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Reg. no.: 16BCE0081

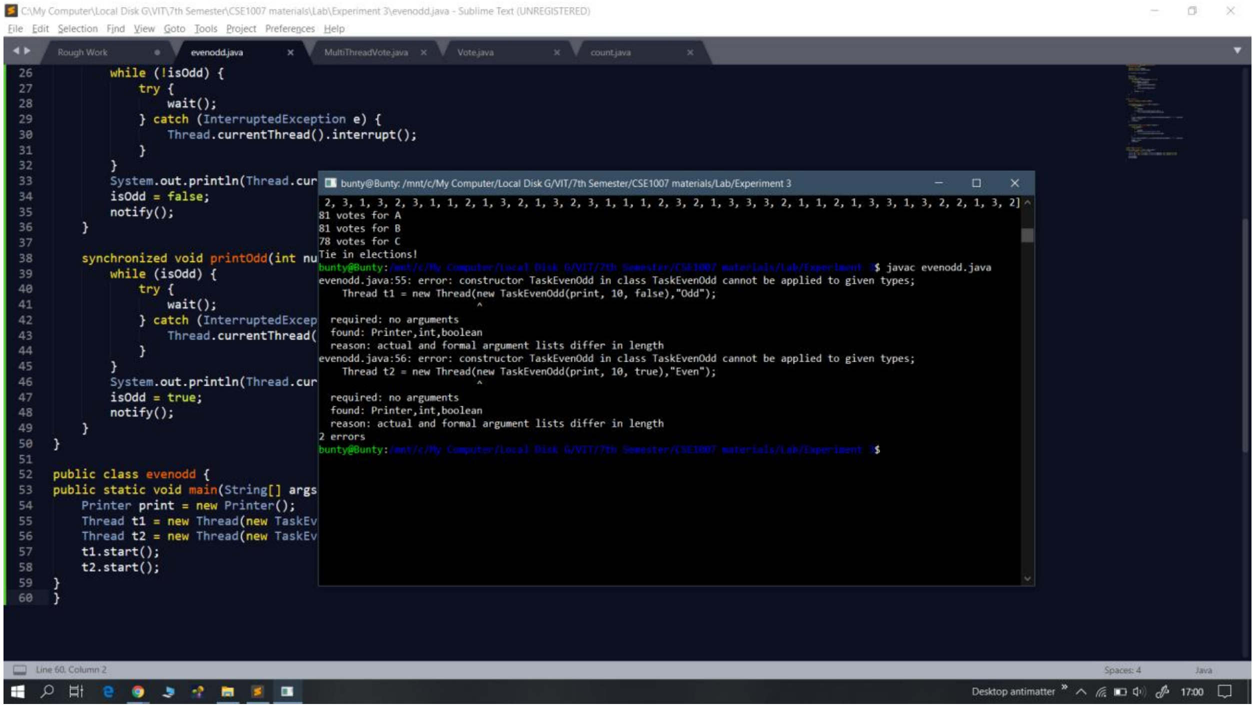
Slot: L33 + L34

Subject: Java Programming (CSE1007) Lab

Multi-threading

1. **Demonstrate multithreading by creating two threads, one for printing the odd numbers and the other for printing even numbers with in a given range of your choice.**

```
class TaskEvenOdd implements Runnable {
    private int max;
    private Printer print;
    private boolean isEvenNumber;

    // standard constructors

    @Override
    public void run() {
        int number = isEvenNumber ? 2 : 1;
        while (number <= max) {
            if (isEvenNumber) {
                print.printEven(number);
            } else {
                print.printOdd(number);
            }
            number += 2;
        }
    }
}

class Printer {
    private volatile boolean isOdd;

    synchronized void printEven(int number) {
        while (!isOdd) {
            try {
                wait();
            } catch (InterruptedException e) {
                Thread.currentThread().interrupt();
            }
        }
        System.out.println(Thread.currentThread().getName() + ":"
+ number);
        isOdd = false;
        notify();
    }

    synchronized void printOdd(int number) {
        while (isOdd) {
            try {
                wait();
            } catch (InterruptedException e) {
                Thread.currentThread().interrupt();
            }
        }
        System.out.println(Thread.currentThread().getName() + ":"
+ number);
        isOdd = true;
        notify();
    }
}

public class evenodd {
public static void main(String[] args) {
    Printer print = new Printer();
    Thread t1 = new Thread(new TaskEvenOdd(print, 10,
false),"Odd");
    Thread t2 = new Thread(new TaskEvenOdd(print, 10,
true),"Even");
    t1.start();
    t2.start();
}
}
```


C:\My Computer\Local Disk G\VIT\7th Semester\CSE1007 materials\Lab\Experiment 3\evenodd.java - Sublime Text (UNREGISTERED)
File Edit Selection Find View Goto Tools Project Preferences Help
Rough Work
evenodd.java
MultiThreadVote.java
Vote.java
count.java
bunty@Bunty: /mnt/c/My Computer/Local Disk G/VIT/7th Semester/CSE1007 materials/Lab/Experiment 3
Line 60, Column 2
Spaces: 4
Java
Desktop antimatter
17:00

