

Java IQ:

1. Write a program to swap 2 numbers without a temporary variable? Swap 2 strings without a temporary variable?

//swap numbers

```
int a=10;
int b=20;
a=a+b; // first this should be there a=10+20=30
b=a-b; // b= 30-20=10
a=a-b; //a=30-10=20
System.out.println(a);
System.out.println(b);
```

//swap strings

```
String x="Hello";
String y="Welcome";
x=x+y; //HelloWelcome
y=x.substring(0,(x).length()-y.length());
x=x.substring(y.length());
System.out.println(x);
System.out.println(y);
```

2. Write a java program to find the second largest number in the array? Maximum and minimum number in the array?

// second largest number in the array

1. easiest way

```
int[] numArray= {12,13,12,15,0, -1};
Arrays.sort(numArray);
System.out.println(numArray[numArray.length-2]);
```

2. more efficient way

```
int[] array= {1000,200,222,11};
int largest=array[0];
```

```
int secondLargest=0;

for(int i=0; i<array.length; i++) {
    if (array[i]>largest) {
        secondLargest=largest;
        largest=array[i];
    } else if (array[i]>secondLargest && array[i]!=largest){
        secondLargest=array[i];
    }
}

System.out.println("The          largest          number="+largest+"          and
secondLargest="+secondLargest);
```

// maximum and minimum number in the array

//1 easiest way

```
int[] numArray= {12,13,12,15,0, -1};
```

```
Arrays.sort(numArray);
int min=numArray[0];
int max=numArray[numArray.length-1];
```

```
System.out.println("Min is="+min+" and max="+max);
```

//2 more efficient way

```
int[] numArray= {12,13,12,15,0, -1};
int smallest=0;
int biggest=0;
for(int i=0; i<numArray.length; i++) {
    if (numArray[i]>biggest){
        biggest=numArray[i];
    } else {
        smallest=numArray[i];
    }
}
```

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

3. Find out how many alpha characters present in a string?

```
String given="wefeqf878979797fewfewrf879797efds&^&^*^^^";

String replaced=given.replaceAll("[^A-Za-z]", "");
System.out.println(replaced.length());
```

4. How to find out the part of the string from a string? What is substring? Find number of words in string?

```
String a="Welcome to the interview sessions with Syntax";
System.out.println(a.substring(39));

String [] words=a.split(" ");
System.out.println(words.length);

for (String string : words) {
    System.out.println(string);
}
```

5. Write a java program to reverse String? Reverse a string word by word?

Reverse String:

Using Reverse Function: //show only after learning StringBuffer

```
String a= "Hello Syntax";

StringBuffer sb=new StringBuffer(a);
System.out.println(sb.reverse());
```

Without Using Reverse Function:

```
String toReverse="Hello World";
```

```
// 1 way using charAt();
```

```
String reversed="";
for (int i=toReverse.length()-1; i>=0; i--) {
    reversed=reversed+toReverse.charAt(i);
}
System.out.println("Reversed String is: "+reversed);
```

//2 way using toCharArray();

```
String reversed1="";
char[] array=toReverse.toCharArray();
for (int i=array.length-1; i>=0; i--) {
    reversed1=reversed1+array[i];
}
System.out.println("Reversed String is: "+reversed1);
```

//3 way using substring();

```
String reversed2="";
for (int i=toReverse.length(); i>=1; i--) {
    reversed2=reversed2+toReverse.substring(i-1, i);
}
System.out.println("Reversed String is: "+reversed2);
```

Reverse a string word by word

```
String str = "Todays is Sunday";
String reversed = "";
String[] array = str.split(" ");

for (int i = array.length - 1; i >= 0; i--) {
    reversed = reversed + array[i]+" ";
}
System.out.println(reversed);
```

6. Write a Java Program to find whether a String is palindrome or not.

```
String original="hellhe";
String reversed="";
for (int i =original.length()-1; i>=0; i--) {
    reversed=reversed+original.charAt(i);
```

```
}  
  
if (original.equals(reversed)) {  
    System.out.println("Given String is Palindrome");  
} else {  
    System.out.println("Given String is NOT Palindrome");  
}
```

7. Write a java program to check whether a given number is prime or not?

```
int num=37;  
boolean isPrime=true;  
for (int i=2; i<num/2; i++) {  
    if (num%i==0) {  
        isPrime=false;  
        break;  
    }  
}  
if (isPrime) {  
    System.out.println(num+" is a prime number");  
} else {  
    System.out.println(num+" is NOT a prime number");  
}
```

8. Write a Java Program to print first 10 numbers of Fibonacci series.

```
int a=0,b=1,c;  
  
for (int i=0; i<10; i++) {  
  
    System.out.print(a+" ");  
    c=a+b;  
    a=b;  
    b=c;  
}
```

9. How can you remove all duplicates from ArrayList?

```
ArrayList aList=new ArrayList();
```

```
arr.add("John");  
arr.add("Jane");  
arr.add("James");  
arr.add("Jasmine");  
arr.add("Jane");  
arr.add("James");
```

// 1 way

```
HashSet set=new HashSet(aList);
```

// 2 way

```
HashSet hset=new HashSet();  
for (Object name : arr) {  
    hset.add(name);  
}  
System.out.println(hset);
```

10. Versions of java you worked with? What version of java do you currently use in your framework? Difference between JRE, JDK ?

