LOGICAL PROGRAMMING

Low level programming language:

a language which can be understandable by only machines is low level language.

High level Programming language:

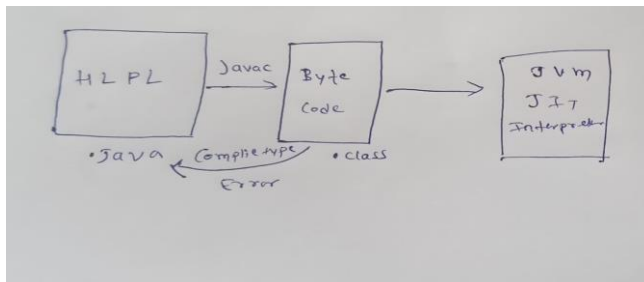A language which is written in simple English is understandable by the humans.

E.g.: java, python, c, c++, …

Compiler:

This is used to executes the whole program if it finds any error it returns back the error otherwise it gives the output.
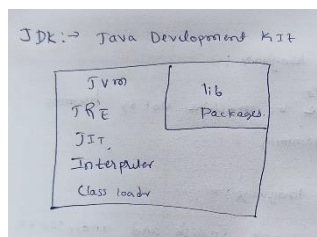
Interpreter:

It will run the program by line-by-line execution till it finds the error.

JDK:

- Jdk contains JVM, JRE, JIT, Interpreter, Class loader, Library, Package.

Keyword:

*Word which is given by programming language which has some meaning or value is called Keywords.

E.g., int, double, float, ….

*In JAVA keywords are lower case.

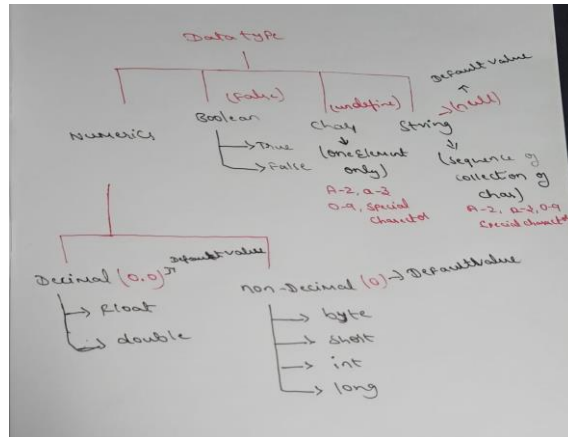**Identifiers:**

*A references given to access some value.

E.g., function name, variable name, class name, …

Variables:

*A memory space which is used to store value or information is called as variable.

Data types:

The kind of data which can be stored in the memory space, container is called as Data types.

Rules for naming the variables or user defined identifiers:

*It must not start with numeric.
*Keywords cannot be used.
*Only '_' & '$' are permitted as special characters.
*We can't use space.
*It's case sensitive.

E.g.,

1abc	X
ab c	X
abc123	√
ab_c	√
int	X
abs 126	X

Declaration of variables:

Syntax: Datatype variablename;

e.g., int a;

Variable Initialisation:

Variablename=value;

e.g., a=10;

Declaration and initialisation:

Datatype Variable name=value;

e.g., int a=10;

Print Statement in JAVA:

System.out.println(value/variable);

```
Public class demo{
        Double d=5;
        System.out.println(d);
        Char c=65;
        System.out.println(c);
        Int n='A';
        System.out.println(n);
}
```
o/p:

5
A
65

*[**note:** if the ACSII value is more than 255 it gives the '?'**].**

Operators:

* A symbol which is used to particular task is called as operator.

e.g., 10 + 20   => + is an operator and 10,20 is operands.

Concatenation:

* Concatenation joining of string with any values.
* The concatenation operator is + .
* + will act as concatenation operator if at least it's one operand is a string.

e.g.,

1.

```
1 package logicalprograms;
2
3 public class Concatination {
4⊙    public static void main(String[] args) {
5        String s1="hello";
6        String s2="  hi";
7        String s3=s1+s2;
8        System.out.println(s3);
9    }
10 }
11
```

o/p:

hello   hi

2.
```
public class Concatination {
    public static void main(String[] args) {
        String s1="hello ";
        int n=10;
        String s3=s1+n;
        System.out.println(s3);
        System.out.println(s1+n);
        System.out.println("hello "+10);
    }
}
```
o/p:

hello 10
hello 10
hello 10

3.

```java
public class Concatination {
    public static void main(String[] args) {
        System.out.println("hello "+10+20);
        System.out.println(10+20+" hello");
        System.out.println("hello "+(10+20));
    }
}
```

o/p:
 hello 1020
 30 hello
 hello 30

types of operators in java:

*Arithmetic operator
*Assignment operator
*Relational operator [or] comparison operator.
* Logical operator
*Unary operator
*Bitwise operator {shift operators included also}
*Ternary operator

i) Arithmetic operator:

+ -> addition
- ->subtraction
* -> multiplication
/ -> division
% ->modulo (remainder)

e.g.,

```java
public class Concatination {
    public static void main(String[] args) {
        int a=10,b=2;
        System.out.println("add "+(a+b));
        System.out.println("sub "+(a-b));
        System.out.println("mul "+(a*b));
        System.out.println("div "+(a/b));
        System.out.println("mod "+(a%b));
    }
}
```

o/p:

add 12
sub 8
mul 20
div 5
mod 0

- If any thing values with decimal it also a decimal.

e.g.,

```java
public class Concatination {
    public static void main(String[] args) {
        System.out.println(5.5+2.5);
        System.out.println(5+3);
        System.out.println(3.0+5);
    }
}
```

o/p:

8.0
8
8.0

- Character with any arithmetic operator with any numeric values it act as arithmetic operator. Else it act as a concatenation.

e.g.,

```java
public class Concatination {
    public static void main(String[] args) {
        System.out.println('A'+'B');
        System.out.println('A'+5);
        System.out.println("hello "+ 'A');
        System.out.println('1'+5);
    }
}
```

o/p:

131
70
Hello A
54

Run time error:

```java
public class Concatination {
    public static void main(String[] args) {
        System.out.println(0/2);
        System.out.println(0%2);
        System.out.println(2%0);/* Exception in thread "main" java.lang.ArithmeticException: / by zero
            at Logiacl_Programming/logicalprograms.Concatination.main(Concatination.java:7)*/
        System.out.println(2/0);/*  Exception in thread "main" java.lang.ArithmeticException: / by zero
            at Logiacl_Programming/logicalprograms.Concatination.main(Concatination.java:7)  */
    }
}
```

o/p:

0
0

Exception in thread "main" java.lang.ArithmeticException: / by
zero at
Logiacl_Programming/logicalprograms.Concatination.main(Concatinati
on.java:7)

ii) Assignment operators:

- Types of assignment operators =, +=, -=, *= , /= , %=.
- For we have to use the operator we have initialize the value first itself if it's a local variable.

e.g.,

```java
public class Concatination {
    public static void main(String[] args) {
        int a=10;
        a+=20;
        System.out.println(a);
        a-=5;
        System.out.println(a);
        a/=5;
        System.out.println(a);
        a%=2;
        System.out.println(a);
    }
}
```

o/p:

30
25
5
1

- **Char value:**

```java
public class Concatination {
    public static void main(String[] args) {
        char c='A';
        c+=32;
        System.out.println(c);
        System.out.println("_____");
        char c1='D';
        c1+=32;
        System.out.println(c1);
        System.out.println("_____");
        char c2='d';
        c2-=32;
        System.out.println(c2);
    }
}
```
o/p:

a

_____
d

_____
D

iii) Comparison or Relational Operator:

- Relational operator is used to check relation between two operands is correct it will return **true**, otherwise it will return **false**.
- Types of relational operator **<, >, <=, >=, !=, == .**

e.g.,

i)

```java
public class ComparisionOperator {
    public static void main(String[] args) {
        int a=10,b=20,c=30,d=10;
        System.out.println(a>b);// 10>20 ->f
        System.out.println(c>b);// 30>20 ->t
        System.out.println(d<c);// 10<30 ->t
        System.out.println(a==d);// 10==10 ->t
        System.out.println(d!=c);// 10!=30 ->t
        System.out.println(d!=a);// 10!=10 ->f
        System.out.println(b<=c);// 20<=30 ->t
        System.out.println(a>=c);// 10>=30 ->f
        System.out.println(d<=a);// 10<=10 ->t
    }
}
```

o/p:

false
true
true
true
true
false
true
false
true

ii)

```java
public class ComparisionOperator {
    public static void main(String[] args) {
        int c='A';
        System.out.println(c=='A');// 65==65 ->t
        System.out.println(c<'a');// 65<97 ->t
        System.out.println(c>'a');// 65>97 ->f
        System.out.println(c<100);// 65<100 ->t
        System.out.println(c>50);// 65>50 ->t
    }
}
```

o/p:

true
true
false
true
true

iii)
```
public class ComparisionOperator {
    public static void main(String[] args) {
        int a=1;
        double b=1.0;
        System.out.println(a==b);// 1==1 ->t
    }
}
```

o/p:

true

iv) Logical Operators:

- Types of operators are &&(Logical AND), ||(Logical OR), !(Logical NOT).

i) Logical AND:
        * This operator will return Boolean true if all the condition in the given expression is correct, otherwise it will return false.

e.g.,

i)
```
public class ComparisionOperator {
    public static void main(String[] args) {
        System.out.println(true&&true&&true);
        System.out.println(true&&true&&false);
    }
}
```

o/p:

true
false

ii)
```
public class ComparisionOperator {
    public static void main(String[] args) {
        int a=10,b=20,c=30,d=10;
        System.out.println(a>=d&&d<b&&c>d&&a!=c);
    }
}
```

o/p:

true

iii)

```java
public class ComparisionOperator {
    public static void main(String[] args) {
        int a=10,b=20,c=30,d=10;
        System.out.println((d<=a&&d>=c)&&c<=b);// (true && false) && false -> f
        System.out.println((d-10>=a && a*3==c)&& c-20<=d);// (false && true) && true ->f
        System.out.println(c>=d && d/2<=c && c%2==d);// true && true && false ->f
        System.out.println(a*3==c && d/2==b/4 && c*2!=c);// true && true && true ->t
    }
}
```

o/p:

false
false
false
true

iv)

```java
public class ComparisionOperator {
    public static void main(String[] args) {
        char c='a';
        System.out.println(c>='A' && c<='Z');
        //System.out.println(c>=65 && c<=90);
        System.out.println(c>='a' && c<='z');
        //System.out.println(c>=97 && c<=122);
        System.out.println(c>='0' && c<='9');
        //System.out.println(c>=48 && c<=57);
    }
}
```

o/p:

false
true
false

Logical OR(||):

- This operator will return Boolean true if at least if one condition in the given expression is correct, otherwise it will return false.

e.g.,

i)
```java
public class ComparisionOperator {
    public static void main(String[] args) {
        System.out.println(true||true||true||true);
        System.out.println(false||true||false);
        System.out.println(false||false||false);
    }
}
```
o/p:
true
true
true

ii)

```
public class ComparisionOperator {
    public static void main(String[] args) {
        int a=10,b=20,c=30,d=10;
        System.out.println(a>=b||c<=d||c!=d);//10>=20 || 30<=10 || 30!=10 ->t
        System.out.println(a*30==c||b/2==d||(c*2)/2==c);//10*30==30||20/2==10||(30*2)/2==30 ->t
    }
}
```

o/p:

true

true

iii)

```
public class ComparisionOperator {
    public static void main(String[] args) {
        char c='A';
        System.out.println((c>='A' && c<='Z') || (c<='a' && c>='z'));
    }
}
```

o/p:

true

Logical NOT(!):

This operator is used to reverse the Boolean result.

! condition

! true = false

! false = true

e.g.,

```
public class LogicalNot {
    public static void main(String[] args) {
        System.out.println(!true);
        System.out.println(! false);
        System.out.println(!((10>=9&&2*3 != 6)||(40>=20)));
    }
}
```

o/p:

false

true

false

v) Unary Operator:

* Unary operator is used to increment value by 1 or decrement by 1.

* Types of unary Operator

i) Post increment   → var++

ii) pre increment   → var--

iii) Post decrement → ++var

iv) pre decrement   → --var

E.g.,

i)

```java
public class UnaryOperator {
    public static void main(String[] args) {
        int a=10;
        System.out.println(a++);// 10
        System.out.println(a);// 11
        System.out.println("===========");
        int b=1;
        System.out.println(b=b+1);// 2
        System.out.println(b);// 2
    }
}
```

o/p:

10

11

=======

2

2

ii)

```java
public class UnaryOperator {
    public static void main(String[] args) {
        int b=1;
        b++;
        System.out.println(b);// 2
        System.out.println("===========");
        double d=5.5;
        d++;
        System.out.println(d);
        System.out.println("===========");
        char c='A';
        c++;
        System.out.println(c);
    }
}
```

o/p:

2

=======

6.5

=======

B

iii)

```java
public class UnaryOperator {
    public static void main(String[] args) {
        int a=10;
        System.out.println(a--);
        System.out.println(a);
    }
}
```

o/p:

10

9

iv)

```java
public class UnaryOperator {
    public static void main(String[] args) {
        int a=10;
        System.out.println(++a);
        System.out.println(a);
        System.out.println("===========");
        int b=4;
        System.out.println(--b);
        System.out.println(b);
    }
}
```

o/p:
11
11
=========
3
3

v)

```java
public class UnaryOperator {
    public static void main(String[] args) {
        int a=1,b=2,c=3;
        int d= a++ + b++ - c-- + b++ - a-- + a++;
        /*
         a= 1 -> 2 -> -> 1 ->2
         b= 2 -> 3 -> 4
         c= 3 -> 2
         */
        System.out.println(a);
        System.out.println(b);
        System.out.println(c);
        System.out.println(d);
    }
}
```

o/p:
2
4
2
2

vi)

```java
public class UnaryOperator {
    public static void main(String[] args) {
        int a=1,b=2,c=3;
        int d= ++b + ++c - --a + ++a + ++c - ++b;
        /*
         a= 1 -> 0 -> 1
         b= 2 -> 3 -> 4
         c= 3 -> 4 -> 5
         */
        System.out.println(a);
        System.out.println(b);
        System.out.println(c);
        System.out.println(d);
    }
}
```

o/p:
1
4
5
9

vii)

```java
public class UnaryOperator {
    public static void main(String[] args) {
        int z=10,x=20,y=30,u=10;
        int v= z++ + ++x + --u + ++y + y++ - x + --z - --x;
        System.out.println(z);
        System.out.println(x);
        System.out.println(y);
        System.out.println(u);
        System.out.println(v);
        System.out.println("==================");

        char c1='A',c2='B',c3='C',c4='D';
        int ans=c1++ + ++c2 - --c3 + ++c2 - --c4;
        System.out.println(c1);
        System.out.println(c2);
        System.out.println(c3);
        System.out.println(c4);
        System.out.println(ans);

    }
}
```

o/p:
10
20
32
9
71
=============
B
D
B
C
67

Octa Decimal Numbers:

e.g.,
i) Octa Decimal:

```java
public class UnaryOperator {
    public static void main(String[] args) {
        int n=0100;
        System.out.println(n);


    }
}
```

o/p:
64

Binary Numbers:

```
2⁴    2³  2²  2¹  2⁰
      2
      8   4   2   1

1 →  0001
8 →  1000
12 → 1100
9 →  1001
15 → 1111
14 → 1110
6 →  0110
11 → 1011
```
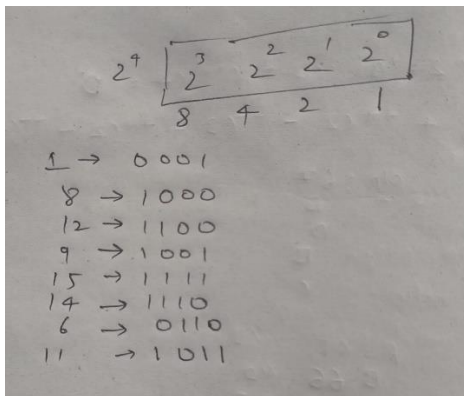
QUESTIONS:

1.Write a program to swap two numbers?
        Int a=10, b=20, temp;
        Sop(a+" "+b);
        temp=a;
        a=b;
        b=temp;
        Sop(a+" "+b);

2.Write a program to swap two numbers without using third variable?
   i)   Int a=10, b=20;
         Sop(a+" "+b);
         a= a+b;
         b= a-b;
         a= a-b;
         sop(a+" "+b);

   ii)   int a=10, b=20;
         sop(a+" "+b);
         a= a^b;
         b= a^b;
         a= a^b;
         sop(a+" "+b);

3. Write a program to find even and odd numbers?

   i)   n%2==0; even
         n%2==1; odd

   ii)   (n/2)*2==n; even
         (n/2)*2!=n; odd

   iii) n&1==0; even
         n&1==1; odd

   iv)   n|1==n+1; even
         n|1==n; odd

vi) Bitwise operator:

Bitwise And (&):
Bitwise operator usually follows the truth table.

X	Y	(&)
0	0	0
0	1	0
1	0	0
1	1	1

```
public class LogicalNot {
    public static void main(String[] args) {
        System.out.println(7&3);
        int n=7&3;
        System.out.println(n);
    }
}
```


o/p:
3
3
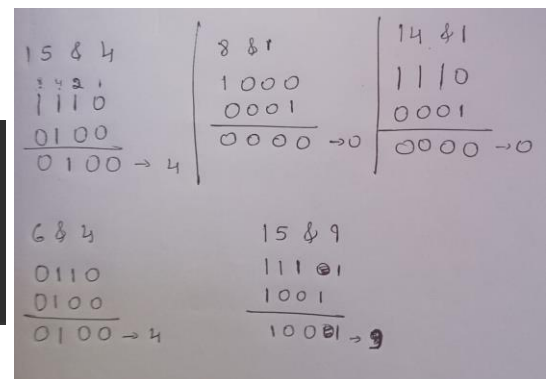
Bitwise OR (|):
Bitwise

X	Y	(|)
0	0	0
0	1	1
1	0	1
1	1	1

```
public class LogicalNot {
    public static void main(String[] args) {
        System.out.println(7|3);
        int n=7|3;
        System.out.println(n);
    }
}
```

o/p:
7
7

Bitwise XOR (^):

X	Y	(^)
0	0	0
0	1	1
1	0	1
1	1	0

```java
public class LogicalNot {
    public static void main(String[] args) {
        System.out.println(7^3);
        int n=7^3;
        System.out.println(n);
    }
}
```

o/p:
4
4

Right Shift (>>):
Number << No.of shift
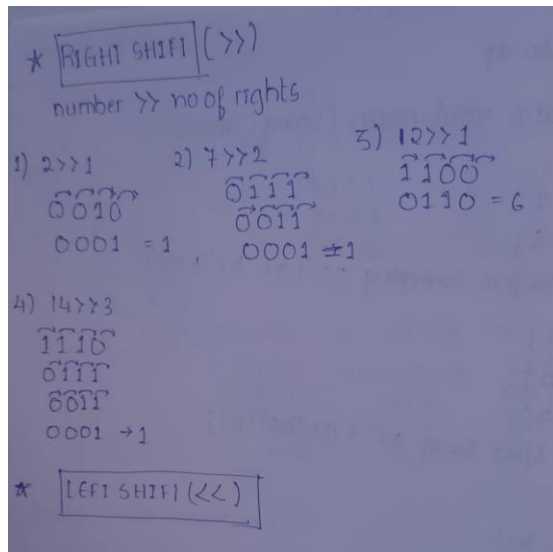
Division:
   n>>1 => n/2
   n>>2 => n/4
   n>>3 => n/8

Left Shift (<<):

Number << No.of shift

Left Shift (<<)

Number << no. of shifts

1) 8<<1
1000
10000 = 16

2) 7<<2
0111
01110
011100 → 28

3) 4<<3
0100
0100000
= 32

4) 9<<2
= 36

5) 5<<2
= 20

6) 11<<1
= 22
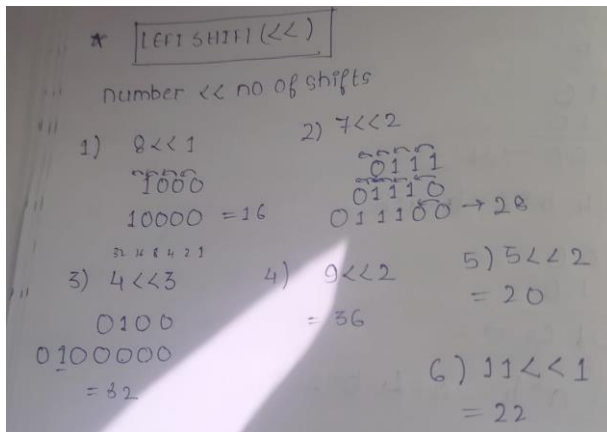
Multiplication:
    n<<1 => n*2
    n<<2 => n*4
    n<<3 => n*8
    n<<4 => n*32

E.g.,

```java
public class Shift {
    public static void main(String[] args) {
        int n=6;
        System.out.println(n*2);
        System.out.println(n<<1);
        System.out.println("============");
        System.out.println(n*4);
        System.out.println(n<<2);
        System.out.println("============");
        System.out.println(n/2);
        System.out.println(n>>1);
        System.out.println("============");
        System.out.println(19/4);
        System.out.println(19>>2);
    }
}
```

o/p:
12
12
=======
24
24
=======
3
3
=======
4
4

What is WORA?
- **WORA Abbreviation: Write once Run Any where**
- **By using dot class(.class) file we can run any where using .class file in the presence of JDK in different OS.**

<u>Scanner :</u>
- Scanner class which is used to take input from the user through the console.
- This Scanner class has been present in java.util package.
- Scanner class consist of NON0-staic predefined function which is used to take inputs

- Scanner is present in **util** package.
- Using import keyword, we can use util package.
- Scanner class have some NON-static methods.
- Create an Object of scanner class.

- Import java.util. Scanner;
- Create object of Scanner class.

    Scanner ip =new Scanner(Sytem.in);

    => System.in   is taking input from the people.

- Use predefined Non-Static methods in Scanner class to take input.
  Int n=ip.nextInt();

    next();   => String
    nextLine();   => String
    nextInt();   => Int
    nextDouble(); => Double

e.g.,
i)

```java
import java.util.Scanner;

public class ScannerClass {
    public static void main(String[] args) {
        System.out.println("enter the String :");
        Scanner a=new Scanner(System.in);
        String s=a.next();
        System.out.println("enter the String :");
        Scanner b=new Scanner(System.in);
        String s1=b.nextLine();
        System.out.println("=============");
        System.out.println(s);
        System.out.println(s1);


        Scanner ip=new Scanner(System.in);
        System.out.println("Enter the 2 integer value :");
        int n1=ip.nextInt();
        int n2=ip.nextInt();
        System.out.println("sum :"+(n1+n2));

        a.close();
        b.close();
        ip.close();

    }
}
```

o/p:
enter the string :
hello
enter the string :
sir, you are select for the company
=====================
Hello
Sir, you are select for the company
Enter the 2 integer value :
20
34
Sum :54

Flow Diagram:

- The factorial representation of flow of program is called as Flow diagram.

