Java installation procedure:
All program/ press window button -> Enter cmd
Step1 : Command to check java version: **java -version**

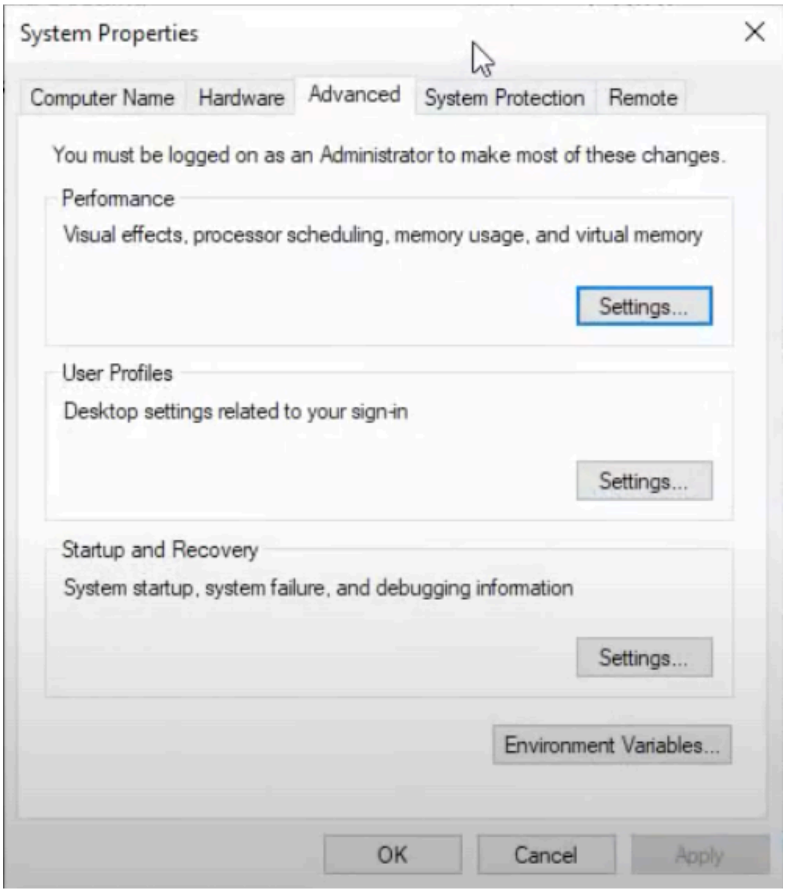
Step2 : check operating system: right click on This PC/My Computer--> properties-->Device Specifications--> system type
OS 32 bit--> **8** (1.8)
OS 64 bit--> **11** - 18

Step3 : how to download java
search download java 1.8-->click on oracle.com--> scroll down up to java 8/11--> windows --> click on 32/64 related file to download java

Step4 : install downloaded java file by double clicking on file, click on next – next until process completed, don’t change any configuration while installing

Step5 : set java path:
Step 5A : Copy java path
My computer --> open C drive-->program files-->java-->JDK/JRE(JDK preferred)-->bin folder-->copy bin folder path (control + C)

Step 5B : Set java path
All program/ press window button ---> Search **edit environment variable**



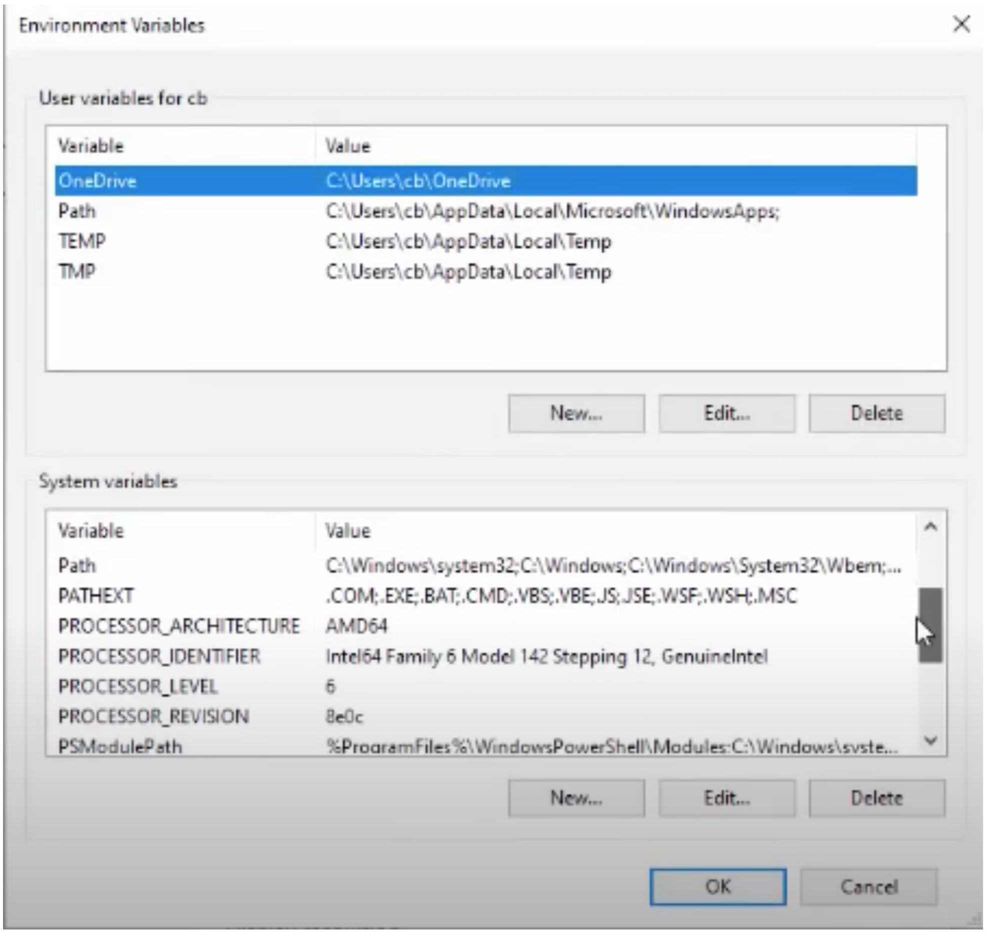
You must be logged on as an Administrator to make most of these changes.

Visual effects, processor scheduling, memory usage, and virtual memory

Desktop settings related to your sign-in

System startup, system failure, and debugging information

Click on **environment variable** button



Environment Variables

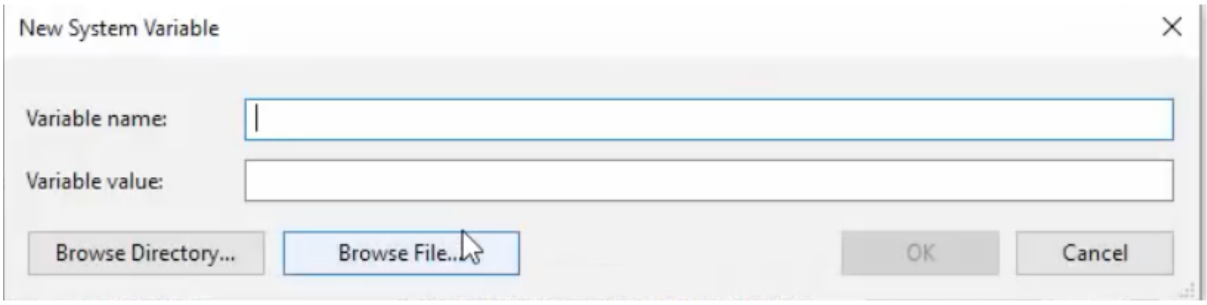
User variables for cb

Variable	Value
OneDrive	C:\Users\cb\OneDrive
Path	C:\Users\cb\AppData\Local\Microsoft\WindowsApps;
TEMP	C:\Users\cb\AppData\Local\Temp
TMP	C:\Users\cb\AppData\Local\Temp

System variables

Variable	Value
Path	C:\Windows\system32;C:\Windows;C:\Windows\System32\Wbem;...
PATHEXT	.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC
PROCESSOR_ARCHITECTURE	AMD64
PROCESSOR_IDENTIFIER	Intel64 Family 6 Model 142 Stepping 12, GenuineIntel
PROCESSOR_LEVEL	6
PROCESSOR_REVISION	8e0c
PSModulePath	%ProgramFiles%\WindowsPowerShell\Modules;C:\Windows\syste...

In System variable click on **new** button



New System Variable

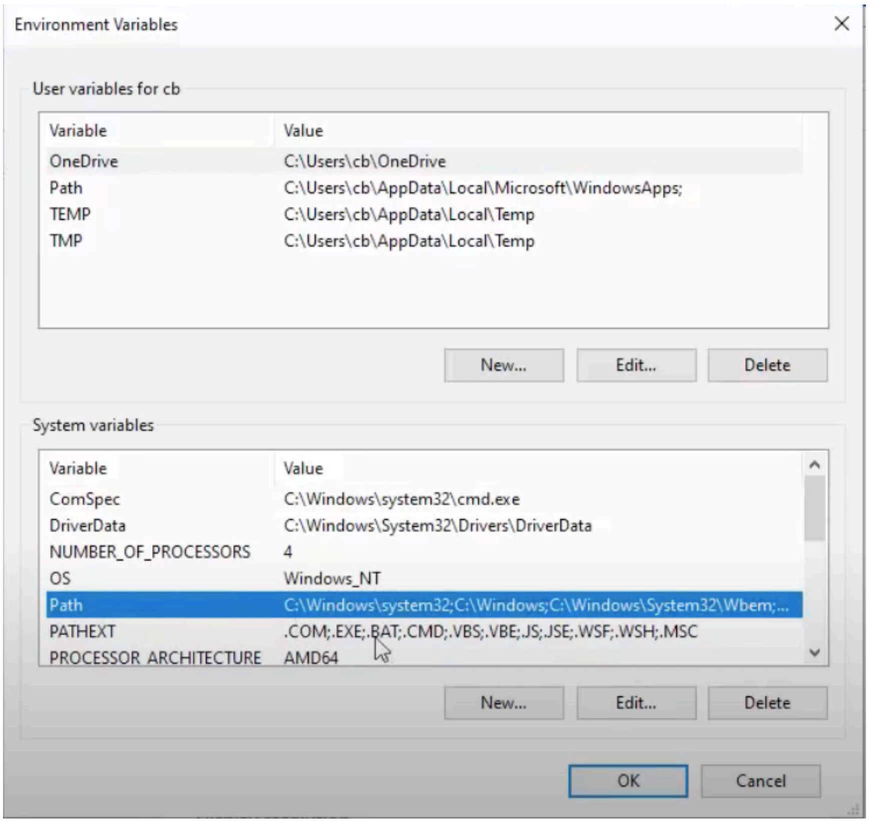
Variable name:

Variable value:

Variable name = JAVA_HOME
Variable value = c:\Program files\Java\jdk1.8.0\bin

Press OK

Select path variable in System variables



Environment Variables

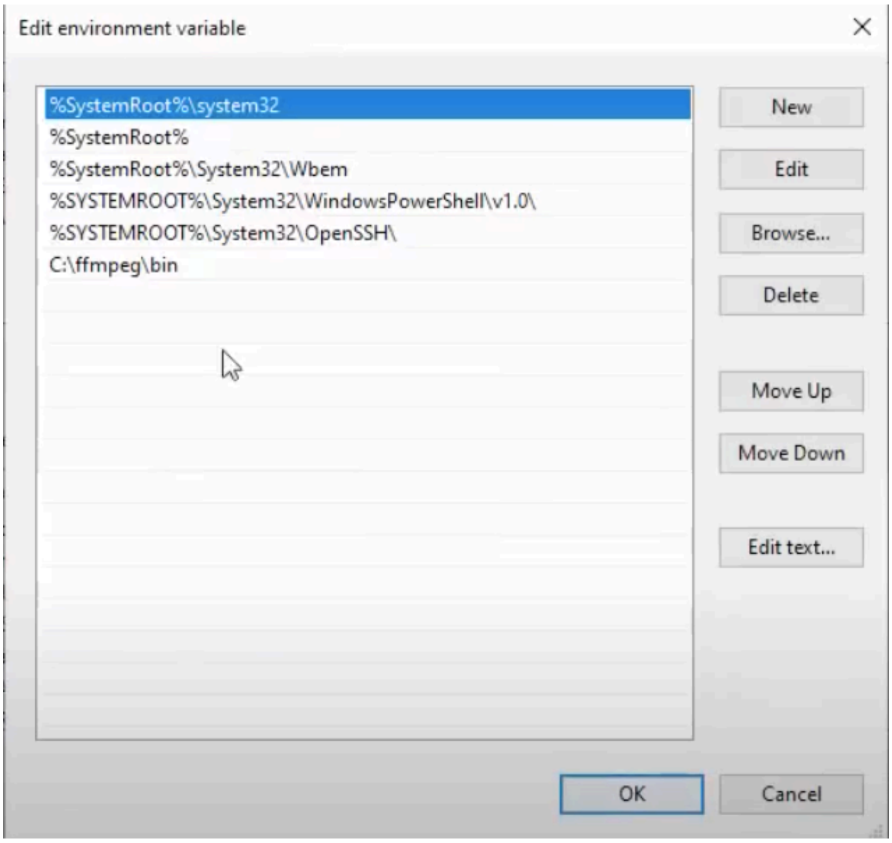
User variables for cb

Variable	Value
OneDrive	C:\Users\cb\OneDrive
Path	C:\Users\cb\AppData\Local\Microsoft\WindowsApps;
TEMP	C:\Users\cb\AppData\Local\Temp
TMP	C:\Users\cb\AppData\Local\Temp

