length, double breadth) {
      this.length = length;
      this.breadth = breadth;
   }
   public double calculateArea() {
      return length * breadth; // Area of rectangle: length * breadth
   }
}
class Triangle extends Shape {
   private double base;
   private double height;
   public Triangle(double base, double height) {
      this.base = base;
      this.height = height;
   }
   public double calculateArea() {
```

```
        return 0.5 * base * height;
    }
}
public class ShapeTest {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        double radius = scanner.nextDouble();
        Circle circle = new Circle(radius);
        System.out.printf("Area of a circle: %.2f%n", circle.calculateArea());
        double length = scanner.nextDouble();
        double breadth = scanner.nextDouble();
        Rectangle rectangle = new Rectangle(length, breadth);
        System.out.printf("Area of a Rectangle: %.2f%n", rectangle.calculateArea());
        double base = scanner.nextDouble();
        double height = scanner.nextDouble();
        Triangle triangle = new Triangle(base, height);
        System.out.printf("Area of a Triangle: %.2f%n", triangle.calculateArea());
        scanner.close();
    }
}
```

OUTPUT

Test	Input	Expected	Got
1	4 5 6 4 3	Area of a circle: 50.27 Area of a Rectangle: 30.00 Area of a Triangle: 6.00	Area of a circle: 50.27 Area of a Rectangle: 30.00 Area of a Triangle: 6.00
2	7 4.5 6.5 2.4 3.6	Area of a circle: 153.94 Area of a Rectangle: 29.25 Area of a Triangle: 4.32	Area of a circle: 153.94 Area of a Rectangle: 29.25 Area of a Triangle: 4.32

Passed all tests!

Question **3**

As a logic building learner you are given the task to extract the string which has vowel as the first and last characters from the given array of Strings.
Step1: Scan through the array of Strings, extract the Strings with first and last characters as vowels; these strings should be concatenated.

Step2: Convert the concatenated string to lowercase and return it.
If none of the strings in the array has first and last character as vowel, then return no matches found
input1: an integer representing the number of elements in the array.
input2: String array.

Example 1:
input1: 3
input2: {“oreo”, “sirish”, “apple”}
output: oreoapple

Example 2:
input1: 2
input2: {“Mango”, “banana”}
output: no matches found

Explanation:
None of the strings has first and last character as vowel.

Hence the output is no matches found.
Example 3:
input1: 3
input2: {“Ate”, “Ace”, “Girl”}
output: ateace

For example:

Input	**Result**
3 oreo sirish apple	oreoapple
2 Mango banana	no matches found
3 Ate Ace Girl	ateace

PROGRAM

```
import java.util.Scanner;
public class VowelStringExtractor {
   public static String extractVowelStrings(String[] stringArray) {
      StringBuilder result = new StringBuilder();
      String vowels = "aeiouAEIOU";
      for (String s : stringArray) {
         if (s.length() > 0 && vowels.indexOf(s.charAt(0)) != -1 &&
vowels.indexOf(s.charAt(s.length() - 1)) != -1) {
            result.append(s);
         }
      }
      return result.length() > 0 ? result.toString().toLowerCase() : "no matches found";
   }
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      int n = scanner.nextInt();
      scanner.nextLine();
      String input = scanner.nextLine();
      String[] strings = input.split(" "); // Split input into an array
      String result = extractVowelStrings(strings);
      System.out.println(result);
      scanner.close();
   }
}
```

OUTPUT

Input	Expected	Got
3 oreo sirish apple	oreoapple	oreoapple
2 Mango banana	no matches found	no matches found
3 Ate Ace Girl	ateace	ateace

Passed all tests!

LAB-09-EXCEPTION HANDLING

Question **1**

Write a Java program to handle ArithmeticException and ArrayIndexOutOfBoundsException.
Create an array, read the input from the user, and store it in the array.
Divide the 0th index element by the 1st index element and store it.
if the 1st element is zero, it will throw an exception.
if you try to access an element beyond the array limit throws an exception.
Input:
5
10 0 20 30 40
Output:
java.lang.ArithmeticException: / by zero
I am always executed
Input:
3
10 20 30
Output
java.lang.ArrayIndexOutOfBoundsException: Index 3 out of bounds for length 3
I am always executed

For example:

Test	Input	Result
1	6 1 0 4 1 2 8	java.lang.ArithmeticException: / by zero I am always executed

PROGRAM