 → **Start/ End**

 → **Implementation**

 → **Condition**

 → **Initialize / Input**
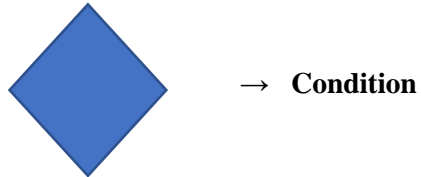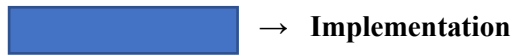
Conditional Statement / Balancing Statement:

Conditional Statement is used to executes the implementation based on condition Provided / given.

1. If(Simple if)
2. if else
3. If else if
4. Switch
5. Nested if

1. If(Simple if):
- **If is** of type of the conditional statement in java which with executes its instruction if the given condition is true.
- **If** is the independent conditional statement.

Syntax:

```
if(condition){
------------      implementation
------------
}
```

Flowchart:
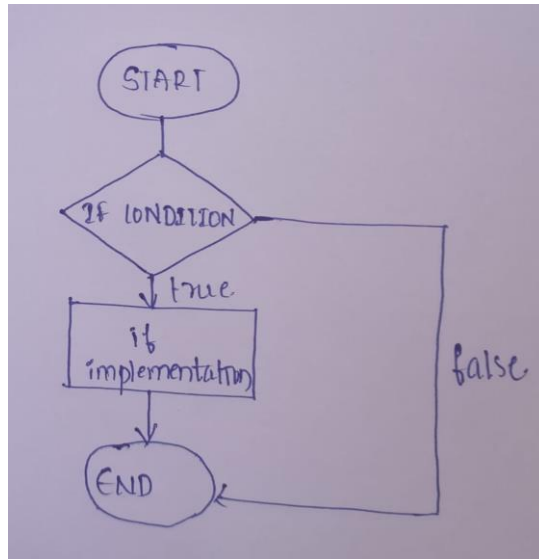
Program:
i)

```java
public class Demo {

    public static void main(String[] args) {
        System.out.println("start");
        int n=10;
        if(n==10) {
            System.out.println("number equal to 10");
        }
        System.out.println("end");

    }

}
```

o/p:
start
number equal to 10
end

ii)

```java
public class Demo {

    public static void main(String[] args) {
        System.out.println("start");
        int n=10;
        if(true) {
            System.out.println("is 1 impl");
        }
        if(false) {
            System.out.println("is 2 impl");
        }
        if(true) {
            System.out.println("is 3 impl");
        }
        System.out.println("end");

    }

}
```

o/p:
start
is 1 impl
is 3 impl
end

2. If else:

- Else Is a conditional statement which does not contain any condition but it depends on other conditional statement for its other execution.
- For single if we can have only one else.

Syntax:

If(condition){
    ----------   **if implementation**
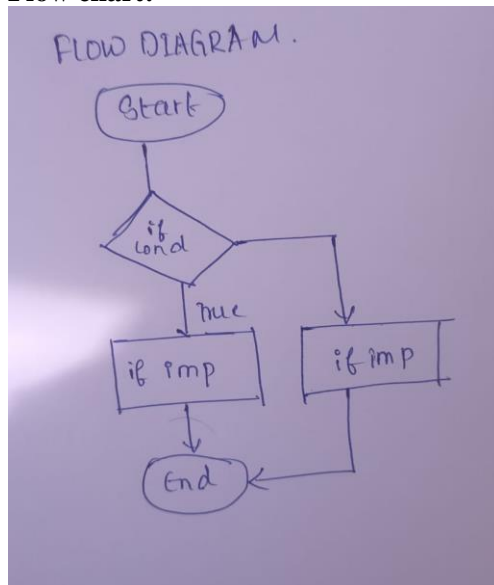
}
else{
------------   **else implementation**

}

Flow chart:

FLOW DIAGRAM.

Start

if cond

true

if imp

if imp

End

Program:

```java
public class Demo {

    public static void main(String[] args) {
        System.out.println("start");
        int n=10;
        if(false) {
            System.out.println("if impl");
        }
        else {
            System.out.println("else impl");
        }
        System.out.println("end");

    }

}
```

o/p:
start
else impl
end

q1. Write a java program to check the number is grater than and lesser than 100.

```java
import java.util.Scanner;
public class Demo {

    public static void main(String[] args) {
        System.out.println("start");
        Scanner a=new Scanner(System.in);
        System.out.println("enter the number :");
        int n=a.nextInt();
        if(n<=100) {
            System.out.println("number is less than 100");
        }
        else {
            System.out.println("number is grater than 100");
        }
        System.out.println("end");

    }

}
```

o/p:

start
enter the number :
23
Number is less than 100
End

Q2. Write a program to check the number is even or odd.

```java
import java.util.Scanner;
public class Demo {

    public static void main(String[] args) {
        System.out.println("start");
        Scanner a=new Scanner(System.in);
        System.out.println("enter the number :");
        int n=a.nextInt();
        if(n%2==0) {
            System.out.println("number is even");
        }
        else {
            System.out.println("number is odd");
        }
        System.out.println("end");

    }

}
```

o/p:

start
enter the number :
2
Number is even
End

Q3. Write a program to check greatest of two numbers.

```java
import java.util.Scanner;
public class Demo {

    public static void main(String[] args) {
        System.out.println("start");
        Scanner a=new Scanner(System.in);
        System.out.println("enter the number :");
        int n=a.nextInt();
        int n1=a.nextInt();
        if(n>n1) {
            System.out.println("first number is greatest" +n);
        }
        else {
            System.out.println("second number is greatest" +n1);
        }
        System.out.println("end");

    }

}
```

o/p:

start
enter the number :
75
5
First number is greatest 75
End

Q4. Write a program to check both numbers or equal or not without using "=" operator.

```java
import java.util.Scanner;
public class Demo {

    public static void main(String[] args) {
        System.out.println("start");
        Scanner a=new Scanner(System.in);
        System.out.println("enter the number :");
        int n=a.nextInt();
        int n1=a.nextInt();
        if(n<n1 || n>n1) {
            System.out.println("numbers is not equal");
        }
        else {
            System.out.println("numbers is equal");
        }
        System.out.println("end");

    }

}
```

o/p:

start
enter the number :
3
4
Number is not equal
End

Q5. Write a program to check given character is Alpha or not.

```java
public class Demo {
    public static void main(String[] args) {
        char c='A';
        if((c>='A'&&c<='Z')||(c>='a'&&c<='z')) {
            System.out.println("Alpha");
        }
        else {
            System.out.println("Not Alpha");
        }
    }
}
```

o/p:
Alpha

Q6. Write a program to check given character is Numeric or not.

```java
public class Demo {
    public static void main(String[] args) {
        char c='1';
        if(c>='0'&&c<='9') {
            System.out.println("Numeric");
        }
        else {
            System.out.println("Not Numeric");
        }
    }
}
```

o/p:
Numeric

Q6. Write a program to check given character is special character or not.

```java
public class Demo {
    public static void main(String[] args) {
        char c='1';
        if((c>='A'&&c<='Z')||(c>='a'&&c<='z')||(c>='0'&&c<='9')) {
            System.out.println("Not Special Character");
        }
        else {
            System.out.println("Special character");
        }
    }
}
```

o/p:
Not a special character

IF ELSE IF(LADDER):

- The statement contains multiple condition and each condition has its own implementation, we choose **if else if.**

Syntax:

```
If(condition){
-----------
-----------                    if implementation
}
else if(condition){
-----------
-----------                    else if implementation
}
else if(condition){
-----------
-----------                    else if implementation
}
else{
-----------
-----------                    else implementation
}
```

Flow chart:
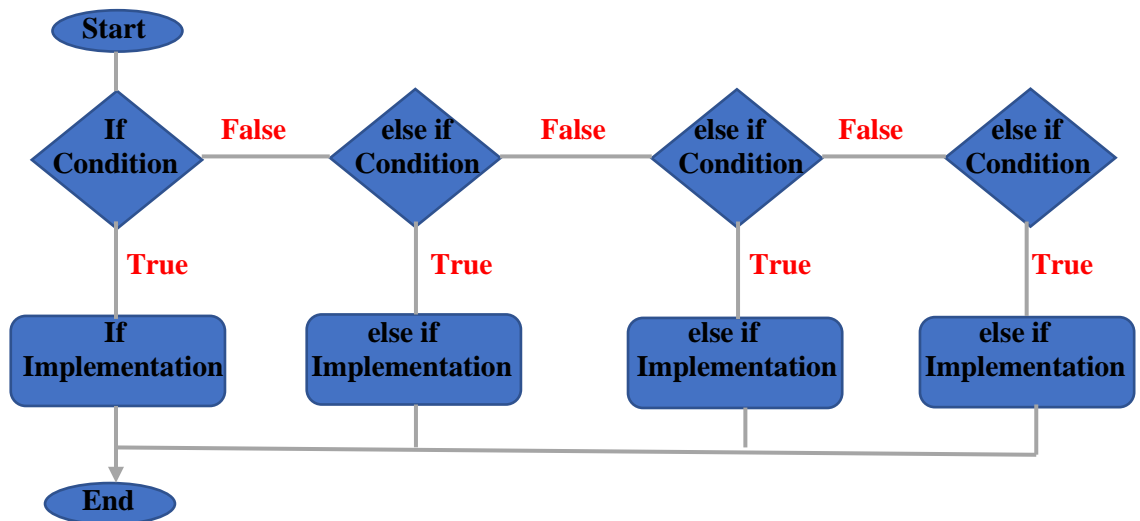
Q1. Write a program to check the student's grade.
   Above 90 -> 'A'
   Above 75 -> 'B'
   Above 65 -> 'C'
   Above 50 -> 'D'
   Above 35 -> 'E'
   Below 35 -> 'F'

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        Scanner s=new Scanner(System.in);
        int mark=s.nextInt();
        if (mark<=100&& mark>=0) {
            if(mark>=90) {
                System.out.println("A grade");
            }
            else if(mark>=75) {
                System.out.println("B Grade");
            }
            else if(mark>=65) {
                System.out.println("C Grade");
            }
            else if(mark>=50) {
                System.out.println("D grade");
            }
            else if(mark>=35) {
                System.out.println("E Grade");
            }
            else {
                System.out.println("FAIL");
            }
        }
        else {
            System.out.println("Enter the valid Marks");
        }
        s.close();
    }
}
```

o/p:
100
A Grade

Q2. Write a program to age<= 5 drinking milk, age<=10 drinking boost, age<=15 drinking fruit juice, age <=20 drinking cool drinks, age <= 30 drinking OMR, age <=45 drinking JD, age>=45 ORS

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        Scanner s=new Scanner(System.in);
        int age=s.nextInt();
        if ( age>=0) {
            if(age<=5) {
                System.out.println("Drinking Milk");
            }
            else if(age<=10) {
                System.out.println("Drinking Boost");
            }
            else if(age<=15) {
                System.out.println("Fruit Juice");
            }
            else if(age<=20) {
                System.out.println("Cool Drinks");
            }
            else if(age<=30) {
                System.out.println("OMR");
            }
            else if(age<=45) {
                System.out.println("JD");
            }
            else {
                System.out.println("ORS");
            }
        }
        else {
            System.out.println("Enter the valid age");
        }
        s.close();
    }
}
```

o/p:

43
JD

Q3. Write a program to check numeric, aliphatic ,special characters.

```java
public class Demo {
    public static void main(String[] args) {
        char c='a';
            if((c>='A'&&c<='Z')||(c>='a'&&c<='z')) {
                System.out.println("Alphateic");
            }
            else if(c>='0'&&c<='9') {
                System.out.println("Numeric");
            }
            else {
                System.out.println("Special character");
            }

    }
}
```

o/p:
Alphabetic

Q4. Write a program to check which is the greatest number among three numbers.

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        System.out.println("Enter the three numbers: ");
        Scanner s=new Scanner(System.in);
        int a=s.nextInt();
        int b=s.nextInt();
        int c=s.nextInt();
        if(a>=b&&a>=c) {
            System.out.println(a+"a is greater");
        }
        else if(b>=a&&b>c) {
            System.out.println(b+"b is greater");
        }
        else {
            System.out.println(c+"c is greater");
        }

    }
}
```

o/p:

Enter the three numbers:
34
45
56
56 c is a greatest

Q5. Write a program to check the calculator

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        System.out.println("=======Welcome Simple Calculator========");
        System.out.println("please Enter the numbers: ");
        Scanner s=new Scanner(System.in);
        int a=s.nextInt();
        int b=s.nextInt();
        System.out.println("=======mennu========");
        System.out.println("1.add\n2.sub\n3.mul\n4.div\n5.mod\n6.exit");
        System.out.println("=======Enter the option========");
        Scanner t=new Scanner(System.in);
        int z=t.nextInt();
        System.out.println("======Result========");
        if(z==1) {
            System.out.println("add :"+(a+b));
        }
        else if(z==2) {
            System.out.println("sub :"+(a-b));
        }
        else if(z==3) {
            System.out.println("mul :"+(a*b));
        }
        else if(z==4) {
            System.out.println("div :"+(a/b));
        }
        else if(z==5) {
            System.out.println("mod :"+(a%b));
        }
        else if(z==6) {
            System.out.println("---Exit---");
        }
        System.out.println("\n======Thank you Visit again======");


    }
}
```

o/p:

=======Welcome simple calculator========
Please enter the numbers:
23
32
=========menu==========
1.add
2.sub
3.mul
4.div
5.mod
6.exit
=========Enter the option=========
1
=========Result=========
Add :55

=======Thank you Visit again=======

Q6. Write a program to check whether the character is vowel or not.

```java
public class Demo {
    public static void main(String[] args) {
        char a='a';
        if(a=='A'||a=='E'||a=='I'||a=='O'||a=='U'||a=='a'||a=='e'||a=='i'||a=='o'||a=='u') {
            System.out.println(a+" it is a Vowel");
        }
        else {
            System.out.println(a+" it is not a Vowel");
        }

    }
}
```

o/p:

a it is a vowel

Q7. Write a program to convert character into lower case into upper case [or] upper case into lower case.

```java
public class Demo {
    public static void main(String[] args) {
        char c='2';
        if(c>='A' && c<='Z') {
            c+=32;
            System.out.println(c);
        }
        else if(c>='a' && c<='z') {
            c-=32;
            System.out.println(c);
        }
        else {
            System.out.println(c);
            System.out.println("please enter the alphapet");
        }
    }
}
```

o/p:
2
Please Enter the alphabet

Q8. Write a program to add two numeric character.

```java
public class Demo {
    public static void main(String[] args) {
        char c1='1',c2='8';
        System.out.println((c1-48)+(c2-48));
    }
}
```

o/p:
9

Nested if:

Syntax:
```
If(condition){
        If(condition){
        ---------          implementation
        ---------
        }
        else{
        ------             implementation
        ------
        }
}
else if(condition){
        if(condition){
        ---------          implementation
        ---------
        }
        else{
        ------             implementation
        ------
        }
}
else {
        if(condition){
        ---------          implementation
        ---------
        }
        else{
        ------             implementation
        ------
        }
}
```

Q1. Write a program to check the number is positive or negative or neutral, if positive check even or odd.

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int a=s.nextInt();
        if(a>0) {
            System.out.println(a+" is Positive Number");
            if(a%2==0) {
                System.out.println(a+" is even number");
            }
            else {
                System.out.println(a+" is odd number");
            }
        }
        else if(a<0) {
            System.out.println(a+" is Negative Number");
        }
        else {
            System.out.println(a+" is Netural Number");
        }
    }
}
```

o/p:
Enter the number:
4
4 is a Positive Number
4 is a even number

Q2. Write a program to check age->a and gender->g ,gender =male, female, trans, if age of male >=(21) {rip} else{happy life}. If female is age>=18 {happy life} else {freedom for boys}

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        System.out.println("Enter the age:");
        Scanner s=new Scanner(System.in);
        int age=s.nextInt();
        System.out.println("Enter the Gender :");
        Scanner t=new Scanner(System.in);
        String gender=t.next();
        if(gender=="male") {
            if(age>=21) {
                System.out.println("RIP");
            }
            else {
                System.out.println("Happy Life");
            }
        }
        else if(gender=="female") {
            if(age>=18) {
                System.out.println("Happy Life");
            }
            else {
                System.out.println("Freedom for Boys");
            }
        }
        else {
            System.out.println("Invalid");
        }
    }
}
```

o/p:
Enter the age :
23
Enter the Gender :
Male
RIP

Q3. Write a java program greatest among 3 numbers using nested if without relational operator.

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        System.out.println("Enter the three numbers");
        Scanner s=new Scanner(System.in);
        int a=s.nextInt();
        int b=s.nextInt();
        int c=s.nextInt();
        if(a>=b) {
            if(a>=c) {
                System.out.println(a+" a is greatest");
            }
            else {
                System.out.println(c+" c is greatest");
            }
        }
        else if(b>=a) {
            if(b>=c) {
                System.out.println(b+ "b is greatest");

            }
            else {
                System.out.println(c+"c is greatest");
            }
        }

    }

}
```

o/p:

Enter the three numbers
34
34
45
45 c is greatest

Q4. Write a java program, to check leap year.

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        Scanner s=new Scanner(System.in);
        int year=s.nextInt();
        if(year%400==0) {
            System.out.println(year +" is a leap year");
        }
        else if(year%4==0) {
            System.out.println(year+ " is a leap year");
        }
        else if(year%100==0) {
            System.out.println(year+" is not a leap year");
        }
        else {
            System.out.println(year+"is not a leap year");
        }
    }
}
```

o/p:
2004
2004 is a leap year

Ternary Operator(?):

- Ternary operator which the operator consists of three operands is called as ternary operator.
- Ternary operator is used to replace of **if else statement.**
  Syntax:
  i)   Operand_1? operand_2: operand_3;
  ii)   Condition? instruction_1: instruction_2;

  Working of ternary of operator:

  True

  Condition ? instruction_1 : instruction_2;
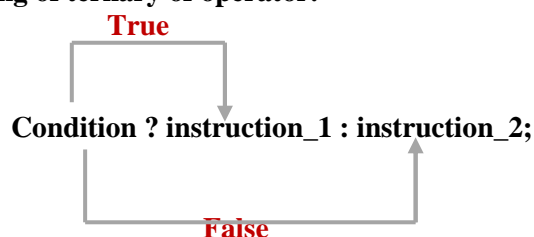
  False

Rules:

      i)   **Instruction_1 and instruction_2 must be same data type.**

e.g.,

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        System.out.println(true?"inst1":"instr2");
        String s=false?"instr1":"instr2";
        System.out.println(s);
        System.out.println("Enter the two numbers");
        Scanner q=new Scanner(System.in);
        int a=q.nextInt();
        int b=q.nextInt();
        System.out.println(a>b?a:b+" is greatest");
        q.close();

    }
}
```

o/p:
inst1
instr2
enter the two numbers
2
4
4 is greatest

Q1. Write a java program to check whether the number is even or odd using ternary statement.

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        Scanner q=new Scanner(System.in);
        int a=q.nextInt();
        System.out.println(a%2==0?"even":"odd");
        q.close();

    }
}
```

o/p:
3
Odd

Q2. Write a java program to check a>b? a>c ? a : c : b>c? b:c;.

        a=8
        b=7
        c=20

                instruction1   instruction2
        a>b? a>c ? a : c : b>c? b:c

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        System.out.println("Enter the three numbers ");
        Scanner q=new Scanner(System.in);
        int a=q.nextInt();
        int b=q.nextInt();
        int c=q.nextInt();
        System.out.println(a>b?a>c?a:c:b>c?b:c);
        q.close();

    }
}
```

o/p:
Enter the three numbers
2
34
33
34

Q5. Keshav sir wants to find a student who is good in java and programming, so he decides to get mock details of the student, if the mock details of the student pass for the both the subject he is the awesome student, if the student in passed in only in one subject he is average of awesome student, if student is failed in both subject he is bad student, your task is to help Keshav sir in the process [note: the mock rating in the terms of Boolean values.

i)

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        System.out.println("Enter the java result");
        Scanner q=new Scanner(System.in);
        Boolean a=q.nextBoolean();
        Boolean b=q.nextBoolean();
        if(a&b) {
            System.out.println("Awesome student");
        }
        else if(a||b) {
            System.out.println("Average awesome student");
        }
        else {
            System.out.println("Bad awesome student");
        }
        q.close();
    }
}
```

o/p:
Enter the result
true
true
Awesome student

ii)

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        System.out.println("Enter the java result");
        Scanner q=new Scanner(System.in);
        Boolean a=q.hasNext();
        System.out.println("Enter the SQL result");
        Scanner r=new Scanner(System.in);
        Boolean b=r.hasNext();
        if(a&b) {
            System.out.println("Awesome student");
        }
        else if(a||b) {
            System.out.println("Average awesome student");
        }
        else {
            System.out.println("Bad awesome student");
        }
        q.close();
        r.close();
    }
}
```

o/p:
Enter the java result
true
Enter the SQL result
true
Awesome student

Q6. StringNumberChar:

Manoj sir wants to print ascii code and character of the number given. Your task is to help Manoj sir.

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        System.out.println("Enter the number");
        Scanner q=new Scanner(System.in);
        int a=q.nextInt();
        int b=q.nextInt();
        int c=q.nextInt();
        char x=(char)a;
        char y=(char)b;
        char z=(char)c;
        System.out.println(""+a+x+b+y+c+z);
        q.close();
    }
}
```

o/p:
Enter the number
49
68
67
49168D67C

Switch Statement :

- It is a conditional statement which is used for character comparison.
- We can use the default anywhere.

