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SIX WEEKS SUMMER TRAINING REPORT

on

OBJECT ORIENTED PROGRAMMING IN JAVA

Submitted by

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Programme Name : Btech. CSE (3rd Year)

Under the Guidance of

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DECLARATION

I hereby declare that I have completed my Six weeks summer training at upGrad platform from may 28,2021 to july 15,2021 under the guidance of MR. Chetan. I declare that I have worked full dedication during there 6 weeks of training and my learning outcomes fulfill the requirements of training for the award of degree of B.tech. CSE , Lovely Proffesional University, Phagwara.

Date – 27 Sept. 2021

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ACKNOWLEDGEMENT

I would like to express my gratitude towards my University as well as upGrad for providing me the golden opportunity to do this wonderful summer training regarding Oops in java, which also helped me in doing a lot of homework and learning. As a result, I came to know about so many new things. So, I am really thank full to them.

Moreover I would like to thank my friends who helped me a lot whenever I got stuck in some problem related to my course. I am really thankful to have such a good support of them as they always have my back whenever I need.

I have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them.

Deepest thanks to our Trainer **Mr. Chetan(Senior Trainer)** for his guidance, monitoring, constant encouragement and correcting various assignments of ours with attention and care. He has taken pain to go through the project and training sessions and make necessary corrections as when needed and we are very grateful for that.

Summer Training Certificate By upGrad



S. No.	Title	Page No.
1	Introduction	06
2	Technology Learnt	07 - 23
3	Reason for choosing Oopsin java	24
4	Conclusion	25
5	Bibliography	25

INTRODUCTION

Java is one of the programming language or technology used for developing web applications. Java language developed at SUN Micro Systems in the year 1995 under the guidance of James.

Gosling and there team. Originally SUN Micro Systems is one of the Academic university (Standford University Network).

Whatever the software developed in the year 1990, SUN Micro Systems has released on the name of oak, which is original name of java (scientifically oak is one of the tree name). The OAK has taken 18 months to develop. The oak is unable to fulfill all requirements of the industry. So James Gosling again reviews this oak and released with the name of java in the year 1995. Scientifically java is one of the coffee seed name.

Java divided into three categories, they are

- J2SE (Java 2 Standard Edition)
- J2EE (Java 2 Enterprise Edition)
- J2ME (Java 2 Micro or Mobile Edition)

J2SE

J2EE

J2EE is used for developing server side applications.

J2ME

J2ME is used for developing mobile or wireless application by making use of a predefined protocol called WAP (wireless Access / Application protocol).

TECHNOLOGY LEARNT

It had 24 units which was further divided into chapters and then topics so during my whole 6 week course I learned the following :

INTRODUCTION TO JAVA

Overview Of Java

Java is a platform independent, more powerful, secure, high performance, multithreaded programming language. Here we discuss some points related to java.

Define JRE

The **Java Runtime Environment (JRE)** is part of the Java Development Kit (JDK). It contains set of libraries and tools for developing java application. The Java Runtime Environment provides the minimum requirements for executing a Java application.

Define JVM

JVM is set of programs developed by sun Micro System and supplied as a part of jdk for reading line by line of byte code and it converts into native understanding form of operating system. Java language is one of the compiled and interpreted programming language.

Garbage Collector

Garbage Collector is the system Java program which runs in the background along with regular Java program to collect un-Referenced (unused) memory space for improving the performance of our applications.

Define an API

An **API (Application Programming Interface)** is a collection of packages, a package is the collection of classes, interfaces and sub-packages. A sub-package is a collection of classes

interfaces and sub sub packages etc.

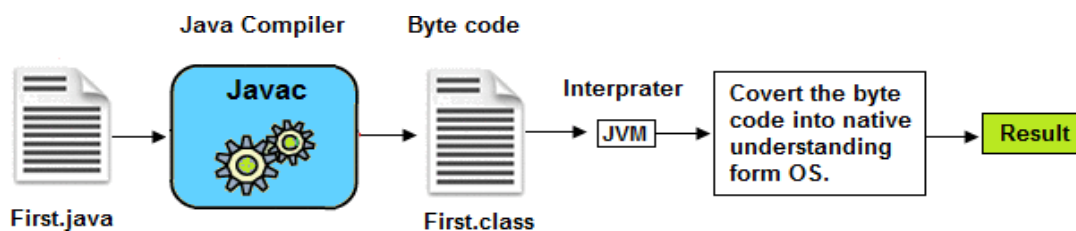
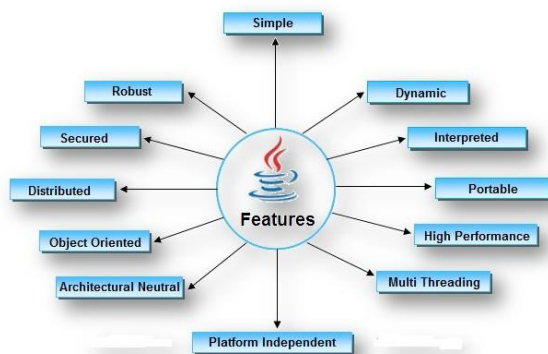
Java programming is containing user friendly syntax so that we can develop effective applications. In other words if any language is providing user friendly syntax, we can develop error free applications.

