

A
PRACTICALON

(IT11L)

Java Programming

&

Data Structure and Algorithms

SUBMITTEDBY

Ms.Sakshi Nitin Chaudhari

SUBMITTEDTO

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

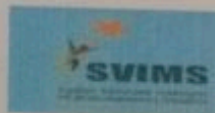
IN PARTIAL FULFILLMENT OF DEGREE

MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF

Prof.GirishBal & Prof.OmkarBarve

Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

CERTIFICATE



This is to certify that **Ms. Sakshi Nitin Chaudhari** student of Master of Computer Application SEM I has satisfactorily completed all the practicals in the subject: **IT11L-Java Programming & Data Structures & Algorithms** for the purpose of Practical Examination-December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023- 24.

RollNo:23501

SeatNo:8223

GBL
Sign of Internal Practical Incharge

Rajesh Kashyap
Dr. Rajesh Kashyap

HOD-MCA

[Signature]
Sign of External Examiner

B. H. Nanwani
Dr. B. H. Nanwani

Date:



Director

DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

SAKSHI CHAUDHARI

Roll No. 23501

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

MCA I – SEMESTER I

IT11 Java Programming - Practical

INDEX

| S# | Practical List | Due Date | Sign/Remarks |
|-----|---|-----------|--------------|
| 1. | Fibonacci Series in java | 20-Sep-23 | GBD |
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Sakshi Chaudhari
23501

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
IT-11L – Data Structure and Algorithm Practicals
Lab Assignments

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A
PRACTICAL ON
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Java Programming
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SUBMITTED BY
Ms. Sayma Tamboli

SUBMITTED TO
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IN PARTIAL FULFILLMENT OF DEGREE
MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF
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Through,



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2023-24

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RollNo: 23503

SeatNo: 8263

G Bal

Sign of Internal Practical Incharge

Rajesh Kashyap

Dr. Rajesh Kashyap
HOD-MCA

Aiz

Sign of External Examiner

B. H. Nanwani

Dr. B. H. Nanwani

Date:

Director

DR. B. H. NANWANI
DIRECTOR

SADHU YASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGADN ROAD, PUNE-411 001

Place:Pune



Sayma Tambali 23503

Sadhu Vaswani Institute of Management Studies for Girls
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ITI1 Java Programming - Practical
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Sayma Tamboli 23503

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

MCA I – SEMESTER I

IT-III – Data Structure and Algorithm Practicals
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Roll No: 23504

Seat No: 8252

G. Bad

Sign of Internal Practical Incharge

[Signature]

Dr. Rajesh Kashyap,

HOD-MCA

[Signature]

Sign of External Examiner

Date:



[Signature]

Dr. B.H. Nanwani,

Director of SVIMS

DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Name :- Pranali Pandurang Pokode

Roll no :- 23504

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

MCA I - SEMESTER I

IT11 Java Programming - Practical

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Pranali

Name -: Pranali Pandurang Rokde

Roll NO -: 23504

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ACADEMIC YEAR 2023-24
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
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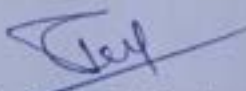


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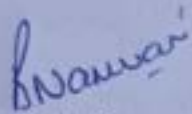

Sign of Internal Practical Incharge


Dr. Rajesh Kashyap
HOD-MCA


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Date:




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A
PRACTICAL ON
(IT11L)
Java Programming
&
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SUBMITTED BY
Ms. Kadlag saumitee

SUBMITTED TO
SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN PARTIAL FULFILLMENT OF DEGREE
MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF
Prof. Girish Bal & Prof. Omkar Barve

Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

Certificate



This is to certify that **Ms. Saumitee Vijay Kadlag** student of Master of Computer Application SEM I has satisfactorily completed all the practicals in the subject: **IT11L-Java Programming & Data Structures & Algorithms** for the purpose of Practical Examination-December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023-24.

Roll No: 23505

Seat No: 8235

G.B.
Sign of Internal Practical Incharge

[Signature]
Dr. Rajesh Kashyap
HOD-MCA

[Signature]
Sign of External Examiner

Date:



[Signature]
Dr. B.H. Nanwani

Director
DR. B. H. NANWANI
DIRECTOR

SADHU NANWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Name: Kadlag Saumitee VIJAY
Roll NO: 23505.

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
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SUBMITTED BY

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Seat No: 8254

G.Bal
Sign of Internal Practical Incharge

Rajesh
Dr. Rajesh Kashyap
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Az
Sign of External Examiner

Date:



B.Nanwani
Dr. B.H. Nanwani

Director

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SADHU YASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGADN ROAD, PUNE-411 001

Sakshi Mohan Toraskar - 28506

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A. S.
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Sakshi Mohan Toraskar - 23506

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Java Programming
&
Data Structure and Algorithms

SUBMITTED BY

Ms. Pratiksha Manoj Jadhav

SUBMITTED TO

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

IN PARTIAL FULFILLMENT OF DEGREE

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Through,



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Roll No: 23507

Seat No: 8233

G. B. J.

Sign of Internal Practical Incharge

[Signature]

Dr. Rajesh Kashyap

HOD-MCA

Sign of External Examiner

Date:



[Signature]

Dr. B.H. Nanwani

Director

DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Place: Pune

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Roll No: 23508

Seat No: 8226

GB
Sign of Internal Practical Incharge

Rajesh Kashyap
Dr. Rajesh Kashyap
HOD-MCA

Sign of External Examiner

B. H. Nanwani
Dr. B.H. Nanwani

Date:

Director

Place: Pune



DR. B. H. NANWANI
DIRECTOR
SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Kshitiya Garkwad

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Kchitija Shankar Gaikwad
23508

Sadhu Vaswani Institute of Management Studies for Girls

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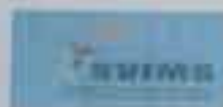
A
PRACTICAL ON
(IT111)
Java Programming
&
Data Structure and Algorithms

SUBMITTED BY
Ms.Sneha Ravindra Kamat

SUBMITTED TO
SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN PARTIAL FULFILLMENT OF DEGREE
MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF
Prof. Girish Bal & Prof. Omkar Barve

Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

CERTIFICATE



This is to certify that **Ms. Sneha Ravindra Kamal** student of Master of Computer Application SEM I has satisfactorily completed all the practicals in the subject: **IT111-Java Programming & Data Structures & Algorithms** for the purpose of Practical Examination—December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023-24.

Roll No: 23509

Seat No: 8230


Sign of Internal Practical Incharge


Dr. Rajesh Kashyap
HOD-MCA

Sign of External Examiner


Dr. B.H. Nanwani

Date:



Director
DR. B. H. NANWANI
DIRECTOR
Savitribai Phule Pune University
Campus: Shivajinagar, Pune-411 004

JAVA Practicals

Sadhvi Vaswani Institute of Management Studies for Girls
 ACADEMIC YEAR 2023-24
 MCA I - SEMESTER I
 IT11 Java Programming - Practical
INDEX

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Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

MCA I – SEMESTER I

IT-111 – Data Structure and Algorithm Practicals
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A
PRACTICAL ON
(IT11L)

Java Programming

&

Data Structure and Algorithms

SUBMITTED BY

Ms. Yashvanti Vinayak Gujar

SUBMITTED TO

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

IN PARTIAL FULFILLMENT OF DEGREE

MASTER OF COMPUTER APPLICATION (SEM-I)

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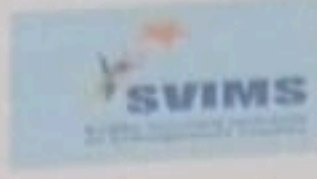
Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

CERTIFICATE



This is to certify that **Ms. Yashvanti Vinayak Gujar** student of Master of Computer Application SEM I has satisfactorily completed all the practicals in the subject: **IT11L-Java Programming & Data Structures & Algorithms** for the purpose of Practical Examination—December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023- 24.

Roll No: 23510

Seat No: 8231

G.Bal
Sign of Internal Practical Incharge

Kashyap
Dr. Rajesh Kashyap

HOD-MCA

[Signature]
Sign of External Examiner



B.Nanwani
Dr. B.H. Nanwani

Date:

Director

DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
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IT11 Java Programming - Practical
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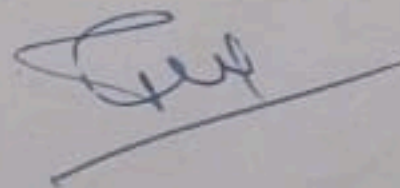
Yashvanti Gujar
23510

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
IT-11L – Data Structure and Algorithm Practicals
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SUBMITTED BY
Ms. Arati Thorat

SUBMITTED TO
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for Girls, Koregaon Park, Pune-411001**

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Roll No: 23511

Seat No: 8219

G.B.

Sign of Internal Practical Incharge

Rajesh

Dr. Rajesh Kashyap
HOD-MCA

Sign of External Examiner

Date: *[Signature]*

Place: Pune



Nanwani

Dr. B.H. Nanwani
Director

DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE 411 001

Name :- Anjali Prady Tharod
Roll No :- 23511

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
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Teer

Name :- Arati Bhandu Thakral
Roll No :- 23511

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
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Ms. Prachi Sunil Gaikwad

SUBMITTED TO
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Roll No: 23512

Seat No: 8248

G. Bal

Sign of Internal Practical Incharge



Dr. Rajesh Kashyap
HOD-MCA

Asi
23/12/23

Sign of External Examiner



Dr. B.H. Nanwani

Date:

Director

DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGADN ROAD, PUNE-411 001

Place: Pune



NAME → Prachi Sunil Gairwad
R.NO → 23512

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
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45

NAME → Prachi .Soni/ Gaikwad
R.No → 23512

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24 MCA I – SEMESTER I IT-11L – Data Structure and Algorithm Practicals Lab Assignments

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Prachi

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PRACTICAL ON
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Java Programming
&
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SUBMITTED BY
Ms. Mokshita Gaur

SUBMITTED TO
SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN PARTIAL FULFILLMENT OF DEGREE
MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF
Prof. Girish Bal & Prof. Omkar Barve

Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

Certificate

This is to certify that **Miss. Mokshita Gaur** student of Master of Computer Application SEM I has satisfactorily completed all the practicals in the subject: **IT11L-Java Programming & Data Structures & Algorithms** for the purpose of Practical Examination-December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023-24.

Roll No: 23513

Seat No: 8228

G. Bal

Sign of Internal Practical Incharge

Rajesh Kashyap

Dr. Rajesh Kashyap
HOD-MCA

Sign of External Examiner

Date:

[Signature]

B. H. Nanwani

Dr. B.H. Nanwani
Director

Place: Pune



DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
K. KOREGAON ROAD, PUNE-411 001

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
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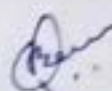
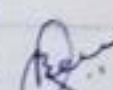
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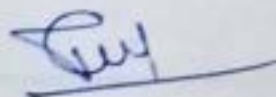
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Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
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(IT11L)

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&

Data Structure and Algorithms

SUBMITTED BY

Ms. Samruddhi Anant Satam

SUBMITTED TO

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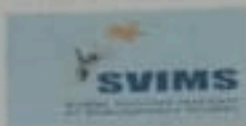
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2023-24

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Roll No: 23514

Seat No: 8258

A handwritten signature in blue ink, appearing to read 'Rajesh Kashyap', is written above the name.

Dr. Rajesh Kashyap

HOD-MCA

A handwritten signature in blue ink, appearing to read 'G. B.', is written above the text.
Sign of Internal Practical Incharge

A handwritten signature in blue ink, appearing to read 'A. H.', is written above the text.
Sign of External Examiner

Date:



A handwritten signature in blue ink, appearing to read 'B. H. Nanwani', is written above the name.
Dr. B.H. Nanwani

Director
DR. B. H. NANWANI
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Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
IT-11L – Data Structure and Algorithm Practicals
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Roll No: 23515

Seat No: 8245

GBJ

Sign of Internal Practical Incharge

[Signature]

Dr. Rajesh Kashyap

HOD-MCA

[Signature]

Sign of External Examiner

[Signature]

Dr. B.H. Nanwani

Director

DR. B. H. NANWANI
DIRECTOR

SADHU VASIBAI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Date:

Place: Pune



Nikita Janny
23515

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
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Sadhu Vaswani Institute of Management Studies for Girls




ACADEMIC YEAR 2023-24

MCA I – SEMESTER I

IT-11L – Data Structure and Algorithm Practicals

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A
PRACTICAL ON
(IT111L)
Java Programming
&
Data Structure and Algorithms

SUBMITTED BY
Ms. Jayanti Pandurang Rokade

SUBMITTED TO
SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN PARTIAL FULFILLMENT OF DEGREE
MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF
Prof. Girish Bal & Prof. Omkar Barve Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

Certificate



This is to certify that **Ms. Jayanti Pandurang Rokade** student of Master of Computer Application SEM I has satisfactorily completed all the practical's in the subject: **IT11L-Java Programming & Data Structures & Algorithms** for the purpose of Practical Examination- December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Degree, during the Academic Year 2023-24.

Roll No: 23516



Seat No: 8253

Sign of Internal Practical Incharge

Dr. Rajesh Kashyap
HOD-MCA

Sign of External Examiner

Dr. B.H. Nanwani

Date:

Director
DR. B. H. NANWANI
DIRECTOR
SAVITRIBAI PHULE INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Name:- Jayanti Pandurang Rokade

Roll NO:- 23516

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
IT11 Java Programming - Practical
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Name :- ~~A~~ Jayanti Pandurang Rokade

RollNo - : 23516

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
IT-11L – Data Structure and Algorithm Practicals
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Ms. Gauri Tukaram Khaire

SUBMITTED TO
SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN PARTIAL FULFILLMENT OF DEGREE
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Through,



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2023-24

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Roll No: 23517

Seat No: 8240

G. Khaire

Sign of Internal Practical Incharge

[Signature]

Dr. Rajesh Kashyap
HOD-MCA

[Signature]

Sign of External Examiner

[Signature]

Dr. B.H. Nanwani

Date:



Director

DR. B. H. NANWANI
DIRECTOR
SACHU VASWAN INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
4, KOREGAON ROAD, PUNE-411 001

Name: Gauri Tukaram Khairi
Roll NO: 23517

Sadhu Vaswani Institute of Management Studies for Girls
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Ms. SAKSHI SHASHIKANT JADHAV

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2023-24

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Roll No:23518

Seat No: 8255

Sign of Internal Practical Incharge

Dr. Rajesh Kashyap
HOD-MCA

Sign of External Examiner



Dr. B.H. Nanwani
Director

DR. B. H. NANWANI
DIRECTOR

SAVITRIBAI PHULE PUNE UNIVERSITY
6, KOREGAON ROAD, PUNE - 411 001

Date:

Place: Pune

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Sadhu Vaswani Institute of Management Studies for Girls
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Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

MCA I – SEMESTER I

IT-111 – Data Structure and Algorithm Practicals

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&

Data Structure and Algorithms

SUBMITTED BY

Ms. Geetanjali Kamanboina Shrinivasulu

SUBMITTED TO

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

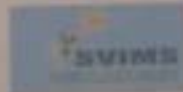
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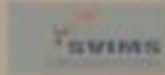
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
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Roll No: 23519

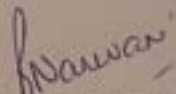
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Sign of Internal Practical Incharge


Dr. Rajesh Kashyap

HOD-MCA

Sign of External Examiner


Dr. B.H. Nanwani

Date:

Director

DR. B. H. NANWANI
DIRECTOR

SARHU NANWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
& KOREGADH ROAD, PUNE-411 001



Gokrajali Kamanbaina
23519

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Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA 1 - SEMESTER 1
IT-11L - Data Structure and Algorithm Practicals
Lab Assignments

INDEX

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July

A
PRACTICAL ON
(IT11L)
Java Programming
&
Data Structure and Algorithms

SUBMITTED BY

MS. Radhika Patil.

SUBMITTED TO

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

IN PARTIAL FULFILLMENT OF DEGREE

MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF

Prof. Girish Bal & Prof. Omkar Barve

Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

Certificate





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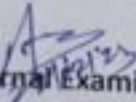
Roll No: 23521

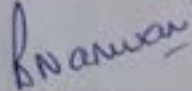
Seat No: 8250




Sign of Internal Practical Incharge


Dr. Rajesh Kashyap
HOD-MCA


Sign of External Examiner


Dr. B.H. Nanwani

Date:

Director
DR. B. H. NANWANI
DIRECTOR
SADHU VASWANU INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
8, KOREGAON ROAD, PUNE-411 001

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
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SUBMITTED BY

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SUBMITTED TO

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2023-24

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Roll No: 23521

Seat No: 8250



G.B.
Sign of Internal Practical Incharge

Rajesh Kashyap
Dr. Rajesh Kashyap
HOD-MCA

A. Patil
Sign of External Examiner

B. H. Nanwani
Dr. B.H. Nanwani

Date:

Director
DR. B. H. NANWANI
DIRECTOR
SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

MCA I – SEMESTER I

IT-11L – Data Structure and Algorithm Practicals

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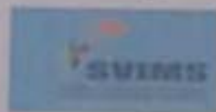
A
PRACTICAL ON
(IT11L)
Java Programming
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Data Structure and Algorithms

SUBMITTED BY
Ms. Sanskruti Sangram Bede

SUBMITTED TO
SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN PARTIAL FULFILLMENT OF DEGREE
MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF
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Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

CERTIFICATE



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Roll No: 23522

Seat No: 8220

Dr. Rajesh Kashyap

HOD-MCA

Sign of Internal Practical Incharge

Sign of External Examiner

Date:

Dr. B.H. Nanwani

Director

DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
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| | | | |
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| 45 | Threads creation and design applications by using Extending the Thread class/ Implementing the Runnable Interface. Application of multithreading in java. | 08-Nov-23 | <u>GB</u> |
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Sadhvi Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

MCA I – SEMESTER I

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Name : Sanskruti Bede
Roll no. : 23522

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
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(IT111L)

Java Programming

&

Data Structure and Algorithms

SUBMITTED BY

Ms.RIYA SANJAY BHISMIRE

SUBMITTED TO

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

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Girls, Koregaon Park, Pune-411001**

2023-24

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Phule Pune University, Pune forth Master of Computer Application Program, during the Academic Year 2023-24.

RollNo:23523

Seat No:8221

GB

Sign Of Internal Practical Incharge

[Signature]

Dr.Rajesh Kashyap

Prof Girish Bal & Prof Omkar Barve

Guide

[Signature]

sign of External Examiner



[Signature]

Dr.B.H.Nanwani

Director

DR. B. H. NANWANI
DIRECTOR

SACHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE - 411 001

Roll no - 252 23523
Class - MCA I

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ACADEMIC YEAR 2023-24
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Riya Bismira

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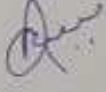

GB

Name - Riya bhismire
Rollno - 23623
Class - MCA I

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
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A
PRACTICAL ON
(IT11L)
Java Programming
&
Data Structure and Algorithms

SUBMITTED BY
Ms. Saniya Shabbir Qureshi

SUBMITTED TO
SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN PARTIAL FULFILLMENT OF DEGREE
MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF
Prof. Girish Bal & Prof. Omkar Barve

Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

Certificate

This is to certify that Ms. SANIYA SHABBIR QURESHI student of Master of Computer Application SEM I has satisfactorily completed all the practical in the subject: IT11L-Java Programming & Data Structures & Algorithms for the purpose of Practical Examination-December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023-24.

Roll No: 23524

Seat No: 28257

G. Bal

Sign of Internal Practical Incharge

Rajesh Kashyap

Dr. Rajesh Kashyap
HOD-MCA

A. S.
23/12/23

Sign of External Examiner

Date:

B. H. Nanwani

Dr. B.H. Nanwani
Director

Place: Pune



DR. B. H. NANWANI
DIRECTOR
SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Saruya Purosh
MCA - I
23524

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
MCA I - SEMESTER I
IT11 Java Programming - Practical
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Sanya Qureshi
FYMCA 23524

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA I - SEMESTER I
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Roll No: 23525

Seat No: 8247

GB

Sign of Internal Practical Incharge

[Signature]

Dr. Rajesh Kashyap
HOD-MCA

[Signature]

Sign of External Examiner

Date:

[Signature]

Dr. B.H. Nanwani

Director

DR. B. H. NANWANI
DIRECTOR

Place: Pune



SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Pooja Anil Jashi

23525

Sadhu Vaswani Institute of Management Studies for Girls
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Roll No: 23525

Seat No: 8247

GBal

Sign of Internal Practical Incharge

Rajesh

Dr. Rajesh Kashyap
HOD-MCA

Asi
12/12/23

Sign of External Examiner

Date:

Place: Pune



B. H. Nanwani

Dr. B.H. Nanwani

Director

DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Pooja Joshi
23525.

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
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RollNo: 23526

SeatNo: 2830 8230

GBal

Sign of Internal Practical Incharge

Rajesh Kashyap

Dr. Rajesh Kashyap
HOD-MCA

Sign of External Examiner

Date: *10/12/23*

B. H. Nanwani

Dr. B. H. Nanwani

Director

DR. B. H. NANWANI
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SADHU VASWAMI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
4, KOREGADON ROAD, PUNE - 411 004

Place: Pune



Name: Ghule komal Baliram

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Name: Gihule kamal Baliram

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MCA I – SEMESTER I

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SADHU VASWAN INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
& FORESADH ROAD, PUNE-411 001

Place: Pune



Jyegenti Sandbhos

Roll no: 23527

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

MCA I – SEMESTER I

IT11 Java Programming - Practical

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| 3. | Palindrome Program in java | 20-Sep-23 | G.Bal |
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6.8

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
IT-11L – Data Structure and Algorithm Practicals
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A
PRACTICAL ON
(IT111L)

Java Programming

&

Data Structure and Algorithms

SUBMITTED BY

Ms. Minal Natha Waghmode

SUBMITTED TO

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

IN PARTIAL FULFILLMENT OF DEGREE

MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF

Prof. Girish Bal & Prof. Omkar Barve

Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

CERTIFICATE



This is to certify that **Ms. Minal Natha Waghmode** student of Master of Computer Application SEM I has satisfactorily completed all the practicals in the subject: **IT111L-Java Programming & Data Structures & Algorithms** for the purpose of Practical Examination—December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023- 24.

Roll No: 23528

Seat No: 8266

A handwritten signature in blue ink, appearing to read 'Rajesh Kashyap', is written above the name.

Dr. Rajesh Kashyap

HOD-MCA

A handwritten signature in blue ink, appearing to read 'G. B. ...', is written above the text.
Sign of Internal Practical Incharge

A handwritten signature in blue ink, appearing to read 'A. ...', is written above the text.
Sign of External Examiner

A handwritten signature in blue ink, appearing to read 'B. H. Nanwani', is written above the name.
Dr. B.H. Nanwani

Date:



Director

DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6 KOREGAON ROAD, PUNE 411 001

Name :- Minal Waghmode
Roll No :- 23523

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2023-24

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Roll No: 23529

Seat No: 8227

GBL

Sign of Internal Practical Incharge

[Signature]

Dr. Rajesh Kashyap
HOD-MCA

Sign of External Examiner
Date: *[Signature]*



[Signature]
Dr. B.H. Nanwani
Director
DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Name:- Sayali Shobaji Gaikwad


Roll No:- 23529


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1. Fibonacci Series in java

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Gaikwad Sayali Shahaji

23529

Sadhu Vaswani Institute of Management Studies for Girls




ACADEMIC YEAR 2023-24

MCA I – SEMESTER I

IT-111. – Data Structure and Algorithm Practicals

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1.Fibonacci Series

```
package main.com.programs;

public class FibonacciSeries {

    public static void nextFibonacci() {
        // TODO Auto-generated method stub
        int i=0,j=1,k=1;
        System.out.println("Fibonacci series");
        while(i<10)
        {
            System.out.println(k);
            k=i+j;
            i=j;
            j=k;
        }
    }
}
```

1 1 2 3 5 8 13 21 34

2.Prime Number program in java

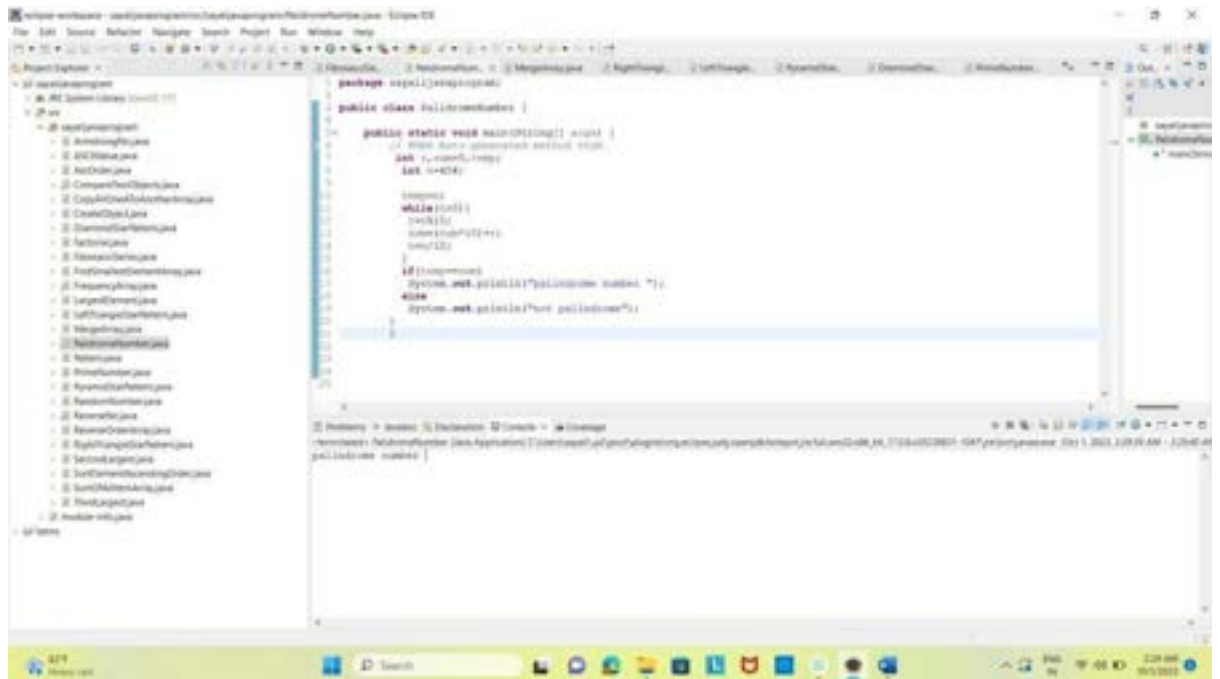
```
package main.com.programs;

public class PrimeNumber {

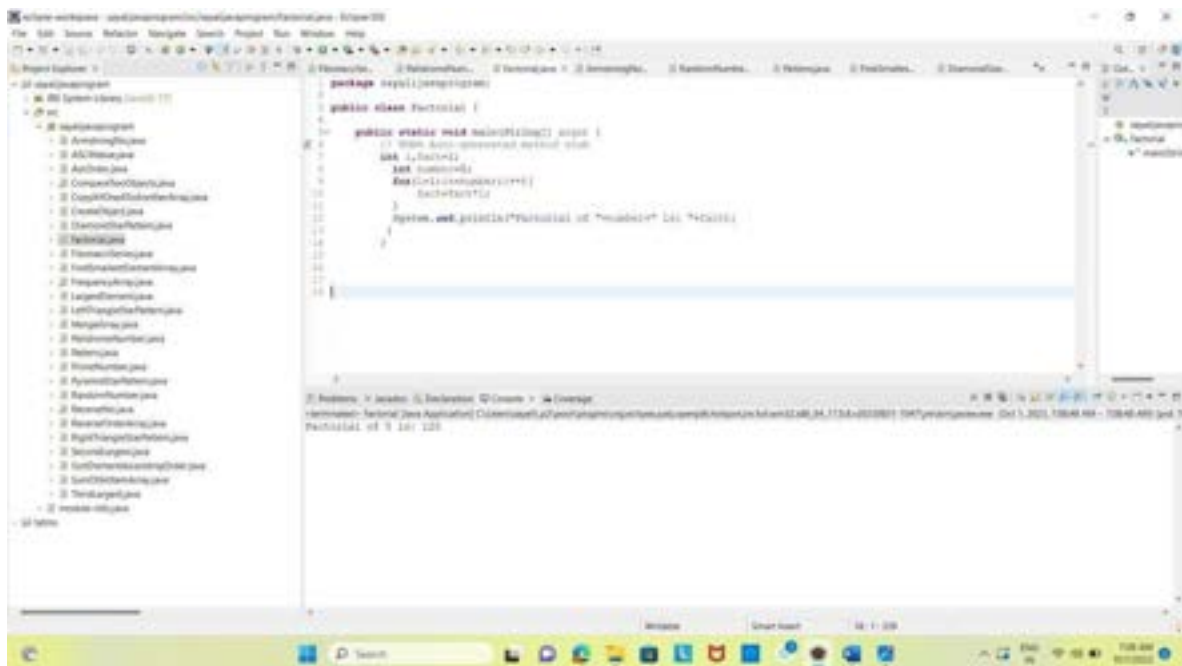
    public static void nextPrime() {
        // TODO Auto-generated method stub
        int i=4;
        while(i<10)
        {
            System.out.println(i);
            if(isPrime(i))
            {
                System.out.println(i+" is not prime number");
            }
            else
            {
                System.out.println(i+" is not prime number");
            }
            i++;
        }
    }
}
```

4 is not prime number
5 is not prime number

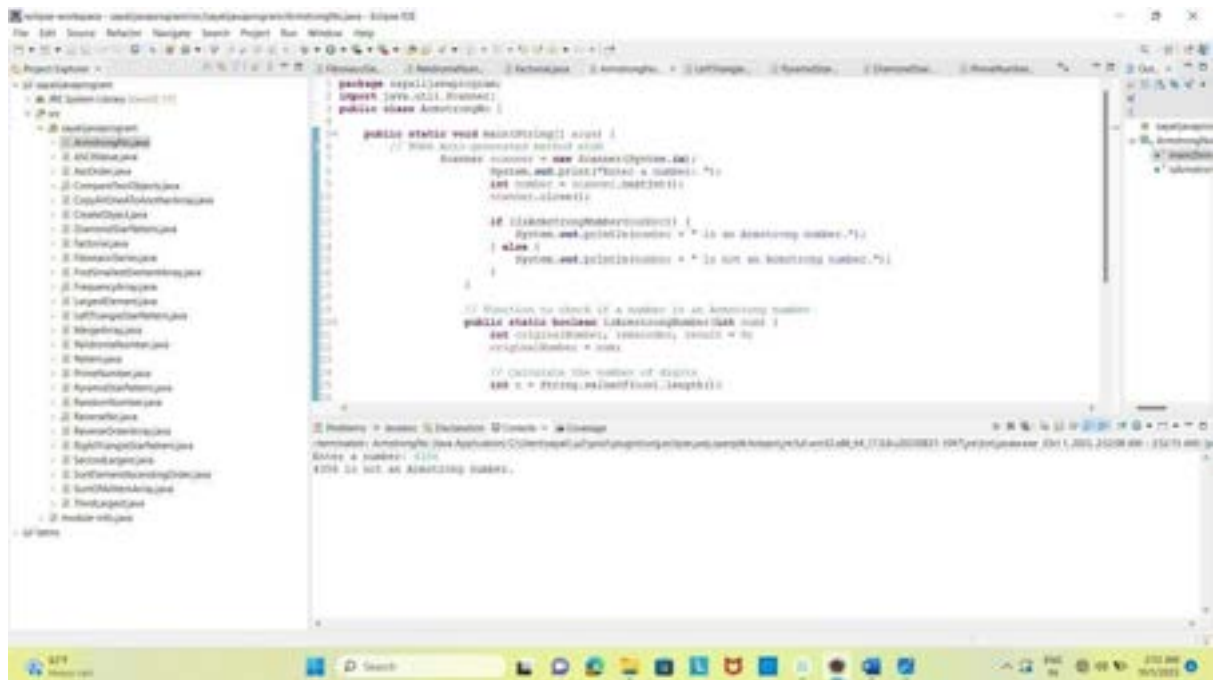
3. Palindrome Program in java



4. Factorial Program in java



6. Armstrong number in java



```
package org.jaydeep;
import java.util.Scanner;
public class Armstrong {

    public static void main(String[] args) {
        // Take user input and store it into
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int number = scanner.nextInt();
        scanner.close();

        // Check Armstrong number or not
        if (isArmstrongNumber(number)) {
            System.out.println(number + " is an Armstrong number.");
        } else {
            System.out.println(number + " is not an Armstrong number.");
        }
    }

    // Function to check if a number is an Armstrong number
    public static boolean isArmstrongNumber(int num) {
        int originalNumber = num;
        int tempNumber = num;

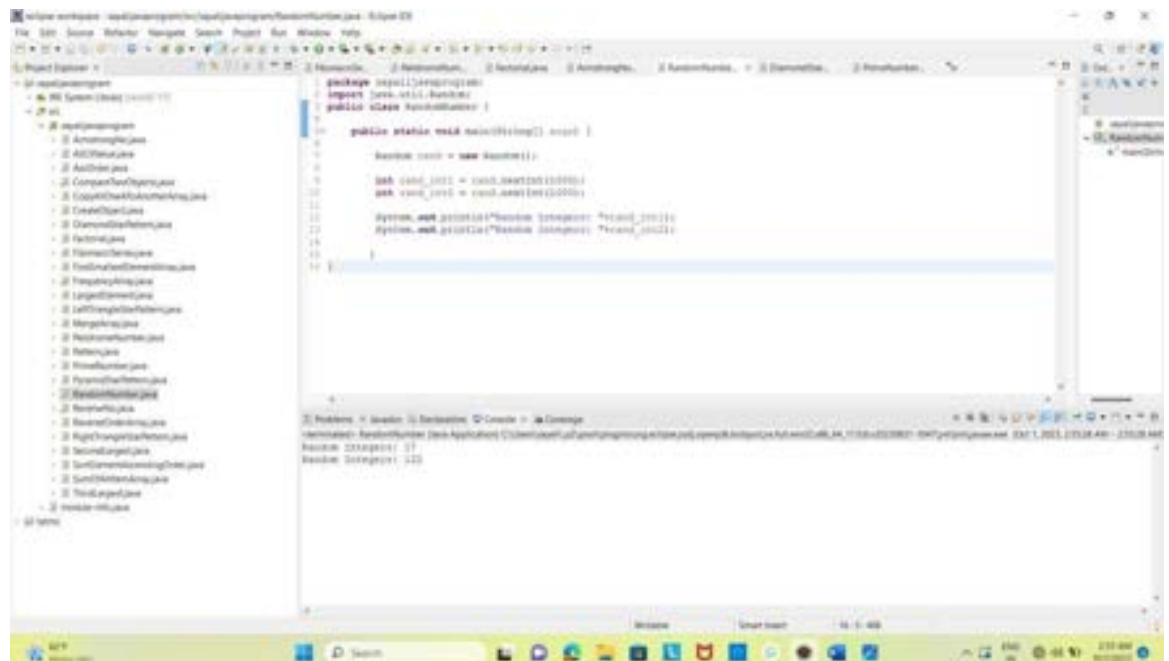
        // Calculate the number of digits
        int n = String.valueOf(num).length();

        while (tempNumber > 0) {
            int digit = tempNumber % 10;
            int power = (int) Math.pow(digit, n);
            tempNumber /= 10;
            originalNumber -= power;
        }

        return originalNumber == 0;
    }
}
```

Output:
Enter a number: 153
153 is an Armstrong number.

7. Generate Random Number in java



```
package org.jaydeep;
import java.util.Random;
public class RandomNumber {

    public static void main(String[] args) {
        Random rand = new Random();

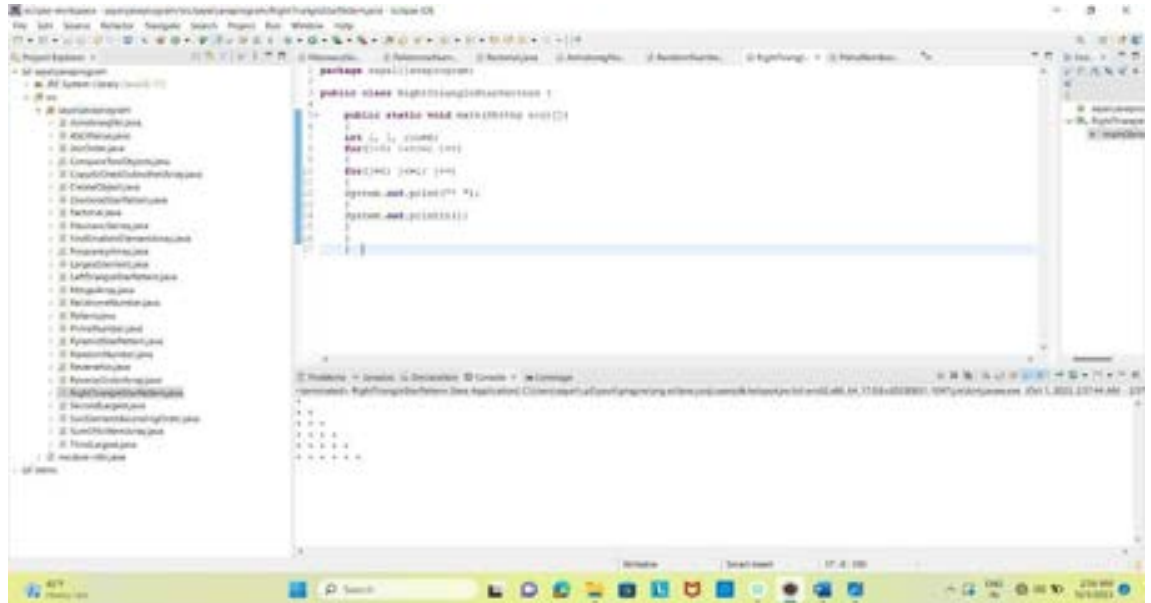
        int rand1000 = rand.nextInt(1000);
        int rand100 = rand.nextInt(100);

        System.out.println("Random 1000: " + rand1000);
        System.out.println("Random 100: " + rand100);
    }
}
```

Output:
Random: 2334914
Random: 2229911

8. Print Pattern (Right Triangle Star pattern, Left Triangle star pattern, pyramid star pattern, Daimond Star pattern)

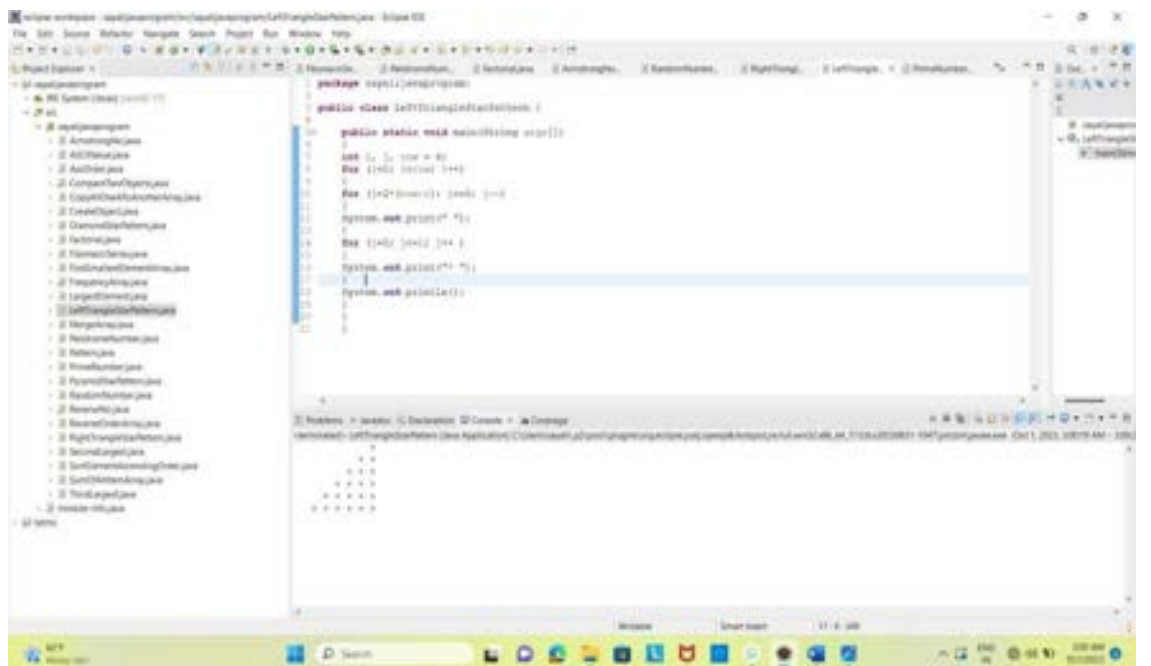
A. Right Triangle Star pattern



```
package main {
import "fmt"

func main() {
    n := 5
    for i := 0; i < n; i++ {
        for j := 0; j < n-i; j++ {
            fmt.Print("*")
        }
        fmt.Println()
    }
}
```