Version Name	Release Date
Java SE 7	July 2011
Java SE 8	March 2014
Java SE 9	September 2017
Java SE 10	March 2018
Java SE 11	September 2018

JRE stands for **Java Runtime Environment** which we usually download as a Java software. The JRE consists of the Java Virtual Machine, Java platform classes, and supporting libraries. The JRE is the runtime component of Java software and is all we need to run any Java application.

JDK stands for **Java Development Kit** is a superset of the JRE and includes everything that the JRE contains. Additionally, it comes with the compilers and debuggers tools required for developing Java applications.

JVM stands for **Java Virtual machine**. It translates and executes the Java bytecode. It's the entity which transform Java to become a "portable language" (i.e. write once, run anywhere). Java compiler generates bytecode for all the Java code and converts into class files.

11. Difference between == and =.

= we are assigning value

== comparison operator (reference and address comparison)

When we use it with primitives it is checking the value.

12. What is a main method? Why do we need one in java? Do we have to have a main method in java?

Main method is the starting point of an application. JVM starts execution by invoking the main method of some specified class, passing it a single argument, which is an array of strings. Whenever we execute a program, the main() is the first function to be executed. We can call other functions from main to execute them. It is not mandatory to have main method in java, without main() our Java code will compile but won't run.

13. Explain public static void main (String[] args)?

public: it is an access specified that means it will be accessible by any Class.

static: is a keyword to call this method directly using class name without creating an object of it.

void: it is a return type i.e. it does not return any value.

main(): it is the name of the method which is searched by JVM as a starting point for an application with a particular signature only.
it is the method where the main executions occurs.

string[] args: it's a command line arguments passed to the main method.

14. What is Access Modifiers (Private,public,protected)?

Java provides access modifiers used to set access levels for classes, variables, methods and constructors.

public: A class or interface may be accessed from outside the package. Constructors, inner classes, methods and field variables may be accessed wherever their class is accessed.

protected: Accessed by other classes in the same package or any subclasses of same package or different package.

private: Accessed only within the class in which they are declared.

default: When no access modifier is specified for a class , method or data member – It is said to be having the default access modifier by default.

	default	private	protected	public
Same Class	Yes	Yes	Yes	Yes
Same package subclass	Yes	No	Yes	Yes
Same package non-subclass	Yes	No	Yes	Yes
Different package subclass	No	No	Yes	Yes
Different package non-subclass	No	No	No	Yes

15. How can we access variable without creating an object instance of it? What is difference between local and instance variables?

Variables which are declared **inside a method or constructor or blocks** are called **local variables**. Local variables are created when a method is called and destroyed when the method exits.

Variables which are declared **inside the class, but outside a method, constructor or any block** are called **instance variables**. We can access instance variables by creating an Object of the class they belong to. Instance variables are created when an object is created with the use of the keyword 'new' and destroyed when the object is destroyed.

16. Difference between Instance Variable and static Variable? What is static keyword in java?

1. Static variables are declared with the **static** keyword in a class, but outside a method, constructor or a block. By declaring variable as a static we can access it

from different class without creating an Object - those variables called class variables and also known as static variables.

Whereas, **Instance** variables are declared in a class, but outside a method, constructor or any block. To access instance variables we need to create an object of the Class they belong to.

```
public class Q13 {
```

```
String ApplicationUrl = "https://www.syntaxtechs.com/";// Instance variable
```

```
static String ApplicationUrl2 = "https://www.orangeHRM.com/";// Static variable
```

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

```
    System.out.println(ApplicationUrl2);
```

```
    Q13 t1 = new Q13();
```

```
    System.out.println(t1.ApplicationUrl);
```

```
}
```

```
}
```

- 2. Class variables only have one copy** that is shared by all the different objects of a class, whereas every object has its own **personal copy of an instance variable**. So, **instance variables across different objects can have different values** and when we make changes to the instance variable they don't reflect in other instances of that class **whereas class variables across different objects can have only one value**.