Definition of JIT

JIT is the set of programs developed by SUN Micro System and added as a part of JVM, to speed up the interpretation phase

Features Of JAVA

Features of a language are nothing but the set of services or facilities provided by the language vendors to the industry programmers. Some important features are I learnt about graphical and mathematical explanation of theta notation. Theta notation encloses the function from above and below. Hence it is used for analysing the average complexity of an algorithm.



Java Classpath Setting

Path Variable

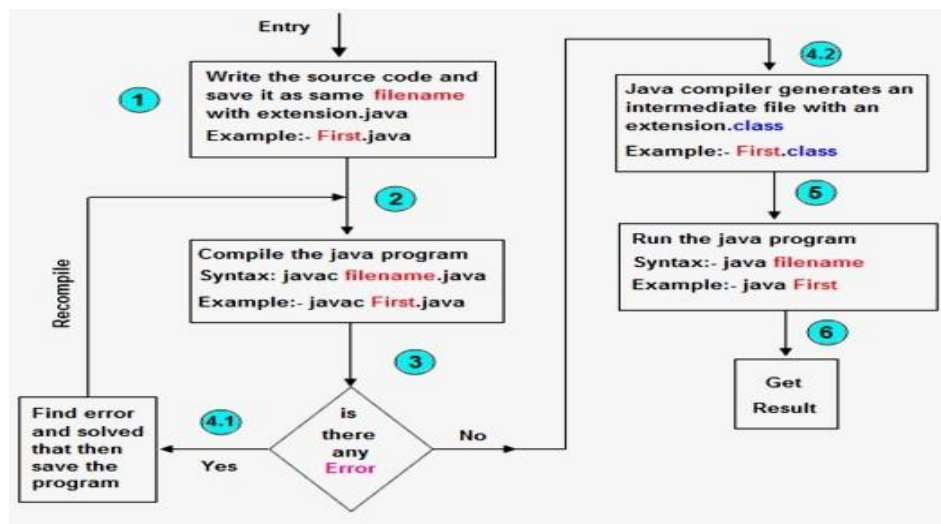
Path variable is set for providing path for all java tools like java, javac, javap, javah, jar, appletviewer which are use in java programming. These all tools are available in **bin** folders so we set path upto bin folders.

Classpath Variable

Classpath variable is set for providing path for predefined java classes which is used in our application. All classes are available in **lib/rt.jar** so we set classpath upto lib/rt.jar.

Steps For Compiling And Executing Programs

The following sequence of steps represented in the diagram use compiling the java program and executing the java programs.



Difference Between JDK,JRE AND JVM

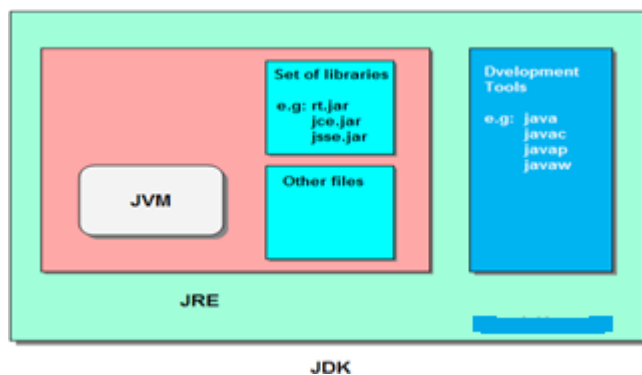
Jvm, Jre, Jdk these all the backbone of java language. Each components have separate works.

Jdk and Jre physically exists but Jvm are abstract machine it means it not physically exists.