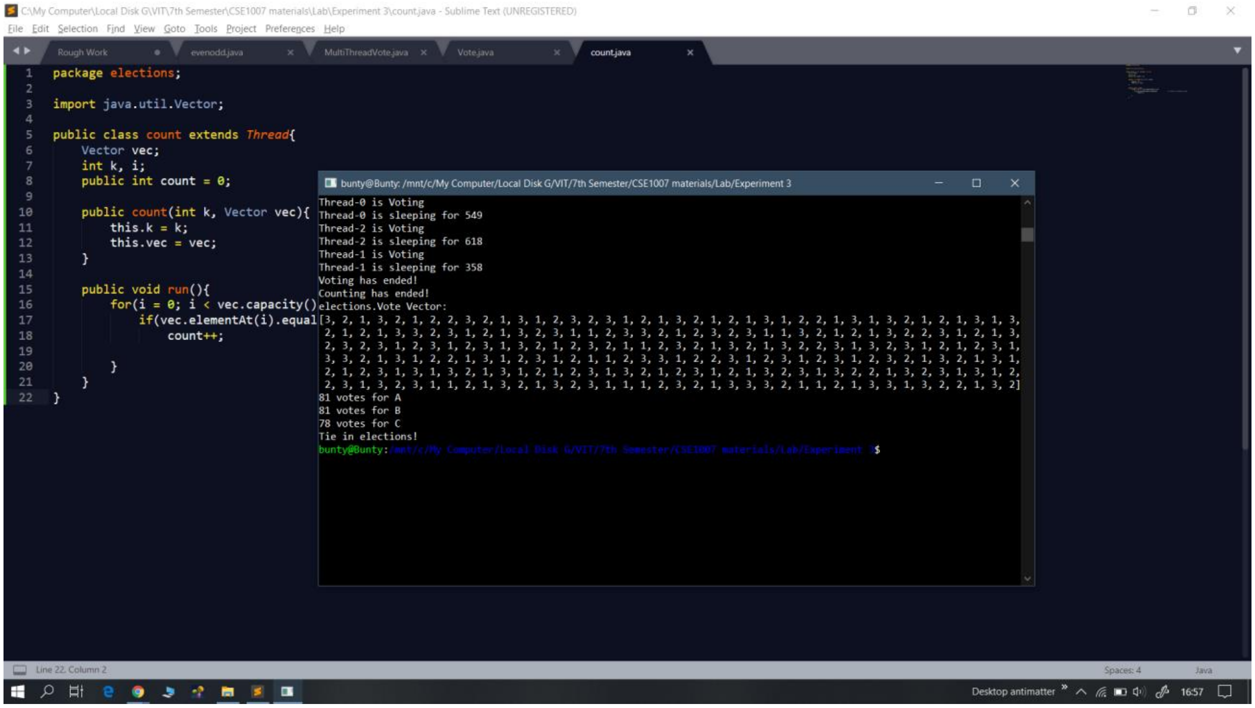
```java
        while (!isOdd) {
            try {
                wait();
            } catch (InterruptedException e) {
                Thread.currentThread().interrupt();
            }
        }
        System.out.println(Thread.cur
        isOdd = false;
        notify();
    }

    synchronized void printOdd(int nu
        while (isOdd) {
            try {
                wait();
            } catch (InterruptedExcep
                Thread.currentThread(
            }
        }
        System.out.println(Thread.cur
        isOdd = true;
        notify();
    }
}

public class evenodd {
public static void main(String[] args
    Printer print = new Printer();
    Thread t1 = new Thread(new TaskEv
    Thread t2 = new Thread(new TaskEv
    t1.start();
    t2.start();
}
}
```

```
 2, 3, 1, 3, 2, 3, 1, 1, 2, 1, 3, 2, 1, 3, 2, 3, 1, 1, 1, 2, 3, 2, 1, 3, 3, 3, 2, 1, 1, 2, 1, 3, 3, 1, 3, 2, 2, 1, 3, 2]
81 votes for A
81 votes for B
78 votes for C
Tie in elections!
bunty@Bunty:/mnt/c/My Computer/Local Disk G/VIT/7th Semester/CSE1007 materials/Lab/Experiment 3$ javac evenodd.java
evenodd.java:55: error: constructor TaskEvenOdd in class TaskEvenOdd cannot be applied to given types;
    Thread t1 = new Thread(new TaskEvenOdd(print, 10, false),"Odd");
                           ^
  required: no arguments
  found: Printer,int,boolean
  reason: actual and formal argument lists differ in length
evenodd.java:56: error: constructor TaskEvenOdd in class TaskEvenOdd cannot be applied to given types;
    Thread t2 = new Thread(new TaskEvenOdd(print, 10, true),"Even");
                           ^
  required: no arguments
  found: Printer,int,boolean
  reason: actual and formal argument lists differ in length
2 errors
bunty@Bunty:/mnt/c/My Computer/Local Disk G/VIT/7th Semester/CSE1007 materials/Lab/Experiment 3$
```

