



CORE JAVA MATERIAL

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Java



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JAVA INTRODUCTION

- Java is a simple programming language
- Writing, compilation and debugging a program is very easy in java
- It helps to create reusable code
- Java has more features,
 1. Platform independent
 2. Open source
 3. Multithreading
 4. More secure
 5. Portable

1. Platform independent

- During the compilation the java program converts into byte code
- Using byte code we can run the application to any platform such as windows, mac, linux, etc

2. Open source:

- A program in which source code is available to the general public for use and/or modification from its original design at free of cost is called open source

3. Multithreading:

- Java supports multithreading
- It enables a program to perform several task simultaneously

4. More secure:

- It provides the virtual firewall between the application and the computer
- So it's doesn't grant unauthorized access

5. Portable:

- "Write once run anywhere"
- Java code written in one machine can run on another machine

CORE JAVA

Syllabus:

1. OOPS concept
2. Control statement/looping
3. Arrays
4. String
5. Exceptions
6. Collections



Terminology:

1. JDK
2. JRE
3. JVM

JDK:

- Java Development Kit
- If run any applications we need JDK have to installed
- JDK versions: 1.0 to 1.9
- Mostly V1.8 is used now

JRE:

- Java Runtime Environment
- It is a pre-defined. class files (i.e.) library files

JVM:

- Java Virtual Machine
- It is mainly used to allocate the memory and compiling

TOOLS:

1. Notepad
 2. Net bean
 3. Eclipse
 4. J Developer-oracle
 5. RAD-IBM
- Nowadays we mostly used eclipse (75% of the people using).
 - Versions of eclipse:
 - Juno
 - Kepler
 - Luna
 - Mars
 - Neon

OOPS CONCEPT:

- Object Oriented Programing Structure
- OOPS is a method of implementation in which programs are organized as collection of objects, class and methods



Oops principles are

1. Class
2. Method
3. Object
4. Abstraction
5. Encapsulation
6. Inheritance
7. Polymorphism

CLASS:

- Class is nothing but collection of methods or collection of objects.
 - Project name : Should be in Pascal notation
 - Pascal notation : Each word of the first letter should be in capital
 - src - Source file
 - Class name: Pascal notation
 - Package creation: ex, org.cts.scope-All small letters

Syntax:

(First type class name and click ctrl +space)

```
public class Bank    {  
    } // Bank is a class name
```

Public-Access specifier

METHOD:

- Set of action to be performed

Method name: camel notation

Camel notation: First word should be small after every word of the first letter should be capital

Syntax:

```
public void dummy() {  
    // Here dummy is a method name  
}
```

Main Method:

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

Main method □ type main and click ctrl +space



OBJECT:

- Run time memory allocation
- Using object we call the any methods

Syntax:

(Class name) (Object name) =new (Class name) ();

- Alignment □ ctrl + shift+ F
- Run □ ctrl +F11

Example program:

1. StudentDatabase

```
public class StudentInfo {  
    public void Studentname() {  
        System.out.println("Name:Vengat");  
    }  
  
    public void studentList() { System.out.println();  
    }  
  
    public void StudentMark() { System.out.println("Mark:1005");  
    }  
  
    public void StudentAddress() { System.out.println(" Address:  
        Chennai");  
    }  
  
    public static void main(String[] arg) { StudentInfo info =  
        new StudentInfo(); info.Studentname();  
        info.StudentMark(); info.StudentAddress();  
    }  
}
```

2.ECommerce

```
public class OnlineShoppingSite {  
    public void myAccount() { System.out.println("Account  
        Name");  
    }  
  
    public void catalog() { System.out.println("My  
        cat");  
    }  
  
    public void orders() {
```



```
        System.out.println("My Orders");
    }

    public void myWishList() {

        System.out.println("MY Wish List");
    }

    public static void main(String[] args) { OnlineShoppingSite info = new
        OnlineShoppingSite(); info.catalog();
        info.myAccount(); info.orders();
        info.myWishList();
    }
}
```

Heap Memory:

- Object are stored in heap memory
- RAM ☐ JVM ☐ Heap memory
- To reduce object memory we go for inheritance

ENCAPSULATION

- Structure of creating folders

INHERITANCE:

- We can access one class property into another class using 'extend' keyword and reusable purpose

Child class _ Sub class

Parent class _ Super class

Types:

1. Single Inheritance
2. Multilevel Inheritance
3. Multiple Inheritances
4. Hybrid Inheritance
5. Hierarchical Inheritance



1. Single Inheritance :

- One parent class is directly support into one child class using extend keyword

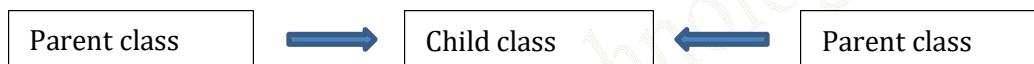


2. Multilevel Inheritance:

- One child class and more than one parent class



3. Multiple Inheritance:



- More than one parent class parallely support into one child class but it won't support in java because

1. Priority problem
2. Compilation error/syntax error

(i.e) if both parent class having same method name it will get priority problem so it doesn't work in java
Parent class □ child class □ parent class

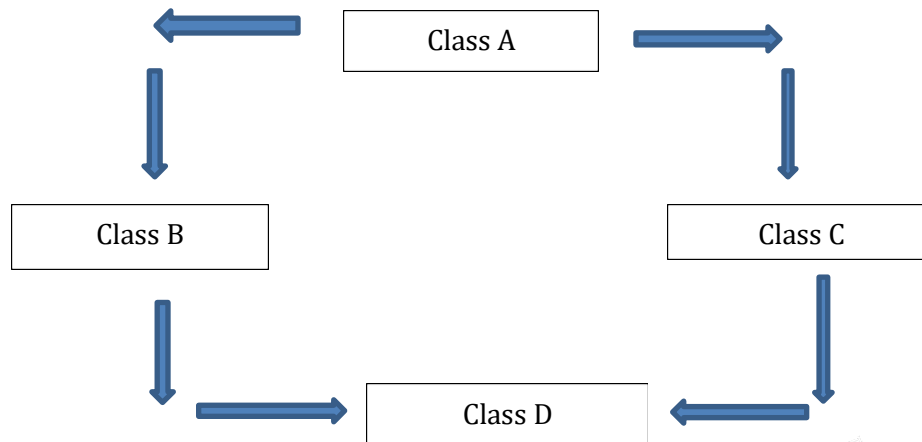


- test () is a method name, it present in both parent class, so its get priority problem



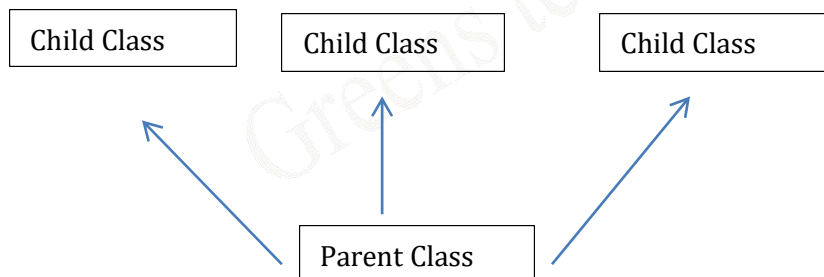
4. Hybrid Inheritance:

- It is a combination of single and multiple inheritance



5. Hierarchical Inheritance:

- One parent class and more than one child class



ACCESS SPECIFIER:

1. Public
2. Protected
3. Default
4. Private

1. Public:

- It is global level access(same package + different package)

2. Private:

- It is a class level access

3. Default:

- Package level access
- Without access specifier within the package we can access

Ex,

Public static _ public- access specifier (need to mention public)

Private static _ private- access specifier (need to mention)

Static ☐ default- access specifier (need not to mention default)

4. Protected:

Inside package + outside Package (Extends)

DATA TYPES:

Data types	Size	Wrapper Class	Default value
byte	1	Byte	0
short	2	Short	0
int	4	Integer	0
long	8	Long	0
float	4	Float	0.0
double	8	Double	0.0
boolean	-	Boolean	false
char	-	Character	-
String	-	String	null

- To find range: formula

$$-2^{n-1} \text{ to } +2^{n-1} - 1$$

For **byte**,

1 byte = 8 bits

So n=8

Apply

-128 to + 127

This is a byte range

Ex:

```
public class ByteInfo {  
    public static void main(String[] args) { byte num=12;  
        System.out.println(num);  
    }  
}
```

Long:

symbol 'l'

long n= 123467l(need to enter l finally)

Float

Symbol-'f'

float f=10.06f

Double:

No need to enter d

char:

Character is any number, any alphabet or any special character

char= 'A' single quotation

String:

String = "klaou8778k" _ double quotation

Boolean:

Boolean is a true or false value

boolean b1=true;

boolean b2=false;

Default package of java:

➤ java.lang

- ctrl+2 + L this shortcut is used to find the data type

Syntax: to get the values from the user

- byte _nextByte();
- short _nextShort();
- int _nextInt();
- long _nextLong();
- float _nextFloat();
- double _nextDouble();
- char _next().charAt(0);
- String _next();
- String _nextLine();
- boolean _nextBoolean();

String:

- nextLine() is used to include space

String s=sc.nextLine();

WRAPPER CLASS:

- Classes of data types is called wrapper class
- It is used to convert any data type into object
- All classes and wrapper classes default value is Null

CONTROL STATEMENT:

1. if
2. if.else
3. else.if

variable name camel notation

Difference between "=" and "=="

- _ = is used to assigning the value
- _ == is used for condition checking

Example Program:

```
public class IfCondition {  
    public static void main(String[] args) {  
        int empID=20;  
        if(empID==20){  
            System.out.println("valid");  
        }else {  
            System.out.println("not valid");  
        }  
    }  
}
```

Output ☐ valid

- More than one condition we use for
 1. logical &&/_ logical && check first condition if its fail it doesn't check second
 2. Bitwise &/_ bitwise & is check both condition
- So logical && is better than bitwise

LOOPING:

1. for
2. while
3. do.while

For:

Example Program:

```
public class ForLoop {  
    public static void main(String[] args) {  
        System.out.println("Start");  
        for (int i = 1; i <= 3; i++) {  
            System.out.println(i);  
        }  
        System.out.println("End");  
    }  
}
```

output:

Start

1

2

3

End

Inner for loop;

Example Program:

```
public class InnerForLoop {  
    public static void main(String[] args) {  
        for (int i = 1; i <= 5; i++) {  
            for (int j = 1; j <= 6; j++) {  
                System.out.print(i);  
            }  
        }  
    }  
}
```

```

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

```

Output:

111111

222222

333333

444444

555555

Println □ printline

Break:

- It will exit from the current loop

Example Program:

```

public class InnerForLoop {
    public static void main(String[] args) {
        for (int i = 1; i <= 10; i++) {
            if (i == 5) {
                break;
            }
            System.out.println(i);
        }
    }
}

```

Output:

1

2

3

4

Continue:

- It will skip the particular iteration

Example Program:

```

public class InnerForLoop {
    public static void main(String[] args) {
        for (int i = 1; i <= 10; i++) {
            if (i == 5) {
                continue;
            }
            System.out.println(i);
        }
    }
}

```

```
    }  
}
```

Output

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

Basic programs using conditional statements:

EVEN NUMBER AND ODD NUMBER:

To print Even num:

Example Program:

```
public class InnerForLoop {  
    public static void main(String[] args) {  
        for (int i = 1; i <= 20; i++) {  
            if (i % 2 == 0) {  
                System.out.println(i);  
            }  
        }  
    }  
}
```

output

```
2  
4  
6  
8  
10  
12  
14  
16  
18  
20
```


To print Odd:

Example Program:

```
public class InnerForLoop {  
    public static void main(String[] args) {  
        for (int i = 1; i <= 20; i++) {  
            if (i % 2 == 1) {  
                System.out.println(i);  
            }  
        }  
    }  
}
```

Output

1
3
5
7
9
11
13
15
17
19

Sum of odd and even numbers:

Sum of odd:

Example Program:

```
public class SumofOddNum {  
    public static void main(String[] args) {  
        int count=0;  
        for(int i=1;i<=100;i++)  
        {  
            if(i%2==1){  
                count=count+i;  
            }  
        }  
        System.out.println(count);  
    }  
}
```

Output:

2500

Sum of even:**Example Program:**

```
public class SumofOddNum {  
    public static void main(String[] args) {  
        int count=0;  
        for(int i=1;i<=100;i++)  
        {  
            if(i%2==0){  
                count=count+i;  
            }  
        }  
        System.out.println(count);  
    }  
}
```

Output:

2550

Factorial Numbers:**Example Program:**

```
public class FactorialNumbers {  
    public static void main(String[] args) {  
        int count=1;  
        for(int i=1;i<=8;i++){  
            count=count*i;  
        }System.out.println(count);  
    }  
}
```

Output:

40320

POLYMORPHISM:

- Poly-many
- Morphism-forms
- Taking more than one forms is called polymorphism or one task completed by many ways

It has 2 types,

- 1.Method overloading(static binding/compile time polymorphism)
- 2.Method overriding(dynamic binding/run time polymorphism)

1.Method overloading:

Class-same
Method-same
Argument-differ

- In a same class method name is same and the argument is different is called method overloading
- the argument is depends on
 - data types
 - data types count
 - data type order

Example Program:

```
public class StudentInfo {  
    private void studentId(int num) {  
    }  
    private void studentId(String name) {           // depends on order  
    }  
    private void studentId(String email, int ph) {   //depends on data type  
    }  
    private void studentId(int dob, String add) {   //depends on datatype count  
    }  
    public static void main(String[] arg) { StudentInfo info =  
        new StudentInfo();  
    }  
}
```

- In the same method the argument can't use int and byte because int & byte both are numbers. so it doesn't work.
- public void employeeID(int num, byte num2) is not correct

2.Method overriding:

Class name-differ(using extends)
Method-same
Argument- same

- In a different class , the method name should be same and argument name should be same is called overriding

Example Program:

- our aim is boy getting marry
- 1st class(sub class)

```
public class Boy extends Marriage {  
    public void girlName() { System.out.println("ramya");
```

```

    }
    public static void main(String[] args) { Boy b=new
    Boy();
    b.girlName();
    }

```

- 2nd class(super class)

```

    public class Marriage {
        public void girlName() { System.out.println("priya");
    }

```

output : ramya;

- The same method name in both class it take sub class only
- If we satisfied with super class we go for super class method but we won't satisfy with super class we go for sub class method
- We can assign our sub class to our super class but can't reverse

Example Program:

- Marriage b=new Boy() is possible
- Boy b=new Marriage() impossible
- Inside the class if we use static we dont want to crate object (i.e)

```

    public class Employee{ public static
    void addNum(){
    System.out.println("Hello");
    }
    public static void main(String[] args){
    addNum();    // dont want to create object
    }
    }