- 3.** Static variables are created when the program starts and destroyed when the program stops whereas instance variables are created when an object is created with the use of the keyword 'new' and destroyed when the object is destroyed.

Static keyword in java:

- Static keyword means that the variable or method belongs to the class and shared between all instances.
- Using static keyword we can access class variables and methods without object reference

- Static methods can not call/refer Non Static members

17. What is a constructor? Use of constructor in class? Can you make the constructor static? What is difference between constructor and method? Can we overload a constructor?

What is constructor

A constructor in java is a block of code similar to a method. Constructor called when an instance of a class is created. A constructor is a special method whose task is to initialize the object of its class.

Constructors cannot be abstract, final, static.

Rules to create constructor:

1. Constructor name class name must be same.
2. Constructor do not have any return type.
3. Constructor may or may not have parameters.

Usage of Constructor

The primary use of constructor is to **initialize the instance variables**.

Constructors are special function which are called automatically when we create object of the class. So once we create object of the class all the variables get initialized, and we don't need to write extra code for initialization of variables.

Constructor is the property of an object while static has nothing to do with object. That's why there is nothing like static constructor. But we have static block to do the similar task as constructor i.e. initialization of fields etc.

Difference between Constructor and Method

- Constructor must not have return type where as method must have return type.
- Constructor name same as the class name where as method may or may not the same class name.
- Constructor will be called automatically whenever an object is created whereas method invoke explicitly.
- Constructor compiler provide default constructor where as method compiler doesn't provide.

WE CAN OVERLOAD CONSTRUCTOR (using different parameters)

18. Super vs super()? this vs this()? Can a super() and this() keywords be in same constructor?

this vs this()

- **this keyword** is used to refer to the current object and differentiate between local and instance variables

```
public class ThisKeyword {
```

```
    String name;
```

```
    int age;
```

```
    ThisKeyword(String name, int age){
```

```
        this.name=name;
```

```
        this.age=age;
```

```
    }
```

```
}
```

- **this()** is used to access one constructor from another where both constructors belong to the same class.

```
public class ThisKeyword4 {
```

```
    int z;
```

```
    ThisKeyword4() {
```

```
        System.out.println("This a default constructor");
```

```
    }
```

```
    ThisKeyword4(String a) {
```

```
        this();
```

```
        System.out.println("Parameterized constructor");
```

```
    }
```

```
}
```

super vs super()

Both are used in a subclass as a way to invoke or refer to its superclass.

- **super keyword** is used to call super class(parent class/ base class) variables and methods by the subclass object when they are overridden by subclasses.
- **super()** is used to call super class constructor from subclass constructor.

```
public class SuperKeyword1 extends SuperKeyword{
```

```
    SuperKeyword1(){  
        super(4);  
        System.out.println("This is a child default constructor");  
    }  
}
```

We can use **super()** and **this()** only in the constructor not anywhere else, any attempt to do so will lead to a compile-time error. **This()** and **super()** are always have to be in first line within constructor and for that reason we **CANNOT** use them within the same constructor. We have to keep either **super()** or **this()** as the first line of the constructor but NOT both simultaneously.

19. Difference between an abstract class and interface? Can we create an object for an abstract class? interface? When to use abstract class and interface in Java?

Interface is a blueprint for your class that can be used to implement a class.

Interface is a collection of public static methods and public static final variables

An abstract class is the class which is declared with **abstract** keyword and can contain defined(concrete) and undefined(abstract) methods.

Abstract Class	Interface
The abstract keyword is used to declare abstract class	The interface keyword is used to declare interface

Abstract class does not support multiple inheritance	Interface support multiple inheritance
Abstract class contains Constructors	Interface doesn't contain Constructors
An abstract class Contains both incomplete (abstract) and complete member and Abstract class can have abstract and non-abstract methods.	An interface Contains only incomplete member (signature of member) and Interface can have only abstract methods.
An abstract class can contain access modifiers for the methods, properties(variables)	An interface cannot have access modifiers by default everything is assumed as public
Abstract class can have final, static and non-static variables.	Interface has only final static variables.
There properties can be reused commonly in a specific application.	There properties commonly usable in any application of java environment.
Abstract class may contain either variables or constants.	Interface should contain only constants.
The default access specifier of abstract class methods are default.	The default access specifier of interface method are public.
These class properties can be reused in other class using extends keyword.	These properties can be reused in any other class using implements keyword.
For the abstract class there is no restriction like initialization of variables at the time of variable declaration.	For the interface it should be compulsory to initialization of variables at the time of variable declaration.
There are no any restrictions for abstract class variable.	For the interface variable can not declare variable as private, protected
There are no any restrictions for abstract class method modifier that means we can use any modifiers.	For the interface method cannot declare method as protected, static, private, final

We cannot create object of interface or an abstract class !