System variables

Variable	Value
ComSpec	C:\Windows\system32\cmd.exe
DriverData	C:\Windows\System32\Drivers\DriverData
NUMBER_OF_PROCESSORS	4
OS	Windows_NT
Path	C:\Windows\system32;C:\Windows;C:\Windows\System32\Wbem;...
PATHEXT	.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC
PROCESSOR_ARCHITECTURE	AMD64

Click on **edit** button



Edit environment variable

```
%SystemRoot%\system32
%SystemRoot%
%SystemRoot%\System32\Wbem
%SYSTEMROOT%\System32\WindowsPowerShell\v1.0\
%SYSTEMROOT%\System32\OpenSSH\
C:\ffmpeg\bin
```

Click on new
Enter %JAVA_HOME%

Press OK
Press OK

Case1 : Already path variable exist -->click on path variable-->edit-->new—Enter> %JAVA_HOME% --> ok-- ok
Case2 : No path variable--> click on new --> enter variable name i.e. -"path"--> variable value - %JAVA_HOME% --> ok-- ok

Step6 : Verify java installed or not ?
check for java version
execute command --> java -version

Error message : version 1.80 _261 of the JVM is not suitable for this product version 11 or greater is required --> install java 11 or install eclipse old version

Check PC/laptop configuration : Right click on This PC/ My Computer --> Properties--> System type

Eclipse installation procedure:
Step1 : Search download eclipse -->
click on https://www.eclipse.org/-->
click on Download
click on x86_64
Click on Download

Step2 : Open downloads folder --> unzip eclipse file ---> open eclipse folder--> double click on eclipse application file (blue colour icon)-->
it should ask for workspace path--> keep as it is(default path)-->select checkbox-->launch--> welcome page

Compatibility issue for windows 7 32 bit OS:
the version of this file is not compatible with the version of windows you are running check your computer info---.
java 8 with eclipse version helious

---Core Java---

Section-1 (basic java)

1. Variable & data types

2. Keywords & Identifiers

3. Methods

3. Types of variable

4. Constructor

5. Control statements

6. Loops

Section-2 (OOPs)

1. Inheritance

2. This & super keyword

3. Access specifiers

2. Polymorphism

4. Abstract class & concrete class

5. Interface & Implementation class

6. generalization

7. casting

8. encapsulation --> selenium framework

9. Abstraction

Section-3

1. String Class --vvp

2. Array

3. Exception handling

4. Collection

5. Map

5. Pattern programs

6. Logical programs

Java:

James Gosling developed the Java platform at Sun Microsystems at 1991 and the Oracle Corporation later acquired it.

Java is general purpose, concurrent, object oriented, class based and runtime environment (JRE) which consist of JVM which is cornerstone (base) of java platform

- It is object oriented language with advance and simplified features
- It is free to access and can run on all platform
- It is concurrent where we can execute many statement instead of sequential execution
- It is independent programming language which follow the logic of "Write once, Run anywhere" i.e. complied code can run on all platform which support java
- All code converted in bytecode after compilation which is unreadable for human
- It enable to develop virus free and tamper free application
- It is purely object oriented, platform independent language

Java Versions

Here are a brief history of all the Java versions with its release date.

Java Versions	***Release Date***
JDK Alpha and Beta	1995
JDK 1.0	23rd Jan 1996
JDK 1.1	19th Feb 1997
J2SE 1.2	8th Dec 1998
J2SE 1.3	8th May 2000
J2SE 1.4	6th Feb 2002
J2SE 5.0	30th Sep 2004
Java SE 6	11th Dec 2006
Java SE 7	28th July 2011
Java SE 8/1.8	18th Mar 2014
Java SE 9	21st Sep 2017
Java SE 10	20th Mar 2018
JAVA SE 11	25th Sep 2018
JAVA SE 12	19th Mar 2019
JAVA SE 13	17th Sep 2019
JAVA SE 14	17th Mar 2020
JAVA SE 15	15th Sep 2020 (latest Java Version)

JDK :- JDK stands for java development kit, it internally contain JRE and JVM where JRE stands for java runtime environment and JVM stands for java virtual machine, JDK provide all the tools to work with java language (JDK = JRE + JVM)

JRE : JRE stands for java runtime environment, it provide environment to execute the java program, it internally contain JVM which is responsible to execute java program (JRE = JVM + libraries)

JVM : JVM stands for java virtual machine, it is the software in the form of **interpreter** written in C language through which we can execute our java program.

After compiling .class file is generated and then interpreter further process it and gives the output

Compiler – Check the complete program at a time
Interpreter – Run the program line by line

Features of Java

1. Object oriented
2. Platform independent
3. Simple language (no pointer and operator overloading)
4. Secure (java member are private and virus free)
5. Portable :- compile source code and generate bytecode then bytecode can run on any system
6. Compiled and interpreted :- First compiler convert .java file (source code) to .class file (bytecode) then interpreter (JVM) convert .class file to machine code and then execute it.
7. Robust (inbuilt exception handling, automatic garbage collection)
8. Distributed (can run on internet as application can be distributed, uses internet protocol like HTTP, FTP)
9. Multi-threaded (parallel execution)
10. Performance (bytecode execute very fast)
11. Dynamic (can add things runtime)
12. Popular (free and easy)

Purpose :- Write once run anywhere, platform independent
.class file is of size 8 bits so said to be bytecode

Compilation process
.java (source code) ---> compiler (javac) ---> .class (size 8 bits) it is in bytecode 0101
.class ---> interpreter (JVM – class loader) ---> machine language -> output

Program: Basic Java Program

Java 1st program:
1. Create java project
2. create java package
3. create java class
4. main method
5. printing statement
6. save program (Control + s)
7. run program (click green button)
8. check output--> Console tab

Step1: create java project--> file--> new--> java project--> enter project name--> finish
Step2: create java package--> right click on project name/Src folder-->new--> package--> enter package name--> finish
Step3: create java class-->right click on package -->new-->class-->enter class name--> finish
Step4: create main method
Step5: create printing statement

1 java project--> multiple packages

1 packages--> multiple classes

1 class--> multiple method--> main method

1 main method -->multiple printing statements-->to print messages

Shortcuts in eclipse:

1. main method: "main"+ control + space
2. Printing statement: "syso"+control + space
3. Run java program:- F11
4. Save java class: Control + "S"
5. undo:- Control + "z"
6. Select all: Control + "A"
7. delete 1 statement: Control + "d"

How to open Console: Windows-->show view--> Console
How to open Project/Package Explorer: Windows-->show view--> Project/Package Explorer
How to open open perspective: Windows-->perspective--> open perspective--> other

Public :- cause we should able to access program from outside class as JVM is going to access it from outside class
Static :- able to call main without object, main get automatically called no need to depend on object of class

Run the java program on terminal / cmd:

a) Save -> class_name.java
b) Compilation -> javac class_name.java
c) Execution -> java class_name

Variables:

Variables are nothing but piece of memory use to store information. One variable can store one information at a time.
Variables also used in information reusability.

To utilise variables in java programming language we need to follow below steps:

1. Variable declaration (Allocating/Reserving memory)
2. Variable Initialization(Assigning or Inserting value)
3. Variable Usage

Note:- According to all programming language dealing with information directly is not a good practice, to overcome this variables are introduced.

Program :

Class:

Class is nothing but definition block where programmer can declare

1. Variables / data members
2. Methods / member functions
3. Constructor
4. blocks

8:15 16 17 18 19

Data Types:

Data type are used to represent type of data or information which we are going to use in our java program.
In java programming it is mandatory to declare datatype before declaration of variable.

In java datatypes are classified into two types :

1. Primitive datatype.
2. Non-primitive datatype.

1. **Primitive Data Type**

There are 8 types of primitive data type

- All primitive data type are known as **keywords**
- Memory size of primitive data type is fixed
- It start with lower case

Syntax:
Datatype variable_name;   int num1;

The types of primitive datatype are:
(Numeric + Non-decimal):- 10, 99, 100
Ex: 80,85,10,5..etc

byte – Value range from -128 to +127
Takes 1 byte (8 bit)
Default value is zero
Ex. byte b = 10;

short – Value range from $-(2^{16})/2$ to $+(2^{16})/2 - 1$
Takes 2 byte
Default value is zero
Ex. short d = 20;

int – Value range from $-(2^{32})/2$ to $+(2^{32})/2 - 1$
Takes 4 byte
Default value is zero
Ex. int e = 100;

long – Value range from $-(2^{64})/2$ to $+(2^{64})/2 - 1$ (add l/L at last by default)
Takes 8 byte
Default value is zero
Ex. long h = 1000l OR 1000L;

(Numeric + decimal):-
Ex: 22.5, 22.8, 6.4....
float – Value range from $3.40282347 \times 10^{38}$, $1.40239846 \times 10^{-45}$
Takes 4 byte
Default value is 0.0f
Ex. float f = 10.10f;

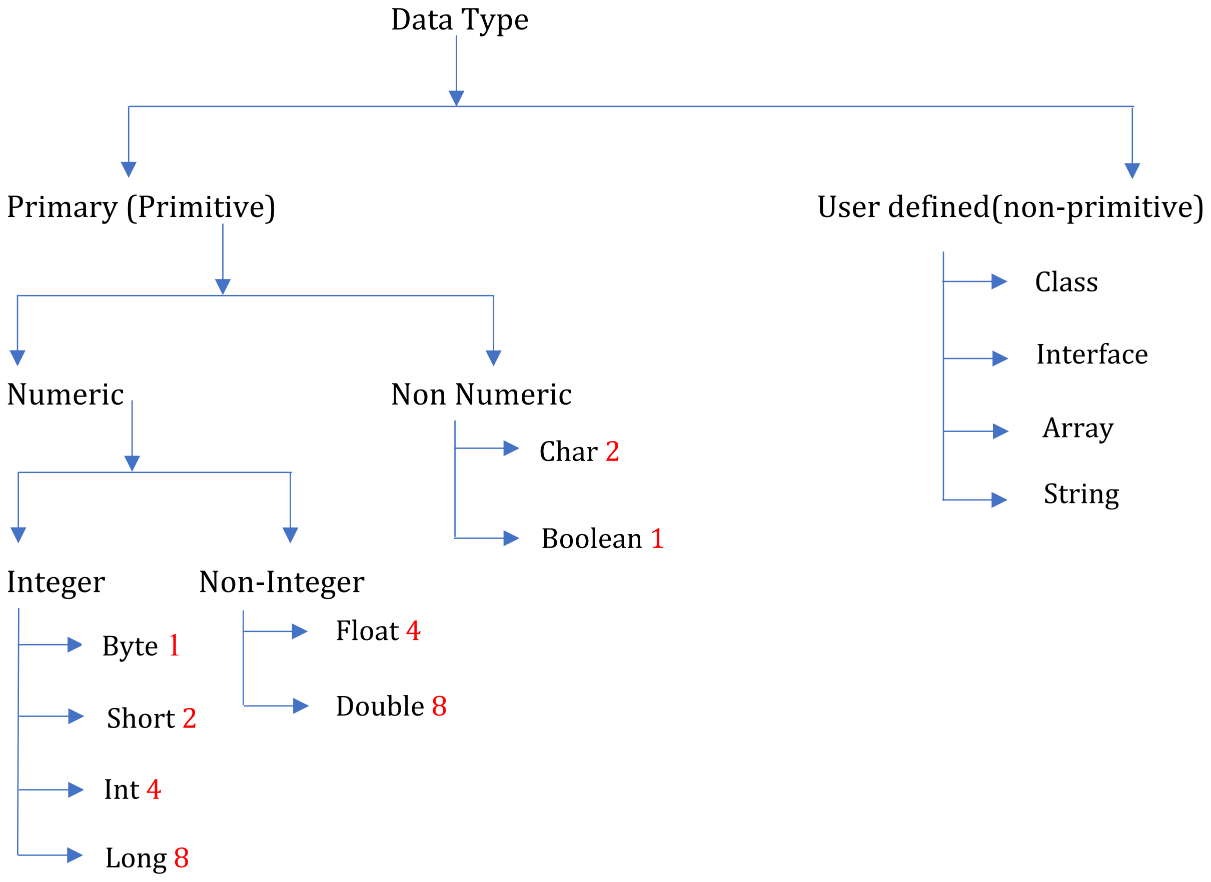
double – range from $1.7976931348623157 \times 10^{308}$, $4.9406564584124654 \times 10^{-324}$
(by default decimal value is of type double)

