```
Experiment 1.1- WAP to display "Hello, World"

public class Exp1A {
    public static void main(String[] args) {
        System.out.println("Hello, world");
    }
}
```

```
Output-JavaLab(run) ×

run:
Hello, world
BUILD SUCCESSFUL (total time: 0 seconds)
```

Experiment 1.2 — WAP to evaluate the following expressions:

```
1. (a/c)z/a
2. c++ + b/x -y
package javalab;
public class Exp1B {
   public static void main(String[] args) {
       int a=6,b=2,c=2,x=6,y=4,z=12;
       int sol;
       sol=(a/c)*z/a;
       System.out.println("(a/c)z/a :"+sol);
        sol=c++ + b/x-y;
       System.out.println("c++ + b/x-y :"+sol);
    }
}
```

```
Output - JavaLab (run) ×

run:
(a/c)z/a :6
c++ + b/x-y :-2
BUILD SUCCESSFUL (total time: 0 seconds)
```

Experiment 1.3-WAP to display the values by taking input from console using Scanner class.

```
import java.util.Scanner;

public class Exp1C {
    public static void main(String[] args) {
        Scanner input=new Scanner(System.in);
        System.out.println("Enter name:");
        String name=input.next();
        System.out.println("Hello, "+name);
    }
}
```

```
Output - JavaLab (run) ×

run:
Enter name:
SHAKTIMAN
Hello, SHAKTIMAN
BUILD SUCCESSFUL (total time: 1 minute 11 seconds)
```

Experiment 1.4- WAP to display "diamond" pattern

```
for (int k = 0; k < (i * 2 + 1); k++) {
                System.out.print("*");
            }
            System.out.println();
        }
        for (int i = 0; i < 9; i++) {
            System.out.print("*");
        }
        System.out.println();
        for (int i = 4; i > 0; i--) {
            for (int j = 4; j >= i; j--) {
                System.out.print(" ");
            }
            for (int k = (2 * (i - 1) + 1); k > 0; k--) {
                System.out.print("*");
            }
            System.out.println();
        }
    }
}
```

```
Output-JavaLab (run) x

run:

***

****

******

******

****

***

***

***

***

BUILD SUCCESSFUL (total time: 0 seconds)
```

Experiment 2.1-Find the largest and smallest element in an areay after getting values from the console.

```
import java.util.Scanner;
public class Exp2A {
    public static void main(String[] args) {
```

```
Scanner input = new Scanner(System.in);
        int size = input.nextInt();
        int arr[] = new int[size];
        for (int i = 0; i < size; i++) {
            System.out.print("arr[" + i + "]:");
            arr[i] = input.nextInt();
        }
        int large = largest(arr, size);
        int small = smallest(arr, size);
        System.out.println("Largest:" + large + "\nSmallest:"
+ small);
    }
    private static int largest(int[] arr, int size) {
        int temp = arr[0];
        for (int i = 0; i < size; i++) {
            if (temp < arr[i]) {</pre>
                temp = arr[i];
            }
        }
        return temp;
    }
    private static int smallest(int[] arr, int size) {
        int temp = arr[0];
        for (int i = 0; i < size; i++) {
            if (temp > arr[i]) {
                temp = arr[i];
            }
```

	}
	return temp;
}	
}	
	OUTPUT

```
Output-JavaLab(run) ×

run:

arr[0]:21
arr[1]:3
arr[2]:43
arr[3]:111
arr[4]:54
Largest:111
Smallest:3
BUILD SUCCESSFUL (total time: 19 seconds)
```