- An abstract class is good if you think you will plan on using inheritance since it provides a common base class implementation to derived classes.
- An abstract class is also good if you want to be able to declare non-public members. In an interface, all methods must be public.
- If you think you will need to add methods in the future, then an abstract class is a better choice. Because if you add new method headings to an interface, then all of the classes that already implement that interface will have to be changed to implement the new methods. That can be quite a hassle.

20. Explain OOPS concepts? Is java 100% object oriented?

OOP concepts in Java are the main idea behind Java's Object Oriented Programming.

They are an **abstraction, inheritance, polymorphism and encapsulation.**

Inheritance is a mechanism in which one object acquires all the properties and behaviors of parent object.

Polymorphism is the ability of an object to take on many forms.

Abstraction is the methodology of hiding the implementation of internal details and showing the functionality to the users.

Encapsulation is a mechanism of binding code and data together in a single unit.

No, **Java is not 100% object oriented**, since it has primitive data types, which are different from objects.

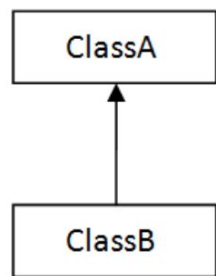
21. What is inheritance and benefits of it? Types of inheritance?

Inheritance

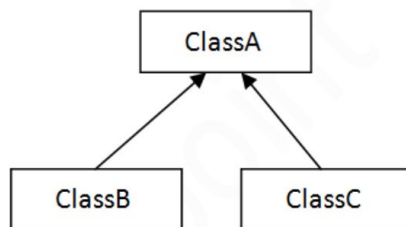
- The process of acquiring properties (variables) & methods (behaviors) from one class to another class is called inheritance.
- We are achieving inheritance concept by using extends keyword. Also known as is-a relationship.
- Extends keyword is providing relationship between two classes.
- The main objective of inheritance is code extensibility whenever we are extending the class automatically code is reused.

Types of Inheritance:

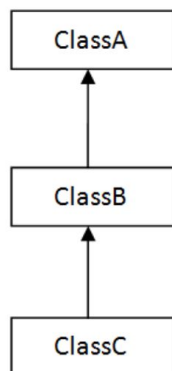
- **Single Inheritance** - single base class and single derived class.



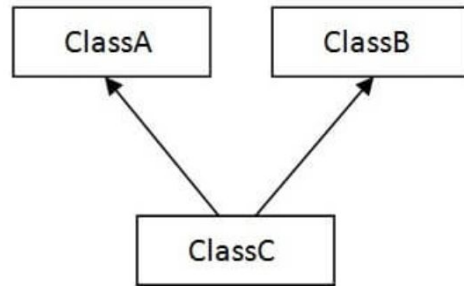
- **Hierarchical Inheritance** - when a class has more than one child classes (sub classes)



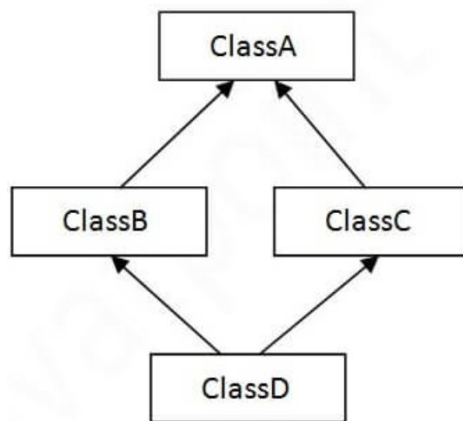
- **Multilevel Inheritance** - single base class, single derived class and multiple intermediate base classes.



- **Multiple Inheritance** - multiple classes and single derived class (Possible through interface only)



- **Hybrid Inheritance** - combination of both Single and Multiple Inheritance (Possible through interface only)



22. What is polymorphism? Types of polymorphism?

Polymorphism is the ability of an object to take on many forms. Polymorphism allows us to perform a task in multiple ways.

Combination of overloading and overriding is known as Polymorphism.

There are two types of Polymorphism in Java

1. **Compile time polymorphism (Static binding) – Method overloading**
2. **Runtime polymorphism (Dynamic binding) – Method overriding**

23. Method overloading & overriding?

Method overloading in Java occurs when two or more methods in the same class have the exact same name but different parameters (remember that method parameters accept values passed into the method).

Overloading: Same method name with different arguments **in the same class**

Method overriding

Declaring a method in child class which is already present in the parent class is called Method Overriding. In simple words, overriding means to override the functionality of an existing method.