Syntax:

```
switch(choice / expression / value){
case op1: implementation
        break;
case op2: implementation
        break;
case op3 : implementation
        break;
default : implementation
        break;
}
```

E.g.,

```
public class SwitchDemo{
        public static void main(String[] args){
                switch('k'){
                case 'a': System.out.println("apple");
                        break;
                case 'b': System.out.println("apple");
                        break;
                case 'c': System.out.println("apple");
                        break;
                case 'd': System.out.println("apple");
                        break;
                default : System.out.println("Invalid");
                        break;
                }
        o/p:
        Invalid
```

Q1. Write a program to print whether the number is even or odd.

```java
import java.util.Scanner;

public class Demo1 {
        public static void main(String[] args) {
                System.out.println("Enter the number :");
                Scanner s=new Scanner(System.in);
                int n=s.nextInt();
                switch(n%2) {
                case 0: System.out.println("this is even number");
                        break;
                default : System.out.println("this is odd number");
                        break;
                }
                s.close();
        }
}
```
o/p:
Enter the number:
3
This is odd number

Q2. Write a program for simple calculator.
```java
import java.util.Scanner;

public class Demo1 {
        public static double add(int a,int b) {
                return a+b;
        }
        public static double sub(int a,int b) {
                return a-b;
        }
        public static double mul(int a,int b) {
                return a*b;
        }
        public static double div(int a,int b) {
                return a/b;
        }
        public static double mod(int a,int b) {
                return a%b;
        }
        public static void main(String[] args) {

                Scanner s=new Scanner(System.in);

                System.out.println("======welcome to jsp calculator========");
                while(true) {

        System.out.println("====menu=====\n1.add\n2.sub\n3.mul\n4.div\n5.mod\n6.exit");
                        System.out.print("please enter the choice : ");
                        int choice=s.nextInt();
                        if(choice==6) {
```

```java
                    System.out.println("exit");

            System.out.println("\n=========Thank you Visit Again===========");
                    System.exit(0);
            }
            System.out.print("Enter the number-1 : ");
            int n=s.nextInt();
            System.out.print("Enter the number-2 : ");
            int m=s.nextInt();

            switch(choice) {
            case 1: System.out.println("add :"+(int)add(n,m));
                    break;
            case 2: System.out.println("sub :"+(int)sub(n,m));
                    break;
            case 3: System.out.println("add :"+(int)mul(n,m));
                    break;
            case 4: System.out.println("add :"+(int)div(n,m));
                    break;
            case 5: System.out.println("add :"+(int)mod(n,m));
                    break;
            default : System.out.println("invalid choice");
                    break;
            }
            s.close();
        }

    }
}
```

o/p:
======welcome to asp calculator=======
====menu=====
1.add
2.sub
3.mul
4.div
5.mod
6.exit

Please enter your choice : 2
Enter the number-1 : 23
Enter the number-2 : 12
Sub : 11

====menu=====
1.add
2.sub
3.mul
4.div
5.mod
6.exit
Please enter your choice : 6
Exit

=============Thank you Visit Again==========

Looping Statement:

- The statements which is used to perform the same task 'n' number of times.
- The types of Looping statements are
  - For loop
  - While loop
  - Do while loop
  - Nested for loop
  - For each (Advance for loop)

i)For loop:

- For loop used to repeat the same task for known number of times.
- For loop is used when we know exact starting point and ending point.
- If for we can have n number of iterative variable and we can use n number of updation.

  e.g.,
  ```
  for(int i=1, int j=10; i<=10 && j>=1 ; i++ ,j--){
          -----------
   }
  ```

Syntax:

```
for(  initialize of iterative variable  ;  Condition ;  update  ){
------------------
------------------         implementation
------------------
}
```

Working of For loop:
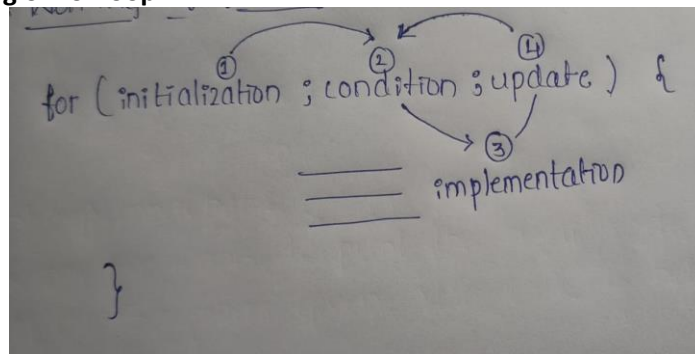
Program:
Q1. Write a program print 5 times "MSD".

```java
public class Demo1 {

    public static void main(String[] args) {
        for(int i=1;i<=5;i++) {
            System.out.println("MSD");
        }
    }
}
```

o/p:
MSD
MSD
MSD
MSD
MSD

Iteration:

i=1 , MSD
i=2 , MSD
i=3 , MSD
i=4 , MSD
i=5 , MSD

Q2. Write the program to check 1 to 'n' numbers.

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        for(int i=1;i<=n;i++) {
            System.out.println(i);
        }
        s.close();
    }
}
```

o/p:
Enter the number :
5
1
2
3
4
5

Iteration :

N=5
i=1
i=2
i=3
i=4
i=5

Syntax for infinite for loop:

```java
public class Demo1 {

    public static void main(String[] args) {
        for(;;) {    // Standard infinite syntax
            System.out.println("i");
        }
    }
}
```

o/p:
i
i
.
.
.
{Infinite loop}

i)

```java
    public static void main(String[] args) {
        int i=0;
        for(i=1;i<=5;i++) {
        }
        System.out.println(i);
    }
}
```

o/p:
6

Iteration :

i=1
i=3
i=4
i=5
i=6

iii) Here we are using loop declaration. There is no implementation in loop.

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
        int i=0;
        for(i=1;i<=5;i++);
        {
            System.out.println(i);
        }

    }
}
```

o/p:
6

Iteration :

i=1, i=3, i=4, i=5, i=6
i=6

iv) Write a program to print alphabet.

```java
public class Demo1 {

    public static void main(String[] args) {

        for(char c='A';c<='Z';c++)
        {
            System.out.println(c);
        }

    }
}
```

o/p:
A
B
.
.
.
Z

v) Write a java program to print sum of 1 to n.

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        int sum=0;
        for(int i=1;i<=n;i++) {
            sum=sum+i;
        }
        System.out.println(sum);
        s.close();
    }
}
```

o/p:
Enter the number :
5
15

Iteration :

i=1 , sum=0+1
i=2 , sum=1+2
i=3 , sum=3+3
i=4 , sum=6+4
i=5 , sum=10+5
sum=15

Q1. Write a program to print the factorial of even numbers.

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        int fact=1;
        for(int i=1;i<=n;i++) {
            fact=fact*i;
        }
        System.out.println(fact);
        s.close();
    }
}
```

o/p:
Enter the number :
5
120

Iteration :

i=1 , fact=1*1
i=2 , fact=1*2
i=3 , fact=2*3
i=4 , fact=6*4
i=5 , fact=24*5
fact=120

Q2. Write a program to print factor of the given number.

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        System.out.println("\nThe factors are ");
        for(int i=1;i<=n;i++) {
            if(n%i==0) {
                System.out.println(i);
            }
        }
        s.close();
    }
}
```

o/p:
Enter the number :
8

The factors are
1
2
4
8

Iteration :
n=8

i=1 , 8%1==0
i=2 , 8%2==0
i=3 , 8%3 !=0
i=4 , 8%4==0
i=5 , 8%5 !=0
i=6 , 8%6 !=0
i=7 , 8%7 !=0
i=8 , 8%8==0

Q3. Write a program to count a factor of n.

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        int count=0;
        for(int i=1;i<=n;i++) {
            if(n%i==0) {
                count++;
            }
        }
        System.out.println("\nThe number of factors of "+n+" is "+count);
        s.close();
    }
}
```

o/p:
Enter the number :
8

The number of factors of 8 is 4

Iteration :
N=8,count=0

i=1 , 8%1==0 , count=1
i=2 , 8%2==0 , count=2
i=3 , 8%3 !=0 , count=2
i=4 , 8%4==0 , count=3
i=5 , 8%5 !=0 , count=3
i=6 , 8%6 !=0 , count=3
i=7 , 8%7 !=0 , count=3
i=8 , 8%8==0 , count=4

Q4. Write a program to print given number is prime or not.

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        int count=0;
        for(int i=2;i<n;i++) {
            if(n%i==0) {
                count++;
            }
        }
        if(count==0) {
            System.out.println(n+" is a prime number");
        }
        else {
            System.out.println(n+" is not a prime number");
        }
        s.close();
    }
}
```

o/p:
Enter the number :
2
2 is a prime number

Q5. Write aa program to print 1 to 50 prime number using nested for loop.

```java
import java.util.Scanner;

public class Demo1 {
    public static Boolean prime(int a) {
        int count =0;
        for(int i=1;i<=a;i++) {
            if(a%i==0) {
                count++;
            }
        }
        if(count==2) {
            return true;
        }
        else {
            return false;
        }
    }

    public static void main(String[] args) {

        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        for(int i=1;i<=n;i++) {
            boolean ans=prime(i);
            if(ans==true) {
                System.out.println(i);
            }
        }
        s.close();
    }
}
```

o/p:
Enter the number :
50
2
3
5
7
11
13
17
19
23
29
31
37
41
43
47

Q6. Write a program for TIME FORMAT.

{n input is a minutes.
Hr is minute is divide by 60 gives the hour
Minutes is remainder by minutes divide by 60}

```java
public class Demo {
    public static void main(String[] args) {
        int n=123;
        int hr=n/60;
        int min=n%60;
        if(hr<24) {
            System.out.println(hr+" hr:"+min+" min");
        }
        else {
            System.out.println("Invalid time");
        }
    }
}
```

o/p:
2 hr:3 min

ii) While Loop:

- This Loop is used when we don't know the exact number of iterations.

  Syntax:

  ```
  while(condition){
  --------------
  --------------    implementation
  --------------
  }
  ```

- Declaration and initialization of iterative variable must be done outside of the while loop before condition.
- Updation must be inside implementation.

  Working of while loop:

  While(condition){

  Updation;
  }
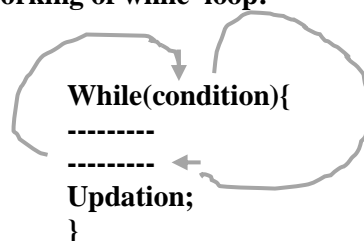
e.g.,
Write a program to print 1 to 10 using while loop.

```java
import java.util.Scanner;

public class Demo1 {
    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        int a=1;
        while(a<=n) {
            System.out.println(a);
            a++;
        }

        s.close();
    }
}
```

o/p:
Enter the number :
10
1
2
3
4
5
6
7
8
9
10

Iteration :

i=1	1<=10	1	i++ → 2
i=2	2<=10	2	i++ → 3
i=3	3<=10	3	i++ → 4
i=4	4<=10	4	i++ → 5
i=5	5<=10	5	i++ → 6
i=6	6<=10	6	i++ → 7
i=7	7<=10	7	i++ → 8
i=8	8<=10	8	i++ → 9
i=9	9<=10	9	i++ → 10
i=10	10<=10	10	i++ → 11
i=11			

Q1. Write a program for factorial using while loop.

```java
import java.util.Scanner;

public class Demo1 {
    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        int a=1;
        int fact=1;
        while(n>=a) {
            fact=fact*n;
            n--;
        }
        System.out.println("\nThe factorial is : "+fact);
        s.close();
    }
}
```

o/p:
Enter the number :
5

The factorial is : 120

Iteration :
N=5,a=1,fact=1

n=5   5>=1   fact=1*5   n-- →4
n=4   4>=1   fact=5*4   n-- →3
n=3   3>=1   fact=20*3   n-- →2
n=2   2>=1   fact=60*2   n-- →1
n=1   1>=1   fact=120*1 n-- →0
n=0

iii)Do while:

- In do while first we gone a executes the implementation then we are checking the condition, if the given condition is **false** also the implementation will be executed for at least one time.
- If the updation position is not in the wright position also "the output is changed".

Syntax:

do{

---------   implementation

}while(condition);

e.g.,
Write a program to print 1 to 10 using do while loop.

```java
import java.util.Scanner;

public class Demo1 {
    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        int a=1;
        do{
            System.out.println(a);
            a++;
        }while(a<=n);
        s.close();
    }
}
```

o/p:
Enter the number :
10
1
2
3
4
5
6
7
8
9
10

Break :
- Break is the keyword in java which is used to come out of looping statement.

E.g.,
i)

```java
import java.util.Scanner;

public class Demo1 {
    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        for(int i=1;i<=n;i++) {
            System.out.println(i);
            break;
        }
        s.close();
    }
}
```

o/p:
Enter the number :
5
1

ii)
check the program function correctly.

```java
import java.util.Scanner;

public class Demo1 {
    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        for(int i=1;i<=n;i++) {
            if(i==3) {
                break;
            }
            System.out.println(i);
        }
        s.close();
    }
}
```

o/p:
Enter the number :
5
1
2

Iteration :
n=5
Start →
i=1   1<=5   i++ →2
i=2   2<=5   i++ →3
i=3   3<=5   break; → End

Continue:

- Continue is the keyword is used to skip the instruction of current iteration.

- [**Note: Continue will skip only the Instruction below if].**

E.g.,
i)

```java
import java.util.Scanner;

public class Demo1 {
        public static void main(String[] args) {
                System.out.println("Enter the number :");
                Scanner s=new Scanner(System.in);
                int n=s.nextInt();
                for(int i=1;i<=n;i++) {
                        if(i==3) {
                                continue;
                        }
                        System.out.println(i);
                }
                s.close();
        }
}
```

o/p:
Enter the number :
10
1
2
4
5
6
7
8
9
10

Iteration :
n=10

```
i=1      1<=10       i++ →2
i=2      2<=10       i++ →3
i=3      3<=10       i++ →4    →  Skip ( Continue Keyword )
i=4      4<=10       i++ →5
i=5      5<=10       i++ →6
i=6      6<=10       i++ →7
i=7      7<=10       i++ →8
i=8      8<=10       i++ →9
i=9      9<=10       i++ →10
i=10     10<=10      i++ →11
i=11
```

ii)
```java
import java.util.Scanner;

public class Demo1 {
    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        for(int i=1;i<=n;i++) {
            if(i==3||i==7) {
                continue;
            }
            System.out.println(i);
        }
        s.close();
    }
}
```
o/p:
Enter the number :
10
1
2
4
5
6
8
9
10

iii)
```java
import java.util.Scanner;

public class Demo1 {
    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        for(int i=1;i<=n;i++) {
            if(i==3||i==7) {
                continue;
            }
            if(i==3){
                break;
            }
            System.out.println(i);
        }
        s.close();
    }
}
```

o/p:

Enter the number :

10

1

2

4

5

6

8

9

10

n%10 → 8567 %10   → 7 → return the last digit.

n/10 → 8567/10 → 856 → return the number leaving last digit.

n*10 → 8567*10 → 85670 → return the number with increasing one digit.

Q1. Write a program to check number of digits in number.

```java
import java.util.Scanner;
public class Demo1 {
        public static void main(String[] args) {
                System.out.println("Enter the number :");
                Scanner s=new Scanner(System.in);
                int n=s.nextInt();
                int count=0;
                while(n!=0) {
                        n/=10;
                        count++;
                }
                System.out.println(count);
                s.close();
        }
}
```

o/p:

Enter the number :

5652

4

Iteration :
N=5652,count=0;

5652	5652!=0	5652/10	count++ →1
565	565!=0	565/10	count++ →2
56	56!=0	56/10	count++ →3
5	5!=0	5/10	count++ →4
0			

Q2. Write a program to print if last digit is 0 or 5 print zero or five itself. else print last digit is even or odd.

```java
import java.util.Scanner;
public class Demo1 {
        public static void main(String[] args) {
                System.out.println("Enter the number :");
                Scanner s=new Scanner(System.in);
                int n=s.nextInt();
                int a=0;
                if(n%10==0) {
                        System.out.println("Zero");
                }
                else if(n%10==5) {
                        System.out.println("Five");
                }
                else {
                        if((n%10)%2==0) {
                                System.out.println("Even");
                        }
                        else {
                                System.out.println("odd");
                        }
                }

                s.close();
        }
}
```
o/p:
Enter the number :
5647
Odd

Q3. Write a program to print the integer number from reverse order one by one.

```java
import java.util.Scanner;

public class Demo1 {
        public static void main(String[] args) {
                System.out.println("Enter the number :");
                Scanner s=new Scanner(System.in);
                int n=s.nextInt();
                int rem=0;
                while(n!=0) {
                        rem=n%10;
                        System.out.println(rem);
                        n/=10;
                }

                s.close();
        }
}
```

o/p:
Enter the number :
8678
8
7
6
8

Iteration :
n=8678 , rem=0

8678	8678!=0	rem=8678%10	rem=8	8678/10
867	867!=0	rem=867%10	rem=7	867/10
86	86!=0	rem=86%10	rem=6	86/10
8	8!=0	rem=8%10	rem=8	8/10
0				

Q4. Write a java program to get sum of digits in the given number.

```java
import java.util.Scanner;

public class Demo1 {
        public static void main(String[] args) {
                System.out.println("Enter the number :");
                Scanner s=new Scanner(System.in);
                int n=s.nextInt();
                int a=0;
                int sum=0;
                while(n!=0) {
                        a=n%10;
                        sum=sum+a;
                        n/=10;
                }
                System.out.println("sum of the number is "+sum);

                s.close();
        }
}
```
o/p:
Enter the number :
5674
Sum of the number is 22

Iteration :
n=5674, a=0, sum=0

5674	5674!=0	a=5674%10	sum=0+4	5674/10
567	567!=0	a=567%10	sum=4+7	567/10
56	56!=0	a=56%10	sum=11+6	56/10
5	5!=0	a=5	sum=17+5	5/10
0				

Q5. Write a program to print the sum of the given even numbers.

import java.util.Scanner;

public class Demo1 {
        public static void main(String[] args) {
                System.*out*.println("Enter the number :");
                Scanner s=new Scanner(System.*in*);
                int n=s.nextInt();
                int a=0;
                int sum=0;
                while(n!=0) {

                        a=n%10;
                        if(a%2==0) {
                                sum=sum+a;
                        }
                        n/=10;
                }
                System.*out*.println(sum);

                s.close();
        }
}

o/p:
Enter the number :
4567
10

Iteration :
n=4567, a=0, sum=0

4567	a=4567%10	7%2!=0	sum=0	4567/10
456	a=456%10	6%2==0	sum=0+6	456/10
45	a=45%10	5%2!=0	sum=6	45/10
4	a=4%10	4%2==0	sum=6+4	4/10
0				

Q6. Write a program for digits of prime
Keshav sir wants to find the given number is digits of prime so he decides to add these all the digits of the number and check the sum is prime or not.
Your task is to help Keshav sir in this process.

```java
import java.util.Scanner;

public class Demo1 {
    public static Boolean prime(int a) {
        int count=0;
        for(int i=1;i<=a;i++) {
            if(a%i==0) {
                count++;
            }
        }
        if(count==2) {
            return true;
        }
        else {
            return false;
        }
    }


    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        int a=0;
        int sum=0;
        while(n!=0) {
            a=n%10;
            sum=sum+a;
            n/=10;
        }

        if(prime(sum)){
            System.out.println("this is a prime number");
        }
        else {
            System.out.println("this is not a prime number");
        }

        s.close();
    }
}
```

o/p:
Enter the number :
3456
This is not a prime number

Iteration :

n=3456, a=0,sum=0

n	n!=0	a=n%10	sum=sum+a	n/10
3456	3456!=0	a=3456%10	sum=0+6	3456/10
345	345!=0	a=345%10	sum=6+5	345/10
34	34!=0	a=34%10	sum=11+4	34/10
3	3!=0	a=3%10	sum=15+3	3/10
0				

Sum=18,count=0;

i=1	**1<=18**	**18%1==0**	**count++ →1**	**i++ →2**
i=2	**2<=18**	**18%2==0**	**count++ →2**	**i++ →3**
i=3	**3<=18**	**18%3==0**	**count++ →3**	**i++ →4**
i=4	**4<=18**	**18%4==0**		**i++ →5**
i=5	**5<=18**	**18%5!=0**		**i++ →6**
i=6	**6<=18**	**18%6==0**	**count++ →4**	**i++ →7**
i=7	**7<=18**	**18%7!=0**		**i++ →8**
i=8	**8<=18**	**18%8!=0**		**i++ →9**
i=9	**9<=18**	**18%9==0**	**count++ →5**	**i++ →10**
i=10	**10<=18**	**18%10!=0**		**i++ →11**
i=11	**11<=18**	**18%11!=0**		**i++ →12**
i=12	**12<=18**	**18%12!=0**		**i++ →13**
i=13	**13<=18**	**18%13!=0**		**i++ →14**
i=14	**14<=18**	**18%14!=0**		**i++ →15**
i=15	**15<=18**	**18%15!=0**		**i++ →16**
i=16	**16<=18**	**18%16!=0**		**i++ →17**
i=17	**17<=18**	**18%17!=0**		**i++ →18**
i=18	**18<=18**	**18%18==0**	**count++ →6**	**i++ →19**
i=19				

Q7. Write a program for wants to find Lucky Employee, so he decides to take employee id. If the sum of the last 4 digits of the empid is prime number he is LuckyEmp. Your task is to help Keshav sir.
NOTE: The length of empid will be more than or equal to 6 digits.

i)Using while loop

```java
import java.util.Scanner;

public class Demo1 {
        public static Boolean prime(int a) {
                int count=0;
                for(int i=1;i<=a;i++) {
                        if(a%i==0) {
                                count++;
                        }
                }
                if(count==2) {
                        return true;
                }
                else {
                        return false;
                }
        }
        public static void main(String[] args) {
                System.out.println("Enter the number :");
                Scanner s=new Scanner(System.in);
                int empid=s.nextInt();
                int a=0;
                int sum=0;
                int count=0;
                Boolean b;
                while(empid!=0) {
                        a=empid%10;
                        sum=sum+a;
                        empid/=10;
                        count++;
                        if(count==4) {
                                break;
                        }
                }
                System.out.println(sum);
                b=prime(sum);
                if(b==true) {
                        System.out.println("LuckyEmp");
                        System.out.println("sum of last four digits : "+sum+" is a prime number");
                }
                else {
                        System.out.println("Not A LuckyEmp");
                System.out.println("sum of last four digits : "+sum+" is not a prime number");
                }

                s.close();
        }
}
```

o/p:

Enter the number :
45113782
20
Not A LuckyEmp
Sum of last four digits : 20 is not a prime number.

ii)Using for loop:
```java
import java.util.Scanner;

public class Demo3 {
	public static Boolean prime(int a) {
		int count=0;
		for(int i=1;i<=a;i++) {
			if(a%i==0) {
				count++;
			}
		}
		if(count==2) {
			return true;
		}
		else {
			return false;
		}
	}
	public static void main(String[] args) {
		System.out.println("Enter the number :");
		Scanner s=new Scanner(System.in);
		int empid=s.nextInt();
		int a=0;
		int sum=0;
		int count=0;
		Boolean b;
		for(int i=1;i<=4;i++) {
			a=empid%10;
			sum=sum+a;
			empid/=10;
		}
		System.out.println(sum);
		b=prime(sum);
		if(b==true) {
			System.out.println("LuckyEmp");
	System.out.println("sum of last four digits : "+sum+" is a prime number");
		}
		else {
			System.out.println("Not A LuckyEmp");
		System.out.println("sum of last four digits : "+sum+" is not a prime number");
		}

		s.close();
	}
}
```

o/p:
Enter the number :
45113782
20
Not A LuckyEmp
Sum of last four digits : 20 is not a prime number.

STRONG NUMBER : SUM OF FACTORIAL OF EACH DIGIT =TO SAME NUMBER

Q8. Write a program to check whether the number is strong number or not.