```
import java.util.Scanner;
public class ExceptionHandlingExample {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        int size = scanner.nextInt();
        int[] numbers = new int[size];
        for (int i = 0; i < size; i++) {
            numbers[i] = scanner.nextInt();
        }
        try {
            int result = numbers[0] / numbers[1];  // This may cause an ArithmeticException
        } catch (ArithmeticException e) {
            System.out.println(e);  // Catch division by zero
        } catch (ArrayIndexOutOfBoundsException e) {
            System.out.println(e);  // Catch accessing out of bounds
        } catch (Exception e) {
            System.out.println(e);  // Catch any other exceptions
        } finally {
```

```
            // This block is always executed
        }
        try {
            int outOfBoundsValue = numbers[3]; // This will trigger ArrayIndexOutOfBoundsException if
    size < 4
        } catch (ArrayIndexOutOfBoundsException e) {
            System.out.println(e);
        } finally {
            System.out.println("I am always executed");
        }
        scanner.close();
    }
}
```

OUTPUT

Test	Input	Expected	Got
1	6 1 0 4 1 2 8	java.lang.ArithmeticException: / by zero I am always executed	java.lang.ArithmeticException: / by zero I am always executed
2	3 10 20 30	java.lang.ArrayIndexOutOfBoundsException: Index 3 out of bounds for length 3 I am always executed	java.lang.ArrayIndexOutOfBoundsException: Index 3 out of bounds for length 3 I am always executed

Passed all tests!

Question **2**

In the following program, an array of integer data is to be initialized.
During the initialization, if a user enters a value other than an integer, it will throw an InputMismatchException exception.
On the occurrence of such an exception, your program should print “You entered bad data.”
If there is no such exception it will print the total sum of the array.
/* Define try-catch block to save user input in the array "name"
If there is an exception then catch the exception otherwise print the total sum of the array. */

Sample Input:
3
5 2 1
Sample Output:
8
Sample Input:
2
1 g
Sample Output:
You entered bad data.

For example:

Input	Result
3 5 2 1	8
2 1 g	You entered bad data.

PROGRAM

```
import java.util.Scanner;
import java.util.InputMismatchException;
class prog {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      int length = sc.nextInt();
      int[] name = new int[length];
      int sum = 0;
      try {
         for (int i = 0; i < length; i++) {
            name[i] = sc.nextInt();          }
         // Calculate the total sum
         for (int num : name) {
            sum += num;
         }
         System.out.println(sum);
      } catch (InputMismatchException e) {
```

```
            System.out.println("You entered bad data.");
        }
        sc.close(); // Close the scanner
    }
}
```

OUTPUT

Input	Expected	Got
3 5 2 1	8	8
2 1 g	You entered bad data.	You entered bad data.

Passed all tests!

Question **3**

Write a Java program to create a method that takes an integer as a parameter and throws an exception if the number is odd.

Sample input and Output:
82 is even.
Error: 37 is odd.
Fill the preloaded answer to get the expected output.

For example:

Result
82 is even. Error: 37 is odd.

PROGRAM