Takes 8 byte
Default value is 0.0d
Ex. double g = 122.1;

char – Value range from 0 to 65535 (2^{32} – 1)
Takes 2 byte (because it support Unicode)
Default value is ‘00000’
Ex. ‘a’, ‘B’, ‘0’ etc.
Ex. char c = '+';
1Kg = 1000gram 1MB =1024 kb. Binary

Boolean – Value can be true or false
Size depend on JVM
Default value is false
Ex. true, false
boolean a = true

2 4 8 16 32 64 128 256 512 1024
1GB=1024MB 1MB=1024KB 1KB=1024Byte 1Byte= 8bit



Data Type	*Default Value (for fields)*
byte	0
short	0
int	0
long	0L
float	0.0f
double	0.0d

char	'\u0000'
String (or any object)	null
boolean	false

There are four types of non-primitive data type

Class Interface Array String

- It is known as identifier
- Memory size is not fixed
- Memory allocated at run time

Program:

Identifier

Identifiers are the name given to variables, classes, methods, package etc

Rules for defining identifier :-

- The only allowed character for identifier are alpha numeric ex. [a-z] [A-Z] [0-9] [$ & _]
- It should not start with number or digit
  Allowed :- abc, abc_123, abc$123
  Not allowed :- abc@123, 123_abc
- Identifier are case sensitive
- Reserved word cannot be used as identifier
- White spaces are not allowed

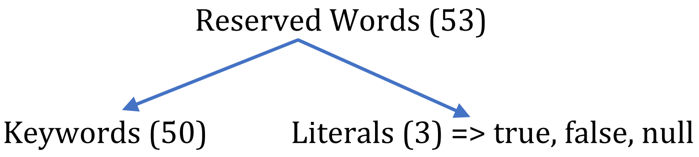
Java Keywords:

Keywords are predefined, reserved words used in Java programming that have special meanings to the compiler. For example:

abstract
assert
boolean
break
byte
case
catch
char
class
const
continue
default
do
double
else
enum
extends
final
finally
float
for
goto
if
implements
import
instanceof
int
interface
long
native
new
package
private
protected
public
return
short
static
strictfp
super
switch
synchronized
this
throw
throws
transient
try
void
volatile
while

Reserved Words

Any programming language reserved some words to represent functionality defined by that language, these words are called as reserved words



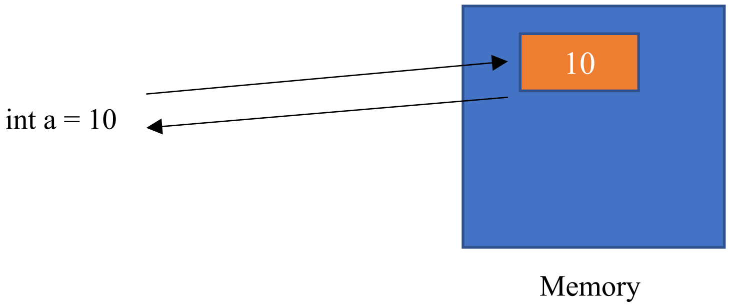
Reserved Words (53)

Keywords (50) Literals (3) => true, false, null

Keyword define functionality and Literals define value

Variable

- It is name of memory location.
- It is user defined given by user.
- Variable can store any type of value.
- One variable can store one information at a time and it can be change.



Control statements

It is used to control the flow of execution of program based on certain condition

1. If statement
2. If else statement
3. Else if statement
4. Nested if statement
5. Switch statement

1. If statement

It is used to decide whether certain statement or block of statement will be executed or not i.e. if the condition is true then only

Program:

2. If else statement

Else statement execute a block of code when condition is false

Program:

3. Else if statement

Here user can decide multiple option while executing the statement from top as soon as one of the condition is true the statement associated with will execute and rest of condition are skipped. If none of the condition is true then final else statement will execute

Note :- If multiple condition are true then it will execute first condition

Program:

4. Nested if statement

It means if statement inside if statement

Program:

5. Switch Case

The Java switch statement executes one statement from multiple conditions.

Points about Switch Statement:

There can be one or N number of case values for a switch expression.

The case value must be of switch expression type only.

The case values must be unique. In case of duplicate value, it renders compile-time error.

Each case statement can have a break statement which is optional.

The case value can have a default label which is optional.

Switch Case Syntax :

```
switch(expression){ case value1:
//code to be executed;
break; //optional case value2:
//code to be executed;
break; //optional ......
default:
code to be executed if all cases are not matched;
}
```

Program:

Program :

Program :

Loops : Loops are used to execute a set of instructions/ methods repeatedly when some conditions become true.

Advantages:

- Fast execution
- Reusability
- Decrease line of code
- Less memory required

In Java we have four Loops:

- For loop
- Do-while loop
- While loop
- For each loop – Array, Collection

For loop is used to iterate a part of program multiple times if number of iteration is fixed

While loop is used to iterate a part of program multiple times if number of iteration is not fixed

Do-While loop is used to iterate a part of program multiple times if number of iteration is not fixed and you must have execute loop at least once.

For Loop: We can initialize the variable, check condition and increment/decrement value in one line.

Syntax :

```
for(initialization; condition; incr/decr){ //statement or code to be executed
}
```

```
for (statement 1; statement 2; statement 3)
 {
  // code block to be executed
}
```

Statement 1 is executed (one time) before the execution of the code block.
Statement 2 defines the condition for executing the code block.
Statement 3 is executed (every time) after the code block has been executed.

Program :

```
public class SecondProgram {
public static void main(String [] args){
for (int i=0;i<10;i++){
System.out.println(i);
}}}
```

Program :- Print number from 1 to 5
Program :- Print number from 55-75
Program :- Print even number from 2-10
Program :- Print odd number from 5-51
Program :- Print number 5 to 1
Program :- Print even number from 100 to 2
Program :- Print odd number from 9 to 1
Program :- Print cube of values from 1 to 5

While Loop:
while loop is preferred to use, If the number of iteration is not fixed. It is pre-test loop it is also called as entry control loop

Syntax :

```
while(condition){
//code to be executed
}
```

Program :

Do-While loop

do-while Loop: If the number of iteration is not fixed and **you must have to execute the loop at least once**, it is recommended to use do-while loop. It is post test loop

Syntax :

```
do{
//code to be executed
}
while(condition);
```

Program :

Class

It is user defined prototype from which objects are created. It represent set of method that are common to all objects of one type

- Collection of objects is called class.
- A class can also be defined as a blueprint from which you can create an individual object.

Object

- It is basic unit of object oriented programming and represent real life entities. A typical java program create many object used to interact or call the method
- Any entity that has state and behavior is known as an object. For example a chair, pen, table, keyboard, bike, etc. It can be physical or logical.
- Example: A man is an object because it has states like name, height, weight, etc. as well as behaviors like walking, running etc.

Characteristics of objects are:
1. State
2. Behaviour

eg. Marker
state- colour, size, price, weight
behaviour- write, throw

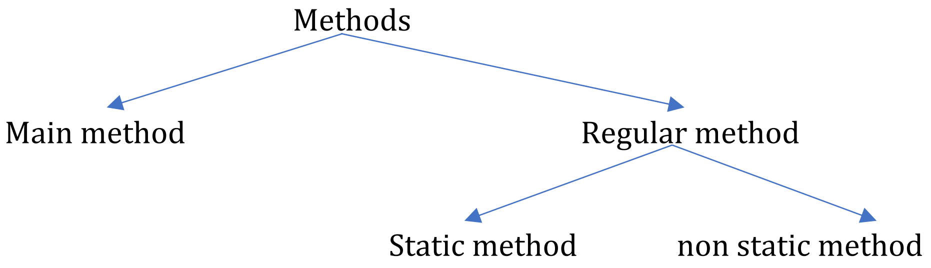
eg. Car
state: What the objects have: Speed, Gear, Direction, Fuel level, Engine temperature
Behaviours: Change Gear, Go faster/slower, Go in reverse, Stop, Shut-off

Student:
State: what the objects have, Student have a first name, last name, age, etc
Behaviour: what the objects do, Student attend a course "Software testing"

In the filed of java each and everything is consider to be as object.
Object is copy of class or instance class which is having state & behaviour.
where state stands for variable(data member) & behaviour stands for methods(member functions).

Methods:

A method is a block of code which only runs when it is called.
Methods are used to perform certain actions, and they are also known as functions.
You can pass data, known as parameters, into a method.



Why to use method:

- To reuse the code
- At the time of program execution main method is going to execute automatically where as regular method has to be called
- At the time of program execution priority is scheduled for main method only
- To execute regular method programmer need to make call from main method until and unless call is not made regular method will not get executed

1. Main method (pre-defined)

In any Java program, the main() method is the starting point from where compiler starts program execution.

So, the compiler needs to call the main() method.
without main method we can't run any java program.

2. Regular method (user defined)

Static Method : If you apply static keyword with any method, it is known as static method.

- A static method belongs to the class rather than the object of a class.
- A static method can be invoked (call) without the need for creating an instance of a class. (object of class)
- A static method can access static data member and can change the value of it.

Non-Static Method : If you do not apply static keyword with any method, it is known as non-static method.

- A non-static method belongs to the object of the class.
- A non-static method can be invoked (call) with an instance of a class (object).
- A non-static method can access static data member and method without creating instance of class.

1. Static method call from same class

When we used void in method declaration, method cannot return any value

Program :

2. Static method call from different class

Program :

3. Static method with parameter in same class

Program :

4. Static method with parameter from different class

Program :

5. Static method with return type in same class

For method to return a value we need to use relevant data type such as int, float, String instead of void and use return keyword inside the method

- Information can be passed to method as parameter
- Parameter act as variable inside method

- It is specified after method name inside parenthesis
- We can add as many parameter as we need

Program:

6. **Static method with return type from different class**

Program :

7. **Non static method call from same class**

Program12:

8. **Non static method call from different class**

Program13:

9. **Non-Static method with parameter in same class**

Program14:

10. **Non-Static method with parameter from different class**

Program15:

11. **Non-Static method with return type from same class**

Program16:

12. **Non-Static method with return type from different class**

Program17:

13. **Static method and non-static method call from same and different class with parameter, without parameter and return type**

Program18: Assignment

Constructor

- Constructor is a special member of class
- It is used to initialize data member (objects/variables) of class and to load non-static member of class into object
- According to java language each and every class should have constructor
- **The constructor is called when an object of a class is created.**

Rules

- Constructor name should be same as class
- It does not have any return type
- Any number of constructor can be declared inside java class but constructor name should be same as class name while argument must be different

Use of Constructor

- To copy/load all members of class into object --> when we create object of class
- To initialize data member/variable

Constructor are classified into two types

1. **Default constructor**

- If constructor is not declared in java class then at the time of compilation compiler will provide constructor for class called as default constructor
- If programmer has declared the constructor then compiler will not provide default constructor
- The Constructor provided by compiler at the time of compilation is known as Default Constructor

2. **User defined constructor**

   If programmer declaring constructor in java class then it is considered to be user defined constructor

User defined Constructor are classified into 2 types

1. Without/zero parameter constructor

// example-without parameter constructor --ex. addition

2. With parameter constructor

// example-with parameter constructor- only 1 constructor – ex. addition

// example-with parameter constructor- multiple constructor -- ex. addition

a) Zero argument or zero parameter

Program:

b) Argument or parameterized constructor

Program:

Static block

It is executed at the time of loading .class file in jvm memory

Instance block

It is like to method which has no name, we can write instance block inside class not method.