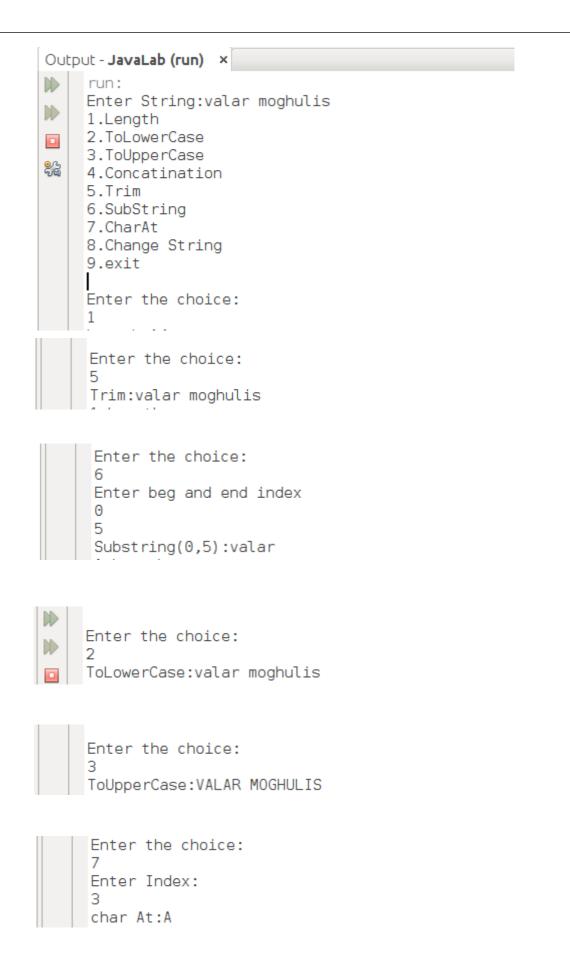
Experiment 2.2 — Write a menu driven program to implement String and StringBuffer operations.

```
public class Exp2B {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
}
```

```
System.out.print("Enter String:");
        String str = input.nextLine();
        do {
            initMenu();
            System.out.println("Enter the choice:");
            int choice = input.nextInt();
            switch (choice) {
                case 1:
                    System.out.println("Length:" +
str.length());
                    break;
                case 2:
                    str = str.toLowerCase();
                    System.out.println("ToLowerCase:" + str);
                    break;
                case 3:
                    str = str.toUpperCase();
                    System.out.println("ToUpperCase:" + str);
                    break;
                case 4:
                    System.out.print("Enter String:");
                    String two = input.nextLine();
                    str = str + two;
                    //using stringbuilder
                    System.out.println("Concatinated string:"
+ str);
                    break;
                case 5:
                    str = str.trim();
                    System.out.println("Trim:" + str);
                    break;
                case 6:
```

```
System.out.println("Enter beg and end
index");
                    int beg = input.nextInt();
                    int end = input.nextInt();
                    System.out.println("Substring(" + beg +
"," + end + "):" + str.substring(beg, end));
                    break;
                case 7:
                    System.out.println("Enter Index:");
                    int index = input.nextInt();
                    System.out.println("char At:" +
str.charAt(index));
                    break;
                case 8:
                    System.out.println("Enter String:");
                case 9:
                    System.exit(0);
                default:
                    System.out.println("wrong choice!!\nTry
Again!");
            }
        } while (true);
    }
    private static void initMenu() {
        System.out.println("1.Length");
        System.out.println("2.ToLowerCase");
        System.out.println("3.ToUpperCase");
        System.out.println("4.Concatination");
        System.out.println("5.Trim");
```

```
System.out.println("6.SubString");
System.out.println("7.CharAt");
System.out.println("8.Change String");
System.out.println("9.exit");
System.out.println();
```



Experiment 2.3- Imlement Stack and Queue operations using ArrayList and Iterator class

STACK

```
import java.util.ArrayList;
import java.util.Scanner;
import java.util.Iterator;
import java.util.ListIterator;
public class Exp2C {
    public static void main(String[] args) {
        Scanner input=new Scanner(System.in);
        Stack stack=new Stack();
       do{
           System.out.println("1.push");
           System.out.println("2.pop");
           System.out.println("3.exit");
           System.out.println("Enter choice:");
           int choice=input.nextInt();
           switch(choice){
               case 1: System.out.println("Enter value:");
                   int value=input.nextInt();
                   stack.push(value);
                   break;
               case 2:int pop=stack.pop();
                        System.out.println("Popped
element:"+pop);
                        break;
               case 3:System.exit(0);
               default: System.out.println("wrong choice!!");
           }
       }while(true);
```

```
}
public class Stack {
    private ArrayList<Integer> stack=new ArrayList<>();
    private int top=-1;
    private static final int SIZE=10;
    public void push(int value){
        if(top==SIZE){
            System.out.println("OVERFLOW --->>");
        }else{
            top++;
            stack.add(value);
            System.out.println("PUSHED --->>");
            show();
        }
    }
    public int pop() {
        int value=-1;
        if(top==-1){
            System.out.println("UNDERFLOW --->>");
        }else{
            value=stack.get(top);
            stack.remove(top);
            top--;
            System.out.println("POPPED--->>");
            show();
        }
        return value;
    }
    public void show(){
        ListIterator itr=stack.listIterator(stack.size());
```

```
Output - JavaLab (run) #2 ×
     run:
     1.push
    2.pop
    3.exit
    Enter choice:
    Enter value:
    21
    PUSHED --->>
    --->>21
    1.push
    2.pop
    3.exit
    Enter choice:
    Enter value:
    45
    PUSHED --->>
    --->>45
     --->>21
     1.push
    2.pop
    3.exit
    Enter choice:
    POPPED--->>
     --->>21
    Popped element:45
    1.push
     2.pop
    3.exit
    Enter choice:
    POPPED--->>
    Popped element:21
    1.push
    2.pop
    3.exit
    Enter choice:
    UNDERFLOW --->>
```