2. **Write a program to demonstrate the knowledge of students in multithreading. Eg., Three students A, B and C of B.Tech- II year contest for the PR election. With the total strength of 240 students in II year, simulate the vote casting by generating 240 random numbers (1 for student A, 2 for B and 3 for C) and store them in an array. Create four threads to equally share the task of counting the number of votes cast for all the three candidates. Use synchronized method or synchronized block to update the three count variables. The main thread should receive the final vote count for all three contestants and hence decide the PR based on the values received.**

```java
package elections;

import java.util.Vector;

public class count extends Thread{
    Vector vec;
    int k, i;
    public int count = 0;

    public count(int k, Vector vec){
        this.k = k;
        this.vec = vec;
    }

    public void run(){
        for(i = 0; i < vec.capacity(); i++){
            if(vec.elementAt(i).equals(k))              // check
if elements match
                count++;

        }
    }
}

package elections;

import java.util.Random;
import java.util.Vector;

public class Vote extends Thread{
    Random rand = new Random();                      //
generating a random number
    int max = 750;                                   // max wait
time for thread
    int min = 100;                                   // min wait
time for thread
    int v, s;
    Vector vec;

    public Vote(int v, Vector vec)
    {
        this.v = v;
        this.vec = vec;
    }

    public void run() {
        try
        {
            // while voting print id
            while(vec.size() < 240) {               // ensure
size of vote vector is below 240
                System.out.println(this.getName() + " is
Voting");
```

```
                vec.add(v);

                s = rand.nextInt((max - min) + 1) + min;
                System.out.println(this.getName() + " is sleeping 
for " + s);
                Thread.sleep(s);                    // create 
random delay between threads
            }

        }
        catch(InterruptedException e)
        {
            System.out.println("Voting Exception: " + e);
        }
    }

}


import elections.Vote;
import elections.count;
import java.util.Vector;

public class MultiThreadVote {
    public static void main(String[] args) {
        Vector votevec = new Vector(240);   // creating a vote 
array for 240 votes

        Vote a = new Vote(1, votevec);
        a.start();

        Vote b = new Vote(2, votevec);
        b.start();

        Vote c = new Vote(3, votevec);
        c.start();

        try{
            a.join();
            b.join();
            c.join();
            System.out.println("Voting has ended!");
        }catch(Exception e){System.out.println(e);}

        count ac = new count(1, votevec);
        count bc = new count(2, votevec);
        count cc = new count(3, votevec);

        ac.start();
        bc.start();
        cc.start();

        try{
            ac.join();
            bc.join();
            cc.join();
            System.out.println("Counting has ended!");
        }catch(Exception e){System.out.println(e);}

        int av = ac.count;
        int bv = bc.count;
        int cv = cc.count;

        System.out.println("elections.Vote Vector:" + "\n" +
votevec);
        System.out.println(av + " votes for A");
        System.out.println(bv + " votes for B");
        System.out.println(cv + " votes for C");

        if(av >= bv && av >= cv){
            if(av == bv || av == cv)
                System.out.println("Tie in elections!");
            else
                System.out.println("A has won the elections!");
        }
        else if(bv >= av && bv >= cv){
            if(av == bv || bv == cv)
                System.out.println("Tie in elections!");
            else
                System.out.println("B has won the elections!");
        }
        else if(cv >= av && cv >= bv){
            if(cv == bv || cv == av)
                System.out.println("Tie in elections!");
            else
                System.out.println("C has won the elections!");
        }
    }
}
```



C:\My Computer\Local Disk G\VIT\7th Semester\CSE1007 materials\Lab\Experiment 3\count.java - Sublime Text (UNREGISTERED)
File Edit Selection Find View Goto Tools Project Preferences Help
Rough Work
evenodd.java
MultiThreadVote.java
Vote.java
count.java
bunty@Bunty: /mnt/c/My Computer/Local Disk G/VIT/7th Semester/CSE1007 materials/Lab/Experiment 3
Line 22, Column 2
Spaces: 4
Java
Desktop antimatter
16:57