```java
import java.util.Scanner;

public class Demo1 {
      public static void main(String[] args) {
            System.out.println("Enter the number :");
            Scanner s=new Scanner(System.in);
            int n=s.nextInt();
            int m=n;
            int a=0;
            int sum=0;
            while(n!=0) {
                  int fact=1;
                  a=n%10;
                  for(int i=1;i<=a;i++) {
                        fact=fact*i;
                  }
                  sum=sum+fact;
                  n/=10;
            }
            System.out.println("sum of factorial number is "+sum);
            if(m==sum) {
                  System.out.println("this is a Strong number");
            }
            else {
                  System.out.println("This is not a Strong number");
            }
            s.close();
      }
}
```

o/p:
Enter the number :
145
sum of factorial number is 145
This is a Strong number

Iteration :

n=145, m=n, a=0, sum=0, fact=1

145
145!=0   a=145%10

                i=1   1<=5   fact=1*1   i++ →2
                i=2   2<=5   fact=1*2   i++ →3
                i=3   3<=5   fact=2*3   i++ →4
                i=4   4<=5   fact=6*4   i++ →5
                i=5   5<=5   fact=24*5   i++ →6
                i=6

      sum=0+120   n=145/10

14
14!=0   a=14%10

                i=1   1<=4   fact=1*1   i++ →2
                i=2   2<=4   fact=1*2   i++ →3
                i=3   3<=4   fact=2*3   i++ →4
                i=4   4<=4   fact=6*4   i++ →5
                i=5

      sum=120+24   n=14/10

1
1!=0   a=1%10

                i=1   1<=1   fact=1*1   i++ →2
                i=2
      sum=144+1   n=1/10

0

Flag name:

- **Using variable for indicating the conditions or loop**
- **Boolean , Colour, Name, Yes/No, ………………**

DUCK NUMBER:
    THE NUMBER WHICH CONTAINS { IRRESEPECTIVE OF POSITION IS CALLED AS
DUCK NUMBER *}.*
    E.G.,
    867 → not a duck number
    709 → duck number
    11098 → duck number
    10302 → duck number

Q9. Write a program to check the given number is duck number , the number which contains (Which contain zeros is called duck number).

```java
import java.util.Scanner;

public class Demo3 {
    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner s=new Scanner(System.in);
        int n=s.nextInt();
        int a;
        Boolean b = false;
        while(n!=0) {
            a=n%10;
            if(a==0) {
                b=true;
                break;
            }
            n/=10;
        }
        if(b==true) {
            System.out.println("This is a Duck Number");
        }
        else {
            System.out.println("This is a Not a Duck Number");
        }
        s.close();
    }
}
```

o/p:

Enter the number :
708
This is a Duck Number

Iteration :

n=708, b=false

708	708!=0	a=708%10		708/10
70	70!=0	a=70%10	0==0	b=true(break)

Q9. Write a program to check whether the number is perfect square or not.
i)

```java
import java.util.Scanner;

public class Demo4 {
    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner z=new Scanner(System.in);
        int m=z.nextInt();
        int n=1;
        int p=1;
        while(p<m) {
            n=n+1;
            p=n*n;
        }
        System.out.println(n);
        if(p==m) {
            System.out.println("This is a perfect square number");
        }
        else {
            System.out.println("This is not perfect square number");
        }
        z.close();
    }
}
```

o/p:
Enter the number :
9
This is a perfect square number

<div align="center">

(or)

</div>

ii)

```java
import java.util.Scanner;
public class Demo4 {
    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner z=new Scanner(System.in);
        int m=z.nextInt();
        boolean flag=false;
        for(int i=1;i<=m;i++) {
            if(i*i==m) {
                flag=true;
                break;
            }
        }
        if(flag==true) {
            System.out.println("this is a perfect square");
        }
        else {
            System.out.println("this is not a perfect square");
        }
        z.close();
    }
}
```

o/p:
Enter the number :
4
This is a perfect square

m=4, flag=false

i=1 1<=4   i++ →2
i=2 2<=4   2*2==4(break)

Q10. Write program to print the power of number the given base with exponential.

```java
import java.util.Scanner;

public class Demo3 {
    public static void main(String[] args) {
        System.out.println("Enter the base :");
        Scanner s=new Scanner(System.in);
        int m=s.nextInt();
        System.out.println("Enter the exponential :");
        int n=s.nextInt();
        int power=1;
        for(int i=1;i<=n;i++) {
            power=power*m;
        }
        System.out.println(power+" this is the power of the given
numbers");

        System.out.println("\n=========In Build method=========");
        System.out.println((int)Math.pow(m, n)+" this is the power of
    the given numbers");
        s.close();
    }
}
```

o/p:
Enter the base :
7
Enter the exponential :
5
16807 this is the power of the given numbers

============In Build method============
16807 this is the power of the given numbers

Iteration :
m=7, n=5,power=1

i=1   1<=5   power=1*7   i++ →2
i=2   2<=5   power=7*7   i++ →3
i=3   3<=5   power=49*7   i++ →4
i=4   4<=5   power=343*7   i++ →5
i=5   5<=5   power=2401*7   i++ →6
i=6

Q11. Write a program a person went to doctor for medical check up.

Now doctor has to decide if the person love failure or not. Doctor to check both heart and liver condition. With the help lab reports doctor will decide the answer.

[Note : reports will be given in the number format(1-10), if the person heart rate is more than 6 And liver rate is more than 7 he is a love failure person.

```java
import java.util.Scanner;

public class Demo4 {
    public static void main(String[] args) {
        System.out.println("Enter the heart rate :");
        Scanner z=new Scanner(System.in);
        int m=z.nextInt();
        System.out.println("Enter the liver rate :");
        int n=z.nextInt();
        if(m>6 && n>7) {
            System.out.println("Love failure");
        }
        else {
            System.out.println("not a Love failure");
        }
        z.close();
    }
}
```

o/p:

Enter the heart rate :

7

Enter the liver rate :

5

Not a Love Failure

iv)Nested for loop:

Syntax:

outer loop

```
for( ; ; ){
      for( ; ; ){

      }
}
```
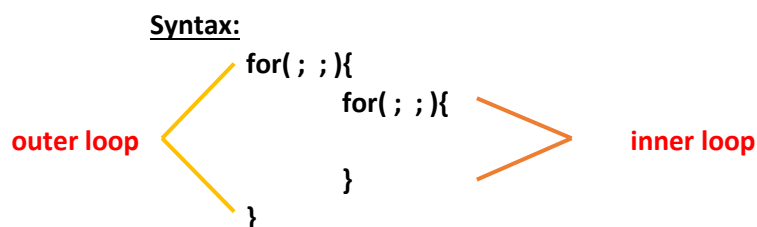
inner loop

- **Outer loop controls the column.**
- **Inner loop controls the row {by the condition}.**
- **If the outer loop run once the inner loop complete its implementation.**

This is majorly for pattern program.

Q1. Write a program to print e.g. For nested loop.

```
public class Demo3 {
      public static void main(String[] args) {
            for(int i=10;i<=30;i=i+10) {
                  for(int j=1;j<=5;j++) {
                        System.out.println(i+j);
                  }
            }

      }
}
```

o/p:
11
12
13
14
15
21
22
23
24
25
31
32
33
34
35

Iteration :

i=10   10<=30
      j=1   1<=5   10+1   j++ →2
      j=2   2<=5   10+2   j++ →3
      j=3   3<=5   10+3   j++ →4
      j=4   4<=5   10+4   j++ →5
      j=5   5<=5   10+5   j++ →6
      j=6
                           i=10+10

i=20   20<=30
      j=1   1<=5   20+1   j++ →2
      j=2   2<=5   20+2   j++ →3
      j=3   3<=5   20+3   j++ →4
      j=4   4<=5   20+4   j++ →5
      j=5   5<=5   20+5   j++ →6
      j=6
                           i=20+10

i=30   30<=30
      j=1   1<=5   30+1   j++ →2
      j=2   2<=5   30+2   j++ →3
      j=3   3<=5   30+3   j++ →4
      j=4   4<=5   30+4   j++ →5
      j=5   5<=5   30+5   j++ →6
      j=6
                           i=30+10

i=40

Q2. Write a program to print nested for loop.

```
public class LogicalPrograming{

        public static void main(String[] args){
                int a=2,b=6;
                for(int i=a; i<=a; i++){
                        for(int j=i; j<=b; j++){
                                System.out.println(j);
                        }
                        if(a==4&&b==8){
                                break;
                        }
                        a++;
                        b++;

                }
        }

}
```
o/p:
2
3
4
5
6
3
4
5
6
7
4
5
6
7
8

System.out.println("hi");
  It executes the output as line by line. After the execution

System.out.print("hi");
  It executes the output in a line. After the execution.

System.out.println();
  The println can be empty, it is also known as dummy print, it is for next line.

Q3. Write a program for nested loop.

public class LogicalPrograming{

        public static void main(String[] args){
            for(int i=10;i<=50;i=i+10){
                for(int j=1;j<=5;j++){
                    System.out.print(i+j+" ");
                }
                System.out.println();
            }
        }

}
o/p:
11 12 13 14 15
21 22 23 24 25
31 32 33 34 35
41 42 43 44 45
51 52 53 54 55

Iteration :

i=10   10<=50

j=1	1<=5	10+1	j++ →2
j=2	2<=5	10+2	j++ →3
j=3	3<=5	10+3	j++ →4
j=4	4<=5	10+4	j++ →5
j=5	5<=5	10+5	j++ →6
j=6			

                                i=10+10

i=20   20<=50

j=1	1<=5	20+1	j++ →2
j=2	2<=5	20+2	j++ →3
j=3	3<=5	20+3	j++ →4
j=4	4<=5	20+4	j++ →5
j=5	5<=5	20+5	j++ →6
j=6			

                                i=20+10

i=30   30<=50

j=1	1<=5	30+1	j++ →2
j=2	2<=5	30+2	j++ →3
j=3	3<=5	30+3	j++ →4
j=4	4<=5	30+4	j++ →5
j=5	5<=5	30+5	j++ →6
j=6			

                                i=30+10

i=40   40<=50

j=1	1<=5	40+1	j++ →2

j=2	2<=5	40+2	j++ →3
j=3	3<=5	40+3	j++ →4
j=4	4<=5	40+4	j++ →5
j=5	5<=5	40+5	j++ →6
j=6			

i=40+10

i=50   50<=50

j=1	1<=5	50+1	j++ →2
j=2	2<=5	50+2	j++ →3
j=3	3<=5	50+3	j++ →4
j=4	4<=5	50+4	j++ →5
j=5	5<=5	50+5	j++ →6
j=6			

i=50+10

i=60

Q4. Write a program to print love failure -> when the patient has heart rate is more than 6 and liver rate is more than 7, else print not a love failure.

```java
import java.util.Scanner;

public class Demo4 {
    public static void main(String[] args) {
        System.out.println("Enter the heart rate :");
        Scanner z=new Scanner(System.in);
        int m=z.nextInt();
        System.out.println("Enter the liver rate :");
        int n=z.nextInt();
        if(m>6 && n>7) {
            System.out.println("Love failure");
        }
        else {
            System.out.println("not a Love failure");
        }
        z.close();
    }
}
```

o/p:
Enter the heart rate :
7
Enter the liver rate :
8
Not a Love failure

Q5. Write a program to print the pattern.

```
public class Demo3 {
      public static void main(String[] args){
            int a =0;
            for(int i=1;i<=5;i++){
                for(int j=0;j<=4;j++){
                    System.out.print(a+" ");
                    if(a==0) {
                        a++;
                    }
                    else {
                        a--;
                    }
                }
                System.out.println();
            }

      }
}
```

o/p:

0 1 0 1 0
1 0 1 0 1
0 1 0 1 0
1 0 1 0 1
0 1 0 1 0

Iteration :

a=0

i=1 1<=5

j	condition	if(a==0)	else	increment
j=0	0<=4	a++ →1		j++ →1
j=1	1<=4		a-- →0	j++ →2
j=2	2<=4	a++ →1		j++ →3
j=3	3<=4		a-- →0	j++ →4
j=4	4<=4	a++ →1		j++ →4
j=5				
				i++ →2

i=2   2<=5

j	condition	if(a==0)	else	increment
j=0	0<=4		a-- →0	j++ →1
j=1	1<=4	a++ →1		j++ →2
j=2	2<=4		a-- →0	j++ →3
j=3	3<=4	a++ →1		j++ →4
j=4	4<=4		a-- →0	j++ →4
j=5				
				i++ →3

i=3   3<=5

j	condition	if(a==0)	else	increment
j=0	0<=4	a++ →1		j++ →1
j=1	1<=4		a-- →0	j++ →2
j=2	2<=4	a++ →1		j++ →3
j=3	3<=4		a-- →0	j++ →4
j=4	4<=4	a++ →1		j++ →4

j=5
                                        i++ →4
i=4   4<=5
        j   condition   if(a==0)   else   increment
        j=0   0<=4   a-- →0   j++ →1
        j=1   1<=4   a++ →1   j++ →2
        j=2   2<=4   a-- →0   j++ →3
        j=3   3<=4   a++ →1   j++ →4
        j=4   4<=4   a-- →0   j++ →4
        j=5
                                        i++ →5
i=5   5<=5
        j   condition   if(a==0)   else   increment
        j=0   0<=4   a++ →1   j++ →1
        j=1   1<=4   a-- →0   j++ →2
        j=2   2<=4   a++ →1   j++ →3
        j=3   3<=4   a-- →0   j++ →4
        j=4   4<=4   a++ →1   j++ →4
        j=5
                                        i++ →6

i=6

Q6. Write a program to print I .

```
public class Demo3 {
      public static void main(String[] args){
            int a =0;
            for(int i=1;i<=5;i++){
                  for(int j=0;j<=4;j++){
                        System.out.print(i+" ");
                  }
                  System.out.println();

            }
      }
}
```

o/p:
1 1 1 1 1
2 2 2 2 2
3 3 3 3 3
4 4 4 4 4
5 5 5 5 5

Q7. Write a program to print * pattern.

```java
public class Demo3 {
    public static void main(String[] args) {
        for(int i=1;i<=5;i++) {
            for(int j=1;j<=5;j++) {
                System.out.print("* ");
            }
            System.out.println();
        }
    }
}
```

o/p:

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

Q8. Write a program to print alphabet pattern.

```java
public class Demo3 {
    public static void main(String[] args) {
        char c='A';
        for(int i=1;i<=5;i++) {
            for(int j=0;j<=4;j++) {
                System.out.print(((char)(c+j))+" ");
            }
            System.out.println();
        }
    }
}
```

o/p:

```
A B C D E
A B C D E
A B C D E
A B C D E
A B C D E
```

ITERATION :

c='A',

i=1   1<=5

        j=0   0<=4   65+0='A'   j++ →1

        j=1   1<=4   65+1='B'   j++ →2

        j=2   2<=4   65+2='C'   j++ →3

        j=3   3<=4   65+3='D'   j++ →4

        j=4   4<=4   65+4='E'   j++ →5

        j=5

                          i++ →2

i=2   2<=5

        j=0   0<=4   65+0='A'   j++ →1

        j=1   1<=4   65+1='B'   j++ →2

        j=2   2<=4   65+2='C'   j++ →3

        j=3   3<=4   65+3='D'   j++ →4

        j=4   4<=4   65+4='E'   j++ →5

        j=5

                          i++ →3

i=3   3<=5

        j=0   0<=4   65+0='A'   j++ →1

        j=1   1<=4   65+1='B'   j++ →2

        j=2   2<=4   65+2='C'   j++ →3

        j=3   3<=4   65+3='D'   j++ →4

        j=4   4<=4   65+4='E'   j++ →5

        j=5

                          i++ →4

i=4   4<=5

        j=0   0<=4   65+0='A'   j++ →1

        j=1   1<=4   65+1='B'   j++ →2

        j=2   2<=4   65+2='C'   j++ →3

        j=3   3<=4   65+3='D'   j++ →4

        j=4   4<=4   65+4='E'   j++ →5

        j=5

                          i++ →5

i=5   5<=5

        j=0   0<=4   65+0='A'   j++ →1

        j=1   1<=4   65+1='B'   j++ →2

        j=2   2<=4   65+2='C'   j++ →3

        j=3   3<=4   65+3='D'   j++ →4

        j=4   4<=4   65+4='E'   j++ →5

        j=5

                          i++ →6

Q9. Write a program to print alphabet pattern.

```
public class Demo3 {
    public static void main(String[] args) {
        char c='A';
        int length=4;
        for(int i=c;i<=c+length;i++) {
            for(int j=1;j<=5;j++) {
                System.out.print((char)i);
            }
            System.out.println();
        }
    }
}
```

o/p:
A A A A A
B B B B B
C C C C C
D D D D D
E E E E E

Q10. Write a program for all the pattern.

```
public class Demo3 {
```

*1.
* * * * *
*
*
*
*

```
    public static void main(String[] args) {
        int n=5;
        for(int i=1;i<=n;i++) {
            for(int j=1;j<=n;j++) {
                if(i==1||j==1) {
                    System.out.print("* ");
                }
                else {
                    System.out.print("  ");
                }
            }
            System.out.println();
        }
    }
```

2.

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

```java
public static void main(String[] args) {
    int n=5;
    for(int i=1;i<=n;i++) {
        for(int j=1;j<=n;j++) {
            if(i==1||j==n) {
                System.out.print("* ");
            }
            else {
                System.out.print("  ");
            }

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

3.

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

```java
    public static void main(String[] args) {
    int n=5;
        for(int i=1;i<=n;i++) {
            for(int j=1;j<=n;j++) {
                if(i==1||i==n||j==1) {
                    System.out.print("* ");
                }
                else {
                    System.out.print("  ");
                }
            }
            System.out.println();
        }
    }
```

4.

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

```java
        public static void main(String[] args) {
        int n=5;
        for(int i=1;i<=n;i++) {
            for(int j=1;j<=n;j++) {
                if(i==1||i==n||j==1||j==n) {
                    System.out.print("* ");
                }
                else {
                    System.out.print("  ");
                }
            }
            System.out.println();
        }
}
```

5.

```
 *
  *
   *
    *
     *
```

```java
        public static void main(String[] args) {
            int n=5;
            for(int i=1;i<=n;i++) {
                for(int j=1;j<=n;j++) {
                    if(i==j) {
                        System.out.print("* ");
                    }
                    else {
                        System.out.print("  ");
                    }
                }
                System.out.println();
            }
        }
```

6.

```
        *
      *
    *
  *
*
```

```java
    public static void main(String[] args) {
    int n=5;
    for(int i=1;i<=n;i++) {
        for(int j=1;j<=n;j++) {
            if(i+j==n+1) {
                System.out.print("* ");
            }
            else {
                System.out.print("  ");
            }
        }
        System.out.println();
    }
}
```

7.

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

```java
    public static void main(String[] args) {
    int n=5;
    for(int i=1;i<=n;i++) {
        for(int j=1;j<=n;j++) {
            if((i+j==n+1)||(i==j)) {
                System.out.print("* ");
            }
            else {
                System.out.print("  ");
            }
        }
        System.out.println();
    }
}
```

8.

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

```java
public static void main(String[] args) {
    int n=5;
    for(int i=1;i<=n;i++) {
        for(int j=1;j<=n;j++) {
            if(i+j==n+1||i==j) {
                System.out.print("  ");
            }
            else {
                System.out.print("* ");
            }
        }
        System.out.println();
    }
}
```

9.

```
*
* *
* * *
* * * *
* * * * *
*/
```

```java
public static void main(String[] args) {
    int n=5,a=1;
    for(int i=1;i<=5;i++) {
        for(int j=1;j<=5;j++) {
            if(j<=a) {
                System.out.print("* ");
            }
            else {
                System.out.print("  ");
            }
        }
        System.out.println();
        a++;
    }
}
```

10.

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

```
      public static void main(String[] args) {
      int n=5,a=n;
      for(int i=1;i<=5;i++) {
            for(int j=1;j<=5;j++) {
                  if(j>=a) {
                        System.out.print("* ");
                  }
                  else {
                        System.out.print("  ");
                  }
            }
            System.out.println();
            a--;
      }
}
```

11.

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

```
      public static void main(String[] args) {
      int n=5,a=n;
      for(int i=1;i<=5;i++) {
            for(int j=1;j<=5;j++) {
                  if(j<=a) {
                        System.out.print("* ");
                  }
                  else {
                        System.out.print("  ");
                  }
            }
            System.out.println();
            a--;
      }
}
```

12.

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

```java
        public static void main(String[] args) {
        int n=5,a=0;
        for(int i=1;i<=5;i++) {
            for(int j=1;j<=5;j++) {
                if(j<=a) {
                    System.out.print("  ");
                }
                else {
                    System.out.print("* ");
                }
            }
            System.out.println();
            a++;
        }
}
```

13.

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

```java
        public static void main(String[] args) {
            int n=5;
            for(int i=1;i<=n;i++) {
                for(int j=1;j<=n;j++) {
                    if(i==1||j==1||i==j) {
                        System.out.print("* ");
                    }
                    else {
                        System.out.print("  ");
                    }
                }
                System.out.println();
            }
        }
```

14.

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

```java
public static void main(String[] args) {
    int n=5;
    for(int i=1;i<=n;i++) {
        for(int j=1;j<=n;j++) {
            if(j==1||i==n||i+j==n+1) {
                System.out.print("* ");
            }
            else {
                System.out.print("  ");
            }
        }
        System.out.println();

    }
}
```

15.

```
A B C D E
A B C D
A B C
A B
A
```

```java
public static void main(String[] args) {
    int n=5,m=n-1;
    char c='A';
    for(int i=1;i<=n;i++) {
        for(int j=0;j<=m;j++) {
            System.out.print((char)(c+j)+" ");
        }
        m--;
        System.out.println();
    }
}
```

16.

```
A
A B
A B C
A B C D
A B C D E
```

```java
    public static void main(String[] args) {
        int n=5,m=1;
        char c='A';
        for(int i=1;i<=n;i++) {
            for(int j=0;j<m;j++) {
                System.out.print((char)(c+j)+" ");
            }
            m++;
            System.out.println();
        }
    }
```

17.

```
A
1 2
A B C
1 2 3 4
A B C D E
```

```java
    public static void main(String[] args) {
        int n=5;
        char c='A';
        for(int i=1;i<=n;i++) {
            for(int j=1;j<=i;j++) {
                if(i%2==1) {
                    System.out.print((char)(c+j-1)+" ");
                }
                else {
                    System.out.print(j+" ");
                }
            }
            System.out.println();
        }
    }
```

18.

```
1
A B
1 2 3
A B C D
1 2 3 4 5
```

```java
    public static void main(String[] args) {
    int n=5;
    char c='A';
        for(int i=1;i<=n;i++) {
            for(int j=1;j<=i;j++) {
                if(i%2==1) {
                    System.out.print(j+" ");
                }
                else {
                    System.out.print((char)(c+j-1)+" ");

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

19.

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

```java
    public static void main(String[] args) {
        int n=11;
        for(int i=1;i<=n;i++) {
            for(int j=1;j<=n;j++) {
                if(i+j>=n+1) {
                    System.out.print("* ");
                }
                else {
                    System.out.print(" ");
                }
            }
            System.out.println();
        }
    }
```

20.

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

```java
public static void main(String[] args) {
    int n=11;
    for(int i=1;i<=n;i++) {
        for(int j=1;j<=n;j++) {
            if(i<=j) {
                System.out.print("* ");
            }
            else {
                System.out.print(" ");
            }
        }
        System.out.println();
    }
}
```

21.

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

```java
public static void main(String[] args) {
    int n=11;
    for(int i=1;i<=n;i++) {
        for(int j=1;j<=n;j++) {
            if(i+j>=n+1) {
                System.out.print("* ");
            }
            else {
                System.out.print(" ");
            }
        }
        System.out.println();
    }
    for(int i=2;i<=n;i++) {
        for(int j=1;j<=n;j++) {
            if(i<=j) {
                System.out.print("* ");
            }
            else {
                System.out.print(" ");
            }
        }
        System.out.println();
    }
}
```

22.