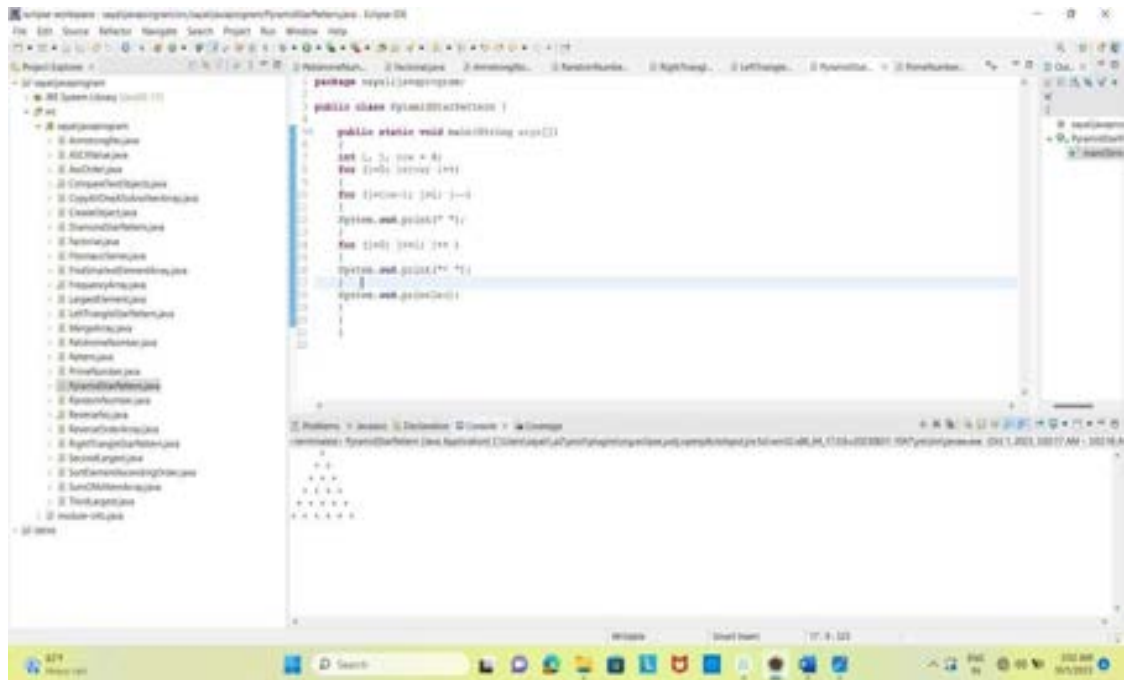
B. Left Triangle star pattern.



```
package main {
import "fmt"

func main() {
    n := 5
    for i := 0; i < n; i++ {
        for j := 0; j < i+1; j++ {
            fmt.Print("*")
        }
        fmt.Println()
    }
}
```

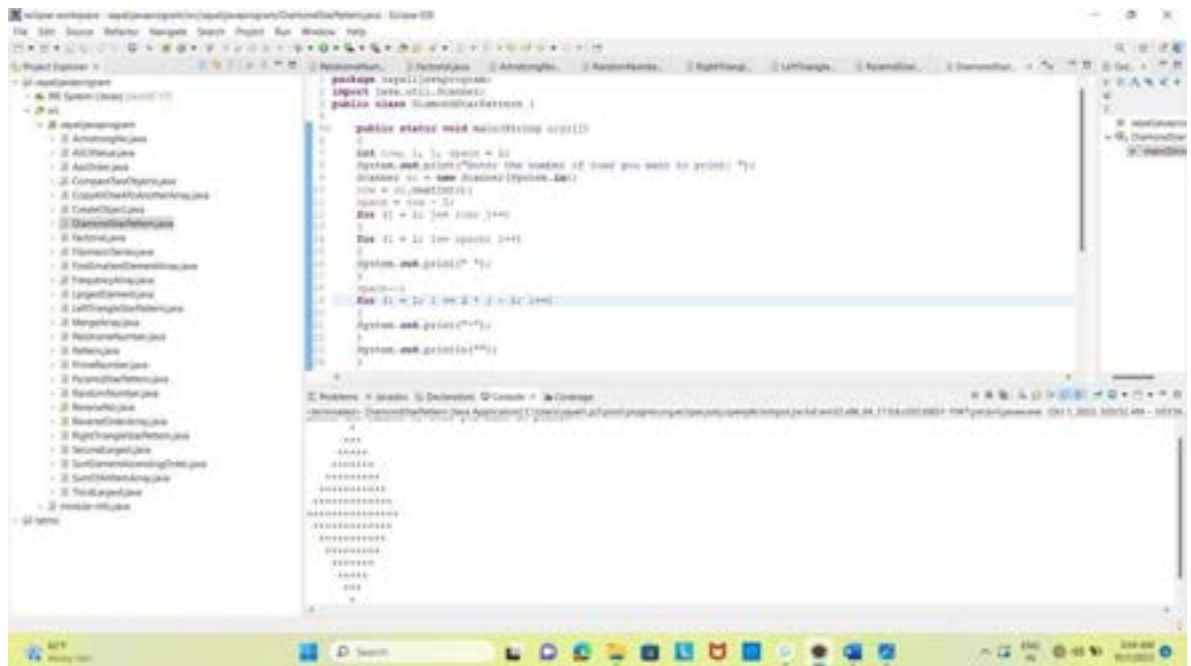

C. pyramid star pattern



```
package myapp.programs;  
  
public class PyramidStarPattern {  
  
    public static void main(String args[])  
    {  
        int n = 5; int row = 0;  
        for (int i = 0; i < n; i++)  
        {  
            for (int j = 0; j < i; j++)  
            {  
                System.out.print(" ");  
            }  
            for (int k = 0; k < (n - i); k++)  
            {  
                System.out.print("* ");  
            }  
            System.out.println();  
        }  
    }  
}
```

```
*****  
****  
***  
**  
*
```

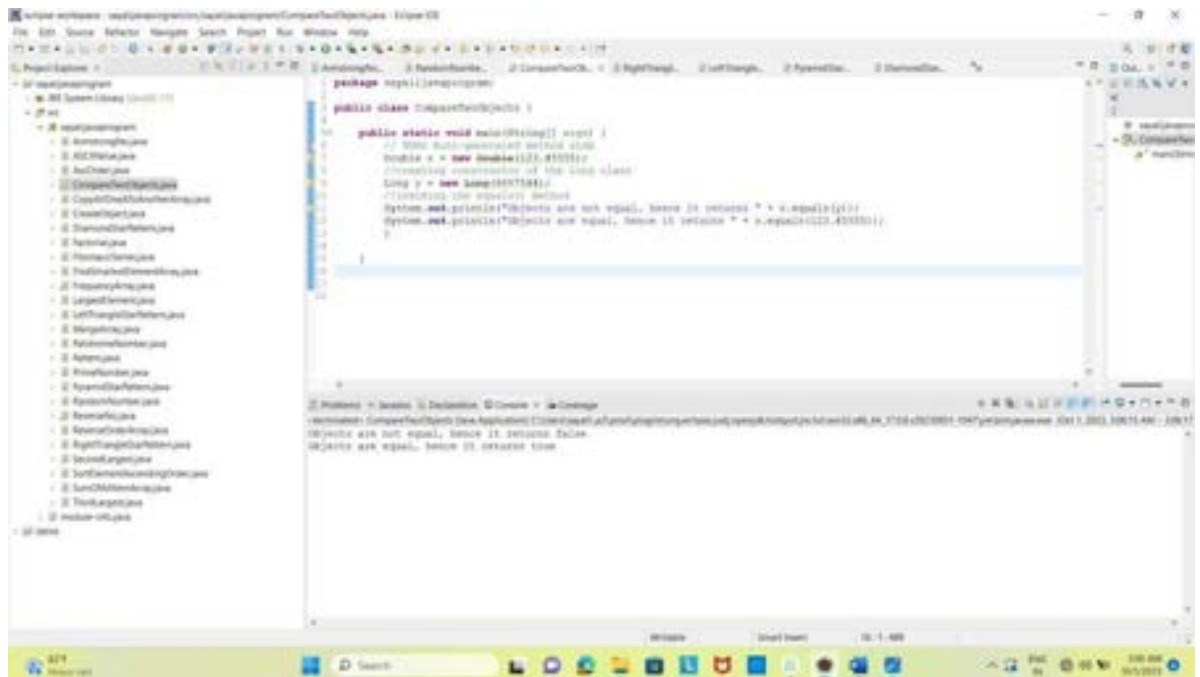
D. Daimond Star pattern



```
package myapp.programs;  
  
public class DiamondStarPattern {  
  
    public static void main(String args[])  
    {  
        int n = 5; int space = 0;  
        System.out.print("Enter the number of rows you want to print: ");  
        int row = 0; int diamond = System.out.nextInt();  
        int w = 0; int d = 0;  
        for (int i = 0; i < n; i++)  
        {  
            for (int j = 0; j < (n - i); j++)  
            {  
                System.out.print(" ");  
            }  
            for (int k = 0; k < (i + 1); k++)  
            {  
                System.out.print("*");  
            }  
            System.out.println();  
        }  
    }  
}
```

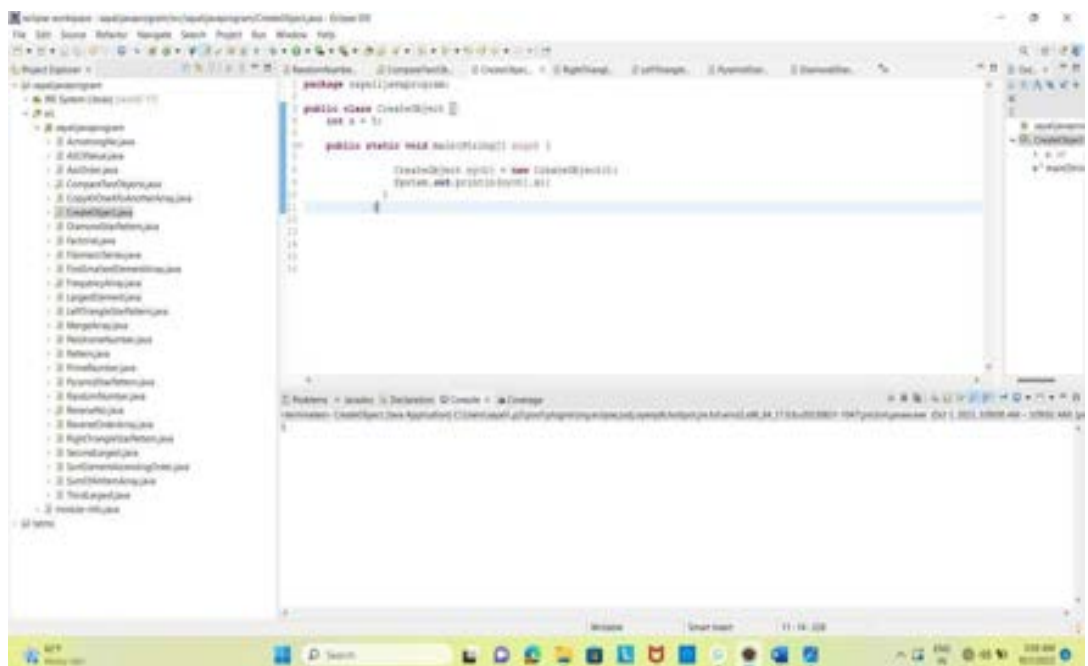
```
*****  
****  
***  
**  
*
```

9. Compare Two object in java



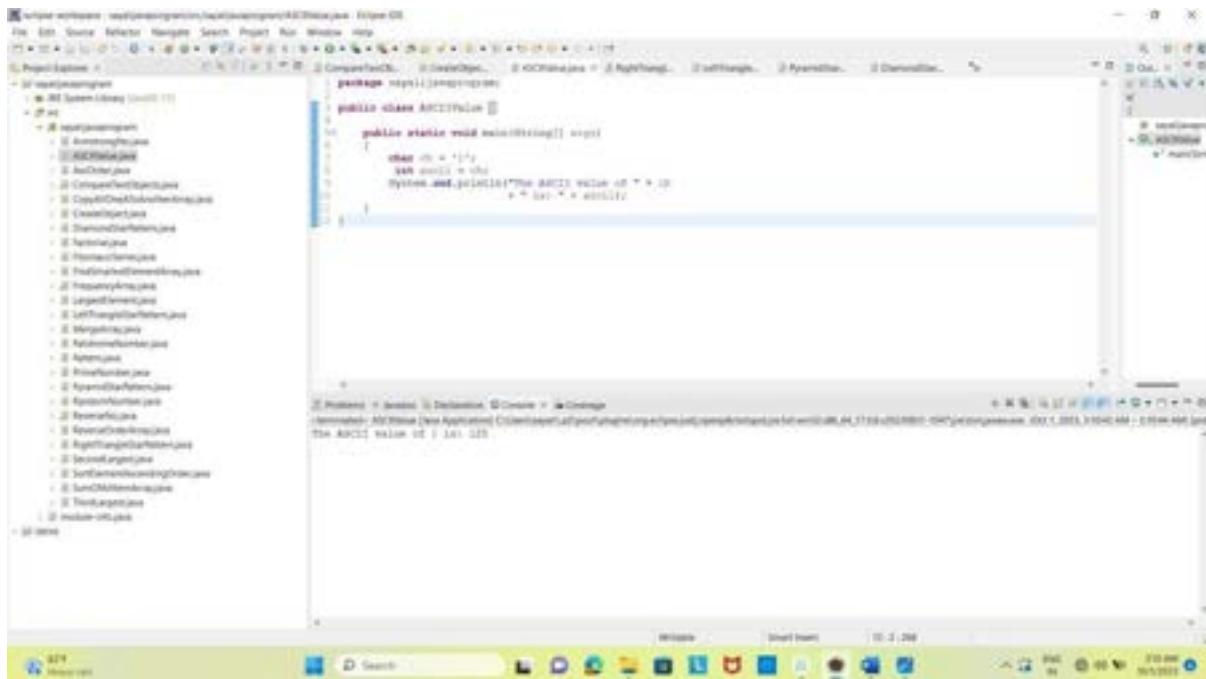
```
package org.javaprogram;  
  
public class CompareTwoObject {  
  
    public static void main(String[] args) {  
        // 1000 Random generated number value  
        Integer x = new Integer(123456789);  
        //Creating constructor of the class class  
        Long y = new Long(123456789L);  
        //Comparing the objects  
        System.out.println("Objects are not equal, since it returns " + x.equals(y));  
        System.out.println("Objects are equal, since it returns " + x.equals(123456789L));  
    }  
}
```

10. How to create Object in java



```
package org.javaprogram;  
  
public class CreateObject {  
    int x = 5;  
  
    public static void main(String[] args) {  
        CreateObject obj = new CreateObject();  
        System.out.println(obj);  
    }  
}
```

11. How to print ASCII value in java



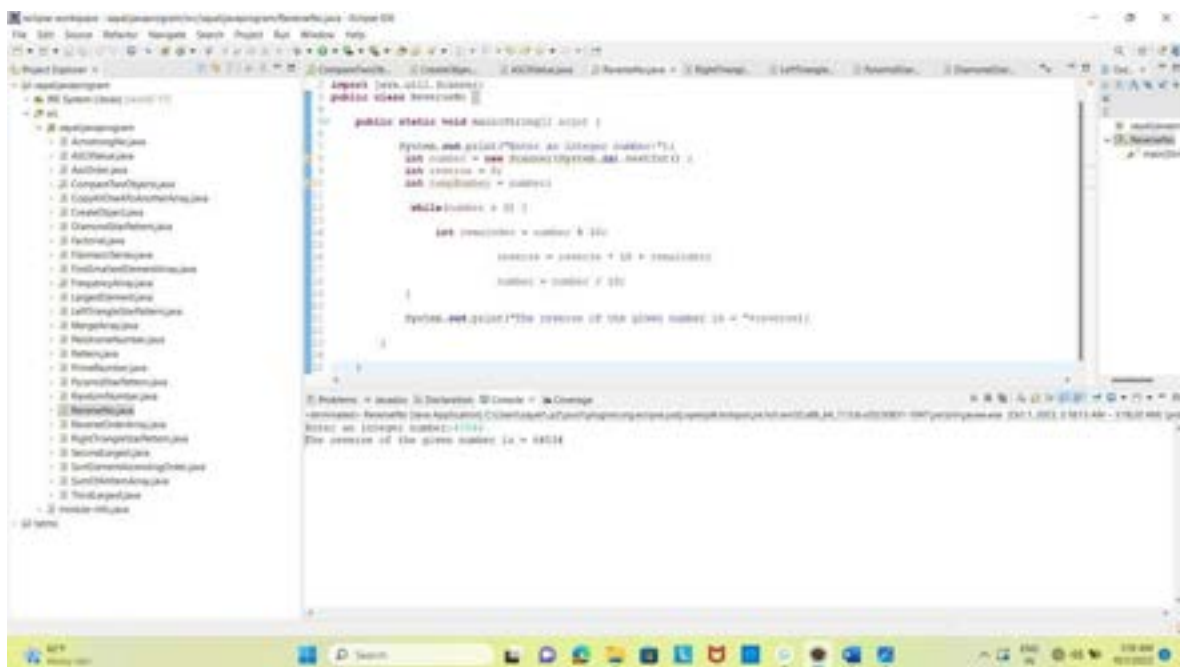
```
package myproj.comprog;

public class ASCIIValue {

    public static void main(String[] args) {
        char ch = 'y';
        int ascii = ch;
        System.out.println("The ASCII value of ' " + ch + " ' is " + ascii);
    }
}
```

The screenshot shows an IDE with a project named 'myproj.comprog'. The main class 'ASCIIValue' contains a 'main' method that takes a character 'y' and prints its ASCII value, which is 121. The console output at the bottom reads: 'The ASCII value of ' y ' is 121'.

12. Reverse a number in java.



```
import java.util.Scanner;

public class ReverseNo {

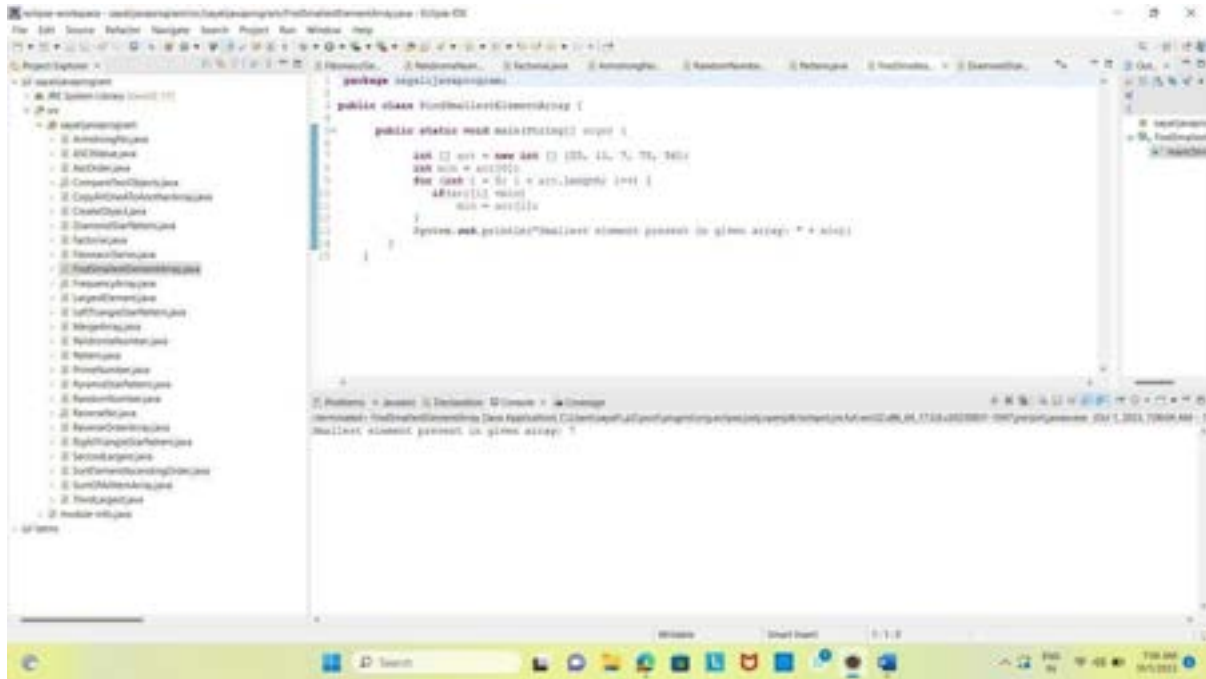
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int number = sc.nextInt();
        int reverse = 0;

        while(number > 0) {
            int remainder = number % 10;
            reverse = reverse * 10 + remainder;
            number = number / 10;
        }

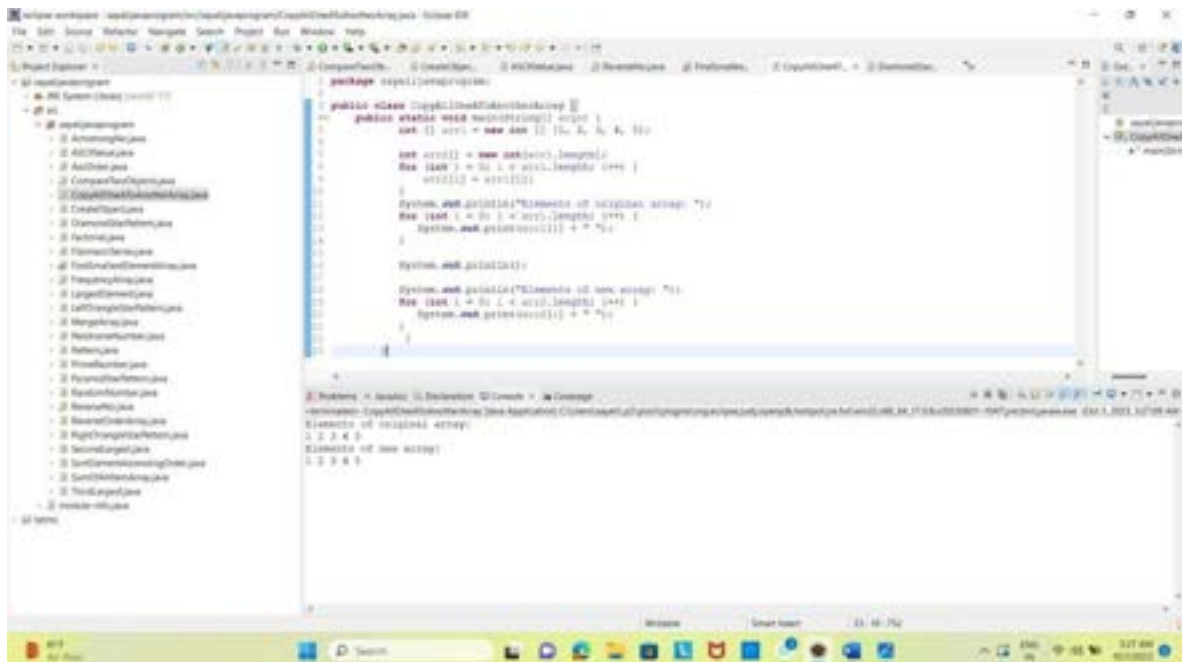
        System.out.println("The reverse of the given number is = " + reverse);
    }
}
```

The screenshot shows an IDE with a project named 'ReverseNo'. The main class 'ReverseNo' contains a 'main' method that uses a 'Scanner' to take an integer input (1234) and prints its reverse (4321). The console output at the bottom reads: 'The reverse of the given number is = 4321'.

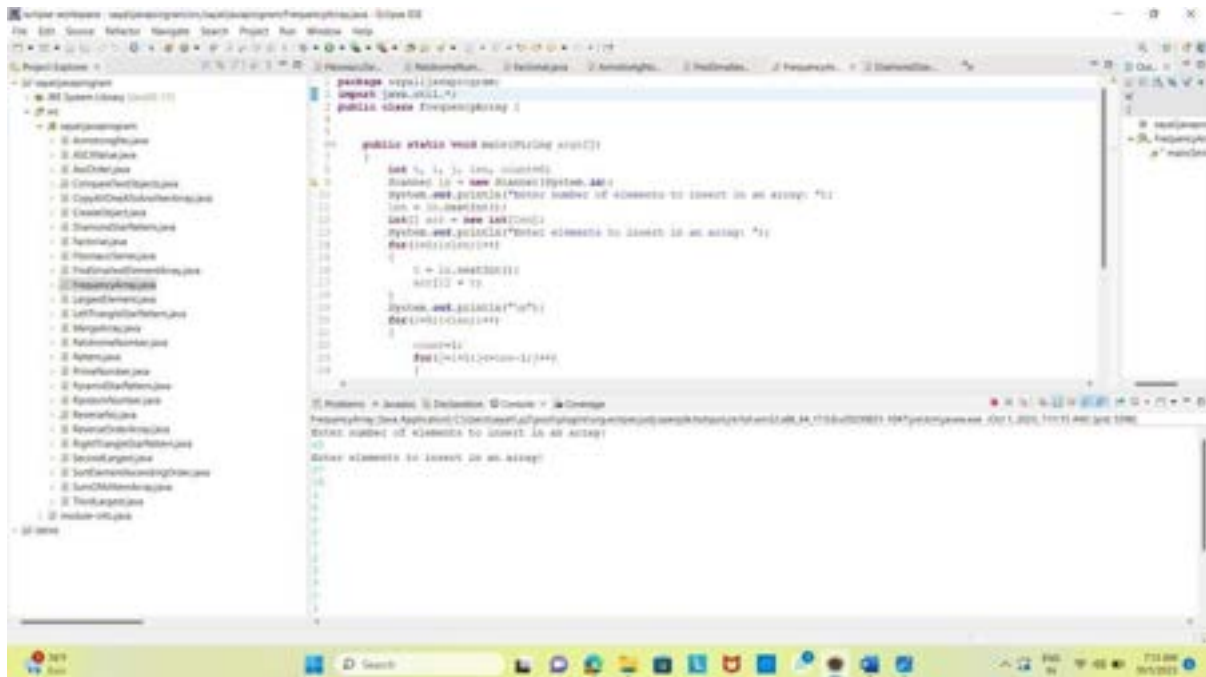
13. Java Program to find smallest element in array



14. Program to copy all element of one array into another array



15. Java Program to print the element of an array in reverse order:



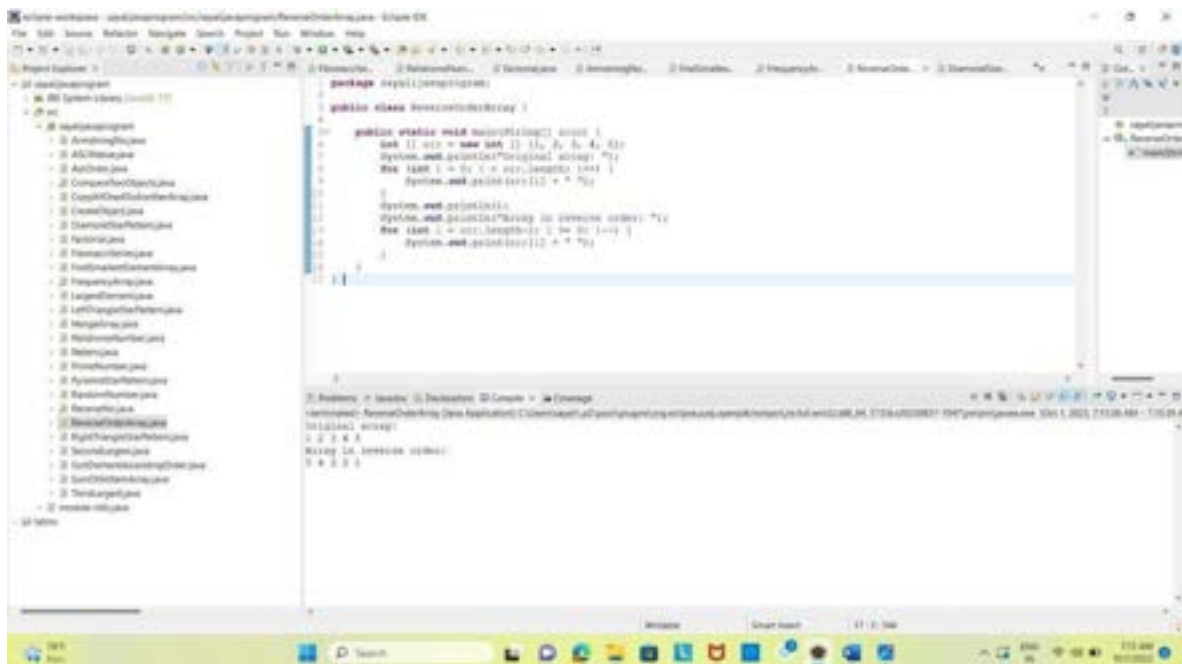
```
package org.jayprakash;

public class ReverseArray1 {

    public static void main(String args[]) {

        int i, j, k, len, count;
        int arr = new int[]{1,2,3,4,5};
        System.out.println("Enter number of elements to insert in an array: ");
        len = 5;
        count = 0;
        int arr1 = new int[10];
        System.out.println("Enter elements to insert in an array: ");
        for(i=0; i<len; i++)
            arr1[i] = arr[i];
        for(i=len; i<arr1.length; i++)
            arr1[i] = 0;
        System.out.println("Original array:");
        for(i=0; i<arr1.length; i++)
            System.out.print(arr1[i] + " ");
        System.out.println();
        for(i=arr1.length-1; i>=0; i--)
            System.out.print(arr1[i] + " ");
        System.out.println();
    }
}
```

16. Java Program to print the element of an array in reverse order



```
package org.jayprakash;

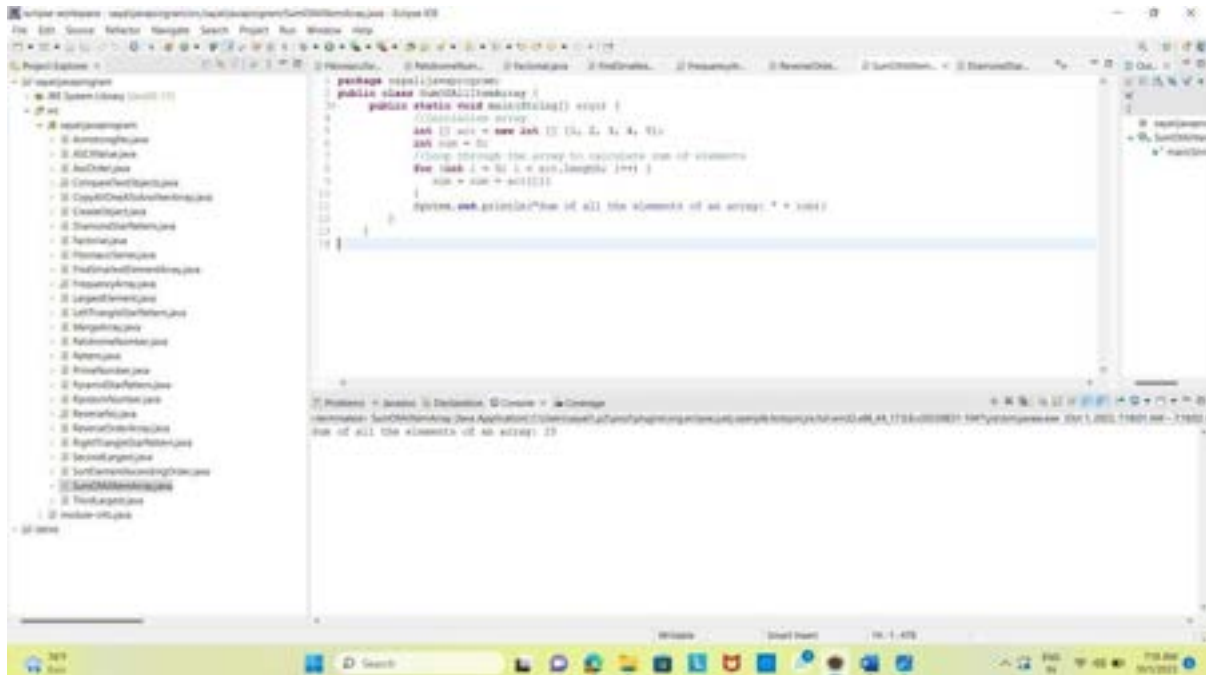
public class ReverseArray2 {

    public static void main(String args[]) {

        int i, arr = new int[] {1, 2, 3, 4, 5};
        System.out.println("Original array:");
        for(i=0; i<arr.length; i++)
            System.out.print(arr[i] + " ");
        System.out.println();
        System.out.println("Array in reverse order:");
        for(i=arr.length-1; i>=0; i--)
            System.out.print(arr[i] + " ");
        System.out.println();
    }
}
```

ReverseArray2 [Data Applcation] C:\Users\jayprakash> java ReverseArray2 1 2 3 4 5
Original array:
1 2 3 4 5
Array in reverse order:
5 4 3 2 1

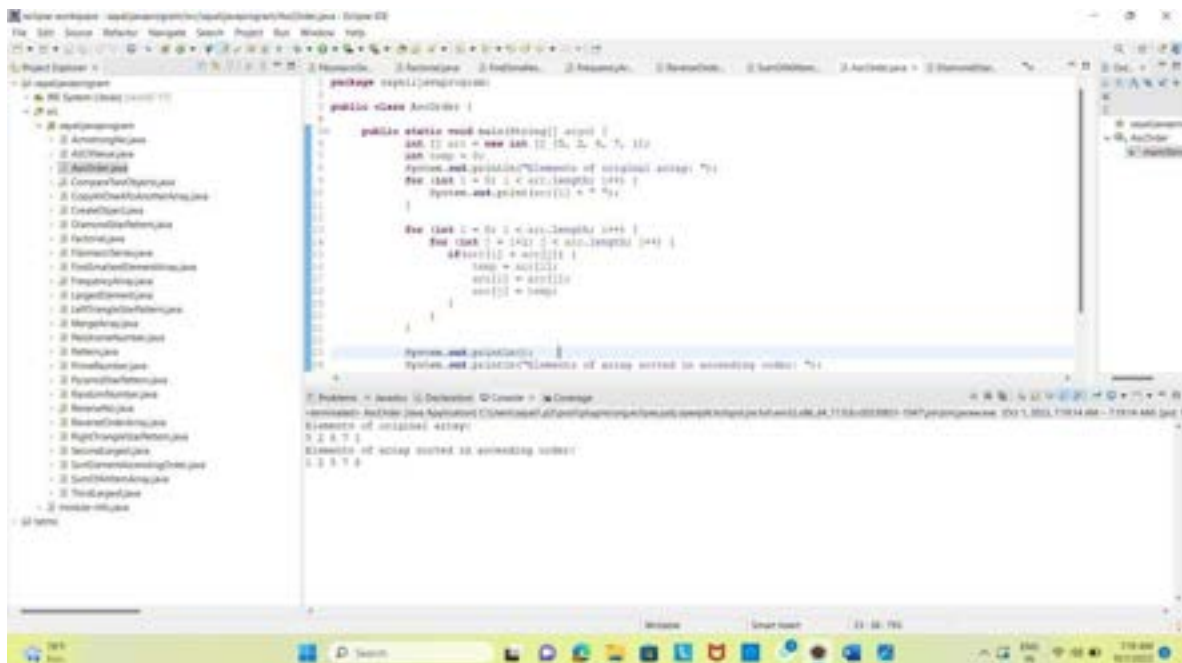
17.java program to print the Sum of all items of array



```
package org.javaprogram;  
public class SumOfArray {  
    public static void main(String[] args) {  
        // Create an array  
        int arr = new int[] { 10, 2, 3, 4, 5};  
        int sum = 0;  
        // Loop through the array to calculate sum of elements  
        for (int i = 0; i < arr.length; i++) {  
            sum = sum + arr[i];  
        }  
        System.out.println("Sum of all the elements of an array: " + sum);  
    }  
}
```

Sum of all the elements of an array: 25

18.Java Program to sort all elements of array in ascending order.



```
package org.javaprogram;  
public class SortArray {  
    public static void main(String[] args) {  
        int arr = new int[] { 5, 2, 4, 7, 10};  
        int temp = 0;  
        System.out.println("Elements of original array:");  
        for (int i = 0; i < arr.length; i++) {  
            System.out.print(arr[i] + " ");  
        }  
  
        for (int i = 0; i < arr.length; i++) {  
            for (int j = i+1; j < arr.length; j++) {  
                if(arr[i] > arr[j]) {  
                    temp = arr[i];  
                    arr[i] = arr[j];  
                    arr[j] = temp;  
                }  
            }  
        }  
        System.out.println();  
        System.out.println("Elements of array sorted in ascending order:");  
    }  
}
```

Elements of original array:
5 2 4 7 10
Elements of array sorted in ascending order:
2 2 4 7 10

19. Java program to sort all Elements of array in descending order.

```
package org.javaprogram;  
  
public class SortElementAscendingOrder {  
    public static void main(String[] args) {  
        // 1000 Auto-generated method stub  
        int arr = new int[] { 3, 2, 1, 4 };  
        int temp = 0;  
  
        //Printing elements of original array  
        System.out.println("Elements of original array:");  
        for (int i = 0; i < arr.length; i++) {  
            System.out.print(arr[i] + " ");  
        }  
  
        //Start the logic to descending order  
        for (int i = 0; i < arr.length; i++) {  
            for (int j = i + 1; j < arr.length; j++) {  
                if (arr[i] < arr[j]) {  
                    temp = arr[i];  
                    arr[i] = arr[j];  
                    arr[j] = temp;  
                }  
            }  
        }  
  
        System.out.println("Elements of array sorted in descending order:");  
        for (int i = 0; i < arr.length; i++) {  
            System.out.print(arr[i] + " ");  
        }  
    }  
}
```

20. Java Program to find 3rd largest element

```
package org.javaprogram;  
  
public class ThirdLargest {  
    public static int getThirdLargest(int[] a, int n) {  
        int temp;  
        for (int i = 0; i < n - 1; i++) {  
            for (int j = i + 1; j < n; j++) {  
                if (a[i] < a[j]) {  
                    temp = a[i];  
                    a[i] = a[j];  
                    a[j] = temp;  
                }  
            }  
        }  
        return a[n - 3];  
    }  
  
    public static void main(String args[]) {  
        int arr[] = { 11, 12, 13, 14, 15 };  
        int n = arr.length;  
        System.out.println("Third Largest: " + getThirdLargest(arr, n));  
    }  
}
```

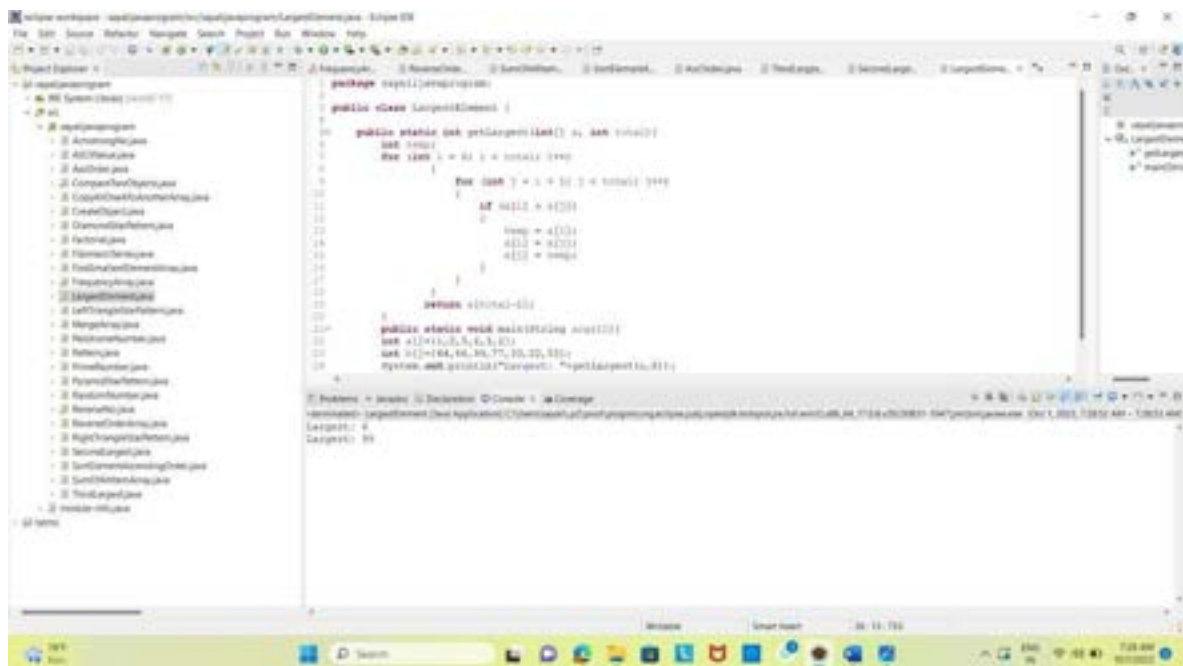
21. Java Program to find 3rd largest element.



```
package org.javaprogram;  
  
public class SecondLargest {  
  
    public static int getSecondLargest(int[] a, int total) {  
        int i=0;  
        for (int i = 0; i < total; i++)  
            for (int j = i + 1; j < total; j++)  
                if (a[i] > a[j])  
                    temp = a[j];  
                    a[i] = a[j];  
                    a[j] = temp;  
        return a[total-3];  
    }  
  
    public static void main(String args[]) {  
        int a[]={1,2,3,4,5};  
        int n[]={14,44,44,44,44,44,44};  
        System.out.println("Second Largest: "+getSecondLargest(a,5));  
    }  
}
```