JVM : JVM (Java Virtual Machine) is a software. It is a specification that provides runtime environment in which java bytecode can be executed. It not physically exists. JVMs are not same for all hardware and software, for example for window os JVM is different and for Linux VJM is different. JVM, JRE and JDK are platform dependent because configuration of each OS differs. But, Java is platform independent.

JRE : The Java Runtime Environment (JRE) is part of the Java Development Kit (JDK). It contains set of libraries and tools for developing java application. The Java Runtime Environment provides the minimum requirements for executing a Java application. It physically exists. It contains set of libraries + other files that JVM uses at runtime.

JDK : The Java Development Kit (JDK) is primary components. It physically exists. It is collection of programming tools and JRE, JVM.



Object And Class

Object is the physical as well as logical entity where as class is the only logical entity. **Class:** Class is a blue print which is containing only list of variables and method and no memory is allocated for them. A class is a group of objects that has common properties.

A class in java contains:

- Data Member
- Method
- Constructor
- Block
- Class and Interface

Object: Object is a instance of class, object has state and behaviors. An Object in java has three characteristics:

- State
- Behavior
- Identity

State: Represents data (value) of an object.

Behavior: Represents the behavior (functionality) of an object such as deposit, withdraw etc.

Identity: Object identity is typically implemented via a unique ID. The value of the ID is not visible to the external user. But, it is used internally by the JVM to identify each object uniquely.

Class is also can be used to achieve user defined data types.

Data Types

Datatype is a spacial keyword used to allocate sufficient memory space for the data, in other words Data type is used for representing the data in main memory (RAM) of the computer.

In general every programming language is containing three categories of data types. They are

- Fundamental or primitive data types
- Derived data types
- User defined data types.

Data Type	Default Value	Default size
boolean	false	1 bit
char	'\u0000'	2 byte
byte	0	1 byte
short	0	2 byte
int	0	4 byte
long	0L	8 byte
float	0.0f	4 byte

double	0.0d	8byte
--------	------	-------

Variable

Variable is an identifier which holds data or another one variable is an identifier whose value can be changed at the execution time of program. Variable is an identifier which can be used to identify input data in a program.

Operators And Its Types

Operator is a special symbol that tells the compiler to perform specific mathematical or logical Operation. Java supports following lists of operators.

- Arithmetic Operators
- Relational Operators
- Logical Operators
- Bitwise Operators
- Assignment Operators
- Ternary or Conditional Operators

PROGRAMMING CONCEPTS

Structure Of Java Program

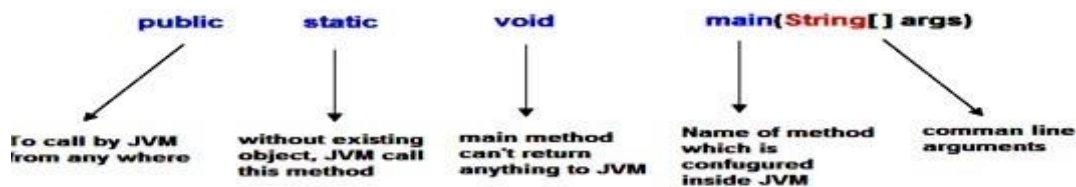
Structure of a java program is the standard format released by Language developer to the Industry programmer. Sun Micro System has prescribed the following structure for the java programmers for developing java application.

package details	→	import java.io.*
class className	→	class Sum
{		
Data members;	→	int a, b, c;
user_defined method;	→	void display();
public static void main(String args[])		
{		
Block of Statements;	→	System.out.println("Hello Java !");
}		
}		

- A **package** is a collection of classes, interfaces and sub-packages. A sub package contains collection of classes, interfaces and sub-sub packages etc. `java.lang.*`; package is imported by default and this package is known as default package.
- **Class** is keyword used for developing user defined data type and every java program must start with a concept of class.

Main() Method

main() method is starting execution block of a java program or any java program start their execution from main method. If any class contain **main()** method known as main class.



Decision Making Statement

Decision making statement statements is also called selection statement. That is depending on the condition block need to be executed or not which is decided by condition. If the condition is "true" statement block will be executed, if condition is "false" then statement block will not be executed. In java there are three types of decision making statement.

- if
- if-else
- switch

Looping Statement

for loop

While loop

Do-While

Wrapper Classes

For each and every fundamental data type there exist a pre-defined class, Such predefined class is known as wrapper class. The purpose of wrapper class is to convert numeric string data into numerical or fundamental data.