```
1 10
2 9
3 8
4 7
5 6
6 5
7 4
8 3
9 2
10 1
```


```java
public static void main(String[] args) {
    int n=10;
    for(int i=1;i<=10;i++){
        for(int j=n;j>=1;j--) {
            System.out.println(i+""+j);
            n--;
            break;
        }
    }

}
```

v) For Each loop(Advance loop):

* for each loop is used to traverse the collection.
* for each loop does not contain any range.
* for each loop will run on number data present in collection.

Syntax:

for (data_type of   iterative   :   column
       element in column   variable   variable)

```
{
-----------
-----------        implements
-----------
}
```

e.g.,

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the array size : ");
        int size=ip.nextInt();

        int []arr=new int[size];
        for(int i=0;i<size;i++) {
            System.out.print("Enter the element : ");
            arr[i]=ip.nextInt();
        }

        int len=0;
        for(int ele:arr) {
            len++;
        }
        System.out.println(len);
        ip.close();
    }
}
```

o/p:

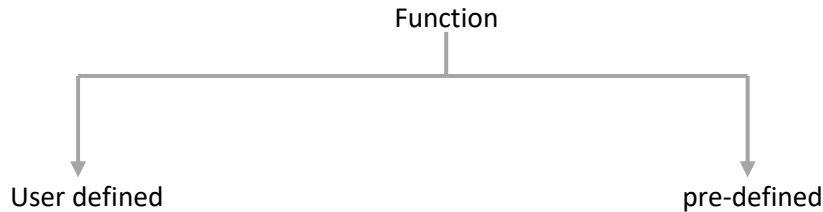enter the array size : 3
Enter the element : 3
Enter the element : 4
Enter the element : 5
3

<div align="center">**FUNCTION:**</div>

Function is the block of code which is used for particular task.

<div align="center">Function</div>

User defined   pre-defined

Types of function:

i) **User defined function:**
   The function which has been declared and implemented by the user.

   Types of user defined function:
   - Function without parameter and without return type.
   - Function with parameter and without return type.
   - Function without parameter and with return type.
   - Function with parameter and with return type.

ii) **Predefined function:**
   A function which has been declared and initialize by the programming language itself.
   e.g.,
   → **length()**
   →**size()**

Parameter:
   - The values which has been accepted by the functions is called as parameter.
   - The parameter must be mention in the function in the function block.

Arguments:
   - The values which we are passing to the functions is called as arguments.

Return:
   - Return is the keyword which is used to come out of the function with some value.
   - The value will be define in the return type of the function syntax.

Void:
   - Void is the keyword in java which is used to define the function is returning null value.

E.g.,
i) Function without parameter and without return type

```
Public class Test {
        Static void add(){
                System.out.println(10+20);
        }
        public static void main(String[] args){
                add();
        }
}
```
o/p:
30

[NOTE: when we have a void return type we can use **return** keyword without any values.**]**

ii) Function with parameters and without return type.

```
Import java.util.Scanner;
Public class test{
        Static void add(int a, int b){
                System.out.println(a+b);
        }
        public static void main(String[] args){
                Scanner ip=new Scanner(System.in);
                System.out.println("Enter two numbers :");
                Int n1=ip.nextInt();
                Int n2=ip.nextInt();
                add(n1,n2);
        }
}
```
o/p:
Enter two numbers :
20
30
50

iii) **Function without parameter and with return type.**

```
Public class test {
     Static void add(){
          return 10+20;
     }
     public static void main(String[] args){
          System.out.println(add());
          int n=add();
          System.out.println(n);
     }
}
```
o/p:
30
30

iv) **Function with parameter and with return type.**

```
Public class test{

     Static void add(int a, int b){
          return a+b;
     }

     public static void main(String[] args){
          Scanner ip=new Scanner(System.in);
          Int n1=ip.nextInt();
          Int n2=ip.nextInt();
          System.out.println(add(n1,n2));
     }
}
```
o/p:
10
20
30

Q1. Write a program to print whether the number is palindrome or not a palindrome.

```java
import java.util.Scanner;

public class Demo4 {
    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner z=new Scanner(System.in);
        int num=z.nextInt();
        int num1=num;
        int rev=0;
        while(num!=0) {
            rev=(rev*10)+num%10;
            num/=10;
        }
        if(num1==rev) {
            System.out.println("palindrome");
        }
        else {
            System.out.println("not a palindrome");
        }
        z.close();
    }
}
```

o/p:
Enter the number :
12321
palindrome

ITERATION :
num=12321,rev=0,num1=12321;

12321	12321!=0	rev=(0*10)+12321%10	12321/10
1232	1232!=0	rev=(1*10)+1232%10	1232/10
123	123!=0	rev=(12*10)+123%10	123/10
12	12!=0	rev=(123*10)+12%10	12/10
1	1!=0	rev=(1232*10)+1%10	1/10
0			

rev=12321

Q2. Write a program to print whether the number is Armstrong number or not.

```java
import java.util.Scanner;

public class Demo4 {


    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner z=new Scanner(System.in);
        int num=z.nextInt();
        int num1=num;
        int count=0;
        int sum=0;
        int rem=0;
        int pow=1;

        while(num!=0) {
            num/=10;
            count++;
        }

        num=num1;
        while(num!=0) {
             rem=num%10;
            for(int i=1;i<=count;i++) {
                pow=pow*rem;
            }
            sum=sum+pow;
            pow=1;
            num/=10;

        }

        System.out.println(sum);
        if(num1==sum) {
            System.out.println("Armstrong number");
        }
        else {
            System.out.println("not a Armstrong number");
        }

System.out.println("\n============IN-BUILD METHOD=============");


        sum=0;
        num=num1;

        while(num1!=0) {
            rem=num1%10;
            sum=sum+(int)(Math.pow(rem, count));
            num1/=10;
        }
```

```
            System.out.println(sum);
            if(num==sum) {
                    System.out.println("Armstrong number");
            }
            else {
                    System.out.println("not a Armstrong number");
            }
            z.close();
      }
}
```

o/p:
Enter the number :
153
153
Armstrong number

===========IN-BUILD METHOD==========
153
Armstrong number

ITERATION :

num=153, count=0, sum=0, rem=0, pow=1, num1=num;

num=153

153   153!=0   153/10   count++ →1
15   15!=0   15/10   count++ →2
1   1!=0   1/10   count++ →3
0

num=num1;

num=153, count=3;

153   rem=153%10
        i=1   i<=count   implementation   incrementation
        i=1   1<=3   pow=1*3   i++ →2
        i=2   2<=3   pow=3*3   i++ →3
        i=3   3<=3   pow=9*3   i++ →4
        i=4

        sum=0+27
        pow=1
        153/10
```

15      rem=15%10
        i=1         i<=count        implementation          incrementation
        i=1         1<=3            pow=1*5                 i++ →2
        i=2         2<=3            pow=5*5                 i++ →3
        i=3         3<=3            pow=25*5                i++ →4
        i=4


        sum=27+125
        pow=1
        15/10


1       rem=1%10
        i=1         i<=count        implementation          incrementation
        i=1         1<=3            pow=1*1                 i++ →2
        i=2         2<=3            pow=1*1                 i++ →3
        i=3         3<=3            pow=1*1                 i++ →4
        i=4


        sum=152+1
        pow=1
        1/10

0

num1=153, sum=153

Q4. Write a program to print the fibonnaci series.

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner z=new Scanner(System.in);
        int num=z.nextInt();
        int n1=0;
        int n2=1;
        int n3=0;
        int y=1;

        while(y<=num) {
            n3=n1+n2;
            System.out.print(n1+" ");
            n1=n2;
            n2=n3;
            y++;
        }

        z.close();
    }
}
```
o/p:
Enter the number :
4
0 1 1 2

ITERATION :

num=4, n1=0, n2=1, n3=0, y=1

y<=num

condition	implantation	print	implantation	.	incrementation
1<=4	n3=0+1	0	n1=1	n2=1	y++ →2
2<=4	n3=1+1	1	n1=1	n2=2	y++ →3
3<=4	n3=1+2	1	n1=2	n2=3	y++ →4
4<=4	n3=2+3	2	n1=3	n2=5	y++ →5

Q3. Write a program to print the n th prime number.

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        System.out.println("Enter the number:");
        Scanner z=new Scanner(System.in);
        int num=z.nextInt();
        int count=0,count1=0;
        int prime=1;
        while(true) {
            for(int i=1;i<=prime;i++) {
                if(prime%i==0) {
                    count++;
                }
            }
            if(count==2) {
                count1++;
            }
            count=0;
            if(count1==num) {
                System.out.println(prime);
                break;
            }
            prime++;
        }

        z.close();
    }
}
```

o/p:
Enter the number :
4
7

ITERTATION :

num=4, count=0, count1=0, prime=1

while(true)

i=1   1<=1   1%1==0   count++ →1   i++ →2
i=2

                    count=0   prime++ →2

i=1   1<=2   2%1==0   count++ →1   i++ →2
i=2   2<=2   2%2==0   count++ →2   i++ →3
i=3

count==2
count1++ →1   count=0   prime++ →3

i=1   1<=3   3%1==0   count++ →1   i++ →2
i=2   2<=3   i++ →3
i=3   3<=3   3%3==0   count++ →2   i++ →4
i=4

count==2
count1++ →2   count=0   prime++ →4

i=1   1<=4   4%1==0   count++ →1   i++ →2
i=2   2<=4   4%2==0   count++ →2   i++ →3
i=3   3<=4   i++ →4
i=4   4<=4   4%4==0   count++ →3   i++ →5
i=5

                     count=0   prime++ →5

i=1   1<=5   5%1==0   count++ →1   i++ →2
i=2   2<=5   i++ →3
i=3   3<=5   i++ →4
i=4   4<=5   i++ →5
i=5   5<=5   5%5==0   count++ →2   i++ →6
i=6

count==2
count1++ →3   count=0   prime++ →6

i=1   1<=6   6%1==0   count++ →1   i++ →2
i=2   2<=6   6%2==0   count++ →2   i++ →3
i=3   3<=6   6%3==0   count++ →3   i++ →4
i=4   4<=6   i++ →5
i=5   5<=6   i++ →6
i=6   6<=6   6%6==0   count++ →4   i++ →7
i=7

                     count=0   prime++ →7

i=1   1<=7   7%1==0   count++ →1   i++ →2
i=2   2<=7   i++ →3
i=3   3<=7   i++ →4
i=4   4<=7   i++ →5

i=5	5<=7			i++ →6
i=6	6<=7			i++ →7
i=7	7<=7	7%7==0	count++ →2	i++ →8
i=8				

count==2
count1++ →4   count=0   count1==4   print(7)   break;

Q4. Write a program to print nth prime number based on position value
Input1 → 8
Input → 3
o/p → 17

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        System.out.println("Enter the number :");
        Scanner z=new Scanner(System.in);
        int num=z.nextInt();
        System.out.println("Enter the position :");
        int position=z.nextInt();
        int count=0,count1=0;
        int prime=num;
        while(true) {
            for(int i=1;i<=prime;i++) {
                if(prime%i==0) {
                    count++;
                }
            }
            if(count==2) {
                count1++;
            }
            count=0;
            if(count1==position) {
                System.out.println(prime);
                break;
            }
            prime++;
        }
        z.close();
    }
}
```

o/p:
Enter the number :
8
Enter the position :
3
17

Q5. Write a program to print n th Fibonacci last digit is prime or not.

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        System.out.println("Enter the heart rate :");
        Scanner z=new Scanner(System.in);
        int num=z.nextInt();
        int n1=0,n2=1,n3=0,count=1;
        int prime,check=0;

        while(count<=num) {
            n3=n1+n2;
            if(count==num) {
                System.out.print(n1+" ");
                prime=n1%10;
                for(int i=1;i<=prime;i++) {
                    if(prime%i==0) {
                        check++;
                    }
                }
                if(check==2) {
                    System.out.println("Prime number");
                }
                else {
                    System.out.println("Not a Prime number");
                }
            }

            count++;
            n1=n2;
            n2=n3;

        }
        z.close();
    }
}
```

o/p:
Enter the number :
11
55 prime number

Recursive function :

- **A function which is calling by itself is called as recursive function.**
- **Recursive function cannot be infinite, We get** `StackOverflowError.`
- **Comparing to looping statement recursive function is fastest.**

Stock program :

```java
public class Demo3 {

        static void m1() {
                System.out.println("hi m1");
                System.out.println("bye m1");
        }

        static void m2() {
                System.out.println("hi m2");
                m1();
                System.out.println("bye m2");
        }

        static void m3() {
                System.out.println("hi m3");
                m2();
                System.out.println("bye m3");
        }

        public static void main(String[] args) {
                System.out.println("hi main");
                m3();
                System.out.println("bye main");
        }

}
```
o/p:
hi main
hi m3
hi m2
hi m1
bye m1
bye m2
bye m3
bye main

e.g.,

i)
```java
import java.util.Scanner;

public class Demo3 {

    static void demo() {
        System.out.println("hi");
        demo();
    }
    public static void main(String[] args) {
        demo();
    }

}
```
o/p:
hi
hi
hi
hi
Exception in thread "main" java.lang.StackOverflowError

Q1. Write a program to print the sum of n numbers using recursive function.

```java
import java.util.Scanner;

public class Demo3 {

    static int sum;
    static int add(int n) {

        if(n>=1) {
            sum=sum+n;
            add(n-1);
        }

        return sum;
    }
    public static void main(String[] args) {
        Scanner z=new Scanner(System.in);
        int n=z.nextInt();

        System.out.println(add(n));
    }
}
```
o/p:
10
55

ii)

```
import java.util.Scanner;

public class Demo3 {

        static int demo(int n) {
                if(n==0) {
                        return 0;
                }
                else {
                        return n+demo(n-1);
                }

        }
        public static void main(String[] args) {
                Scanner z=new Scanner(System.in);
                System.out.println("Enter the number :");
                int n=z.nextInt();
                System.out.println(demo(n));
        }
}
```

o/p:
Enter the n number :
10
55

ITERATION :

```
add(0)          return 0
add(1)          return 1+add(1-1)
add(2)          return 2+add(2-1)
add(3)          return 3+add(3-1)
add(4)          return 4+add(4-1)
add(5)          return 5+add(5-1)
add(6)          return 6+add(6-1)
add(7)          return 7+add(7-1)
add(8)          return 8+add(8-1)
add(9)          return 9+add(9-1)
add(10)         return 10+add(10-1)
```

ARRAYS

- The group of data which has been stored in structural manner is called as structure or collection.

Homogenous:
- The collection of similar kind of data or Homogenous

    E.g.,
        10,20,30
        "hi"," hello"

Heterogeneous:
- The collection different kind of data is called as Heterogenous data.

    E.g.,
        105," hello", 6.5

* Array is collection of homogenous data.

Properties of Array:
- Array is used to save data in sequential manner.
- Array allows the duplicate data.
- Insertion order is maintained.
- Array is of index based.

Note:
- In java once we can declare the array Size it is not resizable.
- Array is mutable in java.
- In JAVA Array has been represented with [ ].
- We have **[ ] → 1 D array, [ ] [ ] → 2D array, [ ] [ ] [ ] → 3D Array.**
- In java array is not primitive data type **[** Array is the predefined class in java **].**

Declaration of an Array:
- Data_type[ ] Array_name; → int[ ] arr;
- Data_type Array_name[ ]; → int arr[ ];
- Data_type [ ]Array_name; → int [ ]arr;

Initialization of an Array:
- Array_name = new Data_type[**Size**]; → arr = new int[5] → Dynamic Array
- Array_name = {**Values** }; → arr = {10,20,30} → Static Array

arr

0	0	0	0	0

```
int[ ] arr = new int[5];
```

0 1 2 3 4
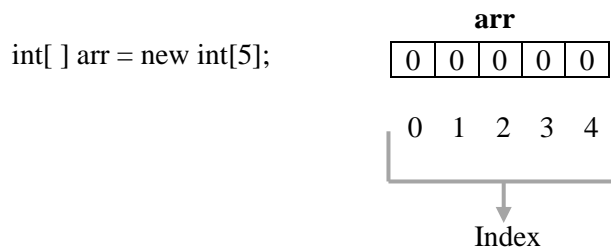
Index

Accessing the Array elements using index number:

➔ arr[0]

Reinitialization of array elements by using index values:

➔ Array_name[index No] = value;

arr[0]=10;

arr[3]=40;

E.g.,

```
public class Demo4 {
    public static void main(String[] args) {
        int[] arr=new int[5];
        System.out.println(arr[0]);
        System.out.println(arr[2]);
        System.out.println(arr[3]);
        System.out.println("===============");
        arr[0]=10;
        arr[2]=20;
        arr[3]=30;
        System.out.println(arr[0]);
        System.out.println(arr[2]);
        System.out.println(arr[3]);
    }
}
```

O/P:

0

0

0

================

10

20

30

Length:

- Predefined identifier.
- It is used to return length of size of the given array.
- Always the length **1** grater than last index number.
- We can calculate the last index number by (arr.length-1).
- **Syntax:**

Array_name.length;

E.g.,
i)
```
public class Demo4 {
      public static void main(String[] args) {
            int[] arr=new int[5];
            int n=arr.length;
            System.out.println(n);
            System.out.println(arr.length);
      }
}
```
o/p:
5
5

----

ii)

```
public class Demo4 {
      public static void main(String[] args) {
            int[] arr=new int[5];
            arr[0]=10;
            arr[1]=20;
            arr[2]=30;
            arr[3]=40;
            arr[4]=50;
            for(int i=0;i<arr.length;i++) {
            System.out.println("index no : "+i+" ; value : "+arr[i]);
            }
      }
}
```
o/p:
index no : 0 ; value : 10
index no : 1 ; value : 20
index no : 2 ; value : 30
index no : 3 ; value : 40
index no : 4 ; value : 50

ITERATION :

i=0	0<5→T	arr[0] →10	i++ →1
i=1	1<5→T	arr[1] →20	i++ →2
i=2	2<5→T	arr[2] →30	i++ →3
i=3	3<5→T	arr[3] →40	i++ →4
i=4	4<5→T	arr[4] →50	i++ →5
i=5	5<5→F		

----

iii)

```
public class Demo4 {
    public static void main(String[] args) {
        int[] arr=new int[5];
        int ele=0;

        for(int i=0;i<arr.length;i++) {
            ele+=10;
            arr[i]=ele;
        }

        for(int i=0;i<arr.length;i++) {
        System.out.println("index no : "+i+" ; value : "+arr[i]);
        }
    }
}
```

o/p:
index no : 0 ; value : 10
index no : 1 ; value : 20
index no : 2 ; value : 30
index no : 3 ; value : 40
index no : 4 ; value : 50

ITERATION :

i=0	0<5→T	ele=0+10	arr[0] =10	i++ →1
i=1	1<5→T	ele=10+10	arr[1] =20	i++ →2
i=2	2<5→T	ele=20+10	arr[2] =30	i++ →3
i=3	3<5→T	ele=30+10	arr[3] =40	i++ →4
i=4	4<5→T	ele=40+10	arr[4] =50	i++ →5
i=5	5<5→F			

_____

Q1. Write a java program by create a array by using user input.