- It executed before constructor.
- Variable can be declare inside instance block not method
- Time consuming code can be written in instance block
- **To execute instance block object should be declared**

Program:

Types of variable

a) Local

b) Instance/Global

c) Static

a) Local variable :- A variable which declare inside method/block/constructor called as local variable
Scope of local variable remains only within the method/block/constructor.
Local variable is also called temporary variable.

Program :

b) Instance/Global variable:-A variable which declare inside the class but outside of all method/block/constructor is called instance variable
scope of global variable remains thought the class.
global variable is also called permanent variable.

c) Static/ Class variable :- A variable which declare with the help of static keyword is called as static variable.
1. static variable call from same class -->variableName
2. static variable call from diff class--> className.variableName

Note: we can access static global variable in both static & non-static method

Object-Oriented Programming System(OOPS)
Java programming language is very popular in software industry because of OOPS concept.
OOPS concept provides 5 important pillar /principles for the language they are
1. Inheritance
2. Polymorphism
3. Encapsulation
4. Interface
5. Abstraction

Inheritance

It is one of the object oriented principal where one class acquire properties of another class with the help of **extends** keyword

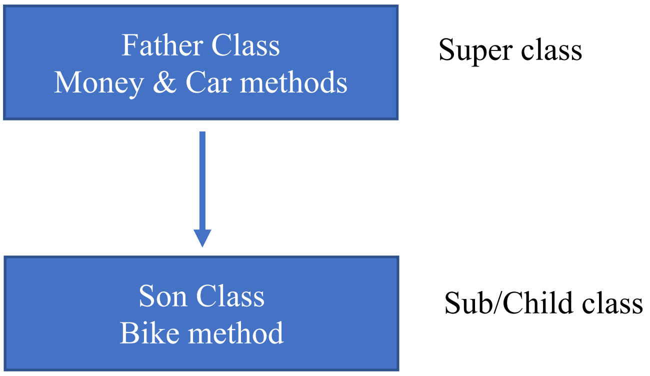
- The class from where properties are acquired is known as super/parent class
- The class to where properties are inherited are known as sub/child class
- Inheritance takes place between 2 or more than 2 classes.

It is classified into four types

1. Single level
2. Multi-level
3. Multiple
4. Hierarchical

1. Single level inheritance

- It is an operation where inheritance takes place between two classes
- To perform single level inheritance two classes are mandatory



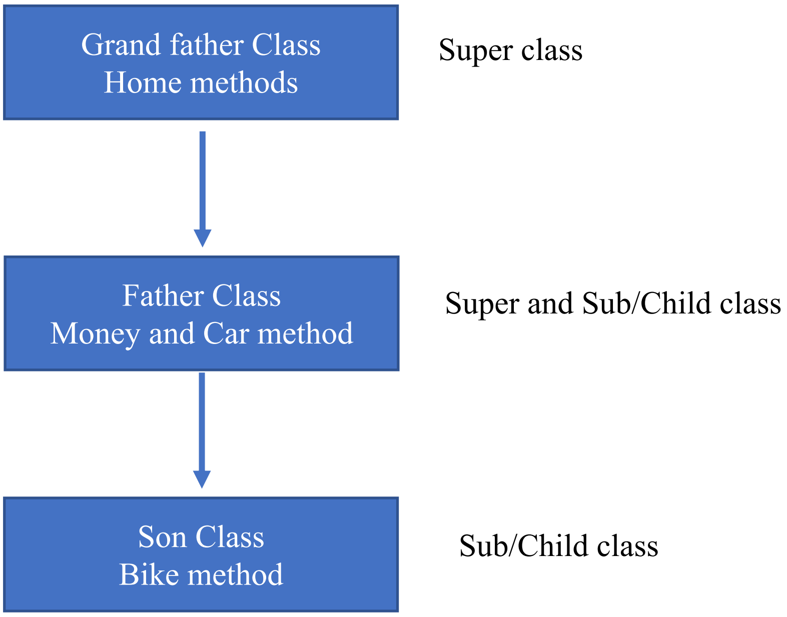
Program:

Program:

2. Multi-level

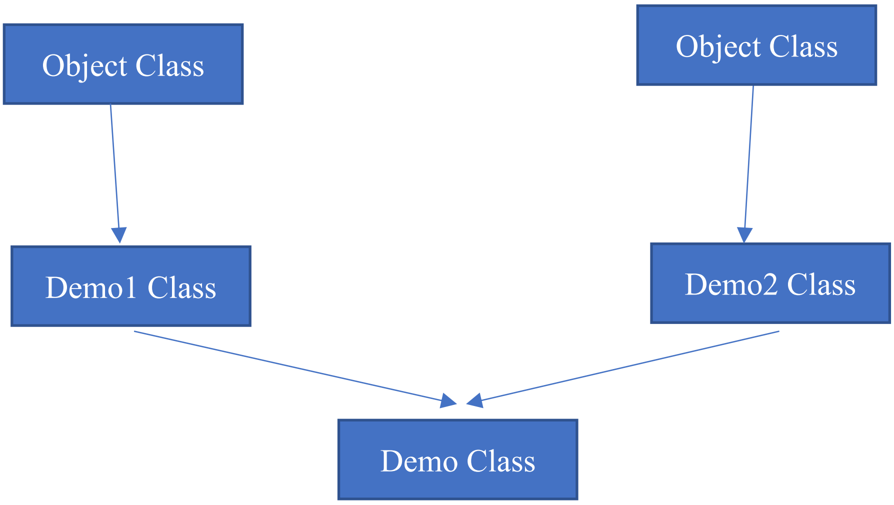
It takes place between three or more classes

One sub class acquires the properties of another super class and that class acquire properties of another super class and phenomena continues

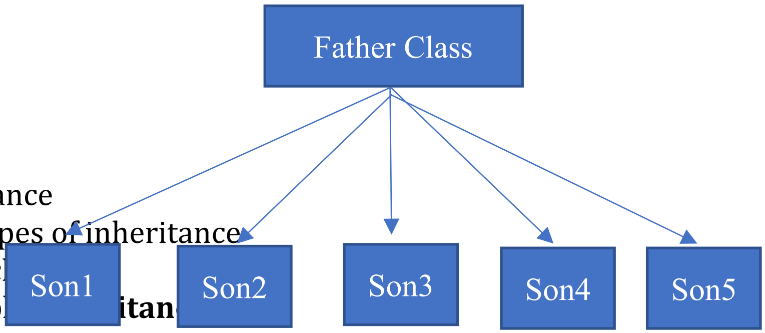


Program:

3. **Multiple Inheritance**
   One sub class acquire the properties of two super classes at same time is known as multiple inheritance
   But java does not support it due to ambiguity problem
   Note: object class is the super most class in java
   By using interface we can achieve Multiple Inheritance.



4. **Hierarchical Inheritance**
   Two or more than two sub classes acquires properties of one super class multiple sub classes can acquire properties of 1 super class is known as hierarchical Inheritance.



Program25:
What is inheritance
What are the types of inheritance
What is object c
What is multip itan
Why we can not implement multiple inheritance in java using classes?

This Keyword

Every class have unique reference number, so reference variable (object) refer the unique reference number of class also this keyword refer the unique reference number.

- This keyword refer to current object inside the method or constructor
- Whenever the name of instance variable and local variable are same then JVM confused which one is local variable and which is instance variable so to avoid this we should used this keyword
- It is also used when we want to call zero parameter constructor of its own class
- It is also used to call parameterized constructor of its own class

Program :
Program :
Program :
Program :

Super Keyword

- Super keywords refer to the objects of super class
- It is used when we want to call super class variable, method and constructor through sub class object.
- Whenever super class and sub class variable and method name are same then JVM confused which one to call so to avoid this we should use super keyword

It is used to access global variable from super class or different class
Program :
Program :
Program :
Program :
Program :

Access Specifier/Modifier
It is used to represent scope of member of class (variables, methods, constructor).

1) Private :- If we define any member of class as private then scope of that member remain only within the class. It cannot access from other classes
2) Default :- In this scope of member remain only within the package. There is no keyword to declare method. It can't be access from other packages.
3) Protected :- in this scope of that member remain within package only. The class which is present outside package can also access it by on condition i.e. inheritance operation
4) Public :- Scope of these member remain throughout the project

Sr. No		Private	Public	Protected	Default
1	Same Class	YES	YES	YES	YES
2	Sub class in same package	NO	YES	YES	YES
3	Non sub class in same package	NO	YES	YES	YES
4	Sub class in another package	NO	YES	YES	NO
5	Non sub class in another package	NO	YES	NO	NO

Program29:
Package 1 => Class A {private int a}
Package 1 => Class B extends A { }
Package 1 => Class C
Package 2 =>Class D extends A {}
Package 2 =>Class E {}

Polymorphism

It is one of the OOPs principle where one object showing different behaviour at different stages of life cycle.

Polymorphism is an latin word where poly stand for many & morphism stands for forms.

It means having many forms OR ability of message to be displayed in more than one form

Ex. A person can be father, husband, employee, friend, trainer

It allowed single action in different way

Poly => many and morphs = form

In java it is classified into two types

1) Compile time polymorphism
2) Run time polymorphism

1) Compile time polymorphism

Which exist in compile time, it is also called as early binding OR static polymorphism

In Compile time Polymorphism method declaration is going to get binded to its definition at compilation time, based on argument/input/parameter/signature is known as compile time Polymorphism.

As binding takes during compilation time only, so it is also known as early binding.

Method overloading is an example of compile time Polymorphism.

Method overloading

When a class contain more than one method with same name and different argument/parameter/inputs is called as method overloading

Program34:

2) Run time polymorphism

In Runtime Polymorphism, method calling is going to get binded to its definition at Runtime/execution time, based on object creation is known as runtime Polymorphism.

As binding takes during Runtime/execution time, so it is also known as late binding.

//once binding is done, again rebinding can be done, so it is called dynamic binding.

Method overriding is an example of Runtime Polymorphism.

Method overriding

When we write method in super and sub class in such a way that method name and parameter must be same then it is known as method overriding

Acquiring super class method into sub class with the help of extends keyword & changing implementation/definition, according to subclass specification is called method overriding

Program:

Program:

Program:

Compile Time	**Run Time**
1) Exist at the time of compilation 2) Early binding 3) Method overloading 4) Static polymorphism	1) Exist at run time 2) Late binding 3) Method overriding 4) Dynamic method dispatch

Encapsulation
It is mechanism where we can wrap data member and member method in single unit (class)
Note:- declare class member as private and method should be public
Program: Data is new oil

Abstraction
abstraction is one of the oops principle in java.
It is the process of hiding implementation details from user only highlighted services are visible to user
The scenario of Abstraction is "if customer is visiting or making use of any application, then he should utilize functionality only & he should not feel any backend code processing"

Advantage :- Security
Enhancement

Implementation of Abstraction
Abstract class
Interface

Abstract class

- A class declare with abstract keyword is known as abstract class
- It may or may not contain abstract method
- To inherit abstract class we need to inherit it with sub class
- If class contain partial implementation then we should declare it as abstract
- programmer can declare incomplete methods as abstract method, by declaring keyword called "abstract" infront of method.

- It is incomplete class where programmer can declare complete and incomplete method
- An incomplete method is method where only method declaration is present and method definition is not available
- We cannot create object of abstract class
- To create object of abstract class we must have concret class (sub / child class)
- Incomplete method is said to be abstract method

Program :
Program :

Concret Class
A class which provide definition for all incomplete method present inside abstract class with the help of extends keyword is known as concret class
*can 1 Abstract Class extends another Abstract Class ? **yes***

Abstract method

A method which contain abstract modifier at the time of declaration is called abstract method

Note:- It can only be used in abstract class

It does not contain any body, contain declaration only

Abstract method must be overridden in sub class else sub class will also become abstract

When action is common but implementation is different then we should use abstract class

Program: Assignment – RBI (method IR) ICICI HDFC SBI

Program:

Interface

Interface is just like class which contain only abstract (incomplete) method
To achieve interface java provide a keyword called **implements**
Interface method are by default public and abstract
Interface variable are by default public, static, final
Interface method must be overridden in implementation class
Interface deals with client developer
constructor concept in not present inside Interface.
To create object of Interface programmer need to make use of Implementation class using implements keyword.

Interface support multiple inheritance.

- It is not 100% abstract in nature
- It is one of the object oriented principal
- There is no constructor principal
- We cannot create object of interface
- To create object we must have implementation class
- Until we complete all method in interface it is said to be abstract class

Program :

Program:

Program:

Program:

Program:

Implementation Class

A class which provide definition for all incomplete method present in interface with the help of implements keyword is known as implementation class

- **There is no object class for interface**

Implementation of multiple inheritance

Program :

Generalization

Extracting all common important properties from subclass and declare it in super class (interface) and providing implementation according to subclass specification
Generalization file can be interface, abstract class or java class but **interface** is recommended

Program:

Type Casting

What is casting?