Access modifiers:

Access modifiers are those which are applied before data members or methods of a class. These are used to where to access and where not to access the data members or methods. In java programming we have four access modifiers they are

Modifiers	Within Same Class	Within other class of Same package	Within derived class of other package	Within external Class of other package
Private (Class level A.S)	Yes	No	No	No
Default (Package level A.S)	Yes	Yes	No	No
Protected (Derived level A.S)	Yes	Yes	Yes	No
Public (Universal A.S)	Yes	Yes	Yes	Yes

JAVA USEFUL KEYWORDS

Final keyword

In java language final keyword can be used in following way.

- Final at variable level
- Final at method level
- Final at class level

Static keyword

The **static keyword** is used in java mainly for memory management. Static keyword are used with variables, methods, blocks and nested class. Static is a keyword that are used for share the same variable or method of a given class. This is used for a constant variable or a method that is the same for every instance of a class. The main method of a class is generally labeled static.

In java language static keyword can be used for following

1. variable (also known as class variable)
2. method (also known as class method)
3. block
4. nested class

This keyword

this is a reference variable that refers to the current object. It is a keyword in java language represents current class object

"**this**" keyword can be use in two ways.

- this . (this dot)
- this() (this off)

Super keyword

Super keyword in java is a reference variable that is used to refer parent class object. **Super** is an implicit keyword create by JVM and supply each and every java program for performing important role in three places.

- At variable level
- At method level
- At constructor level

Synchronized Keyword

Synchronized Keyword is used for when we want to allow only one thread at a time then use Synchronized modifier. If a method or block declared as a Synchronized then at a time only one thread is allowed to operate on the given object.

JAVA CLASSES, BLOCKS AND CONSTRUCTORS

Abstract Classes

We know that every java program must start with a concept of class that is without classes concept there is no java program perfect. In java programming we have two types of classes they are

1. Concrete class
2. Abstract class

Constructor And Its Types

A **constructor** is a special member method which will be called implicitly (automatically) by the JVM whenever an object is created for placing user or programmer defined values in place of default values. In a single word constructor is a special member method which will be called automatically whenever object is created.

The purpose of constructor is to initialize an object called object initialization. Constructors are mainly create for initializing the object. Initialization is a process of assigning user defined values at the time of allocation of memory space.

Types of constructors

Based on creating objects in Java constructor are classified in two types. They are

- Default or no argument Constructor
- Parameterized constructor.

Static Block in Java

Static block is a set of statements, which will be executed by the JVM before execution of main method. At the time of class loading if we want to perform any activity we have to define that activity inside static block because static block execute at the time of class loading.

In a class we can take any number of static block but all these static block will be execute from top to bottom.

Relationship in Java

Type of relationship always makes to understand how to reuse the feature from one class to another class. In java programming we have two types of relationship they are.

- Is-A Relationship
- Has-A Relationship

JAVA OBJECT ORIENTED

Inheritance

The process of obtaining the data members and methods from one class to another class is known as **inheritance**. It is one of the fundamental features of object-oriented programming. A class that is declared with abstract keyword, is known as **abstract class**. An abstract class is one which is containing some defined method and some undefined method. In java programming undefined methods are known as un-Implemented or abstract method. The process of obtaining the data members and methods from one class to another class is known as **inheritance**. It is one of the fundamental features of object-oriented programming.

Types of Inheritance

- Single inheritance
- Multiple inheritance

Hierarchical inheritance

- Multilevel inheritance
- Hybrid inheritance

Why use Inheritance ?

- For Method Overriding (used for Runtime Polymorphism).
- It's main uses are to enable polymorphism and to be able to reuse code for different classes by putting it in a common super class
- For code Re-usability

Method Overloading

Whenever same method name is existing multiple times in the same class with different number of parameter or different order of parameters or different types of parameters is known as **method overloading**.

Why method Overloading ?

Suppose we have to perform addition of given number but there can be any number of arguments, if we write method such as `a(int, int)` for two arguments, `b(int, int, int)` for three arguments then it is very difficult for you and other programmer to understand purpose or behaviors of method they can not identify purpose of method. So we use method overloading to easily figure out the program. For example above two methods we can write `sum(int, int)` and `sum(int, int, int)` using method overloading concept.

Different ways to overload the method

There are two ways to overload the method in java

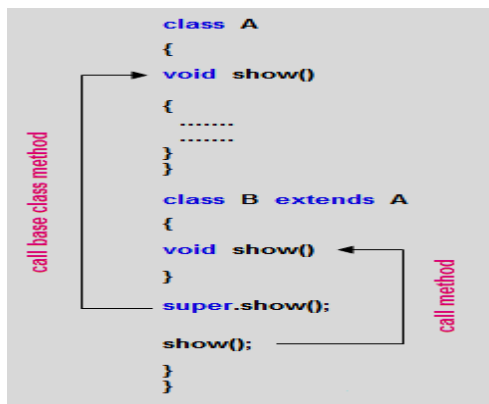
- By changing number of arguments or parameters
- By changing the data type
- By changing the order of arguments.