With method overriding a child class can give its own specific implementation to an inherited method without modifying the parent class method. Assume we have multiple child classes. In case one of the child classes want to use the parent class method and other class want to use their own implementation then we can use overriding feature.

Selenium WebDriver provides an interface WebDriver, which consists of abstract methods `getDriver()` and `closeDriver()`. So any implemented class with respect to browser can override those methods as per their functionality, like `ChromeDriver` implements the `WebDriver` and can override the `getDriver()` and `closeDriver()`.

24. Can we override/overload main method? Explain the reason? Can you override static method? Can we overload and override private method?

We cannot override a static method, so we cannot override main method. However, you can overload main method in Java. But the program doesn't execute the overloaded main method when you run your program; you have to call the overloaded main method from the actual main method.

Practically I do not see any use of it and we don't use it in my framework.

```
public class MainMethodOverload {  
    public static void main(String[] args) {  
        main(5); //if comment this line nothing will get executed  
    }  
  
    public static void main(int r) {  
        System.out.println("Hello");  
    }  
}
```

Static methods are bound with class **it is not possible to override static methods**

```
class Parent {  
    static void m1() {  
        System.out.println("parent m1()");  
    }  
}  
  
class Child extends Parent {  
    static void m1() {  
        System.out.println("child m1()");  
    }  
  
    public static void main(String[] args) {  
        Parent p = new Child();  
        p.m1();  
    }  
}
```

In java not possible to override private methods because these methods are specific to classes, not visible in child classes.

25. What is encapsulation?

It is the technique of making the fields in a class private and providing access to the fields via public methods. If a field is declared private, it cannot be accessed by anyone outside the class, thereby hiding the fields within the class. Therefore encapsulation is also referred to as data hiding. The main benefit of encapsulation is the ability to modify our implemented code without breaking the code of others who use our code. With this Encapsulation gives maintainability, flexibility and extensibility to our code.

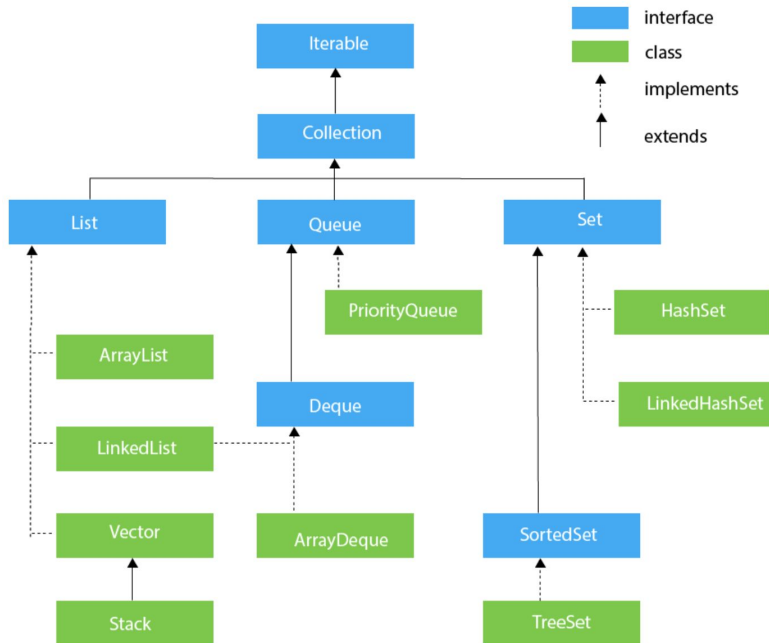
26. What are the primitives and wrapper classes?

Primitives are data types in Java. There is a total of **8 primitive data types in Java: byte, short, int, long, float, double, char, boolean.**

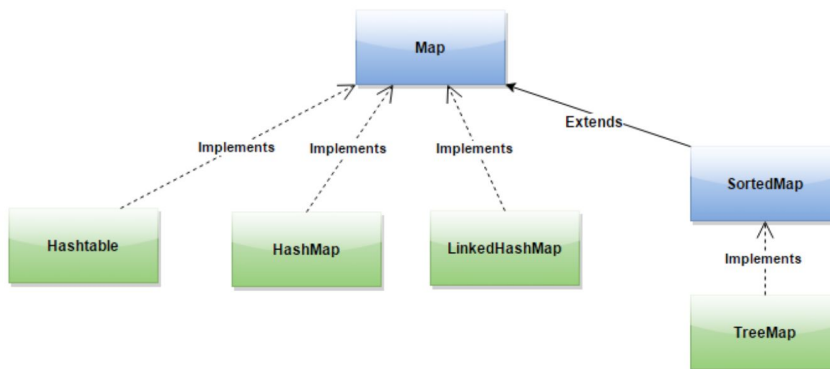
Every primitive data type has a class dedicated to it and these are known as wrapper classes. **These classes wrap the primitive data type into an object** of that class.