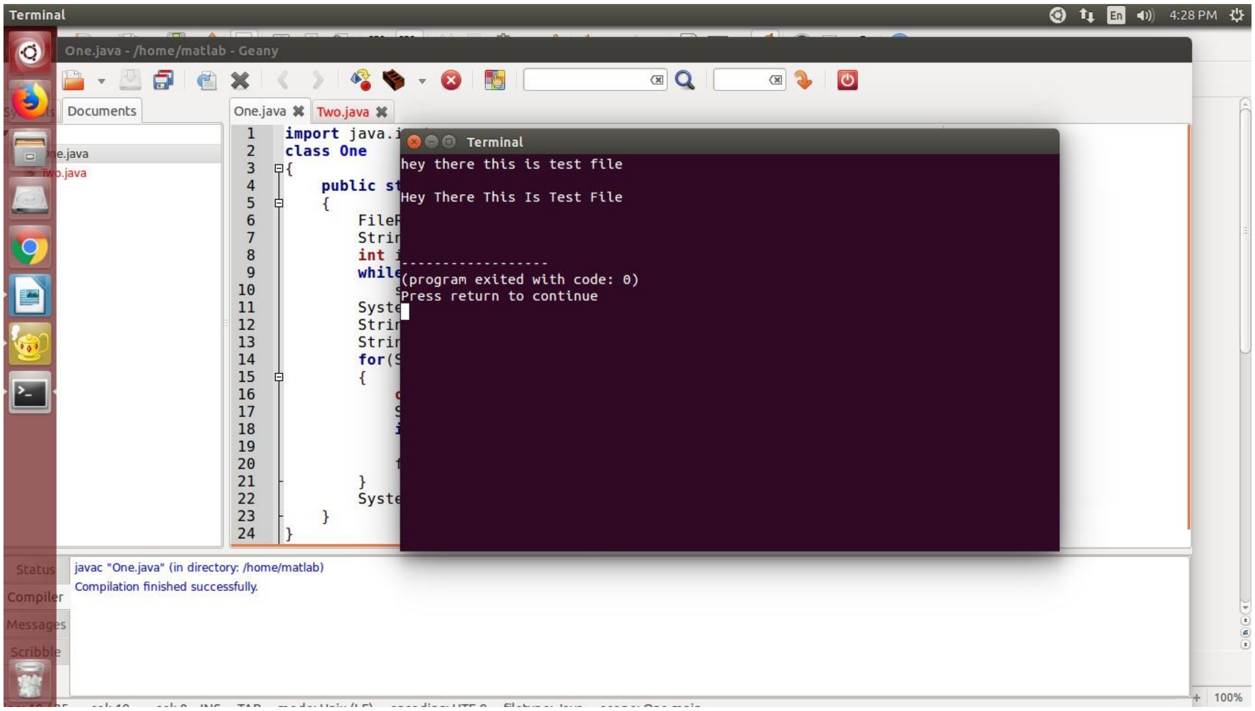
```
package elections;

import java.util.Vector;

public class count extends Thread{
    Vector vec;
    int k, i;
    public int count = 0;

    public count(int k, Vector vec){
        this.k = k;
        this.vec = vec;
    }

    public void run(){
        for(i = 0; i < vec.capacity()
            if(vec.elementAt(i).equal
                count++;

        }
    }
}
```

```
Thread-0 is Voting
Thread-0 is sleeping for 549
Thread-2 is Voting
Thread-2 is sleeping for 618
Thread-1 is Voting
Thread-1 is sleeping for 358
Voting has ended!
Counting has ended!
elections.Vote Vector:
[3, 2, 1, 3, 2, 1, 2, 2, 3, 2, 1, 3, 1, 2, 3, 2, 3, 1, 2, 1, 3, 2, 1, 2, 1, 3, 1, 2, 2, 1, 3, 1, 3, 2, 1, 2, 1, 3, 1, 3,
 2, 1, 2, 1, 3, 3, 2, 3, 1, 2, 1, 3, 2, 3, 1, 1, 2, 3, 3, 2, 1, 2, 3, 2, 3, 1, 1, 3, 2, 1, 2, 1, 3, 2, 2, 3, 1, 2, 1, 3,
 2, 3, 2, 3, 1, 2, 3, 1, 2, 3, 1, 3, 2, 1, 2, 3, 2, 1, 1, 2, 3, 2, 1, 3, 2, 1, 3, 2, 2, 3, 1, 3, 2, 3, 1, 2, 1, 2, 3, 1,
 3, 3, 2, 1, 3, 1, 2, 2, 1, 3, 1, 2, 3, 1, 2, 1, 1, 2, 3, 3, 1, 2, 2, 3, 1, 2, 3, 1, 2, 3, 1, 2, 3, 2, 1, 3, 2, 1, 3, 1,
 2, 1, 2, 3, 1, 3, 1, 3, 2, 1, 3, 1, 2, 1, 2, 3, 1, 3, 2, 1, 2, 3, 1, 2, 1, 3, 2, 3, 1, 3, 2, 2, 1, 3, 2, 3, 1, 3, 1, 2,
 2, 3, 1, 3, 2, 3, 1, 1, 2, 1, 3, 2, 1, 3, 2, 3, 1, 1, 1, 2, 3, 2, 1, 3, 3, 3, 2, 1, 1, 2, 1, 3, 3, 1, 3, 2, 2, 1, 3, 2]
81 votes for A
81 votes for B
78 votes for C
Tie in elections!
bunty@Bunty:/mnt/c/My Computer/Local Disk G/VIT/7th Semester/CSE1007 materials/Lab/Experiment 3$
```

File Handling

1. Java Program to Replace First Letter of Every Word with Capital Letter.

```
class q1
{
        public static void main(String[] args) throws IOException
        {
                FileReader fr = new
FileReader("/home/matlab/file.txt");
                String s="";
                int i;
                while((i = fr.read())!= -1)
                    s+=Character.toString((char)i);
                System.out.println(s);
                String[] arr = s.split(" ");
                String fin = "";
                for(String j:arr)
                {
                    char c = j.charAt(0);
                    String sub = j.substring(1,j.length());
                    if(Character.isLowerCase(c))
                        c = Character.toUpperCase(c);
                    fin+= (c + sub + " ");
                }
                System.out.println(fin);
        }
}
```



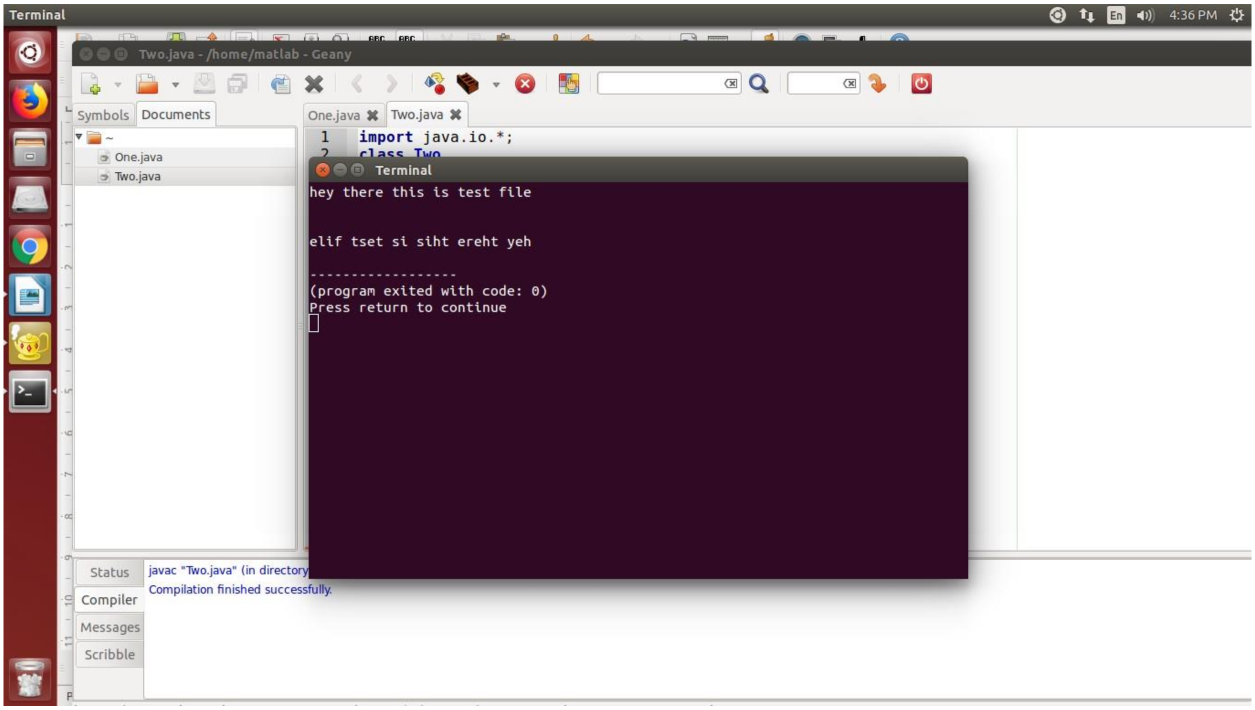
```
import java.i
class One
{
    public st
    {
        FileR
        Strir
        int i
        while
            S
        Syste
        Strir
        Strir
        for(S
        {
            c
            S
            i

            f
        }
        Syste
    }
}
```

```
hey there this is test file

Hey There This Is Test File



------------------
(program exited with code: 0)
Press return to continue
```

```
javac "One.java" (in directory: /home/matlab)
Compilation finished successfully.
```