```

Output: Hello

- If its different class we have to use class name(i.e)

sub class:

```

    public class Employee{ public static
    void addNum(){
    system.out.println("Hello");
    }}

```

super class:

```

    public class sample{
    public static void main(string[] args){
    Employee.addNum();
    }}

```

Output: Hello

ABSTRACTION:

- Hiding the implementation part is called abstraction
- it has 2 types,

1. Partially abstraction (abstract class)
2. Fully abstraction (interface)

1. Partially Abstraction (Abstract class):

- It will support abstract method and non-abstract method.
- We can't create object for abstract class because in the method signature we didn't mention any business logic. so
- In abstract method, we only mention abstract signature, won't create business logic
- It has 2 class, abstract class (sub class) and super class. we create object and business logic only in super class, won't create in abstract class

Example Program:

abstract class

```
public abstract class Bank {  
    abstract void saving();           //method signature  
    abstract void current(); abstract  
    void salary(); abstract void joint();  
    public void branchDetails(){  
        System.out.println("chennai");  
    }  
}
```

super class

```
public class AxisBank extends Bank {  
    public void saving() {           // method signature  
        System.out.println("saving regular");// business logic  
    }  
    public void current() { System.out.println("current");  
    }  
    public void salary() { System.out.println("salary");  
    }  
    public void joint() {  
        System.out.println("joint");  
    }  
    public static void main(String[] args) { AxisBank info  
        = new AxisBank();  
    }
```

```

        info.branchDetails();
        info.salary(); info.saving();
    }
}

```

Output:

```

chennai
salary
saving regular

```

2. INTERFACE/FULLY ABSTRACTION;

- It will support only abstract method, won't support non abstract method
- In interface "public abstract" is default. we no need to mention
- It using implements keywords

Example Program:1

interface

```

public interface Bank { abstract
    void saving(); abstract void
    current(); abstract void salary();
    abstract void joint();
    public void branchDetails();
}

```

super class

```

public class AxisBank implements Bank {
    public void saving() { System.out.println("saving
        regular");
    }

    public void current() { System.out.println("current");
    }
    public void salary() { System.out.println("salary");
    }
    public void joint() {
        System.out.println("joint");
    }
    public void branchDetails() { System.out.println("chennai");
    }
    public static void main(String[] args) { AxisBank info
        = new AxisBank(); info.branchDetails();
        info.salary();
        info.saving();
    }
}

```

Output:

chennai
salary
saving regular

- multiple inheritance its won't support in java but using interface its support
- here we have to create 2 interface(super class) and one sub class(normal). In the sub class we implement both interface

Example Program:2

interface

```
public interface AxisBank {  
    public void test();  
}  
public interface HdfcBank {  
    public void test();  
}  
  
sub class(normal class)  
public class Bank implements AxisBank, HdfcBank {  
    @Override  
    public void test() {  
        // TODO Autogenerated method stub  
    }  
}
```

Difference between abstract class and interface

Abstract class:

- It is partially abstraction
- It support both abstract method and non-abstract method
- It's using "extends" keyword
- Here "public abstract" have to mention
- We can use whatever access specifier we want

Interface:

- It is fully abstraction
- It support only abstract method
- It's using "implement" keyword
- "public Abstract" is default. no need to mention
- Here we use only public(access specifier)

ARRAYS:

- Collection of similar data
- The value are stored based on index
- The index will start 0 to n1

Syntax:

```
int num[]=new num[5]
```

Here,

int _ data type

num _ variable

[] _ Array

5 _ Array length

- It takes 0 to 4(i.e) 0 to n-1, n=5

Example Program:

```
public class BasicArray {  
    public static void main(String[] args) { int  
        num[]=new int[5];  
        System.out.println(num[2]);  
    }  
}
```

Output: 0

- If we didn't assign any value, it will takes the default value of data types(int)
- Default value of int is 0

Example Program:

```
public class BasicArray {  
    public static void main(String[] args) {  
        int num[]=new int[5];  
        num[0]=10;  
        num[1]=20;  
        num[2]=30;  
        num[3]=40;  
        num[4]=50;  
        System.out.println(num[2]);  
    }  
}
```

Output: 30

- Overwrite the value:

```
public class BasicArray {  
    public static void main(String[] args) {  
        int num[]=new int[5];  
        num[0]=10;  
        num[1]=20;  
        num[2]=30;  
        num[3]=40;
```



```
num[4]=50; num[2]=300;  
System.out.println(num[2]);
```

```
}}
```

Output:

300

➤ If we overwrite the value, it takes last one

To find array length:

```
public class BasicArray {  
    public static void main(String[] args) {  
        int num[]=new int[5];  
        num[0]=10;  
        num[1]=20;  
        num[2]=30;  
        num[3]=40;  
        num[4]=50;  
        num[2]=300;  
        int len=num.length;  
        System.out.println(len);  
    }  
}
```

Output:

5

Using for loop:

```
public class BasicArray {  
    public static void main(String[] args) {  
        int num[]=new int[5];  
        num[0]=10;  
        num[1]=20;  
        num[2]=30;  
        num[3]=40;  
        num[4]=50;  
        num[2]=300;  
        for(int i=0;i<num.length;i++)  
            System.out.println(num[i]);  
    }  
}
```

Output:

10

20

300

40

50

Enhanced for loop:

syntax:

```
for(int k:num)
System.out.println(k);
```

Example Program:

```
public class BasicArray {
    public static void main(String[] args) {
        int num[]=new int[5];
        num[0]=10;
        num[1]=20;
        num[2]=30;
        num[3]=40;
        num[4]=50;
        num[2]=300;
        for(int k:num)
            System.out.println(k);
    }
}
```

Output:

```
10
20
300
40
50
```

- In this enhanced for loop, have no condition checking and value assign
- It is very fast compare to normal for loop

Advantage of array:

- In a single variable we can store multiple values

Disadvantage of arrays:

- It support only similar data types
- It is a fixed size
- Memory wastage is high
- To overcome these we go for collections

STRING:

- Collections of charactor or word enclosed with double quotes

Basic Topics:

- String function
- Mutable string
- Immutable string

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) { String  
        s1="Vengat"; System.out.println(s1);  
    }  
}
```

Output: Vengat

Some Basic Methods:

charAt():

- It is used to print the particular character

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) { String  
        s1="Vengat"; System.out.println(s1);  
        char ch = s1.charAt(2);  
        System.out.println(ch);  
    }  
}
```

Output:

Vengat

n

- 2 takes as 0 to 2 (i.e) 0 1 2> v e n

Equals():

- equals is a method is used to check our string index is true or false

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) { String s1 =  
        "Vengat"; System.out.println(s1);  
        boolean b = s1.equals("Vengat");  
        System.out.println(b);  
        boolean b1 = s1.equals("vengat");  
        System.out.println(b1);}}
```

Output:

Vengat
true
false

- b1 is false because equals() is case sensitive

EqualsIgnoreCase():

- It is like a equals() method but it is not case sensitive

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) { String s1 =  
        "Vengat"; System.out.println(s1);  
        boolean b = s1.equals("Vengat");  
        System.out.println(b);  
        boolean b1 = s1.equalsIgnoreCase("vengat");  
        System.out.println(b1);  
    }  
}
```

Output:

Vengat

true
true

contains():

- Contains() is a method , is used to check the particular character or word in the string

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) {  
        String s1 = "Hello welcome to java class";  
        System.out.println(s1);  
        boolean b = s1.contains("welcome");  
        System.out.println(b);  
    }  
}
```

Output:

Hello welcome to java class
true

- If we check other than the string index, it shows false

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) {  
        String s1 = "Hello welcome to java class";  
        System.out.println(s1);  
        boolean b = s1.contains("welcome");  
        System.out.println(b);  
        boolean b1 = s1.contains("hai");  
        System.out.println(b1);  
    }  
}
```

Output:

Hello welcome to java class
true
false

split():

- split() is a method, is used to split the string by space or character or word or whatever

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) {  
        String s1 = "Hello welcome to java class";  
        String[] x = s1.split(" "); // here we split by space  
        System.out.println(s1.length()); System.out.println(x.length);  
        String[] x1 = s1.split("o"); // here we split by "o"  
        System.out.println(s1.length()); System.out.println(x1.length);  
    }  
}
```

Output:

27 //this whole string length s1
5 // this is after splitting by space
27 //this whole string length s1
4 // this is after splitting by "o"x1

For loop:

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) {  
        String s1 = "Hello welcome to java class";
```

```

        String[] x = s1.split(" "); // here we split by space
        for(int i=0;i<x.length;i++){ System.out.println(x[i]);
    }
}

```

Output:

Hello
welcome
to
java
class

Enhanced for loop:

```

public class StringBasic {
    public static void main(String[] args) {
        String s1 = "Hello welcome to java class";
        String[] x = s1.split(" "); // here we split by space
        for (String k : x) {
            System.out.println(k);
        }
    }
}

```

Output:

Hello
welcome
to
java
class

toUpperCase() and toLowerCase():

- toUpperCase() is used to convert the string into uppercase
- toLowerCase() is used to convert the string into lowercase

Example Program:

```

public class StringBasic {
    public static void main(String[] args) { String s1 =
        "Hello";
        String m = s1.toLowerCase(); // to convert lowercase
        System.out.println(m);
        String m1 = s1.toUpperCase(); // to convert upper
    }
}

```

```

        System.out.println(m1);
    }
}

```

Output:

```

hello
HELLO

```

substring():

- It is used to print from, which character we want in the string index

Example Program:

```

public class StringBasic {
    public static void main(String[] args) { String s1 = "Hello
        java";
        String m = s1.substring(2);
        // to print from 3rd character 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060 1061 1062 1063 1064 1065 1066 1067 1068 1069 1070 1071 1072 1073 1074 1075 1076 1077 1078 1079 1080 1081 1082 1083 1084 1085 1086 1087 1088 1089 1090 1091 1092 1093 1094 1095 1096 1097 1098 1099 1100 1101 1102 1103 1104 1105 1106 1107 1108 1109 1110 1111 1112 1113 1114 1115 1116 1117 1118 1119 1120 1121 1122 1123 1124 1125 1126 1127 1128 1129 1130 1131 1132 1133 1134 1135 1136 1137 1138 1139 1140 1141 1142 1143 1144 1145 1146 1147 1148 1149 1150 1151 1152 1153 1154 1155 1156 1157 1158 1159 1160 1161 1162 1163 1164 1165 1166 1167 1168 1169 1170 1171 1172 1173 1174 1175 1176 1177 1178 1179 1180 1181 1182 1183 1184 1185 1186 1187 1188 1189 1190 1191 1192 1193 1194 1195 1196 1197 1198 1199 1200 1201 1202 1203 1204 1205 1206 1207 1208 1209 1210 1211 1212 1213 1214 1215 1216 1217 1218 1219 1220 1221 1222 1223 1224 1225 1226 1227 1228 1229 1230 1231 1232 1233 1234 1235 1236 1237 1238 1239 1240 1241 1242 1243 1244 1245 1246 1247 1248 1249 1250 1251 1252 1253 1254 1255 1256 1257 1258 1259 1260 1261 1262 1263 1264 1265 1266 1267 1268 1269 1270 1271 1272 1273 1274 1275 1276 1277 1278 1279 1280 1281 1282 1283 1284 1285 1286 1287 1288 1289 1290 1291 1292 1293 1294 1295 1296 1297 1298 1299 1300 1301 1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317 1318 1319 1320 1321 1322 1323 1324 1325 1326 1327 1328 1329 1330 1331 1332 1333 1334 1335 1336 1337 1338 1339 1340 1341 1342 1343 1344 1345 1346 1347 1348 1349 1350 1351 1352 1353 1354 1355 1356 1357 1358 1359 1360 1361 1362 1363 1364 1365 1366 1367 1368 1369 1370 1371 1372 1373 1374 1375 1376 1377 1378 1379 1380 1381 1382 1383 1384 1385 1386 1387 1388 1389 1390 1391 1392 1393 1394 1395 1396 1397 1398 1399 1400 1401 1402 1403 1404 1405 1406 1407 1408 1409 1410 1411 1412 1413 1414 1415 1416 1417 1418 1419 1420 1421 1422 1423 1424 1425 1426 1427 1428 1429 1430 1431 1432 1433 1434 1435 1436 1437 1438 1439 1440 1441 1442 1443 1444 1445 1446 1447 1448 1449 1450 1451 1452 1453 1454 1455 1456 1457 1458 1459 1460 1461 1462 1463 1464 1465 1466 1467 1468 1469 1470 1471 1472 1473 1474 1475 1476 1477 1478 1479 1480 1481 1482 1483 1484 1485 1486 1487 1488 1489 1490 1491 1492 1493 1494 1495 1496 1497 1498 1499 1500 1501 1502 1503 1504 1505 1506 1507 1508 1509 1510 1511 1512 1513 1514 1515 1516 1517 1518 1519 1520 1521 1522 1523 1524 1525 1526 1527 1528 1529 1530 1531 1532 1533 1534 1535 1536 1537 1538 1539 1540 1541 1542 1543 1544 1545 1546 1547 1548 1549 1550 1551 1552 1553 1554 1555 1556 1557 1558 1559 1560 1561 1562 1563 1564 1565 1566 1567 1568 1569 1570 1571 1572 1573 1574 1575 1576 1577 1578 1579 1580 1581 1582 1583 1584 1585 1586 1587 1588 1589 1590 1591 1592 1593 1594 1595 1596 1597 1598 1599 1600 1601 1602 1603 1604 1605 1606 1607 1608 1609 1610 1611 1612 1613 1614 1615 1616 1617 1618 1619 1620 1621 1622 1623 1624 1625 1626 1627 1628 1629 1630 1631 1632 1633 1634 1635 1636 1637 1638 1639 1640 1641 1642 1643 1644 1645 1646 1647 1648 1649 1650 1651 1652 1653 1654 1655 1656 1657 1658 1659 1660 1661 1662 1663 1664 1665 1666 1667 1668 1669 1670 1671 1672 1673 1674 1675 1676 1677 1678 1679 1680 1681 1682 1683 1684 1685 1686 1687 1688 1689 1690 1691 1692 1693 1694 1695 1696 1697 1698 1699 1700 1701 1702 1703 1704 1705 1706 1707 1708 1709 1710 1711 1712 1713 1714 1715 1716 1717 1718 1719 1720 1721 1722 1723 1724 1725 1726 1727 1728 1729 1730 1731 1732 1733 1734 1735 1736 1737 1738 1739 1740 1741 1742 1743 1744 1745 1746 1747 1748 1749 1750 1751 1752 1753 1754 1755 1756 1757 1758 1759 1760 1761 1762 1763 1764 1765 1766 1767 1768 1769 1770 1771 1772 1773 1774 1775 1776 1777 1778 1779 1780 1781 1782 1783 1784 1785 1786 1787 1788 1789 1790 1791 1792 1793 1794 1795 1796 1797 1798 1799 1800 1801 1802 1803 1804 1805 1806 1807 1808 1809 1810 1811 1812 1813 1814 1815 1816 1817 1818 1819 1820 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833 1834 1835 1836 1837 1838 1839 1840 1841 1842 1843 1844 1845 1846 1847 1848 1849 1850 1851 1852 1853 1854 1855 1856 1857 1858 1859 1860 1861 1862 1863 1864 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480 2481 2482 2483 2484 2485 2486 2487 2488 2489 2490 2491 2492 2493 2494 2495 2496 2497 2498 2499 2500 2501 2502 2503 2504 2505 2506 2507 2508 2509 2510 2511 2512 2513 2514 2515 2516 2517 2518 2519 2520 2521 2522 2523 2524 2525 2526 2527 2528 2529 2530 2531 2532 2533 2534 2535 2536 2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547 2548 2549 2550 2551 2552 2553 2554 2555 2556 2557 2558 2559 2560 2561 2562 2563 2564 2565 2566 2567 2568 2569 2570 2571 2572 2573 2574 2575 2576 2577 2578 2579 2580 2581 2582 2583 2584 2585 2586 2587 2588 2589 2590 2591 2592 2593 2594 2595 2596 2597 2598 2599 2600 2601 2602 2603 2604 2605 2606 2607 2608 2609 2610 2611 2612 2613 2614 2615 2616 2617 2618 2619 2620 2621 26
```