QUEUE

```
import java.util.ArrayList;
import java.util.Iterator;
import java.util.ListIterator;
public class Exp2CB {
     public static void main(String[] args) {
        Scanner input=new Scanner(System.in);
        Queue queue=new Queue();
       do{
           System.out.println("1.Insert");
           System.out.println("2.Remove");
           System.out.println("3.exit");
           System.out.println("Enter choice:");
           int choice=input.nextInt();
           switch(choice){
               case 1: System.out.println("Enter value:");
                   int value=input.nextInt();
                   queue.insert(value);
                   break;
               case 2:int pop=queue.remove();
                        if(pop!=-1)
                            System.out.println("Popped
element:"+pop);
                        break;
               case 3:System.exit(0);
               default: System.out.println("wrong choice!!");
           }
       }while(true);
    }
}
public class Queue {
```

```
private static final int SIZE = 10;
private ArrayList<Integer> queue = new ArrayList<>(SIZE);
private int rear = -1, front = -1;
public void insert(int value) {
    if ((rear + 1) == SIZE) {
        System.out.println("OVERFLOW --->>");
    } else if (rear == -1) {
        front = 0;
        rear = 0;
        queue.add(value);
        System.out.println("INSERTED --->>");
        show();
    } else {
        rear++;
        queue.add(value);
        System.out.println("INSERTED --->>");
        show();
    }
}
public int remove() {
    int value = -1;
    if (front == -1) {
        System.out.println("UNDERFLOW --->>");
    } else if (front == rear) {
        front = -1;
        rear = -1;
        queue.remove(0);
        System.out.println("QUEUE IS EMPTY!!");
    } else {
        value = queue.get(0);
```

```
queue.remove(0);
    front++;
    System.out.println("REMOVED--->>");
    show();
}
    return value;
}

public void show() {

    Iterator itr = queue.iterator();
    while (itr.hasNext()) {
        System.out.println("-->>" + itr.next());
    }
}
```

```
Output x
   JavaLab (run) #2 × JavaLab (run) #3 ×
run:
    1.Insert
2.Remove
<u>∞</u>
     3.exit
     Enter choice:
     Enter value:
     21
     INSERTED --->>
     -->>21
     1.Insert
     2.Remove
     3.exit
     Enter choice:
     Enter value:
     34
     INSERTED --->>
     -->>21
     -->>34
     1.Insert
     2.Remove
     3.exit
     Enter choice:
     REMOVED - - ->>
     -->>34
     Popped element:21
     1.Insert
     2.Remove
     3.exit
     Enter choice:
     QUEUE IS EMPTY!!
     1.Insert
     2.Remove
     3.exit
     Enter choice:
```

Experiment 3- (a) Calculate Volume of a box using classes.