What is type casting?

What is up casting, what is usage of that in Project? - VIMP

Converting one type of information into another type is known as typecasting OR Converting one data type into another data type is called as type casting

It is classified into two types

1) Primitive casting
2) Class / Non-primitive casting

1) Primitive casting

- Converting one data type information into another is known as primitive casting
- In this compiler take care of conversion operation internally, so it is also called as automatic casting

It is further classified into three types

a) Implicit casting (automatic)
b) Explicit casting (forceful)
c) Boolean casting (incompatible)

a) Implicit casting

Converting lower data type information into higher data type is known as implicit casting

- It is automatically performed by compiler
- External resource support is not allowed or not required
- Ex. int a = 3; (memory size 4 byte)
  System.out.println(a);
  double b = a;
  here we are assigning int type information to double
  system.out.println(b);
  It is also called as widening casting where memory size increases.

b) Explicit casting

Converting higher size of data type into lower size information is known as explicit casting

By default

- External support is required

```
Ex. double a = 2.5;     8 byte     2.5
    int b = (int) a;    4 byte     2
```

  We are converting information then inserting it into respective type
  Data loss

Program33:

c) Boolean casting

It is consider to be incompatible type because boolean is unique data type where information is already provided inside it (TRUE/FALSE)

- For Boolean data type programmer cannot provide additional information so it is incompatible.

2) Class / Non-primitive casting

Converting one type of class into other or assigning property of one class into another is known as class casting

It is classified into two types

a) Up-casting

b) Down casting

a) Up-casting

Assigning sub class properties into super class is known as up-casting

- Before performing upcasting, inheritance operation should takes place
- Then property of super class comes into sub class
- Sub class can have its own properties
- At the time of upcasting, property which are inherit from super class are only eligible for operation, properties of sub class are not eligible for operation

b) Down casting

Assigning super class properties into sub class is known as down-casting

- But it is not allowed in java still if we use down casting there will not be any compiler error but runtime exception will occur
- Java.lang.ClassCastException

Program:

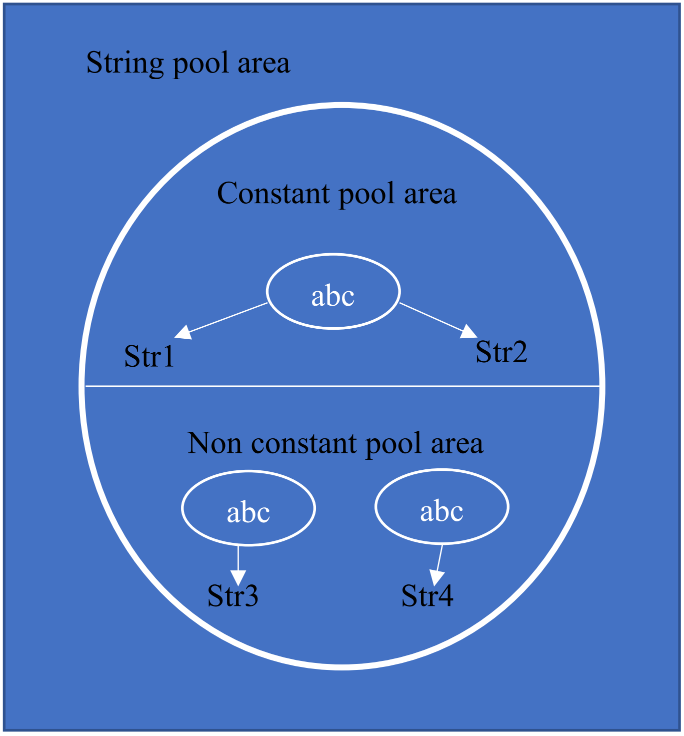
String

String class:

1. String is non-primitive data type, memory size is not fixed.
2. String is use to store collection of characters.
3. String is a inbuilt/ready made class present inside "java.lang" package.
4. String class is final class can't be inherited to other classes.
5. At the time of String declaration, initialization, object creation takes place.
6. **String objects are immutable in nature/can't be change.**
7. Object creation of String can be done in 2 ways:
    1. Without using new keyword
    2. Using new keyword

8. String objects are going to get stored inside String pool area which is present inside heap area.

Heap Area



String object is stored inside of string pool area which present inside heap area
Object creation of string can be done in two ways

a) Using new keyword
b) Without using new keyword

String str = “xyz”; => stored in constant pool area

String str1 = new String(“xyz”) => stored in nonconstant pool area

String pool are classified into two types

a) Constant pool area
b) Non-constant pool area

a) Constant pool area
During object creation if we do not use new keyword then object creation takes place in constant pool area
Duplicate data is not allowed

b) Non-constant pool area
If we use new keyword then object creation takes place in non-constant pool area
Duplicate data is allowed

Reason:-
For string object, string constant pool area concept is available, multiple reference pointing same object. By using one reference if we allowed to change content then remaining references affected to prevent this **immutability** required

Survey :- Name, age, which city you like to live, what about your current city, city=Pune 1000 people

What is string
Why string is immutable
Can you tell any 5-8 (10) string method, with explanation

String class methods

a) **length()**
b) toUpperCase
c) toLowerCase
d) **equals()**
e) equalsIgnoreCase
f) contains
g) isEmpty()
h) **charAt(int index)**
i) indexOf
j) lastIndexOf
k) startsWith
l) endsWith
m) substring(3)
n) substring(2,3)
o) concat
p) replace
q) **split**
r) trim

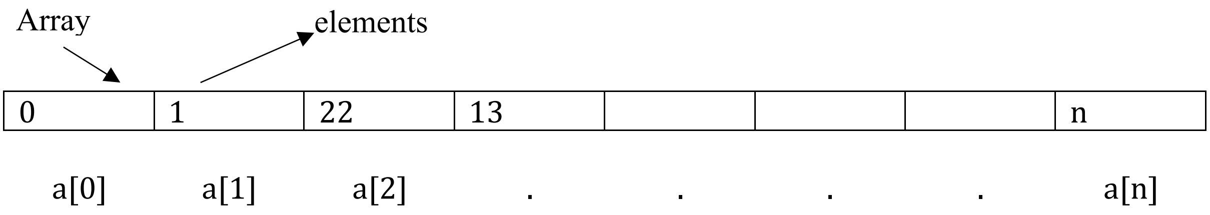
Program:
Program
Program:
Program:
Program:
Program:
Program:

Array

Need?

Array is an object in java which contain similar type of data in contiguous memory location

- It is data structure used to store collection of information (huge data)
- It is homogenous in nature (similar type of data can be maintained in one array)
- Array declaration needs to be done with size
- Array cannot be expanded
- It is memory cell starts from zero
- The information inserted in array is consider to be an element



0	1	22	13				n
a[0]	a[1]	a[2]	.	.	.	.	a[n]

Disadvantage:

- Array has limited length
- Array is homogenous (only one data type)

Syntax:

```
data_type [] variable_name;          OR              data_type var_name[];
String ar[] = new String [5];
ar[0] = “Andy”;
ar[1] = “Anna”;
ar[2] = “Jon”;                   Initialization
ar[3] = “Ron”;
ar[4] = “Harry”;

OR
String ar[] = {“Andy”,”Anna”,”Jon”,”Ron”,”Harry”}
```

Program:
Program:
Program:
Program:
Program:

Final : final keyword in java is used to restrict the user. Variable, Method and Class can be defined final.

- Final Variable : Value of Final Variable can’t be change, it is constant.
- Final Method : Final Method can’t be overridden in any child class.
- Final Class : Final Class can’t be extend in java.

Program

Exception Handling

Exception

During the execution of java program JVM faces abnormal situation base on code declaration then it trigger an event said to be exception which result in termination of java program then code is consider to be non-feasible code for execution
If any event is generated by JVM then programmer need to handle event so that’s all line in program get executed.

An exception is unexpected/unwanted/ abnormal situation that occur at run time is called exception
Ex. if power failure at our home (power cut exception - power backup),
medical issue with us (ill exception – by medicine or doctor),
if we try to read file in java but not getting the file is HDD (display the message)
Program:

Exception Hierarchy

Throwable is a super class of java exception hierarchy which contain two sub classes

a) Exception
    a. RunTimeException (Unchecked)
    b. IOException (Checked)
    c. SQLException (Checked)

        d. InterruptedException (Checked)
        e. ClassNotFoundException (Checked)

b) Error (Unchecked)
    a. StackOverflowError
    b. OutofMemoryError
    c. IOError
    d. LinkageError

a. RunTimeException (Unchecked)
    a. ArithmaticException
    b. NullPointerException
    c. NumberFormatException
    d. IndexOutofBoundException
        i. ArrayIndexOutofBoundException
        ii. StringIndexOutofBoundException

b. IOException (Checked)
    a. EOFException
    b. FileNotFoundException

Mechanism to handle the exception

Following are the technique to handle the exception

a) Try
b) Catch
c) Throw
d) Throws
e) Finally

To handle predefined exception created by user and we are taking the responsibility of it then we can use try-catch block

Throw

If we want to create our own exception object and wants to throw the exception as we are not taking the responsibility of it and we want JVM should handle that exception then we use throw

Throws:

We can assign exception handling responsibility to caller (JVM or another method)
Needed for checked exception, for unchecked no use of it
No prevention of abnormal termination

Try Block :- Put risky code in try block

- Used to declare risky code only
- Controller visit try only once throughout lifeline of program
- Try block followed by catch or finally block
- Multiple try block are not allowed

Catch Block :- it handle the exception throws by try block

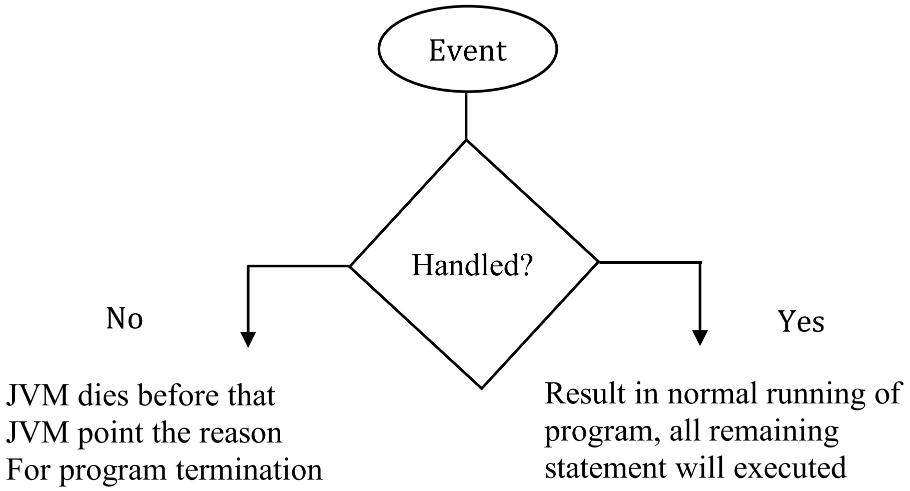
- Used to handle event generated from try block
- **Executed if event generated in try block**
- Should be declare after try block
- Any number of catch block can be declare for single try

Note :- Catch will not execute if no exception in try block

Finally Block is followed by try block and always executed whenever the exception occurs or not.

Finally Block is used to execute important code such as closing connection, stream, cleanup code etc.