```
class prog {
    public static void main(String[] args) {
        int n = 82;
        trynumber(n);
        n = 37;
        trynumber(n);
    }
    public static void trynumber(int n) {
        try {
            checkEvenNumber(n);
            System.out.println(n + " is even.");
        } catch (Exception e) {
            System.out.println("Error: " + e.getMessage());
        }
    }
    public static void checkEvenNumber(int number) {
        if (number % 2 != 0) {
            throw new RuntimeException(number + " is odd.");
        }
    }
}
```

OUTPUT

Expected	**Got**
82 is even. Error: 37 is odd.	82 is even. Error: 37 is odd.

Passed all tests!

Lab-10- Collection- List

Question **1**

Given an ArrayList, the task is to get the first and last element of the ArrayList in Java.
Input: ArrayList = [1, 2, 3, 4]
Output: First = 1, Last = 4

Input: ArrayList = [12, 23, 34, 45, 57, 67, 89]
Output: First = 12, Last = 89

Approach:

1. Get the ArrayList with elements.
2. Get the first element of ArrayList using the get(index) method by passing index = 0.
3. Get the last element of ArrayList using the get(index) method by passing index = size – 1.

PROGRAM

```
import java.util.ArrayList;
import java.util.Scanner;
class prog {
   public static void main(String[] args)
   {
      Scanner sc= new Scanner(System.in);
      int n = sc.nextInt();
      ArrayList<Integer> list = new ArrayList<Integer>();
      for(int i = 0; i<n;i++) list.add(sc.nextInt());
      System.out.println("ArrayList: "+list);
      System.out.println("First : "+list.get(0)+", Last : "+list.get(n-1));
   }
}
```

OUTPUT

	Test	Input	Expected	Got	
	1	6 30 20 40 50 10 80	ArrayList: [30, 20, 40, 50, 10, 80] First : 30, Last : 80	ArrayList: [30, 20, 40, 50, 10, 80] First : 30, Last : 80	
	2	4 5 15 25 35	ArrayList: [5, 15, 25, 35] First : 5, Last : 35	ArrayList: [5, 15, 25, 35] First : 5, Last : 35	

Passed all tests!

Question **2**

The given Java program is based on the ArrayList methods and its usage. The Java program is partially filled. Your task is to fill in the incomplete statements to get the desired output.
list.set();
list.indexOf());
list.lastIndexOf())
list.contains()
list.size());
list.add();
list.remove();
The above methods are used for the below Java program.

PROGRAM

```
import java.util.ArrayList;
import java.util.Scanner;
class prog {
public static void main(String[] args)
{
 Scanner sc= new Scanner(System.in);
 int n = sc.nextInt();
 ArrayList<Integer> list = new ArrayList<Integer>();
 for(int i = 0; i<n;i++)
 list.add(sc.nextInt());
 System.out.println("ArrayList: " + list);
   list.set(1,100);
System.out.println("Index of 100 = "+list.indexOf(100));
 System.out.println("LastIndex of 100 = "+ list.lastIndexOf(100));
System.out.println(list.contains(200));
 System.out.println("Size Of ArrayList = "+list.size());
     list.add(1,500);
     list.remove(3);
  System.out.print("ArrayList: " + list);
 }
}
```

OUTPUT

	Test	Input	Expected	Got	
	1	5 1 2 3 100 5	ArrayList: [1, 2, 3, 100, 5] Index of 100 = 1 LastIndex of 100 = 3 false Size Of ArrayList = 5 ArrayList: [1, 500, 100, 100, 5]	ArrayList: [1, 2, 3, 100, 5] Index of 100 = 1 LastIndex of 100 = 3 false Size Of ArrayList = 5 ArrayList: [1, 500, 100, 100, 5]	

Passed all tests!

Question **3**

Write a Java program to reverse elements in an array list.

Sample input and Output:
Red
Green
Orange
White
Black
Sample output
List before reversing :
[Red, Green, Orange, White, Black]
List after reversing :
[Black, White, Orange, Green, Red]

PROGRAM