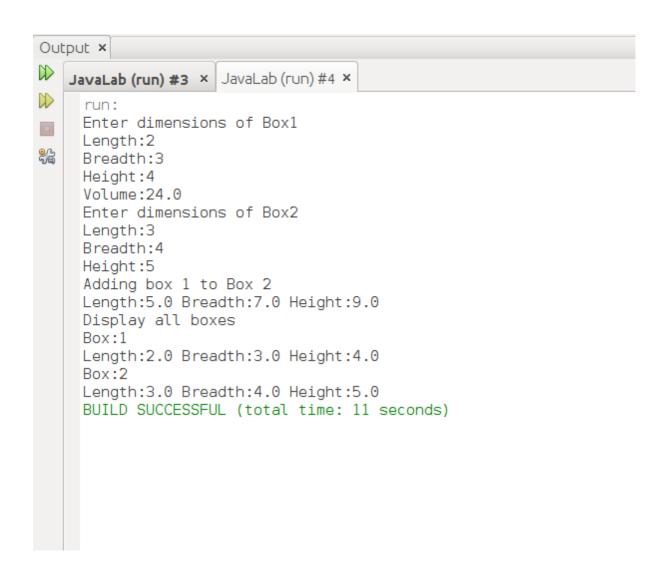
- (b)-Modify Part (a) by adding constructors and
 "this" reference.
- (c) Add the member function to the existing class to show the demo of passing objects as a value and returning objects from class.
- (d) Add member function to give a demo of varargs (variable arguments).

```
import java.util.Scanner;
public class Exp3A {
    public static void main(String[] args) {
        Scanner input=new Scanner(System.in);
        Box box1=new Box();
        System.out.println("Enter dimensions of Box1");
        System.out.print("Length:");
        box1.setLength(input.nextFloat());
        System.out.print("Breadth:");
        box1.setBreadth(input.nextFloat());
        System.out.print("Height:");
        box1.setHeight(input.nextFloat());
        System.out.println("Volume:"+box1.volume());
        System.out.println("Enter dimensions of Box2");
        System.out.print("Length:");
        float l=input.nextFloat();
        System.out.print("Breadth:");
        float b=input.nextFloat();
        System.out.print("Height:");
        float h=input.nextFloat();
        Box box2=new Box(1,b,h);
```

```
System.out.println("Adding box 1 to Box 2");
        Box box3=box1.addBox(box2);
        System.out.println(box3.toString());
        System.out.println("Display all boxes");
        Box.displayBoxes(box1,box2);
    }
}
class Box{
    float length, breadth, height;
    public Box() {
    }
   //using constructor with this reference PART (B)
    public Box(float length, float breadth, float height) {
        this.length = length;
        this.breadth = breadth;
        this.height = height;
    }
    public float getLength() {
        return length;
    }
    public void setLength(float length) {
        this.length = length;
    }
    public float getBreadth() {
        return breadth;
    }
```

```
public void setBreadth(float breadth) {
        this.breadth = breadth;
    }
    public float getHeight() {
        return height;
    }
    public void setHeight(float height) {
        this.height = height;
    }
    public float volume(){
        return length*breadth*height;
    }
    //method to take and return arguments as objects PART (C)
    public Box addBox(Box box2){
        float len=box2.getLength()+this.length;
        float bre=box2.getBreadth()+this.breadth;
        float hei=box2.getHeight()+this.height;
        return new Box(len,bre,hei);
    }
    @Override
    public String toString() {
        return "Length:"+length+" Breadth:"+breadth
                + " Height: "+height; //To change body of
generated methods, choose Tools | Templates.
    }
    // method to demonstrate varargs
    public static void displayBoxes(Box...arg){
        int i=1;
```

```
for(Box box:arg){
            System.out.println("Box:"+i);
            System.out.println(box.toString());
            i++;
        }
    }
}
```



Experiment 4-(a) Write a program to give the demo of 'static' and 'final' variable using Nested class concept.

```
package javalab;
public class Exp4A {
  public static void main(String args[]){
  TestOuter1.Inner obj=new TestOuter1.Inner();
  obj.msg();
  obj.msg2();
  }
}
class TestOuter1{
  static int data=30;
  static final int data2=50;
  static class Inner{
   void msg(){
       System.out.println("static data is "+data);
   }
   void msg2(){
      System.out.println("final static data is "+ data2 );
  }
  }
}
```

Output

```
Output-JavaLab (run) ×

run:
static data is 30
final static data is 50
BUILD SUCCESSFUL (total time: 0 seconds)
```

Experiment 4-(b) Write a program to input command line arguments.