Program:

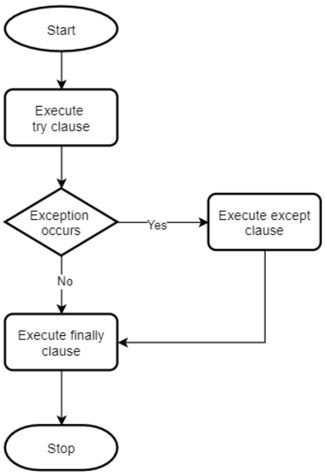


To handle the event / exception below block are used

Syntax:

```
try {
// Risky code
}
catch(event / exception name ref_variable) {
// event handled message
}
```

Program:



```
try {
statement1;
statement2;
statement3;
}
catch(Exception e) {
statement4;
}
finally {
statement5;
}
statement6;
```

Case 1 : No exception => 1 2 3 5 6 (normal execution)
Case 2 : Exception at 2 and match with catch => 1 4 5 6 (normal execution)
Case 3 : Exception at 2 and not match with catch => 1 5 (abnormal termination)
Case 4 : Exception at 2 and even in catch => 1 5 (abnormal termination)
Case 5 : Exception at 2 and even in finally => 1 (abnormal termination)

Program:
Program :- Multiple try catch
Program : Multiple catch block

Checked Exception	**Unchecked Exception**
Exception checked by compiler for smooth execution of program	Exception not checked by compiler and handled by JVM
Mostly occurred so compiler checked	Rarely occurred so compiler not take care
Ex. file not found, interruptException	Ex. Arithmetic, null pointer, arrayIndexoutofBound

Final, finally, finalize

Finalize

Method available in object super class

Release the resources allocated by unused object, before removing unused object by garbage collection

Finalize is protected by default/ but we can use public

Program:

What is garbage collection

Delete the used entity

Data Base connection and network connection

Then finalize method is to be called by garbage collection before destroying the object for object to perform cleanup activity

Finally	**Finalize()**
It is block used in try catch	It is method
Used to close the resources open in try block	Used to take the resource back from unused object, garbage collector deallocate the resource before destroying the object

Selenium configuration setup

1. Search selenium hq on google
2. Select the link https://www.selenium.dev
3. Go to downloads
4. Look for previous releases and click on link here
5. Look for Selenium 4.0.0
6. Look for **selenium-java-4.0.0.zip**
7. Download the zip
8. Extract the zip file

1. Open the installed chrome
2. Click on 3 dots
3. Select help option
4. Select about chrome option
5. Check for the version we are using

1. Search chromedriver download in google
2. Select the link https://chromedriver.chromium.org/downloads
3. Look the current release
4. Select and click the version which is available on machine
5. Select and download proper link of chromedriver for OS we are using
6. Extract the zip file

1. Open the eclipse
2. Right click on the project we are working
3. Select the last option properties
4. Select java build path
5. Select libraries tab
6. Click on add external JARs
7. Select all the extracted jar of selenium 4.0.0 (from selenium folder and libs folder too)
8. Click on Apply and Ok

1. Copy the downloaded chrome driver and paste in project by right clicking on current project
2. Look for chrome driver in project and right click
3. Copy the location and paste in system.setProperties as second argument

1. Create a new package
2. Create new class with main function
3. Use the below code to verify the selenium configuration

```
public class webdriverMethods {
public static void main(String [] args)       {
System.setProperty("webdriver.chrome.driver","Address of chrome driver");
WebDriver driver = new ChromeDriver();
driver.get("https://www.facebook.com/");
}}
```

Automation Testing

Testing an application feature with the help of automation tool and executing test script is called automation testing

Disadvantage of Manual Testing

- Compatibility testing is difficult
- Test cycle duration increases
- More human efforts are required
- Regression testing is time consuming

Advantage of automation testing

1) Reusability of test script
2) Project duration will be reduced
3) Cross browser / cross platform testing is possible
4) Less human effort are required
5) To overcome drawback of regression testing
6) Cost of project will be reduced
7) It is reliable and efficient

Advantage of Selenium

1) Open source
2) Multi language support
3) Cross browser testing is possible
4) Cross platform is possible

Disadvantage of Selenium

1) We cannot automate standalone application
2) Adhoc test cases cannot be automated
3) We cannot automate captcha
4) No support for file uploading
5) Only for web based application

Selenium flavors

a) Selenium IDE (Integrated dev environment)
b) Selenium RC (Remote Control)
c) **Selenium webdriver**
d) Selenium Grid

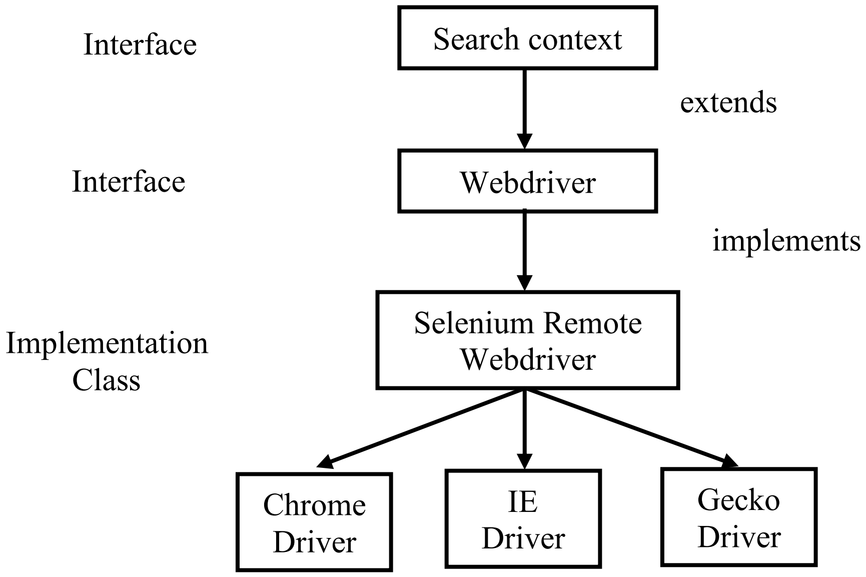
Advantage of selenium IDE :- record and playback
Drawback :- it can be useful only on Firefox browser
It can be useful in java language only

Advantage of selenium RC :- Compatible testing is possible
Drawback :- Execute script only in java

Advantage of Selenium webdriver:

- Compatibility testing is possible
- Support multiple languages

Selenium Architecture



Webdriver driver = new ChromeDriver (). --→upcasting

ChromeDriver driver = new ChromeDriver ().

EdgeDriver driver = new EdgeDriver ().

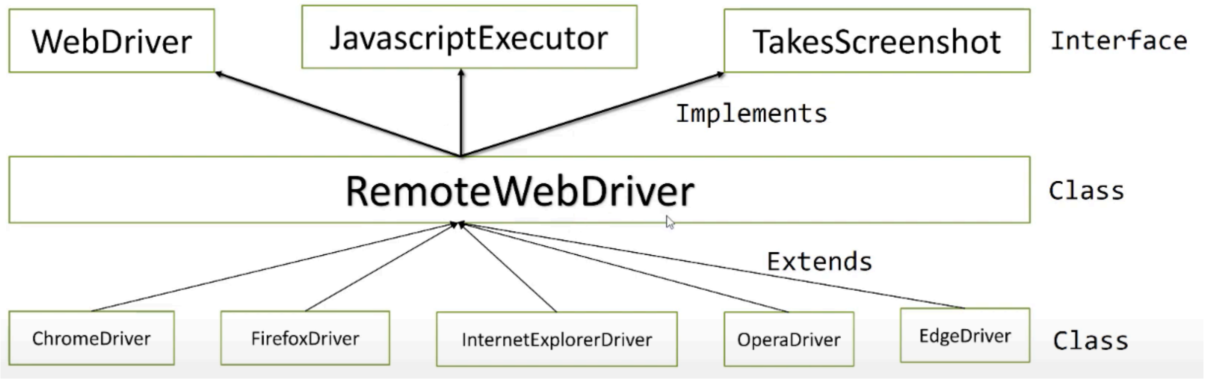
Webdriver driver;

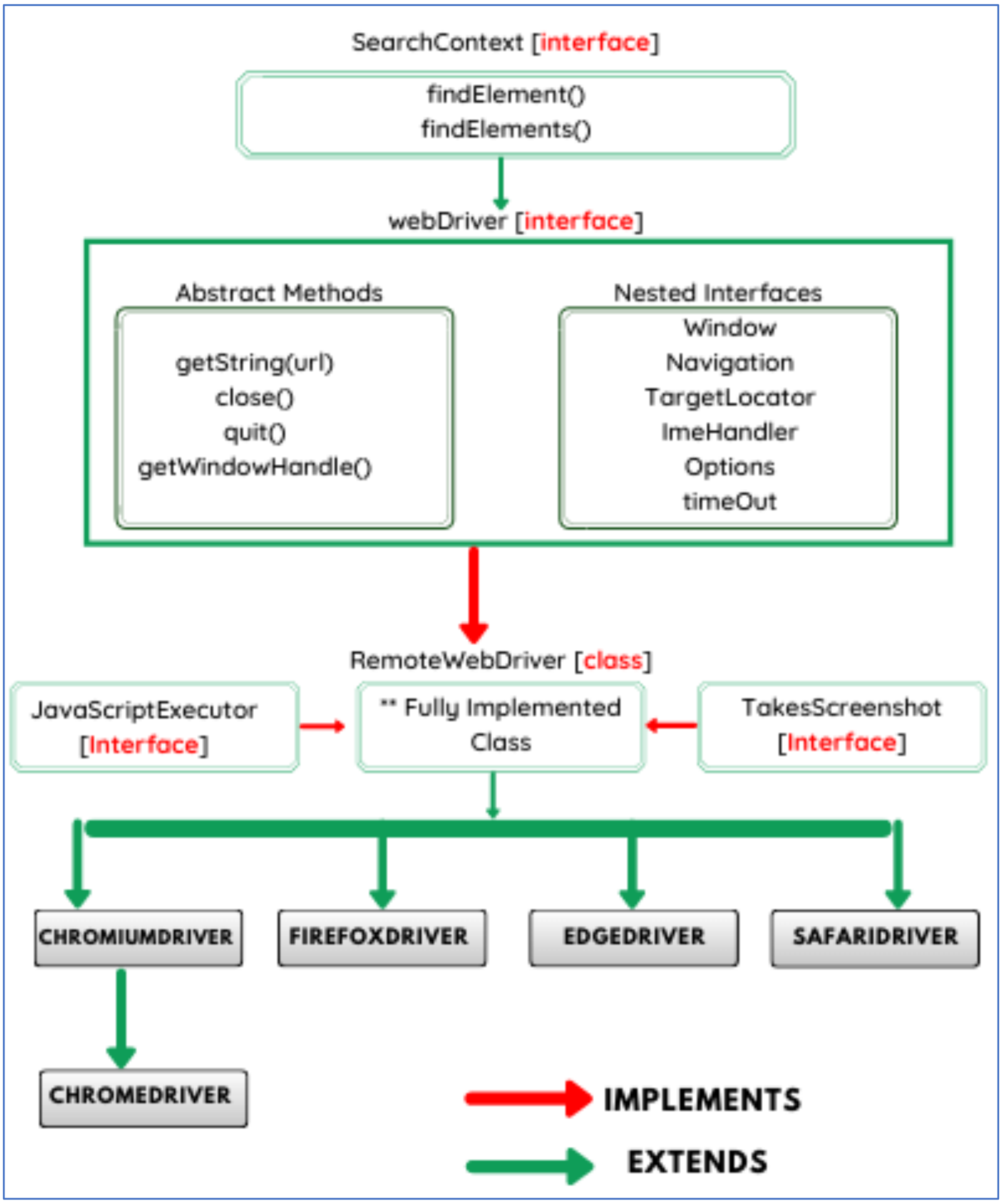
If(browser= “chrome”)
driver = new ChromeDriver ();
else if (browser= “edge”)
driver = new EdgeDriver ();

int a = 10;
Search context is super most interface which contain abstract method and inherited to webdriver interface
Webdriver is interface which contain abstract method of search context and its own abstract methods

Selenium remote webdriver

- All abstract or incomplete method are implemented in selenium remote webdriver class
- This class is extended to different browser like chrome, Firefox, IE etc
- To run application in multiple browser for compatibility testing we need to perform upcasting


WebDriver
JavascriptExecutor
TakesScreenshot
Interface
Implements
RemoteWebDriver
Class
Extends
ChromeDriver
FirefoxDriver
InternetExplorerDriver
OperaDriver
EdgeDriver
Class


SearchContext [interface]
findElement()
findElements()
webDriver [interface]
Abstract Methods
getString(url)
close()
quit()
getWindowHandle()
Nested Interfaces
Window
Navigation
TargetLocator
ImeHandler
Options
timeOut
RemoteWebDriver [class]
JavaScriptExecutor
[Interface]
** Fully Implemented
Class
TakesScreenshot
[Interface]
CHROMIUMDRIVER
FIREFOXDRIVER
EDGEDRIVER
SAFARIDRIVER
CHROMEDRIVER
IMPLEMENTS
EXTENDS

Selenium webdriver and its methods

Webdriver is an interface used to perform action on browser

1) **Get method**

   It is use to enter URL or to open an application

   driver.get("url of application");

   driver.get("https:-//www.facebook.com");

2) **Close method**

   It is used to close the browser or current tab of browser

   driver.close();

3) **Maximize method**

   It is used to maximize the browser

   driver.manage().window().maximize();

4) **Quit method**

   It use to close all tabs or close the browser

   driver.quit();

5) **Navigate method**

   It is used to enter URL as well as we can perform move forward, back and refresh functionality

