**Q1)**

Write a java program to check whether a number is emirp number or not

Example:

13, 17, 31, 37, 71, 73, 79, 97, 107, 113, 149, 157, 167, 179, 199

**Algorithm**

1. START
2. Take input form user
3. Execute a loop from i=2 to i<(n/2)
4. Check if n is divisible by I from 2 to n/2
5. If I is not divisible by any value of I then n is prime
6. If I is divisible by any value of I then print “invalid input” and exit program
7. To find the reverse of n calculate the n%10 and add to the reverse number
8. Update n by n/10
9. Now check if the reverse number is prime or not
10. Repeat steps 3 to 5 to check for prime number
11. If reverse number is prime number print n is an Emirp number otherwise print n is not an Emirp number
12. END

**Source code**

import java.util.Scanner;

public class Emirp{

public static boolean isPrime(int num){

if(num<=1)

return false;

for(int i=2;i<(num/2);i++){

if(num%i==0)

return false;

}

return true;

}

public static void main(String args[]){

Scanner nrt=new Scanner(System.in);

System.out.println(“enter a number”);

int user=nrt.nextInt();

if(isPrime(user)){

//reversing the number

int copy=user,reverse=0;

while(copy!=0){

reverse = (reverse\*10) +(copy%10);

copy/=10;

}

if(isPrime(reverse))

System.out.println(user+” is an Emirp Number”);

else

System.out.println(user+” is NOT an Emirp Number”);

}

else

System.out.println(“Invalid Input”);

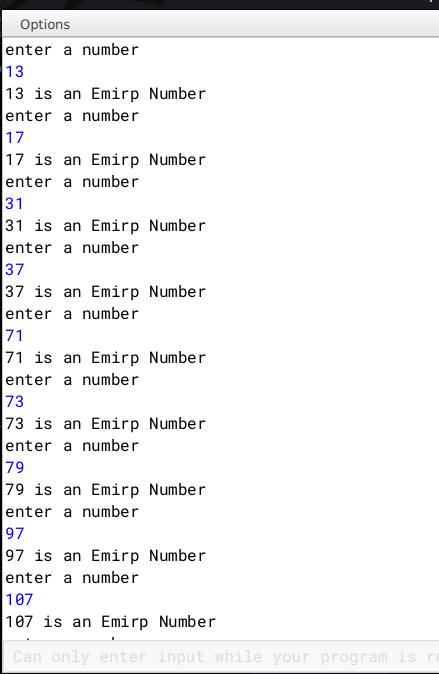
}

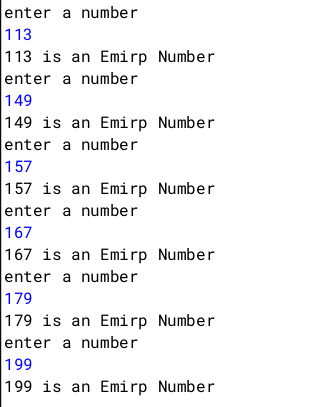
}

Variable Description Table

|  |  |  |
| --- | --- | --- |
| Variable name | Data type | Use |
| num | int | Argument for isPrime method |
| nrt | Wrapper object | For taking input |
| user | int | To store the input |
| copy | int | To store a copy of user variable’s value |
| reverse | int | To store the reverse of user |

**Output**





**Q2)**

A Circular Prime is a prime number that remains prime under cyclic shifts of its digits. When the leftmost digit is removed and replaced at the end of the remaining string of digits, the generated number is still prime. The process is repeated until the original number is reached again.

A number is said to be prime if it has only two factors 1 and itself.

Example:

131

311

113

Hence, 131 is a circular prime.

Write a program to accept a positive number N and check whether it is a circular prime or not. The new numbers formed after the shifting of the digits should also be displayed.