```java
import java.util.Scanner;

public class Demo4 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        int size=ip.nextInt();
        int []a=new int[size];
        int c=0;
        System.out.println("\n");

        while(c<size) {
            System.out.print("Enter the number : ");
            a[c]=ip.nextInt();
            c++;
        }

        System.out.println("\n");
        for(int i=1;i<=size;i++) {
            System.out.println(i-1+" index number ; value is "+ a[i-1]);
        }

        ip.close();
    }
}
```

o/p:
the number of input going to enter : 7

Enter the number : 10
Enter the number : 20
Enter the number : 30
Enter the number : 40
Enter the number : 50
Enter the number : 60
Enter the number : 70

0 index number ; value is 10
1 index number ; value is 20
2 index number ; value is 30
3 index number ; value is 40
4 index number ; value is 50
5 index number ; value is 60
6 index number ; value is 70

Q2. Write a java program to reverse the array elements and print.

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {

        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");

        int size=ip.nextInt();
        int []a=new int[size];
        int c=0;

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

        while(c<size) {
            System.out.print("Enter the number : ");
            a[c]=ip.nextInt();
            c++;
        }

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

        for(int i=size-1;i>=0;i--) {
         System.out.println(i+" index number ; value is "+ a[i]);
        }

        ip.close();
    }
}
```
o/p:
the number of input going to enter : 5

Enter the number : 10
Enter the number : 20
Enter the number : 30
Enter the number : 40
Enter the number : 50

4 index number ; value is 50
3 index number ; value is 40
2 index number ; value is 30
1 index number ; value is 20
0 index number ; value is 10

Q3. Write a program to get sum of array elements.

```java
import java.util.Scanner;

public class Demo4 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        int size=ip.nextInt();
        int []a=new int[size];
        int c=0,sum=0;
        System.out.println("\n");
        while(c<size) {
            System.out.print("Enter the number : ");
            a[c]=ip.nextInt();
            c++;
        }
        System.out.println("\n");
        for(int i=0;i<size;i++) {
            sum=sum+a[i];
        }
        System.out.println("sum is : "+sum);
        ip.close();
    }
}
```

o/p:
the number of input going to enter : 5

Enter the number : 10
Enter the number : 20
Enter the number : 30
Enter the number : 40
Enter the number : 50

sum is : 150

ITERATION :
Sum=0

i=0	0<5→T	sum=0+10	i++ →1
i=1	1<5→T	sum=10+20	i++ →2
i=2	2<5→T	sum=30+30	i++ →3
i=3	3<5→T	sum=60+40	i++ →4
i=4	4<5→T	sum=100+50	i++ →5
i=5	5<5→F		

Q4. Write a program to print sum of even numbers in array.

```java
import java.util.Scanner;

public class Demo4 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        int size=ip.nextInt();
        int []a=new int[size];
        int c=0,sum=0;
        System.out.println("\n");
        while(c<size) {
            System.out.print("Enter the number : ");
            a[c]=ip.nextInt();
            c++;
        }
        System.out.println("\n");
        for(int i=0;i<size;i++) {
            if(a[i]%2==0) {
                sum=sum+a[i];
            }

        }
        System.out.println("sum is : "+sum);
        ip.close();
    }
}
```

O/P:

the number of input going to enter : 5

Enter the number : 1
Enter the number : 22
Enter the number : 33
Enter the number : 42
Enter the number : 51

Sum is : 64

ITERATION :

C=0, sum=0

		If(a[i]%2==0)	
i=0	0<5→T		i++ →1
i=1	1<5→T	sum=0+22	i++ →2
i=2	2<5→T		i++ →3
i=3	3<5→T	sum=22+42	i++ →4
i=4	4<5→T		i++ →5
i=5	5<5→F		

Q5. Write a program to get sum of array elements whether the number is prime number or Fibonacci number and Armstrong number.

```java
import java.util.Scanner;

public class Demo4 {
    public static int prime(int a) {
        int count = 0;
        for(int i=1;i<=a;i++) {
            if(a%i==0) {
                count++;
            }
        }
        if(count==2) {
            return a;
        }
        else {
            return 0;
        }

    }

    public static int fibonnaci(int a) {
        int n1=0,n2=1,n3=0;
        while(true) {
            n3=n1+n2;
            if(n1>=a) {
                if(n1==a) {
                    return a;
                }
                else {
                    return 0;
                }
            }
            n1=n2;
            n2=n3;
        }
    }

    public static int ArmStrongNo(int num) {
        int num1=num;
        int count=0;
        int sum=0;
        int rem=0;
        int pow=1;

        while(num!=0) {
            num/=10;
            count++;
        }

        num=num1;
        while(num!=0) {
            rem=num%10;
            for(int i=1;i<=count;i++) {
```

```
                    pow=pow*rem;
            }
            sum=sum+pow;
            pow=1;
            num/=10;

        }

        if(num1==sum)  {
            return num1;
        }
        else  {
            return 0;
        }

    }
    public static void main(String[] args)  {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        int size=ip.nextInt();
        int []a=new int[size];
        int c=0,primeSum=0,fibonnaciSum=0,armStrongNoSum=0;
        System.out.println("\n");
        while(c<size)  {
            System.out.print("Enter the number : ");
            a[c]=ip.nextInt();
            c++;
        }
        System.out.println("\n");
        for(int i=0;i<size;i++)  {
            primeSum=primeSum+prime(a[i]);
            fibonnaciSum=fibonnaciSum+fibonnaci(a[i]);
            armStrongNoSum=armStrongNoSum+ArmStrongNo(a[i]);
        }
        System.out.println("sum of prime number is : "+primeSum);
    System.out.println("sum of fibonnaci number is : "+fibonnaciSum);
  System.out.println("sum of Armstrong number is : "+armStrongNoSum);
        ip.close();
    }
}
```

o/p:
the number of input going to enter : 5

Enter the number : 13
Enter the number : 21
Enter the number : 34
Enter the number : 55
Enter the number : 153

sum of prime number is : 13
sum of fibonnaci number is : 123
sum of Armstrong number is : 153

Q6. Write a java program to replace each the array elements with its sum of factors.

```java
import java.util.Scanner;

public class Demo4 {
    public static int sumFactor(int num) {
        int sum=0;
        for(int i=1;i<=num;i++) {
            if(num%i==0) {
                sum=sum+i;
            }
        }
        return sum;
    }
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        int size=ip.nextInt();
        int []a=new int[size];
        for(int i=0;i<size;i++) {
            System.out.print("Enter the number : ");
            a[i]=ip.nextInt();
        }
        System.out.println("The original array value are");
        for(int k=0;k<size;k++) {
            System.out.print(a[k]+"  ");
        }
        for(int j=0;j<size;j++) {
            a[j]=sumFactor(a[j]);
        }
        System.out.println("\nThe sum of the factors of the each
elements are");
        for(int k=0;k<size;k++) {
            System.out.print(a[k]+"  ");
        }
        ip.close();
    }
}
```
o/p:
the number of input going to enter : 3
Enter the number : 12
Enter the number : 14
Enter the number : 18
The original array value are
12 14 18
The sum of the factors of the each elements are
28 24 39

Q7. Write a program to print the maximum and minimum elements in the array.

```java
import java.util.Scanner;

public class Demo4 {
    public static void prime(int a) {
        int count=0;
        for(int i=1;i<=a;i++) {
            if(a%i==0) {
                count++;
            }
        }
        if(count==2) {
            System.out.println(a+" is a prime number");
        }

    }

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        int size=ip.nextInt();
        int []a=new int[size];
        for(int i=0;i<size;i++) {
            System.out.print("Enter the number : ");
            a[i]=ip.nextInt();
        }

        int max=a[0];
        int min=a[0];
        for(int i=1;i<size;i++) {
            if(a[i]>=max) {
                max=a[i];
            }
            if(a[i]<=min) {
                min=a[i];
            }
        }
        System.out.println("maximum elements in the array is "+max);
        System.out.println("minimum elements in the array is  "+ min);

        ip.close();
    }
}
```

o/p:
the number of input going to enter : 5
Enter the number : 1
Enter the number : 1
Enter the number : 2
Enter the number : 2
Enter the number : 3
maximum elements in the array is 3
minimum elements in the array is 1

Q8. Write a program to check the sum of (maximum number and minimum number)is prime or not.

```java
import java.util.Scanner;

public class Demo4 {
    public static void prime(int a) {
        int count=0;

        for(int i=1;i<=a;i++) {
            if(a%i==0) {
                count++;
            }
        }

        if(count==2) {
            System.out.println(a+" is a prime number");
        }
        else {
            System.out.println(a+" is not a prime number");
        }
    }

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        int size=ip.nextInt();
        int []a=new int[size];
        int sum=0;

        for(int i=0;i<size;i++) {
            System.out.print("Enter the number : ");
            a[i]=ip.nextInt();
        }

        int max=a[0];
        int min=a[0];
        for(int i=1;i<size;i++) {
            if(a[i]>=max) {
                max=a[i];
            }

            if(a[i]<=min) {
                min=a[i];
            }
        }

        System.out.println("maximum elements in the array is "+max);
        System.out.println("minimum elements in the array is  "+ min);

        sum=min+max;
        prime(sum);

        ip.close();
    }
}
```

o/p:
the number of input going to enter : 5
Enter the number : 1
Enter the number : 2
Enter the number : 3
Enter the number : 4
Enter the number : 5
maximum elements in the array is 5
minimum elements in the array is 1
6 is not a prime number

Q9. Write a program to check the difference of (maximum number and minimum number) prime or not.

```java
import java.util.Scanner;

public class Demo4 {
    public static void prime(int a) {
        int count=0;
        for(int i=1;i<=a;i++) {
            if(a%i==0) {
                count++;
            }
        }
        if(count==2) {
            System.out.println(a+" is a prime number");
        }
        else {
            System.out.println(a+" is not a prime number");
        }
    }

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        int size=ip.nextInt();
        int []a=new int[size];
        int diff=0;
        for(int i=0;i<size;i++) {
            System.out.print("Enter the number : ");
            a[i]=ip.nextInt();
        }

        int max=a[0];
        int min=a[0];
        for(int i=1;i<size;i++) {
            if(a[i]>=max) {
                max=a[i];
            }
            if(a[i]<=min) {
                min=a[i];
            }
```

```
        }
    System.out.println("maximum elements in the array is "+max);
    System.out.println("minimum elements in the array is  "+ min);
        diff=max-min;
        prime(diff);

        ip.close();
    }
}
```
o/p:
the number of input going to enter : 6
Enter the number : 1
Enter the number : 2
Enter the number : 3
Enter the number : 4
Enter the number : 5
Enter the number : 6
maximum elements in the array is 6
minimum elements in the array is 1
5 is a prime number

Q10. Write a java program to replace the array elements with largest element towards its left side. otherwise replace with -1.

Test case:
[45,7,88,9,12,99]
o/p: [-1,45,-1,88,88,-1]

```java
import java.util.Scanner;

public class Demo3 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        int size=ip.nextInt();
        int []a=new int[size];
        int num=0,count=0;
        for(int i=0;i<size;i++) {
            System.out.print("Enter the number : ");
            a[i]=ip.nextInt();
        }
        int max=a[0];
        a[0]=-1;
        for(int i=1;i<size;i++) {
            if(max>a[i]) {
                a[i]=max;
            }
            else {
                max=a[i];
                a[i]=-1;
            }
        }
```

```
            }
            for(int i=0;i<size;i++) {
                System.out.println(a[i]);
            }
            ip.close();
        }
}
```

o/p:

the number of input going to enter : 6
Enter the number : 45
Enter the number : 7
Enter the number : 88
Enter the number : 9
Enter the number : 12
Enter the number : 99
-1
45
-1
88
88
-1

ITERATION :

max=45, a[0]= -1

i=1	1<6 →T	45>7 →T	a[1]=45		i++ →2
i=2	2<6 →T	45>88 →F	max=88	a[2]=-1	i++ →3
i=3	3<6 →T	88>9 →T	a[3]=88		i++ →4
i=4	4<6 →T	88>12 →T	a[4]=88		i++ →5
i=5	5<6 →T	88>99 →F	max=99	a[5]=-1	i++ →6
i=6	6<6 →F				

Q11. Write a java program to check sum of every element except maximum element is equal to sum of element.

```
import java.util.Scanner;

public class Demo3 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        int size=ip.nextInt();
        int []a=new int[size];
        int sum=0;
        for(int i=0;i<size;i++) {
            System.out.print("Enter the number : ");
            a[i]=ip.nextInt();
        }
        int max=a[0];
```

```java
            for(int i=0;i<size;i++) {
                if(a[i]>=max) {
                    max=a[i];
                }
            }
            for(int i=0;i<size;i++) {
                if(a[i]<max) {
                    sum=sum+a[i];
                }
            }
            if(max==sum) {
                System.out.println("equal");
            }
            else {
                System.out.println("not equal");
            }
            ip.close();
        }
    }
```

O/P:
the number of input going to enter : 7
Enter the number : 12
Enter the number : 4
Enter the number : 8
Enter the number : 9
Enter the number : 14
Enter the number : 11
Enter the number : 2
not equal

Q12. Write a java program to convert given number to binary format.

```java
import java.util.Scanner;

public class Test {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the number : ");
        int num=ip.nextInt();
        String s="";
        while(num>=1) {
            int rem=0;
            rem=num%2;
            s=rem+s;
            num/=2;
        }
        System.out.println(Integer.parseInt(s));
        ip.close();
    }
}
```

o/p:
Enter the number : 15
1111

String :

- String is sequence of collection of characters which is enclosed/encoded within " ".
- String class present in java.lang package.
- String is Non-primitive data type.
- String is immutable in nature.
- **Declaration and initialization of String.**
  - String s= "hello";
  - String s new String("hello");

Predefined function in String:

1) **equals( ) :**
   - This function is used to compare the value of the two String variable of object and return the Boolean value.
     - String s1= "hello";
     - String s2= "hello";
     - String s3= new String("hello");
     - String s4 = new String("hello");
     - System.out.println(s1==s2); → true
     - System.out.println(s1==s3); → false
     - System.out.println(s3==s4); → false
   - **Syntax:**
     Variable1 . equals(varialble2);

2) **charAt( ):**
   This function is used to return character at particular index position.
   E.g.,
   ```
   Public class StringDemo{
           Public static void main(String[] args){
                   String s= "hello";
                   System.out.println(s.charAt(2));
                   Char c= s.charAt(3);
                   int n=s.charAt(0);
           }
   }
   o/p:
   l
   ```
3) **length( ):**
   This function is used to return the length of the given String in integer format.
   E.g.,
   ```
   public class StringDemo{
           public static void main(String[] args){
                   String s = "hello";
                   System.out.println(s.length( ));
                   int n= s.length();
                   System.out.println(n);
           }
   }
   o/p:
   5
   ```

4) toLowerCase( ):

This function is used to convert the given String into lower Case and return it.
- **Syntax:**
  Variable . toLowerCase( );

5) toUpperCase( ):

This function is used to convert the given into upper Case and return it.
- **Syntax:**
  Variable . toUpperCase( );

E.g.,
i)

```
Public class StringDemo{
    Public static void main(String[] args){
            String s= "HeLLo";
            System.out.println(s.toLowerCase());
            System.out.println(s);
            System.out.println("==========");
            System.out.println(s.toUpperCase());
            System.out.println(s);
            char c = "bye".charAt(0);
            System.out.println(c);
    }
}
```
o/p:
hello
HeLLo
HELLO
HeLLo
b

```
ii) public class StringDemo{
        public static void main(String[] args){
                Scanner ip=new Scanner(System.in);
                System.out.println("Enter the char :");
                Char c=ip.next().charAt(0);
                System.out.println(c);
        }
}
```
o/p:
Enter the char :
G
G

Q1. Write a program to get the char from the user whether the character is belonged to numeric alphabet or special character.

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the character : ");
        char c=ip.next().charAt(0);
        if(c>='A' && c<='Z' || c>='a' && c<='z') {
            System.out.println("alphabet character");
        }
        else if(c>='0' && c<='9') {
            System.out.println("numeric character");
        }
        else {
            System.out.println("special character");
        }
        ip.close();
    }
}
```
o/p:
enter the character : /
special character

Q2. Write a program to print nearest vowel.
Test case : input → b
       o/p: → a
test case : input → a
       o/p: → a
test case : input → c
       o/p: → e

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the character a to z : ");
        char a1=ip.next().charAt(0);

        if(a1>='a' && a1<'c') {
            System.out.println("\nThe nearest vowel is "+'a');
        }
        else if(a1>='c' && a1 <'g') {
            System.out.println("\nThe nearest vowel is "+'e');
        }
```

```
        else if(a1>='g' && a1 < 'l') {
          System.out.println("\nThe nearest vowel is "+'i');
        }
        else if(a1>='l' && a1<'r') {
          System.out.println("\nThe nearest vowel is "+'o');
        }
        else if(a1>='r' && a1<='z') {
          System.out.println("\nThe nearest vowel is "+'u');
        }
        else {
          System.out.println("\nplease enter the valid input");
        }
          ip.close();
      }
}
```

o/p:

Enter the character a to z : y

The nearest vowel is u

Q3. Write a program to print the reverse of name.

```
import java.util.Scanner;

public class Demo3 {

      public static void main(String[] args) {
            Scanner ip=new Scanner(System.in);
            System.out.print("the number of input going to enter : ");
            String name=ip.next();

            for(int i=name.length()-1;i>=0;i--) {
                  System.out.print(name.charAt(i));
            }
            ip.close();
      }
}
```

o/p:

the number of input going to enter : sridharan
narahdirs

Q4. Write a program to check whether the string is palindrome or not.

```java
import java.util.Scanner;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        String name=ip.next();
        String rev="";

        for(int i=name.length()-1;i>=0;i--) {
            rev=rev+name.charAt(i);
        }

        if(name.equalsIgnoreCase(rev))
        {
            System.out.println("palindrome");
        }
        else
        {
            System.out.println("not a palindrome");
        }
        ip.close();
    }
}
```

o/p:
the number of input going to enter : madam
palindrome

**ITERATION :**

name=madam, rev= "";

i=4	4>=0 →T	rev=rev+m	i-- →3
i=3	3>=0 →T	rev=m+a	i-- →2
i=2	2>=0 →T	rev=ma+d	i-- →1
i=1	1>=0 →T	rev=mad+a	i-- →0
i=0	0>=0 →T	rev=mada+m	i-- →-1
i=-1	-1>=0 →F		

rev=madam

Q5. Write a program to check how many alphabets, numeric, and special character are present in a given String.

```java
import java.util.Scanner;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        String name=ip.nextLine();
        int countalpha=0,countnum=0,countspe=0;

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

            char ch=name.charAt(i);

            if((ch>='a' && ch<='z') || (ch>='A' && ch<='Z') ) {
                countalpha++;
            }
            else if(ch>='0' && ch<='9') {
                countnum++;
            }
            else {
                countspe++;
            }
        }

        System.out.println("number of alphabet        : "+countalpha);
        System.out.println("number of numeric         : "+countnum);
        System.out.println("number of special character: "+countspe);
        ip.close();
    }
}
```

o/p:
the number of input going to enter : Sridharan143@^^^
number of alphabet   : 9
number of numeric   : 3
number of special character : 4

Q6. Write a program to print number of vowels present int the given name.

```java
import java.util.Scanner;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the String : ");
        String name=ip.nextLine().toLowerCase();
        int countvowel=0;
        for(int i=0;i<name.length();i++) {
            char ch=name.charAt(i);
            if(ch=='a' || ch=='e'||ch=='i'||ch=='o'||ch=='u') {
            countvowel++;
            }
        }
        System.out.println("number of vowel : "+countvowel);

        ip.close();
    }
}
```
o/p:
enter the String : Imran Khan
number of vowel : 3

Q7. Write a program to print vowels which are not present in a string (in case all the vowels present just print as present.

```java
import java.util.Scanner;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("the number of input going to enter : ");
        String name=ip.nextLine().toLowerCase();
        int a=0,e=0,i=0,o=0,u=0;

        for(int j=0;j<name.length();j++) {
            char ch=name.charAt(j);
            if(ch=='a') {
                a++;
            }
            else if(ch=='e') {
                e++;
            }
            else if(ch=='i') {
                i++;
            }
            else if(ch=='o') {
                o++;
            }
            else if(ch=='u') {
                u++;
            }
```

```
                }
                if(a!=0 && e!=0 && i!=0 && o!=0 && u!=0) {
                        System.out.println("present");
                }
                else {
                        if(a==0) {
                                System.out.print('a');
                        }
                        if(e==0) {
                                System.out.print('e');
                        }
                        if(i==0) {
                                System.out.print('i');
                        }
                        if(o==0) {
                                System.out.print('o');
                        }
                        if(u==0) {
                                System.out.print('u');
                        }

                }
                ip.close();
        }
}
```

o/p:

Enter the String : SridharaN

Eou

Q8. Write a program to print the sum of the numeric in the String.

```
import java.util.Scanner;

public class Demo3 {

        public static void main(String[] args) {
                Scanner ip=new Scanner(System.in);
                System.out.print("Enter the String : ");
                String name=ip.nextLine().toLowerCase();
                int sum=0;

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

                        char ch=name.charAt(i);
                        if(ch>='0' && ch<='9') {
                                sum=sum+(ch-48);
                        }
                }
                System.out.println(sum);
                ip.close();
        }
}
```

                _(or)_

```java
import java.util.Scanner;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String name=ip.nextLine().toLowerCase();
        int sum=0;

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

            char ch=name.charAt(i);
            if(ch=='0') {
                sum=sum+0;
            }
            else if(ch=='1') {
                sum=sum+1;
            }
            else if(ch=='2') {
                sum=sum+2;
            }
            else if(ch=='3') {
                sum=sum+3;
            }
            else if(ch=='4') {
                sum=sum+4;
            }
            else if(ch=='5') {
                sum=sum+5;
            }
            else if(ch=='6') {
                sum=sum+6;
            }
            else if(ch=='7') {
                sum=sum+7;
            }
            else if(ch=='8') {
                sum=sum+8;
            }
            else if(ch=='9') {
                sum=sum+9;
            }
        }
        System.out.println(sum);
        ip.close();
    }
}
```
o/p:
Enter the String : hello12 @hi77
17

Q9. Write a program to print if the character of String is lower alphabet convert into upper character and upper character into lower character.

```
import java.util.Scanner;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String name=ip.nextLine();
        String name1="";

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

            char ch=name.charAt(i);
            if(ch>='A' && ch<='Z') {
                name1=name1+(char)(ch+32);
            }
            else if(ch>='a' && ch<='z') {
                name1=name1+(char)(ch-32);
            }
            else {
                name1=name1+ch;
            }
        }
        System.out.println(name1);
        ip.close();
    }
}
```
o/p:
Enter the String : hi 12@HellO BYe$
HI 12@hELLo byE$

Q10. Write a program to print the reverse the alphabet alone else as it is.
Input → R85DB&DS##J
O/P: → J85SG&BD##R

Input → 12#AC&KL
O/p: → 12#LK&CA


```java
import java.util.Scanner;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        String s1="";
        String s2="";
        int a=0;
        for(int i=0;i<s.length();i++) {
            char c=s.charAt(i);
            if((c>='a' && c<='z') || (c>='A' && c<='Z')) {
                s1=c+s1;
            }
        }

        for(int i=0;i<s.length();i++) {
            char c=s.charAt(i);
            if((c>='a' && c<='z')||(c>='A' && c<='Z')) {
                s2=s2+s1.charAt(a);
                a++;
            }
            else {
                s2=s2+c;
            }
        }
        System.out.println(s2);
        ip.close();
    }
}
```
o/p:
Enter the character String : R85DB&DS##J
J85SD&BD##R

Q11. Write a program to print the unique character in the String space is not included.