Method Overriding

Whenever same method name is existing in both base class and derived class with same types of parameters or same order of parameters is known as **method Overriding**.

Advantage of Java Method Overriding

- Method Overriding is used to provide specific implementation of a method that is already provided by its super class.
- Method Overriding is used for Runtime Polymorphism



Interface

Interface is similar to class which is collection of public static final variables (constants) and abstract methods. The interface is a mechanism to achieve fully abstraction in java. There can be only abstract methods in the interface. It is used to achieve fully abstraction and multiple inheritance in Java.

Why we use Interface ?

- It is used to achieve fully abstraction.
- By using Interface, you can achieve multiple inheritance in java.

When we use abstract and when Interface

If we do not know about any things about implementation just we have requirement specification then we should be go for **Interface**

If we are talking about implementation but not completely (partially implemented) then we should be go for **abstract**

Abstraction

Abstraction is the concept of exposing only the required essential characteristics and behavior with respect to a context.

Hiding of data is known as **data abstraction**. In object oriented programming language this is implemented automatically while writing the code in the form of class and object.

Real life example of Abstraction

Abstraction shows only important things to the user and hides the internal details for example when we ride a bike, we only know about how to ride bike but can not know about how it work ? and also we do not know internal functionality of bike.

Encapsulation

Encapsulation is a process of wrapping of data and methods in a single unit is called encapsulation. Encapsulation is achieved in java language by class concept. Combining of state and behavior in a single container is known as encapsulation. In java language encapsulation can be achieve using **class** keyword, state represents declaration of variables on attributes and behavior represents operations in terms of method.

Benefits of encapsulation

- Provides abstraction between an object and its clients.
- Protects an object from unwanted access by clients.
- Example: A bank application forbids (restrict) a client to change an Account's balance

Polymorphism

The process of representing one form in multiple forms is known as **Polymorphism**. Here original form or original method always resides in base class and multiple forms represents overridden method which resides in derived classes.

Polymorphism is not a programming concept but it is one of the principal of OOPs. For many objects oriented programming language polymorphism principle is common but whose implementations are varying from one objects oriented programming language to another object oriented programming language.

Polymorphism principal is divided into two sub principal they are:

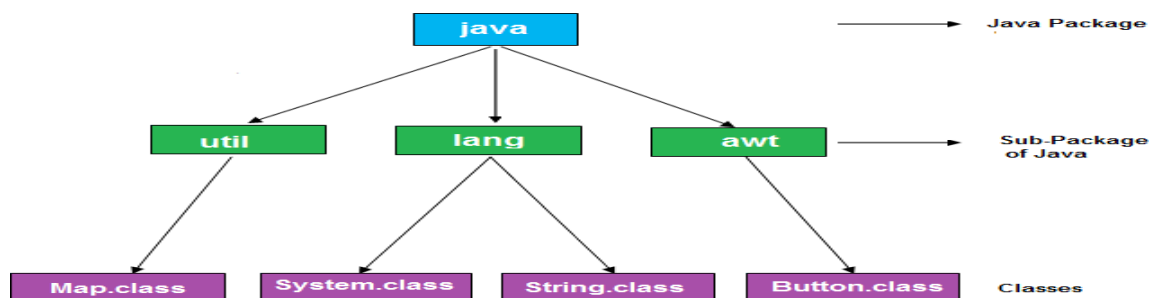
- Static or Compile time polymorphism
- Dynamic or Runtime polymorphism

JAVA ADVANCED

Package

A package is a collection of similar types of classes, interfaces and sub-packages. **Purpose of package**

The purpose of package concept is to provide common classes and interfaces for any program separately. In other words if we want to develop any class or interface which is common for most of the java programs than such common classes and interfaces must be place in a package.