Second Largest: 5
Second Largest: 44

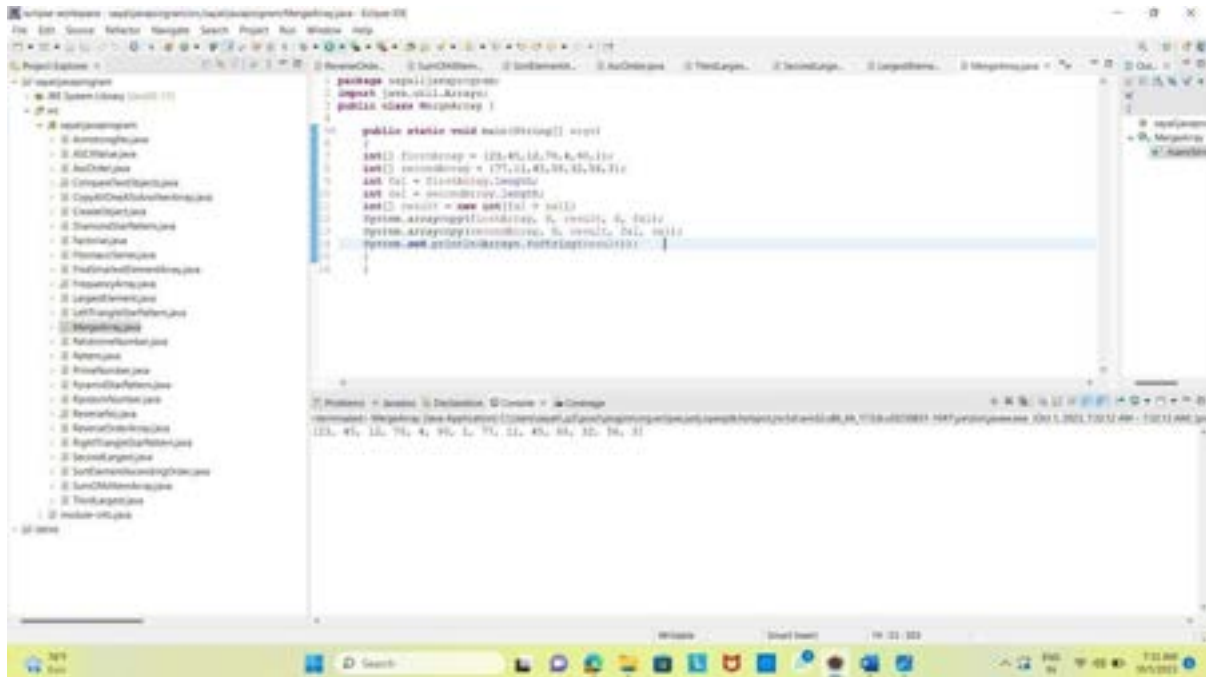
22. Java Program to find largest element



```
package org.javaprogram;  
  
public class LargestElement {  
  
    public static int getLargest(int[] a, int total) {  
        int i=0;  
        for (int i = 0; i < total; i++)  
            for (int j = i + 1; j < total; j++)  
                if (a[i] > a[j])  
                    temp = a[j];  
                    a[i] = a[j];  
                    a[j] = temp;  
        return a[total-1];  
    }  
  
    public static void main(String args[]) {  
        int a[]={1,2,3,4,5};  
        int n[]={14,44,44,44,44,44,44};  
        System.out.println("Largest: "+getLargest(a,5));  
    }  
}
```

Largest: 5
Largest: 44

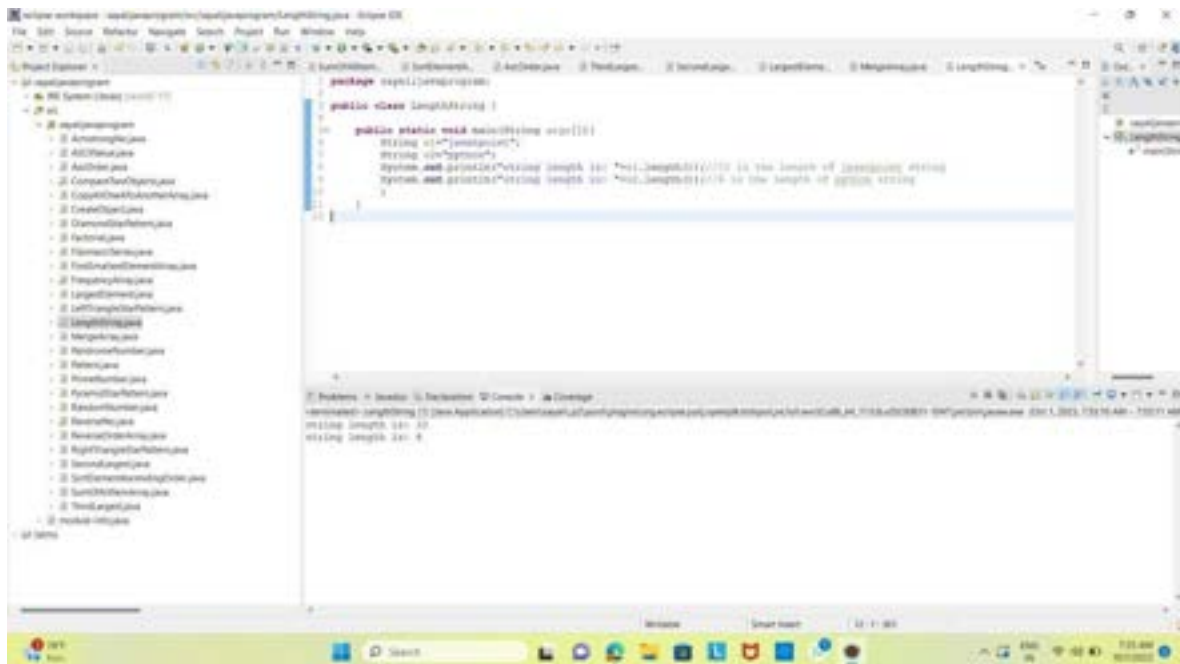
23. Java program to merge array



```
package org.jproggram;
import java.util.Arrays;
public class MergeArray {
    public static void main(String[] args) {
        int[] firstArray = {12, 45, 12, 78, 4, 90, 10};
        int[] secondArray = {77, 11, 43, 33, 43, 54, 31};
        int[] result = new int[firstArray.length + secondArray.length];
        System.arraycopy(firstArray, 0, result, 0, firstArray.length);
        System.arraycopy(secondArray, 0, result, firstArray.length, secondArray.length);
    }
}
```

Output: [12, 45, 12, 78, 4, 90, 11, 43, 33, 43, 54, 31]

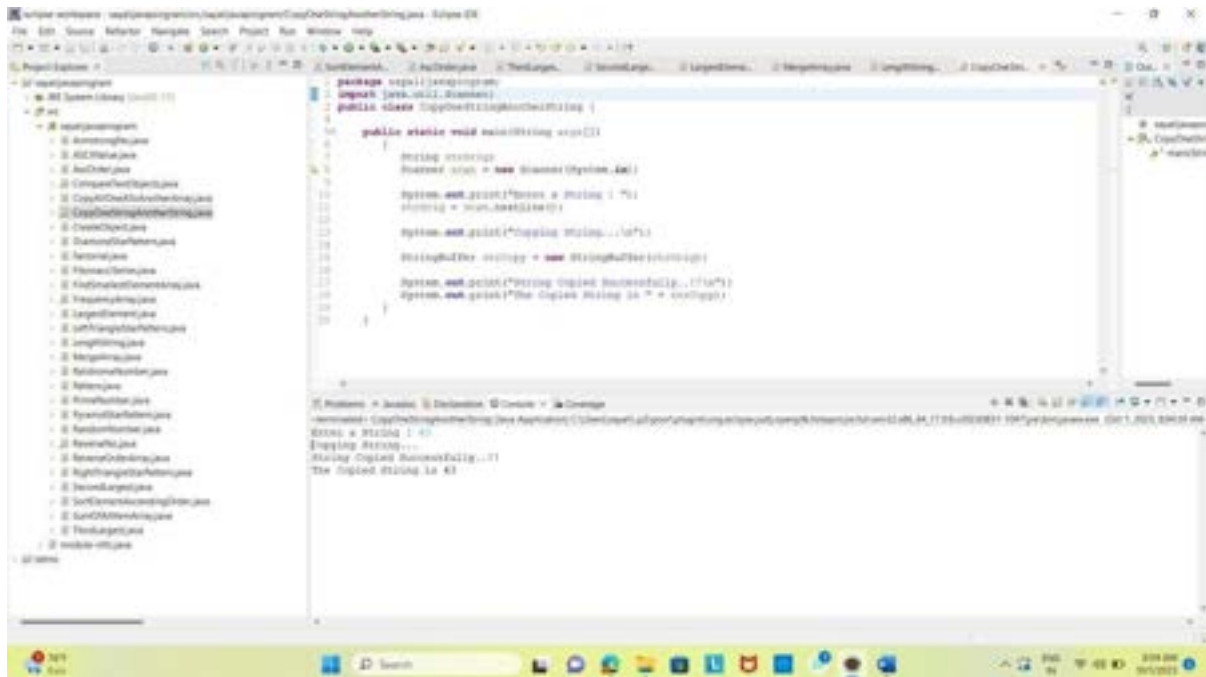
24. Write a java program to find length of a string.



```
package org.jproggram;
public class LengthOfString {
    public static void main(String args[]) {
        String str = "jproggram";
        String str1 = "jprog";
        System.out.println("Length of 'jproggram' is the length of 'jproggram' string");
        System.out.println("Length of 'jprog' is the length of 'jprog' string");
    }
}
```

Output: Length of 'jproggram' is the length of 'jproggram' string
Length of 'jprog' is the length of 'jprog' string

25. Write a java program to copy one string to another string.

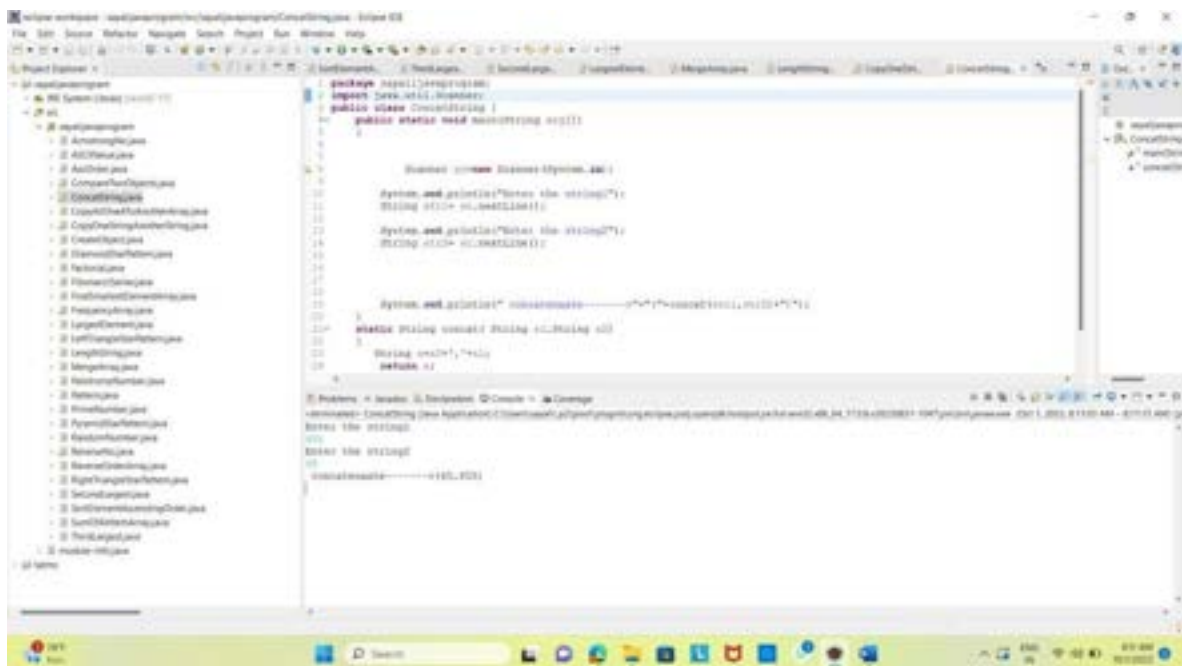


The screenshot shows an IDE with a Java program named CopyString.java. The code defines a class CopyString with a main method that prints the original string, its length, and the copied string. The output window shows the execution results.

```
package org.javaprogram;  
import java.util.Scanner;  
public class CopyString {  
    public static void main(String args[])  
    {  
        String str1;  
        Scanner sc = new Scanner(System.in);  
        System.out.println("Enter a string : ");  
        str1 = sc.nextLine();  
        System.out.println("Original string...");  
        StringBuffer str2 = new StringBuffer(str1);  
        System.out.println("String copied successfully...");  
        System.out.println("The copied string is " + str2);  
    }  
}
```

Output:
Enter a string : 45
Original string...
String copied successfully...
The copied string is 45

26. Write a java program to concatenate two strings.

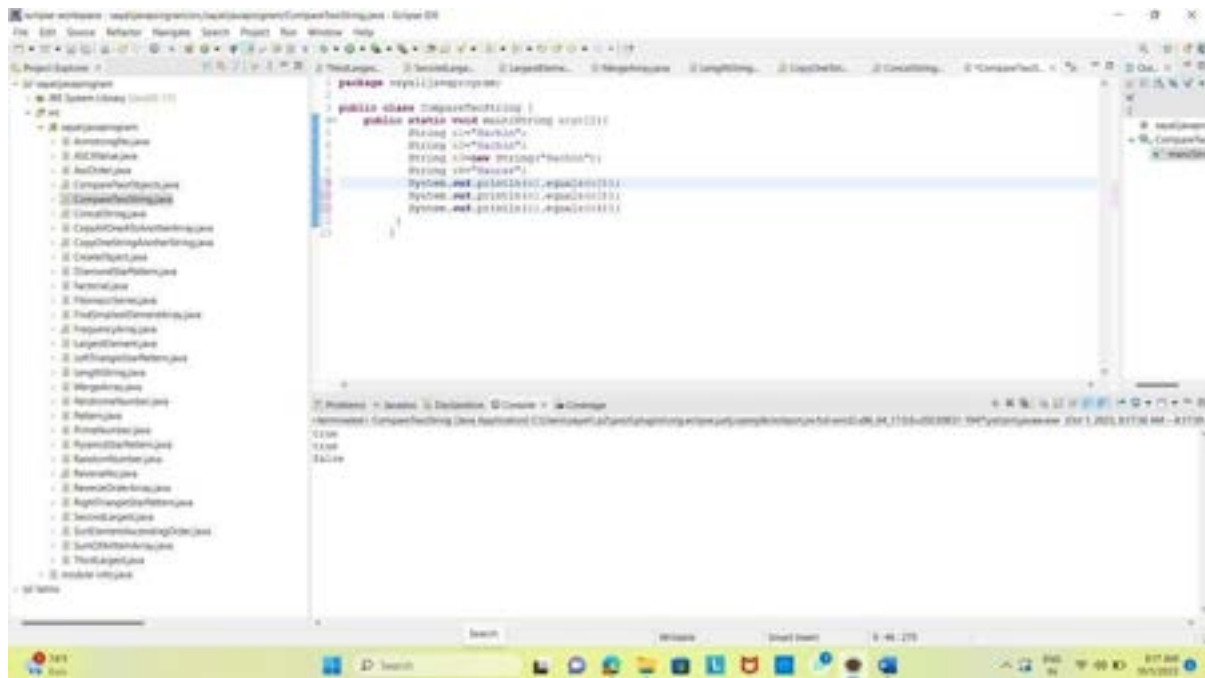


The screenshot shows an IDE with a Java program named ConcatString.java. The code defines a class ConcatString with a main method that prints two strings, concatenates them, and prints the result. The output window shows the execution results.

```
package org.javaprogram;  
import java.util.Scanner;  
public class ConcatString {  
    public static void main(String args[])  
    {  
        Scanner sc = new Scanner(System.in);  
        System.out.println("Enter the string1");  
        String str1 = sc.nextLine();  
        System.out.println("Enter the string2");  
        String str2 = sc.nextLine();  
        System.out.println("Concatenation of string1 and string2");  
        String str3 = str1 + str2;  
        System.out.println("Concatenated string is " + str3);  
    }  
}
```

Output:
Enter the string1
45
Enter the string2
67
Concatenation of string1 and string2
Concatenated string is 4567

27. Write a java program to compare two strings



The screenshot shows an IDE with a Java program for comparing two strings. The code is as follows:

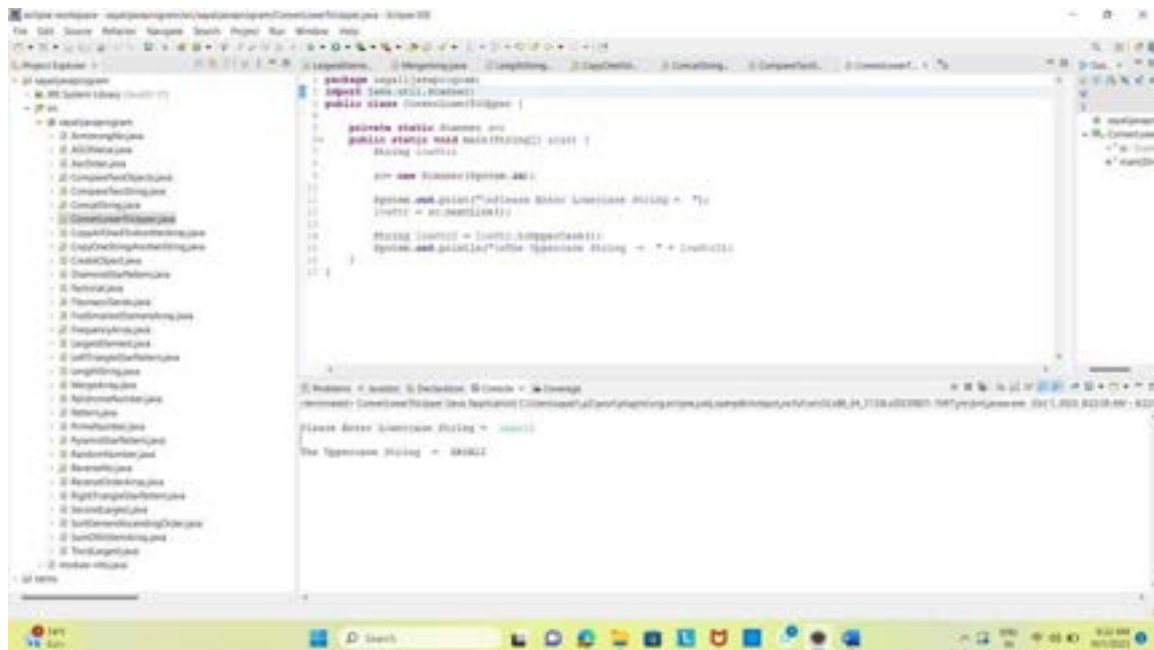
```
package myprog;

public class CompareTwoString {
    public static void main(String args[]) {
        String s1="abc1234";
        String s2="abc1234";
        String s3="abcde";
        System.out.println(s1.equals(s2));
        System.out.println(s1.equals(s3));
        System.out.println(s2.equals(s3));
    }
}
```

The output of the program is:

```
true
false
false
```

28. Write a java program to convert lowercase string to uppercase.



The screenshot shows an IDE with a Java program for converting a lowercase string to uppercase. The code is as follows:

```
package myprog;

import java.util.Scanner;

public class ConvertLowerToUpper {

    public static Scanner sc;

    public static void main(String[] args) {
        String s;

        sc = new Scanner(System.in);

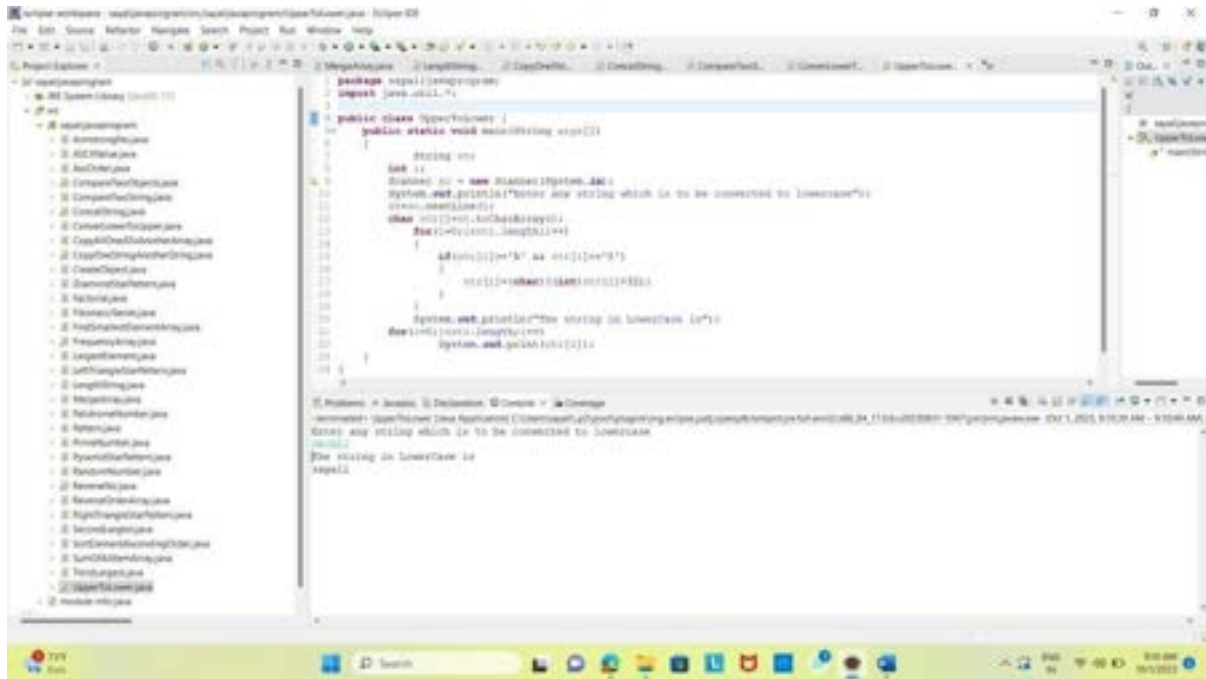
        System.out.println("Enter Lowercase String = ");
        s = sc.nextLine();

        String s1 = s.toUpperCase();
        System.out.println("The Uppercase String = " + s1);
    }
}
```

The output of the program is:

```
Enter Lowercase String = abc1234
The Uppercase String = ABC1234
```

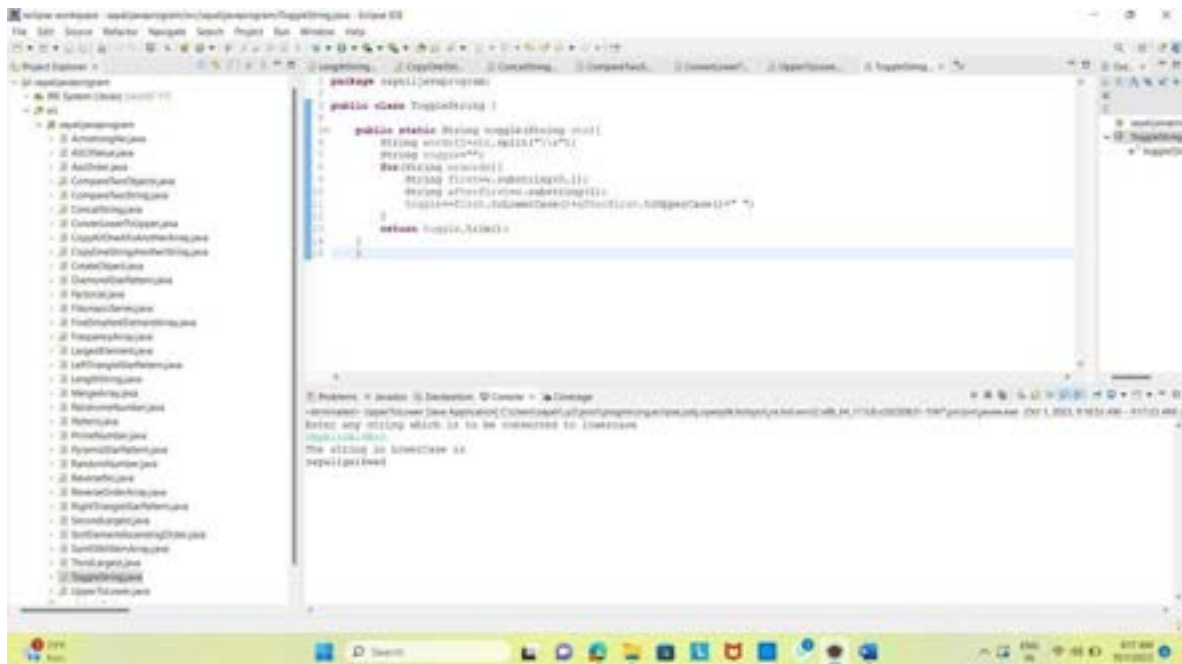
29. Write a java program to convert uppercase string to lowercase



```
package org.javaprogram;  
import java.util.*;  
  
public class UpperToLower {  
    public static void main(String args[])  
    {  
        String str;  
        int i;  
        Scanner sc = new Scanner(System.in);  
        System.out.println("Enter any string which is to be converted to lowercase");  
        str = sc.nextLine();  
        char ch[] = str.toCharArray();  
        for(i=0; i<ch.length; i++)  
        {  
            if(ch[i]>='A' && ch[i]<='Z')  
            {  
                ch[i] = Character.toLowerCase(ch[i]);  
            }  
        }  
        System.out.println("The string in lowercase is");  
        for(i=0; i<ch.length; i++)  
        System.out.print(ch[i]);  
    }  
}
```

Output:
Enter any string which is to be converted to lowercase
HELLO
The string in lowercase is
hello

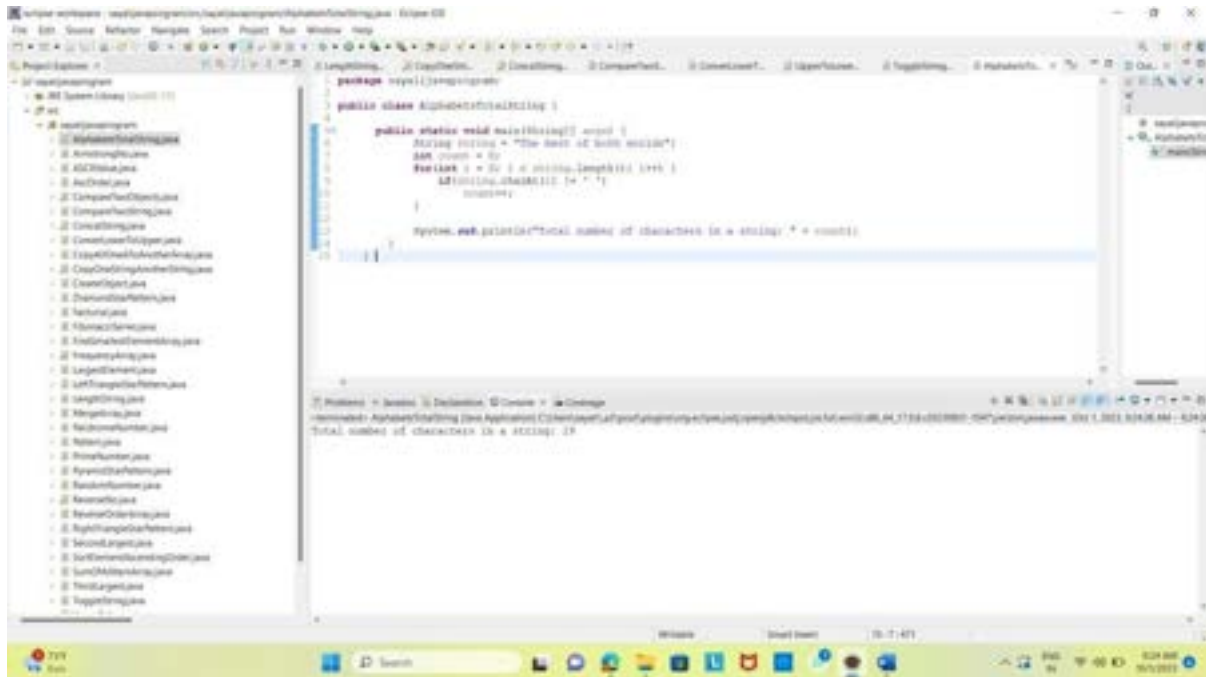
30. Write a java program to toggle case of each character of a string.



```
package org.javaprogram;  
  
public class ToggleCase {  
    public static String toggle(String str)  
    {  
        String str1="";  
        String str2="";  
        for(int i=0; i<str.length(); i++)  
        {  
            if(str.charAt(i)>='A' && str.charAt(i)<='Z')  
            {  
                str1+=Character.toLowerCase(str.charAt(i));  
            }  
            else  
            {  
                str2+=Character.toUpperCase(str.charAt(i));  
            }  
        }  
        return str1+str2;  
    }  
}
```

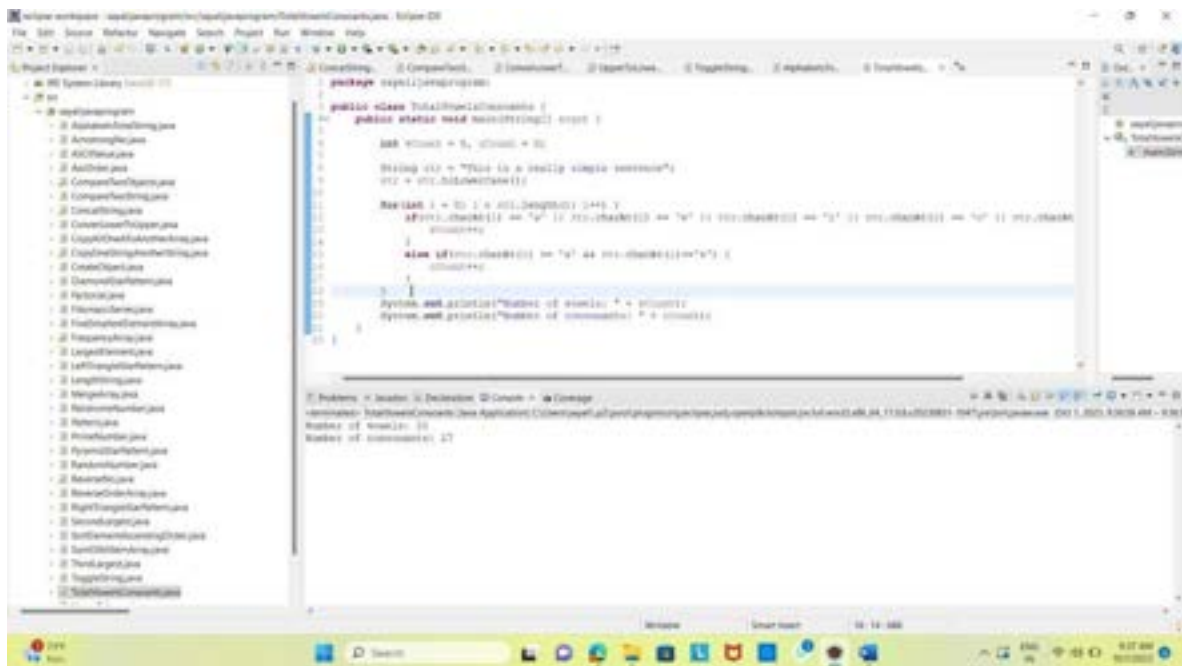
Output:
The string in lowercase is
helloworld

31. Write a java program to find total number of alphabets, digits or special character in a string.



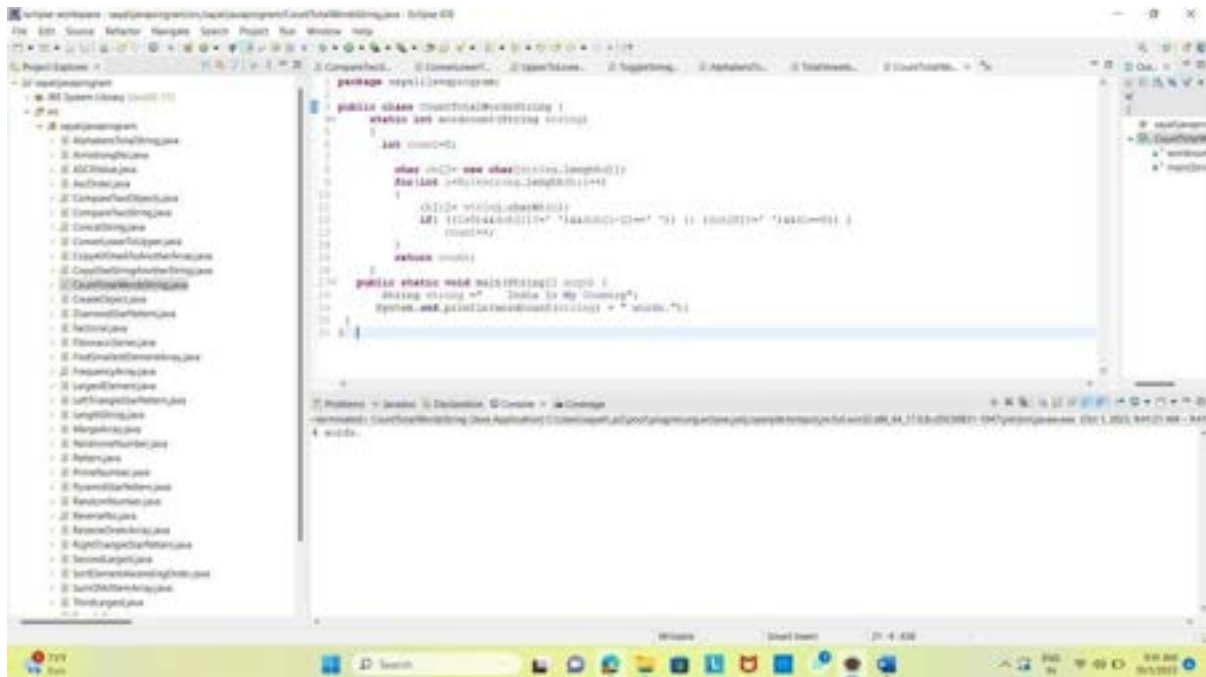
```
package myproj.programs;  
  
public class AlphabeticalString {  
  
    public static void main(String[] args) {  
        String str = "The best of both worlds";  
        int count = 0;  
        for(int i = 0; i < str.length(); i++)  
            if(str.charAt(i) != " ")  
                count++;  
  
        System.out.println("Total number of characters in a string: " + count);  
    }  
}
```

32. Write a java program to count total number of vowels and consonants in a string.



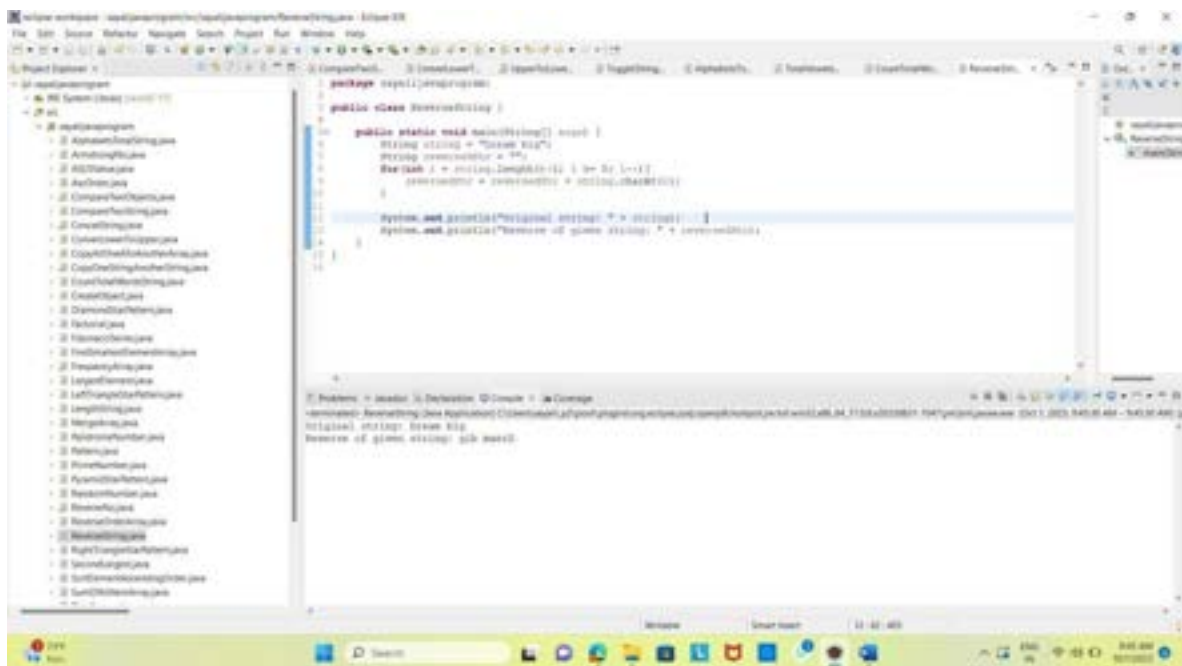
```
package myproj.programs;  
  
public class TotalVowelsConsonants {  
  
    public static void main(String[] args) {  
  
        int vowels = 0, consonants = 0;  
  
        String str = "The best of both worlds";  
        for(int i = 0; i < str.length(); i++)  
            if(str.charAt(i) == "a" || str.charAt(i) == "e" || str.charAt(i) == "i" || str.charAt(i) == "o" || str.charAt(i) == "u")  
                vowels++;  
            else if(str.charAt(i) != " ")  
                consonants++;  
  
        System.out.println("Number of vowels: " + vowels);  
        System.out.println("Number of consonants: " + consonants);  
    }  
}
```

33. Write a java program to count total number of words in a string.



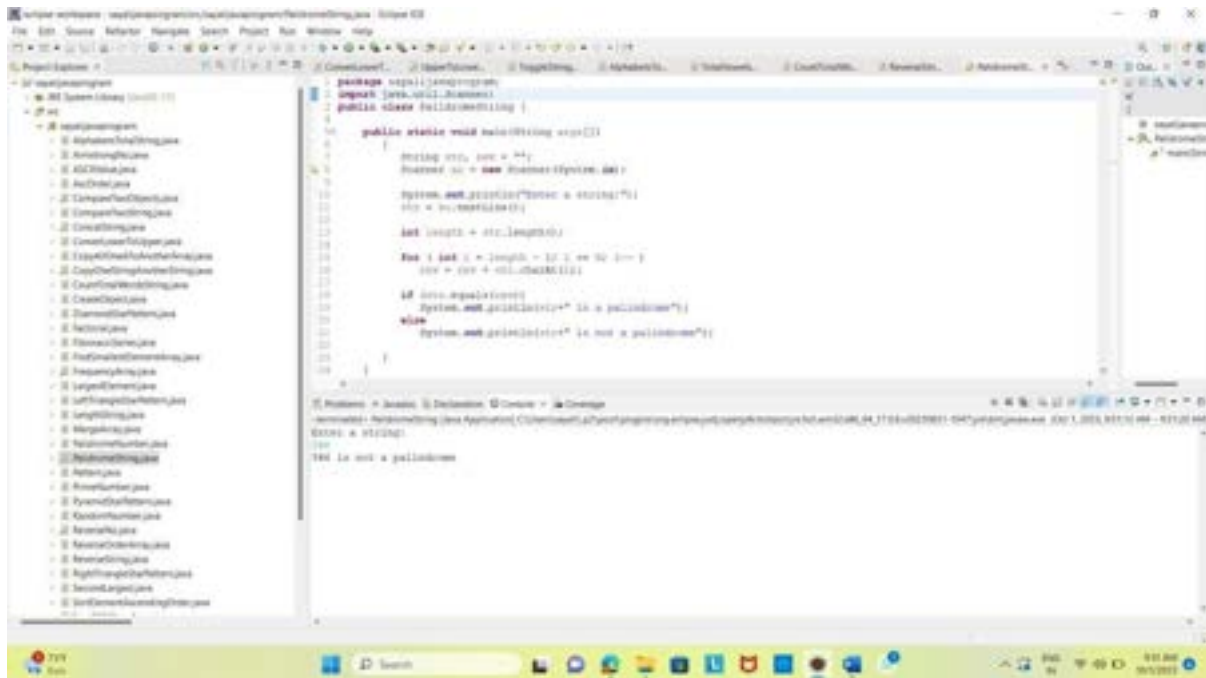
```
package myproj.programs;  
  
public class CountTotalWordsOfString {  
    static int wordCount(String string)  
    {  
        int count=0;  
  
        char ch[]= new char[string.length()];  
        for(int i=0;i<string.length();i++)  
        {  
            ch[i]=string.charAt(i);  
            if( (Character.isLetter(ch[i]) || Character.isDigit(ch[i]) || Character.isSpace(ch[i])) )  
            {  
                count++;  
            }  
        }  
        return count;  
    }  
  
    public static void main(String[] args) {  
        String string = "India is My Country";  
        System.out.println(wordCount(string) + " words.");  
    }  
}
```

34. Write a java program to find reverse of a string.



```
package myproj.programs;  
  
public class ReverseOfString {  
  
    public static void main(String[] args) {  
        String string = "Swas Kip";  
        String reverse = "";  
        for(int i = string.length()-1; i >= 0; i--)  
            reverse = string.charAt(i) + reverse;  
        System.out.println("Original string: " + string);  
        System.out.println("Reverse of given string: " + reverse);  
    }  
}
```

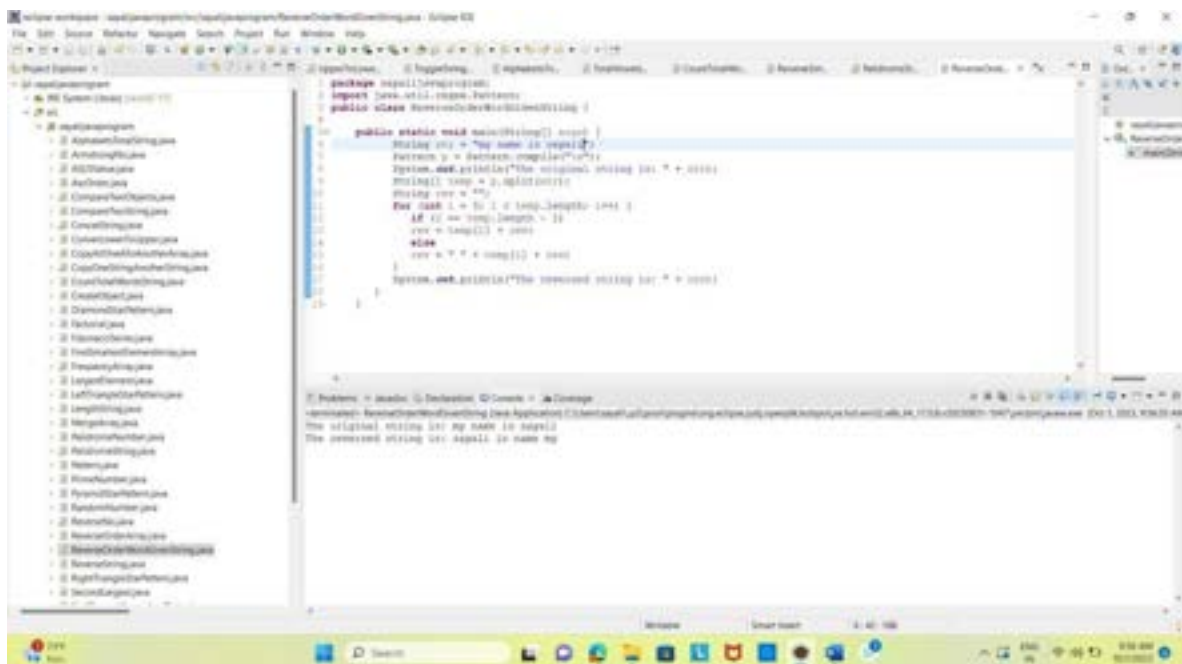
35. Write a java program to check whether a string is palindrome or not.



```
package org.jayprogram;  
import java.util.Scanner;  
public class PalindromeString {  
    public static void main(String args[])  
    {  
        String str, rev = "";  
        Scanner sc = new Scanner(System.in);  
        System.out.println("Enter a string");  
        str = sc.nextLine();  
        int length = str.length();  
        for (int i = length - 1; i >= 0; i--)  
            rev = str.charAt(i) + rev;  
        if (str.equals(rev))  
            System.out.println(str + " is a palindrome");  
        else  
            System.out.println(str + " is not a palindrome");  
    }  
}
```