Test your program with the following data and some random data:

Example 1

INPUT:

N = 197

OUTPUT:

197

971

719

197 IS A CIRCULAR PRIME.

Example 2

INPUT:

N = 1193

OUTPUT:

1193

1931

9311

3119

1193 IS A CIRCULAR PRIME.

Example 3

INPUT:

N = 29

OUTPUT:

29

92

29 IS NOT A CIRCULAR PRIME.

**Algorithm**

1. Start.

2. Input a number n.

3. Find if the number is prime.

4. Declare a function isPrime() to check prime.

5. Execute loop from i=1 to i<=n.

6. If n is divisible by any i then count the number of times it gets divisible by doing c++.

7. If c==2, then the number n is prime .

8. If not then stop otherwise go to next step.

9. Calculate the length (l) of the number by converting n into string.

10. Then find the divisor=(int)(Math.pow(10,l-1)).

11. Store a copy of n in m.

12. Execute a loop from i=0 to i<l to generate new circulated numbers.

13. Calculate the quotient=n1/divisor and the remainder=n2%divisor.

14. To generate the new circulated number(m) follow the next step.

15. m=r\*10+n1;

16. Call the function isPrime() to check whether new number(m) is prime.

17. If m is not prime then break;

18. If all the numbers are prime then print it is a circular prime otherwise not a circular

prime.

19. Stop

**Source Code**

import java.util.Scanner;

class CircularPrime{

static boolean isPrime(int num) {

int c = 0;

for (int i = 2; i <= num/2; i++)

{ if (num % i == 0){

c++;

}

}

if(c==2)

System.out.println(num+"is prime");

else

System.out.println(num+"is not prime");

return c == 2;

}

public static void main(String args[]){

Scanner in = new Scanner(System.in);

System.out.print("Enter the number: ");

int n = in.nextInt();

int f=1;

if (isPrime(n)){

//System.out.println(n);

String s=Integer.toString(n);

int l=s.length();

int divisor = (int)(Math.pow(10, l- 1));

int m = n;

for (int i = 1; i < l; i++){

int n1 = m / divisor;

int n2 = m % divisor;

m = n2 \* 10 + n1;

//System.out.println(m);

if (!isPrime(m)) {

f=0;

break;

}

}

}

else {

f=0;

}

if (f==1){

System.out.println(n + " is a circular prime.");

}

else {

System.out.println(n + " is not a circular prime.");

}

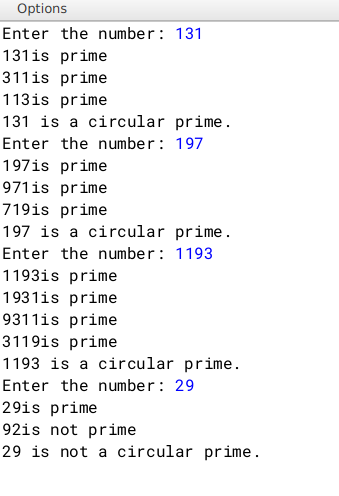
}

}

**Variable Description Table**

|  |  |  |
| --- | --- | --- |
| Variable name | Data type | Use |
| num | int | Argument for isPrime method |
| in | Wrapper object | For taking input |
| n | int | To store the input |
| m | int | Stores a copy of n |
| n1 | int | Stores quotient |
| n2 | int | divisor |
| copy | int | To store a copy of user variable’s value |
| c | int | To check if a number is prime or not |
| l | int | Stores length of n |
| s | String | Stores String form of n |
| divisor | int | Stores the divisor |

**Output**



**Q3**)

Write a program to declare a square matrix M [ ] [ ] of order ‘N’ where ‘N’ must be greater than 3 and less than 10. Allow the user to accept three different characters from the keyboard and fill the array according to the instruction given below:

(i) Fill the four corners of the square matrix by character 1.

(ii) Fill the boundary elements of the matrix (except the four corners) by character 2.

(iii) Fill the non-boundary elements of the matrix by character 3.

Test your program with the following data and some random data:

INPUT: N = 5

FIRST CHARACTER: A

SECOND CHARACTER: C

THIRD CHARACTER: X

OUTPUT:

A C C C A

C X X X C

C X X X C

C X X X C

A C C C A

INPUT: N = 4

FIRST CHARACTER: @

SECOND CHARACTER: ?

THIRD CHARACTER: #

OUTPUT:

@ ? ? @

? # # ?

? # # ?

@ ? ? @

**Algorithm**

1 START

2 Ask user to input three characters.

3 Ask user to input the order of matrix 'M'.

4 Declare a two dimensional array of type char with name 'M'.

5 Start a for loop for(int i=0;i<n;i++).

6 Start a for loop inside as for(int j=0;j<n;j++)

7 If (i and j are both zero) or (either i is zero and j is n-1) or (i is

n-1 and j is zero) or (both i and j are n-1), then

fill two dimensional array M at location M[i][j] with the

first character the user has given as input.

8 If i and j lies between 1 and n-2 then fill two dimensional array M at

location M[i][j] with the second character user has given.