27. What is collection in Java and what type of collections have you used?

Java provides Collection Framework which defines several classes and interfaces to represent a group of objects as a single unit.



Maps are not part of collection but built based on the collection concepts



Mostly in my current project we use List and Map.

28. What is array and Arraylist (List)? Difference between them?

- Arrays are fixed in size but ArrayLists are dynamic in size.
- Array can contain both primitives and objects but ArrayList can contain only object elements.

- To find the size on an Array we use `ArrayName.length` and for `arrayList` we use `ArrayListName.size()`
- Array use assignment operator to store elements but `ArrayList` use `add()` to insert elements.
- Array can be multi dimensional , while `ArrayList` is always single dimensional.

ArrayList:

```
ArrayList names = new ArrayList();  
names.add("Daniela");  
names.add("Patrick");
```

How to print all values from arrayList

//1. using for loop

```
for (int i=0; i<names.size();i++) {  
    System.out.println(names.get(i));  
}
```

//2. use advance for loop/enhanced/for each loop

```
for (String value: names) {  
    System.out.println(value);  
}
```

//3 using Iterator

```
Iterator<String> it=names.iterator();//create/initialize Iterator  
while(it.hasNext()) {  
    String name=it.next();  
    System.out.println(name);  
}
```

//4 using while loop

```
int count=0;  
while(names.size()>count) {  
    System.out.println(names.get(count));  
}
```

```
        count++;  
    }
```

Array:

```
String[] array=new String[3];  
array[0]="Jordan";  
array[1]="Jack";  
array[2]="Jack";  
  
for(int i=0; i<array.length; i++) {  
    System.out.println(array[i]);  
}
```

29. Difference between ArrayList vs LinkedList?

ArrayList and LinkedList, both implements List interface and provide capability to store and get objects as in ordered collections. Both are non synchronized classes and both allow duplicate elements.

ArrayList

- ArrayList internally uses a dynamic array to store the elements.
- Manipulation with ArrayList is slow because it internally uses an array. If any element is removed from the array, all the bits are shifted in memory.
- ArrayList is better for storing and accessing data.

LinkedList

- LinkedList internally uses a doubly linked list to store the elements (consist on value + pointer to previous node and pointer to the next node)
- Manipulation with LinkedList is faster than ArrayList because it uses a doubly linked list, so no bit shifting is required in memory.
- LinkedList is better for manipulating data.

```
//Create linked list  
LinkedList linkedList = new LinkedList();
```

```
//Add elements
linkedList.add("A");
linkedList.add("B");

System.out.println(linkedList);

//Add elements at specified position
linkedList.add(2, "C");
linkedList.add(3, "D");

System.out.println(linkedList);

//Remove element
linkedList.remove("A"); //removes A
linkedList.remove(0); //removes B

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

Bonus:

ArrayList vs Vector?

Both implement List Interface and maintains insertion order

ArrayList is not synchronized, so it is fast.

Vector - is synchronized, so it is slow.

30. Difference between HashSet vs HashMap ?

HashSet

1. HashSet class implements Set interface
2. In HashSet, we store objects(elements or values).
3. HashSet does not allow duplicate elements that mean you cannot store duplicate values in HashSet.
4. HashSet permits to have a single null value.
5. HashSet is not synchronized.

```
//create HashSet
```

```
HashSet hset = new HashSet();  
hset.add("BMW");  
hset.add(2018);
```

How to print all values from hashSet

// 1. advance loop

```
for (Object obj : hset) {  
    System.out.println(obj);  
}
```

// 2. using iterator

```
Iterator itr = hset.iterator();  
while (itr.hasNext()) {  
    Object words = itr.next();  
    System.out.println(words);  
}
```

HashMap

1. HashMap class implements the Map interface
2. HashMap is used for storing Key, Value paired objects.
3. HashMap does not allow duplicate keys however it allows having duplicate values.
4. HashMap permits single null key and any number of null values.
5. HashMap is not synchronized.

Bonus:

ArrayList vs HashSet?

Both ArrayList and HashSet are non synchronized collection class

Both ArrayList and HashSet can be traversed using Iterator

ArrayList

- ArrayList implements List interface
- ArrayList allows duplicate values
- ArrayList maintains the order of the object in which they are inserted

- In ArrayList we can add any number of null values
- ArrayList is index based

HashSet

- HashSet implements Set interface
- HashSet doesn't allow duplicates values
- HashSet is an unordered collection and doesn't maintain any order
- HashSet allow one null value
- HashSet is completely object based

31. What is Map/ HashMap?

Java Map Interface. A map contains values on the basis of key, i.e. key and value pairs. Each key and value pair is known as an entry. Map is collection of entry objects.

A Map Contains unique keys. A Map is useful if we have to search, update or delete elements on the basis of a key.

The Map interface is implemented by different Java classes, such as HashMap, Hashtable, and TreeMap.

HashMap: it makes no guarantees concerning the order of iteration, HashMap doesn't maintain the insertion order of elements.

LinkedHashMap: It orders its elements based on the order in which they were inserted into the set (insertion-order).

TreeMap: It stores its elements in a red-black tree, orders its elements based on their values; it is substantially slower than HashMap.