Output

```
Output-JavaLab(run) ×

run:
Command line arguments are
my
name
is
rishabh
BUILD SUCCESSFUL (total time: 0 seconds)
```

Experiment 5- (a) Calculate Volume of a box by implementing Simple Inheritance

```
import java.util.Scanner;
public class Exp5ABoxProperties extends Box1{
    public Exp5ABoxProperties(double length, double breadth,
double height) {
        super(length, breadth, height);
    }
    public static void main(String[] args) {
        Scanner input=new Scanner(System.in);
        System.out.print("Enter Length:");
        double length=input.nextInt();
        System.out.print("Enter Breadth:");
        double breadth=input.nextInt();
        System.out.print("Enter Height:");
        double height=input.nextInt();
        Exp5ABoxProperties box=new Exp5ABoxProperties(length,
breadth, height);
        double volume=box.getVolume();
        System.out.println("Volume:"+volume);
    }
    double getVolume(){
        double vol=0;
        double length=getLength();
```

```
double breadth=getBreadth();
        double height=getHeight();
        vol=length*breadth*height;
        return vol;
    }
}
public class Box1 {
    double length, breadth, height;
    public Box1(double length, double breadth, double height)
{
        this.length = length;
        this.breadth = breadth;
        this.height = height;
    }
    public double getLength() {
        return length;
    }
    public void setLength(double length) {
        this.length = length;
    }
    public double getBreadth() {
        return breadth;
    }
    public void setBreadth(double breadth) {
        this.breadth = breadth;
    }
```

```
public double getHeight() {
    return height;
}

public void setHeight(double height) {
    this.height = height;
}

@Override
    public String toString() {
        return "Box1{" + "length=" + length + ", breadth=" + breadth + ", height=" + height + '}';
    }
}
```

```
Output - JavaLab (run) ×

run:
Enter Length:4
Enter Breadth:5
Enter Height:6
Volume:120.0
BUILD SUCCESSFUL (total time: 6 seconds)
```

Experiment 5 -(b) Modify part (a) by using method overriding and 'super' keyword.

```
public class Exp5B extends Box1 {
    double vol = 0;
    public Exp5B(double length, double breadth, double height)
{
        super(length, breadth, height);
    }
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Enter Length:");
        double length = input.nextInt();
        System.out.print("Enter Breadth:");
        double breadth = input.nextInt();
        System.out.print("Enter Height:");
        double height = input.nextInt();
        Exp5B box = new Exp5B(length, breadth, height);
        box.vol = box.getVolume();
        System.out.println(box.toString());
    }
    @Override
    public String toString() {
        return super.toString() + "Volume:" + vol;
    }
    double getVolume() {
```

```
double vol = 0;
double length = getLength();
double breadth = getBreadth();
double height = getHeight();

vol = length * breadth * height;

return vol;
}

//Box class is same as Exp1
```

Output

```
Output - JavaLab (run) x

run:
Enter Length:3
Enter Breadth:4
Enter Height:2
Box1{length=3.0, breadth=4.0, height=2.0}Volume:24.0
BUILD SUCCESSFUL (total time: 8 seconds)
```

Experiment 5- (c) Implement the concept of dynamic method dispatch.

```
public class Exp5C extends Game{
    public void type()
 { System.out.println("outdoor game"); }
 public static void main(String[] args)
 {
   Game gm = new Game();
   Exp5C ck = new Exp5C();
   gm.type();
   ck.type();
   gm=ck;
   gm.type();
 }
}
public class Game {
    public void type(){
        System.out.println("Indoor & outdoor");
    }
}
```

```
Output-JavaLab (run) x

run:
Indoor & outdoor
outdoor game
outdoor game
BUILD SUCCESSFUL (total time: 0 seconds)
```

Experiment 5 (d) - Create Abstract and final class concept.

```
abstract class Bank {
    abstract int getRateOfInterest();
}
class SBI extends Bank {
    int getRateOfInterest() {
        return 7;
    }
}
class PNB extends Bank {
    int getRateOfInterest() {
        return 8;
    }
}
class TestBank {
    public static void main(String args[]) {
        Bank b;
        b = new SBI();
        System.out.println("Rate of Interest is: " +
b.getRateOfInterest() + " %");
        b = new PNB();
        System.out.println("Rate of Interest is: " +
b.getRateOfInterest() + " %");
    }
}
```

```
Output - JavaLab (run) ×

run:
Rate of Interest is: 7 %
Rate of Interest is: 8 %
BUILD SUCCESSFUL (total time: 0 seconds)
```