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        String s1="";

        for(int i=0;i<s.length();i++) {
            int count=0;
            char c =s.charAt(i);
            for(int j=0;j<s.length();j++) {
                if(c==s.charAt(j)) {
                    count++;
                }
            }
            if(count==1 && c!=' ') {
                s1=s1+c;
            }
        }
        System.out.println(s1);
        ip.close();
    }
}
```
o/p:
Enter the String : hi hello bye
ioby

Q12. Write a program to print character in the given pattern.
Input → hello
o/p:
hh he hl hl ho
eh ee el el eo
lh le ll ll lo
lh le ll ll lo
oh oe ol ol oo

```java
import java.util.Scanner;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        for(int i=0;i<s.length();i++) {
            for(int j=0;j<s.length();j++) {
                System.out.print(s.charAt(i)+""+s.charAt(j)+" ");
            }
            System.out.println("");
```

```
            }
            ip.close();
        }
    }
```

o/p:

Enter the String : hello

hh he hl hl ho

eh ee el el eo

lh le ll ll lo

lh le ll ll lo

oh oe ol ol oo

Q13. Write a program to print unique element in array.

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the type of array : ");
        String type=ip.next();

        if(type.equalsIgnoreCase("character")) {
        System.out.print("Enter the Size of array : ");
            Integer size=ip.nextInt();
        char[] a=new char[size];

            for(int i=0;i<size;i++) {
              System.out.print("Enter the array element : ");
              a[i]=ip.next().charAt(0);
            }

            for(int i=0;i<size;i++) {
              Integer count=0;
              for(int j=0;j<size;j++) {
                    if(a[i]==a[j]) {
                    count++;
                    }

              }
              if(count==1) {
                    System.out.print(a[i]+"\t");
              }
            }
        }
        else if(type.equalsIgnoreCase("Integer")) {
          System.out.print("Enter the Size of array : ");
            Integer size=ip.nextInt();
          int [] a=new int[size];

            for(int i=0;i<size;i++) {
              System.out.print("Enter the array element : ");
              a[i]=ip.nextInt();
            }
```

```
                    for(int i=0;i<size;i++) {
                      Integer count=0;
                      for(int j=0;j<size;j++) {
                            if(a[i]==a[j]) {
                            count++;
                            }
                      }
                      if(count==1) {
                            System.out.print(a[i]+"\t");
                      }
                    }
              }
              else if(type.equalsIgnoreCase("Decimal")) {
                System.out.print("Enter the Size of array : ");
                    Integer size=ip.nextInt();
                double [] a=new double[size];

                    for(int i=0;i<size;i++) {
                      System.out.print("Enter the array element : ");
                      a[i]=ip.nextDouble();
                    }

                    for(int i=0;i<size;i++) {
                      Integer count=0;
                      for(int j=0;j<size;j++) {
                            if(a[i]==a[j]) {
                            count++;
                            }
                      }
                      if(count==1) {
                            System.out.print(a[i]+"\t");
                      }
                    }
              }
              else {
                System.out.println("Please Enter The Valid Array Type");
              }

                ip.close();
          }
}
```

o/p:
Enter the type of array : character
Enter the Size of array : 5
Enter the array element : s
Enter the array element : w
Enter the array element : s
Enter the array element : w
Enter the array element : r
r

Q14. Write a program to print duplicate elements in String.
Input → "hello"
o/p   → l

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        String s1="";


        for(int i=0;i<s.length();i++) {
          int count=0;
          char c =s.charAt(i);
          for(int j=0;j<s.length();j++) {
              if(c==s.charAt(j)) {
                      count++;
              }
          }
          if(count>1) {
                  s1=s1+c;
          }
        }

        char []a=new char[s1.length()];
        char []b=new char[s1.length()];

        for(int i=0;i<s1.length();i++) {
          a[i]=s1.charAt(i);
          b[i]=s1.charAt(i);
        }

        for(int i=0;i<s1.length();i++) {
          Integer count=0;
          for(int j=0;j<s1.length();j++) {
              if(a[i]==b[j]) {
                      count++;
                      b[j]='`';
              }
          }
          if(count>1) {
                  System.out.println(a[i]);
          }

        }
          ip.close();
    }
}
```
o/p:
Enter the String : hello
l

Q15. Write a program to convert string into character of arrays.

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();

        char []a=new char[s.length()];

        for(int i=0;i<s.length();i++) {
          a[i]=s.charAt(i);

        }

        for(int i=0;i<s.length();i++) {
          System.out.println(a[i]);

        }
          ip.close();
    }
}
```

                (or)


```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();

        char []a=s.toCharArray();
        for(int i=0;i<s.length();i++) {
          System.out.println(a[i]);

        }
          ip.close();
    }
}
```
o/p:
Enter the String : hello
h
e
l
l
o

Q16. Write a program to print the characters count.

```java
import java.util.Scanner;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        char[] arr=s.toCharArray();
        char[] arr1= s.toCharArray();
        for(int i=0;i<arr.length;i++) {
            int c=0;
            for(int j=0;j<arr1.length;j++) {
                if(arr[i]==arr1[j]) {
                    c++;
                    arr1[j]='\0';
                }

            }
            if(c>0) {
                System.out.println(arr[i]+"-"+c);
            }
        }
    }
}
```
o/p:
Enter the String : hello
h-1
e-1
l-2
o-1

Q17. Write a program to print the sum of duplicate elements.
[10,30,2,4,10,30]

Sum → 10+30 → 40

```java
import java.util.Scanner;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the Size : ");
        int size=ip.nextInt();
        int []a=new int[size];

        for(int i=0;i<size;i++) {
            System.out.print("Enter the array element : ");
            a[i]=ip.nextInt();
```

```
                }
                int sum=0;
                for(int i=0;i<size;i++) {
                        int count=0,temp=a[i];
                        for(int j=i+1;j<size;j++) {
                                if(a[i]==a[j]) {
                                        count++;
                                }
                        }
                        if(count==1) {
                                sum=sum+temp;
                        }
                }
                System.out.println(sum);
                ip.close();
        }
}
```
o/p:

Enter the Size : 6
Enter the array element : 10
Enter the array element : 30
Enter the array element : 2
Enter the array element : 4
Enter the array element : 10
Enter the array element : 30
40

Q18. Write a program to print the sum of unique elements.
[10,30,2,4,10,30]

Sum → 2+4 → 6

```
import java.util.Scanner;

public class Demo3 {

        public static void main(String[] args) {
                Scanner ip=new Scanner(System.in);
                System.out.print("Enter the Size : ");
                int size=ip.nextInt();
                int []a=new int[size];

                for(int i=0;i<size;i++) {
                        System.out.print("Enter the array element : ");
                        a[i]=ip.nextInt();
                }

                int sum=0;
                for(int i=0;i<size;i++) {
                        int count=0;
                        for(int j=0;j<size;j++) {
                                if(a[i]==a[j]) {
```

```
                                        count++;
                            }
                    }
                    if(count==1) {
                            sum=sum+a[i];
                    }
            }
            System.out.println(sum);
            ip.close();
        }
}
```

o/p:

Enter the Size : 6
Enter the array element : 10
Enter the array element : 30
Enter the array element : 2
Enter the array element : 4
Enter the array element : 10
Enter the array element : 30
6

Q19. Write a program to print the sum of numeric numbers.
Input → "hello 120 bye 355 welcome 24"
Output → 120+355+24 → 499

```
import java.util.Scanner;

public class Demo3 {

        public static void main(String[] args) {
                Scanner ip=new Scanner(System.in);
                System.out.print("Enter the String : ");
                String s=ip.nextLine();
                int sum=0,iteration=0;
                for(int i=iteration;i<s.length();i++) {
                        int no=0;
                        for(int j=iteration;j<s.length();j++) {
                                char c=s.charAt(j);
                                iteration++;
                                if(c>='0' && c<='9') {
                                        no=(no*10)+(int)(c-48);
                                }
                                else {
                                        break;
                                }
                        }
                        sum=sum+no;
                }
                System.out.println("sum "+sum);
                ip.close();
        }
}
```

o/p:

Enter the String : hello 120 bye 355 welcome24
sum : 499

Q20. Write a program to print balanced and unbalanced.
String → "()()()"
o/p: → balanced

string → "))))((("
o/p: → unbalanced

string → "))()()("
o/p: → unbalanced

string → "(())()(())"
o/p: → balanced

```java
import java.util.Scanner;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        int fc=1,bc=-fc;
        for(int i=0;i<s.length()/2;i++) {
            char c=s.charAt(i);
            if(c=='(') {
                fc++;
            }
            else {
                fc--;
            }
        }

        for(int i=s.length()/2;i<s.length();i++) {
            char c=s.charAt(i);
            if(c==')') {
                bc--;
            }
            else {
                bc++;
            }
        }

        if(fc== -(bc)) {
            System.out.println("balanced");
        }
        else {
            System.out.println("unbalanced");
        }
        ip.close();
    }
}
```

(or)

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

public class Test {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.next();
        int count=0;
        char[] c=s.toCharArray();
        for(int i=0;i<c.length;i++) {
            if(c[i]=='(') {
                for(int j=i+1;j<c.length;j++) {
                    if(c[j]==')') {
                        c[j]='\0';
                        count++;
                    }
                }
            }
        }
        if(count==s.length()/2 && s.length()%2==0) {
            System.out.println("balanced");
        }
        else {
            System.out.println("unbalanced");
        }
        ip.close();
    }
}
```
o/p:
Enter the String :))))((((
unbalanced

Q21. Write a java program for all type of brackets to print balanced and unbalanced.

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        int fc=0,bc=0;
        for(int i=0,j=s.length()/2;i<s.length()/2 && j<s.length();i++,j++) {
            char c=s.charAt(i);
            if(c=='(' || c=='{' || c=='[' || c=='<') {
                fc++;
            }
            else {
                fc--;
            }
            char c1=s.charAt(j);
            if(c1==')' || c1=='}' || c1==']' || c1=='>') {
                bc++;
            }
```

```java
                else {
                        bc--;
                }
        }
        if(fc== bc) {
                System.out.println("balanced");
        }
        else {
                System.out.println("unbalanced");
        }
        ip.close();
    }
}
```

(or)

```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.next();
        int count=0;
        char[] c=s.toCharArray();
        for(int i=0;i<c.length;i++) {
                if(c[i]=='(' || c[i]=='{' || c[i]=='[' || c[i]=='<') {
                        for(int j=i+1;j<c.length;j++) {
                if(c[j]==')' || c[j]=='}' || c[j]==']' || c[j]=='>') {
                                        c[j]='\0';
                                        count++;
                        }
                    }
                }
        }
        if(count==s.length()/2 && s.length()%2==0) {
                System.out.println("balanced");
        }
        else {
                System.out.println("unbalanced");
        }
        ip.close();
    }
}
```
o/p:
Enter the String : {[}](<>)
balanced

Q22. Write a program to print number of words in the String.

```java
import java.util.Scanner;
public class Demo3 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        int count=1;
        for(int i=0;i<s.length();i++) {
            char c=s.charAt(i);
            if(c==' ') {
                count++;
            }
        }
        System.out.println(count);
        ip.close();
    }
}
```
o/p:
Enter the String : hello hi bye welcome
4

Q23. Write a program to remove the extra space in the given String.

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        String s1=""+s.charAt(0);

        for(int i=1;i<s.length();i++) {
            char c=s.charAt(i);
            if(c!=' ' && s.charAt(i-1)==' ') {
                s1=s1+' '+c;
            }
            else if(c!=' ') {
                s1=s1+c;
            }
        }

        System.out.println(s1);
        ip.close();
    }
}
```
o/p:
Enter the String : hello   hi   bye
hello hi bye

Q24. Write a program to print all the word in array form of the String.

```
import java.util.Scanner;

public class Demo3 {
        public static void main(String[] args) {
                Scanner ip=new Scanner(System.in);
                System.out.print("Enter the String : ");
                String s=ip.nextLine();
                int count=1;
                String s1="";
                int z=0;

                for(int i=0;i<s.length();i++) {
                        char c=s.charAt(i);
                        if(c==' ') {
                                count++;
                        }
                }

                String[] arr=new String[count];

                for(int i=0;i<s.length();i++) {
                        char c=s.charAt(i);
                        if(c==' ') {
                                arr[z]=s1;
                                z++;
                                s1="";
                        }
                        else if(c!=' ') {
                                s1=s1+c;
                        }
                }

                arr[z]=s1;

                for(int i=0;i<arr.length;i++) {
                        System.out.println(arr[i]);
                }
                ip.close();
        }
}
```

                                (or)


```
import java.util.Scanner;

public class Demo1 {

        public static void main(String[] args) {
                Scanner ip=new Scanner(System.in);
                System.out.print("enter the string : ");
                String s=ip.nextLine();
                String[] arr=s.split(" ");
```

```
            for(int i=0;i<arr.length;i++) {
                    System.out.println(arr[i]);
            }
            ip.close();
        }
}
```

o/p:
Enter the String : hello hi bye
hello
hi
bye

Q25. Write a program to print the given problem. Print the largest length of the word.
Input → "hello hi hi bye hello welcome"
o/p:
Hello-2
Hi-2
Bye-1
Welcome-1
======================
Welcome

```
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        int count=1;
        String s1="";
        int z=0;
        for(int i=0;i<s.length();i++) {
            char c=s.charAt(i);
            if(c==' ') {
                count++;
            }
        }
        String[] arr=new String[count];
        String[] arr1=new String[count];

        for(int i=0;i<s.length();i++) {
            char c=s.charAt(i);
```

```java
                    if(c==' ') {
                        arr[z]=s1;
                        arr1[z]=s1;
                        z++;
                        s1="";
                    }
                    else if(c!=' ') {
                        s1=s1+c;
                    }
            }
            arr[z]=s1;
            arr1[z]=s1;

            for(int i=0;i<arr.length;i++) {
                int count2=0;
                for(int j=0;j<arr1.length;j++) {
                    if(arr[i].equalsIgnoreCase(arr1[j])) {
                        count2++;
                        arr1[j]="/0";
                    }
                }
                if(count2>0) {
                    System.out.println(arr[i]+" "+count2);
                }
            }

            String max=arr[0];
            for(int i=1;i<arr.length;i++) {
                String temp=arr[i];
                if(temp.length()>max.length()) {
                    max=arr[i];
                }
            }
            System.out.println(max);

            ip.close();
        }
    }
}
```

o/p:

Enter the String : hello hi hi bye hello welcome
hello 2
hi 2
bye 1
welcome 1
======================
welcome

Q26. Write a program to print the length of the string without using length().
Input: → "hello hi"
o/p: → 8

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

```java
public class Demo4 {

    public static void check(String s) {
        int i=0;
        try {
            while(true) {
                s.charAt(i);
                i++;
            }
        }
        catch(StringIndexOutOfBoundsException a){
            System.out.println("length of the String : "+i);
        }
    }
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        check(s);
        ip.close();
    }
}
```

o/p:
Enter the String : hello hi bye
length of the String : 12

Q27. Write a program to print the length of the array without using length function.

```java
import java.util.Scanner;


public class Demo1 {


    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the array size : ");
        int size=ip.nextInt();
        int []arr=new int[size];
        for(int i=0;i<size;i++) {
            System.out.print("Enter the element : ");
            arr[i]=ip.nextInt();
        }
        int len=0;
        for(int ele:arr) {
            len++;
        }
        System.out.println(len);
        ip.close();
    }
}
```
o/p:
enter the array size : 4
Enter the element : 1
Enter the element : 2
Enter the element : 3
Enter the element : 4
4

Q28. Write a program to print the length of the String without using length function.

```java
import java.util.Scanner;


public class Demo1 {


    public static void main(String[] args) {
            Scanner ip=new Scanner(System.in);
            System.out.print("enter the string : ");
            String s=ip.nextLine();

            char []arr=s.toCharArray();

            int len=0;
            for(int ele:arr) {
                len++;
            }
            System.out.println("length : "+len);
            ip.close();
    }
}
```

(or)

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
            Scanner ip=new Scanner(System.in);
            System.out.print("enter the string : ");
            String s=ip.nextLine();

            int i=0;
            try {
                for(i=0;s.charAt(i)!=0;i++);
            }
            catch(Exception e) {
                System.out.println("length : "+i);
            }
            ip.close();
    }
}
```

o/p:
enter the string : hello
length : 5

Q29. Write a program to print the largest length of the word in the given String.

```java
import java.util.Scanner;

public class Demo1 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        String s=ip.nextLine();
        String[] arr=s.split(" ");
        int max=arr[0].length();
        String ans=arr[0];
        for(String ele:arr) {
            if(max<ele.length()) {
                max=ele.length();
                ans=ele;
            }
        }
        System.out.println(ans);
        ip.close();
    }
}
```

o/p:

enter the string : hello hi bye welcome

welcome

Q30. Write a program to print the reverse the array and given the new array.

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        String s=ip.nextLine();
        String[] arr=s.split(" ");
        String[] arr1=new String[arr.length];
        int z=arr.length-1;

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

            arr1[z]=arr[i];
            z--;
        }
        for(int i=0;i<arr1.length;i++) {
            System.out.println(arr1[i]);
        }
        ip.close();
    }
}
```

o/p:

enter the string : hello hi bye

bye

hi

hello

Q31. Write a program to print the array in the given order.
Input → **hello hi bye welcome**
Output → **hello ih bye emoclew**

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        String s=ip.nextLine();
        String[] arr=s.split(" ");
        String[] arr1=s.split(" ");
        String z="";

        for(int i=0;i<arr1.length;i++) {
            if(i%2==0) {
                continue;
            }
            else {
                for(int j=0;j<arr1[i].length();j++) {

                    char c=arr[i].charAt(j);
                    z=c+z;
                }
                arr1[i]=z;
                z="";
            }
        }

        System.out.print("[ ");

        for(int i=0;i<arr1.length;i++) {

            if(i!=arr1.length-1) {
                System.out.print(arr1[i]+", ");
            }
            else {
                System.out.print(arr1[i]);
            }
        }
        System.out.println(" ]");
        ip.close();

    }
}
```
o/p:
enter the string : hello hi bye welcome
[hello, ih, bye, emoclew]

Q32. Write a program to print the String by removing both side of the character alternatively.
Input → combination
Output :
Combination
combinatio
ombinatio
ombinati
mbinati
mbinat
binat
bina
ina
in
n


```java
import java.util.Scanner;
public class Demo3 {
      public static void main(String[] args) {
            Scanner ip=new Scanner(System.in);
            System.out.print("enter the string : ");
            String s=ip.nextLine();
            int r=s.length();
            int l=0;
            for(int i=0;i<s.length();i++) {
                  if(i%2==0) {
                        r--;
                  }
                  else {
                        l++;
                  }
                  String s2="";
                  for(int j=l;j<r;j++) {
                        s2=s2+s.charAt(j);
                  }
                  System.out.println(s2);
            }
            ip.close();
      }
}
```
o/p:
enter the string : combination
combinatio
ombinatio
ombinati
mbinati
mbinat
binat
bina
ina
in
n

Q33. Write a program to print the given pattern.
i/p: → knowledge
o/p: → ledgewonk

```java
import java.util.Scanner;

public class Demo1 {
      public static void main(String[] args) {
            Scanner ip=new Scanner(System.in);
            System.out.print("enter the string : ");
            String s=ip.nextLine();
            String s1="";
            for(int i=s.length()/2;i<s.length();i++) {
                  s1=s1+s.charAt(i);
            }
            for(int i=s.length()/2-1;i>=0;i--) {
                  s1=s1+s.charAt(i);
            }
            System.out.println(s1);
            ip.close();
      }
}
```

(or)

ii)without using length():

```java
import java.util.Scanner;

public class Demo1 {
      public static void main(String[] args) {
            Scanner ip=new Scanner(System.in);
            System.out.print("enter the string : ");
            String s=ip.nextLine();
            String s1="";
            int len = 0;
            try {

                  for(int i=0;s.charAt(i)!='\0';i++) {
                        len++;
                  }
            }
            catch(Exception e) {

            }
            for(int i=len/2;i<len;i++) {
                  s1=s1+s.charAt(i);
            }
            for(int i=len/2-1;i>=0;i--) {
                  s1=s1+s.charAt(i);
            }
            System.out.println(s1);
            ip.close();
      }
}
```

o/p:
enter the string : knowledge
ledgewonk

Regular Expression (regex) :

- Regular expression is pre-defined API which is present in java.util package.
- regex → regex is mainly used to
    - Pattern matching
    - Email validation
    - Password validation

Character Expression in regex:

i.	·	→ Single character
ii.	[A-Z]	→ cap Alpha
iii.	[a-z]	→ small Alpha
iv.	[A-Z, a-z]	→ Alpha
v.	[0-9]	→ Numbered

Ranges :

- * → power[0 – n]
  e.g., .* → n number of any characters.
- [a-z]* → number of small alpha
- {static range} → range of number.
  e.g., [a-z]{4} → Alpha range must 4 characters.
- { start point, end point }
  e.g., [a-z]{4}{7} → minimum-4 & maximum-7 range.

Regex → how to write

- Import regex.
- Pattern & compile

  Pattern p=Pattern.compile(" A.*");
- Pattern must be matched with string.

  Matcher m=p.matcher(str);
  Boolean ans=m.matches();

Q1. Write a program to satisfy the condition.
i)A or a first character.
ii)abc.
iii)last character z.

```java
import java.util.*;
import java.util.regex.Matcher;
import java.util.regex.Pattern;

public class Demo3 {
      public static void main(String[] args) {
              Scanner ip=new Scanner(System.in);
              System.out.print("enter the string : ");
              String s=ip.nextLine();
              Pattern p=Pattern.compile("[A||a].*[abc,ABC].*z");
              Matcher m=p.matcher(s);
              boolean res=m.matches();
              System.out.println("Res   :"+res);
              Pattern p1=Pattern.compile("[A,a].*abc.*z");
              Matcher m1=p1.matcher(s);
              boolean res1=m1.matches();
              System.out.println("Res1   :"+res1);
              ip.close();
      }
}
```

o/p:
enter the string : acbabcz
Res :true
Res1 :true

Q2. Write a program to check the string having only alphabet and length should be 6.

```java
import java.util.*;
import java.util.regex.Matcher;
import java.util.regex.Pattern;

public class Demo3 {
     public static void main(String[] args) {
             Scanner ip=new Scanner(System.in);
             System.out.print("enter the string : ");
             String s=ip.nextLine();
             if(s.length()<=6) {
                    Pattern p=Pattern.compile("[A-Z,a-z]{6}");
                    Matcher m=p.matcher(s);
                    boolean res=m.matches();
                    System.out.println("Res   :"+res);
             }
             ip.close();
     }
}
```
o/p:
enter the string : asdfgh
Res :true

Q3. Write a program to check the string not

```java
import java.util.*;
import java.util.regex.Matcher;
import java.util.regex.Pattern;

public class Demo3 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        String s=ip.nextLine();
        Pattern p=Pattern.compile("[A-Z,a-z]{4}[0-9]{6}");
        Matcher m=p.matcher(s);
        boolean res=m.matches();
        System.out.println("Res  :"+res);
        ip.close();
    }
}
```
o/p:
enter the string : HELLO456123
Res :false

Q4. Write a program to check the given string first letter should not be alphabet.

```java
import java.util.*;
import java.util.regex.Matcher;
import java.util.regex.Pattern;

public class Demo3 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        String s=ip.nextLine();
        Pattern p=Pattern.compile("[^A-Z,a-z].*");
        Matcher m=p.matcher(s);
        boolean res=m.matches();
        System.out.println("Res  :"+res);
        ip.close();
    }
}
```
o/p:
enter the string : $abcd1123
Res :true

Q5. Write a program to check the given String is alpha 4-6 and numeric 6-8.

```java
import java.util.*;
import java.util.regex.Matcher;
import java.util.regex.Pattern;

public class Demo3 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        String s=ip.nextLine();
        Pattern p=Pattern.compile("[A-Z,a-z]{4,6}[0-9]{6,8}");
        Matcher m=p.matcher(s);
        boolean res=m.matches();
        System.out.println("Res  :"+res);
        ip.close();
    }
}
```
o/p:
enter the string : hello123445
Res :true

Q6. Write a program to validate the given phone number.
        Note : phone number starts with 6,7,8,9.

```java
import java.util.*;
import java.util.regex.Matcher;
import java.util.regex.Pattern;

public class Demo3 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        String s=ip.nextLine();
        Pattern p=Pattern.compile("[6-9]{1}[0-9]{9}");
        Matcher m=p.matcher(s);
        boolean res=m.matches();
        System.out.println("Res  :"+res);
        ip.close();
    }
}
```
o/p:
enter the string : 7123456789
Res :true

Q7. Write a program to validate the given email.

```java
import java.util.*;
import java.util.regex.Matcher;
import java.util.regex.Pattern;

public class Demo3 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        String s=ip.nextLine();
        Pattern p=Pattern.compile("[A-z,a-z]{4,6}_*[0-
9]{6,8}@gmail.com");

        Matcher m=p.matcher(s);
        boolean res=m.matches();
        System.out.println("Res  :"+res);
        ip.close();
    }
}
```
o/p:
enter the string : hello_123456@gmail.com
Res :true

_____

Sorting

- Sorting is comparing the value from left to its right until the last elements.