9 Else fill M[i][j] with the third character given as input by the user.

10 Run two nested loops as for(int i=0;i<n;i++) and inside

for(int j=0;j<n;j++) and print all elements.

11 END

**Source Code**

import java.util.Scanner;

public class Matrix{

public static void main(){

Scanner nrt=new Scanner(System.in);

System.out.println("Enter three characters");

char ch1,ch2,ch3;

ch1=(nrt.nextLine()).charAt(0);

ch2=(nrt.nextLine()).charAt(0);

ch3=(nrt.nextLine()).charAt(0);

System.out.println("Enter order of Matrix");

int n=nrt.nextInt();

char M[][]= new char[n][n];

for(int i=0;i<n;i++){

for(int j=0;j<n;j++){

if( (i==0 && j==0) || (i==0 && j==n-1) || (i==n-1 && j==0) || (i==n-1 && j==n-1))

M[i][j]=ch1;

else if ( (i>=1 && i<=(n-2)) && (j>=1 && j<=(n-2)))

M[i][j]=ch2;

else

M[i][j]=ch3;

}

}

//printing the matrix

for(int i=0 ;i<n;i++){

for(int j=0; j<n;j++){

System.out.print("\t"+M[i][j]);

}

System.out.println();

}

nrt.close();

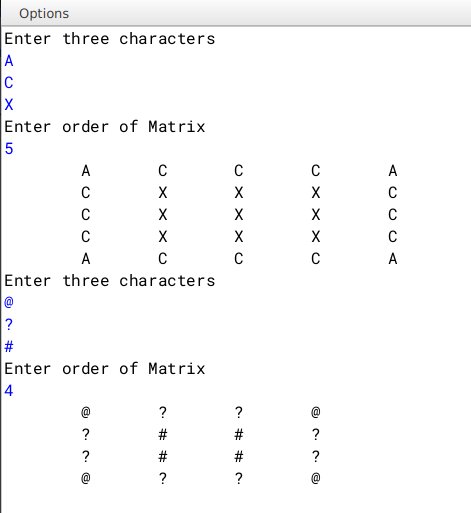
}

}

**Variable Description Table**

|  |  |  |
| --- | --- | --- |
| Type | Name | Description |
| char | M | Two dimensional array to store the characters |
| int | i ,j | Loop variables |
| Int | n | Stores the order of the matrix |
| char | ch1 ,ch2,ch3 | Stores the first, second and third characters given as input by the user respectively |

**Output**



**Q4**)

Write a program to declare a square matrix a[][] of order M× M, where M is a positive integer and represents rows and columns for the matrix. M should be greater than 2 and less than 10. Accept the value of M from the user. Display an appropriate message for an invalid input.

Perform the following tasks:

a) Display the original matrix.

b) Find the sum of the elements in each row of the matrix and display them.

c) Find the sum of the elements in each column of the matrix and display them.

d) Find the sum of the elements of left and right diagonals of the matrix and display them.

Example 1:

INPUT:

M = 3

1 2 3

2 4 5

3 5 6

OUTPUT:

1 2 3

2 4 5

3 5 6

Sum of row1 = 6

Sum of row2 = 11

Sum of row3 = 14

Sum of column1 = 6

Sum of column2 = 11

Sum of column3 = 14

Sum of the left diagonal = 11

Sum of the right diagonal = 10

Example 2:

INPUT:

M = 4

7 8 9 2

4 5 6 3

8 5 3 1

7 6 4 2

OUTPUT:

7 8 9 2

4 5 6 3

8 5 3 1

7 6 4 2

Sum of row1 = 26

Sum of row2 = 18

Sum of row3 = 17

Sum of row4 = 19

Sum of column1 = 26

Sum of column2 = 24

Sum of column3 = 22

Sum of the left diagonal = 17

Sum of the right diagonal = 20

**Algorithm**

1 START

2 Take input for the order of matrix as 'n'

3 Declare and initialise a two dimensional array as int M[][] =

new int[n][n]. This will set order of 'M' as n X n

4 Initialise variables with names r\_sum, c\_sum, l\_d\_sum, r\_d\_sum( standing for

row sum, column sum, left diagonal sum, right diagonal sum) as type int

and declare their values to be zero

5 Run a for loop as for(int i=o;i<n;i++) and inside another nested loop

as for(int j=0;i<n;j++)