Output:

4

-1

7

lastIndexOf():

- If multiple same character , it takes last one

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) { String s1 =  
        "Hello java";  
        int m = s1.indexOf("o"); // "o", to print o position  
        System.out.println(m);  
        int m1 = s1.indexOf("b"); // "b" is not in the string, so it print "-1" System.out.println(m1);  
        int m2 = s1.indexOf("a"); // multiple character "a", it takes first one System.out.println(m2);  
        int m3 = s1.lastIndexOf("a"); // multiple character "a", it takes last  
one  
        System.out.println(m3);  
    }  
}
```

Output:

4

-1

7

9

replace():

- replace() is a method ,it is used to replace the index character or word

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) { String s1 =  
        "Hello world";  
        String m = s1.replace("world", "java"); // to replace world to java System.out.println(m);  
    }  
}
```

Output:

Hello java

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) { String s1 = "This is  
        manual Testing";  
        String m = s1.replace("manual", "Automation"); // to replace manual to  
Automation  
        System.out.println(m);  
    }  
}
```

Output:

This is Automation Testing

isEmpty():

- It is used to check the index length is zero or not,
- If its zero, its true otherwise false

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) { String s1 = "";  
        boolean m = s1.isEmpty(); // here index is empty, so its true System.out.println(m);  
        String s2 = " ";  
        boolean m1 = s2.isEmpty();  
        // here index is not empty because space included System.out.println(m1); // space is also  
        a one character  
    }  
}
```

Output:

true
false

startsWith() and endsWith():

- It is used to check the index starts with particular word or character
- As well as ends with

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) { String s1 =  
        "Hello java class"; boolean m =  
        s1.startsWith("Hello"); System.out.println(m);  
        boolean m1 = s1.endsWith("class");  
        System.out.println(m1);  
    }  
}
```

**Output:**

true

true

ASCII value:

- To find ascii value

Example Program:

```
public class Dummy {  
    public static void main(String[] args) {  
        char ch='M';  
        int x=ch; System.out.println(x);  
    }  
}
```

Output: 77

- Every character have one ASCII value
- A-Z _ 65 to 90
- A-z _ 97 to 122
- 0-9 _ 48 to 57
- remaining special characters

compareTo():

- It is a method, it is used to compare the character based on ASCII value

Example Program:

```
public class Dummy {  
    public static void main(String[] args) { String s="A";  
        int i = s.compareTo("A");  
        System.out.println(i);  
    }  
}
```

Output:

0

Here, A ASCII value is 65, so 65-65=0

Example Program:

```
public class Dummy {  
    public static void main(String[] args) { String s="A";  
        int i = s.compareTo("B");  
        System.out.println(i);  
    }  
}
```

**Output:**

1

Here, 65-66=1

- If we use many character, it will compare only first differing character

Example Program:

```
public class Dummy {  
    public static void main(String[] args) { String  
        s="ABCD";  
        int i = s.compareTo("ABFK ");  
        System.out.println(i);  
    }  
}
```

Output:

3 // 6770=3

- If it is different length and same accuracy, the output will be based on length

Example Program:

```
public class Dummy {  
    public static void main(String[] args) { String  
        s="ABCD";  
        int i = s.compareTo("AB");  
        System.out.println(i);  
    }  
}
```

Output:

2

Here, ABCD length is 4

AB2, 4-2=2

- If different length and different accuracy , it will compare the first differing character

Example Program:

```
public class Dummy {  
    public static void main(String[] args) { String  
        s="ABCD";  
        int i = s.compareTo("ACLK");  
        System.out.println(i);  
    }  
}
```



Output:

1

Here, 6667=1, BC=1

Literal String:

- It's stored inside the heap memory (string pool or string constant).
- It will share the memory if same value (duplicate value)

Non-literal string:

- Its stored in the heap memory.
- Its create a new memory every time even if its duplicate value(same value)

Example Program:

```
public class StringBasic {  
    public static void main(String[] args) { String s1 =  
        "vengat";  
        String s2 = "vengat";           // literal string(same value so its share  
the memory)  
        System.out.println(System.identityHashCode(s1));  
        System.out.println(System.identityHashCode(s2)); String x1=new  
        String("vengat");  
        String x2=new String("vengat");// non literal string( its won't  
share, create new memory)  
        System.out.println(System.identityHashCode(x1));    System.out.println(System.identityHashCode(x2));  
    }  
}
```

- identityHashCode() is used to print the reference value(storage reference)

Output:

31168322 // literal string share the memory if same value
31168322
17225372

5433634 // but non literal won't share

Immutable string:

- We can store more duplicate value in same memory
- We can't change the value in memory
- In concord nation, it's have to create new memory

Mutable string:

- we can't store duplicate value in same memory
- we can change the value in memory
- In concord nation, its takes same memory



Example Program:

```
public class StringBasic {  
    public static void main(String[] args) { String s1 =  
        "vengat";  
        String s2 = "prabu";           // mutable string  
        System.out.println("Immutable string");  
        System.out.println(System.identityHashCode(s1));  
        System.out.println(System.identityHashCode(s2)); String r =  
        s1.concat(s2); System.out.println(r);  
        System.out.println(System.identityHashCode(r)); StringBuffer  
        x1=new StringBuffer("vengat");  
        StringBuffer x2=new StringBuffer("prabu");// mutable string  
        System.out.println("mutable string");  
        System.out.println(System.identityHashCode(x1));  
        System.out.println(System.identityHashCode(x2)); x1.append(x2);  
        System.out.println(x1); System.out.println(System.identityHashCode(x1));  
    }  
}
```

Output:

```
Immutable string  
31168322  
17225372  
  
vengatprabu  
  
5433634           // here it takes new memory for concordination  
mutable string  
2430287  
  
17689166  
  
vengatprabu  
  
2430287           // but here it takes x1 memory
```

COLLECTIONS:

Why we go for collections:

- It will support dissimilar data types.
- It is dynamic memory allocation
- No memory wastage like array

It has 3 types,

1. List
2. Set
3. Map

1. List :(Interface)

- ❖ ArrayList(class)
- ❖ LinkedList(c)
- ❖ Vector(c)

2.Set:(Interface)

- ❖ HashSet(c)
- ❖ Linked hashset(c)
- ❖ TreeSet(c)

3.Map:(Interface)

- ❖ HashMap(c)
- ❖ LinkedHashMap(c)
- ❖ TreeMap(c)
- ❖ Hashtable(c)
- ❖ concurrent HashMap(C)

List:

ArrayList:

Syntax:

```
List ex=new ArrayList();
```

Here,

List_interface

ex_object name

ArrayList() □ class

Example Program:

```
public class ArList {  
    public static void main(String[] args) { List ex=new  
        ArrayList(); ex.add(10);  
ex.add(1000000000000000000L);  
ex.add(10.12f);  
ex.add("Hai");  
ex.add("A"); ex.add(true);  
        System.out.println(ex);  
    }  
}
```



Output:

[10, 10000000000000000, 10.12, Hai, A, true]

- _ add() is a method, it is used to insert a value.
- _ ArrayList will display the output based on the insertion order

Generics:

- _ It will support particular datatypes or object only
- _ It is a features of jdk 1.5
- _ In the generics, we can mention only wrapper class
- _ <>- This is generic symbol, is used to define the particular datatype
- _ If we need integer datatype,

syntax:

List<Integer> ex=new ArrayList<Integer>();

Example Program:

```
public class ArList {  
    public static void main(String[] args) { List<Integer> ex=new  
        ArrayList<Integer>(); ex.add(10);  
        ex.add(20);  
        ex.add(30);  
        ex.add(40);  
        ex.add(40);  
        ex.add(50); System.out.println(ex);  
    }  
}
```

Output:

[10, 20, 30, 40, 40, 50]

- _ List allows the duplicate value
- _ ArrayList print in a insertion order

size():

- ☐ size is a method, it is used to find the size of the ArrayList

Example Program:

```
public class ArList {  
    public static void main(String[] args) { List<Integer> ex=new  
        ArrayList<Integer>(); ex.add(10);  
        ex.add(20);  
        ex.add(30);  
        ex.add(40);  
    }  
}
```



```
ex.add(40);
ex.add(50);
int i = ex.size(); System.out.println(i);

}}
```

Output:

6

get():

- get() is a method , it is used to print the particular value

Example Program:

```
public class ArList {
    public static void main(String[] args) { List<Integer> ex=new
        ArrayList<Integer>(); ex.add(10);
        ex.add(20);
        ex.add(30);
        ex.add(40);
        ex.add(40);
        ex.add(50);
        int x = ex.get(3); System.out.println(x);
    }
}
```

Output:

40

- it takes the value from 0(i.e) 0 1 2 3 > 10 20 30 40

For loop:

```
public class ArList {
    public static void main(String[] args) { List<Integer> ex=new
        ArrayList<Integer>(); ex.add(10);
        ex.add(20);
        ex.add(30);
        ex.add(40);
        ex.add(40);
        ex.add(50);
        for(int i=0;i<ex.size();i++){ System.out.println(ex.get(i));
        }
    }
}
```


**Output:**

10
20
30
40
40
50

Enhanced for loop:

```
public class ArList {  
    public static void main(String[] args) { List<Integer> ex=new  
        ArrayList<Integer>(); ex.add(10);  
        ex.add(20);  
        ex.add(30);  
        ex.add(40);  
        ex.add(40);  
        ex.add(50);  
        for(Integer k:ex){ System.out.println(k);  
    }  
}
```

Output:

10
20
30
40
40
50

Remove():

- _ remove is a method, it is used to remove the particular index value
- _ If we remove the particular index value, index order will not change
- _ After that the index value move to forward

Example Program:

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



```
List<Integer> ex = new ArrayList<Integer>(); ex.add(10);
ex.add(20);
ex.add(30);
ex.add(40);
ex.add(40);
ex.add(50);
ex.remove(3); System.out.println(ex);
}
}
```

Output:

[10, 20, 30, 40, 50]

- In this output, index order is not change
- But the values moved to forward

Index based add():

- ☐ It is used to add the value based on the index

Example Program:

```
public class ArList {
    public static void main(String[] args) { List<Integer> ex = new
        ArrayList<Integer>(); ex.add(10);
        ex.add(20);
        ex.add(30);
        ex.add(40);
        ex.add(40);
        ex.add(50);
        ex.add(2,100); System.out.println(ex);
    }
}
```

Output:

[10, 20, 100, 30, 40, 40, 50]

- ☐ In this o/p , if we insert one value based on index, after all the index value move to backward

set():

- ☐ set is a method, it is used to replace the value but index and value order will not change

Example Program:

```
public class ArList {
    public static void main(String[] args) { List<Integer> ex = new
        ArrayList<Integer>();
```



```
        ex.add(10);
        ex.add(20);
        ex.add(30);
        ex.add(40);
        ex.add(40);
        ex.add(50);
        ex.set(2,100); System.out.println(ex);
    }
}
```

Output:

[10, 20, 100, 40, 40, 50]

contains():

- ☐ contains() is a method it is used to check the particular value or object

Example Program:

```
public class ArList {
    public static void main(String[] args) { List<Integer> ex = new
        ArrayList<Integer>(); ex.add(10);
        ex.add(20);
        ex.add(30);
        ex.add(40);
        ex.add(40);
        ex.add(50);
        boolean x = ex.contains(30);
        System.out.println(x); boolean y =
        ex.contains(100);
        System.out.println(y);
    }
}
```

Output:

true
false

clear():

- ☐ clear is a method it is used to clear the all index value

Example Program:

```
public class ArList {
    public static void main(String[] args) { List<Integer> ex = new
        ArrayList<Integer>(); ex.add(10);
        ex.add(20);
```



```
        ex.add(30);
        ex.add(40);
        ex.add(40);
        ex.add(50);
        System.out.println(ex); // before clearing ex.clear();
        System.out.println(ex); // after clearing
    }
}
```

Output:

[10, 20, 30, 40, 40, 50]

[]

indexOf():

- indexOf() is a method, it is used to print the position of the list

Example Program:

```
public class ArList {
    public static void main(String[] args) { List<Integer> ex = new
        ArrayList<Integer>(); ex.add(10);
        ex.add(20);
        ex.add(30);
        ex.add(40);
        ex.add(40);
        ex.add(50);
        int x = ex.indexOf(30);
        System.out.println(x);
    }
}
```

Output:

2

LastindexOf():

- It is used to print the position from the last

Example Program:

```
public class ArList {
    public static void main(String[] args) { List<Integer> ex = new
        ArrayList<Integer>(); ex.add(10);
        ex.add(20);
        ex.add(30);
        ex.add(40);
        ex.add(40);
    }
```



```

        ex.add(50);
        int x = ex.lastIndexOf(40);
        System.out.println(x);
    }
}

```

Output:

4

addAll():

- ❑ addAll() is a method, it is used to copy from one list to another list

Example Program:

```

public class ArList {
    public static void main(String[] args) { List<Integer> ex = new
        ArrayList<Integer>(); List<Integer> ex1 = new
        ArrayList<Integer>(); ex.add(10);
        ex.add(20);
        ex.add(30);
        ex.add(40);
        ex.add(40);
        ex.add(50); System.out.println(ex);
        System.out.println(ex1); // before addAll
        ex1.addAll(ex);
        System.out.println(ex); System.out.println(ex1); //
        After addAll
    }
}

```

Output:

[10, 20, 30, 40, 40, 50]

[]

[10, 20, 30, 40, 40, 50]

[10, 20, 30, 40, 40, 50]

removeAll():

- ❑ removeAll() is a method , it is used to compare the both list and remove all the list1 values in list 2

(i.e)

list2=list2-list1



Example Program:

```
public class ArList {  
    public static void main(String[] args) { List<Integer> ex = new  
        ArrayList<Integer>(); List<Integer> ex1 = new  
        ArrayList<Integer>(); ex.add(10);  
        ex.add(20);  
        ex.add(30);  
        ex.add(40);  
        ex.add(50);  
        ex1.addAll(ex);  
        ex.add(100);  
        ex.add(200);  
        ex.add(300); ex1.add(1000);  
        ex1.add(50); ex1.add(2000);  
        ex1.add(3000);  
        System.out.println(ex);  
        System.out.println(ex1);  
        ex1.removeAll(ex);  
        System.out.println(ex1);  
    }  
}
```

Output:

[10, 20, 30, 40, 50, 100, 200, 300]

[10, 20, 30, 40, 50, 1000, 50, 2000, 3000]

[1000, 2000, 3000]

- ☐ If we go for removeAll method, here ex1.removeAll(ex), ex1 compare to ex and remove all ex values in the ex1.

retainAll():

- ☐ retainAll() is a method, it is used to compare both list and print the common values

Example Program:

```
public class ArList {  
    public static void main(String[] args) { List<Integer> ex = new  
        ArrayList<Integer>(); List<Integer> ex1 = new  
        ArrayList<Integer>(); ex.add(10);  
        ex.add(20);  
        ex.add(30);  
        ex.add(40);  
        ex.add(50);  
        ex1.addAll(ex);  
        ex.add(100);
```



```
        ex.add(200);
        ex.add(300); ex1.add(1000);
        ex1.add(2000); ex1.add(3000);
        System.out.println(ex);
        System.out.println(ex1);
        ex1.retainAll(ex);
        System.out.println(ex1);
    }
}
```

Output:

[10, 20, 30, 40, 50, 100, 200, 300]

[10, 20, 30, 40, 50, 1000, 2000, 3000]

[10, 20, 30, 40, 50]

LinkedList:

syntax:

```
List<Integer> ex = new LinkedList<Integer>();
```

Example Program:

```
public class ArList {
    public static void main(String[] args) { List<Integer> ex = new
        LinkedList<Integer>(); ex.add(10);
        ex.add(20);
        ex.add(30);
        ex.add(40);
        ex.add(50); System.out.println(ex);
    }
}
```

Output:

[10, 20, 30, 40, 50]

- ☐ it will also print in insertion order.

Vector:

syntax:

```
List<Integer> ex = new Vector<Integer>();
```

Example Program:

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



```
List<Integer> ex = new Vector<Integer>(); ex.add(10);  
ex.add(20);  
ex.add(30);  
ex.add(40);  
ex.add(50); System.out.println(ex);  
}  
}
```

Output:

[10, 20, 30, 40, 50]

- It will also print the same insertion order.
- in all the arraylist methods, will also support in LinkedList and Vector

ArrayList: Worst case

- ☐ In ArrayList deletion and insertion is a worst one because if we delete/insert one index value after all the index move to forward/backward.
- ☐ It makes performance issue.

ArrayList: Best case

- In Arraylist retrieve/searching is a best one
- For ex we have 100 index is there, if we going to print 60th value, we can easily search

LinkedList: Best case

- Insertion and deletion is a best one because
- Here all values based on the separate nodes. so, here we can easily delete/insert one value(i.e) if we delete one value, the next node will join to the previous one

LinkedList: Worst case

- Searching/retrieving is a worst
- For ex, if we have 100 nodes, we have to print 90th node value, it will pass to all the previous nodes and comes to first and then it will print.
- ☐ It's makes performance issue

Difference between ArrayList and Vector:

ArrayList:

- Asynchronize
- It is not a thread safe

Vector:

- Synchronize
- Thread safe



Here,

Synchronize _ one by one(thread safe)

Asynchronize paralally(not thread safe)

Example: ticket booking,

If one ticket is having,10 people is booking at a same time, what happen , the one person only booked the ticket. because its a synchronize process. it allows one by one.

```
List<Integer> ex = new ArrayList<Integer>();
```

```
List<Integer> ex = new LinkedList<Integer>();
```

```
List<Integer> ex = new Vector<Integer>();
```

here we can write these in different way,

```
ArrayList<Integer> ex = new ArrayList<Integer>();
```

```
LinkedList<Integer> ex = new LinkedList<Integer>();
```

```
Vector<Integer> ex = new Vector<Integer>();
```

User defined Array list:

- ☐ Here we can use our own data type

Pojo class :(client old java object/model class/bean class)

- ☐ In class level if we use private , even we can access in another class.
- ☐ If we use private in class 2, right click in class 2 ☐source ☐ generate getters and setters
- ☐ Using this methods we can access in another class
- ☐ This method is called pojo class

Class 1:

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

```
import java.util.List;
```

```
public class Employee extends New {
```

```
    public static void main(String[] args) {
        List<Employee> emp=new ArrayList<Employee>();
        Employee E1=new Employee();
        E1.setId(12);
        E1.setName("vengat");
        E1.setEmail("vengat123@gmail.com");
        Employee E2=new Employee();
        E2.setId(13);
    }
}
```



```
E2.setName("mohan");
E2.setEmail("mohan123@gmail.com");
Employee E3=new Employee();
E3.setId(14);
E3.setName("vel");
E3.setEmail("vel123@gmail.com");
emp.add(E1);
emp.add(E2);
emp.add(E3);
for (Employee x : emp) {
    System.out.println(x.getId());
    System.out.println(x.getName());
    System.out.println(x.getEmail());
}
}
```

Class 2:

```
public class New {
    private int id;
    private String name;
    private String email;
    public int getId() {
        return id;
    }
    public void setId(int id) {
        this.id = id;
    }
    public String getName() {
        return name;
    }
    public void setName(String name) {
        this.name = name;
    }
    public String getEmail() {
        return email;
    }
    public void setEmail(String email) {
        this.email = email;
    }
}
```

**Output:**

12
vengat
vengat123@gmail.com
13
mohan
mohan123@gmail.com
14
vel
vel123@gmail.com

List:

In the list we have to know these points,

- _ It is all insertion order
- _ It allows duplicate value
- _ It is index based

Set:

- _ It ignore the duplicate value
- _ It is value based

Hashset:

- ☐ It will print random order

Example Program:

```
public class ArList {  
    public static void main(String[] args) { Set<Integer> ex = new  
        HashSet<Integer>(); ex.add(10);  
        ex.add(20);  
        ex.add(30);  
        ex.add(40);  
        ex.add(50);  
        ex.add(50); System.out.println(ex);  
    }  
}
```

Output:

[50, 20, 40, 10, 30] // random order and ignore duplicate value

- ☐ It will allows one Null value and won't allow duplicate NULL

LinkedHashset:

- ☐ Insertion order



Example Program:

```
public class ArList {  
    public static void main(String[] args) {  
        Set<Integer> ex = new LinkedHashSet<Integer>(); ex.add(10);  
        ex.add(20);  
        ex.add(30);  
        ex.add(40);  
        ex.add(50);  
        ex.add(50); System.out.println(ex);  
    }  
}
```

Output:

[10, 20, 30, 40, 50] // insertion order

- ☐ It will also allows one Null value and won't allow duplicate NULL

TreeSet:

- ☐ Ascending order

Example Program:

```
public class ArList {  
    public static void main(String[] args) { Set<Integer> ex = new  
        TreeSet<Integer>(); ex.add(20);  
        ex.add(10);  
        ex.add(30);  
        ex.add(50);  
        ex.add(40);  
        ex.add(50); System.out.println(ex);  
    }  
}
```

Output:

[10, 20, 30, 40, 50]

Example Program:

```
public class ArList {  
    public static void main(String[] args) { Set<String> ex = new  
        TreeSet<String>(); ex.add("Ramesh");  
        ex.add("babu");  
        ex.add("Vasu");  
        ex.add("10000"); System.out.println(ex);  
    }  
}
```



Output:

[10000, Ramesh, Vasu, babu]

Here,

- _ It will print ascending order
- _ Ascending order based on the ASCII value

(i.e)

- _ 1_ASCII value is 49
- _ R_ASCII value is 82
- _ V_ASCII value is 86
- _ b_ASCII value is 98

[49,82,86,98] □ [10000, Ramesh, Vasu, babu] □ this is a way to print ascending order.

- TreeSet won't allow single Null value

Set:

- _ It is not maintaining any order(i.e)
- _ HashSet □ random order
- _ LinkedHashMap insertion order
- _ TreeSet □ ascending order
- _ It is value based

remove():

- remove is a method , it is used to remove particular value

```
public class ArList {  
    public static void main(String[] args) { Set<Integer> ex = new  
        TreeSet<Integer>(); ex.add(10);  
        ex.add(20);  
        ex.add(30);  
        ex.add(40);  
        ex.add(50);  
        ex.add(50); ex.remove(40);  
        System.out.println(ex);  
    }  
}
```

Output:

[10, 20, 30, 50]

- Normal for loop is not work here because it is not index based, it is value based



Enhanced for loop:

```
public class ArList {  
    public static void main(String[] args) { Set<Integer> ex = new  
        TreeSet<Integer>(); ex.add(10);  
        ex.add(20);  
        ex.add(30);  
        ex.add(40);  
        ex.add(50);  
        ex.add(50);  
        for(int i:ex){ System.out.println(i);  
    }  
}
```

Output:

10
20
30
40
50

- ☐ All wrapper class default value is Null as well as all class default value is Null

Null:

- _ Null is a undefined/unknown/unassigned value
- _ Null is won't create any memory
- _ So TreeSet will give exception in compile time if we use Null

Difference between List and Set:

List:

- _ It is all insertion order
- _ It allows duplicate value
- _ It is index based

Set:

- _ It is not maintaining any order(i.e)
- HashSet _ random order
LinkedHashSet insertion order
TreeSet ☐ ascending order



- _ It is value based
- _ It ignores duplicate value

we can copy the values from List to set as well as set to list

Example Program:

```
public class ArList {  
    public static void main(String[] args) { List<Integer> ex=new  
        ArrayList(); Set<Integer> ex1 = new TreeSet<Integer>();  
        ex.add(10);  
        ex.add(20);  
        ex.add(30);  
        ex.add(40);  
        ex.add(50);  
        ex.add(50);  
        ex.add(10); ex1.addAll(ex);  
        System.out.println(ex);  
        System.out.println(ex1);  
    }  
}
```

Output:

[10, 20, 30, 40, 50, 50, 10]

[10, 20, 30, 40, 50]

Here, set ignore the duplicate value

- ☐ we can find the duplicate count using size() method

Example Program:

```
public class ArList {  
    public static void main(String[] args) { List<Integer> ex = new  
        ArrayList(); Set<Integer> ex1 = new TreeSet<Integer>();  
        ex.add(10);  
        ex.add(20);  
        ex.add(30);  
        ex.add(40);  
        ex.add(50);  
        ex.add(50);  
        ex.add(10); ex1.addAll(ex);  
        System.out.println(ex);  
        System.out.println(ex1);  
        int i = ex.size() - ex1.size();  
        System.out.println(i);  
    }  
}
```

**Output:**

[10, 20, 30, 40, 50, 50, 10]

[10, 20, 30, 40, 50]

2

Here 2 duplicate value is there

Map:

- _ It is key and value pair
- _ Here key+value is a one entry
- _ Key ignore the duplicate value and value allow the duplicate

Hashmap:

- ☐ It is a random order(based on key)

Example Program:

```
public class ArList {  
    public static void main(String[] args) {  
        Map<Integer, String> ex = new HashMap<Integer,String>(); ex.put(10, "Java");  
        ex.put(20, "Java");  
        ex.put(30, "sql");  
        ex.put(40, ".net");  
        ex.put(50, "sales");  
        ex.put(50, "fire"); System.out.println(ex);  
    }  
}
```

Output:

{50=fire, 20=Java, 40=.net, 10=Java, 30=sql}

- _ If duplicate key is there, it takes the last one
- _ Key will allows the only one Null
- _ Value allow the duplicate null

Linked Hashmap:

- _ Insertion order(based on key)
- _ Key will allows the only one Null
- _ Value allow the duplicate null

```
Map<Integer, String> ex = new LinkedHashMap<Integer, String>()
```




TreeMap:

- _ Ascending order(based on key)
- _ Key won't allow Null(even single null)
- _ Value allow the duplicate null

Map<Integer, String> ex = new TreeMap<Integer, String>()

Hashtable:

- _ Random order
- _ Both key and values are ignore the Null

Map<Integer, String> ex = new Hashtable<Integer, String>()

concurrent hashmap:

- _ Random order
- _ Both key and values are ignore the Null

Map<Integer, String> ex = new ConcurrentHashMap<Integer, String>()

Difference between HashMap and Hashtable:

HashMap:

- _ Key allows single null
- _ Asynchronies(not thread safe)

Hashtable:

- _ Key and value won't allow null
- _ Synchronize(thread safe)

Some Methods:

get():

- ☐ It is a method, it is used to print the value based on key

Example Program:

```
public class ArList {  
    public static void main(String[] args) {  
        Map<Integer, String> ex = new HashMap<Integer,String>(); ex.put(10, "Java");  
        ex.put(20, "Java");  
        ex.put(30, "sql");  
        ex.put(40, ".net");  
        ex.put(50, "sales");  
        ex.put(50, "fire"); String  
        s=ex.get(40);  
        System.out.println(s);  
    }  
}
```



Output:

.net

keySet():

- ☐ It is a method, it is used to separate the key

Example Program:

```
public class ArList {  
    public static void main(String[] args) {  
        Map<Integer, String> ex = new HashMap<Integer,String>(); ex.put(10, "Java");  
        ex.put(20, "Java");  
        ex.put(30, "sql");  
        ex.put(40, ".net");  
        ex.put(50, "sales");  
        ex.put(50, "fire"); Set<Integer> s =  
        ex.keySet(); System.out.println(s);  
    }  
}
```

Output:

[50, 20, 40, 10, 30]

Value():

- ☐ It is a method, it is used to separate the value

Example Program:

```
public class ArList {  
    public static void main(String[] args) {  
        Map<Integer, String> ex = new HashMap<Integer,String>(); ex.put(10, "Java");  
        ex.put(20, "Java");  
        ex.put(30, "sql");  
        ex.put(40, ".net");  
        ex.put(50, "sales");  
        ex.put(50, "fire"); Collection<String> s =  
        ex.values(); System.out.println(s);  
    }  
}
```

Output:

[fire, Java, .net, Java, sql]



entrySet():

- ☐ It is used to iterate the map

Example Program:

```
public class ArList {  
    public static void main(String[] args) {  
        Map<Integer, String> ex = new HashMap<Integer,String>(); ex.put(10, "Java");  
        ex.put(20, "Java");  
        ex.put(30, "sql");  
        ex.put(40, ".net");  
        ex.put(50, "sales");  
        ex.put(50, "fire");  
        Set<Entry<Integer, String>> s = ex.entrySet();  
        for(Entry<Integer, String> x:s){  
            System.out.println(x);  
        }  
    }  
}
```

Output:

```
50=fire  
20=Java  
40=.net  
10=Java  
30=sql
```

- ☐ We can print key and value separately

Example Program:

```
public class ArList {  
    public static void main(String[] args) {  
        Map<Integer, String> ex = new HashMap<Integer,String>(); ex.put(10, "Java");  
        ex.put(20, "Java");  
        ex.put(30, "sql");  
        ex.put(40, ".net");  
        ex.put(50, "sales");  
        ex.put(50, "fire");  
        Set<Entry<Integer, String>> s = ex.entrySet();  
        for(Entry<Integer, String> x:s){  
            System.out.println(x.getKey());  
            System.out.println(x.getValue());  
        }  
    }  
}
```

**Output:**

50
fire
20
Java
40
.net
10
Java
30
Sql

EXCEPTION:

- ☐ Exception is like a error, the program will terminated that line itself

Example Program:

```
public class Exception {  
    public static void main(String[] args) {  
        System.out.println("Start");  
        System.out.println("1");  
        System.out.println("2");  
        System.out.println("3");  
        System.out.println(10/0);  
        System.out.println("4");  
        System.out.println("5");  
        System.out.println("End");  
    }  
}
```

Output:

Start
1
2
3



Exception in thread "main" java.lang.ArithmeticException: / by zero
at org.exception.Exception.main(Exception.java:9)
_ This is exception, if we getting error in run time , the program will be terminated from that line
_ Here, java:9 is 9th line only we getting exception

Throwable:

- _ Super class of exception □ throwable
- _ Exception
- _ Error

Exception:

1. Unchecked exception(Run time exception)
2. Checked exception(Compile time exception)

Unchecked exception:

1. ArithmeticException
2. NullPointerException
3. InputMismatchException
4. ArrayIndexOutOfBoundsException
5. StringIndexOutOfBoundsException
6. IndexOutOfBoundsException
7. NumberFormatException

Checked exception:

1. IOException
2. SQLException
3. FileNotFoundException
4. ClassNotFoundException

1. ArithmeticException:

- If we are trying to give any number divided by zero, we get Arithmetic exception.

Example Program:

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



```
System.out.println("1"); System.out.println("2");  
System.out.println("3"); System.out.println(10/0);  
System.out.println("4"); System.out.println("5");  
System.out.println("End");  
}  
}
```

Output:

Start

1

2

3

Exception in thread "main" java.lang.ArithmeticException: / by zero
at org.exception.Exception.main(Exception.java:9)

2. NullPointerException:

- If we give Null in the string, it will throw the Null point exception. Because default value of string is Null.

Example Program:

```
public class Exception {  
    public static void main(String[] args) { String s= null;  
        System.out.println(s.length());  
    }  
}
```

Output:

Exception in thread "main" java.lang.NullPointerException
at org.exception.Exception.main(Exception.java:6)

3. InputMismatchException:

- If we getting input from the user, the user need to give integer input but the user trying to input string value , at this this we get input mismatch exception



Example Program:

```
public class Exception {  
    public static void main(String[] args) { Scanner sc=new  
        Scanner(System.in); System.out.println("PLs enter  
        value"); int i=sc.nextInt(); System.out.println(i);  
    }  
}
```

Output:

PLs enter value
hai
Exception in thread "main" java.util.InputMismatchException
 at java.util.Scanner.throwFor(Unknown Source)
 at java.util.Scanner.next(Unknown Source)

 at java.util.Scanner.nextInt(Unknown Source)
 at java.util.Scanner.nextInt(Unknown Source)
 at org.exception.Exception.main(Exception.java:9)

4. ArrayIndexOutOfBoundsException:



In particular array, the index value is not available it will throw Array index of bound exception.

Example Program:

```
public class Exception {  
    public static void main(String[] args) { int  
        num[]=new int[4];  
        System.out.println(num[5]);  
    }  
}
```

Output:

Exception in thread "main" java.lang.ArrayIndexOutOfBoundsException: 5
 at org.exception.Exception.main(Exception.java:8)



5. StringIndexOutOfBoundsException:

- In particular String, the index value is not available it will throw String index Out of bound exception.

Example Program:

```
public class Exception {  
    public static void main(String[] args) { String  
        s="Java";  
        char c = s.charAt(10);  
        System.out.println(c);  
    }  
}
```

Output:

Exception in thread "main" java.lang.StringIndexOutOfBoundsException: String index out of range: 10
at java.lang.String.charAt(Unknown Source)
at org.exception.Exception.main(Exception.java:8)

6. IndexOutOfBoundsException:

- In a list, the index value is not available it will throw index out of bound exception.

Example Program:

```
public class Exception {  
    public static void main(String[] args) { List<Integer> ex = new  
        ArrayList<Integer>(); ex.add(10);  
        ex.add(20);  
        ex.add(30);  
        ex.add(40); System.out.println(ex.get(3));  
        System.out.println(ex.get(10));  
    }  
}
```

Output:

40

Exception in thread "main" java.lang.IndexOutOfBoundsException: Index: 10, Size: 4
at java.util.ArrayList.rangeCheck(Unknown Source)
at java.util.ArrayList.get(Unknown Source)
at org.exception.Exception.main(Exception.java:16)



7. NumberFormatException:

- if we give numbers in the string, we can convert the data type into integer. but if we give numand char combination in the string, we can't convert to integer.
- if we trying to convert, it will throw number format exception

Example Program:

```
public class Exception {  
    public static void main(String[] args) { String s="1234";  
        System.out.println(s+5); // string +5 int i =  
        Integer.parseInt(s); System.out.println(i+5); //  
        Integer +5  
        String s1="123Abc45"; int j =  
        Integer.parseInt(s1);  
        System.out.println(j+5);  
    }  
}
```

Output:

12345

1239

Exception in thread "main" java.lang.NumberFormatException: For input string: "123Abc45"
at java.lang.NumberFormatException.forInputString(Unknown Source)
at java.lang.Integer.parseInt(Unknown Source)
at java.lang.Integer.parseInt(Unknown Source)
at org.exception.Exception.main(Exception.java:13)

Exception Handling:

1. Try
2. Catch
3. Finally
4. Throw
5. Throws



Errors:

1. Network error
2. JVM crack
3. out of memory
4. stack overflow

Try and catch:

- ☐ If we get exception, try will throw the exception and catch will catch the exception

Example Program:

```
public class Exception {  
    public static void main(String[] args) {  
        System.out.println("start");  
        System.out.println("1");  
        System.out.println("2");  
        System.out.println("3");  
        try {  
            System.out.println(10/0);}  
            catch(ArithmeticException e){  
                System.out.println("dont/by zero");  
            }  
        System.out.println("4"); System.out.println("5");  
        System.out.println("end");  
    }  
}
```

Output:

```
start  
1  
2  
3  
  
dont/by zero  
4  
5  
  
end
```

- ☐ Here we can enter the same exception or super class of the exception



(i.e)

- Super class of the all unexpected exception is run time exception/exception
- Super class of exception \square throwable
- So we can use runtime exception/exception/throwable instead of the particular exception

Example Program:

we can use throwable

```
try {
    System.out.println(10/0);}
catch(Throwable e){
    System.out.println("dont/by zero");
}
```

instead of

```
try {

    System.out.println(10/0);}
catch(ArithmeticException e){
    System.out.println("dont/by zero");

}
```

Finally:

- finally will execute always whether the exception through or not
- We can give the combination like try _catch finally, we can't reverse/interchange
- If we give try finally, again it will show the exception

Example Program:

```
public class Exception {
    public static void main(String[] args) {
        System.out.println("start");
        System.out.println("1");
        System.out.println("2");
        System.out.println("3");
        try {
            System.out.println(10/0);}
        catch(ArithmeticException e){
            System.out.println("dont/by zero");
        }finally{
            System.out.println("final");
        }
        System.out.println("4"); System.out.println("5");
        System.out.println("end");}}}
```

**Output:**

start
1
2
3

dont/by zero
final
4

5

end

- ☐ Even if exception not through, finally will print

Example program:

```
public class Exception {  
    public static void main(String[] args) {  
        System.out.println("start");  
        System.out.println("1");  
        System.out.println("2");  
        System.out.println("3");  
        try {  
            System.out.println(10/0);}  
            catch (NullPointerException e){  
                System.out.println("dont/by zero");  
            }finally{  
                System.out.println("final");  
            }  
        System.out.println("4"); System.out.println("5");  
        System.out.println("end");  
    }  
}
```

Output:

start
1
2
3

final



Exception in thread "main" java.lang.ArithmeticException: / by zero
at org.exception.Exception.main(Exception.java:11)

- _ In between try ,catch and finally, we won't write any logics
- _ In one try block we can use n-number of catch blocks but we can't repeat the same exception
- _ In one try block we can handle only one exception

Example Program:

```
public class Exception {  
    public static void main(String[] args) {  
        System.out.println("start");  
        System.out.println("1");  
        System.out.println("2");  
        System.out.println("3");  
        try {  
            System.out.println(10/0);}  
            catch(NullPointerException e){  
                System.out.println("null point");  
            }  
            catch(ArithmeticException e) {  
                System.out.println("dont/by zero");  
            }  
            finally{  
                System.out.println("final");  
            }  
        System.out.println("4"); System.out.println("5");  
        System.out.println("end");  
    }  
}
```

Output:

```
start  
1  
2  
  
3  
  
dont/by zero  
final  
4  
  
5  
  
end
```

- ☐ In a try block, one catch we can use same exception and another catch we use throwable exception



- At this time, it will through the first one if it is match, will print. if it is not correct will throw the second
- throwable is the super class of all exception
- In more than one catch block, we can use like sub class and super class combination. But we can't use reverse

sub class □ ArithmeticException, NullPointerException,.....

super class □ Throwable/Exception

- if we give Super class and sub class combination, it will give compilation error

Example Program:

```
public class Exception {  
    public static void main(String[] args) {  
        System.out.println("start");  
        System.out.println("1");  
        System.out.println("2");  
        System.out.println("3");  
        try {  
            System.out.println(10/0);}  
            catch(NullPointerException e){  
                System.out.println("null point");  
            }  
            catch(Throwable e) {  
                System.out.println("dont/by zero");  
            }  
            finally{  
                System.out.println("final");  
            }  
        System.out.println("4"); System.out.println("5");  
        System.out.println("end");  
    }  
}
```

Output:

```
start  
1  
2  
  
3  
  
dont/by zero  
final  
4
```



5

end

Example Program:

```
try {  
    System.out.println(10/0);}  
    catch(Throwable e) {  
        System.out.println("dont/by zero");  
    }  
  
    catch(NullPointerException e){  
        System.out.println("null point");  
    }  
  
    finally{  
        System.out.println("final");  
    }  
}
```

- _ If we give like above, will get compile time exception/error because we can't reverse
- _ In one try block, we can write only one finally block

Inner try:

- _ If we use inner try, it will print inner catch, inner finally and outerfinally.
- _ But one try block handle one exception only, even if we use inner try also
- _ If main try have no exception, it will through inner try. in that inner try if catch exception is wrong, it will goes and print outer finally

Example Program:

```
public class Exception {  
    public static void main(String[] args) {  
        System.out.println("start");  
        System.out.println("1");  
        System.out.println("2");  
        System.out.println("3");  
        try {  
            System.out.println(10/0);  
            try {  
                String s=null; System.out.println(s.charAt(0));  
            }catch(NullPointerException e){  
                System.out.println("inner catch");  
            }finally{  
                System.out.println("inner finally");  
            }  
        }  
    }  
}
```



```
    }  
    catch(ArithmeticException e) {  
        System.out.println("dont/by zero");  
    }  
    finally{  
        System.out.println("outer finaly");  
    }  
    System.out.println("4"); System.out.println("5");  
    System.out.println("end");  
}  
}
```

Output:

start
1
2
3

dont/by zero
outer finaly
4
5

end

Example Program:

```
public class Exception {  
    public static void main(String[] args) {  
        System.out.println("start");  
        System.out.println("1");  
        System.out.println("2");  
        System.out.println("3");  
        try {  
            System.out.println(10/2);  
            try {  
                String s=null; System.out.println(s.charAt(0));  
            }catch(NullPointerException e){  
                System.out.println("inner catch");  
            }finally{  
                System.out.println("inner finaly");  
            }  
        }  
        catch(ArithmeticException e) {  
            System.out.println("dont/by zero");  
        }  
    }  
}
```




```
        finally{
            System.out.println("outer finaly");
        }
    System.out.println("4"); System.out.println("5");
    System.out.println("end");
}
}
```

Output:

```
start
1
2
3
5
inner catch
inner finally
outer finaly
4
5
end
```

Throw and Throws:

Throw:

- _ Throw is a keyword, we can through any exception inside the method
- _ At a time we can throw only one exception

Throws:

- _ Throws is a keyword, it is used to declare the exception(in method level)
- _ At a time we can declare more than one exception

Example Program:

```
public class Exception {
    public static void main(String[] args) throws InterruptedException, IOException{
        info();
    }
    private static void info() throws IOException {
        System.out.println("hello");
        throw new IOException();
    }
}
```

- ☐ If we try to throws the compile time exception in any method, we must handle it in compile time



Example Program:

```

public class Exception {
    public static void main(String[] args) throws InterruptedException,
        ArithmeticException, IOException {
        info();
    }
    private static void info() throws IOException {
        System.out.println("hello");
        throw new IOException();
    }
}

```

Constructor:

- ☐ Class name and constructor name must be same.
- ☐ It doesn't have any return type.
- ☐ We don't want to call constructor which is creating object itself.
- ☐ It will automatically invoke the default constructor.
- ☐ It will support in method overloading but won't support in method overriding

Example :

```

public class Const1 {
    public Const1() {
        System.out.println("i am in constructor");
    }

    public Const1(int a) {
        System.out.println("1 argument int");
    }

    private void Const1(int i) {
        System.out.println(i);
    }

    public static void main(String[] args) {
        Const1 c = new Const1();
        Const1 c1 = new Const1(10);

        c.Const1(10);
    }
}

```

Here,

```

public Const1() □ Non- Argument based constructor

```



public Const1(**int** a) □ Argument based constructor

- In argument base constructor we have to pass the argument in object
Const1 c1=**new** Const1(10);
- In non-argument base constructor we don't want to pass any argument
Const1 c=**new** Const1();

Output:

i am in constructor
1 argument int
10

This:

- It is a keyword.
- If we use 'this' argument , we can pass without object
- This argument we must use only in first statement

Example 1:

```
public class Const1 {  
public Const1() {  
    this(10);  
    System.out.println("i am in constructor");  
}  
public Const1(int a){  
    System.out.println("1 argument int");  
}  
  
public static void main(String[] args) {  
  
    Const1 c=new Const1();  
  
    }  
}
```

sOutput:

1 argument int
i am in constructor



EXAMPLE 2:

```
public class sample {  
    public sample(){  
        this(10);  
        System.out.println("i am in constructor");  
    }  
    public sample(int i) {  
        this(23.23f);  
        System.out.println("am integer constructor");  
    }  
    public sample(float f) {  
        System.out.println("am float constructor");  
    }  
  
    public static void main(String[] args) {  
  
        sample s=new sample();  
    }  
}
```

Output:

am float constructor
am integer constructor
i am in constructor

- If we trying to declare any variable without value in class level. It will print the default value

```
public class sample {  
    int id;
```

- Inside the method, we must initialize the local variable otherwise we get compile time error

```
public class sample {  
    int id=10;  
    private void num() {  
        int id=100;  
        System.out.println(id);  
    }  
}
```

Output: 100

- If same variable name in local level and class level, it will give first preference is local level

This():

Class level:

- It will refer the class level variable value

Example:

```
public class sample {  
    int id=100;  
    private void num() {  
        System.out.println(id);  
    }  
    public static void main(String[] args) {  
        sample s=new sample();  
        s.num();  
    }  
}
```

Output:

100

Method level access of this():

Without this():

```
public class Const1 {  
    int id=100;  
    private void num() {  
        int id=10;  
        System.out.println(id);  
    }  
    public static void main(String[] args) {  
        Const1 s=new Const1();  
        s.num();  
    }  
}
```

Output:

10

With this():

```
public class sample {  
    int id=100;  
    private void num() {  
        int id=10;  
        System.out.println(this.id);  
    }  
    public static void main(String[] args) {  
        sample s=new sample();  
        s.num();  
    }  
}
```

Output:

100

Greens technologies

Super :

- It will refer the parent class level variable value

Class 1:

```
public class sample extends Const1 {  
    int id=100;  
    private void num() {  
        int id=10;  
        System.out.println(super.id);  
    }  
    public static void main(String[] args) {  
        sample s=new sample();  
        s.num();  
    }  
}
```

Class 2:

```
public class Const1 {  
    int id =30;  
}
```

Output:

30

Final:

- It's a keyword.
- If we use final before the variable, we can't overwrite.
- If we trying to overwrite it show compile time error.
- As well as if we use final before the method/class, we can't extend.
- We can use final in three ways,
 - Variable level
 - Method level
 - Class level

Variable level using final:

- ☐ We can overwrite the value of variable on variable declaration.
- ☐ If we final, the value of variable can't be overwrite.

Example:

Without using final:

```
public class sample {  
  
    public static void main(String[] args) {  
  
        int a=10;  
        a=20;  
        System.out.println(a);  
    }  
}
```

Output:

20

With using final

```
public class sample {  
  
    public static void main(String[] args) {  
  
        final int a=10;  
        a=20;  
        System.out.println(a);  
    }  
}
```

output:

- ☐ We get compile time error.
- ☐ if we use final , we can't overwrite

Method level using final():

Class 1:

```
public class sample {  
    public final void example() {  
  
    }  
}
```

Class 2:

```
public class Const1 extends sample {  
    public void example(){ // we get compile time error here, because if we use final in  
    method level(parent class), we can't use again  
  
    }  
}
```

- ☐ We get compile time error, because we using final in method level
- ☐ We can't over ride while using final

Class level :

- ☐ If we are using final in class level , we can't extends to anywhere

```
public final class sample {  
  
}
```


JAVA INTERVIEW QUESTIONS:

1. What is the difference between JDK, JRE and JVM?

- ☐ **JDK:** Java Development Kit
 - JDK is a software, it contains JRE and JVM
 - If we run any applications, JDK have to installed
- ☐ **JRE:** Java Runtime Environment
 - It is a predefined .class files(i.e.) library files
- ☐ **JVM:** Java Virtual Machine
 - It is mainly used to allocate the memory and compiling

2. What is meant by class, method and objects?

- ☐ **CLASS:**
 - Class is nothing but collection of methods or collection of objects.
- ☐ **METHOD:**
 - A set of action to be performed
- ☐ **OBJECT:**
 - Run time memory allocation
 - Using object we can call the any methods

3. What is meant by Encapsulation?

- ☐ Structure of creating folder is called encapsulation

4. What is the use of inheritance and its types?

- ☐ Inheritance is used to reduce the object memory
- ☐ We can access one class property into another class using 'extend' keyword is called inheritance
 - Reusable purpose
 - It has 5 types
 1. Single Inheritance
 2. Multilevel Inheritance
 3. Multiple Inheritance
 4. Hybrid Inheritance
 5. Hierarchical Inheritance

1. Single Inheritance:

- One parent class is directly support into one child class using extend keyword

2. Multilevel Inheritance:

- More than one parent class support into one child class using extends keyword

3. Multiple Inheritance:

- More than one parent class parallely support into one child class but it won't support in java because
 - Priority problem
 - Compilation error/syntax error

(i.e.) if both parent class having same method name it gets priority problem so it doesn't work in java

- but multiple inheritance support in java using interface

4. Hybrid inheritance:

- It's a combination of single and multiple inheritance

5. Hierarchical Inheritance:

- One parent class directly support into more than one child class

5. What is meant by java? why we go for java??

1. Java is a simple programing language
2. Writing, compilation and debugging a program is very easy in java
3. It helps to create reusable code
4. Java has more features,
 1. platform independent
 2. open source
 3. multithreading
 4. more secure
 5. portable

1. Platform independent:

- During the compilation the java program converts into byte code
- Using byte code we can run the application to any platform such as windows, mac, Linux.Etc.

2. Open source:

- A program in which source code is available to the general public for use and/or modification from its original design at free of cost is called open source

3. Multithreading:

- Java supports multithreading
- It enables a program to perform several task simultaneously

4. More secure:

- It provides the virtual firewall between the application and the computer
- So it's doesn't grant unauthorized access

5. Portable:

- "Write once Run anywhere"
- Java code written in one machine can run on another machine

6. What is meant by garbage collection??

- ☐ Automatic De- allocation of objects is called garbage collection.

7. What is the difference between while and do while?

- ☐ While:

- Entry level condition checking

- ☐ Do. While:

- Exit level condition checking
- Even if condition fails, it print one time

8. What is the difference between break and continue??

- ☐ Break:

- It exit from the current loop

- ☐ Continue:

- It will skip the particular iteration

9. What is the use of polymorphism??

- _ Poly many
- _ Morphism forms

- ☐ Taking more than one forms is called polymorphism
- ☐ One task is completed by many ways

10. What is the difference between method overloading and method over hiding?

Method overloading :(static binding/compile time polymorphism)

- ☐ In a same class method name is same and the argument is different is called method overloading
- ☐ The argument is depends on
 - data types
 - data types count
 - data type order

Method overriding :(dynamic binding/run time polymorphism)

- ☐ In a different class , the method name should be same and argument name should be same is called overriding

11. What is meant by abstraction??

- ☐ Hiding the implementation part is called abstraction
- ☐ It has 2 types,
 1. Partially abstraction(abstract class)
 2. Fully abstraction(interface)

12. What is the difference between abstract class and interface??

Abstract class:

- It is partially abstraction
- It support both abstract method and non-abstract method
- Its using "extends" keyword
- Here "public abstract" have to mention
- We can use whatever access specifier we want

Interface:

- It is fully abstraction
- It support only abstract method
- It's using "implement" keyword
- "Public Abstract" is default. no need to mention
- Here only use public(access specifier)

13. *What is the super class of java??*

- ☐ Object

14. *What is default package of java??*

- ☐ java.lang

15. *Define heap memory???*

- ☐ The objects are stored in the heap memory

16. *What is meant by wrapper class and uses??*

- ☐ Classes of data types is called wrapper class
- ☐ It is used to convert any data types into objects

17. *What is meant by string????*

- ☐ Collections of character or word enclosed with double quotes is called string

18. *What is the difference between literal and non-literal string???*

Literal String:

- _ Its stored inside the heap memory(string pool or string constant).
- _ It share the memory if same value (duplicate value)

Non literal string:

- _ It's stored in the heap memory.
- _ its create a new memory every time even if its duplicate value(same value)

19. *Define oops concept,*

- _ Object Oriented Programing Structure
 - _ OOPS is a method of implementation in which programs are organized as collection of objects, class and methods
-
- ☐ Oops principles are
 1. Class
 2. Method
 3. Object

4. Abstraction
5. Encapsulation
6. Inheritance
7. Polymorphism

20. *What is meant by interface??*

Interface:

- ☐ It will support only abstract method, won't support non abstract method
- ☐ In interface "public abstract" is default. we no need to mention
- It using implements keywords
- It is fully abstraction

21. *Define abstraction:*

ABSTRACTION:

- Hiding the implementation part is called abstraction
- It has 2 types,
 1. Partially abstraction(abstract class)
 2. Fully abstraction(interface)

1. Partially Abstraction(Abstract class):

22. *variable??*

- Long-8

23. *What is the size of short variable??*

- Short-2

24. *What is the size of int variable??*

- Int-4

25. Define access specifier & its types??

ACCESS SPECIFIER:

1. Public
2. Protected
3. Default
4. Private

1. Public:

- It is global level access(same package + different package)

2. Private:

- It is a class level access

3. Default :

- Package level access
- Without access specifier within the package we can access

EX,

- public static _ public access specifier(need to mention public)
- private static _ private access specifier(need to mention)
- static □ default access specifier(need not)

4. Protected:

- Inside package + outside Package(Extends)
- we can access inside package and outside package using extend keyword

26. What is meant by polymorphism???

POLYMORPHISM:

- _ Poly-many
- _ Morphism-forms
- _ Taking more than one forms is called polymorphism.
- _ One task is completed by many ways

- It has 2 types,

1. Method overloading (static binding/compile time polymorphism)
2. Method overriding (dynamic binding/run time polymorphism)

1. Method overloading:

- In a same class method name is same and the argument is different is called method overloading

- The argument is depends on
 - Data types
 - Data types count
 - Data type order

2. Method overriding:

- In a different class , the method name should be same and argument name should be same is called overriding

27. *What is array??*

- _ Collection of similar data
- _ The values are stored based on index
- _ The index will start from 0 to n-1

28. *What is difference between hashmap and hashtable?*

HashMap:

- _ Key allows single null
- _ Asynchronies(not thread safe)

Hashtable:

- _ Key and value won't allow null
- _ Synchronize(thread safe)

29. *What is the difference between linked list and array list?*

ArrayList: Worst case

- ☐ In ArrayList deletion and insertion is a worst one because if we delete/insert one index value after the entire index move to forward/backward.
- ☐ It makes performance issue.

ArrayList: Best case

- _ In arraylist retrieve/searching is a best one
- _ For ex we have 100 index is there, if we going to print 60th value, we can easily search

LinkedList: Best case

- Insertion and deletion is a best one because

- Here all values based on the separate nodes. So, here we can easily delete/insert one value(i.e.) if we delete one value, the next node will join to the previous one

LinkedList: Worst case

- Searching/retrieving is a worst
- For ex, if we have 100 nodes, we have to print 90th node value, it's communicate all the previous nodes and comes to first and then it will print.
- It's makes performance issue

30. *Can we able to write any logic in interface?*

- No. In class only we can write

31. *What is the difference between mutable and immutable string?*

Immutable string:

- We can store more duplicate value in same memory
- We can't change the value in memory
- In concord nation, we have to create new memory

Mutable string:

- We can't store duplicate value in same memory
- We can change the value in memory
- In concord nation, its takes same memory

32. *What is the difference between thread safe and non-thread safe?*

Thread safe:

- synchronize we can access one by one
- ex. ticket booking

Non-thread safe:

- Asynchronies parallaly we can access

33. *List will allow duplicate value?*

- Yes. it will allow

34. *What are all coding standards available in java? Where we use it?*

Coding standards:

- a. Pascal notation
- b. Camel notation
- Pascal notation: Each word of first letter should be in capital
- Camel notation : First word should be small after every word of the first letter should be capital
- Pascal notation:
 - 1. Project name
 - 2. Class name
- Camel notation :
 - 1. Method name
 - 2. Variable name

35. *What is NullPointerException?*

- If we give Null in the string, it will throw the Null point exception. Because default value of string is Null.

36. *What is meant by List and set?*

List:

- It is all insertion order
- It allows duplicate value
- It is index based

Set:

- It is not maintaining any order(i.e.)
 - HashSet □ Random order
 - LinkedHashSet □ Insertion order
 - TreeSet □ Ascending order
- It is value based
- it will not allow duplicate value

37. *How will you iterate map?*

- Using entrySet() method we can iterate the map

38. *What is the difference between ArrayList and Vector ?*

ArrayList:

- Asynchronies
- It is not a thread safe

Vector:

- Synchronize
- Thread safe

Here,

Synchronize _ One by one (thread safe)

Asynchronies _ Paralally(not thread safe)

Ex, ticket booking,

39. *Define map?*

- It is key and value pair
- Here key + value is a one entry
- Key ignore the duplicate value and value allow the duplicate
- It has 5 types
 - Hashmap(c)
 - Linked hashmap(c)
 - Treemap(c)
 - Hashtable(c)
 - Concurrent hashmap(C)

40. *Define generics?*

- It will support particular datatypes or object only
- It is a one of the features of JDK 1.5
- In the generics, we can mention only wrapper class
- <> it is a generic symbol. it is used to define the particular data type
- If we need integer data type,
- Syntax:

```
List<Integer> ex=new ArrayList<Integer>();
```

41. *What is the difference between throw and throws?*

Throw:

- _ Throw is a keyword, we can through any exception inside the method
- _ At a time we can throw only one exception

Throws:

- _ Throws is a keyword, it is used to declare the exception(in method level)
- _ At a time we can declare more than one exception

42. *What is the difference between hashset,linked hashset and treeset*

Hashset:

- It will print random order
- It will allow single Null value but won't allow duplicate Null

Linked hashset:

- It will print insertion order
- It will allow single Null value but won't allow duplicate Null

Treeset:

- It will print ascending order
- Treeset won't allow Null value

43. *How many null values allow in treeset?*

- Treeset won't allow Null value

44. *What is the super class of all exceptions?*

- Throwable

45. *What is the difference between equal and double equals?*

- ☐ = _ It is used to assigning the value
- ☐ == _ It is used for condition checking

46. *What is the difference between retain all and remove all?*

removeAll():

- removeAll() is a method , it is used to compare the both list and remove all the list1 values in list 2

(i.e)

list2 = list2-list1 or a = a-b

retainAll():

- retainAll() is a method, it is used to compare both list and print the common values

47. *How to create object for interface and abstract class?*

- We won't create object for interface and abstract class.

48. *What are the advantages and disadvantages of arrays?*

Advantage of array:

- In a single variable we can store multiple values

Disadvantage of arrays:

- It support only similar data types
- It is a fixed size
- Memory wastage is high
- To overcome these we go for collections

49. *What is the difference between normal class and abstract class*

Abstract class:

- ☐ It will support abstract method and non-abstract method
- ☐ We won't create object for abstract class
- ☐ We won't write any business logic in abstract method

Class:

- ☐ It support only in non-abstract method
- ☐ We can create object for class

50. *Difference between final and finally?*

Final

1. A final class variable whose value cannot be changed.
2. A final is declared as class level, they cannot be inherited.
3. If final is declared as method level, they cannot be override.

Finally

1. It's a block of statement that definitely executes after the try catch block.
2. If try block fails means, the final block will executes once.

51. *How to access one class property into another class?*

2 ways we can access

1. by using extends keyword (inheritance)
2. By creating object

CORE JAVA PROGRAMS

1. Sum of odd number(1 to 100):

```
public class SumofOddNum {  
    public static void main(String[] args) {  
        int count = 0;  
        for (int i = 1; i <= 100; i++) {  
            if (i % 2 == 1) {  
                count = count + i;  
            }  
        }  
        System.out.println(count);  
    }  
}
```

Output:

2500

2. Sum of even number(1 to 100):

```
public class SumofEvenNum {  
    public static void main(String[] args) {  
        int count = 0;  
        for (int i = 1; i <= 100; i++) {  
            if (i % 2 == 0) {  
                count = count + i;  
            }  
        }  
        System.out.println(count);  
    }  
}
```

Output:

2550

3. Count of odd number(1 to 100):

```
public class CountOfOddNumber {  
    public static void main(String[] args) {  
        int count = 0;  
        for (int i = 1; i <= 100; i++) {
```

```

        if (i % 2 == 1) {
            count = count + 1;
        }
    }
    System.out.println(count);
}
}

```

Output:

50

4. Count of even number(1 to 100):

```

public class CountOfEvenNumbers {
    public static void main(String[] args) {
        int count = 0;
        for (int i = 1; i <= 100; i++) {
            if (i % 2 == 0) {
                count = count + 1;
            }
        }
        System.out.println(count);
    }
}

```

Output:

50

5. Factorial number:

```

public class FactorialNumbers {

    public static void main(String[] args) {
        int count = 1;
        for (int i = 1; i <= 8; i++) { count =
            count * i;
        }
        System.out.println(count);
    }
}

```

Output:

40320

6. Fibonacci series:

```
public class Fibanacci {  
    public static void main(String[] args) { int a = 0, b =  
        1; System.out.println(a);  
        System.out.println(b);  
        for (int i = 2; i <= 10; i++) { int c = a + b;  
            System.out.println(c);  
            a = b; b  
            = c;  
        }  
    }  
}
```

Output:

0
1
1
2
3
5
8
13
21
34

7. To find even/odd number:

```
public class EvenoddNumber {  
    public static void main(String[] args) { Scanner e = new  
        Scanner(System.in); System.out.println("Enter a  
        Number"); int n = e.nextInt();  
        if (n % 2 == 0) {  
            System.out.println("Even number");  
        } else {  
            System.out.println("Odd number");  
        }  
    }  
}
```

Output:

Enter a Number
121
Odd number

8. Swapping numbers using third variable:

```
public class SwappingNumbersWithVar {  
  
    public static void main(String[] args) {  
        int a, b, c;  
        Scanner sw = new Scanner(System.in);  
        System.out.println("The numbers are"); a =  
        sw.nextInt();  
        b = sw.nextInt(); c = a;  
        a = b; b  
        = c;  
        System.out.println("swapping numbers are");  
        System.out.println(a); System.out.println(b);  
    }  
}
```

Output:

The numbers are
25
45

swapping numbers are
45
25

9. Swapping numbers without using third variable:

```
public class SwappingNumWithoutVar {  
    public static void main(String[] args) {  
        int a, b;  
        Scanner sw = new Scanner(System.in);
```

```

        System.out.println("The numbers are"); a =
        sw.nextInt();
        b = sw.nextInt(); a = a
        + b;
        b = a - b;
        a = a - b;
        System.out.println("swapping numbers are");
        System.out.println(a); System.out.println(b);

    }

}

```

Output:

The numbers are
20
40

Swapping numbers are
40
20

10.Reverse the number:

```

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

        Scanner rn = new Scanner(System.in);
        System.out.println("Enter a number"); int n =
        rn.nextInt();
        int a, i = 0, j = 0;

        a = n;
        while (a > 0) {
            i = a % 10;
            j = (j * 10) + i; a = a /
            10;
        }
        System.out.println("Reverse number is=" + j);

    }

}

```

Output:

Enter a number
12345
Reverse number is=54321

11. To check palindrome number:

```
public class PolyndromeNumberCheck {  
    public static void main(String[] args) {  
  
        int n, a, i = 0, j = 0;  
        Scanner an = new Scanner(System.in);  
        System.out.println("Enter a number"); n =  
        an.nextInt();  
        a = n;  
        while (a > 0) {  
            i = a % 10;  
            j = (j * 10) + i; a = a /  
            10;  
        }  
        if (n == j) {  
            System.out.println("palindrome");  
        } else {  
            System.out.println("Not palindrome Number");  
        }  
    }  
}
```

Output:

Enter a number
141
palindrome

12. To print palindrome number(1 to 100):

```
public class PolyndromeNumbers {  
    public static void main(String[] args) {  
        for (int n = 1; n <= 100; n++) {  
            int a, i = 0, j = 0; a = n;  
            while (a > 0) {  
                i = a % 10;
```

```
        j = (j * 10) + i; a = a /  
        10;  
    }  
    if (n == j) {  
        System.out.println(n);  
    }  
}  
}
```

Output:

1
2
3
4
5
6
7
8
9
11
22
33
44
55
66
77
88
99

13. To count palindrome number(1 to 1000):

```
public class palindromeNum{
    public static void main(String[] args) {
        int c = 0;
        for (int n = 1; n <= 1000; n++) {
            int a, i = 0, j = 0; a = n;
            while (a > 0) {
                i = a % 10;
                j = (j * 10) + i; a = a / 10;
            }
            if (n == j) {
                c++;
            }
        }
        System.out.println(c);
    }
}
```

Output:

108

14. To check Armstrong number:

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

        int n, a, i = 0, j = 0;
        Scanner an = new Scanner(System.in);
        System.out.println("Enter a number"); n =
        an.nextInt();
        a = n;

        while (a > 0) {
            i = a % 10;
            j = j + (i * i * i); a = a / 10;
        }
        if (n == j) {
```

```

        System.out.println("Armstrong number");
    } else {
        System.out.println("Not armstrong Number");
    }
}
}

```

Output:

Enter a number
153
Armstrong number

15.To print Armstrong number(1 to 1000):

```

public class ArmstrongNumbers {
    public static void main(String[] args) {
        for (int n = 1; n <= 1000; n++) {
            int a, i = 0, j = 0; a = n;
            while (a > 0) {
                i = a % 10;
                j = j + (i * i * i); a = a / 10;
            }
            if (n == j) {
                System.out.println(n);
            }
        }
    }
}

```

Output:

1
153
370
371
407

16. To count Armstrong number(1 to 1000):

```
public class ArmsrongNumberCount {  
    public static void main(String[] args) {  
        int c = 0;  
  
        for (int n = 1; n <= 1000; n++) {  
            int a, i = 0, j = 0; a = n;  
            while (a > 0) {  
                i = a % 10;  
                j = j + (i * i * i); a = a / 10;  
            }  
            if (n == j) {  
                c++;  
            }  
        }  
        System.out.println(c);  
    }  
}
```

Output:

5

17. Triangle program:

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


Output:

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

18. Reverse triangle:

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

Output:

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

19. To check prime number:

```
public class PrimeNumberChecking {  
    public static void main(String[] args) {  
        int n;  
        Scanner input = new Scanner(System.in);  
        System.out.println("enter the number"); n =  
        input.nextInt();  
        int count = 0;  
        for (int i = 2; i <= n / 2; i++) {
```

```

        if (n % i == 0) {
            count = 1;
        }
    }
    if (count == 0) {
        System.out.println("prime");
    } else {
        System.out.println("not prime");
    }
}
}

```

Output:

enter the number
17
prime

enter the number
21
not prime

20. To print prime number(1 to 10):

```

public class PrimeNumber {
    public static void main(String[] args) {
        int count;
        for (int i = 1; i <= 10; i++) { count = 0;
            for (int j = 2; j <= i / 2; j++) {
                if (i % j == 0) {
                    count++;
                }
            }
            if (count == 0) {
                System.out.println(i);
            }
        }
    }
}

```

Output:

1
2
3
5
7

21. To count prime number(1 to 100):

```
public class PrimeNumberCount {  
    public static void main(String[] args) {  
        int count, c = 0;  
        for (int i = 1; i <= 100; i++) { count = 0;  
            for (int j = 2; j <= i / 2; j++) {  
                if (i % j == 0) {  
                    count++;  
                }  
            }  
            if (count == 0) { c++;  
            }  
        }  
        System.out.println(c);  
    }  
}
```

Output:

26

22. Student grade:

```
public class StudentsGrade {  
    public static void main(String[] args) { Scanner sm =  
        new Scanner(System.in);  
        System.out.println("enter value:"); int n =  
        sm.nextInt();  
        if (100 >= n && n >= 90) { System.out.println("S  
            grade");  
        } else if (89 >= n && n >= 80) {  
            System.out.println("A grade");  
        } else if (79 >= n && n >= 70) {
```

```

        System.out.println("B grade");
    } else if (69 >= n && n >= 60) {
        System.out.println("C grade");
    }

    else if (59 >= n) {
        System.out.println("Fail");
    }

}

}

```

Output:

enter value:

67

C grade

enter value:

55

Fail

23. Multiplication table:

```

public class MultiflicationTable {
    public static void main(String[] args) {
        int n, j;
        Scanner mt = new Scanner(System.in);
        System.out.println("Enter the Table"); n =
mt.nextInt(); System.out.println("table upto");
j = mt.nextInt();
        for (int i = 1; i <= j; i++) {
            int c = n * i;
            System.out.println(i + "*" + n + "=" + c);
        }
    }
}

```

Output:

Enter the Table

6

table upto

10

1*6=6

2*6=12

3*6=18

4*6=24

5*6=30

6*6=36

7*6=42

8*6=48

9*6=54

10*6=60

24. Biggest of 4 numbers:

```
public class BiggestNumberUsingif {  
    public static void main(String[] args) {  
        int a, b, c, d;  
        Scanner bn = new Scanner(System.in);  
        System.out.println("The four numbers are"); a =  
        bn.nextInt();  
        b = bn.nextInt(); c =  
        bn.nextInt(); d =  
        bn.nextInt();  
        if (a > b && a > c && a > d) {  
            System.out.println("the biggest number is=" + a);  
        } else if (b > a && b > c && b > d) { System.out.println("the biggest  
            number is=" + b);  
        } else if (c > a && c > b && c > d) { System.out.println("the biggest  
            number is=" + c);  
        } else {  
            System.out.println("the biggest number is=" + d);  
        }  
    }  
}
```

```

        }
    }
}

```

Output:

The four numbers are

23

45

56

22

The biggest number is=56

25. Find vowels and non-vowels count

```

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

        String a = "welcome";
        int vowels = 0;
        int nonVowels = 0;

        for (int i = 0; i < a.length(); i++) {
            char ch = a.charAt(i);
            if (ch == 'a' || ch == 'A' || ch == 'e' || ch == 'E' || ch == 'i'
                || ch == 'I' || ch == 'o' || ch == 'O' || ch == 'u'
                || ch == 'U') {

                vowels++;

            } else {
                nonVowels++;
            }
        }

        System.out.println(vowels);
        System.out.println(nonVowels);
    }
}

```

Output:

3

4

26. Ascending order using array:

```
public class Ascending {  
    public static void main(String[] args)  
    {  
        int n, temp;  
        Scanner s = new Scanner(System.in);  
        System.out.print("Enter no. of elements you want in array:"); n = s.nextInt();  
        int a[] = new int[n]; System.out.println("Enter all the  
        numbers:"); for (int i = 0; i < n; i++)  
        {  
            a[i] = s.nextInt();  
        }  
        for (int i = 0; i < n; i++)  
        {  
            for (int j = i + 1; j < n; j++)  
            {  
                if (a[i] > a[j])  
                {  
                    temp = a[i]; a[i]  
                    = a[j]; a[j] =  
                    temp;  
                }  
            }  
        }  
        System.out.print("Ascending Order:");  
        for (int i = 0; i < n - 1; i++)  
        {  
            System.out.print(a[i] + ",");  
        }  
        System.out.print(a[n - 1]);  
    }  
}
```

Output:

Enter no. of elements you want in array:6

Enter all the numbers:

10

20

100

40

200

60

Ascending Order: 10,20,40,60,100,200

27. Descending order using array:

```
public class DescendingOrder {  
    public static void main(String[] args) {  
        int n, temp;  
        Scanner s = new Scanner(System.in);  
        System.out.print("Enter no. of elements you want in array:"); n = s.nextInt();  
        int a[] = new int[n]; System.out.println("Enter all the  
        elements:"); for (int i = 0; i < n; i++) {  
            a[i] = s.nextInt();  
        }  
        for (int i = 0; i < n; i++) {  
            for (int j = i + 1; j < n; j++) {  
                if (a[i] > a[j]) {  
                    temp = a[i]; a[i]  
                    = a[j]; a[j] =  
                    temp;  
                }  
            }  
        }  
        System.out.print("Descending Order:");  
        for (int i = n - 1; i > 0; i--) {  
            System.out.print(a[i] + ",");  
        }  
        System.out.print(a[0]);  
    }  
}
```

Output:

Enter no. of elements you want in array:6

Enter all the elements:

10

20

100

40

200

60

Descending Order:200,100,60,40,20,10

28. Second minimum number:

```
public class SecondMinimumNumber {
    public static void main(String[] args) {
        int a[]={-12,45,-23,64,-100,24};
        for(int i=0;i<a.length;i++){
            for(int j=i+1;j<a.length;j++){ int
                temp=0; if(a[i]<a[j]){
                    temp=a[j];
                    a[j]=a[i];
                    a[i]=temp;
                }
            }
        }
        for(int k=0;k<a.length;k++){
            System.out.println(a[k]);
        }
        System.out.println("The Second minimum number is" + a[a.length-2]
    );
    }
}
```