Program:

```
driver.navigate().to("https://www.google.com/");
driver.navigate().back();
driver.navigate().forward();
driver.navigate().refresh();
```

6) **Get Title**

Use to get title of web page, return type is string

7) **Get current URL**

It is used to get current URL of webpage and it return string type value

Program:

```
String expTitle = "Rediff.com";
String actualTitle = driver.getTitle();
driver.getCurrentUrl();
```

8) Setsize method

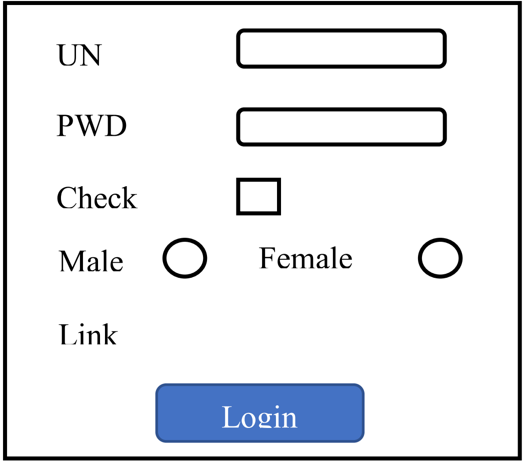
Program:

```
Dimension z = new Dimension(600, 1000);
driver.manage().window().setSize(z);

Point p = new Point(500,500);
driver.manage().window().setPosition(p);
```

HTML Coding

```
<html>
<body>
UN <input type=‘text’ id=’1234’ ></br>
PWD <input type=‘password class=’abc’ ></br>
Check <input type=‘checkbox id=’abcd’ name=’xyz’ >
Male <input type=’radio’ id=’xyz’></br>
Female <input type=’radio’ id=’xyz’></br>
        <a href=’ure’> link </a> </br>
        <input type=”button” value=”login”>
</body>
</html>
```



1) Tag name = html, body, input, a
2) Attribute
3) Text

a) Any keyword present in > < :- Text
b) Any keyword present after < :- Tag name
c) Any keyword present before = :- Attribute name (type, class, name, href, id)
d) Any keyword present after = :- Attribute value

1) Component / Element :- input
2) List Box :- select
3) Link :- a
4) Webpage :- table
5) Image :- img

Element of web page

Which are the type of locator used in selenium????????????????

Locators

1) Tagname
2) Id $\}$ Tag name for attribute
3) Name
4) Class name
5) Link text $\}$ For link
6) Partial link text
7) CSS $\}$ Expression
8) **xpath**

- It is used to identify elements/ static method using By class

```
System.setProperty("webdriver.chrome.driver","chromedriver");
WebDriver driver = new ChromeDriver();
driver.get("https://www.facebook.com/");
Thread.sleep(3000);
driver.findElement(By.xpath("Xpath expression")).sendKeys("username");
```

- These are used to identify an element with the help of locator type
- To identify an element present in browser webpage, we need to use findelement method
- findelement() method will identify element with help of By class which contain static method
- all the static method present in By class are known as locator type

Tagname

```
driver.findElement(By.tagname(“input”)).sendkeys(“ ”);
WebElement fname3 = driver.findElement(By.tagName("input"));
```

Note:- We cannot use tag name when tag name is not present or duplicate.

ID

```
driver.findElement(By.id(“1234”)).click();
WebElement fname4 = driver.findElement(By.id("day"));
```

Note :- We cannot use id when id is not present or duplicate.

Name

```
driver.findElement(By.name(“name2”)).click();
WebElement fname6 = driver.findElement(By.name("name"));
```

Note :- We cannot use name when name is not present or duplicate

Class Name

```
driver.findElement(By.classname(“abc”)).click();
WebElement fname5 = driver.findElement(By.className("name"));
```

Note :- We cannot use classname when classname is not present or duplicate.

Link Text

```
driver.findElement(By.linkText(“link2”)).click();
WebElement fname7 = driver.findElement(By.linkText(""));
```

Partial link text

driver.findElement(By.partialLinkText("link2")).click();
WebElement fname8 = driver.findElement(By.partialLinkText(""));

Xpath

What is absolute xpath OR relative xpath OR diff between absolute and relative

a) **Absolute xpath**
Navigate from root to child

Navigating from root of parent to immediate child is possible with the use of single forward slash "/"
/html/body/div[3]/div[4]/div/form/div[2]/input
Ex. /html/body/div[3]/div[4]/div/form/div[2]/input
Drawbacks:

- It is too lengthy and time consuming
- Identifying an element by developing html tree diagram is difficult

b) **Relative xpath**
Navigating from any point and to achieve this we need to use double forward slash "//"

i) **xpath by attribute**
//tagname[@attribute name = 'attribute value']
Ex. //input[@id="1234"]. --→ xpath expression
WebElement fname =
driver.findElement(By.xpath("//input[@name='firstname']"));

j) **xpath by text**
//tagname[text() = 'text value']
Ex. //a[text() = "link1"]   => For link
//input[text() = "login"]
WebElement femaleLabel = driver.findElement(By.xpath("//label[text()='Female']"));

k) **xpath by contains**
How to identify dynamic elements???????????????
//tagname[contains(@attribute_name, 'attriute_value')]
Ex. //input[contains(@type,'password']
→ subtext (constant text)

WebElement f1 = driver.findElement(By.xpath("//input[contains(@name,'firstname')]"));

l) **xpath by index**
//Use index in worst case scenario
For multiple matching we use index
(xpath expression)[index]
Ex. (//input[@type="text"])[1] OR [2]

```
        WebElement fname2 =
driver.findElement(By.xpath("(//input[@type='text'])[1]"));
```

CSS

```
#idname
.classname
input[id='fullname']
```

Web elements and its methods

It is an interface used to perform action on element present in browser

Methods of web elements

a) **sendKeys**

It is used to enter value in text field or input field

```
driver.findElement(By.xpath(“ “).sendKeys(“aaa”);
```

b) **click**

It is used to select radio button, checkbox, click the link and click button

```
driver.findElement(By.xpath(“ “).click();
```

c) **getText**

It is used to get text present on web page and its return type is string

```
String text = driver.findElement(By.xpath(“ “)).getText();
                                        OR
webElement ele1 = driver.findElement(By.xpath(“ “));
String text = ele1.getText();
```

When we have to apply multiple actions on same element then identify once and use multiple times.

How we can get the status of element????????????

d) **isDisplayed**

It is used to verify weather element is present or not, if element is present on webpage it return true else return false

e) **IsEnabled**

It used to verify weather element is enabled or disable, if element enable return true else return false

f) **isSelected**

It used to verify weather radio button or checkbox selected or not

Program:

Link :- http://megrecruitment.nic.in/rpa/register.htm

How to automate dropdown/ list box in selenium??????????????

Handling of listbox

Step 1 :- Identify the list box which needs to be handle and store it in reference variable

```
WebElement ele1 = driver.findElement(By.xpath(“//select[@id=”abc” ));
```

Step 2 :- create an object of select class which accept web element argument as input
Select s = new Select(ele1);

Step 3 :- To select the option present in list box we need to call the method like
s.selectByVisibleText("Sri");
s.selectByValue("5678");
s.selectByIndex(2);
Program:
Link :- https://is.rediff.com/signup/register

Get all options present in listbox
Program:

Verify weather listbox is single selectable or multi selectable
Program:
Link :- https://www.w3schools.com/tags/tryit.asp?filename=tryhtml_select_multiple

Get selected option present in listbox

Get first selected option from multi selected listbox
Link :- https://www.w3schools.com/tags/tryit.asp?filename=tryhtml_select_multiple

Deselect the options present in multi selectable list box
s.deselectByIndex(0);
s.deselectByValue(selectedOption);
s.deselectByVisibleText(selectedOption);
s.deselectAll();

//How you can take the screenshot in automation
Screenshot

- We need to typecast driver object (reference variable) to TakesScreenshot interface
- Then call getScreenshotAs() method
- Pass the argument OutputType.FILE
- This will return object of type file
- Store the screenshot in local memory
- Use fileHandler to copy the file, which take two parameter source and dest Or
- Use file.utils.copyfile(src,dest)

- We need to type cast driver object to take screenshot interface

Ex. ((TakesScreenshot)driver)

- Then call method getScreenshotAs() and pass the argument "OutputType.FILE"

This method will return object of type file

- File source = ((TakesScreenshot)driver). getScreenshotAs(OutputType.FILE)

Above statement will take screenshot but image will be available inside local memory

- To store screen shot in local drive, we need to call a method i.e. copy file() which is present inside fileutils class or fileHandler class
- This method will accept two parameter i.e. source and destination
- Ex. file.utils.copyfile(src,new File ("")); OR FileHandler.copy(source, dest);

Program:

Parameterization

Fetching data from external source and using it in selenium test case script is known as parameterization. This can be achieve by using excel sheet, csv file and test NG data provider

Fetching of data from excel sheet

- Configure apache poi jar file in project
- Create excel file with sample data
- Create object of FileInputStream class with excel sheet path as input
- Open excel use static method create() which present in WorkBookFactory class
- Open the excel sheet by getsheet method
- To identify row use getrow() method
- To identify column use getcell() method
- To fetch string information use getStringCellValue() method OR getNumericCellValue() for numeric

What is parametrization?????????????????

How to read excel file? ?????????????????

How you provide the test data in script? ?????????????????

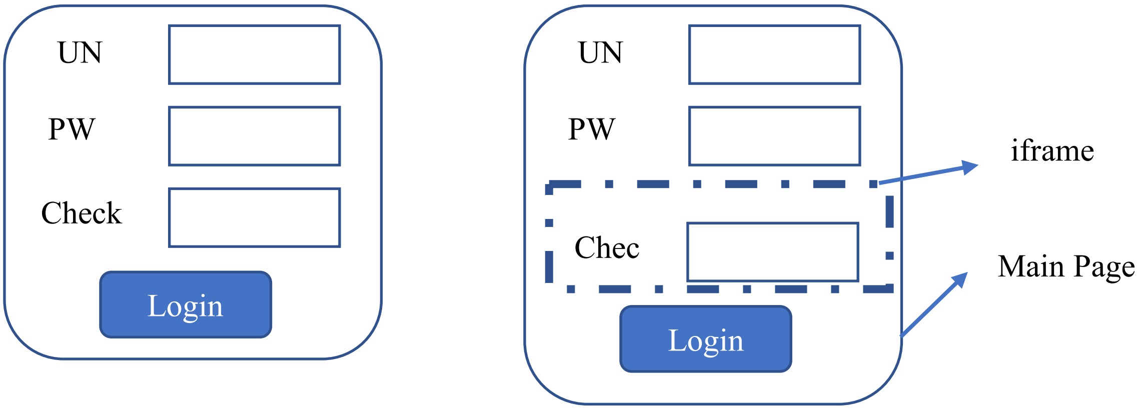
Program:

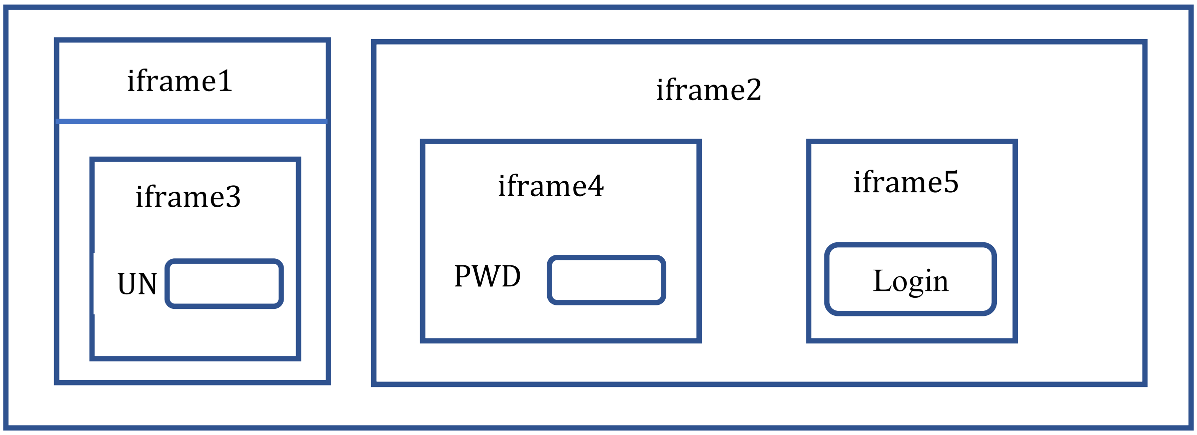
//If everything is write about our script and even xpath is unique but still we are unable to use the element then what can be the possible reason????????