```
Map<String, Integer> groceryMap=new LinkedHashMap<>();  
groceryMap.put("Milk", 1);  
groceryMap.put("Bread", 2);  
groceryMap.put("Ice Cream", 10);  
groceryMap.put("Cookie", 5);  
groceryMap.put("Tea", 3);
```

```
for(Map.Entry<String, Integer> entry:groceryMap.entrySet()) {
```



```
        if (entry.getKey().contains("Tea")) {  
            entry.setValue(2);  
        }  
    }  
  
    for (String key:groceryMap.keySet()) {  
        if(key.contains("Cookie")) {  
            groceryMap.replace(key, 3);  
        }  
    }  
  
    System.out.println(groceryMap);
```

32. Difference HashTable vs HashMap ?

Both **HashMap** and **Hashtable** implement Map Interface

HashMap

- HashMap is non synchronized, so it is not-thread safe
- HashMap is fast
- HashMap allows one null key and multiple null values

```
HashMap <Integer, String> hmap=new HashMap<Integer, String>();
```

```
hmap.put(1, "January");  
hmap.put(1, "January");  
hmap.put(2,"February");  
hmap.put(null, "February");  
hmap.put(null, "February");
```

```
for (Map.Entry obj: hmap.entrySet()) {  
    System.out.println(obj.getKey()+" "+obj.getValue());  
}
```

Output:

null February

1 January
2 February

Hashtable

- Hashtable is synchronized, so it is thread-safe
- Hashtable is slow
- Hashtable doesn't allow any null key or value

```
Hashtable <Integer, String> htable=new Hashtable<Integer, String>();
```

```
htable.put(1, "January");  
htable.put(1, "January");  
htable.put(2, "February");  
htable.put(null, "February");  
htable.put(null, "February");
```

```
for (Map.Entry obj: htable.entrySet()) {  
    System.out.println(obj.getKey()+" "+obj.getValue());  
}
```

Output:

```
Exception in thread "main" java.lang.NullPointerException  
    at java.util.Hashtable.put(Hashtable.java:464)
```

33. How can you handle exceptions? What is the parent of all exceptions? Types of exceptions you faced in your project?

An Exception is a problem that can occur during the normal flow of execution.

Depending on the situation, we can use try catch finally blocks.

In **try block**: Code that might throw some exceptions

In **catch block**: We define exception type to be caught and what to do if an exception happens in TRY block code

Throwable class is parent of all Exceptions:

```
try {  
    int a=10;
```

```
int b=0;

int c=a/b;
}catch (ArithmeticException e) {
    System.out.println(e.getMessage());
}
```

Types of Exception:

1. **Checked Exception** - are the exceptions that are checked at compile time.

Example of checked exceptions:

- **ClassNotFoundException** - Class not found
- **InstantiationException** - Attempt to create an object of an abstract class or interface
- **FileNotFoundException** - Attempt to open file that doesn't exist or open file to write but have only read permission

2. **Unchecked Exception** - are the exceptions that are not checked at compile time, they are Runtime Exceptions.

Exception faced as part of JAVA perspective:

- **ArithmeticException** - Arithmetic error, such as divide-by-zero.
- **ArrayIndexOutOfBoundsException** - Array index is out-of-bounds.
- **NullPointerException** - Invalid use of a null reference.
- **IllegalArgumentException** - Illegal argument used to invoke a method.

34. How many catch blocks can we have? Which catch block will get executed if u get ArithmeticException?

There can be any number of catch block for a single try block and it is not necessary that each try block must be followed by a catch block. It should be followed by either a catch block or a finally block.

However only the catch block encountered first on the call stack that satisfies the condition for the exception will be executed for that particular exception, rest will be ignored.