6 Inside nested loop, take input for two dimensional array M

7 After taking input, run another nested loop as Line 5 and print the array

8 Run another nested loop as in Line 5

9 Inside the inner loop, store value of r\_sum and c\_sum as r\_sum+= M[i][j]

and c\_sum+= M[j][i] respectively

10 Check if (i==j), if true then store value of l\_d\_sum as

l\_d\_sum+= M[i][j]

11 Check if (i+j)==(n-1), if true then store value of r\_d\_sum as

r\_d\_sum += M[i][j]

12 Outside the inner loop, print values of r\_sum and c\_sum after every iteration

and re-initialise their values with zero

13 Outside the nested loop. print the values of left diagonal sum and

right diagonal sum as l\_d\_sum and r\_d\_sum respectively

14 END

**Source Code**

import java.util.Scanner;

public class Sum{

public static void main(String args[]){

Scanner nrt=new Scanner(System.in);

int n,r\_sum=0,c\_sum=0,l\_d\_sum=0,r\_d\_sum=0;

System.out.println("Enter the order of Matrix");

n=nrt.nextInt();

int M[][]=new int[n][n];

for(int i=0;i<n;i++){

for(int j=0;j<n;j++){

System.out.println("Enter value at row "+i+" and column "+j);

M[i][j]=nrt.nextInt();

}

}

// printing the array

for(int i=0;i<n;i++){

for(int j=0;j<n;j++){

System.out.print("\t"+M[i][j]);

}

System.out.println();

}

//condition checking and finding out the sums

int i,j=0;

for(i=0;i<n;i++){

for(j=0;j<n;j++){

r\_sum+= M[i][j];

c\_sum+= M[j][i];

if(i==j)

l\_d\_sum+= M[i][j];

if((i+j)==(n-1))

r\_d\_sum+= M[i][j];

}

System.out.println("Sum of row "+i+" is "+r\_sum+"\nSum of column "+j+" is "+c\_sum);

r\_sum=0;

c\_sum=0;

}

System.out.println("Sum of left diagonal elements of the matrix = "+l\_d\_sum+"\nSum of right diagonal elements of the matrix = "+r\_d\_sum);

nrt.close();

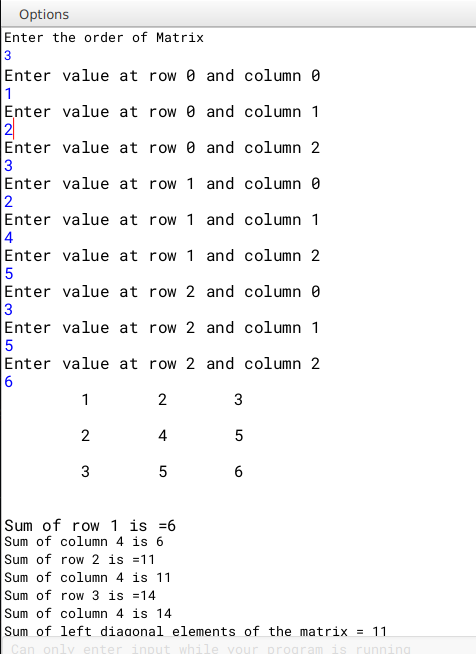
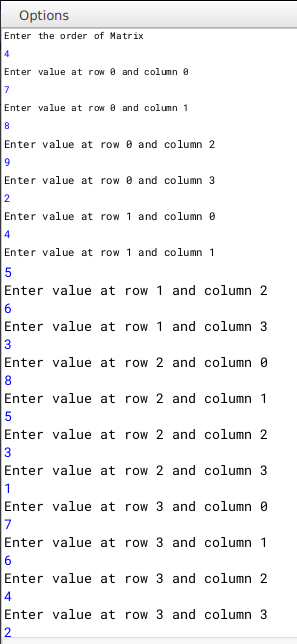
}

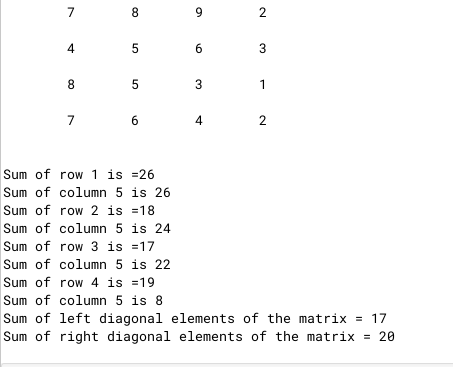
}

**Variable Description Table**

|  |  |  |
| --- | --- | --- |
| Variable Name | Type | Description |
| n | int | Order of two dimensional array |
| r\_sum | int | stores sum of a particular row |
| c\_sum | int | stores sum of a particular column |
| l\_d\_sum | int | store sum of left diagonal elements |
| r\_d\_sum | int | store sum of right diagonal elements |
| i,j | int | loop variable |
| M | int | Two dimensional array |