Output: 123 is not a palindrome

36. Write a java program to reverse order of words in a given string.



```
package org.jayprogram;  
import java.util.Scanner;  
public class ReverseOrderOfWordsString {  
    public static void main(String[] args) {  
        String str = "My name is jay";  
        System.out.println("The original string is: " + str);  
        String temp = str.split(" ");  
        for (int i = 0; i < temp.length - 1; i++)  
            str = temp[i] + " ";  
        str = str + temp[temp.length - 1];  
        System.out.println("The reversed string is: " + str);  
    }  
}
```

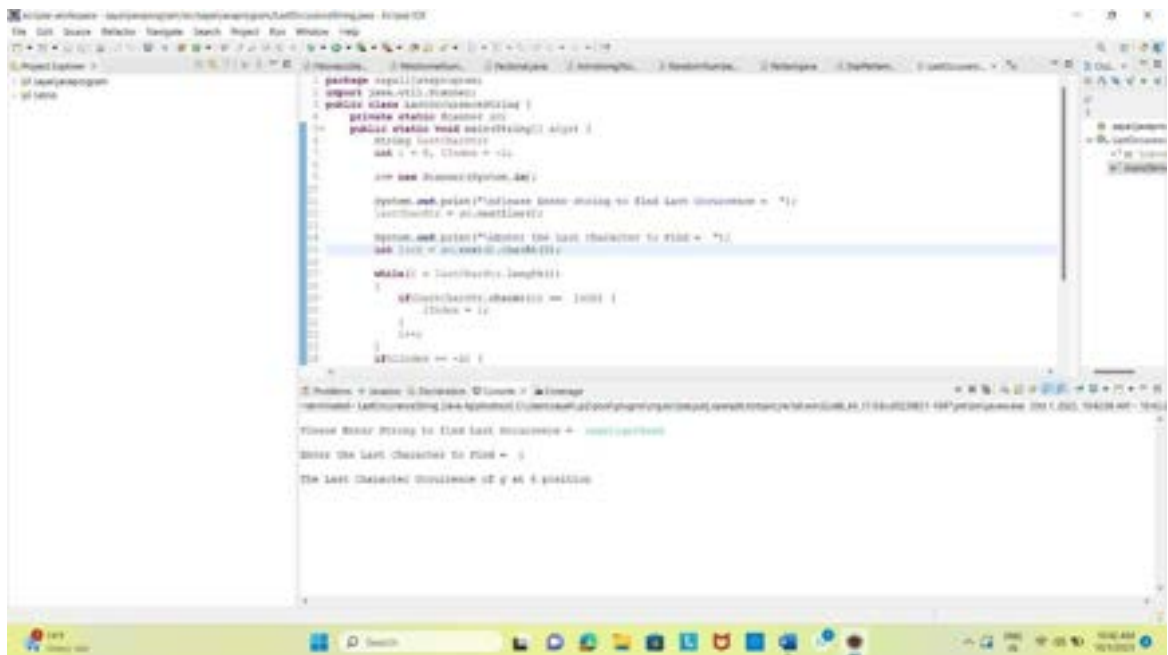
Output: The original string is: My name is jay
The reversed string is: jay is name My

37. Write a java program to find first occurrence of a character in a given string.



```
1  int count = new Integer(0);
2  int len = str.length();
3  for (int i = 0; i < len; i++)
4      count++;
5
6  char ch = str.charAt(0);
7  for (int i = 0; i < len; i++)
8      if (ch == str.charAt(i))
9          break;
10
11  if (ch == str.charAt(i))
12      System.out.println("The occurrence of " + str.charAt(i) + " is " + count);
13
14  public static void main(String args[])
15  {
16      String str = "Helloworld";
17      findFirstChar(str);
18  }
19
20  The occurrence of H is 1
21  The occurrence of e is 2
22  The occurrence of l is 2
23  The occurrence of o is 2
24  The occurrence of w is 1
25  The occurrence of r is 1
26  The occurrence of d is 2
27  The occurrence of l is 4
28  The occurrence of o is 4
29  The occurrence of e is 2
30  The occurrence of s is 1
31  The occurrence of t is 1
```

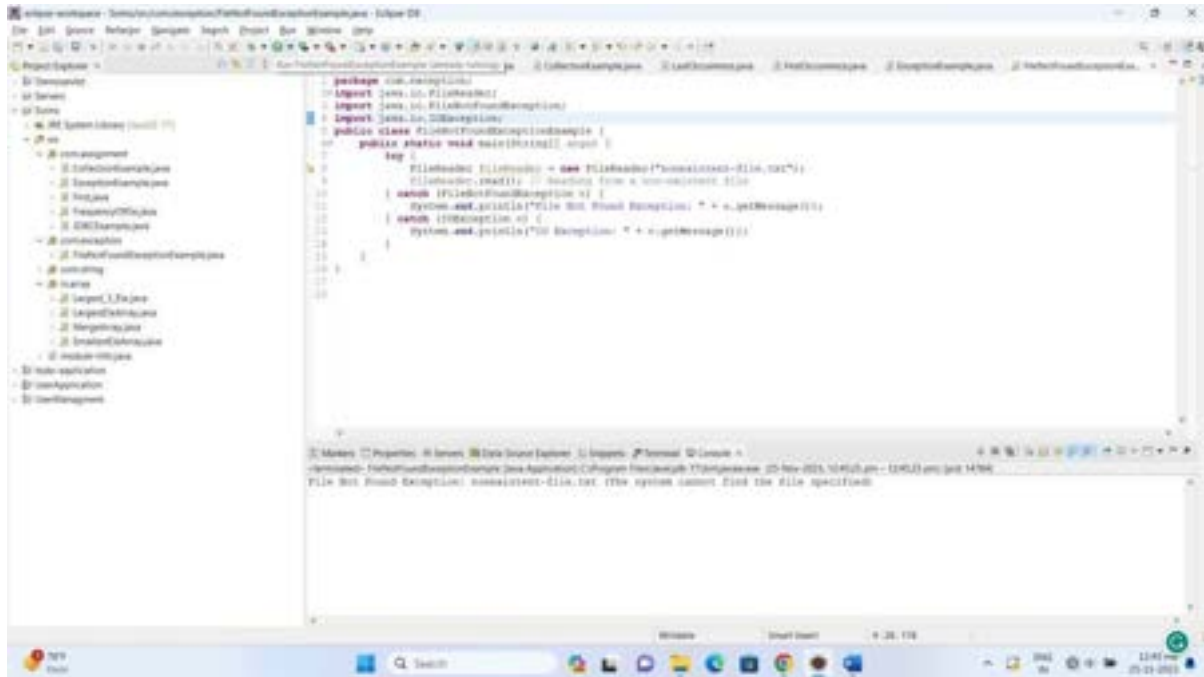
38. Write a java program to find last occurrence of a character in a given string.



```
1 package org.jps.programs;
2 import java.util.Scanner;
3 public class FindLastOccurrence {
4     private static Scanner sc;
5
6     public static void main(String[] args) {
7         String lastChar;
8         int i = 0, count = 0;
9
10        int len = Integer.parseInt(sc.nextLine());
11
12        System.out.println("Please Enter string to find last occurrence = ");
13        lastChar = sc.nextLine();
14
15        System.out.println("Enter the last character to find = ");
16        char ch = sc.nextLine().charAt(0);
17
18        while (i < lastChar.length())
19            if (lastChar.charAt(i) == ch)
20                count = i;
21            i++;
22
23        System.out.println();
24
25        System.out.println("Please Enter string to find last occurrence = " + lastChar);
26
27        System.out.println("Enter the last character to find = " + ch);
28
29        System.out.println("The last character occurrence of " + ch + " is " + count);
30    }
31 }
```


39. Test any five of standard exception and user Defined Custom Exceptions in java

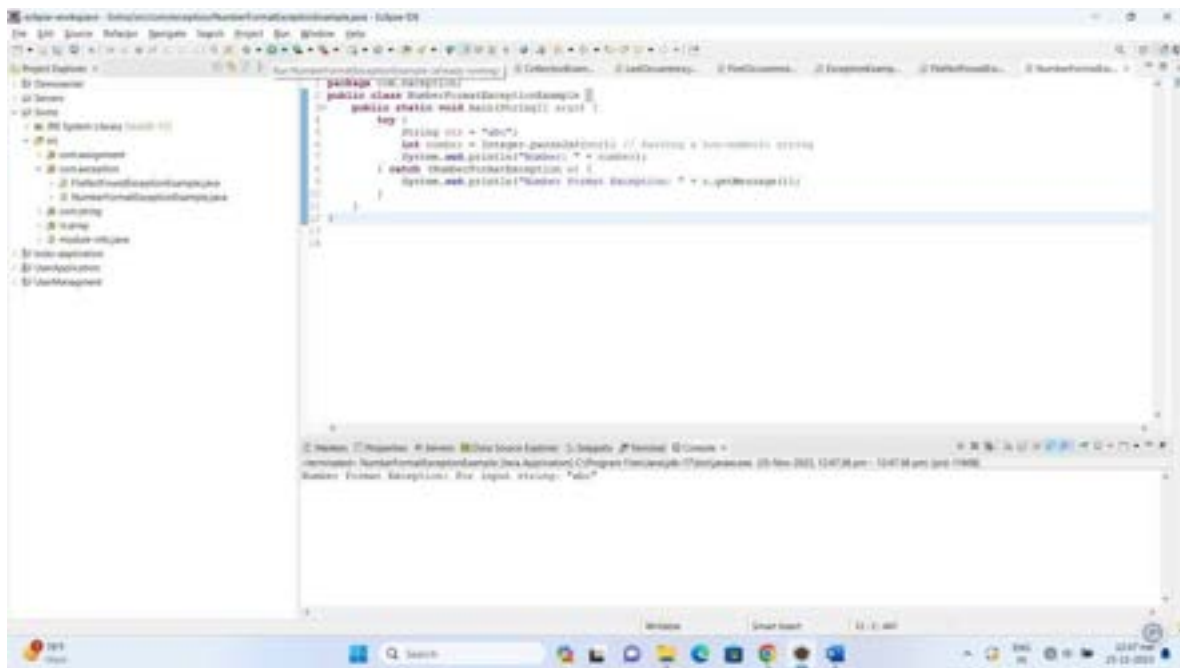
a) File not found exception



```
package com.exception;
import java.io.FileNotFoundException;
import java.io.IOException;
public class FileNotFoundExample {
    public static void main(String[] args) {
        try {
            File f1 = new File("nonexistent-dll.txt");
            f1.createNewFile(); // Creating a non-existent file
        } catch (FileNotFoundException e) {
            System.out.println("File Not Found Exception: " + e.getMessage());
        } catch (IOException e) {
            System.out.println("IO Exception: " + e.getMessage());
        }
    }
}
```

File not found exception: nonexistent-dll.txt (the system cannot find the file specified)

b. NumberFormatExceptionExample



```
package com.exception;
public class NumberFormatExceptionExample {
    public static void main(String[] args) {
        try {
            String str = "abc";
            int i = Integer.parseInt(str); // Parsing a non-numeric string
        } catch (NumberFormatException e) {
            System.out.println("Number Format Exception: " + e.getMessage());
        }
    }
}
```

Number Format Exception: For input string: "abc"

c) ArrayIndexOutOfBoundsExceptionExample

```
package com.exceptions;

public class ArrayIndexOutOfBoundsExceptionExample {
    public static void main(String[] args) {
        try {
            int[] arr = {1, 2, 3};
            int element = arr[5]; // Accessing an index out of bounds
            System.out.println("Element: " + element);
        } catch (ArrayIndexOutOfBoundsException e) {
            System.out.println("Array Index Out Of Bounds Exception: " + e.getMessage());
        }
    }
}
```

Array Index Out Of Bounds Exception: Index 5 out of bounds for length 3

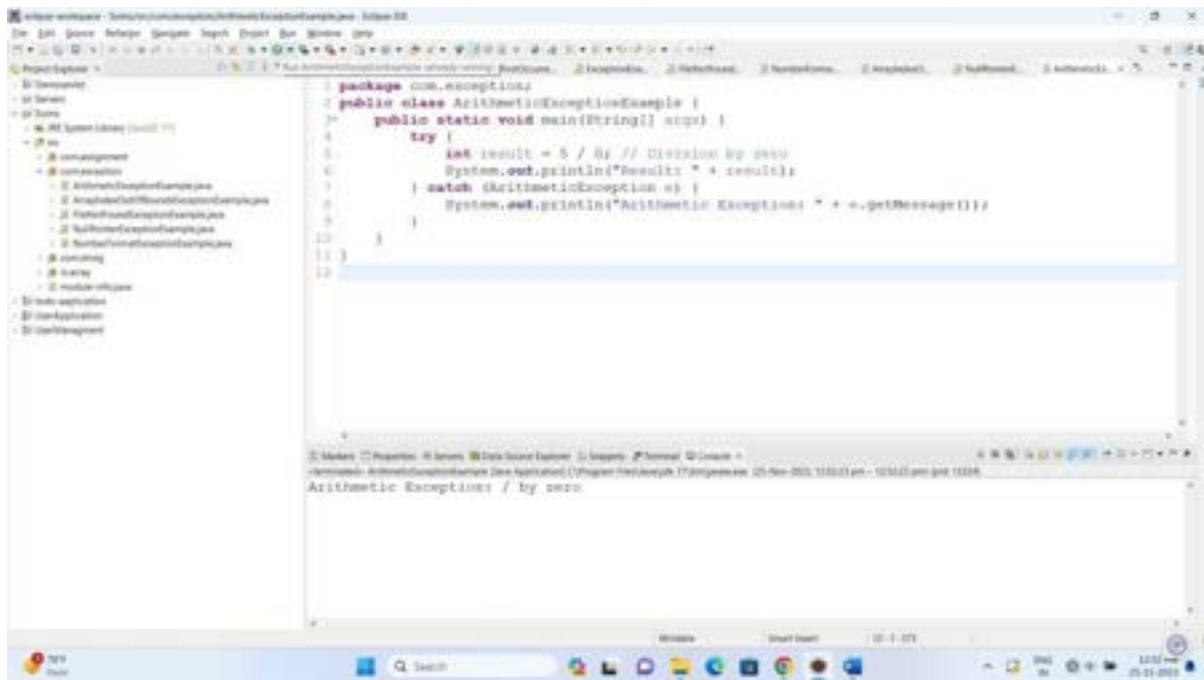
d) NullPointerExceptionExample

```
package com.exceptions;

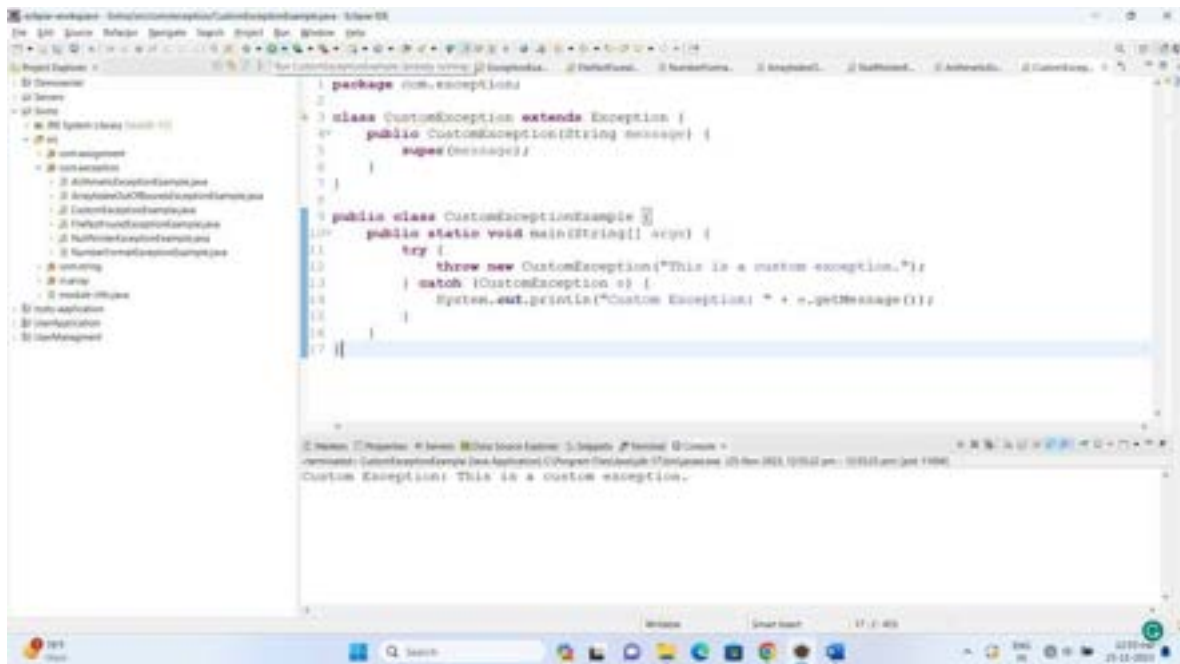
public class NullPointerExceptionExample {
    public static void main(String[] args) {
        try {
            String str = null;
            int length = str.length(); // Attempting to get length of null
            System.out.println("length: " + length);
        } catch (NullPointerException e) {
            System.out.println("Null Pointer Exception: " + e.getMessage());
        }
    }
}
```

Null Pointer Exception: Cannot invoke "String.length()" because "str" is null

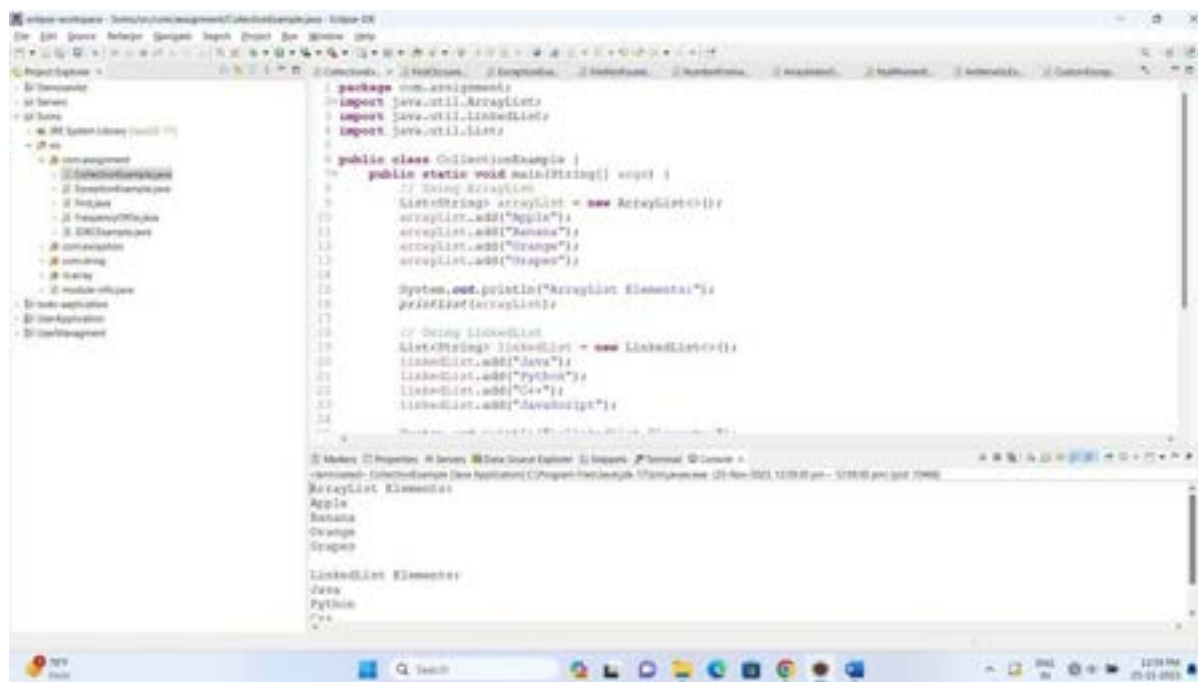
e) ArithmeticExceptionExample



f) CustomException Example



40.Design java application using Collection in javasuch as Array List, Link List



```
package com.assignment;
import java.util.ArrayList;
import java.util.LinkedList;
import java.util.List;

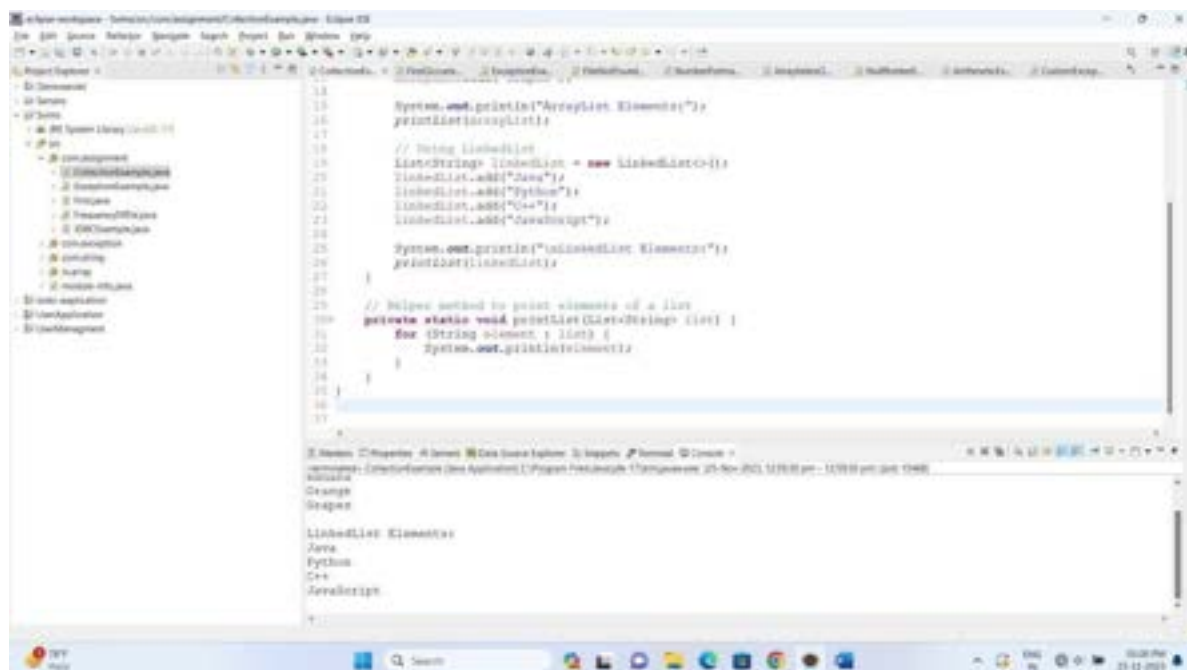
public class CollectionExample {
    public static void main(String[] args) {
        // Using ArrayList
        List<String> arrayList = new ArrayList<>();
        arrayList.add("Apple");
        arrayList.add("Banana");
        arrayList.add("Orange");
        arrayList.add("Grapes");

        System.out.println("ArrayList Elements");
        printList(arrayList);

        // Using LinkedList
        List<String> linkedList = new LinkedList<>();
        linkedList.add("Java");
        linkedList.add("Python");
        linkedList.add("C++");
        linkedList.add("JavaScript");
    }
}

ArrayList Elements
Apple
Banana
Orange
Grapes

LinkedList Elements
Java
Python
C++
JavaScript
```



```
System.out.println("ArrayList Elements");
printList(arrayList);

// Using LinkedList
List<String> linkedList = new LinkedList<>();
linkedList.add("Java");
linkedList.add("Python");
linkedList.add("C++");
linkedList.add("JavaScript");

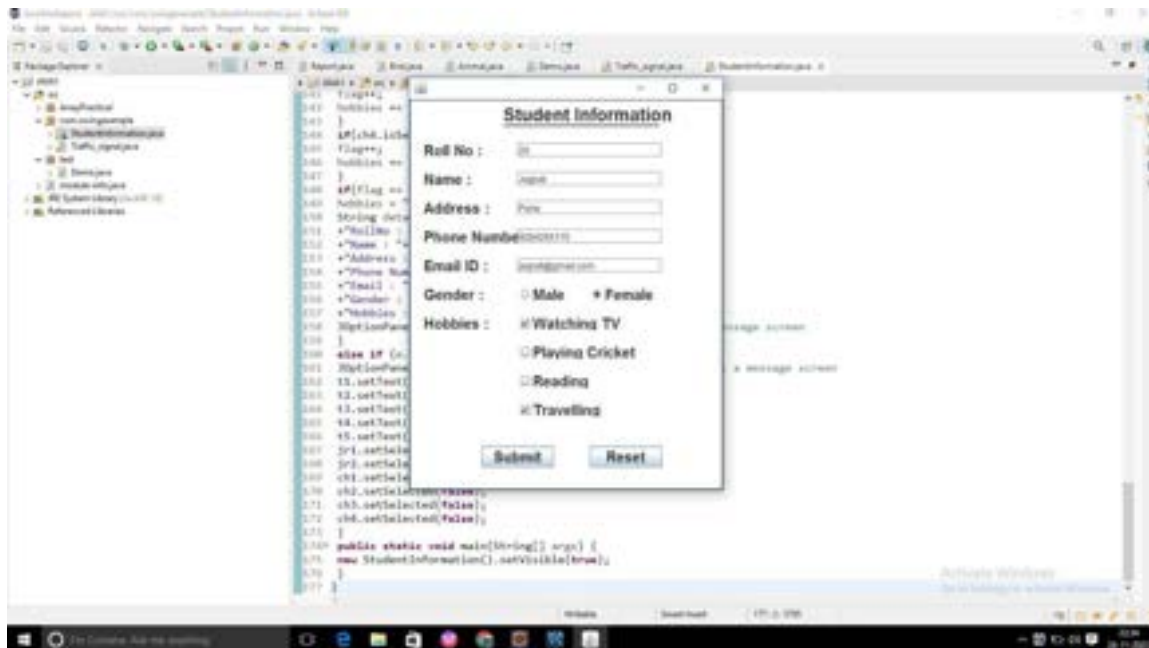
System.out.println("LinkedList Elements");
printList(linkedList);

// helper method to print elements of a list
private static void printList(List<String> list) {
    for (String element : list) {
        System.out.println(element);
    }
}

ArrayList Elements
Orange
Grapes

LinkedList Elements
Java
Python
C++
JavaScript
```

41.Design a and implement JDBC applications.



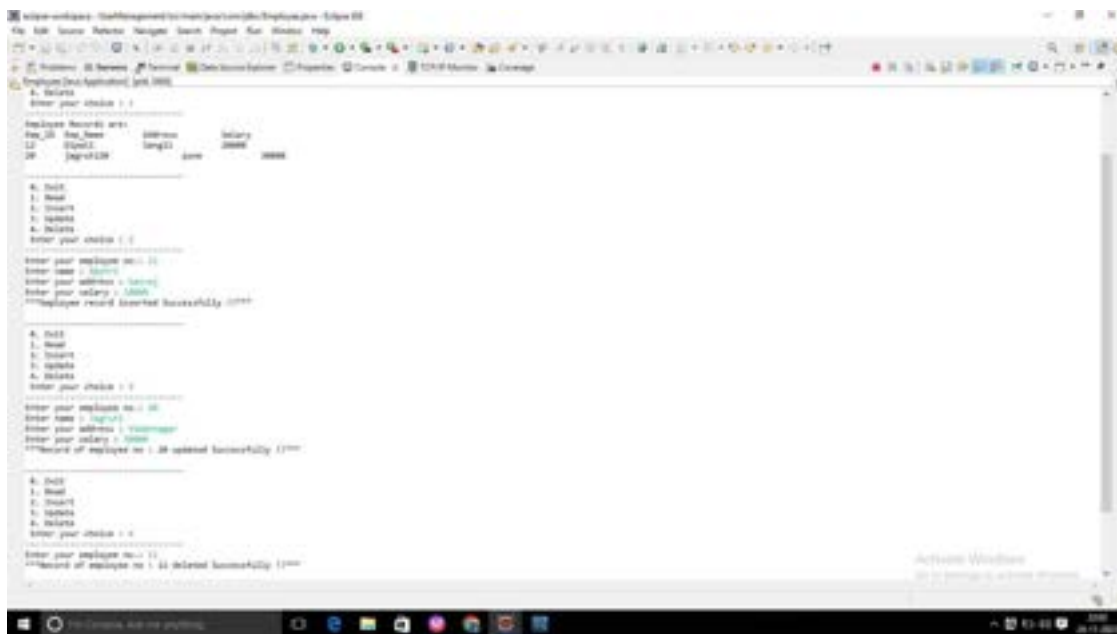
42.Design a and implement servletapplications.



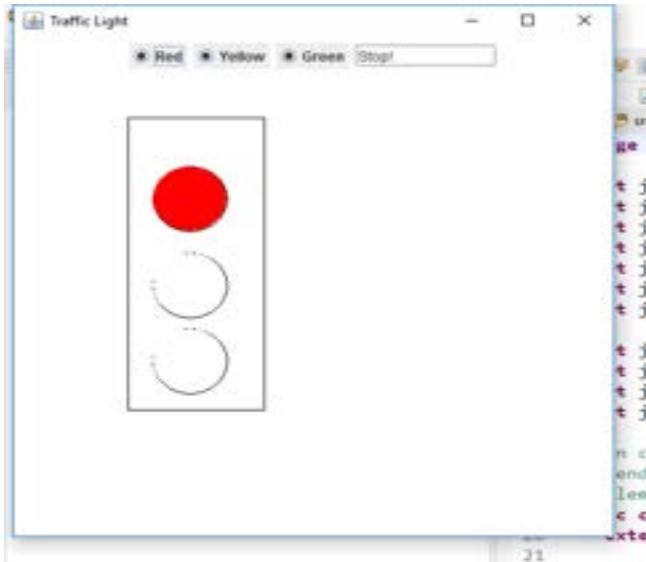
43.Design and implement JSP applications



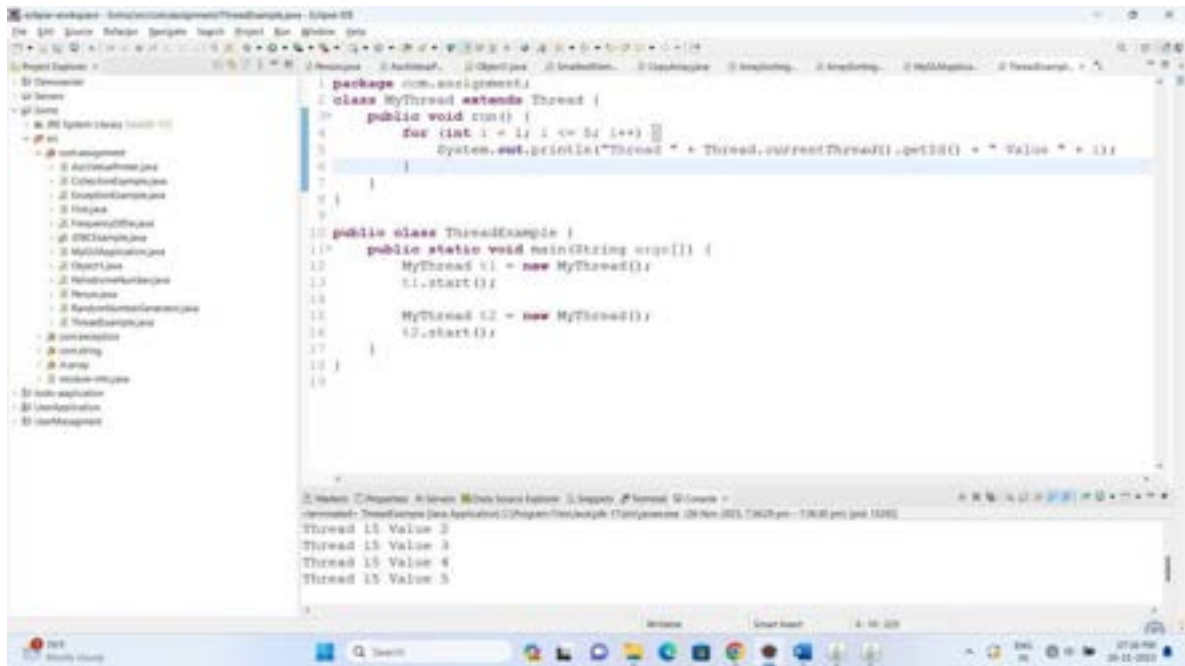
44.Design GUI based java application using AWT,Swing with Event Handling.



45. Java Program to Implement Traffic signal using Swings and AWT



45. Threads creation and design applications by using Extending the Thread class/Implementing the Runnable Interface. Application of multithreading in java.



Demonstrate singly and doubly linked list

```
class Node{
    constructor(element)
    {
        this.element=element;
        this.next=null
    }
}
class LinkedList{
    constructor()
    {
        this.head=null;
        this.size=0;
    }
    add(element)
    {
        var node=new Node(element);
        var current;
        if(this.head===null)
            this.head=node;
        else{
            current=this.head;
            while(current.next)
            {
                current=current.next;
            }
            current.next=node;
        }
    }
}
```

```
    }  
    this.size++;  
  }  
  
  //insert element at position index  
  insertAt(element,index)  
  {  
    if(index<0||index>this.size)  
      return console.log("please enter valid index");  
    else{  
      var node=new Node(element);  
      var current,prev;  
      current=this.head;  
      if(index==0){  
        node.next=this.head;  
        this.head=node;  
      }  
      current=this.head;  
      var it=0;  
      while(it<index)  
      {  
        it++;  
        prev=current;  
        current=current.next;  
      }  
      node.next=current;  
      prev.next=node;  
    }  
    this.size++;  
  }  
}
```

```
}  
  
//remove an element  
removeFrom(index)  
{  
  if(index<0||index<=this.size)  
    return console.log("please enter the valid index");  
  else{  
    var curr,prev,it=0;  
    curr = this.head;  
    prev=curr;  
    //deleting first element  
    if(index ===0){  
      this.head=curr.next;  
    }  
    else{  
      while(it<index){  
        it++;  
        prev=curr;  
        curr=curr.next;  
      }  
      prev.next=curr.next; }  
    this.size--;  
  }  
}  
  
//remove given elment from the list  
removeElement(element)  
{  
  


---


```

```
var current=this.head;

var prev=null;

while(current!=null)
{
    if(current.element===element){
        if(prev==null){
            this.head=current.next;
        }
    }
    else{
        prev.next=current.next;
    }

    this.size--;

    return current.element;
}

prev=current;

current=current.next;

}

return-1;

}

indexOf(element)

{

var count=0;

var current=this.head;

while(current!=null){

if(current.element===element)

return count;

count++;

current=current.next;

}
```

```
    }  
    return-1;  
}  
isEmpty()  
{  
    return this.size==0;  
}  
size_of_list()  
{  
    console.log(this.size);  
}  
printList()  
{  
    var curr=this.head;  
    var str="";  
    while(curr){  
        str +=curr.element + " ";  
        curr=curr.next;  
    }  
    console.log(str);  
}  
}  
var ll =new LinkedList();  
console.log(ll.isEmpty());  
ll.add(10);  
ll.printList();  
console.log(ll.size_of_list());  
ll.add(20);
```

```
ll.add(30);

ll.add(40);

ll.add(50);

ll.printList();

console.log("is element is remove?" + ll.removeElement(50));

ll.printList();

console.log("index of 40" + ll.indexOf(40));

ll.insertAt(60,2);

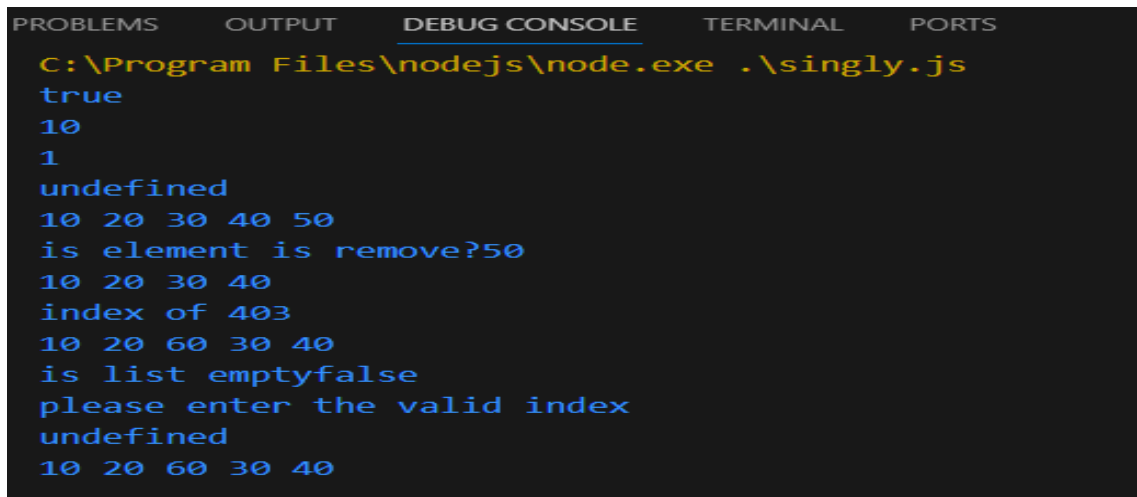
ll.printList();

console.log("is list empty" + ll.isEmpty());

console.log(ll.removeFrom(3));

ll.printList();
```

OUTPUT –



```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
C:\Program Files\nodejs\node.exe .\singly.js
true
10
1
undefined
10 20 30 40 50
is element is remove?50
10 20 30 40
index of 403
10 20 60 30 40
is list emptyfalse
please enter the valid index
undefined
10 20 60 30 40
```

(i) Demonstrate Doubly linked list –

```
class Node {

  constructor(element) {

    this.prev=null

    this.element=element;
```

```
        this.next=null
    }
}
class LinkedList{
    constructor() {
        this.head=null;
        this.size=0;
    }add(element)
        var node=new Node(element);
        var current;
        if(this.head===null)
            this.head=node;
        else{
            current=this.head;
            while(current.next)
            {
                current=current.next;
            }
            current.next=node;
            node.prev=current;
        }
        this.size++;
    }
    insertAt(element,index)
    {
        if(index<0|| index> this.size)
            return console.log("please enter a valid index:");
        else
```

```
{  
  var node=new Node(element);  
  var curr, prev;  
  curr =this.head;  
  if(index==0)  
  {  
    node.next=this.head;  
    this.head=node;  
  }  
  else  
  {  
    curr=this.head;  
    var it=0;  
    while(it<index)  
    {  
      it++;  
      prev=curr;  
      curr=curr.next;  
    }  
    node.next=curr;  
    prev.next=node;  
  }  
  this.size++;  
}  
}removeFrom(index)  
{  
  if(index<0||index>=this.size)  
  return console.log("please enter a valid index");  
}
```

```
else{

    var curr,prev,it=0;

    curr=this.head;

    prev=curr;

    if(index===0){

        this.head=curr.next;

    }else{

        while(it<index){

            it++;

            prev=curr;

            curr=curr.next;

        }

        prev.next=curr.next;

    }

    this.size--;

    return curr.element;

}

}

removeElement(element)

{

    var current =this.head;

    var prev=null;

    while(current!=null)

    {

        if(current.element===element){

            if(prev==null){

                this.head=current.next;

            }

        }

    }

}
```

```
        else{
            prev.next=current.next;
        }
        this.size--;
        return current.element;
    } prev=current
        current=current.next;
    }
    return -1;
}
indexOf(element)
{
    var count=0;
    var current=this.head;
    while(current!=null)
    {
        if (current.element===element)
            return count;
        count++;
        current=(current.next);
    }
    return -1
}
isEmpty(){
    return this.size==0;
}
size_of_list(){
    console.log(this.size);
}
```

```
}  
  
printList(){  
    var curr=this.head;  
    var str="";  
    while(curr){  
        str +=curr.element+" ";  
        curr=curr.next;  
    }  
    console.log(str);  
}  
  
}  
  
var ll=new LinkedList();  
  
console.log("is list empty?" +ll.isEmpty());  
  
ll.add(10);  
  
ll.printList();  
  
console.log(ll.size_of_list());  
  
ll.add(20);  
  
ll.add(30);  
  
ll.add(40);  
  
ll.add(50);  
  
ll.printList();  
  
console.log("is element removed? " +ll.removeElement(50));  
  
ll.printList();  
  
console.log("index of 40 " +ll.indexOf(40));  
  
ll.insertAt(60,2);  
  
ll.printList();  
  
console.log("is empty list " +ll.isEmpty());  
  
console.log(ll.removeFrom(3));
```