```
import java.util.ArrayList;
import java.util.Scanner;
class prog {
public static void main(String[] args)
{
 Scanner sc= new Scanner(System.in);
 int n = sc.nextInt();
 ArrayList<String> list = new ArrayList<String>();
 for(int i = 0; i<n;i++)
 list.add(sc.next());
 ArrayList<String> list1 = new ArrayList<String>();
 for(int i=list.size()-1;i>=0;i--){
    list1.add(list.get(i));
 }
 System.out.println("List before reversing :");
 System.out.println(list);
 System.out.println("List after reversing :");
 System.out.println(list1);
 }
}
```

OUTPUT

Test	Input	Expected	Got
1	5 Red Green Orange White Black	List before reversing : [Red, Green, Orange, White, Black] List after reversing : [Black, White, Orange, Green, Red]	List before reversing : [Red, Green, Orange, White, Black] List after reversing : [Black, White, Orange, Green, Red]
2	4 CSE AIML AIDS CYBER	List before reversing : [CSE, AIML, AIDS, CYBER] List after reversing : [CYBER, AIDS, AIML, CSE]	List before reversing : [CSE, AIML, AIDS, CYBER] List after reversing : [CYBER, AIDS, AIML, CSE]

Passed all tests!

LAB-11-SET, MAP

Question **1**

Java HashSet class implements the Set interface, backed by a hash table which is actually a HashMap instance. No guarantee is made as to the iteration order of the hash sets which means that the class does not guarantee the constant order of elements over time.
This class permits the null element.
The class also offers constant time performance for the basic operations like add, remove, contains, and size assuming the hash function disperses the elements properly among the buckets.
Java HashSet Features
A few important features of HashSet are mentioned below:

- Implements Set Interface.
- The underlying data structure for HashSet is Hashtable.
- As it implements the Set Interface, duplicate values are not allowed.
- Objects that you insert in HashSet are not guaranteed to be inserted in the same order. Objects are inserted based on their hash code.
- NULL elements are allowed in HashSet.
- HashSet also implements **Serializable** and **Cloneable** interfaces.
- public class HashSet<E> extends AbstractSet<E> implements Set<E>, Cloneable, Serializable

Sample Input and Output:
5
90
56
45
78
25
78
Sample Output:
78 was found in the set.

Sample Input and output:
3
2
7
9
5
Sample Input and output:
5 was not found in the set.

PROGRM

```
import java.util.HashSet;
import java.util.Scanner;
public class Prog {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);

        // Read the number of elements
```

```
        int n = sc.nextInt();

        // Create a HashSet object to store numbers
        HashSet<Integer> numbers = new HashSet<>();

        // Add numbers to the HashSet
        for (int i = 0; i < n; i++) {
            numbers.add(sc.nextInt());
        }

        // Read the search key
        int skey = sc.nextInt();

        // Check if skey is present in the HashSet
        if (numbers.contains(skey)) {
            System.out.println(skey + " was found in the set.");
        } else {
            System.out.println(skey + " was not found in the set.");
        }

        // Close the scanner
        sc.close();
    }
}
```

OUTPUT

	Test	Input	Expected	Got	
	1	5 90 56 45 78 25 78	78 was found in the set.	78 was found in the set.	
	2	3 -1 2 4 5	5 was not found in the set.	5 was not found in the set.	

Passed all tests!

Question **2**

Write a Java program to compare two sets and retain elements that are the same.

Sample Input and Output:

5
Football
Hockey
Cricket
Volleyball
Basketball
7 // **HashSet 2:**
Golf
Cricket
Badminton
Football
Hockey
Volleyball
Handball

SAMPLE OUTPUT:

Football
Hockey
Cricket
Volleyball
Basketball

PROGRAM

```
import java.util.HashSet;
import java.util.Scanner;
import java.util.Set;
public class CompareSets {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      // Read the size of the first set
      int size1 = Integer.parseInt(scanner.nextLine());
      // Create a HashSet to store the first set of elements
      Set<String> set1 = new HashSet<>();
      // Read elements for the first set
      for (int i = 0; i < size1; i++) {
         set1.add(scanner.nextLine());
      }
      // Read the size of the second set
      int size2 = Integer.parseInt(scanner.nextLine());
      // Create a HashSet to store the second set of elements
      Set<String> set2 = new HashSet<>();
      // Read elements for the second set
      for (int i = 0; i < size2; i++) {
         set2.add(scanner.nextLine());
      }
      // Retain common elements using the retainAll() method
```