**Output**





**Q5)**

|  |  |
| --- | --- |
| **Class Name** | **TheString** |
| **Data members/ instance variables** |  |
| str | to store a string |
| len | integer to store length of string |
| wordcount | Integer to store number of words |
| cons | integer to store number of consonants |
| **Member functions/methods** |  |
| TheString() | Default constructor to initialize  Data members |
| TheString(String ds) | Parameterized constructor to assign str=ds |
| Void countFreq() | to count the number of words and the number of consonants and store them in wordcount and cons respectively |
| Void display() | To display the original string, along with the number of words and the number of consonants |

**Specify the class TheString giving the details of the constructors, void countFreq() and void Display(). Define the main() function to create an object and call the functions accordingly to enable the task.**

**Algorithm**

1. START

2. Declare class with name TheString

3. Declare variables str(String type) and wordcount, len, cons(all three of int

type)

4. Declare a default constructor and inside set str="", wordcount=0, len=0,

cons=0

5. Declare a parameterised constructor and set str=(ds.trim()).toUpperCase(), where ds is the parameter passed while calling the object of TheString class

6. Set len=str.length(),wordcount=0, cons=0

7. Declare a countFreq method and declare an String array d[]=str.split(" ").

This stores the words in that sentence. Set wordcount=d.length()

8. Run a for each loop to iterate through array d

9. Run a inner loop i=0; i<tmp.length() and declare a char tmp\_c=tmp.charAt(i)

10. Check if tmp\_c is a special character or not. If it is then continue

11. Check if tmp\_c is not a vowel. If not a vowel, increase value of cons by 1

12. Declare display method and print the original string, wordcount, cons

13. Declare a main method and take a string input.

14. Create an object of class TheString and pass the user input as a parameter

15. Call TheString class's countFreq and display method

**Source Code**

import java.util.Scanner;

public class TheString{

String str,copy;

int len,wordcount,cons;

TheString(){

str="";

wordcount=0;len=0;cons=0;

}

TheString(String ds){

copy=ds;

str=(ds.trim()).toUpperCase();

len=str.length();

cons=0;wordcount=0;

}

void countFreq(){

String d[]=str.split(" ");

wordcount=d.length;

for(String tmp: d){

for(int i=0;i<tmp.length();i++){

char tmp\_c=tmp.charAt(i);

if(tmp\_c=='.' || tmp\_c==',' || tmp\_c==' ' || tmp\_c=='\*' || tmp\_c=='\'')

continue;

if(tmp\_c!='A' && tmp\_c!='E' && tmp\_c!='I' && tmp\_c!='O' && tmp\_c!='U')

cons++;

}

}

}

void display(){

System.out.println("Original String ="+copy+"\nwordcount = "+wordcount+"\nnumber of consonants = "+(cons));

}

public static void main(){

Scanner nrt=new Scanner(System.in);

System.out.println("Enter a sentence");

String user=nrt.nextLine();

TheString obj1= new TheString(user);

obj1.countFreq();

obj1.display();

nrt.close();

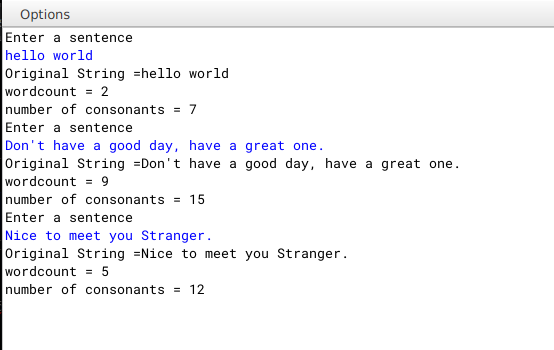
}

}

**Variable Description Table**

|  |  |  |
| --- | --- | --- |
| Variable Name | Type | Description |
| str | String | stores the user input |
| len | int | stores length of str |
| wordcount | int | stores the number of words in str |
| cons | int | stores the number of consonants in the sentence |
| tmp | String | loop variable |
| tmp\_c | char | temporary character for condition checking |
| d | String | an array to store the words in str |
| user | String | stores user input in main method |
| copy | String | stores a copy of the original user input |
| obj1 | class object | Object of TheString |

**Output**



**Q6)**

A Happy number is a number in which the eventual sum of the square of the digits of the number is equal to 1.