`ll.printList();`

OUTPUT –

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
C:\Program Files\nodejs\node.exe .\doubly.js
is list empty?true
10
1
undefined
10 20 30 40 50
is element removed? 50
10 20 30 40
index of 40 3
10 20 60 30 40
is empty list false
30
10 20 60 40
```

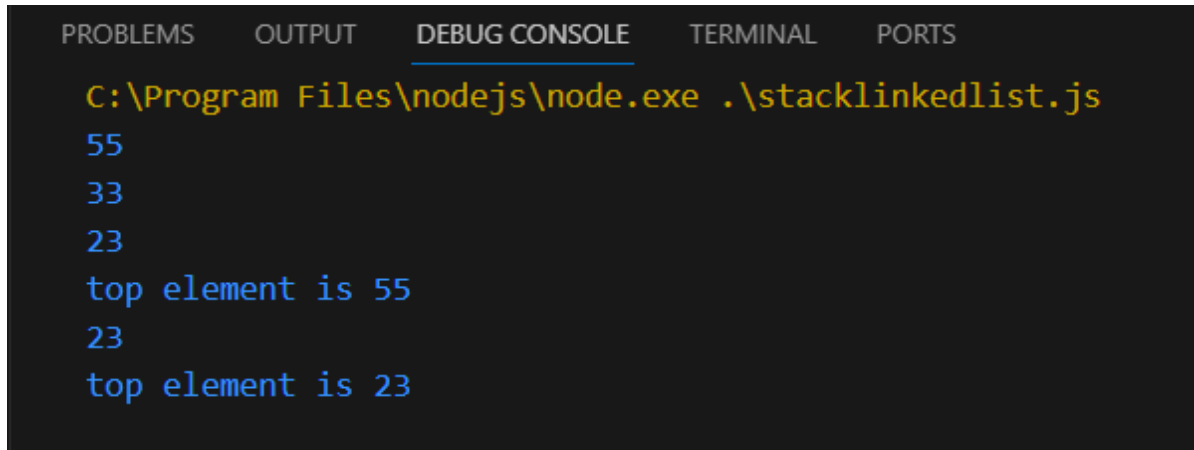
1.STACK implementation using Array with PUSH, POP operations –

```
class node
{
  constructor(element)
  {
    this.element=element;
    this.next=null;
  }
}
class stack
{ constructor()
  {
    this.top=null;
    this.size=0;
  }
  push(x)
  { let temp=new node();
    if(temp==null)
    {
      return overflow;
    }
    temp.element=x;
    temp.next=this.top;
    this.top=temp;
  }
  isEmpty()
  {
    return this.top==null;
  }
  peek()
  {
    if(!this.isEmpty())
```

```
    {
      return this.top.element;
    }
    else{
      return -1;
    }
  }
  pop()
  {
    if(this.top===null)
    {
      return underflow;
    }
    this.top=this.top.next;
  }
  display()
  {
    let temp=this.top;
    while (temp!=null)
    {
      console.log(temp.element);
      temp=temp.next;
    }
  }
}
let Node=new stack();
Node.push(23);
Node.push(33);
Node.push(55);
Node.display();
console.log("top element is",Node.peek());
Node.pop();
Node.pop();
```

```
Node.display();  
console.log("top element is",Node.peek());
```

OUTPUT –



```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS  
C:\Program Files\nodejs\node.exe .\stacklinkedlist.js  
55  
33  
23  
top element is 55  
23  
top element is 23
```

2.Reverse a string using stack

```
class Stack{
    constructor()
    {
        this.top = null
    }

    push(element)
    {
        var node = new newNode(element)
        node.next=this.top
        this.top=node
    }

    pop()
    var temp = this.top
        var Char = temp.data
        this.top=this.top.next
        temp=null
        return Char
    }

    reverseString(str)
    {
        var i = 0
        var reversestr=""
        while(i !=str.length)
        {
            this.push(str.charAt(i))
            i++
        }
        var temp = this.top
        while(temp!=null)
        {
```

```
        var char
        char=this.pop()
        reversestr += char
        temp=this.top
    }
    return reversestr
}

display()
{
    var temp=this.top
    while(temp!=null){
        console.log(temp.data)
        temp=temp.next
    }
}

class newNode
{
    constructor(data,next)
    {
        this.data=data
        this.next=null
    }
}

const stack = new Stack()
const string = "Reverse String";
const reverse=stack.reverseString(string)
console.log(`The string is: ${string} \nReverse string is: ${reverse}`)
```

OUTPUT -

PROBLEMS

OUTPUT

DEBUG CONSOLE

TERMINAL

PORTS

```
C:\Program Files\nodejs\node.exe .\reverse.js
```

```
The string is: Reverse String
```

```
Reverse string is: gnirts esrever
```

3. Check for balanced parentheses by using Stacks

```
function areBracketsBalanced(expr)
{
  let stack = [];
  for(let i = 0; i < expr.length; i++)
  {
    let x = expr[i];
    if (x === '(' || x === '[' || x === '{')
    {
      stack.push(x);
      continue;
    }
    if (stack.length === 0)
      return false;
    let check;
    switch (x){
      case ')':
        check = stack.pop();
        if (check === '{' || check === '[')
          return false;
        break;
      case '}':
        check = stack.pop();
        if (check === '(' || check === '[')
          return false;
        break;
      case ']':
        check = stack.pop();
        if (check === '(' || check === '{')
          return false;
        break;
    }
  }
  return (stack.length === 0);
}

let expr = "({{}})";
if (areBracketsBalanced(expr))
  console.log("Balanced ");
else
  console.log("Not Balanced ");
```

OUTPUT –

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS  
C:\Program Files\nodejs\node.exe .\paranthes.js  
Not Balanced
```

4.Implement Stack using Linked List –

```
class node
{
  constructor(element)
  {
    this.element=element;
    this.next=null;
  }
}
class stack
{ constructor()
  {
    this.top=null;
    this.size=0;
  }
  push(x)
  { let temp=new node();
    if(temp==null)
    {
      return overflow;
    }
    temp.element=x;
    temp.next=this.top;
    this.top=temp;

  }
  isEmpty()
  {
    return this.top==null;
  }
  peek()
  {
    if(!this.isEmpty())
    {
      return this.top.element;
    }
    else{
      return -1;
    }
  }
}
```

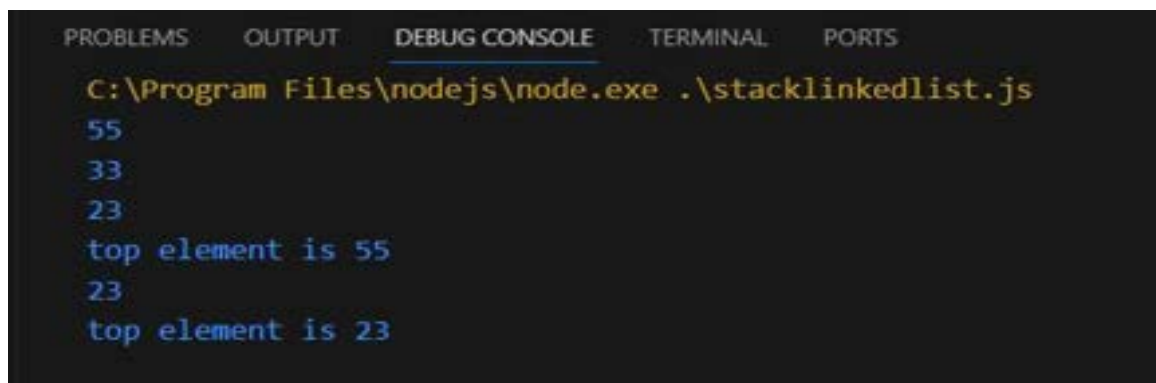
```

    }
    pop()
    {
        if(this.top===null)
        {
            return underflow;
        }
        this.top=this.top.next;
    }
    display()
    {
        let temp=this.top;
        while (temp!=null)
        {
            console.log(temp.element);
            temp=temp.next;
        }
    }
}

let Node=new stack();
Node.push(23);
Node.push(33);
Node.push(55);
Node.display();
console.log("top element is",Node.peek());
Node.pop();
Node.pop();
Node.display();
console.log("top element is",Node.peek());

```

OUTPUT –



```

PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
C:\Program Files\nodejs\node.exe .\stacklinkedlist.js
55
33
23
top element is 55
23
top element is 23

```

5.Demonstration of Linear Queue, Circular Queue, Priority Queue –

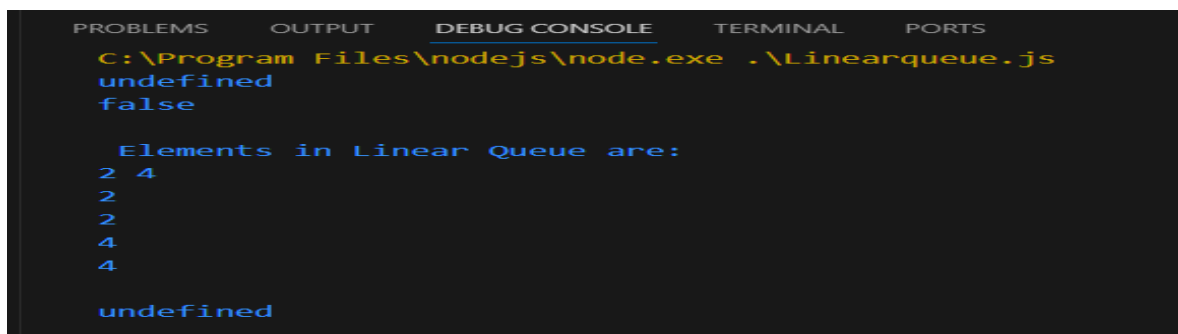
- **Linear Queue-**

```
class linearqueue
{
  constructor()
  {
    this.items =[];
    this.lenght=-1;
  }
  enqueue(element)
  {
    this.items.push(element);
  }
  dequeue()
  {
    if(this.isempty())
      return "underflow";
    return this.items.shift();
  }
  front()
  {
    if(this.isempty())
      return "no element in queue";
    return this.items[0];
  }
  isempty()
  {
    return this.items.lenght===-1;
  }
  printQueue()
  {
    var str = "";
    for(var i = 0; i < this.items.length; i++)
      str += this.items[i] + " ";
    return str;
  }
}

var queue = new linearqueue();
console.log(queue.dequeue());
```

```
console.log(queue.isEmpty());
queue.enqueue(2);
queue.enqueue(4);
console.log("\n Elements in Linear Queue are:");
console.log(queue.printQueue());
console.log(queue.front());
console.log(queue.dequeue());
console.log(queue.printQueue());
console.log(queue.dequeue());
console.log(queue.printQueue());
console.log(queue.dequeue());
console.log(queue.printQueue());
```

OUTPUT -



```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
C:\Program Files\nodejs\node.exe .\Linearqueue.js
undefined
false

  Elements in Linear Queue are:
  2 4
  2
  2
  4
  4

undefined
```

- **Priority Queue –**

```
class QElement
{
  constructor(element,priority)
  {
    this.element=element;
    this.priority=priority;
  }
}
```

```
class PriorityQueue
{
    constructor()
    {
        this.items=[];
    }
    enqueue(element,priority)
    {
        var qElement=new QElement(element,priority);
        var contain =false;
        for(var i=0;i<this.items.length;i++)
        { if(this.items[i].priority>qElement.priority)
            {
                this.items.splice(i,0,qElement);
                contain=true;
                break;
            }
        }
        if(!contain)
        {
            this.items.push(qElement);
        }
    }
    dequeue()
    {
        if(this.isEmpty())
            return "underflow";
    }
}
```

```
        return this.items.shift();
    }
    Front()
    {
        if(this.isEmpty())
            return "no element in queue";
        return this .items[0];
    }
    Rear()
    {
        if(this.isEmpty())
            return "no element in queue";
        return this.items[this.items.length-1];
    }
    isEmpty()
    {
        return this.items.length==0;
    }
    printPQueue()
    {
        var str="";
        for(var i=0;i<this.items.length;i++)
            str+=this.items[i].element+ " ";
        return str;
    }
}

var priorityQueue=new PriorityQueue();

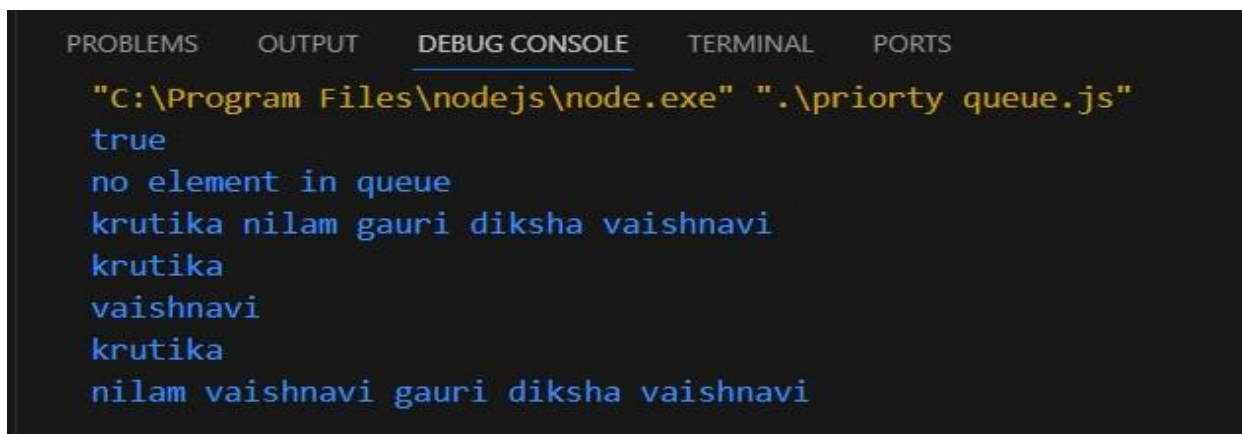
console.log(priorityQueue.isEmpty());
```

```
console.log(priorityQueue.Front());

priorityQueue.enqueue("krutika",1);
priorityQueue.enqueue("nilam",1);
priorityQueue.enqueue("gauri",3);
priorityQueue.enqueue("vaishnavi",4);
priorityQueue.enqueue("diksha",3);

console.log(priorityQueue.printPQueue());
console.log(priorityQueue.Front().element);
console.log(priorityQueue.Rear().element);
console.log(priorityQueue.dequeue().element);
priorityQueue.enqueue("vaishnavi",2);
console.log(priorityQueue.printPQueue());
```

OUTPUT –



```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS

"C:\Program Files\nodejs\node.exe" ".\priority queue.js"
true
no element in queue
krutika nilam gauri diksha vaishnavi
krutika
vaishnavi
krutika
nilam vaishnavi gauri diksha vaishnavi
```

- **Circular Queue –**

```
class CircularQueue
{
    constructor(size)
```

```
{
  this.data=[];
  this.size=size;
  this.length=0;
  this.front=0;
  this.rear=-1;
}
isEmpty()
{
  return (this.length==0)
}
enqueue(element)
{
  if(this.length>=this.size)
    console.log("full");
  //rear=(rear+1)%size;
  this.data[(this.rear+1)%this.size] =element;// data[0]=10
  this.length++;
}

print()
{
  for(let i=0;i<this.data.length;i++)
  {
    console.log[this.data[i]];
  }
}

getfront()
{
  if(this.isEmpty())
  {
    console.log("no element in circular queue");
  }
  return this.data[(this.front) % (this.size)];
}

dequeue()
{
  if(this.isEmpty())
```

```
        console.log("no element");
const value= this.getfront();
this.data[this.front%this.size]=null;
this.front++;
this.length--;
console.log(value);
    }
}
cq=new CircularQueue(5);
cq.enqueue(10);
cq.enqueue(15);
cq.enqueue(16);
cq.enqueue(17);
cq.enqueue(18);
console.log("deleted element ");
cq.dequeue();
```

OUTPUT –



```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
"C:\Program Files\nodejs\node.exe" ".\class CircularQueue.js"
deleted element
18
```

6.Reverse stack using queue –

```
class Queue
{
  constructor ()
  {
    this.front = null
    this.rear = null
  }

  insert(ele)
  {
    var node = new newNode(ele)
    if(this.front===null)
      this.front=node
    else
      this.rear.next=node
    this.rear=node
  }

  push_stack()
  {
    var temp=this.front
    while(temp!=null)
    {
      top.push(temp.data)
      temp=temp.next
      this.front=this.front.next
    }
  }

  display()
  {
    var temp=this.front
    while(temp!=null)
    {
      console.log(temp.data)
      temp=temp.next
    }
  }
}

class Stack
{
```

```
constructor ()
{
  this.top = null
}

push(ele)
{
  var node=new newNode(ele)
  node.next=this.top
  this.top=node
}

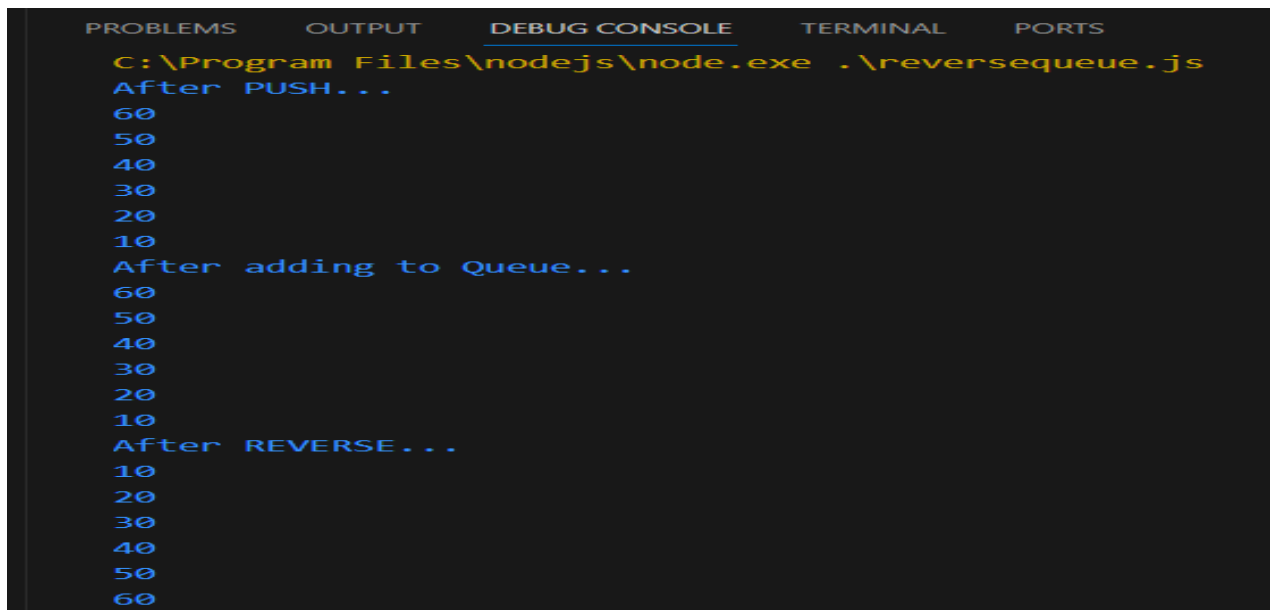
pop_add_queue()
{
  var temp=this.top
  while(temp!=null)
  {
    front.insert(temp.data)
    temp=temp.next
  }
  this.top=null
}

display()
{
  var temp=this.top
  while(temp!=null)
  {
    console.log(temp.data)
    temp=temp.next
  }
}

class newNode
{
  constructor (data, next)
  {
    this.data = data
    this.next = null
  }
}
```

```
}  
const top = new Stack()  
const front = new Queue()  
top.push(10)  
top.push(20)  
top.push(30)  
top.push(40)  
top.push(50)  
top.push(60)  
console.log("After PUSH...")  
top.display()  
top.pop_add_queue()  
console.log("After adding to Queue...")  
front.display()  
front.push_stack()  
console.log("After REVERSE...")  
top.display()
```

OUTPUT –



```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS  
C:\Program Files\nodejs\node.exe .\reversequeue.js  
After PUSH...  
60  
50  
40  
30  
20  
10  
After adding to Queue...  
60  
50  
40  
30  
20  
10  
After REVERSE...  
10  
20  
30  
40  
50  
60
```

7. Practical based on binary search tree implementation with its operations

```
class Node
{
    constructor(data)
    {
        this.data = data;
        this.left = null;
        this.right = null;
    }
}

class BinarySearchTree
{
    constructor()
    {
        // root of a binary search tree
        this.root = null;
    }

    insert(data)
    {
        var newNode = new Node(data);
        if(this.root === null)
            this.root = newNode;
        else
            this.insertNode(this.root, newNode);
    }

    insertNode(node, newNode)
    {
        if(newNode.data < node.data)
        {
            // if left is null insert node here
            if(node.left === null)
                node.left = newNode;
            else
                // if left is not null recur until
```

```

        // null is found
        this.insertNode(node.left, newNode);
    }
else
{

    if(node.right === null)
        node.right = newNode;
    else
        // if right is not null recur until
        // null is found
        this.insertNode(node.right, newNode);
    }
}
remove(data)
{
    // root is re-initialized with
    // root of a modified tree.
    this.root = this.removeNode(this.root, data);
}
// Method to remove node with a
// given data
// it recur over the tree to find the
// data and removes it
removeNode(node, key)
{
    if(node === null)
        return null;
    else if(key < node.data)
    {
        node.left = this.removeNode(node.left, key);
        return node;
    }
    // if data to be delete is greater than
    // roots data then move to right subtree

```

```
else if(key > node.data)
{
    node.right = this.removeNode(node.right, key);
    return node;
}
// if data is similar to the root's data
// then delete this node
else
{
    // deleting node with no children
    if(node.left === null && node.right === null)
    {
        node = null;
        return node;
    }
    // deleting node with one children
    if(node.left === null)
    {
        node = node.right;
        return node;
    }
    else if(node.right === null)
    {
        node = node.left;
        return node;
    }
    // Deleting node with two children
    // minimum node of the right subtree
    // is stored in aux
    var aux = this.findMinNode(node.right);
    node.data = aux.data;

    node.right = this.removeNode(node.right, aux.data);
    return node;
}
```

```
    }  
  }  
  // Performs inorder traversal of a tree  
  inorder(node)  
  {  
    if(node !== null)  
    {  
      this.inorder(node.left);  
      console.log(node.data);  
      this.inorder(node.right);  
    }  
  }  
  preorder(node)  
  {  
    if(node !== null)  
    {  
      console.log(node.data);  
      this.preorder(node.left);  
      this.preorder(node.right);  
    }  
  }  
  
  postorder(node)  
  {  
    if(node !== null)  
    {  
      this.postorder(node.left);  
      this.postorder(node.right);  
      console.log(node.data);  
    }  
  }  
  
  findMinNode(node)  
  {  
  


---


```

```
// if left of a node is null
// then it must be minimum node
if(node.left === null)
    return node;
else
    return this.findMinNode(node.left);
}
```

```
// returns root of the tree
```

```
getRootNode()
```

```
{
    return this.root;
}
```

```
search(node, data)
```

```
{
    // if trees is empty return null
```

```
    if(node === null)
        return null;
```

```
    // if data is less than node's data
```

```
    // move left
```

```
    else if(data < node.data)
        return this.search(node.left, data);
```

```
    // if data is more than node's data
```

```
    // move right
```

```
    else if(data > node.data)
        return this.search(node.right, data);
```

```
    // if data is equal to the node data
```

```
    // return node
```

```
    else
        return node;
```

```
}
```

```
}  
  
// create an object for the BinarySearchTree  
var BST = new BinarySearchTree();  
  
// Inserting nodes to the BinarySearchTree  
BST.insert(15);  
BST.insert(25);  
BST.insert(10);  
BST.insert(7);  
BST.insert(22);  
BST.insert(17);  
BST.insert(13);  
BST.insert(5);  
BST.insert(9);  
BST.insert(27);  
  
//      15  
//     / \  
//    10 25  
//   /\  
//  7 13 22 27  
// /\  
// 5 9 17  
  
var root = BST.getRootNode();  
  
// prints 5 7 9 10 13 15 17 22 25 27  
console.log("Inorder of given data");  
BST.inorder(root);  
  
// Removing node with no children  
BST.remove(5);
```

```
//      15
//     / \
//    10 25
//   /\  /\
//  7 13 22 27
//   \ /
//    9 17

var root = BST.getRootNode();
console.log("Inorder of given data");
// prints 7 9 10 13 15 17 22 25 27
BST.inorder(root);
```

```
// Removing node with one child
BST.remove(7);
```

```
//      15
//     / \
//    10 25
//   /\  /\
//  9 13 22 27
//   /
//    17
```

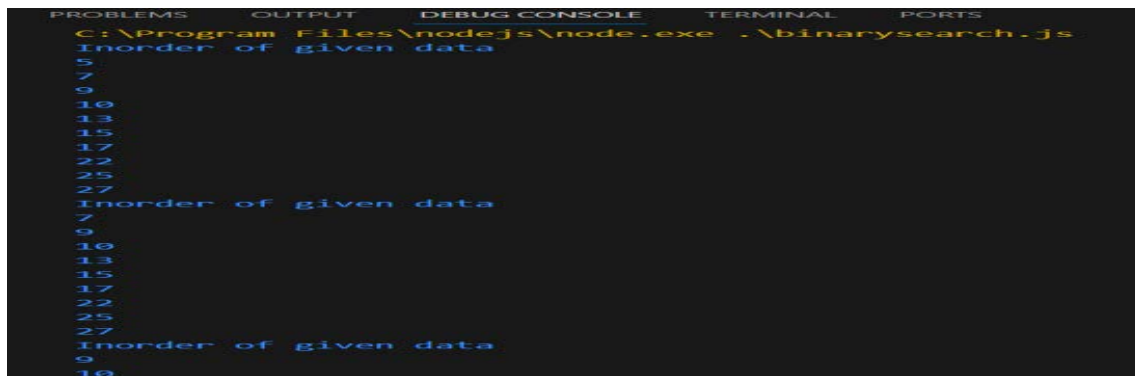
```
var root = BST.getRootNode();
console.log("Inorder of given data");
// prints 9 10 13 15 17 22 25 27
BST.inorder(root);
```

```
// Removing node with two children
BST.remove(15);
```

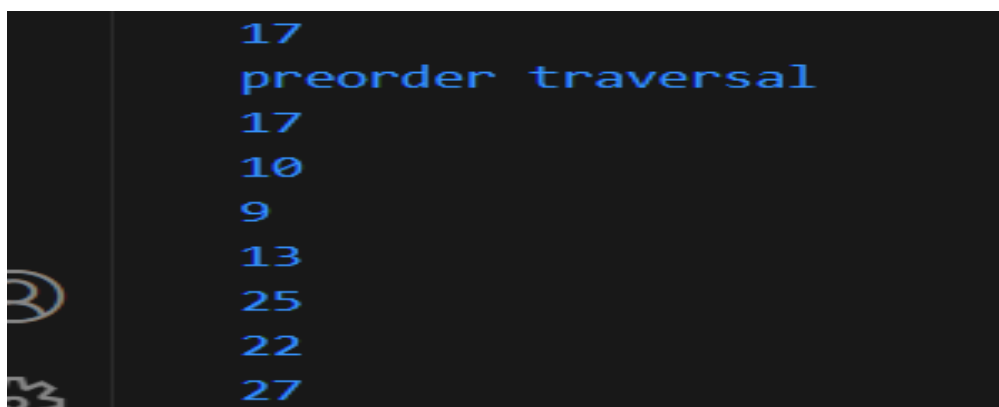
```
//      17
//     / \
//    10 25
```

```
//   /\ /\  
//   9 13 22 27  
  
var root = BST.getRootNode();  
console.log("inorder traversal");  
  
// prints 9 10 13 17 22 25 27  
BST.inorder(root);  
  
console.log("postorder traversal");  
BST.postorder(root);  
console.log("preorder traversal");  
BST.preorder(root);
```

OUTPUT -



```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS  
C:\Program Files\nodejs\node.exe -\binarysearch.js  
Inorder of given data  
5  
7  
9  
10  
13  
15  
17  
22  
25  
27  
Inorder of given data  
7  
9  
10  
13  
15  
17  
22  
25  
27  
Inorder of given data  
9  
10
```



```
17  
preorder traversal  
17  
10  
9  
13  
25  
22  
27
```

8. Graph implementation and graph traversals

```
class Graph {  
  
    constructor(noOfVertices)  
  
    {  
        this.noOfVertices = noOfVertices  
  
        this.AdjList = new Map()  
  
    }  
    addVertex(v)  
  
    {  
        this.AdjList.set(v, [])  
  
    }  
    addEdge(v, w)  
  
    {  
        this.AdjList.get(v).push(w)  
  
        this.AdjList.get(w).push(v)  
  
    }  
    printGraph()  
  
    {  
        var get_keys = this.AdjList.keys()  
  
        for (var i of get_keys)  
  
        {  
            var get_values = this.AdjList.get(i)  
  
            var conc = ""  
  
            // iterate over the adjacency list concatenate the values into a string  
  
            for (var j of get_values)  
  
            {  
                conc += j + " ";  
  
            }  
            console.log(i + " -> " + conc)}  
  
        }  
        bfs(startingNode)  
  
    {  
        var visited = {};  
  
        var q = new Queue();  
  
        visited[startingNode] = true;  
  
        q.enqueue(startingNode);  
  
        while (!q.isEmpty())  
  
        {  
            var getQueueElement = q.dequeue();  
  
            console.log(getQueueElement);  
  
        }  
  
    }  
}
```

```

    var get_List = this.AdjList.get(getQueueElement);

    for (var i in get_List) {

        var neighbour = get_List[i];

        if (!visited[neighbour]) {

            visited[neighbour] = true;

            q.enqueue(neighbour);

        }}

    }dfs(startingNode)

    { var visited = {};

        this.DFS_traversal(startingNode, visited);

    } DFS_traversal(vert, visited)

    { visited[vert] = true;

        console.log(vert);

        var get_neighbours = this.AdjList.get(vert);

        for (var i in get_neighbours) {

            var get_elem = get_neighbours[i];

            if (!visited[get_elem])

                this.DFS_traversal(get_elem, visited);

        }}

class Queue{

constructor()

{ this.items = [];

}enqueue(element)

{ this.items.push(element);

}dequeue()

{ if(this.isEmpty())

    return "Underflow";

    return this.items.shift();
}

```

```

}isEmpty()

{   return this.items.length == 0;}

}var g = new Graph(6);

var vertices = ['A','B','C','D','E','F'];

for (var i = 0; i < vertices.length; i++)

{   g.addVertex(vertices[i]);

}g.addEdge('A', 'B');

g.addEdge('A', 'D');

g.addEdge('A', 'E');

g.addEdge('B', 'C');

g.addEdge('D', 'E');

g.addEdge('E', 'F');

g.addEdge('E', 'C');

g.aaddEdge('C', 'F');

g.printGraph();

console.log("BFS");

g.bfs('A');

console.log("DFS");

g.dfs('A');

```

output:

```

C:\Program Files\nodejs\node.exe .\graphk.js
A -> B D E
B -> A C
C -> B E F
D -> A E
E -> A D F C
F -> E C
BFS
A
B
D
E
C
F
DFS
A
B
C
E
D
F

```

9. Implementation of Hashing

```
class HashTable {  
  
    constructor() {  
        this.table = new Array(10);  
        this.size = 0;  
    }  
  
    // private function to convert key to index  
    // _ shows that the function is private  
    _setKey(key) {  
        return key % 10;  
    }  
  
    insert(value) {  
        const index = this._setKey(value);  
        this.table[index] = value;  
        this.size++;  
    }  
  
    get(key) {  
        const target = this._setKey(key);  
        return this.table[target];  
    }  
  
    search(value) {  
        const index = this._setKey(value);  
        if (this.table[index] == value)  
            console.log("The value is found at index : ", index);  
        else  
            console.log("Not found");  
    }  
  
    delete(key) {  
        const index = this._setKey(key);  
        if (this.table[index]) {  
            this.table[index] = [];  
            this.size--;  
            return true;  
        } else {  
            return false;  
        }  
    }  
}
```

```
const hashExample = new HashTable();
// insert
hashExample.insert(100);
hashExample.insert(87);
hashExample.insert(86);
hashExample.insert(12);
hashExample.insert(9);
    console.log(hashExample.table); // -> shows the hash table
// search
hashExample.search(87); // found
hashExample.search(10); // not found
// delete
hashExample.delete(12);

// showing table after deletion
console.log(hashExample.table);
```

OUTPUT –

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
"C:\Program Files\nodejs\node.exe" ".\class HashTable.js"
> (10) [100, ..., 12, ..., 86, 87, ..., 9]
  The value is found at index : 7
  Not found
> (10) [100, ..., Array(0), ..., 86, 87, ..., 9]
```

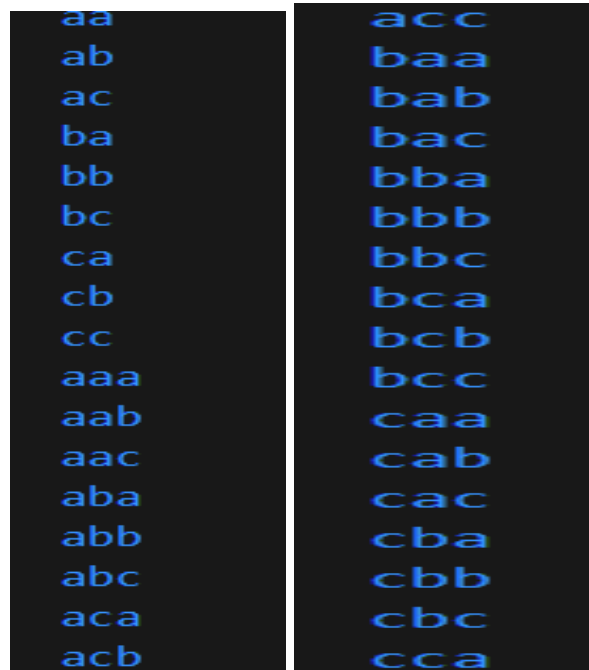
10. Practical based on Brute Force technique

```
function generate(current, len, chars)
{
  if (current.length == len)
    console.log(current);
  if (current.length < len)
    for (var i in chars) {
      generate(current + chars[i], len, chars)
    }
}

function brute(chars, min, max)
{
  for (var l = min; l <= max; ++l)
    generate("", l, chars);
}

brute(['a', 'b', 'c'], 2, 3);
```

OUTPUT –



```
aa
ab
ac
ba
bb
bc
ca
cb
cc
aaa
aab
aac
aba
abb
abc
aca
acb
acc
baa
bab
bac
bba
bbb
bbc
bca
bcb
bcc
caa
cab
cac
cba
cbb
cbc
cca
```

11. Practical based on Greedy Algorithm-Prim's/Kruskal's algorithm

```
let V = 5;

function minKey(key, mstSet)
{
    let min = Number.MAX_VALUE, min_index;
    for (let v = 0; v < V; v++)
        if (mstSet[v] == false && key[v] < min)
            min = key[v], min_index = v;
    return min_index;
}

function printMST(parent, graph)
{
    console.log("Edge    Weight" + "<br>");
    for (let i = 1; i < V; i++)
        console.log(parent[i] + " - " + i + "    " + graph[i][parent[i]] + "<br>");
}

function primMST(graph)
{
    let parent = [];
    let key = [];
    let mstSet = [];

    for (let i = 0; i < V; i++)
        key[i] = Number.MAX_VALUE, mstSet[i] = false;
    key[0] = 0;
    parent[0] = -1;

    for (let count = 0; count < V - 1; count++)
    {
        let u = minKey(key, mstSet);
        mstSet[u] = true;

        for (let v = 0; v < V; v++)
            if (graph[u][v] && mstSet[v] == false && graph[u][v] < key[v])
                parent[v] = u, key[v] = graph[u][v];
    }
    printMST(parent, graph);
}

let graph = [ [ 0, 2, 0, 6, 0 ],
[ 2, 0, 3, 8, 5 ],
[ 0, 3, 0, 0, 7 ],
[ 6, 8, 0, 0, 9 ],
[ 0, 5, 7, 9, 0 ] ];

primMST(graph);
```

OUTPUT –

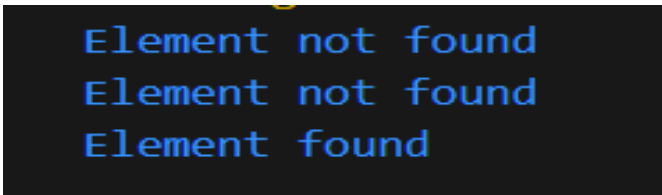
| Edge | | | Weight |
|------|---|---|------------|
| 0 | - | 1 | 2 |
| 1 | - | 2 | 3 |
| 0 | - | 3 | 6 |
| 1 | - | 4 | 5 |

12. Practical based on Divide and Conquer Technique-Binary Search, Tower of Hanoi –

- **Divide and Conquer –**

```
let iterativeFunction = function(arr,x)
{
  let start=0, end=arr.length-1;
  while(start<=end)
  {
    let mid=Math.floor((start +end/2));
    if(arr[mid]==x)return true;
    else if(arr[mid]<x)
      start=mid+1;
    else
      end=mid-1;
  }
  return false;
}
let arr =[1,3,5,7,8,9,10];
let x=5;
if(iterativeFunction(arr,x,0,arr.length-1))
  console.log("Element found");
else
  console.log("Element not found");
x=6;
if(iterativeFunction(arr,x,0,arr.length-1))
  console.log("Element found");
else
  console.log("Element not found");
x=7;
if(iterativeFunction(arr,x,0,arr.length-1))
  console.log("Element found");
else
  console.log("Element not found");
```

OUTPUT –



```
Element not found
Element not found
Element found
```

- **Tower of Hanoi –**

```
function towerofHanoi(n, from_rod, to_rod, aux_rod)
{
  if(n==0)
  {return;}
  towerofHanoi(n-1, from_rod, aux_rod, to_rod);
  console.log("Move disk " + n + " from rod " + from_rod + " to rod " + to_rod);
```



```
towerofHanoi (n-1, aux_rod, to_rod, from_rod);  
}  
var N=5;  
towerofHanoi(N,'A','C','B');
```

OUTPUT –

```
Move disk 1 from rod A to rod C  
Move disk 2 from rod A to rod B  
Move disk 1 from rod C to rod B  
Move disk 3 from rod A to rod C  
Move disk 1 from rod B to rod A  
Move disk 2 from rod B to rod C  
Move disk 1 from rod A to rod C  
Move disk 4 from rod A to rod B  
Move disk 1 from rod C to rod B  
Move disk 2 from rod C to rod A  
Move disk 1 from rod B to rod A  
Move disk 3 from rod C to rod B  
Move disk 1 from rod A to rod C  
Move disk 2 from rod A to rod B  
Move disk 1 from rod C to rod B  
Move disk 3 from rod A to rod C  
Move disk 1 from rod B to rod A  
Move disk 2 from rod B to rod C  
Move disk 1 from rod A to rod C
```

13.Implementation of Dynamic Programming- LCS, Regular Expression Matching –

- **LCS –**

```
/* A Top-Down DP implementation of LCS problem */

/* Returns length of LCS for X[0..m-1], Y[0..n-1] */
function lcs(X, Y, m, n, dp)
{
    if (m == 0 || n == 0)
        return 0;
    if (X[m - 1] == Y[n - 1])
        return dp[m][n] = 1 + lcs(X, Y, m - 1, n - 1, dp);

    if (dp[m][n] != -1) {
        return dp[m][n];
    }
    return dp[m][n] = Math.max(lcs(X, Y, m, n - 1, dp),
                               lcs(X, Y, m - 1, n, dp));
}

/* Driver code */

let X = "AGGTAB";
let Y = "GXTXAYB";

let m = X.length;
let n = Y.length;
let dp = new Array(m + 1);
for(let i = 0; i < m + 1; i++)
{
    dp[i] = new Array(n + 1).fill(-1);
}
console.log("Length of LCS is " + lcs(X, Y, m, n, dp));

// This code is contributed by shinjanpatra
```

OUTPUT -

PROBLEMS

OUTPUT

DEBUG CONSOLE

TERMINAL

PORTS

```
C:\Program Files\nodejs\node.exe .\Untitled-1.js  
Length of LCS is 4
```

- **Regular Expression Matching**

```
function myFunction() {  
  
    // input string  
    let str = "Please visit gfG!";  
  
    // replacing with modifier i  
    let txt = str.replace(/gfg/i, "geeksforgeeks");  
  
    console.log(txt);  
}  
myFunction();
```

OUTPUT –

PROBLEMS

OUTPUT

DEBUG CONSOLE

TERMINAL

PORTS

```
C:\Program Files\nodejs\node.exe .\expression.js  
Please visit geeksforgeeks!
```

14. Practical based on backtracking-N Queen's Problems