2. Java Program to Reverse the Contents of a File and Print it.

```
import java.io.*;
class q2
{
	public static void main(String[] args) throws IOException
	{
		FileReader fr = new
FileReader("/home/matlab/file.txt");
		String s="";
		int i;
		while((i = fr.read())!= -1)
			s+=Character.toString((char)i);
		System.out.println(s);
		for(int j=s.length()-1;j>=0;j--)
			System.out.print(s.charAt(j));
	}
}
```



```
import java.io.*;
class Two
```

```
hey there this is test file


elif tset si siht ereht yeh

------------------
(program exited with code: 0)
Press return to continue
```

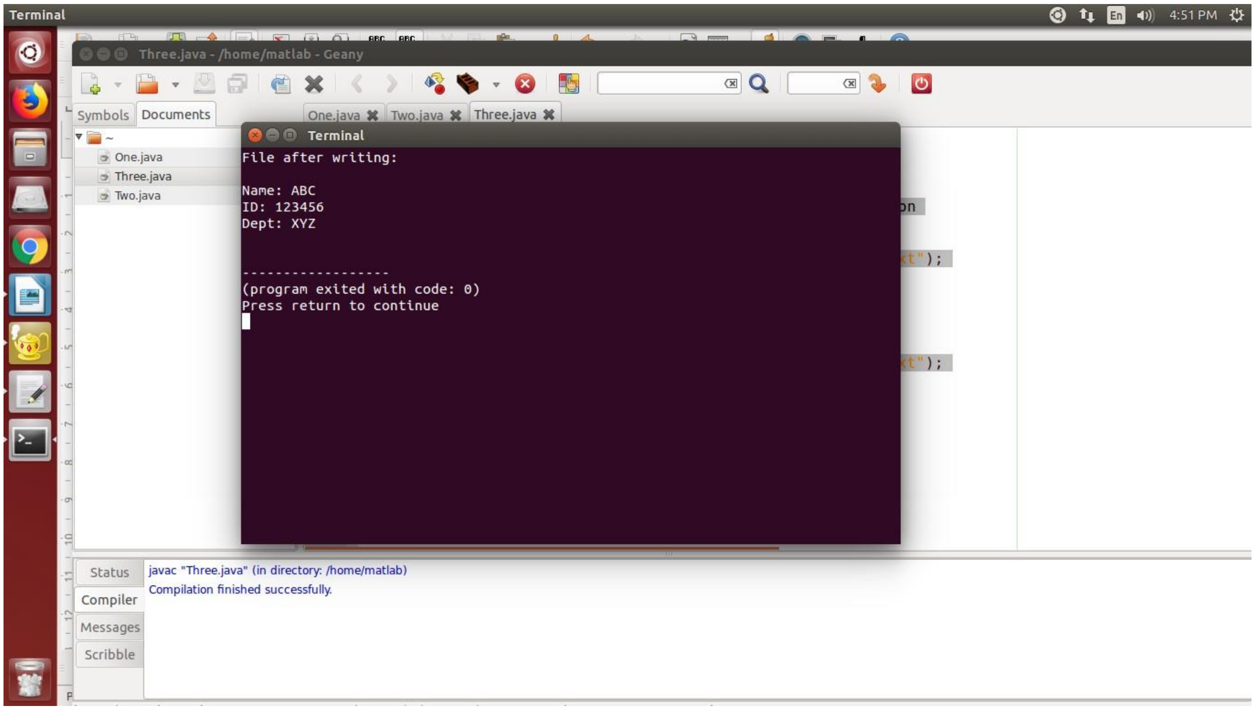
javac "Two.java" (in directory

Compilation finished successfully.