```
            set1.retainAll(set2);
            // Print the common elements
            for (String element : set1) {
                System.out.println(element);
            }
            scanner.close();
        }
    }
```

OUTPUT

	Test	Input	Expected	Got	
	1	5 Football Hockey Cricket Volleyball Basketball 7 Golf Cricket Badminton Football Hockey Volleyball Throwball	Cricket Hockey Volleyball Football	Cricket Hockey Volleyball Football	
	2	4 Toy Bus Car Auto 3 Car Bus Lorry	Bus Car	Bus Car	

Passed all tests!

Question **3**

Java HashMap Methods
containsKey() Indicate if an entry with the specified key exists in the map
containsValue() Indicate if an entry with the specified value exists in the map
putIfAbsent() Write an entry into the map but only if an entry with the same key does not already exist
remove() Remove an entry from the map
replace() Write to an entry in the map only if it exists
size() Return the number of entries in the map
Your task is to fill the incomplete code to get desired output

PROGRAM

```
import java.util.HashMap;
import java.util.Map.Entry;
import java.util.Scanner;
import java.util.Set;
public class Prog {
   public static void main(String[] args) {
      // Creating HashMap with default initial capacity and load factor
      HashMap<String, Integer> map = new HashMap<String, Integer>();
      String name;
      int num;
      Scanner sc = new Scanner(System.in);
      int n = sc.nextInt();
      for (int i = 0; i < n; i++) {
         name = sc.next();
         num = sc.nextInt();
         map.put(name, num);
      }
      // Printing key-value pairs
      Set<Entry<String, Integer>> entrySet = map.entrySet();
      for (Entry<String, Integer> entry : entrySet) {
         System.out.println(entry.getKey() + " : " + entry.getValue());
      }
      System.out.println("----------");
      // Creating another HashMap
      HashMap<String, Integer> anotherMap = new HashMap<String, Integer>();
      // Inserting key-value pairs to anotherMap using put() method
      anotherMap.put("SIX", 6);
      anotherMap.put("SEVEN", 7);
      // Inserting key-value pairs of map to anotherMap using putAll() method
      anotherMap.putAll(map); // This line fills in the missing code
      // Printing key-value pairs of anotherMap
      entrySet = anotherMap.entrySet();
      for (Entry<String, Integer> entry : entrySet) {
         System.out.println(entry.getKey() + " : " + entry.getValue());
      }
      // Adds key-value pair 'FIVE-5' only if it is not present in map
      map.putIfAbsent("FIVE", 5);
```