Output:

```
64
45
24
-12
-23
-100
The Second minimum number is-23
```

29. First maximum number :

```
public class FirstLargest {
    public static void main(String[] args) {
        int a[]={-12,45,-23,64,-100,24};
        for(int i=0;i<a.length;i++){
            for(int j=i+1;j<a.length;j++){ int
                temp=0; if(a[i]<a[j]){
                    temp=a[j];
                    a[j]=a[i];
                    a[i]=temp;
                }
            }
        }
        for(int k=0;k<a.length;k++){
            System.out.println(a[k]);
        }
    }
}
```

```

    }
    System.out.println("The First maximum number is" + a[a.length-6]
);
    }
}

```

Output:

```

64
45
24
-12
-23
-100
The First maximum number is64

```

30. Third maximum number:

```

public class ThirdLarge {
    public static void main(String[] args) {
        int a[]={-12,45,-23,64,-100,24};
        for(int i=0;i<a.length;i++){
            for(int j=i+1;j<a.length;j++){ int
                temp=0; if(a[i]<a[j]){
                    temp=a[j];
                    a[j]=a[i];
                    a[i]=temp;
                }
            }
        }
        for(int k=0;k<a.length;k++){
            System.out.println(a[k]);
        }
        System.out.println("The Third maximum number is" + a[a.length-4]
    ); }}

```

Output:

```

64
45
24
-12
-23
-100
The Third maximum number is24

```

31. Count the Small ,Caps, number and Special character in string:

```
package org.room.assign4;

public class LettersCount {
    public static void main(String[] args) {
        String s = "Hi Welcome To Java Classes Tommorrow At 2.00 p.m!!";
        int count = 0; int
        count1 = 0; int
        count2 = 0; int
        count3 = 0;

        for (int i = 0; i < s.length(); i++) {
            if (s.charAt(i) >= 'a' && s.charAt(i) <= 'z') {

                count++;
            } else if (s.charAt(i) >= 'A' && s.charAt(i) <= 'Z') {

                count1++;
            } else if (s.charAt(i) >= '0' && s.charAt(i) <= '9') {

                count2++;
            } else {

                count3++;
            }
        }
        System.out.println("total no of small letters:" + count); System.out.println("total no of
        capital letters:" + count1); System.out.println("total no of digits :" + count2);
        System.out.println("total no of special characters:" + count3);
    }
}
```

Output:

total no of small letters:27 total no of
capital letters:7 total no of digits :3
total no of special characters:12

32. Count of given number:

```
package org.room.assign4; import
java.util.Scanner; public class
CountOfGivenNum {
    public static void main(String[] args) {
```

```

        int n,i=0; System.out.println("enter a no");
        Scanner get=new Scanner(System.in);
        n=get.nextInt();
        while(n>0)
        {
            n=n/10;
            i++;
        }

        System.out.println("no of digits present:"+i);
    }
}

```

Output:

```

enter a no
5267546
no of digits present:7

```

33. Palindrome string:

```

package org.room.assign4;

import java.util.Scanner;

public class PoyindromeString {
    public static void main(String args[])
    {
        String original, reverse = ""; Scanner in = new
        Scanner(System.in);

        System.out.println("Enter a string to check if it is a palindrome"); original = in.nextLine();

        int length = original.length();

        for (int i = length - 1; i >= 0; i-- ) reverse = reverse +
            original.charAt(i);

        if (original.equals(reverse))
            System.out.println("Entered string is a palindrome.");
        else
            System.out.println("Entered string is not a palindrome.");
    }
}

```



Output:

Enter a string to check if it is a palindrome **madam**
Entered string is a palindrome.

34. Reverse the String:

```
package org.room.assign4; import
java.util.Scanner; public class
ReverseString {
    public static void main(String args[]) {
        String original, reverse = ""; Scanner in = new
        Scanner(System.in);

        System.out.println("Enter a string to reverse"); original =
        in.nextLine();

        int length = original.length();

        for (int i = length - 1; i >= 0; i--)
            reverse = reverse + original.charAt(i);

        System.out.println("Reverse of entered string is: " + reverse);
    }
}
```

Output:

Enter a string to reverse **welcome**
Reverse of entered string is: emoclew

35. Triangle with stars:

```
package org.room.assign4;

public class Triangle1 {
    public static void main(String[] args) {
        for (int i = 1; i <= 5; i++) {
            for (int j = 1; j <= 5 - i; j++) {
                System.out.print(" ");
            }
            for (int k = 1; k <= i; k++) {
                System.out.print("* ");
            }
            System.out.println(" ");
        }
    }
}
```



Output:

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

36. Sum of give num:

```
package org.room.assign4;

public class SumOfGivenNum {
    public static void main(String args[]) {
        int m, n, sum = 0; m =
        12345;
        while (m > 0) {
            n = m % 10;
            sum = sum + n; m
            = m / 10;
        }
        System.out.println("Sum of Digits:" + sum);
    }
}
```

Output:

Sum of Digits:15

37. Count of each word in the string:

```
public class Count {
    public static void main(String args[]) {
        {
            String s = "vengat ram"; String[] s1
            = s.split(" ");
            HashMap<String, Integer> emp = new HashMap<String, Integer>();

            for (String c : s1) {
                if (emp.containsKey(c)) { int x =
                    emp.get(c); emp.put(c, x
                    + 1);
                } else {

                    emp.put(c, 1);
                }
            }

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



```
    }
}
```

Output:

```
{vengat=1, ram=1}
```

38. Count of each character in the string:

```
public class ReverseString {
    public static void main(String args[]) {
        {
            String s = "vengatram";
            HashMap<Character, Integer> emp = new HashMap<Character, Integer>();

            char[] ch = s.toCharArray();

            for (char c : ch) {
                if (emp.containsKey(c)) { int x =
                    emp.get(c); emp.put(c, x
                    + 1);
                } else {
                    emp.put(c, 1);
                }
            }

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

Output:

```
{a=2, r=1, t=1, e=1, v=1, g=1, m=1, n=1}
```

39. Assume a string “welcome to Polaris” remove space and print the string.

```
public class Dummy {
    public static void main(String[] args) {
        String s="Welcome to Polaris";
        String x = s.replace(" ", "");
        System.out.println(x);
    }
}
```

Output:

```
WelcometoPolaris
```



40. Write a program to split and then reverse a string.

Reverse the string:

```
public class ReverseString {  
    public static void main(String args[]) {  
        String original, reverse = "";  
        Scanner in = new Scanner(System.in);  
        System.out.println("Enter a string to reverse");  
        original = in.nextLine();  
        int length = original.length();  
        for (int i = length - 1; i >= 0; i--) {  
            reverse = reverse + original.charAt(i);  
        }  
        System.out.println("Reverse of entered string is: " + reverse);  
    }  
}
```

Output:

```
Enter a string to reverse  
HELLO  
Reverse of entered string is: OLLEH
```

Split:

```
public class StringBasic {  
    public static void main(String[] args) {  
        String s1 = "Hello welcome to java class";  
        String[] x = s1.split(" "); // here we split by space  
        for(int i=0;i<x.length;i++){  
            System.out.println(x[i]);  
        }  
    }  
}
```

Output:

```
Hello  
welcome  
to  
java  
class
```




41. Construct the triangle

```

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

Program:

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

        System.out.println("How Many Rows You Want In Your Pyramid?");

        int noOfRows = sc.nextInt();
        int rowCount = 1;

        System.out.println("Here Is Your Pyramid");

        for (int i = noOfRows; i >= 1; i--)
        {
            //Printing i*2 spaces at the beginning of each row

            for (int j = 1; j <= i*2; j++)
            {
                System.out.print(" ");
            }

            //Printing j where j value will be from i to noOfRows

            for (int j = i; j <= noOfRows; j++)
            {
                System.out.print(j+" ");
            }

            //Printing j where j value will be from noOfRows-1 to i

            for (int j = noOfRows-1; j >= i; j--)
            {
                System.out.print(j+" ");
            }
        }
    }
}
```

```

    }

    System.out.println();

    //Incrementing the rowCount

    rowCount++;
}
}
}

```

Output:

How Many Rows You Want In Your Pyramid?

9

Here Is Your Pyramid

```

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

```

42. Write a program to find sum of each digit in the given number using recursion?

Program:

```

public class MyNumberSumRec {

    int sum = 0;

    public int getNumberSum(int number){

        if(number == 0){
            return sum;
        } else {
            sum += (number%10);
            getNumberSum(number/10);
        }
        return sum;
    }
}

```

```

    }

    public static void main(String a[]){
        MyNumberSumRec a = new MyNumberSumRec();
        System.out.println("Sum is: "+a.getNumberSum(5678));
    }
}

```

Output:

Sum is: 26

43. Longest substring without repeating characters

INPUT		OUTPUT
java2novice	=	a2novice
java_language_is_sweet	=	uage_is
java_java_java_java	=	va_j, _jav
abcabcbb	=	bca, abc, cab

program:

```

public class MyLongestSubstr {

    private Set<String> subStrList = new HashSet<String>();
    private int finalSubStrSize = 0;

    public Set<String> getLongestSubstr(String input){
        //reset instance variables
        subStrList.clear();
        finalSubStrSize = 0;
        // have a boolean flag on each character ascii value
        boolean[] flag = new boolean[256];
        int j = 0;
        char[] inputCharArr = input.toCharArray();
        for (int i = 0; i < inputCharArr.length; i++) {
            char c = inputCharArr[i];
            if (flag[c]) {
                extractSubString(inputCharArr,j,i);
                for (int k = j; k < i; k++) {
                    if (inputCharArr[k] == c) {
                        j = k + 1;
                        break;
                    }
                }
                flag[inputCharArr[k]] = false;
            }
        }
    }
}

```

```

    }
    } else {
        flag[c] = true;
    }
}
extractSubString(inputCharArr,j,inputCharArr.length);
return subStrList;
}

private String extractSubString(char[] inputArr, int start, int end){

    StringBuilder sb = new StringBuilder();
    for(int i=start;i<end;i++){
        sb.append(inputArr[i]);
    }
    String subStr = sb.toString();
    if(subStr.length() > finalSubStrSize){
        finalSubStrSize = subStr.length();
        subStrList.clear();
        subStrList.add(subStr);
    } else if(subStr.length() == finalSubStrSize){
        subStrList.add(subStr);
    }

    return sb.toString();
}

public static void main(String a[]){
    MyLongestSubstr mls = new MyLongestSubstr();
    System.out.println(mls.getLongestSubstr("java2novice"));
    System.out.println(mls.getLongestSubstr("java_language_is_sweet"));
    System.out.println(mls.getLongestSubstr("java_java_java_java"));
    System.out.println(mls.getLongestSubstr("abcabcbb"));
}
}

```

Output :

```

[a2novice]
[uage_is]
[va_j, _jav]
[bca, abc, cab]

```

44. Kth largest or smallest element in an array

Example : if given array is [1,3,12,19,13,2,15] and you are asked for the 3rd largest element i.e., k=3 then your program should print 13

Program:

```
public class ThirdLarge {
    public static void main(String[] args) {
        int a[]={ 1,3,12,19,13,2,15};
        for(int i=0;i<a.length;i++){
            for(int j=i+1;j<a.length;j++){
                int temp=0;
                if(a[i]<a[j]){
                    temp=a[j];
                    a[j]=a[i];
                    a[i]=temp;
                }
            }
        }
        for(int k=0;k<a.length;k++){
            System.out.println(a[k]);
        }
        System.out.println("The Third maximum number is : " + a[a.length-5] );
    }
}
```

Output:

```
19
15
13
12
3
2
1
The Third maximum number is :13
```

45. Armstrong number:

Program:

```
public class ArmstrongNumberCheck {
```

```

public static void main(String[] args) {

    int n, a, i = 0, j = 0;
    Scanner an = new Scanner(System.in);
    System.out.println("Enter a number");
    n = an.nextInt();
    a = n;

    while (a > 0) {
        i = a % 10;
        j = j + (i * i * i);
        a = a / 10;
    }
    if (n == j) {
        System.out.println("Armstrong number");
    } else {
        System.out.println("Not armstrong Number");
    }
}
}

```

Output :

```

Enter a number
371
Armstrong number

```

46. Write a program to remove duplicates from sorted array

Input : 2,3,6,6,9,10,10,10,12,12

Output : 2,3,6,9,10,12

Program:

```

public class MyDuplicateElements {

    public static int[] removeDuplicates(int[] input){

        int j = 0;
        int i = 1;
        //return if the array length is less than 2
    }
}

```

```

    if(input.length < 2){
        return input;
    }
    while(i < input.length){
        if(input[i] == input[j]){
            i++;
        }else{
            input[++j] = input[i++];
        }
    }
    int[] output = new int[j+1];
    for(int k=0; k<output.length; k++){
        output[k] = input[k];
    }

    return output;
}

public static void main(String a[]){
    int[] input1 = {2,3,6,6,8,9,10,10,10,12,12};
    int[] output = removeDuplicates(input1);
    for(int i:output){
        System.out.print(i+" ");
    }
}
}

```

Output:

2 3 6 8 9 10 12

47. Binary search

Program:

```

public class MyBinarySearch {

    public int binarySearch(int[] inputArr, int key) {

        int start = 0;
        int end = inputArr.length - 1;
        while (start <= end) {
            int mid = (start + end) / 2;
            if (key == inputArr[mid]) {
                return mid;
            }
        }
    }
}

```

```

    }
    if (key < inputArr[mid]) {
        end = mid - 1;
    } else {
        start = mid + 1;
    }
}
return -1;
}

public static void main(String[] args) {

    MyBinarySearch mbs = new MyBinarySearch();
    int[] arr = {2, 4, 6, 8, 10, 12, 14, 16};
    System.out.println("Key 14's position: "+mbs.binarySearch(arr, 14));
    int[] arr1 = {6,34,78,123,432,900};
    System.out.println("Key 432's position: "+mbs.binarySearch(arr1, 432));
}
}

```

Output:

Key 14's position: 6
Key 432's position: 4

48. Butterfly shuffle:

Program:

```

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

public class SampleTest {
    public static void main(String[] args) {
        int a[] = { 1, 2, 3, 4, 5, 6, 7, 8, 9, 0 };
        int len = a.length / 2;
        for (int i = len - 1; i >= 0; i--) {
            System.out.println(a[i]);
        }
        for (int i = a.length - 1; i >= len; i--) {
            System.out.println(a[i]);
        }
    }
}

```


Output:

5
4
3
2
1
0
9
8
7
6

Greens technologies