Q1. Write a program to print the sort the array elements in the ascending.

```java
import java.util.*;

public class Demo3 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        int size=ip.nextInt();
        int[] a=new int[size];
        for(int i=0;i<size;i++) {
            System.out.print("Enter the element :");
            a[i]=ip.nextInt();
        }
        int max=0;
        for(int i=0;i<size;i++) {
            for(int j=i+1;j<size;j++) {
                if(a[i]>a[j]) {
                    max=a[i];
                    a[i]=a[j];
                    a[j]=max;
                    max=0;
                }
            }
        }

        for(int i=0;i<size;i++) {
            System.out.println(a[i]);
        }
        ip.close();
    }
}
```
o/p:
enter the size : 5
Enter the element :5
Enter the element :3
Enter the element :2
Enter the element :4
Enter the element :1
1
2
3
4
5

Q2. Write a program to sort the elements in the descending order.

```java
import java.util.*;

public class Demo3 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        int size=ip.nextInt();
        int[] a=new int[size];
        for(int i=0;i<size;i++) {
            System.out.print("Enter the element :");
            a[i]=ip.nextInt();
        }
        int max=0;
        for(int i=0;i<size;i++) {
            for(int j=i+1;j<size;j++) {
                if(a[i]<a[j]) {
                    max=a[j];
                    a[j]=a[i];
                    a[i]=max;
                    max=0;
                }
            }
        }
        for(int i=0;i<size;i++) {
            System.out.println(a[i]);
        }
        ip.close();
    }
}
```
o/p:
enter the size : 5
Enter the element :1
Enter the element :3
Enter the element :2
Enter the element :5
Enter the element :4
5
4
3
2
1

Q3. Write a program to sort the characters in the String.

```java
import java.util.*;

public class Demo3 {
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        String s=ip.nextLine();
        char []a=s.toCharArray();
        char max=0;

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

            for(int j=i+1;j<a.length;j++) {

                if(a[i]>a[j]) {
                    max=a[j];
                    a[j]=a[i];
                    a[i]=max;
                    max=0;
                }
            }
        }

        System.out.println(new String(a));
        ip.close();
    }
}
```
o/p:
enter the string : hello
ehllo

Q4. Write a program to check the two String is anagram or not.
Input :
Str1 → hello
Str2 → olehl

Output → anagram

Input :
Str1 → hello
Str2 → heol

Output → not a anagram.
Input :
Str1 → welcome
Str2 → lewceom

Output → anagram


```java
import java.util.Scanner;

public class Demo {
    public static void main(String[] args) {
        Scanner sc=new Scanner(System.in);
        String s1=sc.nextLine();
        char[] a1=s1.toCharArray();
        String s2=sc.nextLine();
        char[] a2=s2.toCharArray();
        int c=a1.length;
        if(a1.length==a2.length) {
            for(int i=0;i<a1.length;i++) {
                for(int j=0;j<a2.length;j++) {
                    if(a1[i]==a2[j]) {
                        c--;
                        a2[j]='\0';
                        break;
                    }
                }
            }
        }
        if(c==0) {
            System.out.println("Anagram");
        }
        else {
            System.out.println("Not a Anagram");
        }
    }
}
```
o/p:
welcome
lewcome
Anagram

Q5. Write a program to print the sum of two numeric String.

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        String s=ip.nextLine();
        System.out.print("enter the string : ");
        String s1=ip.next();
        System.out.println(Integer.valueOf(s)+Integer.valueOf(s1));
        int n=Integer.parseInt(s);
        int n1=Integer.parseInt(s1);
        System.out.println(n+n1);
        ip.close();
    }
}
```
o/p:
enter the string : 450
enter the string : 550
1000
1000

Q6. Write a program to check whether the IPV4 Address Validation.
    i)   The number should not be more than 255.

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("enter the string : ");
        String s=ip.nextLine();
        String[] s1=s.split("[.]");
        boolean flag=true;
        for(String ele:s1) {
            if(Integer.valueOf(ele)<0 && Integer.valueOf(ele)>255) {
                flag=false;
                break;
            }
        }
        if(flag) {
            System.out.println("It is Valid");
        }
        else {
            System.out.println("It is Invalid");
        }
        ip.close();
    }
}
```
o/p:
enter the string : 250.70.128.200
It is Valid

Q7. Write a program for Make Me Big.
i/p → 5391
o/p → 9531
=============
i/p → 58437
o/p → 87543


```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        int a=ip.nextInt();
        String s=""+a;
        char []b=s.toCharArray();
        char max;
        for(int i=0;i<b.length;i++) {
            for(int j=i+1;j<b.length;j++) {
                if(b[i]<b[j]) {
                    max=b[j];
                    b[j]=b[i];
                    b[i]=max;
                    max=0;
                }
            }
        }
        String t="";
        for(int i=0;i<b.length;i++) {
            t=t+b[i];
        }
        System.out.println(Integer.parseInt(t));
        ip.close();
    }
}
```
o/p:
Enter the String : 5391
9531

Q8. Write a program to print check the String is palindrome print -1, if we remove any character it forms palindrome print the index numbers, if it is not form palindrome however print -2.

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

public class PalindromeString{

    static boolean palindrome(String s) {
        String s2="";

        for(int i=s.length()-1;i>=0;i--) {
            s2=s2+s.charAt(i);
        }
        if(s.equalsIgnoreCase(s2)) {
            return true;
        }
        else {
            return false;
        }
    }

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.next();
        ArrayList<Integer> i1=new ArrayList<Integer>();
        if(palindrome(s)) {
            System.out.println(-1);
        }
        else {
            for(int i=0;i<s.length();i++) {
                String s2="";
                for(int j=0;j<s.length();j++) {
                    if(j!=i) {
                        s2=s2+s.charAt(j);
                    }
                }
                if(palindrome(s2)) {
                    i1.add(i);
                }
            }
            if(i1.size()==0) {
                System.out.println(-2);
            }
            else {
                System.out.println(i1);
            }
        }
        ip.close();
    }
}
```
o/p:
Enter the String : levael
[2, 3]

Q9. Write a program for Array elements must be replaced with lowest largest number towards its right side, if there is no larger number forward replace by -1.

[10 , 99 , 11 , 5 , 18 , 117 , 15 , 21] →i/p
[11 , 117 , 15 , 15 , 21 , -1 , 21 , -1] →o/p


```java
import java.util.ArrayList;

import java.util.Collections;

public class Demo {

    public static void main(String[] args) {

        int[] a= {10,99,11,5,18,117,15,21};
        for(int i=0;i<a.length;i++) {

            ArrayList<Integer> i1=new ArrayList<Integer>();

            for(int j=i+1;j<a.length;j++) {

                if(a[i]<a[j]) {
                    i1.add(a[j]);
                }
            }

            Collections.sort(i1);
            if(i1.size()==0) {
                a[i]=-1;
            }
            else {
                a[i]=i1.get(0);
            }
        }

        for(int ele:a) {
            System.out.print(ele+" ");
        }
    }
}
```
o/p:
11 117 15 15 21 -1 21 -1

2-D Array

2D → Two Dimensional Array → (Array inside Array) → [ ][ ] → Matrix Implementation.

[row size][column size]

3D → Three Dimensional Array → [ ][ ][ ]

Declaration:

- int[ ][ ] arr;

- int arr[ ][ ];

- int [ ][ ]arr;

Initialization :

- int[ ][ ] arr={ {10, 20, 30}, {40, 50, 60}, {70, 80, 90} };

$$
\begin{array}{c|ccc}
 & 0 & 1 & 2 \\
\hline
0 & 10 & 20 & 30 \\
1 & 40 & 50 & 60 \\
2 & 70 & 80 & 90 \\
\end{array}
$$

Access elements:

arr[row no.][column no.]

arr[0][1] → 20
arr[2][2] → 90
arr[3][3] → Error

[Note :   arr.length → row Size]

E.g.,

```java
public class Demo4 {

    public static void main(String[] args) {
        int[][]arr= {{10,20,30},{40,50,60},{70,80,90}};
        System.out.println(arr[0][1]);
        System.out.println(arr[2][2]);
        arr[0][1]=25;
        System.out.println(arr[0][1]);
    }
}
```
o/p:
20
90
25

Row Major Access:

Q1. Write a program to print 2D array in the Matrix format.

```
public class Demo4 {

    public static void main(String[] args) {
        int[][]arr= {{10,20,30},{40,50,60},{70,80,90}};
        for(int i=0;i<arr.length;i++) {
            for(int j=0;j<arr.length;j++) {
                System.out.print(arr[i][j]+" ");
            }
            System.out.println();
        }
    }
}
```
o/p:
10 20 30
40 50 60
70 80 90

Column Major Access

Q2. Write a program to print 2D array in the Matrix format.

```
public class Demo4 {

    public static void main(String[] args) {
        int[][]arr= {{10,20,30},{40,50,60},{70,80,90}};
        for(int i=0;i<arr.length;i++) {
            for(int j=0;j<arr.length;j++) {
                System.out.print(arr[j][i]+" ");
            }
            System.out.println();
        }
    }
}
```
o/p:
10 40 70
20 50 80
30 60 90

Q3. Write a program to print the sum of the left to right diagonal.

```
public class Demo4 {

    public static void main(String[] args) {
        int[][]arr= {{10,20,30},{40,50,60},{70,80,90}};
        int sum=0;
        for(int i=0;i<arr.length;i++) {
            for(int j=0;j<arr.length;j++) {
                if(i==j) {
                    sum=sum+arr[i][j];
                }
            }
        }
        System.out.println(sum);
    }
}
```
o/p:
150

Q4. Write a program to program to print the given pattern.
i/p:

$$\begin{bmatrix} 2 & 7 & 8 \\ 11 & 14 & 18 \\ 12 & 17 & 19 \end{bmatrix}$$

o/p:

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

```
public class Demo4 {

    public static void main(String[] args) {
        int[][]arr= {{2,7,8},{11,14,18},{12,17,19}};
        for(int i=0;i<arr.length;i++) {
            for(int j=0;j<arr.length;j++) {
                arr[i][j]=arr[i][j]%2;
                System.out.print(arr[i][j]+" ");
            }
            System.out.println();
        }
    }
}
```

o/p:

0 1 0
1 0 0
0 1 1

Q5. Write a program to print the two matrix array is identical and same elements.

```java
public class Demo4 {

    public static void main(String[] args) {
        int[][]arr= {{2,7,8},{11,111,17},{108,112,15}};
        int[][]arr1={{2,7,8},{11,111,17},{108,112,15}};
        int count=0;
        for(int i=0;i<arr.length;i++) {
            for(int j=0;j<arr.length;j++) {
                if(arr[i][j]==arr1[i][j]) {
                    count++;
                }
            }
        }
        if(count==arr.length*arr.length) {
            System.out.println("Identical");
        }
        else {
            System.out.println("Non-Identical");
        }
    }
}
```

                            _(or)_

```java
public class Demo4 {

    public static void main(String[] args) {
        int[][]arr= {{2,7,8},{11,111,17},{108,112,15}};
        int[][]arr1={{2,7,8},{11,111,17},{108,112,15}};
        boolean flag=true;
        if(arr.length==arr1.length) {
            for(int i=0;i<arr.length;i++) {
                for(int j=0;j<arr.length;j++) {
                    if(arr[i][j]!=arr1[i][j]) {
                        flag=false;
                        break;
                    }
                }
            }
            System.out.println(flag?"identical":"Non-Identical");
        }
        else {
            System.out.println("Non-identical");
        }
    }
}
```
o/p:
Identical

Q6. Write a program to print the maximum row in matrix Array.

```java
public class Demo4 {

    public static void main(String[] args) {
        int[][]arr= {{2,7,8},{111,14,18},{12,17,19}};
        int max=arr[0][0];
        int row=0;
        for(int i=0;i<arr.length;i++) {
            int sum=0;
            for(int j=0;j<arr.length;j++) {
                sum+=arr[i][j];
            }
            if(sum>max) {
                max=sum;
                row=i;
            }
        }
        System.out.println(row);
    }
}
```
o/p:
1

Q7. Write a program to print the 2D Array by using the user input.

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the row : ");
        int row=ip.nextInt();
        System.out.print("Enter the column : ");
        int col=ip.nextInt();
        int [][]a=new int[row][col];
        for(int i=0;i<row;i++) {
            for(int j=0;j<col;j++) {
                System.out.print("Enter the element : ");
                a[i][j]=ip.nextInt();
            }
        }
        System.out.println("\n==================");
        for(int i=0;i<row;i++) {
            for(int j=0;j<col;j++) {
                System.out.print(a[i][j]+" ");
            }
            System.out.println();
        }
        ip.close();
    }
}
```
o/p:
Enter the row : 3
Enter the column : 3
Enter the element : 1

```
Enter the element : 2
Enter the element : 3
Enter the element : 4
Enter the element : 5
Enter the element : 6
Enter the element : 7
Enter the element : 8
Enter the element : 9


==================
1 2 3
4 5 6
7 8 9
```

Q8. Write a program to print the given String is Mirror String or Not.

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        String s1="";
        String s2="";
        if(s.length()%2==0) {

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

                char c=s.charAt(i);
                if(i<s.length()/2) {
                    s1=s1+c;
                }
                else {
                    s2=c+s2;
                }
            }
            if(s1.equalsIgnoreCase(s2)) {
                System.out.println("Mirror String");
            }
            else {
                System.out.println("Not a Mirror String");
            }
        }
        else {
            System.out.println("Not a Mirror String");
        }
        ip.close();
    }
}
```

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {

        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        if(s.length()%2==0) {

            boolean flag=true;
            for(int i=0,j=s.length()-1;i<j;i++,j--) {

                if(s.charAt(i)!=s.charAt(j)) {
                    flag=false;
                    break;
                }
            }

            if(flag) {
                System.out.println("Mirror String");
            }
            else {
                System.out.println("Not a Mirror String");
            }

        }
        else {
            System.out.println("Not a Mirror String");
        }

        ip.close();
    }
}
```

o/p:
Enter the String : abccba
Mirror String

Q9.Write a program to print the number of iteration take to change the array.

```java
import java.util.Scanner;

public class Demo4 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        int[] a= {5,7,10,5,15};
        int []b= {2,2,1,3,5};
        int z=0;
        int count=0;
        while(true) {

            boolean flag=true;
            for(int i=0;i<b.length;i++) {

                if(a[i]>b[i]) {
                    a[i]=a[i]-b[i];
                    flag=false;
                }
            }

            if(flag==false) {
                count++;
                flag=true;
            }
            else {
                break;
            }

        }
        System.out.println(count);
        ip.close();

    }
}
```

o/p:
9

Q10.Write a program to print the numbers int two parts and check the largest number in the two and arrange the number as one number as output.

i/p: → 345628
o/p: → 468

```java
import java.util.*;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the number : ");
        long n=ip.nextLong();
        String s=n+"";
        String ans="";
        for(int i=0;i<s.length();i=i+2) {

            if(i==s.length()-1) {
                ans=ans+s.charAt(i);
            }
            else if(s.charAt(i)>s.charAt(i+1)) {
                ans=ans+s.charAt(i);
            }
            else {
                ans=ans+s.charAt(i+1);
            }

        }
        n=Long.parseLong(ans);
        System.out.println(n);
        ip.close();

    }
}
```
o/p:
Enter the number : 7963473
9673

Q11. Write a java program to check the given String is weak or Strong, if the String contains same sequence of no's its weak String , if the String contains same characters adjacently it is also weak String otherwise Strong String.

```java
import java.util.Scanner;

public class Demo1 {

    public static void main(String[] args) {

        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        boolean b=true;
        for(int i=0;i<s.length()-1;i++) {

            if(s.charAt(i)>='0' && s.charAt(i)<='9') {

    if(s.charAt(i)!=s.charAt(i)+1 || s.charAt(i)+1==s.charAt(i+1)) {
                    b=false;
                    break;
                }

            }
            else if(s.charAt(i)==s.charAt(i+1)){
                b=false;
                break;
            }

        }
        if(b) {
            System.out.println("Strong String");
        }
        else {
            System.out.println("Weak String");
        }
        ip.close();

    }
}
```
o/p:
Enter the String : hello
Weak String

Q10. Write a program for keypad of mobile to print how many times you have to press the button for the String.

```java
import java.util.Scanner;

public class Demo4 {
      public static void main(String[] args) {
            Scanner ip=new Scanner(System.in);
            System.out.print("Enter the String : ");
            String s=ip.nextLine();
            int sum=0;

String[][] c={{"aox","eku","ntl"},{"fjw","bis","dmv"},{"cpu","qrz","hq"}};


            for(int h=0;h<s.length();h++) {

                  for(int i=0;i<3;i++) {

                        for(int j=0;j<3;j++) {

                              for(int k=0;k<c[i][j].length();k++) {

                                    if(s.charAt(h)==c[i][j].charAt(k)) {
                                          sum=sum+(k+1);
                                    }
                              }
                        }
                  }
            }
            System.out.println(sum);
            ip.close();

      }
}
```
o/p:
Enter the Row String : welcome
13

Q11. Write a program to print the largest palindrome in the String.

```java
import java.util.*;

public class Demo3 {

    public static boolean palindrome(String s){

        String s1="";
        for(int i=0;i<s.length();i++) {

            char c=s.charAt(i);
            s1=c+s1;
        }
        return s.equalsIgnoreCase(s1);

    }

    public static void main(String[] args) {

        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the String : ");
        String s=ip.nextLine();
        String pal="";
        for(int i=0;i<s.length();i++) {

            String s1="";
            for(int j=i;j<s.length();j++) {

                char c=s.charAt(j);
                s1=s1+c;
                if(palindrome(s1)) {

                    if(pal.length()<s1.length()) {
                        pal=s1;
                    }
                }

            }
        }
        System.out.println(pal);
        ip.close();

    }
}
```
o/p:
Enter the String : abacdeaabbbaac
aabbbaa

Q12. Write a java program to remove the duplicate values in Array using collection.

```java
import java.util.*;

public class Demo3 {

    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        int[] a= {1,1,12,3,5,6,6,18};
        LinkedHashSet<Integer> h=new LinkedHashSet<Integer>();
        for(int ele:a) {
            h.add(ele);
        }
        ArrayList l1=new ArrayList(h);
        System.out.println(l1);
        ip.close();
    }
}
```
o/p:
[1, 12, 3, 5, 6, 18]

Q13. Write a program to print the gold question in the hacker rank test cases;

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

public class Test {
    public static int prime(int a) {
        int c=0;
        for(int i=1;i<=a;i++) {
            if(a%i==0) {
                c++;
            }
        }
        if(c==2) {
            return a;
        }
        else {
            return 0;
        }
    }
    public static void main(String[] args) {
        Scanner ip=new Scanner(System.in);
        System.out.print("Enter the test Case : ");
        int test=ip.nextInt();
        int[] target=new int[test];
        int[] ans=new int[test];
        int house=0;
        for(int i=0;i<test;i++) {
            System.out.print("Enter the "+(i+1)+" target");
            target[i]=ip.nextInt();
            System.out.print("Enter the number of house : ");
            house=ip.nextInt();
            ArrayList<Integer> a=new ArrayList<Integer>();
            for(int j=0;j<house;j++) {
                int b=0;
```

```java
                    System.out.println("Enter the gold : ");
                    b=ip.nextInt();
                    a.add(b);
                }
                int count=0;
                int sum=0;
                for(int j=0;j<a.size();j++) {
                    sum=sum+prime(a.get(j));
                    count++;
                    if(sum>=target[i]) {
                        break;
                    }
                }
                if(sum>=target[i]) {
                    ans[i]=count;
                }
                else {
                    ans[i]=-1;
                }
            }
            System.out.println("====answer====");
            for(Integer ele:ans) {
                System.out.println(ele);
            }
        }
    }
}
```

o/p:
```
Enter the test Case : 2
Enter the 1 target25
Enter the number of house : 6
Enter the gold :
7
Enter the gold :
13
Enter the gold :
8
Enter the gold :
3
Enter the gold :
5
Enter the gold :
27
Enter the 2 target20
Enter the number of house : 7
Enter the gold :
2
Enter the gold :
5
Enter the gold :
3
Enter the gold :
7
Enter the gold :
8
Enter the gold :
9
Enter the gold :
4
====answer====
5
-1
```

IN-BUILT METHODS

Integer.paraseInt(str) → to convert the String into number {if the string only consists of numeric}

Integer.valueOf(str) → to convert the String into number {if the string only consists of numeric}

Java has countless built in functions. Few of them.Java Predefined Methods they are…….
i) String Methods
ii) Number Methods
iii) Character Methods
iv) Array Methods etc.

i) Java String Methods

1) compareTo()- It compares two strings and supports 3-way comparison

2) equals ()- It compares two strings and supports 2-way comparison

3) concat()- It concatenates two strings

4) charAt()- Returns a character by index position)

5) toUpperCase () – Converts values to Uppercase

7) toLowerCase() -Converts values to Lowercase

8) trim()- Removes spaces from both sides of a String

9) substring ()- outputs a portion of the string

10) endsWith() -Ends with specified suffix

11) length()- returns string length

ii) Java Number Methods

1) compareTo()- performs 3-way comparison of numbers

2) equals()- performs 2-way comparison of numbers

3) abs() -Returns absolute value

4) round() -It rounds the value to nearest integer

5) min() – Returns minimum value between two numbers

6) max()-Returns maximum value between two numbers

7) random() – Generates a random number

iii) Java Character Methods

1) isLetter() – Checks whether the value is Alfa byte or not?

2) isDigit() -Checks whether the value is Number or not?

3) isUpperCase() – Checks whether the value is Uppercase or not?

4) isLowerCase()-Checks whether the value is Lowercase or not?

iv) Java Array Methods

1) length() -It returns the length of the Array.

2) toString() -It prints an Array.

3) contains() – Checks if the Array contains certain value or not?