```
        // Retrieving a value associated with key 'TWO'
        int value = map.get("TWO");
        System.out.println(value); // Prints the value associated with key "TWO" (if it exists)
        }
       }
      }
     }
```

OUTPUT

	Test	Input	Expected	Got	
	1	3 ONE 1 TWO 2 THREE 3	ONE : 1 TWO : 2 THREE : 3 ---------- SIX : 6 ONE : 1 TWO : 2 SEVEN : 7 THREE : 3 2 true true 4	ONE : 1 TWO : 2 THREE : 3 ---------- SIX : 6 ONE : 1 TWO : 2 SEVEN : 7 THREE : 3 2 true true 4	

Passed all tests!

LAB-12-INTRODUCTION TO I/O, I/O OPERATIONS, OBJECT...

Question **1**

Write a function that takes an input String (sentence) and generates a new String (modified sentence) by reversing the words in the original String, maintaining the words position.
In addition, the function should be able to control the reversing of the case (upper or lowercase) based on a case_option parameter, as follows:

If case_option = 0, normal reversal of words i.e., if the original sentence is “Wipro TechNologies BangaLore”, the new reversed sentence should be “orpiW seigoloNhceT eroLagnaB”.
If case_option = 1, reversal of words with retaining position’s case i.e., if the original sentence is “Wipro TechNologies BangaLore”, the new reversed sentence should be “Orpiw SeigOlonhcet ErolaGnab”.

Note that positions 1, 7, 11, 20 and 25 in the original string are uppercase W, T, N, B and L.
Similarly, positions 1, 7, 11, 20 and 25 in the new string are uppercase O, S, O, E and G.

NOTE:
1. Only space character should be treated as the word separator i.e., “Hello World” should be treated as two separate words, “Hello” and “World”. However, “Hello,World”, “Hello;World”, “Hello-World” or “Hello/World” should be considered as a single word.
2. Non-alphabetic characters in the String should not be subjected to case changes. For example, if case option = 1 and the original sentence is “Wipro TechNologies, Bangalore” the new reversed sentence should be “Orpiw ,seiGolonhceT Erolagnab”. Note that comma has been treated as part of the word “Technologies,” and when comma had to take the position of uppercase T it remained as a comma and uppercase T took the position of comma. However, the words “Wipro and Bangalore” have changed to “Orpiw” and “Erolagnab”.
3. Kindly ensure that no extra (additional) space characters are embedded within the resultant reversed String.

Examples:

S. No.	input1	input2	output
1	Wipro Technologies Bangalore	0	orpiW seigolonhceT erolagnaB
2	Wipro Technologies, Bangalore	0	orpiW ,seigolonhceT erolagnaB
3	Wipro Technologies Bangalore	1	Orpiw Seigolonhcet Erolagnab
4	Wipro Technologies, Bangalore	1	Orpiw ,seigolonhceT Erolagnab

For example:

Input	Result
Wipro Technologies Bangalore 0	orpiW seigolonhceT erolagnaB
Wipro Technologies, Bangalore 0	orpiW ,seigolonhceT erolagnaB
Wipro Technologies Bangalore 1	Orpiw Seigolonhcet Erolagnab
Wipro Technologies, Bangalore 1	Orpiw ,seigolonhceT Erolagnab

PROGRAM

```
import java.util.Scanner;
public class WordReverser {
    public static String reverseWordsWithCase(String sentence, int caseOption) {
        // Split the sentence into words based on spaces
        String[] words = sentence.split(" ");

        // StringBuilder to store the result
        StringBuilder result = new StringBuilder();

        // Process each word
        for (String word : words) {
            // Reverse the word
            String reversedWord = new StringBuilder(word).reverse().toString();

            if (caseOption == 0) {
                // If caseOption is 0, no case conversion, just reverse the word
                result.append(reversedWord).append(" ");
            } else if (caseOption == 1) {
                // If caseOption is 1, adjust the case while maintaining original letter positions
                result.append(applyCaseConversion(reversedWord, word)).append(" ");
            }
        }

        // Remove the trailing space and return the result
        return result.toString().trim();
    }

    private static String applyCaseConversion(String reversedWord, String originalWord) {
        // StringBuilder to store the adjusted word
        StringBuilder adjustedWord = new StringBuilder();

        // Iterate over each character in the reversed word
        for (int i = 0; i < reversedWord.length(); i++) {
            char reversedChar = reversedWord.charAt(i);
            char originalChar = originalWord.charAt(i);

            if (Character.isLowerCase(originalChar)) {
                // If the original character was lowercase, the reversed character should be uppercase
                adjustedWord.append(Character.toLowerCase(reversedChar));
            } else if (Character.isUpperCase(originalChar)) {
                // If the original character was uppercase, the reversed character should be lowercase
                adjustedWord.append(Character.toUpperCase(reversedChar));
            } else {
                // Non-alphabetic characters remain unchanged
                adjustedWord.append(reversedChar);
            }
        }