```
<script>
const N = 4

function printSolution(board)
{
    for(let i = 0; i < N; i++)
    {
        for(let j = 0; j < N; j++)
        {
            if(board[i][j] == 1)
                document.write("Q ")
            else
                document.write(". ")
        }
        document.write("<br>")
    }
}

function isSafe(board, row, col)
{
    // Check this row on left side
    for(let i = 0; i < col; i++){
        if(board[row][i] == 1)
            return false
    }

    for (i = row, j = col; i >= 0 && j >= 0; i--, j--)if (board[i][j])
```

```

        return false

    for (i = row, j = col; j >= 0 && i < N; i++, j--)
        if (board[i][j])
            return false

    return true
}

function solveNQUtil(board, col){

    if(col >= N)
        return true
    for(let i=0;i<N;i++){

        if(isSafe(board, i, col)==true){

            // Place this queen in board[i][col]
            board[i][col] = 1

            // recur to place rest of the queens
            if(solveNQUtil(board, col + 1) == true)
                return true
            board[i][col] = 0
        }
    }
}

function solveNQ(){

```

```
let board = [ [0, 0, 0, 0],
              [0, 0, 0, 0],
              [0, 0, 0, 0],
              [0, 0, 0, 0] ]

if(solveNQUtil(board, 0) == false){
    document.write("Solution does not exist")
    return false
}

printSolution(board)
return true
}
solveNQ()
</script>
```

Output:-



```
. . Q .
Q . . .
. . . Q
. Q . .
```

A
PRACTICAL ON
(IT11L)
Java Programming
&
Data Structure and Algorithms

SUBMITTED BY
Ms. Srushti Sunil Bhosale

SUBMITTED TO
SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN PARTIAL FULFILLMENT OF DEGREE
MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF
Prof. Girish Bal & Prof. Omkar Barve

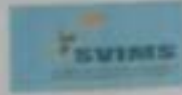
Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

CERTIFICATE




This is to certify that **Ms.Srushti Sunil Bhosale** student of Master of Computer Application SEM I has satisfactorily completed all the practicals in the subject: IT111~Java Programming & Data Structures & Algorithms for the purpose of Practical Examination-December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023- 24.

Roll No: 23535

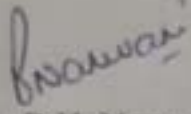
Seat No: 8222

Dr. Rajesh Kashyap

HOD-MCA


Sign of Internal Practical Incharge


Sign of External Examiner


Dr. B.H. Nanwani

Director

DR. B. H. NANWANI
DIRECTOR

SACHIN NANWAN INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
1, KOREGAON ROAD, PUNE 411 001

Date:



Srushti Bhosale
23535

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
IT-11L – Data Structure and Algorithm Practicals
Lab Assignments

INDEX

| Sr. No. | Practical | Due Date | Sign with date |
|---------|--|------------|----------------|
| 1 | Demonstrate singly and doubly linked list | 09/09/2023 | } |
| 2 | STACK implementation using Array with PUSH, POP operations | 16/09/2023 | |
| 3 | Reverse a string using stack | 21/09/2023 | |
| 4 | Check for balanced parentheses by using Stacks | 23/09/2023 | |
| 5 | Implement Stack using Linked List | 28/09/2023 | |
| 6 | Demonstration of Linear Queue, Circular Queue, Priority Queue | 30/09/2023 | } |
| 7 | Reverse stack using queue | 05/10/2023 | |
| 8 | Practical based on binary search tree implementation with its operations | 07/10/2023 | } |
| 9 | Graph implementation and graph traversals | 12/10/2023 | |
| 10 | Implementation of Hashing | 14/10/2023 | |
| 11 | Practical based on Brute Force technique | 19/10/2023 | |
| 12 | Practical based on Greedy Algorithm-Prim's/Kruskal's algorithm | 21/10/2023 | } |
| 13 | Practical based on Divide and Conquer Technique- Binary Search, Tower of Hanoi | 26/10/2023 | |
| 14 | Implementation of Dynamic Programming- LCS, Regular Expression Matching | 28/10/2023 | |
| 15 | Practical based on backtracking- N Queen's problems | 02/11/2023 | |



J

Snoothdi Bapat 20201628635

Sadhu Vawani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
MCA I - SEMESTER I
IT11 Java Programming - Practical
INDEX

| Sr. Practical Ques | Due Date | Sign/Remarks |
|--|-----------|--------------|
| 1. Fibonacci Series in java | 20-Sep-23 | ✓ |
| 2. Prime Number program in java | 20-Sep-23 | ✓ |
| 3. Palindrome Program in java | 20-Sep-23 | ✓ |
| 4. Factorial Program in java | 20-Sep-23 | ✓ |
| 5. Armstrong number in java | 20-Sep-23 | ✓ |
| 6. Generate Random Number in java | 20-Sep-23 | ✓ |
| 7. Print Pattern (Right Triangle Star pattern, Left Triangle star pattern, pyramid star pattern, Diamond Star pattern) | 20-Sep-23 | ✓ |
| 8. Compare Two object in java | 23-Sep-23 | ✓ |
| 9. How to create Object in java | 23-Sep-23 | ✓ |
| 10. How to print ASCII value in java | 23-Sep-23 | ✓ |
| 11. Reverse a number in java | 23-Sep-23 | ✓ |
| 12. Java Program to find smallest element in array | 26-Sep-23 | ✓ |
| 13. Java Program to copy all element of one array into another array | 26-Sep-23 | ✓ |
| 14. Java Program to find the frequency of each element in the array | 26-Sep-23 | ✓ |
| 15. Java Program to print the element of an array in reverse order | 26-Sep-23 | ✓ |
| 16. Java Program to print the sum of all items of array | 26-Sep-23 | ✓ |
| 17. Java Program to sort all element of array in ascending order | 29-Sep-23 | ✓ |
| 18. Java Program to sort all element of array in descending order | 29-Sep-23 | ✓ |
| 19. Java Program to find 2 nd largest element | 29-Sep-23 | ✓ |
| 20. Java Program to find 2 nd largest element | 29-Sep-23 | ✓ |
| 21. Java Program to find largest element | 29-Sep-23 | ✓ |

| | | |
|---|-----------|---|
| 22. Java program to merge array | 29-Sep-23 | ✓ |
| 23. Write a java program to find length of a string | 04-Oct-23 | ✓ |
| 24. Write a java program to copy one string to another string | 04-Oct-23 | ✓ |
| 25. Write a java program to concatenate two strings | 04-Oct-23 | ✓ |
| 26. Write a java program to compare two strings | 04-Oct-23 | ✓ |
| 27. Write a java program to convert lowercase string to uppercase | 04-Oct-23 | ✓ |
| 28. Write a java program to convert uppercase string to lowercase | 04-Oct-23 | ✓ |
| 29. Write a java program to toggle case of each character of a string | 04-Oct-23 | ✓ |
| 30. Write a java program to find total number of alphabets, digits or special character in a string | 04-Oct-23 | ✓ |
| 31. Write a java program to count total number of vowels and consonants in a string | 04-Oct-23 | ✓ |
| 32. Write a java program to count total number of words in a string | 04-Oct-23 | ✓ |
| 33. Write a java program to find reverse of a string | 04-Oct-23 | ✓ |
| 34. Write a java program to check whether a string is palindromic or not | 04-Oct-23 | ✓ |
| 35. Write a java program to reverse order of words in a given string | 04-Oct-23 | ✓ |
| 36. Write a java program to find first occurrence of a character in a given string | 04-Oct-23 | ✓ |
| 37. Write a java program to find last occurrence of a character in a given string | 04-Oct-23 | ✓ |
| 38. Find any five of standard exceptions and give their standard Customized Exception in java | 11-Nov-23 | ✓ |
| 39. Design and implement simple applications using Exception handling using try, catch and finally | 11-Nov-23 | ✓ |
| 40. Design and implement simple applications | 21-Nov-23 | ✓ |
| 41. Design and implement GUI applications | 21-Nov-23 | ✓ |
| 42. Design GUI based Java application using AWT using GUI Event handling | 28-Nov-23 | ✓ |
| 43. Design GUI based Java application using Swing using GUI Event handling | 28-Nov-23 | ✓ |

| | | |
|---|-----------|---|
| 44. Develop interface and design applications by using Extending the Thread class/ implementing the Runnable interface. Application of multithreading in java | 28-Nov-23 | ✓ |
|---|-----------|---|

JAVA Practicals

1) Fibonacci Series

3) Palindrome Program

```
class fibonacci
{
    public static void main(String[] args)
    {
        int n = 20, firstTerm = 0, secondTerm = 1;
        System.out.println("Fibonacci Series till " + n + " terms:");
    }
}

class Palindrome
{
    public static void main(String[] args)
    {
        String str = "Radar", reverseStr = "";
        int strLength = str.length();
        for (int i = (strLength - 1); i >=0; --i)
        {
            reverseStr = reverseStr + str.charAt(i);
        }
        if (str.toLowerCase().equals(reverseStr.toLowerCase()))
        {
            System.out.println(str + " is a Palindrome String.");
        }
        else
        {
            System.out.println(str + " is not a Palindrome String.");
        }
    }
}
```

```
Command Prompt
C:\Users\lenovo1>cd\
C:\>set path=C:\Program Files (x86)\Java\jdk1.8.0\bin
C:\>D:
D:\>cd java_program
D:\java_program>javac Palindrome.java
D:\java_program>java Palindrome
Radar is a Palindrome String.
D:\java_program>
```

4) Prime Number

Factorial Program

```
public class Factorial
{
    public static void main(String[] args)
    {
        int num = 10;
        long factorial = 1;
        for(int i = 1; i <= num; ++i)
        {
            // factorial = factorial * i;
            factorial *= i;
        }
        System.out.printf("Factorial of %d = %d", num, factorial);
    }
}

if (!flag)
    System.out.println(num + " is a prime number.");
else
    System.out.println(num + " is not a prime number.");
}
```

```
Command Prompt
Microsoft Windows [Version 10.0.22621.1848]
(c) Microsoft Corporation. All rights reserved.
C:\Users\lenovo1>cd\
C:\>set path=C:\Program Files (x86)\Java\jdk1.8.0\bin
C:\>D:
D:\>cd java_program
D:\java_program>javac Factorial.java
D:\java_program>java Factorial
Factorial of 10 = 3628800
D:\java_program>
```

```
D:\java_program>java Primeno
29 is a prime number.
D:\java_program>
```

5) Armstrong Number

```
class Armstrong
{
    public static void main(String args[])
    {
        int number = 371, originalNumber , remainder , result = 0;
        originalNumber = number;
        while (originalNumber != 0)
        {
            remainder = originalNumber % 10;
            result += Math.pow(remainder, 3);
            originalNumber /= 10;
        }
        if(result == number)
            System.out.println(number + "is an Armstrong number.");
        else
            System.out.println(number + "is not Armstrong number.");
    }
}
```

```
Command Prompt
D:\java_program>javac Armstrong.java
Armstrong.java:3: error: cannot find symbol
    public static void main(string args[])
                        ^
    symbol:   class string
    location: class Armstrong
1 error
D:\java_program>javac Armstrong.java
D:\java_program>java Armstrong
371is an Armstrong number.
D:\java_program>
```

6) Generate Random Number in java

```
Database db=new * admin_login admin_login Database db = ne * FirstCharOccurence LastCharOccurence path TestCustomException! RandomNumber X + - _ X X
File Edit View
import java.lang.Math;
public class RandomNumber
{
    public static void main(String args[])
    {
        // Generating random numbers
        System.out.println("1st Random Number: " + Math.random());
        System.out.println("2nd Random Number: " + Math.random());
        System.out.println("3rd Random Number: " + Math.random());
        System.out.println("4th Random Number: " + Math.random());
    }
}
```

```
Command Prompt
D:\java_program>javac RandomNumber.java
D:\java_program>java RandomNumber
1st Random Number: 0.6045353028524455
2nd Random Number: 0.012914256364982002
3rd Random Number: 0.508186915532173
4th Random Number: 0.18519568163675248
D:\java_program>
```

Ln 2, Col 27 120% Windows (CRLF) UTF-8
19°C Clear Search ENG IN 23:12 01-11-2023

7)How to print pattern in java (Right Triangle Star Pattern, Left Triangle star pattern, pyramid star pattern, Diamond Star pattern)

Right Triangle Star Pattern



```
Main.java
1 public class Main {
2
3 public static void main(String[] args) {
4     int rows = 5;
5
6     for (int i = 1; i <= rows; ++i) {
7         for (int j = 1; j <= i; ++j) {
8             System.out.print(" * ");
9         }
10        System.out.println();
11    }
12 }
13 }
```

Output

```
java -cp /tmp/5Aek31loYj Main
 *
 * *
 * * *
 * * * *
 * * * * *
```

Left Triangle Star Pattern



```
Main.java
1 import java.io.*;
2
3 // java program for left triangle
4 public class SPT {
5     // Function to demonstrate printing pattern
6     public static void StarLeftTriangle(int k)
7     {
8         int a, b;
9
10        // 1st loop
11        for (a = 0; a <= k; a++) {
12
13            // nested 2nd loop
14            for (b = 2 * (k - a); b >= 0; b--) {
15                // printing spaces
16                System.out.print(" ");
17            }
18
19            // nested 3rd loop
20            for (b = 0; b <= a; b++) {
21                // printing stars
22                System.out.print("* ");
23            }
24
25            // end-line
26            System.out.println();
27        }
28    }
29
30    // Driver Function
31    public static void main(String args[])
32    {
33        int k = 5;
34        StarLeftTriangle(k);
35    }
36 }
37 }
```

Output

```
java -cp /tmp/5Aek31loYj SPT
 *
 * *
 * * *
 * * * *
 * * * * *
```

Pyramid star pattern

```
Main.java
1- public class Main {
2
3- public static void main(String[] args) {
4     int rows = 5, k = 0;
5
6- for (int i = 1; i <= rows; ++i, k = 0) {
7-     for (int space = 1; space <= rows - i; --space) {
8         System.out.print(" ");
9     }
10
11-     while (k != 2 * i - 1) {
12         System.out.print("* ");
13         ++k;
14     }
15
16     System.out.println();
17 }
18 }
19 }
```

```
Output
java -cp /tmp/95nrc8UjK5 Main
 *
 ***
*****
*****
*****
```

Diamond Shape pattern

```
import java.util.Scanner;
public class DiamondPattern
{
public static void main(String args[])
{
int row, i, j, space = 1;
System.out.print("Enter the number of rows you want to print: ");
Scanner sc = new Scanner(System.in);
row = sc.nextInt();
space = row - 1;
for (j = 1; j <= row; j++)
{
for (i = 1; i <= space; i++)
{
System.out.print(" ");
}
space--;
for (i = 1; i <= 2 * j - 1; i++)
{
System.out.print("*");
}
System.out.println("");
space = 1;
for (j = 1; j <= row - 1; j++)
{
```

```
java -cp /tmp/aCwkyEJYz3 DiamondPattern
Enter the number of rows you want to print: 5
 *
 ***
*****
*****
*****
*****
 ***
  *
```

```
{
System.out.print(" ");
}
space--;
for (i = 1; i <= 2 * j - 1; i++)
{
System.out.print("***");
}
System.out.println("");
}
space = 1;
for (j = 1; j<= row - 1; j++)
{
for (i = 1; i<= space; i++)
{
System.out.print(" ");
}
space++;
for (i = 1; i<= 2 * (row - j) - 1; i++)
{
System.out.print("***");
}
System.out.println("");
}
}
}
```

```
java -cp /tmp/aCwkyEJYz3 DiamondPattern
Enter the number of rows you want to print: 5
*
***
*****
*****
*****
***
*
```

8) Compare two object in java

```
public class ObjectComparison
{
    public static void main(String[] args)
    {
        //creating constructor of the Double class
        Double x = new Double(123.45555);
        //creating constructor of the Long class
        Long y = new Long(9887544);
        //invoking the equals() method
        System.out.println("Objects are not equal, hence it returns " + x.equals(y));
        System.out.println("Objects are equal, hence it returns " + x.equals(123.45555));
    }
}
```

```
D:\java_program>javac ObjectComparison.java
D:\java_program>java ObjectComparison
Objects are not equal, hence it returns false
Objects are equal, hence it returns true
D:\java_program>
```


9) How to create Object in java

```
public class CreateObject
{
    void show()
    {
        System.out.println("Welcome to javaTpoint");
    }
    public static void main(String[] args)
    {
        //creating an object using new keyword
        CreateObject obj = new CreateObject();
        //invoking method using the object
        obj.show();
    }
}
```

```
Command Prompt
D:\java_program>javac CreateObject.java
D:\java_program>java CreateObject
Welcome to javaTpoint
D:\java_program>
```

10)How to print ASCII value in java

```
public class PrintAsciiValue
{
    public static void main(String[] args)
    {
        // character whose ASCII value to be found
        char ch1 = 'a';
        char ch2 = 'b';
        // variable that stores the integer value of the character
        int asciiValue1 = ch1;
        int asciiValue2 = ch2;
        System.out.println("The ASCII value of " + ch1 + " is: " + asciiValue1);
        System.out.println("The ASCII value of " + ch2 + " is: " + asciiValue2);
    }
}
```



11)Reverse a number in java


```
class ReverseNumber
{
    public static void main(String[] args)
    {
        int num = 1234, reversed = 0;

        System.out.println("Original Number: " + num);

        // run loop until num becomes 0
        while(num != 0)
        {
            // get last digit from num
            int digit = num % 10;
            reversed = reversed * 10 + digit;

            // remove the last digit from num
            num /= 10;
        }

        System.out.println("Reversed Number: " + reversed);
    }
}
```




```

public class SmallestInArray
{
    public static int getSmallest(int[] a, int total)
    {
        int temp;
        for (int i = 0; i < total; i++)
        {
            for (int j = i + 1; j < total; j++)
            {
                if (a[i] > a[j])
                {
                    temp = a[i];
                    a[i] = a[j];
                    a[j] = temp;
                }
            }
        }
        return a[0];
    }
    public static void main(String args[])
    {
        int a[]={1,2,5,6,3,2};
        int b[]={44,66,99,77,33,22,55};
        System.out.println("Smallest: "+getSmallest(a,6));
        System.out.println("Smallest: "+getSmallest(b,7));
    }
}

```

```

Command Prompt
D:\java_program>javac SmallestInArray.java
D:\java_program>java SmallestInArray
Smallest: 1
Smallest: 22
D:\java_program>

```

12).Java program to find smallest element in array

13).Java Program to copy all element of one array into another array

```

public class CopyArray
{
    public static void main(String[] args)
    {
        //Initialize array
        int [] arr1 = new int [] {1, 2, 3, 4, 5};
        //Create another array arr2 with size of arr1
        int arr2[] = new int[arr1.length];
        //Copying all elements of one array into another
        for (int i = 0; i < arr1.length; i++)
        {
            arr2[i] = arr1[i];
        }
        //Displaying elements of array arr1
        System.out.println("Elements of original array: ");
        for (int i = 0; i < arr1.length; i++)
        {
            System.out.print(arr1[i] + " ");
        }
        System.out.println();

        //Displaying elements of array arr2
        System.out.println("Elements of new array: ");
        for (int i = 0; i < arr2.length; i++)
        {
            System.out.print(arr2[i] + " ");
        }
    }
}

```

```

Command Prompt
Microsoft Windows [Version 10.0.22021.1802]
(c) Microsoft Corporation. All rights reserved.
C:\Users\lenovo\cmd
C:\>set path=C:\Program Files (x86)\Java\jdk1.8.0_61\bin
C:\>cd
D:\>cd java_program
D:\java_program>javac CopyArray.java
D:\java_program>java CopyArray
Elements of original array:
1 2 3 4 5
Elements of new array:
1 2 3 4 5
D:\java_program>

```


14)Java Program to find the frequency of each element in the array

```
public class Frequency
{
    public static void main(String[] args)
    {
        //Initialize array
        int [] arr = new int[] {1, 2, 3, 4, 3, 2, 1, 3, 4, 5};
        //Store the all value frequency of each
        int [] fr = new int [arr.length];
        int count = 0;
        for(int i = 0; i < arr.length; i++)
        {
            int count = 0;
            for(int j = 0; j < arr.length; j++)
            {
                if(arr[i] == arr[j])
                {
                    count++;
                    //To avoid counting same element again
                    fr[j] = 0;
                }
            }
            fr[i] = count;
        }
        //Print the frequency of each element present in array
        System.out.println("\n");
        System.out.println("Element | frequency");
        System.out.println("-----|-----");
        for(int i = 0; i < arr.length; i++)
        {
            System.out.println(" " + arr[i] + " | " + fr[i]);
        }
        System.out.println("\n");
    }
}
```



15)Java Program to print the element of an array in reverse order

```
public class ReverseArray
{
    public static void main(String[] args)
    {
        //Initialize array
        int [] arr = new int [] {1, 2, 3, 4, 5};
        System.out.println("Original array: ");
        for (int i = 0; i < arr.length; i++)
        {
            System.out.print(arr[i] + " ");
        }
        System.out.println();
        System.out.println("Array in reverse order: ");
        //Loop through the array in reverse order
        for (int i = arr.length-1; i >= 0; i--)
        {
            System.out.print(arr[i] + " ");
        }
    }
}
```



16)java program to print the Sum of all items of

array public class SumOfArray { public static

void main(String[] args) {

//Initialize array

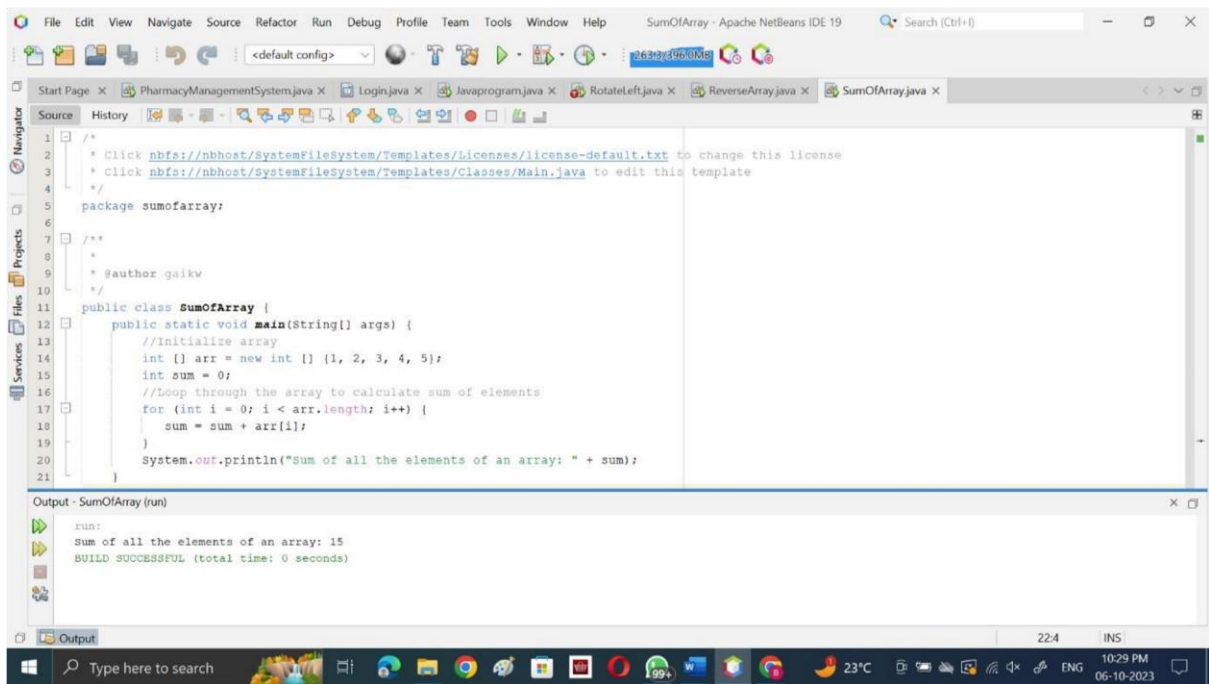
int [] arr = new int [] {1, 2, 3, 4, 5};

int sum = 0;

```

//Loop through the array to calculate sum of elements
for (int i = 0; i < arr.length; i++) {
    sum = sum + arr[i];
}
System.out.println("Sum of all the elements of an array: " + sum);
}
}

```



17. Java program to sort all Elements of array in ascending order:

```

public class SortAsc {
    public static void
    main(String[] args) {
        //Initialize
        array

        int [] arr = new int [] {5, 2, 8, 7, 1};
        int temp = 0;

```

```

//Displaying elements of original array
System.out.println("Elements of original array: ");
for (int i = 0; i < arr.length; i++) {

    System.out.print(arr[i] + " ");

}

//Sort the array in ascending order
for (int i = 0;
i < arr.length; i++) {
    for (int j = i+1; j < arr.length;
j++) {
        if(arr[i] > arr[j]) {
            temp =
arr[i];
            arr[i] = arr[j];
            arr[j] =
temp;

        }
    }
}

System.out.println();

//Displaying elements of array after sorting
System.out.println("Elements of array sorted in ascending order: ");
for (int i = 0; i <
arr.length; i++) {

    System.out.print(arr[i] + " ");

}
}
}

```

18) Java program to sort all Elements of array in descending order:

```

public class SortDsc {
    public static

void main(String[] args) {

```

```

//Initialize array

int [] arr = new int [] {5, 2, 8, 7, 1};
int temp = 0;

//Displaying elements of original array
System.out.println("Elements of original array: ");
for
(int i = 0; i < arr.length; i++) {

    System.out.print(arr[i] + " ");
}

//Sort the array in descending order
for (int i = 0; i < arr.length; i++) {
    for
(int j = i+1; j < arr.length; j++) {
if(arr[i] < arr[j]) {
temp = arr[i];
arr[i] = arr[j];
arr[j] = temp;

}
}
}

System.out.println();

//Displaying elements of array after sorting
System.out.println("Elements of array
sorted in descending order: ");
for (int i = 0; i < arr.length; i++) {

    System.out.print(arr[i] + " ");
}
}

```

```
}
```

19) java program to find 3rd largest no. public class

```
ThirdLargestInArray{ public static int
```

```
getThirdLargest(int[] a, int total){ int temp; for
```

```
(int i = 0; i < total; i++)
```

```
{ for (int j = i + 1; j <
total; j++)
```

```
{ if
(a[i] > a[j])
```

```
{
temp = a[i];
a[i] = a[j];
a[j] = temp;
```

```
}
} }
return a[total-3];
```

```
}
```

```
public static void main(String args[]){
```

```
int a[]={1,2,5,6,3,2}; int
```

```
b[]={44,66,99,77,33,22,55};
```

```
System.out.println("Third Largest: "+getThirdLargest(a,6)); System.out.println("Third Largest:
"+getThirdLargest(b,7));
```

```
}}
```

20) java program to find 2nd Largest number:

```
public class SecondLargestInArray{ public static int
```

```
getSecondLargest(int[] a, int total){ int temp; for
```

```

(int i = 0; i < total; i++)

    {        for (int j = i + 1; j <
total; j++)

        {        if
(a[i] > a[j])

            {

temp = a[i];
a[i] = a[j];
a[j] = temp;

            }

        }

return a[total-2];

}

public static void main(String args[]){
int a[]={1,2,5,6,3,2}; int
b[]={44,66,99,77,33,22,55};

System.out.println("Second Largest: "+getSecondLargest(a,6));
System.out.println("Second Largest: "+getSecondLargest(b,7));
}}

```

21) Java Program to find largest element

```

public class LargestInArray{ public static int
getLargest(int[] a, int total){ int temp; for

(int i = 0; i < total; i++)

    {        for (int j = i + 1; j

```

```

<total;j++)
    {
if(a[i] > a[j])
    {
temp = a[i];
a[i] = a[j];
a[j] = temp;
    }
    }
return a[total-1];

}

public static void main(String args[]){
int a[]={1,2,5,6,3,2}; int
b[]={44,66,99,77,33,22,55};

System.out.println("Largest: "+getLargest(a,6));
System.out.println("Largest: "+getLargest(b,7));
}}

```

OUTPUT;17,18,19,20,21

Command Prompt

```
C:\>cd/srushti
```

```
C:\srushti>java SortAsc.java
```

```
Elements of original array:
```

```
5 2 8 7 1
```

```
Elements of array sorted in ascending order:
```

```
1 2 5 7 8
```

```
C:\srushti>
```

```
C:\srushti>java SortDsc.java
```

```
Elements of original array:
```

```
5 2 8 7 1
```

```
Elements of array sorted in descending order:
```

```
8 7 5 2 1
```

```
C:\srushti>
```

```
C:\srushti>java ThirdLargestInArray.java
```

```
Third Largest: 3
```

```
Third Largest: 66
```

```
C:\srushti>java SecondLargestInArray.java
```

```
Second Largest: 5
```

```
Second Largest: 77
```

```
C:\srushti>java LargestInArray.java
```

```
Largest: 6
```

```
Largest: 99
```

```
C:\srushti>LargestInArray
```

22) Java program to merge array

```
import java.util.Arrays;

public class MergeArrays {    public
static void main(String[] args) {    //
Two arrays to be merged    int[] array1
= {1, 2, 3, 4};    int[] array2 = {5, 6, 7,
8};

    // Merged array

int[] mergedArray = mergeArrays(array1, array2);

    // Display the merged array

System.out.println("Array 1: " + Arrays.toString(array1));

System.out.println("Array 2: " + Arrays.toString(array2));

System.out.println("Merged Array: " + Arrays.toString(mergedArray));
}

public static int[] mergeArrays(int[] array1, int[] array2) {
int length1 = array1.length;    int length2 = array2.length;

    // Create a new array to store the merged elements
int[] mergedArray = new int[length1 + length2];

    // Copy elements from the first array
System.arraycopy(array1, 0, mergedArray, 0, length1);

    // Copy elements from the second array
```

```
        System.arraycopy(array2, 0, mergedArray, length1, length2);
return mergedArray;
    }
}
```

23) Write a java program to find length of a string import

```
java.util.Scanner;
```

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

```
    Scanner scanner = new Scanner(System.in);
```

```
    // Input a string from the user
```

```
    System.out.print("Enter a string: ");
```

```
    String inputString = scanner.nextLine();
```

```
    // Find and display the length of the string
```

```
int length = findStringLength(inputString);
```

```
    System.out.println("Length of the string: " + length);
```

```
    scanner.close();
```

```
}
```

```
public static int findStringLength(String str) {
```

```
    // Using the length() method of the String class to find the length
```

```
return str.length();
```

```
}
```

```
}
```

24)Write a java program to copy one string to another string.

```

import java.util.Scanner; public class
CopyStringUsingPlus {    public static
void main(String[] args) {
Scanner scanner = new
Scanner(System.in);

    // Input a string from the user
    System.out.print("Enter a string: ");
    String originalString = scanner.nextLine();
    // Copy the string using the + operator
    String copiedString = copyStringUsingPlus(originalString);
    // Display the copied string
    System.out.println("Original String: " + originalString);
    System.out.println("Copied String (using + operator): " + copiedString);
scanner.close();

}

    public static String copyStringUsingPlus(String original) {
        // Using the + operator to concatenate the original string with an empty string    return
original + "";

    }
}

```

25) Write a java program to concatenate two strings.

```

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

    Scanner scanner = new Scanner(System.in);

```

```

// Input two strings from the user
System.out.print("Enter the first string: ");
String str1 = scanner.nextLine();
System.out.print("Enter the second string: ");
String str2 = scanner.nextLine();

// Concatenate the two strings using the concat() method
String concatenatedString = concatenateStrings(str1, str2);

// Display the concatenated string
System.out.println("Concatenated String: " + concatenatedString);
scanner.close();

}

public static String concatenateStrings(String str1, String str2) {
// Using the concat() method to concatenate the two strings    return
str1.concat(str2);

}
}

```

26) Write a java program to compare two strings.

```

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

Scanner scanner = new Scanner(System.in);

// Input two strings from the user
System.out.print("Enter the first string: ");
String str1 = scanner.nextLine();

```

```

System.out.print("Enter the second string: ");
String str2 = scanner.nextLine();

// Compare the two strings and display the result
int result = compareStrings(str1, str2);    if (result ==
0) {
    System.out.println("Both strings are equal.");
} else if (result < 0) {
    System.out.println("The first string is lexicographically smaller than the second string.");
} else {
    System.out.println("The first string is lexicographically greater than the second string.");
}

scanner.close();
}

public static int compareStrings(String str1, String str2) {
    // Using the compareTo() method to compare two strings lexicographically
return str1.compareTo(str2);

}
}
OUTPUT:22,23,24,25,26

```

```

C:\srushti>java MergeArrays.java
Array 1: [1, 2, 3, 4]
Array 2: [5, 6, 7, 8]
Merged Array: [1, 2, 3, 4, 5, 6, 7, 8]

C:\srushti>
C:\srushti>java StringLength.java
Enter a string: srushti
Length of the string: 7

C:\srushti>java CopyStringUsingPlus.java
Enter a string: srushti
Original String: srushti
Copied String (using + operator): srushti

C:\srushti>java ConcatenateStrings.java
ConcatenateStrings.java:26: error: reached end of file while parsing
    }
    ^
1 error
error: compilation failed

C:\srushti>java ConcatenateStrings.java
Enter the first string: srushti
Enter the second string: bhosale
Concatenated String: srushtibhosale

C:\srushti>java CompareStrings.java
Enter the first string: srushti
Enter the second string: bhosale
The first string is lexicographically greater than the second string.

```

27) Write a java program to convert lowercase string to uppercase . import

```

java.util.Scanner; public class ConvertToLowerToUpper { public static void
main(String[] args) { Scanner scanner = new Scanner(System.in);

```

```

// Prompt the user to enter a lowercase string

```

```

System.out.print("Enter a lowercase string: ");

```

```

String lowercaseString = scanner.nextLine();

```

```

// Convert the lowercase string to uppercase

```

```

String uppercaseString = lowercaseString.toUpperCase();

```

```

// Display the result

```

```

System.out.println("Uppercase string: " + uppercaseString);

```

```

// Close the scanner to avoid resource leaks scanner.close();

```

```
}  
}
```

28) Write a java program to convert uppercase string to lowercase.

```
import java.util.Scanner; public class  
UpperToLowerConverter { public static  
void main(String[] args) {  
  
    Scanner scanner = new Scanner(System.in);  
  
    // Prompt the user to enter an uppercase string  
    System.out.print("Enter an uppercase string: ");  
  
    String upperCaseString = scanner.nextLine();  
  
    // Convert the string to lowercase  
  
    String lowerCaseString = upperCaseString.toLowerCase();  
  
    // Display the converted string  
  
    System.out.println("Converted to lowercase: " + lowerCaseString);  
  
    // Close the scanner scanner.close();  
  
    }  
}
```

29) Write a java program to toggle case of each character of a string. import java.util.Scanner;

```
public class ToggleCase { public static void  
main(String[] args) {  
    Scanner scanner = new Scanner(System.in);  
    // Prompt the user to enter a string  
    System.out.print("Enter a string: ");  
    String inputString = scanner.nextLine();  
    // Toggle the case of each character in the string  
    String toggledString = toggleCase(inputString);
```



```

// Display the original and toggled strings
System.out.println("Original string: " + inputString);
System.out.println("Toggled case: " + toggledString);

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

// Function to toggle the case of each character in a string private
static String toggleCase(String input) { char[]
charArray = input.toCharArray();

for (int i = 0; i < charArray.length; i++) { char
currentChar = charArray[i];
// Toggle the case of alphabetic characters if
(Character.isUpperCase(currentChar)) { charArray[i]
= Character.toLowerCase(currentChar); } else if
(Character.isLowerCase(currentChar)) { charArray[i]
= Character.toUpperCase(currentChar);
}

// Ignore non-alphabetic characters
}

// Return the toggled string return
new String(charArray);
}
}

```

30) Write a java program to find total number of

alphabets, digits or special character in a string. import

java.util.Scanner; public class CharacterCount{ public

static void main(String[] args) {

```
Scanner scanner = new Scanner(System.in);
```

```
// Prompt the user to enter a string
```

```
System.out.print("Enter a string: ");
```

```
String inputString = scanner.nextLine();
```

```
// Call the function to count characters countCharacters(inputString);
```

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

```

    }

    // Function to count alphabets, digits, and special characters
private static void countCharacters(String input) {    int
alphabetCount = 0;    int digitCount = 0;    int specialCharCount
= 0;
    for (char ch : input.toCharArray()) {
if (Character.isLetter(ch)) {
alphabetCount++;    } else if
(Character.isDigit(ch)) {    digitCount++;

        } else {
            specialCharCount++;
        }
    }
}

// Display the counts
System.out.println("Alphabet count: " + alphabetCount);
System.out.println("Digit count: " + digitCount);
System.out.println("Special character count: " + specialCharCount);
}
}

```

31) Write a java program to count total number of

vowels and consonants in a string. import

java.util.Scanner; public class VowelConsonantCount

```
{ public static void main(String[] args) {
```

```
    Scanner scanner = new Scanner(System.in);
```

```
    // Prompt the user to enter a string
```

```
    System.out.print("Enter a string: ");
```

```

String inputString = scanner.nextLine();

// Call the function to count vowels and consonants
countVowelsAndConsonants(inputString);

// Close the scanner scanner.close();

}

// Function to count vowels and consonants private static void
countVowelsAndConsonants(String input) { int vowelCount = 0;
int consonantCount = 0;

// Convert the input string to lowercase for case-insensitive counting input
= input.toLowerCase();

for (char ch : input.toCharArray()) { // Check if the character
is an alphabet if (Character.isAlphabetic(ch)) {
// Check if the alphabet is a vowel if (ch == 'a' || ch == 'e'
|| ch == 'i' || ch == 'o' || ch == 'u') { vowelCount++;
} else { consonantCount++;
}
}
}

// Display the counts
System.out.println("Vowel count: " + vowelCount);
System.out.println("Consonant count: " + consonantCount);

```

```
}  
}
```

32 Write a java program to count total number of words in a string.

```
import java.util.Scanner; public class  
WordCount{ public static void  
main(String[] args) {  
  
    Scanner scanner = new Scanner(System.in);  
    // Prompt the user to enter a string  
  
    System.out.print("Enter a string: ");  
  
    String inputString = scanner.nextLine();  
  
    // Call the function to count words    int wordCount  
= countWords(inputString);  
  
    // Display the word count  
  
    System.out.println("Total number of words: " + wordCount);  
  
    // Close the scanner    scanner.close();  
  
    }  
  
    // Function to count words in a string    private  
static int countWords(String input) {    if (input  
== null || input.trim().isEmpty()) {    return 0;  
  
    }  
  
    String[] words = input.split("\\s+");    return  
words.length;  
  
    }  
}
```

OUTPUT:27,28,29,30.31.32

```
Select Command Prompt
C:\srushti>java ConvertToLowerToUpper.java
Enter a lowercase string: sru
Uppercase string: SRU

C:\srushti>java UpperToLowerConverter.java
Enter an uppercase string: SRU
Converted to lowercase: sru

C:\srushti>java ToggleCase.java
ToggleCase.java:32: error: reached end of file while parsing
    charArray[i] = Character.toU
                        ^
1 error
error: compilation failed

C:\srushti>java ToggleCase.java
Enter a string: Hi Srushti
Original string: Hi Srushti
Toggled case: hI sRUSHTI

C:\srushti>java .java

C:\srushti>java CharacterCount.java
Enter a string: Srushti@28
Alphabet count: 7
Digit count: 2
Special character count: 1

C:\srushti>java VowelConsonantCount.java
Enter a string: Srushti
Vowel count: 2
Consonant count: 5

C:\srushti>java WordCount.java
Enter a string: srush
Total number of words: 1

C:\srushti>
```

33) Write a java program to find reverse of a string.

```
import java.util.Scanner;
```

```
public class ReverseString{    public
```

```
static void main(String[] args) {
```

```
    Scanner scanner = new Scanner(System.in);
```

```
    // Prompt the user to enter a string
```

```
    System.out.print("Enter a string: ");
```

```
    String inputString = scanner.nextLine();
```

```
    // Call the function to reverse the string
```

```
    String reversedString = reverseString(inputString);
```

```

// Display the reversed string
System.out.println("Reversed string: " + reversedString);

// Close the scanner
scanner.close();

}

// Function to reverse a string private static
String reverseString(String input) { char[]
charArray = input.toCharArray();

int start = 0; int end =
charArray.length - 1;

// Swap characters from start to end
while (start < end) { char temp =
charArray[start]; charArray[start] =
charArray[end]; charArray[end] =
temp; start++; end--;

}

// Create a new string from the reversed char array
return new String(charArray);

}
}

```

34) Write a java program to check whether a string is palindrome or not.

```

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

Scanner scanner = new Scanner(System.in);

```

```

// Prompt the user to enter a string
System.out.print("Enter a string: ");
String inputString = scanner.nextLine();

// Check if the string is a palindrome    boolean isPalindrome
= checkPalindrome(inputString);

// Display the result    if
(isPalindrome) {

    System.out.println("The string is a palindrome.");
} else {
    System.out.println("The string is not a palindrome.");
}

// Close the scanner    scanner.close();

}

// Function to check if a string is a palindrome    private static
boolean checkPalindrome(String str) {

    // Remove spaces and convert to lowercase for case-insensitive comparison    str
= str.replaceAll("\\s", "").toLowerCase();

    int left = 0;    int right
= str.length() - 1;

    while (left < right) {    if

```

```

(str.charAt(left) != str.charAt(right)) {           return
false;

    }
left++;      right--;

    }

return true;
}
}

```

35) Write a java program to reverse order of words in a given string. import

```
java.util.Scanner;
```

```

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

    Scanner scanner = new Scanner(System.in);

    // Prompt the user to enter a string
    System.out.print("Enter a string: ");

    String inputString = scanner.nextLine();

    // Reverse the order of words

    String reversedString = reverseWords(inputString);

    // Display the reversed string

    System.out.println("Reversed order of words: " + reversedString);

    // Close the scanner      scanner.close();

}
}

```



```

// Function to reverse the order of words in a string private
static String reverseWords(String input) {

    // Split the string into words
    String[] words = input.split("\\s+");

    // Reverse the order of words
    StringBuilder reversedStringBuilder = new StringBuilder();    for
(int i = words.length - 1; i >= 0; i--) {
reversedStringBuilder.append(words[i]).append(" ");

    }

    // Remove the trailing space    return reversedStringBuilder.toString().trim();

}
}

```

36) Write a java program to find first occurrence of a character in a given string.

```

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

    Scanner scanner = new Scanner(System.in);

    // Prompt the user to enter a string
    System.out.print("Enter a string: ");

    String inputString = scanner.nextLine();

    // Prompt the user to enter a character

    System.out.print("Enter a character to find its first occurrence: ");    char
targetChar = scanner.next().charAt(0);

    // Find the first occurrence of the character    int firstOccurrence

```

```

= findFirstOccurrence(inputString, targetChar);

    // Display the result    if
(firstOccurrence != -1) {

    System.out.println("First occurrence of " + targetChar + " is at index: " + firstOccurrence);
} else {

    System.out.println("The character " + targetChar + " is not found in the string.");
}

// Close the scanner    scanner.close();

}

// Function to find the first occurrence of a character in a string
private static int findFirstOccurrence(String str, char target) {
for (int i = 0; i < str.length(); i++) {    if (str.charAt(i) == target)
{    return i;

    }

}

return -1; // Character not found
}

}

```

37) Write a java program to find last occurrence of a character in a given string.