2012

e.g. 28 = (2)2 + (8)² = 4 + 64 = 68

68 = (6)² +(8) 2 = 36+ 64 = 100

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100 = (1)2 + (0)2 + (0)2=1+0+0=1 notional

Hence, 28 is a happy number.

e.g. 12 = (1)2 + (2)²=1+4 = 5

Hence, 12 is not a happy number.

Design a class Happy to check if a given number is a happy number. Some of the members of the class are given below:

|  |  |
| --- | --- |
| Class name: | Happy |
| Data members/instance variables |  |
| n | store the numbers |
| Member functions |  |
| Happy () | constructor to assign 0 to n |
| void getnum (int nn) | to assign the parameter value to the number n = nn |
| int sum\_sq\_digits (int x) | returns the sum of the square of the digits of the number x |
| void ishappy() | checks if the given number is a happy number by calling the function sum\_sq\_digits (int) and displays an appropriate message. |

Specify the class Happy giving details of the constructor(), void getnum(int). int sum sq\_digits (int) and void ishappy(). Also define a main() function to create an object and call the methods to check for happy number.

**Algorithm**

**Source code**

**Variable Description Table**

**Output**

**Q7)**

Input a sentence from the user and count the number of times, the words “an” and “and” are present in the sentence. Design a class Frequency using the description given below:

Class name : Frequency

Data Members/ variables :

Text : stores the sentence

Countand : to store the frequency of the word “and”

Countan : to store the frequency of the word “an”

Len : stores the length of the string

Member functions / methods:

Frequency( ) :constructor to initialize the instance variables

void accept(String n):to assign n to text,where the value of the parameter n should be in lower case.

void checkandfreq( ):to count the frequency of “and”

void checkanfreq( ) :to count the frequency of “an”

void display( ) :to display the number of”and” and “an” with appropriate messages.

Specify the class Frequency giving details of the constructor( ), void accept(String),void checkandfreq(),void checkanfreq( ) and void display( ).Also define the main( ) function to create an object and call methods accordingly to enable the task.

**Algorithm**

1. START

2. Declare class with name Frequency

3. Declare variables text(String type) and countand,countan, len(all of int type

4. Declare a default constructor and inside set values of text="" and 0 for len,countand,countan

5. Declare a accept method to accept the string form user and set text=n

6. Declare a checkandfreq method to count the frequency of "and"

7. Inside declare and initialise a String array d[]=text.split(" ")

8. Run a for each loop and check if tmp.equals("and")

9. Declare a checkanfreq method to count the frquency of "an"

10. Repeat step 7

11. Run a for each loop and check if tmp.equals("an")

12. Declare a display method to print the frequencies of "and" and "an"

13. Declare a main method to take input from user.

14. Create a object of Frequency class and call accept method,checkandfreq,

checkanfreq,display

15. END

**Source Code**

import java.util.Scanner;

public class Frequency{

String text;

int countand,countan,len;

Frequency(){

text="";

countand=0;

countan=0;

len=0;

}

void accept(String n){

text=(n.trim()).toLowerCase();

len=text.length();

}

void checkandfreq(){

String d[]=text.split(" ");

for(String tmp:d){

if(tmp.equals("and"))

countand++;

}

}

void checkanfreq(){

String d[]=text.split(" ");

for(String tmp:d){

if(tmp.equals("an"))

countan++;

}

}

void display(){

System.out.println("Frequency of and = "+countand+"\n an = "+countan+"\nlength of string = "+(text.length()));

}

public void main(){

Scanner nrt=new Scanner(System.in);

System.out.println("enter a sentence");

String user=nrt.nextLine();

Frequency F=new Frequency();

F.accept(user);

F.checkandfreq();

F.checkanfreq();

F.display();

nrt.close();

}

}

**Variable Description Table**

|  |  |  |
| --- | --- | --- |
| **Variable name** | **Type** | **Description** |
| **text** | **String** | **to store user input** |
| **len** | **int** | **to store length of text** |
| **countand** | **int** | **to store frequency of "and"** |
| **countan** | **int** | **to store frequency of "an"** |
| **tmp** | **String** | **loop variable** |
| **F** | **class object** |  |
| **d** | **String array** | **stores the words in text** |

**Output**