Experiment 6- (a) Create interface and implement it using class

```
public class Exp6A implements Animal{
    public static void main(String[] args) {
        Exp6A tiger=new Exp6A();
        tiger.eat();
        tiger.travel();
        tiger.type();
    }
    @Override
    public void eat() {
            System.out.println("Animal eats");
    }
    @Override
    public void travel() {
        System.out.println("Animal travels");
    }
    @Override
    public void type() {
        System.out.println("Animal Type: Tiger");
    }
}
public interface Animal {
    void eat();
    void travel();
   void type();
}
```

```
Output-JavaLab (run) ×

run:
Animal eats
Animal travels
Animal Type: Tiger
BUILD SUCCESSFUL (total time: 0 seconds)
```

Experiment 6- (b) Extending an interface to the class.

```
public interface Printable {
    void print();
}
public interface Showable extends Printable{
    void show();
}
public class Exp6B implements Showable{
    public static void main(String[] args) {
        Exp6B obj=new Exp6B();
        obj.show();
        obj.print();
    }
    @Override
    public void show() {
        System.out.println("show function from Showable
interface!");
    }
    @Override
    public void print() {
        System.out.println("print function from Printable
interface!");
    }
}
```

Output-JavaLab(run) ×

run:
show function from Showable interface!
print function from Printable interface!
BUILD SUCCESSFUL (total time: 0 seconds)

Experiment 7- (a) WAP to create package by defining three classes.

(b) Implement the defined package in a class to access the classes defined in a package.

```
package mypackage;
public class A{
  public static int VAR=1;
  public void print(){
    System.out.println("hello, from class:A");
  }
}
package mypackage;
public class B{
  public static int VAR=2;
  public void print(){
    System.out.println("hello, from class:B");
  }
}
package mypackage;
public class C{
  public static int VAR=3;
  public void print(){
    System.out.println("hello, from class:C");
  }
```

```
// Part (b)
import mypackage.C;

class Test{
  public static void main(String[] args) {

    A aObj=new A();
    B bObj=new B();
    C cObj=new C();
    aObj.print();
    bObj.print();
    cObj.print();
}
```

```
run:
hello, from class:A
hello, from class:B
hello, from class:C
BUILD SUCCESSFUL (total time: 0 seconds)
```

Experiment 7 -(c) Implement execption handling using try, throw, finally, finalize keywords.

```
import java.io.*;
public class InsufficientFundException extends Exception {
   private double amount;
   public InsufficientFundException(double amount) {
      this.amount = amount;
   }
   public double getAmount() {
      return amount;
   }
}
import java.io.*;
public class Exp7C {
    private double balance;
   private int number;
   public Exp7C(int number) {
      this.number = number;
   }
   public static void main(String [] args) {
      Exp7C c = new Exp7C(101);
      System.out.println("Depositing $500...");
      c.deposit(500.00);
      try {
         System.out.println("\nWithdrawing $100...");
```

```
c.withdraw(100.00);
         System.out.println("\nWithdrawing $600...");
         c.withdraw(600.00);
      }catch(InsufficientFundException e) {
         System.out.println("Sorry, but you are short $" +
e.getAmount());
         System.out.println("Error!! Rolling back
changes...");
         e.printStackTrace();
      }finally{
          System.gc();
      }
   }
    public void finalize(){
        System.out.println("cleaning garbage!");
    }
    public void deposit(double amount) {
      balance += amount;
   }
   public void withdraw(double amount) throws
InsufficientFundException {
      if(amount <= balance) {</pre>
         balance -= amount;
      }else {
         double needs = amount - balance;
         throw new InsufficientFundException(needs);
      }
   }
   public double getBalance() {
      return balance;
   }
```

```
public int getNumber() {
      return number;
   }
}
```

Experiment 8- (a) WAP to implement StringTokenizer class methods.

```
import java.util.StringTokenizer;
class Exp8A {
    public static void main(String[] args) {
        StringTokenizer st = new StringTokenizer("my name is
khan"," ");
        int count=st.countTokens();
        System.out.println("no. of times nextToken method can
be called:"+count);
        while (st.hasMoreTokens()) {
        System.out.println(st.nextToken());
     }
        // creating string tokenizer with delimeter
         StringTokenizer st2 = new
StringTokenizer("Come/to/learn");
         // checking next token
        System.out.println("Next token is : " +
st2.nextToken("/"));
    }
}
```

```
Output-JavaLab(run) x

run:
no. of times nextToken method can be called:4
my
name
is
jindal
Next token is : keep
BUILD SUCCESSFUL (total time: 0 seconds)
```