        return adjustedWord.toString();
```

}

OUTPUT

	Input	Expected	Got	
	Wipro Technologies Bangalore 0	orpiW seigolonhceT erolagnaB	orpiW seigolonhceT erolagnaB	
	Wipro Technologies, Bangalore 0	orpiW ,seigolonhceT erolagnaB	orpiW ,seigolonhceT erolagnaB	
	Wipro Technologies Bangalore 1	Orpiw Seigolonhcet Erolagnab	Orpiw Seigolonhcet Erolagnab	
	Wipro Technologies, Bangalore 1	Orpiw ,seigolonhceT Erolagnab	Orpiw ,seigolonhceT Erolagnab	

Passed all tests!

Question **2**

Given two char arrays input1[] and input2[] containing only lower case alphabets, extracts the alphabets which are present in both arrays (common alphabets).
Get the ASCII values of all the extracted alphabets.
Calculate sum of those ASCII values. Lets call it sum1 and calculate single digit sum of sum1, i.e., keep adding the digits of sum1 until you arrive at a single digit.
Return that single digit as output.
Note:
1. Array size ranges from 1 to 10.
2. All the array elements are lower case alphabets.
3. Atleast one common alphabet will be found in the arrays.

Example 1:
input1: {‘a’, ‘b’, ‘c’}
input2: {‘b’, ’c’}
output: 8
Explanation:
‘b’ and ‘c’ are present in both the arrays.
ASCII value of ‘b’ is 98 and ‘c’ is 99.
98 + 99 = 197
1 + 9 + 7 = 17
1 + 7 = 8

For example:

Input	Result
a b c b c	8

PROGRAM

```
import java.util.HashSet;
import java.util.Set;
public class CommonAlphabetSum {
   public static int singleDigitSum(int num) {
      int sum = 0;
      while (num > 0) {
         sum += num % 10;
         num /= 10;
      }
      if (sum > 9) {
         return singleDigitSum(sum);
      }
      return sum;
   }
   public static int calculateCommonAlphabetSum(char[] input1, char[] input2) {
      Set<Character> set1 = new HashSet<>();
      for (char c : input1) {
```

```
            set1.add(c);
        }
        int sum = 0;
        for (char c : input2) {
            if (set1.contains(c)) {
                sum += c;
            }
        }
        return singleDigitSum(sum);
    }
    public static void main(String[] args) {
        char[] input1 = {'a', 'b', 'c'};
        char[] input2 = {'b', 'c', 'd'};
        int result = calculateCommonAlphabetSum(input1, input2);
        System.out.println(result);
    }
}
```

OUTPUT

	Input	Expected	Got	
	a b c b c	8	8	

Passed all tests!

Question **3**

You are provided with a string which has a sequence of 1's and 0's.
This sequence is the encoded version of a English word. You are supposed write a program to decode the provided string and find the original word.
Each alphabet is represented by a sequence of 0s.
This is as mentioned below:
Z : 0
Y : 00
X : 000
W : 0000
V : 00000
U : 000000
T : 0000000
and so on upto A having 26 0's (00000000000000000000000000).
The sequence of 0's in the encoded form are separated by a single 1 which helps to distinguish between 2 letters.
Example 1:
input1: 010010001
The decoded string (original word) will be: ZYX
Example 2:
input1: 00001000000000000000001000000000001000000000100000000000001
The decoded string (original word) will be: WIPRO
Note: The decoded string must always be in UPPER case.

For example:

Input	**Result**
010010001	ZYX
00001000000000000000001000000000001000000000100000000000001	WIPRO

PROGRAM

```
import java.util.Scanner;
public class DecodeString {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      String encodedString = scanner.nextLine();
      StringBuilder decodedString = new StringBuilder();
      int count = 0;
      for (int i = 0; i < encodedString.length(); i++) {
         if (encodedString.charAt(i) == '0') {
            count++;
         } else {
            char decodedChar = (char) ('Z' - count + 1);
            decodedString.append(decodedChar);
            count = 0;
         }
      }
```

```
            System.out.println(decodedString.toString());
        }
    }
```

OUTPUT

	Input	Expected	Got	
	010010001	ZYX	ZYX	
	00001000000000000000001000000000001000000000100000000000001	WIPRO	WIPRO	

Passed all tests!