3. **<u>Java Program to Update Details of Employee Using Files.</u>**

```
import java.io.*;
import java.util.Scanner;
class q3
{
     public static void main(String[] args) throws IOException
     {
          Scanner sc = new Scanner(System.in);
          FileWriter fw = new
FileWriter("/home/matlab/file.txt");
          fw.write("Name: ABC\n");
          fw.write("ID: 123456\n");
          fw.write("Dept: XYZ\n");
```

```
        fw.close();

        FileReader fr = new
FileReader("/home/matlab/file.txt");
        String s="";
        int i;
        System.out.println("File after writing: \n");
        while((i = fr.read())!= -1)
            System.out.print((char)i);
    }
}
```



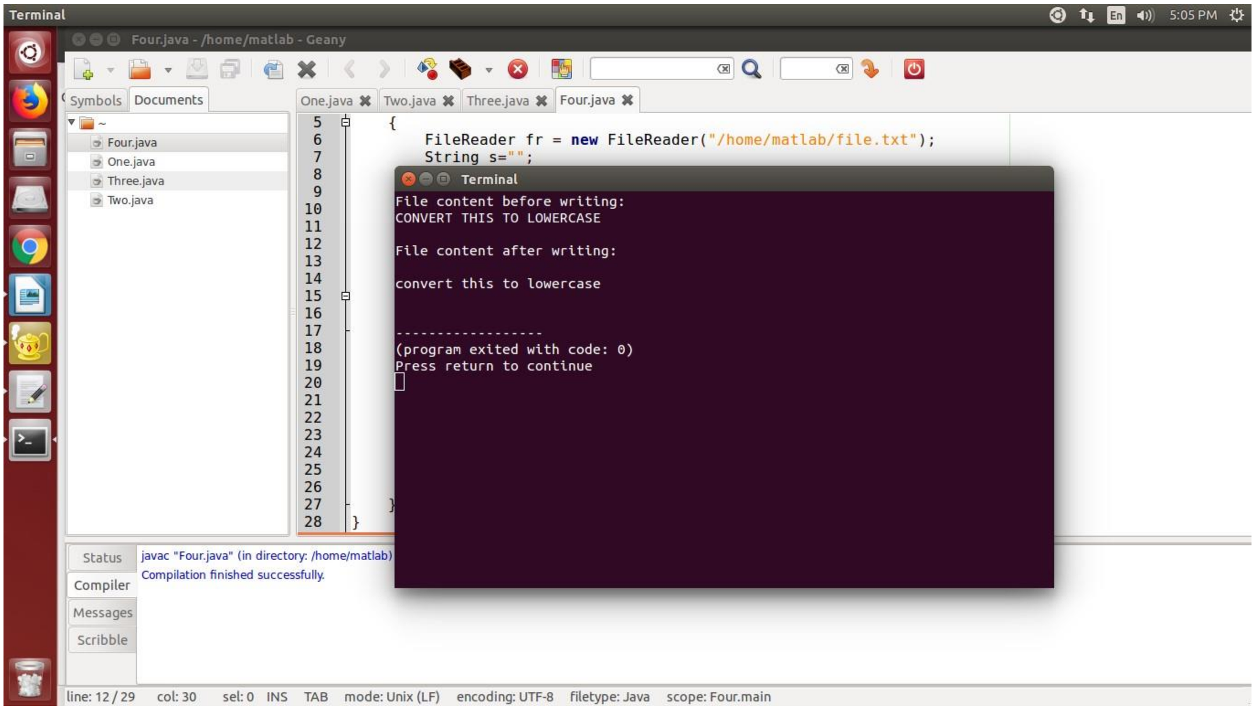
```
File after writing:

Name: ABC
ID: 123456
Dept: XYZ


------------------
(program exited with code: 0)
Press return to continue
```

javac "Three.java" (in directory: /home/matlab)
Compilation finished successfully.

4. Java Program to Convert the Content of File to LowerCase

```
import java.io.*;
```

```
class q4
{
    public static void main(String[] args) throws IOException
    {
        FileReader fr = new
FileReader("/home/matlab/file.txt");
        String s="";
        int i;
        System.out.println("File content before writing:");
        while((i = fr.read())!= -1)
            s+=Character.toString((char)i);
        System.out.println(s);
        String fin = "";
        for(int j=0;j<s.length();j++)
        {
            fin+=Character.toLowerCase(s.charAt(j));
        }

        FileWriter fw = new
FileWriter("/home/matlab/file.txt");
        fw.write(fin);
        fw.close();

        FileReader fr2 = new
FileReader("/home/matlab/file.txt");
        System.out.println("File content after writing: \n");
        while((i = fr2.read())!= -1)
            System.out.print((char)i);
    }
}
```



```
    {
        FileReader fr = new FileReader("/home/matlab/file.txt");
        String s="";
```

```
File content before writing:
CONVERT THIS TO LOWERCASE

File content after writing:

convert this to lowercase


------------------
(program exited with code: 0)
Press return to continue
```