```

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

Scanner scanner = new Scanner(System.in);
    // Prompt the user to enter a string

    System.out.print("Enter a string: ");

```

```

String inputString = scanner.nextLine();

// Prompt the user to enter a character

System.out.print("Enter a character to find its last occurrence: ");    char targetChar
= scanner.next().charAt(0);

// Find the last occurrence of the character    int lastOccurrence =
findLastOccurrence(inputString, targetChar);

// Display the result    if
(lastOccurrence != -1) {

    System.out.println("Last occurrence of " + targetChar + " is at index: " + lastOccurrence);
} else {

    System.out.println("The character " + targetChar + " is not found in the string.");
}

// Close the scanner    scanner.close();

}

// Function to find the last occurrence of a character in a string    private
static int findLastOccurrence(String str, char target) {    for
(int i = str.length() - 1; i >= 0; i--) {    if (str.charAt(i) == target)
{    return i;
    }
}
return -1; // Character not found
}
}

```

OUTPUT:

```
CA: Command Prompt
C:\>cd/srushti

C:\srushti>java ReverseString.java
Enter a string: SVIMS
Reversed string: SMIVS

C:\srushti>java PalindromeCheck.java
Enter a string: Madam
The string is a palindrome.

C:\srushti>java ReverseWords.java
Enter a string: java is good
Reversed order of words: good is java

C:\srushti>java FirstOccurrence.java
Enter a string: Srushti
Enter a character to find its first occurrence: s
First occurrence of 's' is at index: 3

C:\srushti>java LastOccurrence.java
Enter a string: sneha
Enter a character to find its last occurrence: a
Last occurrence of 'a' is at index: 4

C:\srushti>
```

38) Test any five of standard exception and user Defined Custom Exceptions in java

```
import java.util.Scanner;
```

```
// Custom Exception
```

```
class NegativeNumberException extends Exception {    public
NegativeNumberException(String message) {
super(message);

} }
```

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

```
Scanner scanner = new Scanner(System.in);
```

```
// Standard Exception 1: ArithmeticException
try {
    int result = 10 / 0; // Division
    by zero

} catch (ArithmeticException e) {
    System.out.println("Standard Exception 1 - ArithmeticException: " + e.getMessage());
}

// Standard Exception 2: ArrayIndexOutOfBoundsException
try {
    int[] arr = new int[5];
    int value
= arr[10]; // Index out of bounds

} catch (ArrayIndexOutOfBoundsException e) {
    System.out.println("Standard Exception 2 - ArrayIndexOutOfBoundsException: " +
e.getMessage());
}

// Standard Exception 3: NullPointerException
try {
    String str = null;
    int length = str.length(); // Accessing a
method on null object

} catch (NullPointerException e) {
    System.out.println("Standard Exception 3 - NullPointerException: " + e.getMessage());
}

// Standard Exception 4: NumberFormatException
try {
    String str = "abc";
    int num = Integer.parseInt(str); //
```

Parsing a non-numeric string

```
    } catch (NumberFormatException e) {  
        System.out.println("Standard Exception 4 - NumberFormatException: " + e.getMessage());  
    }  
  
    // Standard Exception 5: IllegalArgumentException  
    try {  
        int age = readAgeFromUser();        if (age < 0) {            throw new  
IllegalArgumentException("Age cannot be negative");  
        }  
        System.out.println("Entered Age: " + age);  
    } catch (IllegalArgumentException e) {  
        System.out.println("Standard Exception 5 - IllegalArgumentException: " + e.getMessage());  
    }  
  
    // User-Defined Custom Exception  
    try {  
        int number = readNumberFromUser();        if (number < 0) {            throw  
new NegativeNumberException("Number cannot be negative");  
        }  
        System.out.println("Entered Number: " + number);  
    } catch (NegativeNumberException e) {  
        System.out.println("User-Defined Custom Exception - NegativeNumberException: " +  
e.getMessage());  
    }  
  
    // Close the scanner  
    scanner.close();
```

```

    }
    // Method that reads age from the user    private
static int readAgeFromUser() {

    Scanner scanner = new Scanner(System.in);
System.out.print("Enter your age: ");    return
scanner.nextInt();

}

// Method that reads a number from the user    private
static int readNumberFromUser() {

    Scanner scanner = new Scanner(System.in);
System.out.print("Enter a number: ");    return scanner.nextInt();

}
}

```

39) Design java application using Collection in java such as Array List, Link List

```

import java.util.ArrayList; import
java.util.LinkedList; import
java.util.List; import
java.util.Scanner;

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

    List<String> arrayList = new ArrayList<>();

```

```
List<String> linkedList = new LinkedList<>(); Scanner scanner = new Scanner(System.in); //
Adding elements to ArrayList arrayList.add("Apple");          arrayList.add("Banana");
arrayList.add("Orange");    arrayList.add("Mango");
```

```
// Adding elements to LinkedList
linkedList.add("Red");    linkedList.add("Green");
linkedList.add("Blue");    linkedList.add("Yellow");
```

```
// Displaying elements in ArrayList
System.out.println("Elements in ArrayList:");
displayElements(arrayList);
```

```
// Displaying elements in LinkedList
System.out.println("\nElements in LinkedList:");
displayElements(linkedList);
```

```
// Adding a new element to ArrayList
System.out.print("\nEnter a new fruit to add to ArrayList: ");
String newFruitArrayList = scanner.nextLine();
arrayList.add(newFruitArrayList);
```

```
// Adding a new element to LinkedList
System.out.print("Enter a new color to add to LinkedList: ");
String newColorLinkedList = scanner.nextLine(); linkedList.add(newColorLinkedList);
```

```
// Displaying updated elements in ArrayList
System.out.println("\nUpdated elements in ArrayList:");
displayElements(arrayList);
```



```
        // Displaying updated elements in LinkedList
System.out.println("\nUpdated elements in LinkedList:");
displayElements(linkedList);
```

```
        // Closing the scanner
scanner.close();
```

```
    }
```

```
        // Helper method to display elements in a list    private
static void displayElements(List<String> list) {        for
```

```
(String element : list) {
```

```
            System.out.print(element + " ");
```

```
        }
```

```
        System.out.println();
```

```
    }
```

```
}
```

40) Design a and implement JDBC applications.

Code :

```
import        java.sql.*;
```

```
import java.util.*; class
```

```
Employee{ Connection
```

```
c;
```

```
Statement s;
```

```

Scanner sc = new Scanner (System.in);
public Employee(){ try{

Class.forName("com.mysql.cj.jdbc.Driver");
c =DriverManager.getConnection("jdbc:mysql:///mca1","root","");
s =c.createStatement(); }catch(Exception e){

System.out.println(e);
}
} public void
read(){

System.out.println("Employee Records are: ");
System.out.println("Emp_ID\tEmp_Name\tAddress\tSalary");
try{

PreparedStatement ps=c.prepareStatement("select * from Employee");
ResultSet rs=ps.executeQuery(); while(rs.next()){

System.out.println(rs.getInt("emp_no")+"\t"+rs.getString("emp_name")+
"\t\t"+rs.getString("address")+"\t\t"+rs.getInt("salary"));
}
}catch(Exception e){
System.out.println(e);
} } public void
insert(){

System.out.print("Enter your employee no.: "); int id = sc.nextInt();

System.out.print("Enter name : ");

String name = sc.next();
System.out.print("Enter your address : ");

String address = sc.next();

```

```

System.out.print("Enter your salary : ");
int salary = sc.nextInt(); try{

PreparedStatement ps = c.prepareStatement("insert into Employee
values(""+id+"",""+name+"", ""+address+"", ""+salary+""); ps.executeUpdate();

System.out.println("***Employee record inserted Successfully !!***");
} catch(Exception e){
System.out.println(e);
}
} public void
update(){

System.out.print("Enter your employee no.: "); int
id = sc.nextInt();

System.out.print("Enter name : ");
String name = sc.next();
System.out.print("Enter your address : ");
String address = sc.next();
System.out.print("Enter your salary : ");
int salary = sc.nextInt(); try{

PreparedStatement ps = c.prepareStatement("update Employee set emp_name = ""+name+"",
address = ""+address+"", salary = ""+salary+" where emp_no = ""+id+""");
ps.executeUpdate();

System.out.println("***Record of employee no : "+id+" updated Successfully !!***");
} catch(Exception e){
System.out.println(e);
}
}

```

```

} public void
delete(){
System.out.print("Enter your employee no.:
"); int id =
sc.nextInt(); try{

PreparedStatement ps = c.prepareStatement("delete from Employee where emp_no =
"+id+""); ps.executeUpdate();

System.out.println("***Record of employee no : "+id+" deleted Successfully !!***");
}catch(Exception e){
System.out.println(e);
}

} public static void main(String args[]){
Employee e = new Employee(); Scanner
sc = new Scanner(System.in); int ch=10;

System.out.println("----- Employee Dataset -----"); while(ch!=0){

System.out.println("\n-----");

System.out.print(" 0. Exit\n 1. Read\n 2. Insert\n 3. Update\n 4. Delete\n Enter your
choice : "); ch = sc.nextInt();

System.out.println("-----");
switch(ch){ case 1:

e.read();
break; case

2:

```

e.insert(); break;

case 3:

e.update();

break; case

4:

e.delete();

break; case 0:

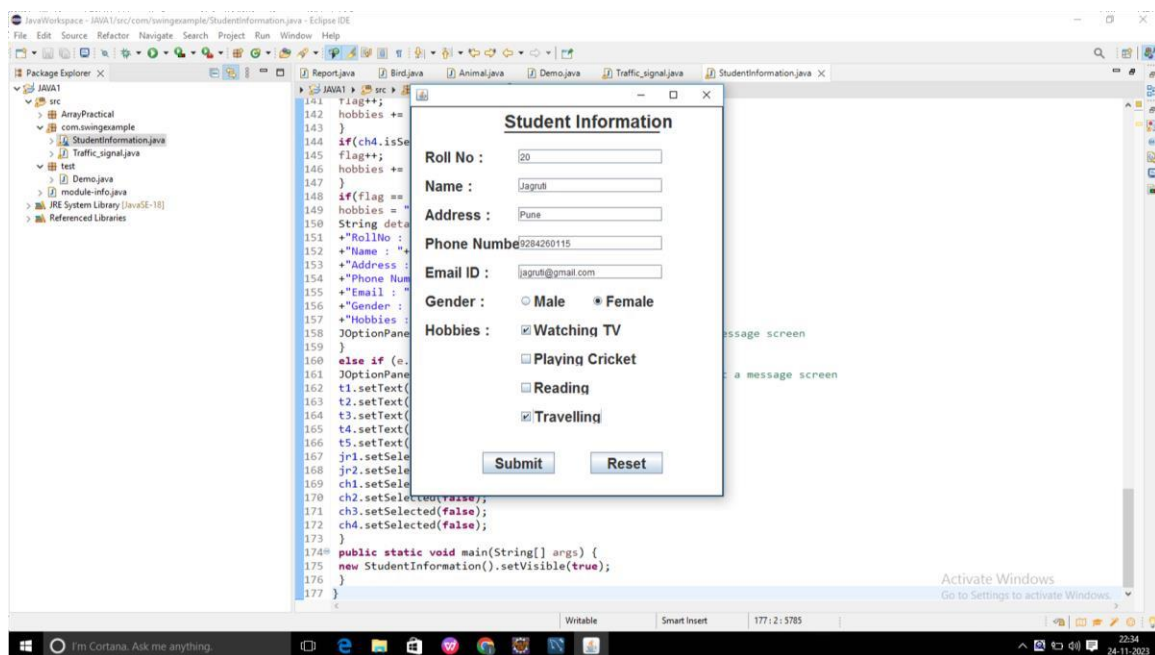
System.exit(0);

default:

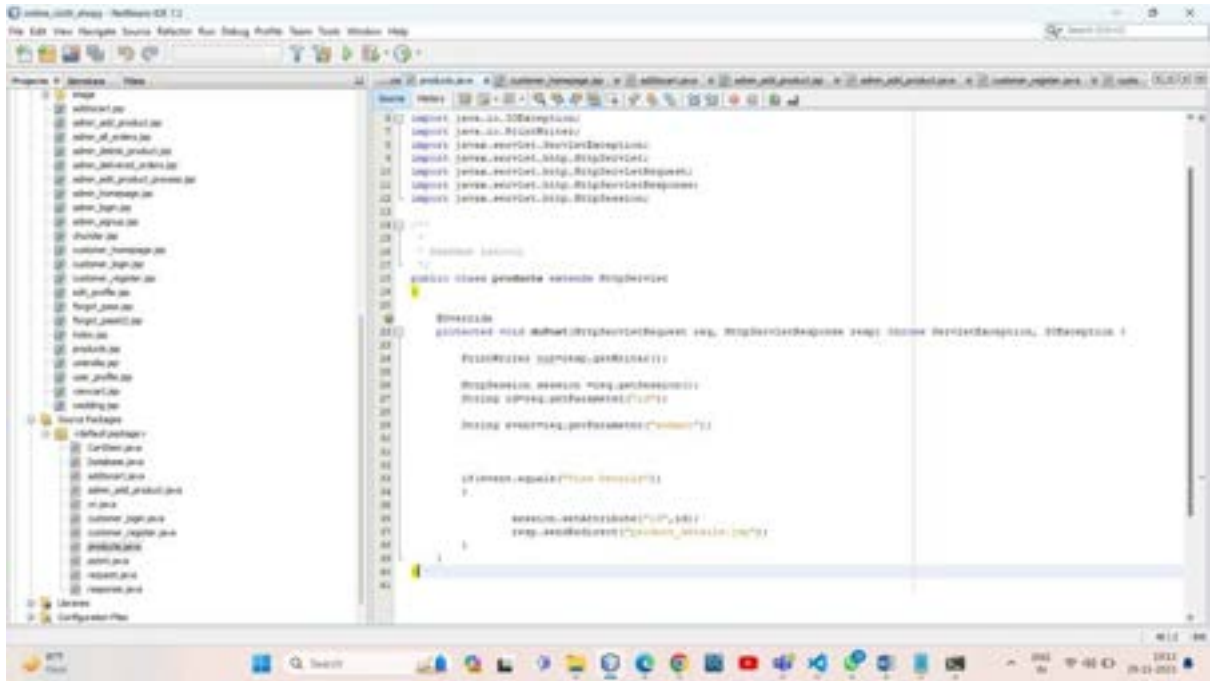
System.out.println("Please enter correct option !!");

} } } }

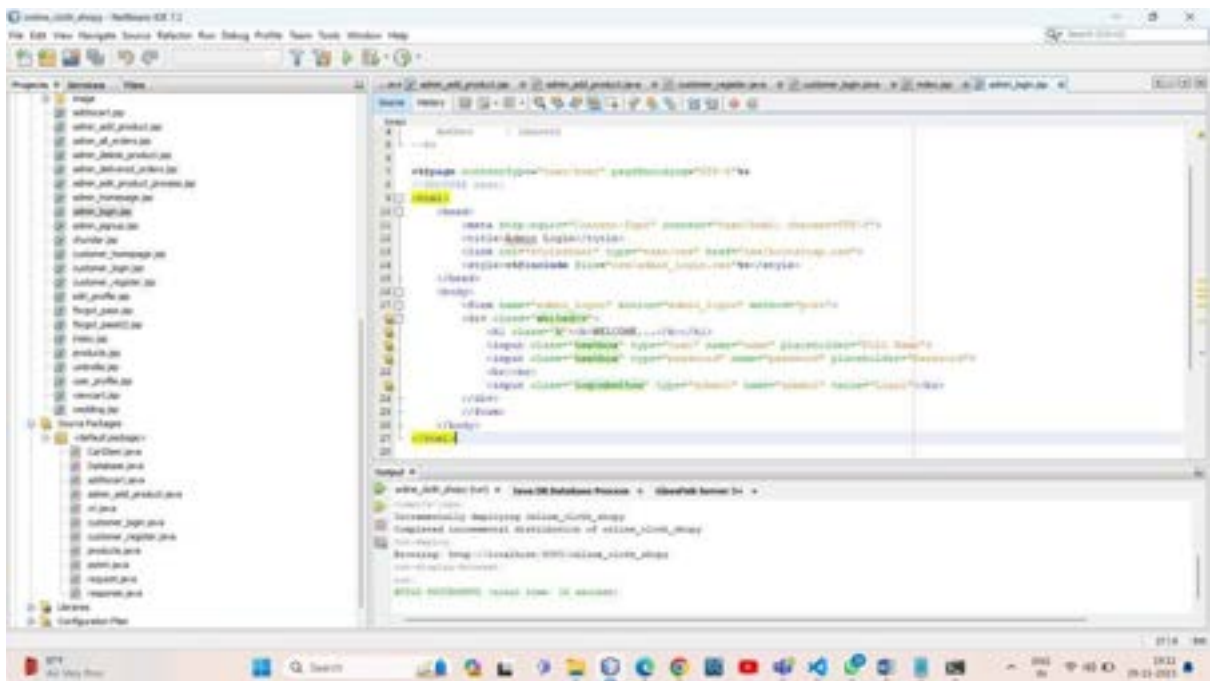
Output –



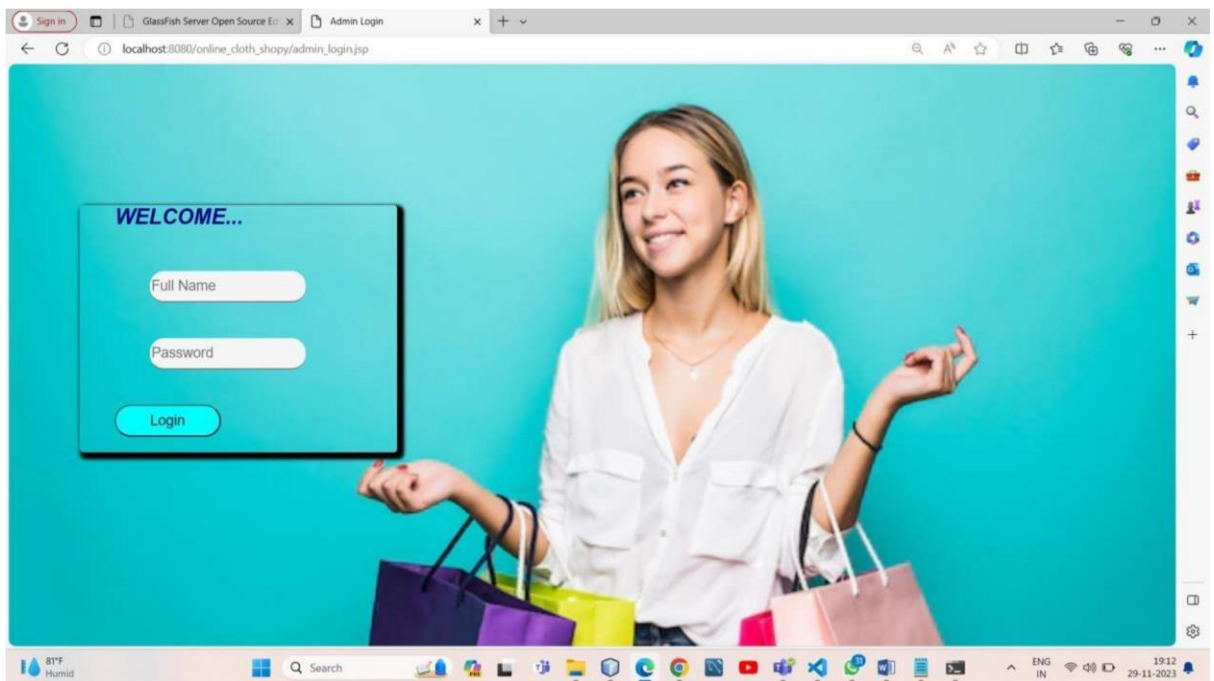
41) Design a and implement servlet applications.



42) Design and implement JSP applications



Output:



43) Design GUI based java application using AWT, Swing with Event Handling. package calculatorapp; import javax.swing.*; import java.awt.*; import java.awt.event.ActionEvent; import java.awt.event.ActionListener;

```
public class CalculatorApp extends JFrame implements ActionListener {  
    // Components    private final JTextField  
display;    private final JButton[] numberButtons;  
private final JButton[] operationButtons;  
private final JButton equalsButton;    private  
final JButton clearButton;  
  
    // Variables    private double num1,  
num2, result;    private char operator;
```

```

    public CalculatorApp() { // Frame settings setTitle("Simple
Calculator"); setSize(300, 400);
setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
setLocationRelativeTo(null);

// Initialize components
display = new JTextField();
display.setEditable(false);

numberButtons = new JButton[10]; for (int i = 0; i
< 10; i++) { numberButtons[i] = new JButton(String.valueOf(i));
numberButtons[i].addActionListener(this);

}

operationButtons = new JButton[4]; String[]
operations = {"+", "-", "*", "/"}; for (int i = 0; i < 4; i++)
{ operationButtons[i] = new JButton(operations[i]);
operationButtons[i].addActionListener(this);

}
equals
Button
= new
JButto
n("=");
equals
Button.
addAct

```



```

ionList
ener(th
is);

clearButton = new JButton("C");    clearButton.addActionListener(this);

// Set layout    setLayout(new
BorderLayout());

JPanel panel1 = new JPanel(new GridLayout(4, 3));    for
(int i = 1; i <= 9; i++) {        panel1.add(numberButtons[i]);

    }
panel1.add(numberButtons[0]);    panel1.add(clearButton);

JPanel panel2 = new JPanel(new GridLayout(4, 1));    for
(JButton button : operationButtons) {        panel2.add(button);

    }

JPanel panel3 = new JPanel(new FlowLayout());    panel3.add(display);

JPanel panel4 = new JPanel(new FlowLayout());    panel4.add(equalsButton);

add(panel3, BorderLayout.NORTH);    add(panel1,
BorderLayout.CENTER);    add(panel2,
BorderLayout.EAST);    add(panel4,
BorderLayout.SOUTH);

}

```

```

@Override public void actionPerformed(ActionEvent
e) {

    for (int i = 0; i < 10; i++) {        if
(e.getSource() == numberButtons[i]) {        display.setText(display.getText()
+ i);

        }
    }

    for (int i = 0; i < 4; i++) {        if (e.getSource() == operationButtons[i])
{        num1 =
Double.parseDouble(display.getText());        char[] operations
= null;        operator = operations[i];
display.setText("");

        }
    }

    if (e.getSource() == equalsButton) {        num2
= Double.parseDouble(display.getText());        switch
(operator) {        case '+' -> result = num1 +
num2;
        case '-' -> result = num1 - num2;        case
'*' -> result = num1 * num2;

        case '/' -> {        if (num2
!= 0) {        result =

```

```

num1 / num2;

        } else {
display.setText("Error");           return;

        }
    }
}

display.setText(String.valueOf(result));
}

    if (e.getSource() == clearButton) {
display.setText("");    num1 = num2 = result
= 0;

    }
}

public static void main(String[] args) {

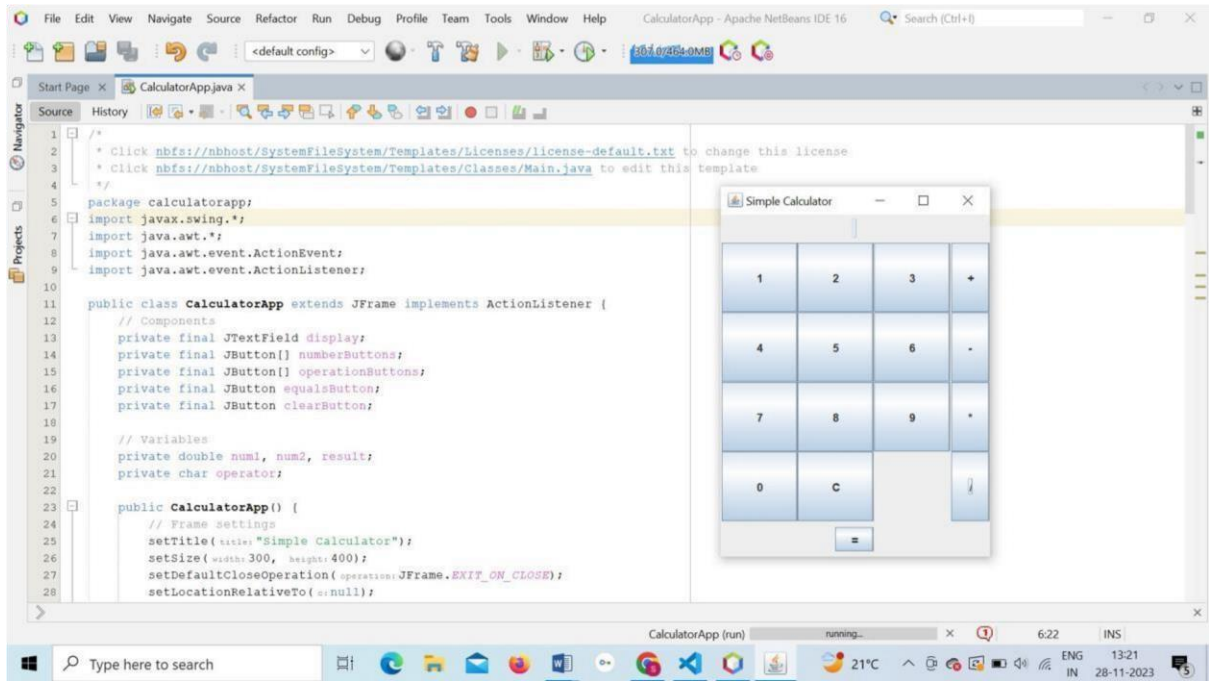
    SwingUtilities.invokeLater(() -> {

        CalculatorApp calculator = new CalculatorApp();    calculator.setVisible(true);

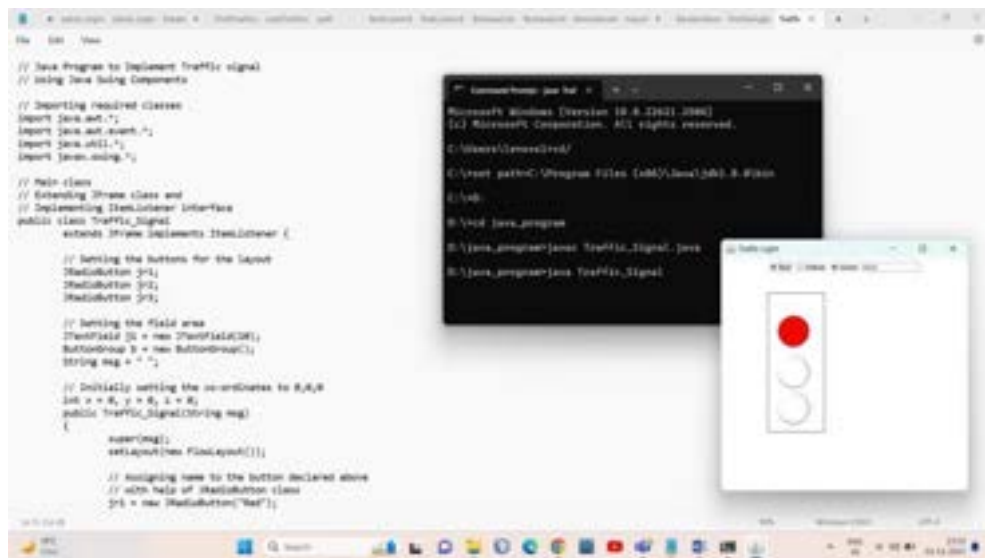
    });
}
}

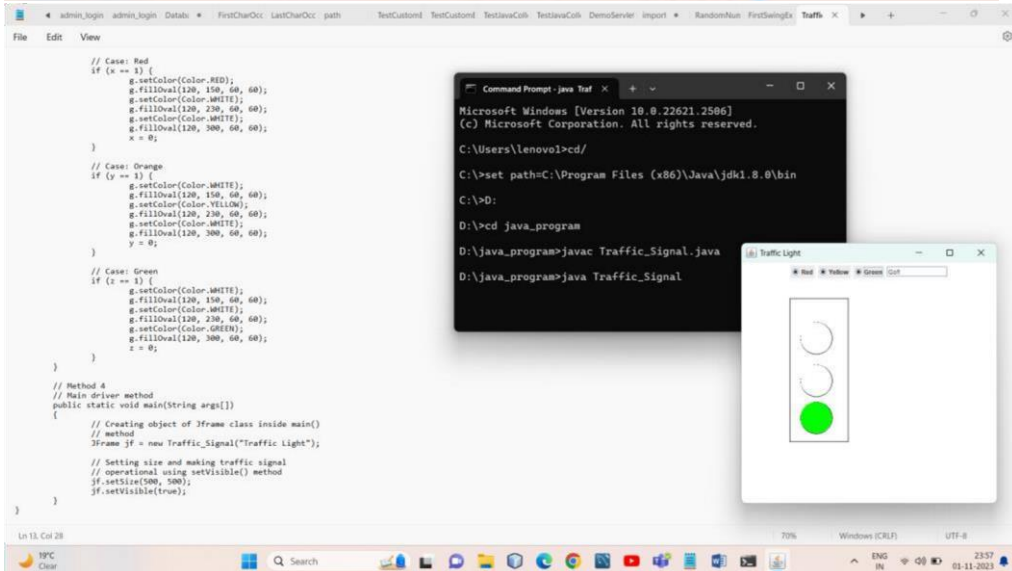
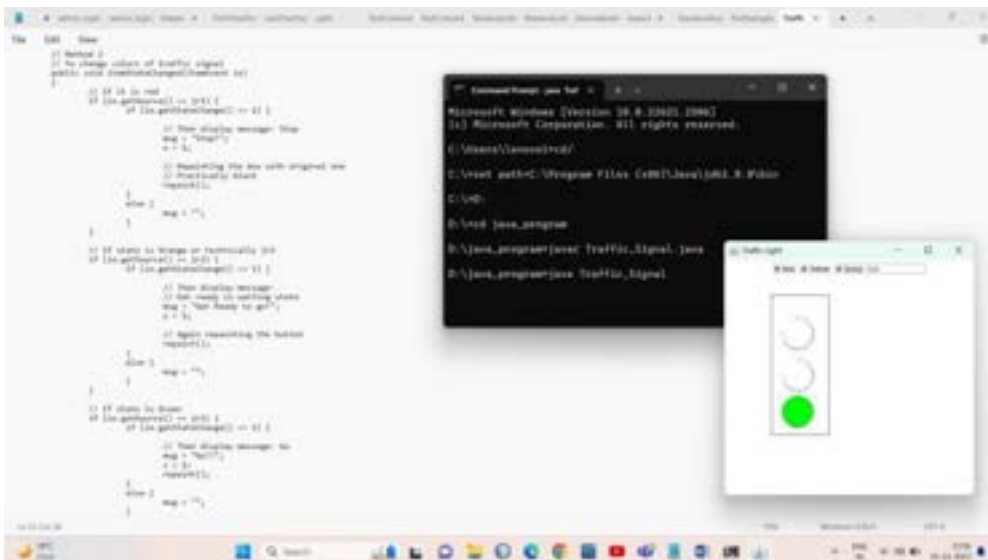
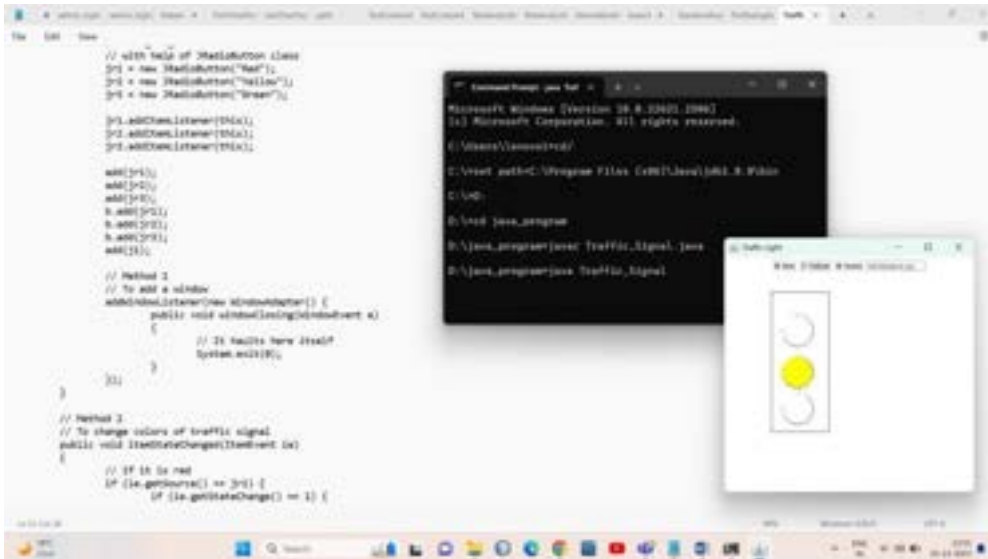
```

Output :



44) Java Program to Implement Traffic signal using Swings and AWT





**45) Threads creation and design applications by using
Extending the Thread class/ Implementing the Runnable
Interface. Application of multithreading in java.**

Code -

```
Package srushtiproject; class MultithreadingDemo
implements Runnable {          public
void run()

        {
            try {

                System.out.println(
                    "Thread " + Thread.currentThread().getId()
                    + " is running");
            }
            catch (Exception e) {

                System.out.println("Exception is caught");
            }
        }
    public class Multithread {      public static
void main(String[] args)

        {
            int n = 8;              for
(int i = 0; i < n; i++) {
```

```
Thread object
= new Thread(new MultithreadingDemo());      object.start();

    }}}
}
```

Output -



```
Thread 19 is running
Thread 16 is running
Thread 21 is running
Thread 17 is running
Thread 15 is running
Thread 14 is running
Thread 20 is running
Thread 18 is running
```



Q.1. Demonstrate singly and doubly linked list

```
class Node {
  constructor(data) {
    this.data = data;   this.next
    = null;
  }
}
class SinglyLinkedList {
  constructor() {
    this.head = null;
  }
  append(data) {
    const newNode = new Node(data);
    if (!this.head) {   this.head =
    newNode;   return;
    }
    let current = this.head;
    while (current.next) {
      current = current.next;
    }
    current.next = newNode;
  }
  print() {
    let current = this.head;
    while (current) {
      console.log(current.data);
      current = current.next;
    }
  }
}
// Example usage of Singly Linked List:
const singlyList = new SinglyLinkedList();
singlyList.append(1); singlyList.append(2);
singlyList.append(3);

console.log("Singly Linked List:"); singlyList.print();
```

Output:

```
Done] exited with code=0 in 0.146 seconds
[Running] node "c:\Users\SUNNY S. GAIKWAD\Downloads\ds\DS programs\Q.1singlyll.js"
```

Singly Linked List:

1
2

3

Doubly linkedlist

```
class Node {
  constructor(data) {
    this.data = data;
    this.prev = null;    this.next
    = null;
  }
}
class DoublyLinkedList {
  constructor() {
    this.head = null;
    this.tail = null;
  }
  append(data) {
    const newNode = new Node(data);
    if (!this.head) {    this.head =
    newNode;    this.tail = newNode;
      return;
    }
    newNode.prev = this.tail;
    this.tail.next = newNode;
    this.tail = newNode;
  }

  print() {
    let current = this.head;
    while (current) {
      console.log(current.data);
      current = current.next;
    }
  }
  printReverse() {    let
  current = this.tail;
  while (current) {
    console.log(current.data);
    current = current.prev;
  }
}
}

// Example usage of Doubly Linked List:
```

```
const doublyList = new DoublyLinkedList();
doublyList.append(1); doublyList.append(2);
doublyList.append(3);

console.log("\nDoubly Linked List:");
doublyList.print();

console.log("\nReverse Doubly Linked List:");
doublyList.printReverse();
```

OUTPUT:

```
[Done] exited with code=0 in 0.213 seconds
[Running] node "c:\Users\SUNNY S. GAIKWAD\Downloads\ds\DS programs\tempCodeRunnerFile.js"
Doubly Linked List:
1
2
3

Reverse Doubly Linked List:
3
2
1

[Done] exited with code=0 in 0.24 seconds
```

Q.2 STACK implementation using Array with PUSH, POP operations

```
class Stack {
  constructor() {
    this.items = [];
  }
  // Push operation to add an element to the stack
  push(element) {
    this.items.push(element);
  }
  // Pop operation to remove the top element from the stack
  pop() { if (this.isEmpty()) {
    return "Underflow";
  }
  return this.items.pop();
}
```

```
// Peek operation to get the top element without removing it
```

```
peek() {
```

```
    if (this.isEmpty()) {
```

```
        return "Stack is empty";
```

```
    }
```

```
    return this.items[this.items.length - 1];
```

```
}
```

```
// Check if the stack is empty
```

```

isEmpty() { return
this.items.length === 0;
}

// Get the size of the stack
size() {
return this.items.length;
}

// Print the elements of the stack
print() {
console.log(this.items.join(' '));
}
}

// Example usage of the Stack class const
stack = new Stack();

// Pushing elements onto the stack
stack.push(1); stack.push(2);
stack.push(3);

// Printing the stack
console.log("Stack after push operations:"); stack.print();

// Popping an element from the stack const
poppedElement = stack.pop();
console.log("\nPopped Element:", poppedElement);
// Peek at the top element
console.log("Top Element (Peek):", stack.peek());
// Printing the stack after pop operation
console.log("\nStack after pop operation:"); stack.print();

```

OUTPUT:

```

[Done] exited with code=0 in 0.24 seconds
[Running] node "c:\Users\SUNNY S. GAIKWAD\Downloads\ds\DS programs\tempCodeRunnerFile.js" Stack
after push operations:
1 2 3
Popped Element: 3
Top Element (Peek): 2 Stack
after pop operation:
1 2

[Done] exited with code=0 i

```

Q.3 Reverse a string using stack

```
class Stack{
    constructor()
    {
        this.top = null
    }

    push(element)
    {
        var node = new newNode(element)
        node.next=this.top
        this.top=node
    }

    pop()
    {
        var temp = this.top
        var Char = temp.data
        this.top=this.top.next
        temp=null    return
        Char
    }

    reverseString(str)
    {
        var i = 0    var
reversestr=""
        while(i !=str.length)
        {
            this.push(str.charAt(i))
i++
        }
        var temp = this.top
        while(temp!=null)
        {
            var char
char=this.pop()
reversestr += char
            temp=this.top
        }
    }
}
```

```
return reversestr
}

display() { var
temp=this.top
while(temp!=null){
console.log(temp.data)
temp=temp.next
}
}
}

class newNode
{
constructor(data,next)
{
this.data=data
this.next=null
}
}

const stack = new Stack() const string =
"Reverse String"; const
reverse=stack.reverseString(string)
console.log(`The string is: ${string} \nReverse string is: ${reverse}`)
```

OUTPUT:

```
The string is: Reverse String Reverse
string is: gnirtS esreveR
```

Q.4 Check for balanced parentheses by using Stacks

```
function isBalancedParentheses(str) {
const stack = []; const
```

```
openingBrackets = ['(', '[', '{'];  const
closingBrackets = [')', ']', '}'];

for (let char of str) {
  if (openingBrackets.includes(char)) {
    // If the character is an opening bracket, push it onto the stack
    stack.push(char);
  } else if (closingBrackets.includes(char)) {
    // If the character is a closing bracket, check if it matches the top of the stack
    const topOfStack = stack.pop();

    // If the stack is empty or the brackets don't match, the string is not balanced
    if (!topOfStack || openingBrackets.indexOf(topOfStack) !== closingBrackets.indexOf(char)) {
      return false;
    }
  }
}
}
```



```

// If the stack is empty, the string is balanced
return stack.length === 0;
}

// Example usage const
balancedString = "{[O]}";
const unbalancedString = "{[()]}";

console.log(`Is "${balancedString}" balanced? ${isBalancedParentheses(balancedString)}`); console.log(`Is
"${unbalancedString}" balanced? ${isBalancedParentheses(unbalancedString)}`);

```

OUTPUT:

```

Is "{[O]}" balanced? true Is
"{[()]}" balanced? false

```

Q.5 Implement Stack using Linked List

```

class node
{
  constructor(element)
  {
    this.element=element;
    this.next=null;
  }
} class
stack
{ constructor()
  {
    this.top=null;
    this.size=0;
  }
  push(x)
  { let temp=new node();
  if(temp==null)

```

```

    {
        return overflow;
    }
    temp.element=x;
temp.next=this.top;
this.top=temp;
}

```

```

isEmpty()
{
    return this.top==null;
}

```

```
peek()
```

```

{
if(!this.isEmpty())

```

```

    {
        return
this.top.element;
    }
    else{
return -1;
    }
}
pop()

```

```

{
if(this.top==null)
    {
        return
underflow;
    }

```

```
this.top=this.top.next;
```

```

}

```

```
display()
```

```

{
    let
temp=this.top;
while (temp!=null)

```

```

    {
        console.log(temp.element);
temp=temp.next;
    }
}

```

```
let Node=new stack();
```

```
Node.push(23);
```

```
Node.push(33);
```

```
Node.push(55);
Node.display();

console.log("top element is",Node.peak());
Node.pop();
Node.pop();
Node.display();

console.log("top element is",Node.peak());
```

OUTPUT:

```
55
33 23
top element is 55
23
top element is 23
```

Q.6 Demonstration of Linear Queue, Circular Queue, Priority Queue

Linear queue

```
class linearqueue
{
    constructor()
    {
        this.items
    }
    =[];
    this.lenght=-1;
    enqueue(element)
    {
        this.items.push(element);
    }
    dequeue()
    {
        if(this.isempty())
        return "underflow";
        return this.items.shift();
    }
}
```

```
    }  
    front() {  
        if(this.isempty())  
            return "no element in queue";  
        return this.items[0];  
    }  
    isempty()  
    {  
        return this.items.length==1;  
    }  
  
    printQueue()  
    {  
        var str = "";  
        for(var i = 0; i < this.items.length; i++)  
            str += this.items[i] + " ";    return str;  
    } }  
    var queue = new linearqueue();
```

```
console.log(queue.dequeue());  
console.log(queue.isempty()); queue.enqueue(2);  
queue.enqueue(4); console.log("\n Elements in  
Linear Queue are:");  
console.log(queue.printQueue());  
console.log(queue.front());  
console.log(queue.dequeue());  
console.log(queue.printQueue());
```

```
console.log(queue.dequeue()); console.log(queue.printQueue());  
console.log(queue.dequeue()); console.log(queue.printQueue());
```

OUTPUT:

```
Elements in Linear Queue are:
```

```
2 4
```

```
2
```

```
2
```

```
4
```

```
4
```

```
undefined
```

PRIORITY QUEUE: class

QElement

```
{  
  constructor(element,priority)  
  {  
    this.element=element;  
    this.priority=priority;  
  }  
}
```

class PriorityQueue

```
{  
  constructor()  
  {  
    this.items=[];  
  }  
  enqueue(element,priority)  
  {  
    var qElement=new QElement(element,priority);  
    var contain =false;  
    for(var i=0;i<this.items.length;i++)
```

```
    { if(this.items[i].priority>qElement.priority)
      {
        this.items.splice(i,0,qElement);
        contain=true;
break;
```

```
    }
  }

  if(!contain)
  {
    this.items.push(qElement);
  }
}
```

```
dequeue()
{ if(this.isEmpty())
return "underflow";
return this.items.shift();
}
```

```
Front() {
  if(this.isEmpty())
    return "no element in queue";
  return this .items[0];
}
```

```
Rear()
{
  if(this.isEmpty())
    return "no element in queue";
  return this.items[this.items.length-1];
}
```

```
isEmpty()
{
  return this.items.length==0;
}
```

```
printPQueue()
{
  var str="";
  for(var i=0;i<this.items.length;i++)
str+=this.items[i].element+ " ";
return str;
}
```

```

}
}

var priorityQueue=new PriorityQueue();
console.log(priorityQueue.isEmpty());
console.log(priorityQueue.Front());

priorityQueue.enqueue("srushti",1);
priorityQueue.enqueue("minal",1); priorityQueue.enqueue("sneha",3);
priorityQueue.enqueue("madhu",4);
priorityQueue.enqueue("aditi",3);

console.log(priorityQueue.printPQueue());
console.log(priorityQueue.Front().element);
console.log(priorityQueue.Rear().element);
console.log(priorityQueue.dequeue().element);
priorityQueue.enqueue("vaishnavi",2); console.log(priorityQueue.printPQueue());

```

OUTPUT

```

true
no element in queue
srushti minal sneha aditi madhu
srushti madhu
srushti
minal vaishnavi sneha aditi madhu

```

CIRCULAR QUEUE:

```


class CircularQueue {   constructor(size) {
this.maxSize = size;   this.queue = new
Array(size).fill(null);   this.front = -1;
this.rear = -1;

}

isEmpty() {   return
this.front === -1;

}

```



```
isFull() {  
    return (this.front === 0 && this.rear === this.maxSize - 1) || (this.rear === (this.front - 1)  
% (this.maxSize - 1));  
}  
  
enqueue(item) {  
    if (this.isFull()) {  
        console.log("Queue is full. Cannot enqueue.");  
return;  
    }  
  
    if (this.isEmpty()) {  
this.front = 0;  
this.rear = 0;  
    } else {  
        this.rear = (this.rear + 1) % this.maxSize;  
    }  
  
    this.queue[this.rear] = item;  
console.log(`Enqueued ${item}`);  
}
```



```
    dequeue() {      if
(this.isEmpty()) {

        console.log("Queue is empty. Cannot dequeue.");
return;

    }
}
```

```
const item = this.queue[this.front];

if (this.front === this.rear) {
    // Reset the queue when the last element is dequeued
    this.front = -1;    this.rear = -1;    } else {

    this.front = (this.front + 1) % this.maxSize;
}

console.log(`Dequeued ${item}`);
}

display() {    if (this.isEmpty()) {
console.log("Queue is empty.");
return;

}

let current = this.front;
console.log("Elements in the Circular Queue:");
do
{
    console.log(this.queue[current]);
current = (current + 1) % this.maxSize;

} while (current !== (this.rear + 1) % this.maxSize);
}
}
```

```
// Example Usage
const circularQueue = new CircularQueue(5);

circularQueue.enqueue(1);
circularQueue.enqueue(2);
circularQueue.enqueue(3);
circularQueue.display();

circularQueue.dequeue();
circularQueue.display();

circularQueue.enqueue(4);
circularQueue.enqueue(5);

circularQueue.enqueue(6); // This will overflow the circular
queue circularQueue.display();
```

OUTPUT:

```
Enqueued 1
Enqueued 2
Enqueued 3
Elements in the Circular Queue:
1
2
3
Dequeued 1
Elements in the Circular Queue:
2
3
Enqueued 4
Enqueued 5
Enqueued 6
Elements in the Circular Queue:
2
3
```

4



5

6

[Done] exited with code=0 in 0.115 seconds



Q.7 Reverse stack using queue

```
class Stack {
  constructor() {
    this.items = [];
  }

  push(item) {
    this.items.push(item);
  }

  pop() {
    if (this.isEmpty()) {
      return "Stack is empty";
    }
    return this.items.pop();
  }

  isEmpty() {
    return this.items.length === 0;
  }

  size() {
    return this.items.length;
  }
}

class Queue {
  constructor() {
    this.items = [];
  }
}
```

```
enqueue(item) {  
  this.items.push(item);  
}  
  
dequeue() {  
  if (this.isEmpty()) {  
return "Queue is empty";
```

```

    }
    return this.items.shift();
  }

  isEmpty() {
    return this.items.length === 0;
  }

  size() {
    return this.items.length;
  }
}

// Function to reverse a stack using a queue function
reverseStack(stack) {
  const queue = new Queue();

  // Enqueue elements from stack to queue
  while (!stack.isEmpty()) {
    queue.enqueue(stack.pop());
  }

  // Dequeue elements from queue and push them back onto stack
  while (!queue.isEmpty()) {
    stack.push(queue.dequeue());
  }
}

// Example usage
const stackToReverse = new Stack();

stackToReverse.push(1); stackToReverse.push(2);
stackToReverse.push(3);

console.log("Original Stack:", stackToReverse.items);

reverseStack(stackToReverse);

console.log("Reversed Stack:", stackToReverse.items);

```

OUTPUT:

```

Original Stack: [ 1, 2, 3 ] Reversed
Stack: [ 3, 2, 1 ]

```

Q.8 Practical based on binary search tree implementation with its operations

```
class Node {
    constructor(data) {
        this.data = data;    this.left
        = null;    this.right = null;
    }
}

class BinarySearchTree {
    constructor() {
        this.root = null;
    }

    // Insert a node into the BST
    insert(data) {
        const newNode = new Node(data);

        if (this.root === null) {
            this.root = newNode;
        } else {
            this.insertNode(this.root, newNode);
        }
    }

    insertNode(node, newNode) {
        if (newNode.data < node.data) {
            if (node.left === null) {
                node.left = newNode;
            } else {
                this.insertNode(node.left, newNode);
            }
        } else {
            if
            (node.right === null) {
                node.right = newNode;
            } else {
                this.insertNode(node.right, newNode);
            }
        }
    }
}
```

```
// Perform in-order traversal on the BST
inOrderTraversal(callback) {
    this.inOrderTraversalNode(this.root, callback);
}

inOrderTraversalNode(node, callback) {
    if (node !== null) {
        this.inOrderTraversalNode(node.left, callback);
        callback(node.data);
        this.inOrderTraversalNode(node.right, callback);
    }
}
```

```
// Search for a node with a given data in the BST
search(data) {
    return this.searchNode(this.root, data);
}

searchNode(node, data) {
    if (node === null) {
        return null; // Node not found
    }

    if (data < node.data) {
        return this.searchNode(node.left, data);
    } else if (data > node.data) {
        return this.searchNode(node.right, data);
    } else {
        return node; // Node found
    }
}

// Delete a node with a given data from the BST
delete(data) {
    this.root = this.deleteNode(this.root, data);
}

deleteNode(node, data) {
    if (node === null) {
        return null; // Node not found
    }

    if (data < node.data) {
        node.left = this.deleteNode(node.left, data);
    } else if (data > node.data) {
        node.right = this.deleteNode(node.right, data);
    }
}
```



```

    } else {
      // Node found, delete it
      if (node.left === null && node.right === null) {
node = null; // Case 1: Node has no children
      } else if (node.left === null) {
        node = node.right; // Case 2: Node has one child (right)
      } else if (node.right === null) {
        node = node.left; // Case 2: Node has one child (left)
      } else {
        // Case 3: Node has two children
        const minValue = this.findMinValue(node.right);
node.data = minValue;
        node.right = this.deleteNode(node.right, minValue);
      }
    }
  }
}

```

```

    return node;
  }

  findMinValue(node) {
    let
minValue = node.data;
    while
(node.left !== null) {
minValue = node.left.data;
      node = node.left;
    }
    return minValue;
  }
}

// Example usage
const bst = new BinarySearchTree();

bst.insert(50); bst.insert(30);
bst.insert(20); bst.insert(40);
bst.insert(70); bst.insert(60);
bst.insert(80);

console.log("In-Order Traversal:");
bst.inOrderTraversal((data) => console.log(data));

console.log("\nSearch for 40:");

```

```
console.log(bst.search(40));

console.log("\nDelete 30:"); bst.delete(30);
bst.inOrderTraversal((data) => console.log(data));
```

OUTPUT:

In-Order Traversal:

```
20
30
40
50
60
70
80
```

Search for 40:

```
Node { data: 40, left: null, right: null }
```

Delete 30:

```
20
40
50
60
70
80
```

Q.9.Graph implementation and graph traversals

```
class Graph {

  constructor(noOfVertices)
  {
    this.noOfVertices = noOfVertices
    this.AdjList = new Map()
  }

  // add vertex to the graph
  addVertex(v)
  {
    this.AdjList.set(v, []) }

  // add edge to the graph
  addEdge(v, w)
```

```
{
  //add an edge from v to w also
  this.AdjList.get(v).push(w)

  // add an edge from w to v also
  this.AdjList.get(w).push(v)
}
// Prints the vertex and adjacency list
printGraph()
{
  // get all the vertices
  var get_keys = this.AdjList.keys()

  // iterate over the vertices
  for (var i of get_keys)
```

```

{
    // great the corresponding adjacency list for the vertex
    var get_values = this.AdjList.get(i)
    var conc = ""

    // iterate over the adjacency list concatenate the values into a string
    for (var j of get_values)      conc += j + " ";

    // print the vertex and its adjacency list
    console.log(i + " -> " + conc);
}
}

bfs(startingNode)
{
    // create a visited object
    var visited = {};

    // Create an object for queue
    var q = new Queue();

    // add the starting node to the queue
    visited[startingNode] = true;    q.enqueue(startingNode);

    // loop until queue is element
    while (!q.isEmpty())
    {
        // get the element from the queue
        var getQueueElement = q.dequeue();

        // passing the current vertex to callback funtion
        console.log(getQueueElement);

        // get the adjacent list for current vertex
        var get_List = this.AdjList.get(getQueueElement);

        // loop through the list and add the element to the
        // queue if it is not processed yet
        for (var i in get_List) {
            var neighbour = get_List[i];

```

```
        if (!visited[neighbour]) {
            visited[neighbour] = true;
            q.enqueue(neighbour);
        }
    }
}
dfs(startingNode)
{
```

```
    var visited = {};
    this.DFS_traversal(startingNode, visited); }

// Recursive function which process and explore
// all the adjacent vertex of the vertex with which it is called
DFS_traversal(vert, visited)
{    visited[vert] =
true;
    console.log(vert);

    var get_neighbours = this.AdjList.get(vert);

    for (var i in get_neighbours) {
        var get_elem = get_neighbours[i];
        if (!visited[get_elem])
            this.DFS_traversal(get_elem, visited);
    }
}

}

class Queue
{
// Array is used to implement a Queue constructor()
{
    this.items = [];
}

enqueue(element)
{
    // adding element to the queue
    this.items.push(element);
```

```
}  
dequeue()  
{  
  
    if(this.isEmpty())  
return "Underflow";  
    return this.items.shift();  
}
```

```
isEmpty()  
{  
    // return true if the queue is empty.  
return this.items.length == 0;  
}
```

```
}  
  
var g = new Graph(6);  
var vertices = ['A','B','C','D','E','F']; for  
(var i = 0; i < vertices.length; i++)  
{  
g.addVertex(vertices[i]);  
}  
  
// adding edges  
g.addEdge('A', 'B');  
g.addEdge('A', 'D');  
g.addEdge('A', 'E');  
g.addEdge('B', 'C');  
g.addEdge('D', 'E');  
g.addEdge('E', 'F');  
g.addEdge('E', 'C');  
g.addEdge('C', 'F');  
g.printGraph();  
console.log("BFS"); g.bfs('A');  
console.log("DFS");  
g.dfs('A');
```

Output:

```
[Running] node "c:\Users\SUNNY S. GAIKWAD\Downloads\ds\DS programs\graphk.js" A  
-> B D E
```

B -> A C
C -> B E F
D -> A E
E -> A D F C
F -> E C

BFS

A

B

D

E

C

F

DFS

A

B

C

E

D
F

[Done] exited with code=0 in 0.107 seconds

Q10. Implementation of Hashing

```
class HashTable {
  constructor() {      this.table =
new Array(10);      this.size =
0;
  }

  // private function to convert key to index
  // _ shows that the function is private
  _setKey(key) {
return key % 10;
  }  insert(value) {      const
index = this._setKey(value);
this.table[index] = value;
this.size++;
  }  get(key) {      const target
= this._setKey(key);      return
this.table[target];
  }
  search(value) {
    const index = this._setKey(value);      if
(this.table[index] == value)      console.log("The value
is found at index : ", index);      else
console.log("Not found");
  }
  delete(key) {
```



```

        const index = this._setKey(key);
    if (this.table[index]) {
    this.table[index] = [];
    this.size--;          return true;
        } else {
    return false;
        }
    }
}
}

const hashExample = new HashTable();
// insert
hashExample.insert(100);  hashExample.insert(87);
hashExample.insert(86);  hashExample.insert(12);
hashExample.insert(9);   console.log(hashExample.table); //
-> shows the hash table

// search  hashExample.search(87);
// found  hashExample.search(10); //
not found

// delete
hashExample.delete(12);

// showing table after deletion
console.log(hashExample.table);

```

OUTPUT –

```

PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
"C:\Program Files\nodejs\node.exe" ".\class HashTable.js"
> (10) [100, ..., 12, ..., 86, 87, ..., 9]
The value is found at index : 7
Not found
> (10) [100, ..., Array(0), ..., 86, 87, ..., 9]

```

Q.11 Practical based on Brute Force technique

```

//Brute force approach to find the maximum subarray sum
function bruteForceMaxSubarraySum(arr) {  const n =
arr.length;

  let maxSum = -Infinity;
  let startIndex, endIndex;

  for (let i = 0; i < n; i++) {
for (let j = i; j < n; j++) {
    let currentSum = 0;

    // Calculate the sum of the subarray [i, j]
for (let k = i; k <= j; k++) {
        currentSum += arr[k];
    }

    // Update maxSum and indices if the currentSum is
greater    if (currentSum > maxSum) {
        maxSum = currentSum;
startIndex = i;    endIndex
= j;
    }
  }
}

  return {
maxSum,
    subarray: arr.slice(startIndex, endIndex + 1)
  };
}

// Example usage
const array = [1, -3, 2, 1, -1];

const result = bruteForceMaxSubarraySum(array);

console.log("Array:", array);
console.log("Maximum Subarray Sum:", result.maxSum);
console.log("Maximum Subarray:", result.subarray);

```

OUTPUT:

```

Array: [ 1, -3, 2, 1, -1 ]
Maximum Subarray Sum: 3 Maximum
Subarray: [ 2, 1 ]

```

Q.12 Practical based on Greedy Algorithm-Prim's/Kruskal's algorithm

```

let V = 5; function
minKey(key, mstSet)

```

```

{   let min = Number.MAX_VALUE,
min_index;   for (let v = 0; v < V; v++)   if
(mstSet[v] == false && key[v] < min)   min
= key[v], min_index = v;

return min_index;
}   function printMST(parent, graph) {   console.log("Edge   Weight" +
"<br>");   for (let i = 1; i < V; i++)   console.log(parent[i] + " - " + i + "
" + graph[i][parent[i]] + "<br>");
}   function primMST(graph)
{   let parent = [];   let key = [];   let mstSet = [];
for (let i = 0; i < V; i++)   key[i] =
Number.MAX_VALUE, mstSet[i] = false;

key[0] = 0;   parent[0] = -1;   for (let count = 0; count < V - 1; count++)
{   let u = minKey(key, mstSet);   mstSet[u] = true;   for
(let v = 0; v < V; v++)   if (graph[u][v] && mstSet[v] == false
&& graph[u][v] < key[v])   parent[v] = u, key[v] = graph[u][v];
}   printMST(parent, graph);
}   let graph = [ [ 0, 2, 0, 6, 0 ],
[ 2, 0, 3, 8, 5 ],
[ 0, 3, 0, 0, 7 ],
[ 6, 8, 0, 0, 9 ],
[ 0, 5, 7, 9, 0 ] ];
primMST(graph);

```

OUTPUT –

| Edge | | | Weight |
|------|---|---|--------|
| 0 | - | 1 | 2 |
| 1 | - | 2 | 3 |
| 0 | - | 3 | 6 |
| 1 | - | 4 | 5 |

Q.13 Practical based on Divide and Conquer Technique-Binary Search, Tower of Hanoi

BinarySearch

```
// Binary Search using Divide and Conquer
function binarySearch(arr, target) {
  let low = 0;
  let high = arr.length - 1;

  while (low <= high) {
    let mid = Math.floor((low + high) / 2);

    if (arr[mid] === target) {
      return mid; // Element found, return its index
    } else if (arr[mid] < target) {
      low = mid + 1; // Search in the right half
    } else {
      high = mid - 1; // Search in the left half
    }
  }

  return -1; // Element not found
}

// Example usage
const sortedArray = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]; const
targetElement = 7;

const resultIndex = binarySearch(sortedArray, targetElement);

if (resultIndex !== -1) {
```

```
console.log(`Binary Search: Element ${targetElement} found at index ${resultIndex}.`);
} else {
console.log(`Binary Search: Element ${targetElement} not found in the array.`); }
```

OUTPUT:

```
Binary Search: Element 7 found at index 6.
```

TOWER OF HANOI

```
function towerOfHanoi(n, source, auxiliary, target) {
if (n === 1) {
console.log(`Move disk 1 from ${source} to ${target}`);
return;
}

towerOfHanoi(n - 1, source, target, auxiliary);
console.log(`Move disk ${n} from ${source} to ${target}`);
towerOfHanoi(n - 1, auxiliary, source, target); }

// Example usage
const
numberOfDisks = 3; const
sourceRod = 'A'; const
auxiliaryRod = 'B';
const targetRod = 'C';

console.log(`Tower of Hanoi with ${numberOfDisks} disks:`);
towerOfHanoi(numberOfDisks, sourceRod, auxiliaryRod, targetRod);
```

OUTPUT:

```
Tower of Hanoi with 3 disks: Move disk 1 from A to C
Move disk 2 from A to B
Move disk 1 from C to B
Move disk 3 from A to C
Move disk 1 from B to A
Move disk 2 from B to C Move disk 1 from A to C
```

14.Implementation of Dynamic Programming- LCS, Regular Expression Matching – □ LCS –

```
/* A Top-Down DP implementation of LCS problem */
```

```
/* Returns length of LCS for X[0..m-1], Y[0..n-1] */
```

```
function lcs(X, Y, m, n, dp)
```

```

    {
        if (m == 0 || n == 0)
            return 0;
        if (X[m - 1] == Y[n - 1])
            return dp[m][n] = 1 +
lcs(X, Y, m - 1, n - 1, dp);

        if (dp[m][n] != -1) {
            return dp[m][n];
        }
        return dp[m][n] = Math.max(lcs(X, Y, m, n - 1, dp),
lcs(X, Y, m - 1, n, dp));
    }

/* Driver code */

let X = "AGGTAB";
let Y = "GXTXAYB";

let m = X.length; let n =
Y.length; let dp = new
Array(m + 1); for(let i = 0;
i < m + 1; i++)
{
    dp[i] = new Array(n + 1).fill(-1);
} console.log("Length of LCS is " + lcs(X, Y, m, n,
dp));

// This code is contributed by shinjanpatra

```

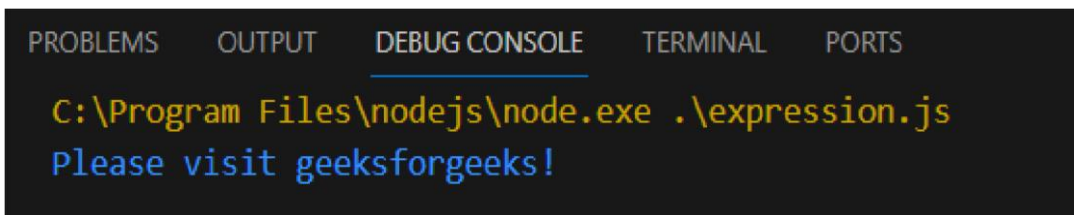
OUTPUT -

The screenshot shows a code editor with a dark background. At the top, there are tabs for 'PROBLEMS', 'OUTPUT', 'DEBUG CONSOLE', 'TERMINAL', and 'PORTS'. The 'DEBUG CONSOLE' tab is active and shows the following output: 'C:\Program Files\nodejs\node.exe .\Untitled-1.js' followed by 'Length of LCS is 4'.

□ Regular Expression Matching –

```
function myFunction() {  
  
    // input string    let str =  
    "Please visit gfG!";  
  
    // replacing with modifier i    let txt =  
    str.replace(/gfg/i, "geeksforgeeks");  
  
    console.log(txt);  
}  
myFunction();
```

OUTPUT –



```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS  
C:\Program Files\nodejs\node.exe .\expression.js  
Please visit geeksforgeeks!
```

Q.15 Practical based on backtracking- N Queen's problems

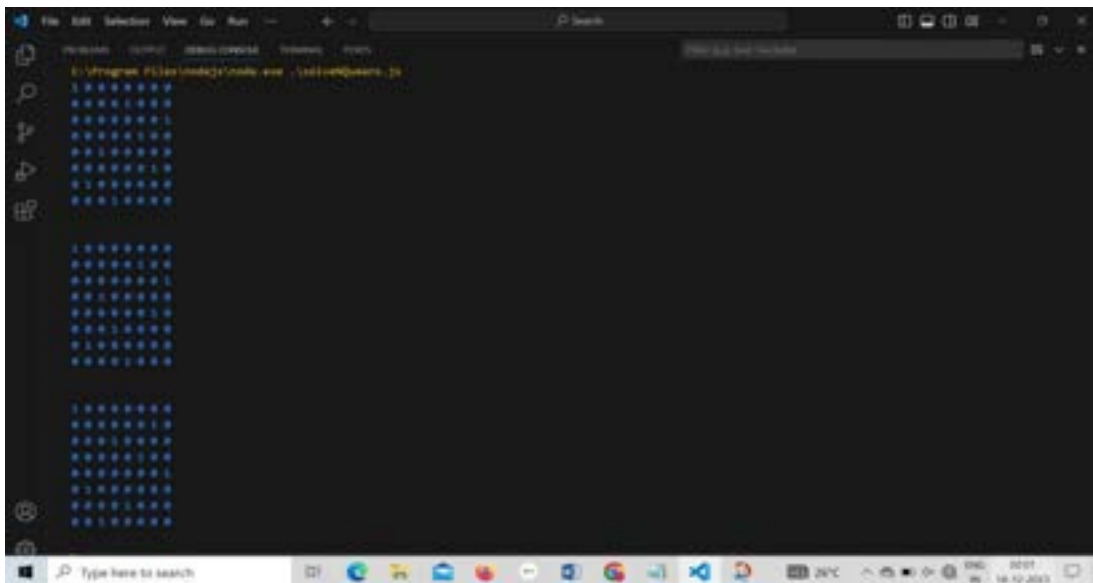
```
function solveNQueens(N) {  
    // Initialize the chessboard  
    const board = Array.from({ length: N }, () => Array(N).fill(0));  
    function isSafe(row, col) {  
        // Check if there is a queen in the same column  
        for (let i = 0; i < row; i++) {  
            if (board[i][col] === 1) {  
                return false;  
            }  
            // Check upper-left diagonal    if  
            (board[i][col - (row - i)] === 1) {  
                return false;  
            }  
            // Check upper-right diagonal    if  
            (board[i][col + (row - i)] === 1) {  
                return false;  
            }  
        }  
    }  
}
```

```

    }
}
return true;
}
function solve(row) {
if (row === N) {
    // All queens are placed successfully, print the solution
for (let i = 0; i < N; i++) {
    console.log(board[i].join(' '));
    }
    console.log('\n');
    return;
}
for (let col = 0; col < N; col++) {
if (isSafe(row, col)) { // Place
queen    board[row][col] = 1;
    // Recur to place queens in the remaining rows
solve(row + 1);
    // If placing queen in the current position doesn't lead to a solution, backtrack
board[row][col] = 0;
    }
}
}
// Start with the first row
solve(0);
}
// Example: Solve N-Queens for N = 8 solveNQueens(8);

```

OUTPUT:



```

1 . . . . . . . .
. . . . . 1 . .
. . . . . . . 1
. . . . . 1 . .
. . 1 . . . . .
. . . . . . 1 .
. . . . . 1 . .
. . . . . . . .

1 . . . . . . . .
. . . . . 1 . .
. . . . . . . 1
. . . . . 1 . .
. . 1 . . . . .
. . . . . . 1 .
. . . . . 1 . .
. . . . . . . .

1 . . . . . . . .
. . . . . 1 . .
. . . . . . . 1
. . . . . 1 . .
. . 1 . . . . .
. . . . . . 1 .
. . . . . 1 . .
. . . . . . . .

```


A
PRACTICAL ON

(IT11L)

Java Programming

&

Data Structure and Algorithms

SUBMITTED BY

Miss. Chindarkar Amisha Rajendra

SUBMITTED TO

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

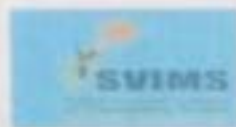
IN PARTIAL FULFILLMENT OF DEGREE

MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF

Prof. Girish Bal & Prof. Omkar Barve

Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

Certificate

This is to certify that Miss. Chindarkar Amisha Rajendra student of Master of Computer Application SEM I has satisfactorily completed all the practicals in the subject: IT11L - Java Programming & Data Structures & Algorithms for the purpose of Practical Examination-December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023-24.

Roll No: 23537

Seat No: 8225

Sign of Internal Practical Incharge

Dr. Rajesh Kashyap
HOD-MCA

Date:

Place: Pune



Dr. B.H. Nanwani
Director

DR. B. H. NANWANI
DIRECTOR
SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
& KOREGAON ROAD, PUNE-411 001

Sadhu Vaswani Institute of Management Studies for Girls
 ACADEMIC YEAR 2023-24
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| 45 | Threads creation and design applications by using Extending the Thread class/ implementing the Runnable Interface. Application of multithreading in java. | 08-Nov-23 | <i>Geetika</i> |
|----|---|-----------|----------------|

Geetika

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

MCA I – SEMESTER I

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Roll No: 23539

Seat 8234

G. B. D.

Sign of Internal Practical Incharge

[Signature]

Dr. Rajesh Kashyap

HOD-MCA

Sign of External Examiner



[Signature]
Dr. B.H. Nanwani

Date:

Director
DR. B.H. NANWANI
DIRECTOR

Name: Anam A Kod.

Roll No: 23559

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
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III Java Programming - Practical
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Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

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Tree

A
PRACTICAL ON
(IT11L)

Java Programming

&

Data Structure and Algorithms

SUBMITTED BY

Ms. Preeti Shankar Tarade

SUBMITTED TO

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

IN PARTIAL FULFILLMENT OF DEGREE

MASTER OF COMPUTER APPLICATION (SEM-I)

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Through,



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Koregaon Park, Pune-411001**

2023-24

CERTIFICATE



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Roll No: 23540

Seat No: 8264

GBD

Sign of Internal Practical Incharge

[Signature]
Dr. Rajesh Kashyap

HOD-MCA

[Signature]

Sign of External Examiner

[Signature]
Dr. B.H. Nanwani

Director

DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6, KOREGAON ROAD, PUNE-411 001

Date:



Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

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A
PRACTICAL ON
(IT11L)
Java Programming
&
Data Structure and Algorithms

SUBMITTED BY
Ms. SAYYED RAHAT HUSSAIN

SUBMITTED TO
SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

IN PARTIAL FULFILLMENT OF DEGREE
MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF
Prof. Girish Bal & Prof. Omkar Barve

Through,



**Sadhv Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

Certificate



This is to certify that Ms. RAHAT HUSSAIN SAYYED student of Master of Computer Application SEM I has satisfactorily completed all the practicals in the subject: IT111 Java Programming & Data Structures & Algorithms for the purpose of Practical Examination–December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023-24.

Roll No:23542

Seat No: 8259

A handwritten signature in blue ink, appearing to be 'G. Bad', is written above the text 'Sign of Internal Practical Incharge'.

Sign of Internal Practical Incharge

A handwritten signature in blue ink, appearing to be 'Rajesh Kashyap', is written above the text 'Dr. Rajesh Kashyap HOD-MCA'.

Dr. Rajesh Kashyap
HOD-MCA

A handwritten signature in blue ink, appearing to be 'A. S. S.', is written above the text 'Sign of External Examiner'.

Sign of External Examiner



A handwritten signature in blue ink, appearing to be 'B. H. Nanwani', is written above the text 'Dr. B.H. Nanwani Director'.

Dr. B.H. Nanwani
Director

DR. B. H. NANWANI
DIRECTOR

Savitribai Phule Pune University
6, KOREGAON ROAD, PUNE-411 001

Date:

Place: Pune

Name:- Sayyed Rahat Huss

Class:- MCA I

Roll no:- 23542

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

MCA I - SEMESTER I

IT11 Java Programming - Practical

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5/2/21

Name :- Rahat sayyed.

Roll no :- 23542

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
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Ms. Maryam Razzaque Shaikh

SUBMITTED TO

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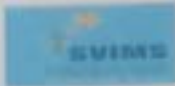
Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

Certificate



This is to certify that Ms. Maryam Razzaque Shaikh student of Master of Computer Application SEM I has satisfactorily completed all the practicals in the subject: IT11Java Programming & : IT12 Data Structure & Algorithms for the purpose of Practical Examination—December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023-24.

Roll No: 23543

Seat No: 8262

G.Bal

Sign of Internal Practical Incharge

Rajesh Kashyap

Dr. Rajesh Kashyap
HOD-MCA

A.S.

Sign of External Examiner



B.H. Nanwani

Dr. B.H. Nanwani

Director

DR. B. H. NANWANI
DIRECTOR

SAVITRIBAI PHULE PUNE UNIVERSITY
KOREGAON ROAD, PUNE - 411004

Date:

Place: Pune

Manjari Sheikh
25543

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
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IT11 Java Programming - Practical

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TH

Manyam Sheikh
23543

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24

MCA I – SEMESTER I

IT-11L – Data Structure and Algorithm Practicals

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Certificate



This is to certify that Ms. Sanskruti Prashant Kurale student of Master of Computer Application SEM I has satisfactorily completed all the practicals in the subject: IT111L-Java Programming & Data Structures & Algorithms for the purpose of Practical Examination- December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023-24.

Roll No: 23345

Seat No: 8241



Sign of Internal Practical Incharge

CSB

Dr. Rajesh Kashyap

Rajesh Kashyap

HOD-MCA

Sign of External Examiner

[Signature]

Dr. B.H. Narwani

[Signature]

Date:

Director

DR. B. H. NANWANI

DIRECTOR

SAVITRIBAI PHULE KRISHI AND VETERINARY UNIVERSITY
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Sadhu Vaswani Institute of Management Studies for Girls

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NAME: SANSKRUTI PRASHANT KURALE

Roll No.: 23545

Java Practical Assignment

1) Fibonacci Series

```

package javaprograms; public
class fibonacci {
public static void main(String[] args) {
int n1=0,n2=1,i3,icount=10; System.out.println("Fibonacci Series is:"); System.out.println(n1+" "+n2);
for(i=2;i<count; i++)
{
n3=n1+n2; System.out.print(" "+n3); n1=n2; n2=n3;
}
}
}

```

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Q.1. Demonstrate singly Linked List and Doubly Linked List.

Syllabi (Doubly linked list)

<DOCTYPE html>

<html lang="en">

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Java Programming
&
Data Structure and Algorithms

SUBMITTED BY
Ms.Perna Uttam Kamble

SUBMITTED TO
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Roll No: 23547

Seat No: 8237

G. B. A.

Sign of Internal Practical Incharge

Rajesh Kashyap
Dr. Rajesh Kashyap
HOD-MCA

Sign of *External* Examiner

B. H. Nanwani
Dr. B. H. Nanwani

Date:

Director
DR. B. H. NANWANI
DIRECTOR
SADHU VASWAN INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
& KOREGACH ROAD, PUNE-411 001

Place: Pune



class - MCAJ Roll NO :- 23547

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
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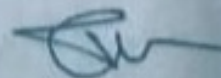
Name- Prerana Uttam Kamble
class:- MCA -I
Roll No:- 23547

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA I - SEMESTER I
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A
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Java Programming
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SUBMITTED BY
MS. Ankita karne

SUBMITTED TO
SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

IN PARTIAL FULFILLMENT OF DEGREE
MASTER OF COMPUTER APPLICATION (SEM-I)

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Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24


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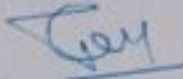



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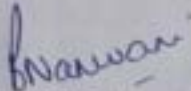
Roll No: 23548

Seat No: 8238


Sign of Internal Practical Incharge


Dr. Rajesh Kashyap
HOD-MCA


Sign of External Examiner


Dr. B.H. Nanwani

Date:



Director

DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
1, KOREGAON ROAD, PUNE-411 001

Name : Ankita Karne

Roll NO : 23548

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
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
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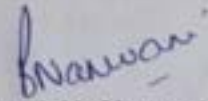
Roll No: 23548

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Date:

Director

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6, KOREGAON ROAD, PUNE-411 001



Name: Ankita karne

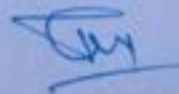
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Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
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A
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Ms. Pratiksha Gavaram Narawade

SUBMITTED TO
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Through,



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2023-24

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Roll No: 23549

Seat No: 8249

G.B.

Sign of Internal Practical Incharge

[Signature]

Dr. Rajesh Kashyap

HOD-MCA

[Signature]

Sign of External Examiner

[Signature]

Dr. B.H. Nanwani

Director

DR. B. H. NANWANI
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SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR OMS
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Place: Pune



Name - Pratiksha Govaram Norawade
Roll No - 23549

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
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IT11 Java Programming - Practical
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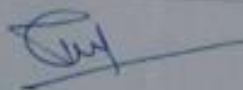
Name - Protiksha Narowade
Roll No - 23549

Sadhu Vaswani Institute of Management Studies for Girls

ACADEMIC YEAR 2023-24
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A
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SUBMITTED BY

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SUBMITTED TO

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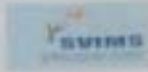
Prof Girish Bal & Prof Omkar Barve

Through,



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RollNo:23550

Seat No:8261

GB
Sign Of Internal Practical Incharge

Prof Girish Bal & Prof Omkar Barve

Guide

[Signature]
25/11/23
Sign of External Examiner



[Signature]
Dr. Rafesh Kashyap
HOD MCA

[Signature]
Dr. B. H. Nanwani

Director
DR. B. H. NANWANI
DIRECTOR
SAVITRIBAI PHULE INSTITUTE OF MANAGEMENT STUDIES FOR DRLS
K. J. SOMAIYA ROAD, PUNE - 411 007

Sadhvi Vaswani Institute of Management Studies for Girls
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 III Java Programming - Practical

CLASS - WCR 2

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| 37 | Write a java program to find last occurrence of a character in a given string. | 04-Oct-23 | |
| 38 | Test any five of standard exception and User Defined Custom Exceptions in java. | 11-Oct-23 | GB |
| 39 | Design java application using Collection in java such as Array List, Link List. | 11-Oct-23 | GB |
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| 45 | Threads creation and design applications by using Extending the Thread class/ implementing the Runnable Interface. Application of multithreading in java. | 08-Nov-23 | GB |

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ACADEMIC YEAR 2023-24
 8th SEMESTER
 DS-111 - Data Structure and Algorithm Practical
 Lab Assignments

INDEX

| Sr | Practical | Due Date | Sign with date |
|----|---|------------|----------------|
| 1 | Implementing Binary Search Tree | 11/09/2023 | } |
| 2 | DS of a Graph (Adjacency List, Adjacency Matrix, DFS, BFS) | 11/09/2023 | |
| 3 | Graphs using adjacency list | 11/09/2023 | |
| 4 | Graphs using Adjacency Matrix | 11/09/2023 | |
| 5 | Implementing Graph using Adjacency List | 28/09/2023 | |
| 6 | Implementation of Linked Queue, Circular Queue | 20/09/2023 | } |
| 7 | Priority Queue | | |
| 8 | Graphs using adjacency matrix | 27/09/2023 | |
| 9 | Graphs based on Binary search tree implementation with its operations | 07/10/2023 | |
| 10 | Graph implementation and graph traversals | 12/10/2023 | |
| 11 | Implementation of Hashing | 14/10/2023 | } |
| 12 | Practical based on Binary Tree Traversal | 19/10/2023 | |
| 13 | Practical based on Graphs: Algorithms Prim's, Kruskal's algorithm | 21/10/2023 | |
| 14 | Practical based on Dynamic and Greedy Technique | 26/10/2023 | } |
| 15 | Priority Queue, Tower of Hanoi | | |
| 16 | Implementation of Dynamic Programming: LXX | 28/10/2023 | |
| 17 | Regular Expression Matching | | } |
| 18 | Practical based on backtracking: N-Queen's problem | 02/11/2023 | |

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A
PRACTICAL ON
(IT11L)
Java Programming
&
Data Structure and Algorithms

SUBMITTED BY

Ms. Saifa Samir Kazi

SUBMITTED TO

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

IN PARTIAL FULFILLMENT OF DEGREE

MASTER OF COMPUTER APPLICATION (SEM-I)

UNDER THE GUIDANCE OF

Prof. Girish Bal & Prof. Omkar Barve

Through,



**Sadhu Vaswani Institute of Management Studies for Girls,
Koregaon Park, Pune-411001**

2023-24

Certificate

This is to certify that Ms. SAIFA SAMIR KAZI student of Master of Computer Application SEM I has satisfactorily completed all the practical in the subject: IT111- Java Programming & Data Structures & Algorithms for the purpose of Practical Examination-December 2023 as prescribed by Savitribai Phule Pune University, Pune for the Master of Computer Application Programme, during the Academic Year 2023-24.

Roll No: 23551

Seat No: 8239

G. B. D.

Sign of Internal Practical Incharge

Rajesh Kashyap

Dr. Rajesh Kashyap
HOD-MCA

Sign of External Examiner

Date:

Place: Pune



B. H. Nanwani

Dr. B.H. Nanwani
Director

DR. B. H. NANWANI
DIRECTOR

SADHU VASWANI INSTITUTE OF MANAGEMENT STUDIES FOR GIRLS
6 KOREGAON ROAD, PUNE-411 001

Saifa kazi
23551

Sadhu Vaswani Institute of Management Studies for Girls
ACADEMIC YEAR 2023-24
MCA I – SEMESTER I
IT11 Java Programming - Practical
INDEX

| S# | Practical List | Due Date | Sign/Remarks |
|-----|---|-----------|--------------|
| 1. | Fibonacci Series in java | 20-Sep-23 | G.Bel |
| 2. | Prime Number program in java | 20-Sep-23 | |
| 3. | Palindrome Program in java | 20-Sep-23 | |
| 4. | Factorial Program in java | 20-Sep-23 | |
| 5. | Armstrong number in java | 20-Sep-23 | |
| 6. | Generate Random Number in java | 20-Sep-23 | |
| 7. | Print Pattern (Right Triangle Star pattern, Left Triangle star pattern, pyramid star pattern, Diamond Star pattern) | 20-Sep-23 | |
| 8. | Compare Two object in java | 23-Sep-23 | G.Bel |
| 9. | How to create Object in java | 23-Sep-23 | |
| 10. | How to print ASCII value in java | 23-Sep-23 | |
| 11. | Reverse a number in java | 23-Sep-23 | |
| 12. | Java Program to find smallest element in array | 26-Sep-23 | G.Bel |
| 13. | Java Program to copy all element of one array into another array | 26-Sep-23 | |
| 14. | Java Program to find the frequency of each element in the array | 26-Sep-23 | |
| 15. | Java Program to print the element of an array in reverse order | 26-Sep-23 | |
| 16. | Java Program to print the sum of all items of array | 26-Sep-23 | |
| 17. | Java Program to sort all element of array in ascending order | 29-Sep-23 | |
| 18. | Java Program to sort all element of array in descending order | 29-Sep-23 | G.Bel |
| 19. | Java Program to find 3 rd largest element | 29-Sep-23 | |
| 20. | Java Program to find 3 rd largest element | 29-Sep-23 | |
| 21. | Java Program to find largest element | 29-Sep-23 | |

| | | | |
|----|--|-----------|------|
| 22 | Java program to merge array | 29-Sep-23 | GBal |
| 23 | Write a java program to find length of a string. | 04-Oct-23 | } |
| 24 | Write a java program to copy one string to another string. | 04-Oct-23 | |
| 25 | Write a java program to concatenate two strings. | 04-Oct-23 | |
| 26 | Write a java program to compare two strings. | 04-Oct-23 | |
| 27 | Write a java program to convert lowercase string to uppercase. | 04-Oct-23 | |
| 28 | Write a java program to convert uppercase string to lowercase. | 04-Oct-23 | |
| 29 | Write a java program to toggle case of each character of a string. | 04-Oct-23 | |
| 30 | Write a java program to find total number of alphabets, digits or special character in a string. | 04-Oct-23 | |
| 31 | Write a java program to count total number of vowels and consonants in a string. | 04-Oct-23 | |
| 32 | Write a java program to count total number of words in a string. | 04-Oct-23 | |
| 33 | Write a java program to find reverse of a string. | 04-Oct-23 | } |
| 34 | Write a java program to check whether a string is palindrome or not. | 04-Oct-23 | |
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