```
try {
    int a=10;
    int b=0;
```

```
        int c=a/b;
    }catch (ArithmeticException e) {
        System.out.println(e.getMessage());
    }catch (Exception e) {
        System.out.println(e.getMessage());
    }
```

35. What is the difference between throw and throws?

Throws :

- is used to declare an exception, which means it works similar to the try-catch block.
- is used in method declaration.
- is followed by exception class names.
- you can declare multiple exception with throws
- throws declare at method it might throws Exception
- used to handover the responsibility of handling the exception occurred in the method to the caller method.

1 Example:

```
public class Test {
    public static void main(String[] args) throws InterruptedException {
        Test test = new Test();
        test.company();
    }

    void studentDetails() throws InterruptedException {
        System.out.println("Sumair is sleeping");
        Thread.sleep(3000);
        System.out.println("Please do not disturb.....");
    }

    void syntax() throws InterruptedException {
        studentDetails();
    }
}
```

```
void company() throws InterruptedException {  
    syntax();  
}  
}
```

Throw :

- is used in the method body to throw an exception
- throw is followed by an instance variable
- you cannot declare multiple exceptions with throw
- The throw keyword is used to handover the instance of the exception created by the programmer to the JVM manually.
- throw keyword is mainly used to throw custom exceptions.

Example

```
class Test {  
    public static void main(String args[]) {  
        policyAge(15);  
    }  
    public static void policyAge(int age) {  
        try {  
            if (age > 18) {  
                System.out.println("You are eligible for Geico policy");  
            } else {  
                throw new ArithmeticException("User is less than 18  
years old and not eligible to have Geico policy");  
            }  
        }  
        } catch (Exception e) {  
            System.out.println(e.getMessage());  
        }  
    }  
}
```

36. What is the difference between final,finally and finalize?

Final keyword:

- **Used to apply restrictions on class, methods, and variable.**
- Used to declare constant values. The variable declared as final should be initialized only once and cannot be changed.
- Used to prevent inheritance. Java classes declared as final cannot be extended.
- Used to prevent method overriding. Methods declared as final cannot be overridden.

Example 1:

```
final int b=30;  
b=37; //cannot change the value of final variable
```

Example 2:

```
public final class Test {  
    public static void main(String args[]) {  
  
        System.out.println("I am parent");  
    }  
  
    //you will get an error "Cannot subclass final class"  
    public class Child extends Test{  
  
        public static void main(String[] args) {  
            System.out.println("I am a child");  
        }  
    }  
}
```

Example 3:

```
public class Test {  
    public final void testFinalKey() {  
        System.out.println("Parent final method");  
    }  
}  
  
//you will get an error "Cannot override the final method"  
  
public class Child extends Test{
```

```
public void testFinalKey() {  
    System.out.println("Child final method");  
}  
}
```

Finally block :

- The finally block **always** executes when the try block exits. This ensures that the finally block is executed even if an unexpected exception occurs.

```
int a = 10;  
int b = 0;  
  
try {  
    System.out.println("Try block code");  
    System.out.println(a / b);  
} catch (ArithmeticException e) {  
    System.out.println("Catch block code");  
} finally {  
    System.out.println("Finally block code");  
}  
  
try {  
    System.out.println(a/b);  
}finally {  
    System.out.println("Finally block code");  
}  
System.out.println("Continues code....");
```

Finalize() method :

- finalize() is protected method of java.lang.object class and it is inherited by every class we create in java.
- finalize() method is used to perform some clean up operations on an object before it is removed from memory.

37. What is the difference between String and StringBuffer? String and StringBuilder? What is mutable and immutable? StringBuffer vs StringBuilder?

The most important difference between **String** and **StringBuffer** in java is that **String object is immutable** whereas **StringBuffer object is mutable**. Once String Object is created **we cannot change** it and everytime we change the value of a String there is actually a new String Object getting created. For example we cannot reverse string directly, only through using StringBuffer class.

There are **2 ways to make String mutable**: 1. by using **StringBuffer** 2. by using **StringBuilder**.

The StringBuffer and StringBuilder Class are mutable means we can change the value of it without creating a new Object. Objects of StringBuilder and StringBuffer Classes live inside **heap memory**.

immutability vs. mutability

- ✓ String is immutability class it means once we are creating String objects it is not possible to perform modifications on existing object. (String object is fixed object)
- ✓ StringBuffer and StringBuilder are mutability class it means once we are creating StringBuffer/ StringBuilder objects on that existing object it is possible to perform modification.

```
class Test {  
    public static void main(String[] args) {  
        String str="Syntax";  
        str = str.concat(" Technologies");  
        System.out.println(str);  
  
        StringBuffer sb=new StringBuffer("Syntax");  
        sb.append(" Technologies");  
        System.out.println(sb);  
    }  
}
```

StringBuffer vs StringBuilder?

Both Classes are mutable, except **StringBuffer is thread-safe (synchronized)** and **StringBuilder is not thread-safe (non synchronized)** which makes **StringBuilder faster compared to StringBuffer**.