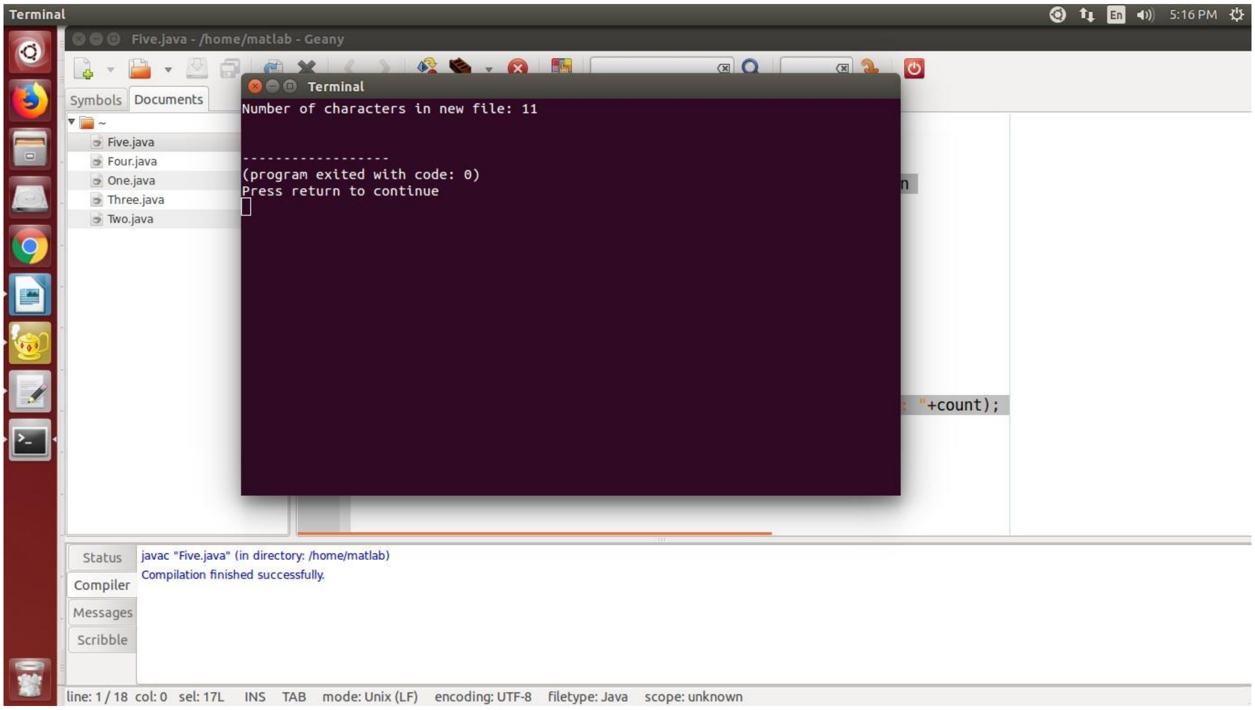
```
javac "Four.java" (in directory: /home/matlab)
Compilation finished successfully.
```

line: 12 / 29 col: 30 sel: 0 INS TAB mode: Unix (LF) encoding: UTF-8 filetype: Java scope: Four.main

5. Java Program to Create and Count Number of Characters in a File.

```
import java.io.*;
class Five
{
        public static void main(String[] args) throws IOException
        {
                int i,count=0;
                String writingString = "Hello World";
                File f = new File("/home/matlab/NewFile.txt");
                FileWriter fw = new FileWriter(f);
                fw.write(writingString);
                fw.close();
                FileReader fr = new FileReader(f);
```

```
            while((i = fr.read())!= -1)
                count++;
            System.out.println("Number of characters in new file: 
"+count);
        }
```



```
Number of characters in new file: 11


------------------
(program exited with code: 0)
Press return to continue
```

```
javac "Five.java" (in directory: /home/matlab)
Compilation finished successfully.
```

```
line: 1 / 18  col: 0  sel: 17L   INS   TAB   mode: Unix (LF)   encoding: UTF-8   filetype: Java   scope: unknown
```

6. Java Program to Join Lines of Two given Files and Store them in a New file

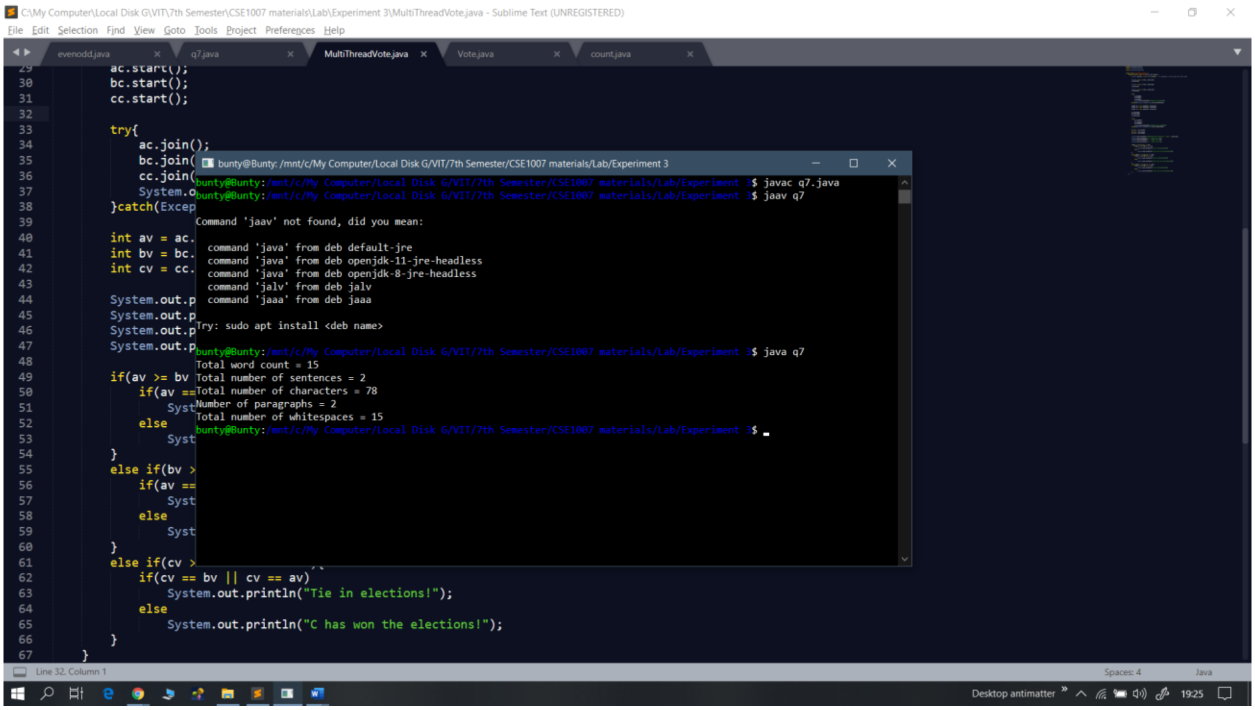
```
import java.io.*;

public class FileMerge
{
    public static void main(String[] args) throws IOException
    {
        // PrintWriter object for file3.txt
        PrintWriter pw = new PrintWriter("file3.txt");

        // BufferedReader object for file1.txt
        BufferedReader br1 = new BufferedReader(new 
FileReader("file1.txt"));
```

```
            BufferedReader br2 = new BufferedReader(new
FileReader("file2.txt"));


            String line1 = br1.readLine();
            String line2 = br2.readLine();

            // loop to copy lines of
            // file1.txt and file2.txt
            // to file3.txt alternatively
            while (line1 != null || line2 !=null)
            {
                  if(line1 != null)
                  {
                        pw.println(line1);
                        line1 = br1.readLine();
                  }

                  if(line2 != null)
                  {
                        pw.println(line2);
                        line2 = br2.readLine();
                  }
            }

            pw.flush();

            // closing resources
            br1.close();
            br2.close();
            pw.close();

            System.out.println("Merged file1.txt and file2.txt
alternatively into file3.txt");
      }
}
```