What is the difference between defaultcontent() and parentframe() method?????

iFrame

- Displaying web page as part of another web page is known as iframe
- iframe will be created by using tagname "iframe"





driver.switchTo.frame("   ");

int index OR String id OR String name

driver.switchTo().defaultContent();
driver.switchTo().parentFrame();

Handle iframe using selenium webdriver

- to handle iframe we need to switch selenium focus from main page to frame
- Ex. driver.switchTo().frame("   ");

We can switch to iframe using 4 ways

- Id
- Name
- Index
- webElement

Once action are performed on component present in iframe, selenium will not navigate by default to main page
So to navigate from iframe to main page we need to use method like

- Parentframe()
- Defaultcontent()

If we use driver.switchTo().parentframe() then it will navigate from child frame to immediate parent frame
While driver.switchTo().defaultContent() navigate from any child to main page

Program:
Link :- https://www.w3schools.com/js/tryit.asp?filename=tryjs_myfirst

Popups
Types of popup

1) Hidden Division
2) Alert Division
3) Child Browser
4) Authentication
5) File Upload
6) File Download

Third party tool need to handle like AutoIt or robot class

Popup are small or separate window which will be displayed then we perform action on any component present in web page.
These popup can be handled by selenium directly but sometime we may need to use third part tools to handle that popups

1) **Hidden Division**

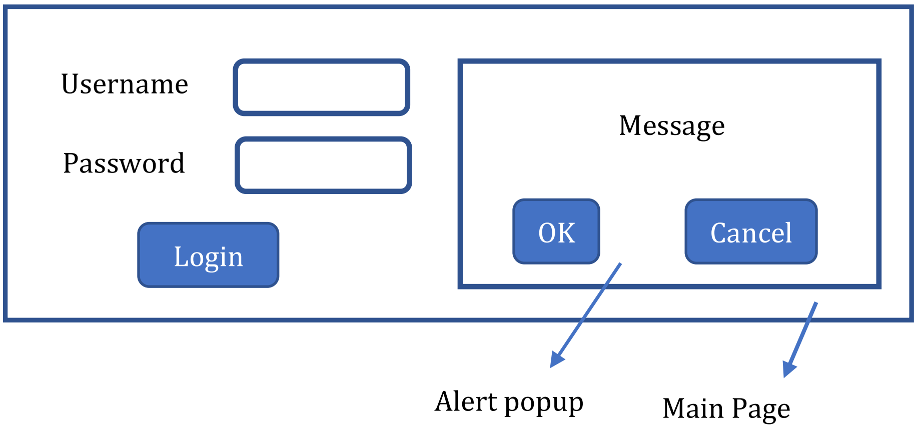
Properties:

- We can inspect element present in popup
- We cannot drag and drop these popup
- These popup are color full

Program:
Link :- https://www.flipkart.com/

2) Alert Popup

- We cannot inspect element present in popup
- We can drag and drop these popup
- It may contain Ok, Cancel, ? symbol, ! symbol or text



Alert alt = driver.switchTo.alert();
alt.accept();   => Ok button
alt.dismiss(); => Cancel button

String text = alt.getText();
System.out.println(text);

To handle alert popup first we need to switch selenium focus from main page to alert popup
Alert is interface

Program:
Link1 :- http://demo.automationtesting.in/Alerts.html
Link2 :- https://demoqa.com/alerts
Link3 :- https://mail.rediff.com/cgi-bin/login.cgi

3) Child Browser

We can inspect, drag and drop, contain add, max, min and close option

```
Set (string) ids = driver.getWindowHandles();
String w1 = ids.get(1);
driver.switchTo().window(w1);
```

getWindowHandles() => Return all window address (main and child)
To handle the child browser popup we need to switch selenium focus from main page to child browser by using following syntax:

```
driver.switchTo.window(String abc);
```

Program:

Link1 :- https://www.aspsnippets.com/demos/1102/
Link1 :- https://skpatro.github.io/demo/links/

Handle multiple elements

- Find total number of links in webpage

Program:

Headless chrome browser

Program:

```
System.setProperty("driver.chrome.driver","chromedriver");
ChromeOptions options = new ChromeOptions();
options.addArguments("headless");
WebDriver driver = new ChromeDriver(options);
```

Where we use headless browser :- Parallel things, Jenkins CICD pipeline

Auto Suggestion

Program:

Handle Webtable

Program:

Actions Class

Handling of customize listbox

Customize listbox

-Handling of DropDown
step1: identify dropdown element

step2: Create an object of Actions class and pass driver as a input
step3: Call Actions class methods--> moveToElement

-Action class methods
1. moveToElement
2. contextClick --> To perform mouse right click action
3. perform -- To execute each statement/action
4. build - To combine multiple actions in a single statement
5. click
6. doubleclick
7. dragAndDrop
8. clickAndHold
9. release
The listbox which created without using select tag name

Program:

Link :- https://www.railyatri.in/train-ticket/create-new-irctc-user

Link :- https://demo.guru99.com/test/simple_context_menu.html

Perform drag and drop action

Program:

Link :- https://www.globalsqa.com/demo-site/draganddrop/

Mouse over

Link :- https://www.americangolf.com/
Link :- https://www.amazon.in/

Exception in Selenium

Which exception you get in your automation career?

1. Not connected

When selenium jar file is unable to interact with browser we will get not connected exception

2. Unhandled alert exception

If we try to perform action on browser without handling alert popup we will get unhandled alert exception

3. Unexpected tagname exception

If we try to handle customize listbox using select class we will get unexpected tagname exception

4. No alert present exception

If we try to perform actions other popup using alert popup, alert popup not present still we try to access

5. Illegal state exception

If we wrongly enter system.setProperty, it happen when we try to enter wrong properties

6. Webdriver exception

When URL is not correct in get function

7. Unreachable browser exception

When we interrupt the browser while running the script, as it support one operation at a time

8. No such element
- When we wrongly used html code to identify an element
- Because of synchronization (due to low speed of internet)
- Element is present but in frame

9. Invalid element state exception

If we try to handle disable element

10. Unsupported operation exception

If we try to deselect option on single selectable list box then we will set

11. Stale element exception

Stale means old or no longer available element. If DOM change the element goes stale when we try to find element on web page
- Element has been deleted entirely
- Element is no longer attached to DOM
- First deleted then created again

Scroll Page
Program:
Link :- https://www.globalsqa.com/demo-site/draganddrop/

File Upload

driver.get("https://cgi-lib.berkeley.edu/ex/fup.html");

Handling multiple browser
Program:

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

String driverused = "firefox1";

if(driverused == "chrome"){
System.setProperty("webdriver.chrome.driver", "chromedriver");
WebDriver driver = new ChromeDriver();
driver.manage().window().maximize();
driver.get("https://www.facebook.com/");
}

else if(driverused == "firefox"){
System.setProperty("webdriver.gecko.driver", "geckodriver");
WebDriver driver = new FirefoxDriver();
}

else{
WebDriver driver = new SafariDriver();
}}}
```

Waits in Selenium : Waits are necessary to capture the web-application reaction.

Waits help user to create the Stable Automation.

Types of Wait in Selenium :

Sleep - java

PageLoadTimeOut

setScriptTimeOut

ImplicitlyWait

ExplicitWait

FluentWait

Sleep : Sleep() is a method present in thread class. It makes java code / selenium code to sleep for the specified time. Sleep() method will not worry about whether the element is present or not, it just sleeps till mentioned time. Sleep() is also called as static wait or blind wait, dead wait.

Timeout Interface in Selenium : Timeout is Interface in WebDriver Interface, which manage all waits of WebDriver Instances.

Timeouts interface has three abstract methods:

implicitlyWait

setScriptTimeout

pageLoadTimeout

There is no implementation present for these methods in Timeouts interface, the browser classes(FirefoxDriver, ChromeDriver..) provides the implementations for these methods because browser classes implements WebDriver Interface.

PageLoadTimeOut() : Page load timeout in selenium requests/set the time limit for a page to load. If page is not loaded within the given time frame selenium throws TimeOutException exception . Page load timeout is useful when we perform performance test. Setting Negative time limit makes the selenium to wait for the page load infinitely.

Program:

```
driver.manage().timeouts().pageLoadTimeout(15, TimeUnit.SECONDS);
driver.get("https://edition.cnn.com/");
```

setScriptTimeOut() : setScriptTimeout sets the time limit for asynchronous script to finish execution. If process is not Completed within the given time frame selenium throws TimeOutException exception. The setScriptTimeout method affects only JavaScript code.

The default timeout for setScriptTimeout method is 0 (zero), if we don't set any time our executeAsyncScript method may fail because the javascript code may take more than zero seconds. So to avoid unnecessary failures we have to set the setScriptTimeout.

Code:-

```
driver.manage().timeouts().setScriptTimeout(11, TimeUnit.SECONDS);
```

ImplicitlyWait

The Implicit Wait in Selenium is used to tell the web driver to wait for a certain amount of time before it throws a "No Such Element Exception". The default setting is 0. Once we set the time, the web driver will wait for the element for that time before throwing an exception.

Implicit waits are used to provide a default waiting time (say 30 seconds) between each consecutive test step/command across the entire test script. Thus, the subsequent test step would only execute when the 30 seconds have elapsed after executing the previous test step/command.

Implicit wait will accept 2 parameters, the first parameter will accept the time as an integer value and the second parameter will accept the time measurement in terms of SECONDS, MINUTES, MILISECOND, MICROSECONDS, NANOSECONDS, DAYS, HOURS, etc.

Program. 10 sec = 2 sec

```
driver.get("https://www.google.com/");
driver.manage().timeouts().implicitlyWait(5, TimeUnit.SECONDS);
```

Explicit wait in Selenium : The explicit wait is used to tell the Web Driver to wait for certain conditions (Expected Conditions) or the maximum time exceeded before throwing an "ElementNotVisibleException" exception.

Explicit wait will be applicable for only one line (one condition), we have to use it with **ExpectedConditions** class.

WebDriverWait by default calls the Expected Condition every 500 milliseconds until it returns successfully.
Expected Condition will not impact findelement() and findelements() in Selenium.

Expected Conditions present in Explicit Wait :
alertIsPresent()
elementSelectionStateToBe(locator, selected)
elementToBeClickable(locator)
elementToBeSelected(locator)
frameToBeAvailableAndSwitchToIt(locator)
presenceOfElementLocated(locator)
textToBePresentInElement(locator, text) title()
titleIs(title)

Explicit Wait

```
            driver.get("https://chercher.tech/practice/explicit-wait");

            WebDriverWait w = new WebDriverWait(driver, 30);
            w.until(ExpectedConditions.alertIsPresent());
            driver.switchTo().alert().accept();
```

```
WebDriverWait w = new WebDriverWait(driver, 30);
w.until(ExpectedConditions.textToBePresentInElement(targetText, "Selenium Webdriver"));

WebDriverWait w = new WebDriverWait(driver, 30);
w.until(ExpectedConditions.visibilityOfAllElements(hiddenBtn));

WebDriverWait w = new WebDriverWait(driver, 30);
w.until(ExpectedConditions.elementToBeClickable(disableBtn)); }

WebDriverWait w = new WebDriverWait(driver, 30);
w.until(ExpectedConditions.elementToBeSelected(checkBox));
```

Fluent Wait.

The Fluent Wait in Selenium is used to define maximum time for the web driver to wait for a condition, as well as the frequency with which we want to check the condition before throwing an "ElementNotVisibleException" exception. It checks for the web element at regular intervals until the object is found or timeout happens.

Frequency: Setting up a repeat cycle with the time frame to verify/check the condition at the regular interval of time

Let's consider a scenario where an element is loaded at different intervals of time. The element might load within 10 seconds, 20 seconds or even more then that if we declare an explicit wait of 20 seconds. It will wait till the specified time before throwing an exception. In such scenarios, the fluent wait is the ideal wait to use as this will try to find the element at different frequency until it finds it or the final timer runs out.

Syntax:

```
Wait wait = new FluentWait(WebDriver reference)
.withTimeout(Duration.ofSeconds(SECONDS)).  30
.pollingEvery(Duration.ofSeconds(SECONDS)).  5
.ignoring(Exception.class);
```

Example

```
Wait<WebDriver> wait = new FluentWait<WebDriver>(driver)
        .withTimeout(30, TimeUnit.SECONDS)
        .pollingEvery(5, TimeUnit.SECONDS)
        .ignoring(NoSuchElementException.class);
```

In the above example, we are declaring a fluent wait with the timeout of 30 seconds and the frequency is set to 5 seconds by ignoring "NoSuchElementException"