Exception Handling

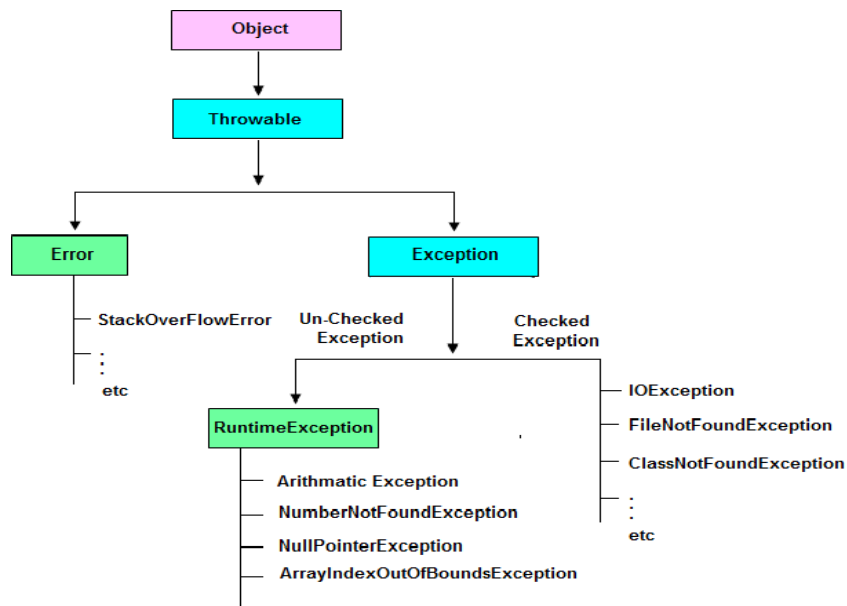
The process of converting system error messages into user friendly error message is known as **Exception handling**. This is one of the powerful feature of Java to handle run time error and maintain normal flow of java application.

An **Exception** is an event, which occurs during the execution of a program, that disrupts the normal flow of the program's Instructions.

Type of Exception

- Checked Exception
- Un-Checked Exception

Hierarchy of Exception classes



Multithreading

Multithreading in java is a process of executing multiple threads simultaneously. The aim of multithreading is to achieve the concurrent execution.

Thread

Thread is a lightweight components and it is a flow of control. In other words a flow of control is known as thread. State of a thread are classified into five types they are

1. New State
2. Ready State
3. Running State
4. Waiting State
5. Halted or dead State

String

String is a sequence of characters enclosed within double quotes (" ") is known as **String**.

Example: "Java Programming".

In java programming to store the character data we have a fundamental datatype called **char**.

Similarly to store the string data and to perform various operation on String data, we have three predefined classes they are:

- String
- StringBuffer
- StringBuilder

Collection

Collections in java is a framework that provides an architecture to store and manipulate the group of objects. All the operations that you perform on a data such as searching, sorting, insertion, manipulation, deletion etc. can be performed by Java Collections. Java Collection simply means a single unit of objects. Java Collection framework provides many interfaces (Set, List, Queue, Deque etc.) and classes (ArrayList, Vector, LinkedList, PriorityQueue, HashSet, LinkedHashSet, TreeSet etc.).

REASON FOR CHOOSING JAVA

All of the above was part of my training during my summer break I specially choose the JAVA by upGrad for reasons stated below :

- One of the reason was the upGrad platform which is offering the course because upGrad is one of the best platform for Computer Science Students.
- It's a good precursor to learning other programming languages.
- One need to learn how to make algorithm of a real life problem he/she is facing.
- It had video lectures of all the topics from which one can easily learn. I prefer learning from video rather than books and notes.
- It had 250+ java problems with video explaine solutions.
- It had track based learning and weekly assesment to test my skills.
- It was a great opportunity for me to invest my time in learning instead of wasting it here and there during my summer break in this Covid-19 panademic.
- It contained a lot of knowledge for such a resonable price.
- This was a life time accessable course which I can use to learn even after my training whenever I want to revise.

CONCLUSION

Practical knowledge means the visualization of the knowledge, which we read in our books. For this, we perform experiments and get observations. Practical knowledge is very important in every field. One must be familiar with the problems related to that field so that he may solve them and become a successful person.

After achieving the proper goal in life, an engineer has to enter in professional life. According to this life, he has to serve an industry, may be public or private sector or self-own. For the efficient work in the field, he must be well aware of the practical knowledge as well as theoretical knowledge.

Due to all above reasons and to bridge the gap between theory and practical, our Engineering curriculum provides a practical training of 45 days. During this period a student work in the industry and get well all type of experience and knowledge about the working of companies and hardware and software tools.

I have undergone my 45 days summer training in 5th sem at **upGrad**. This report is based on the knowledge, which I acquired during my 45 days of summer training.

BIBLIOGRAPHY

- upGrad website
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