7. Java Program to Collect Statistics of a Source File like Total Lines, Total no. of Blank Lines, Total no. of Lines Ending with Semicolon

```
// Java program to count the
// number of characters in a file
import java.io.*;

public class q7
{
      public static void main(String[] args) throws IOException
      {
            File file = new File("C:\\input.txt");
            FileInputStream fileStream = new
FileInputStream(file);
            InputStreamReader input = new
InputStreamReader(fileStream);
            BufferedReader reader = new BufferedReader(input);

            String line;

            // Initializing counters
            int countWord = 0;
            int sentenceCount = 0;
            int characterCount = 0;
            int paragraphCount = 1;
            int whitespaceCount = 0;

            // Reading line by line from the
            // file until a null is returned
            while((line = reader.readLine()) != null)
            {
                  if(line.equals(""))
                  {
                        paragraphCount++;
                  }
                  if(!(line.equals("")))
                  {

                        characterCount += line.length();

                        // \\s+ is the space delimiter in java
                        String[] wordList = line.split("\\s+");

                        countWord += wordList.length;
```

```
                                whitespaceCount += countWord -1;

                                // [!?.:]+ is the sentence delimiter in
java
                                String[] sentenceList =
line.split("[!?.:]+");

                                sentenceCount += sentenceList.length;
                        }
                }

                System.out.println("Total word count = " + countWord);
                System.out.println("Total number of sentences = " +
sentenceCount);
                System.out.println("Total number of characters = " +
characterCount);
                System.out.println("Number of paragraphs = " +
paragraphCount);
                System.out.println("Total number of whitespaces = " +
whitespaceCount);
        }
}
```



C:\My Computer\Local Disk G\VIT\7th Semester\CSE1007 materials\Lab\Experiment 3\MultiThreadVote.java - Sublime Text (UNREGISTERED)
File Edit Selection Find View Goto Tools Project Preferences Help
evenodd.java
q7.java
MultiThreadVote.java
Vote.java
count.java
bunty@Bunty: /mnt/c/My Computer/Local Disk G/VIT/7th Semester/CSE1007 materials/Lab/Experiment 3
Line 32, Column 1
Spaces: 4
Java
Desktop antimatter
19:25

```
bunty@Bunty:/mnt/c/My Computer/Local Disk G/VIT/7th Semester/CSE1007 materials/Lab/Experiment 3$ javac q7.java
bunty@Bunty:/mnt/c/My Computer/Local Disk G/VIT/7th Semester/CSE1007 materials/Lab/Experiment 3$ jaav q7

Command 'jaav' not found, did you mean:

  command 'java' from deb default-jre
  command 'java' from deb openjdk-11-jre-headless
  command 'java' from deb openjdk-8-jre-headless
  command 'jalv' from deb jalv
  command 'jaaa' from deb jaaa

Try: sudo apt install <deb name>

bunty@Bunty:/mnt/c/My Computer/Local Disk G/VIT/7th Semester/CSE1007 materials/Lab/Experiment 3$ java q7
Total word count = 15
Total number of sentences = 2
Total number of characters = 78
Number of paragraphs = 2
Total number of whitespaces = 15
bunty@Bunty:/mnt/c/My Computer/Local Disk G/VIT/7th Semester/CSE1007 materials/Lab/Experiment 3$
```

```
        ac.start();
        bc.start();
        cc.start();

        try{
            ac.join();
            bc.join(
            cc.join(
            System.o
        }catch(Excep

        int av = ac.
        int bv = bc.
        int cv = cc.

        System.out.p
        System.out.p
        System.out.p
        System.out.p

        if(av >= bv
            if(av ==
                Syst
            else
                Syst
        }
        else if(bv >
            if(av ==
                Syst
            else
                Syst
        }
        else if(cv >
            if(cv == bv || cv == av)
                System.out.println("Tie in elections!");
            else
                System.out.println("C has won the elections!");
        }
    }
```