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Ans 1 1) Evolution of Java

Java started out as a research project. Research started in 1991 as the Green project as Sun Microsystems. Research give new language OAK, but this name is already specified by the OAK company so name was changed to Java. It was developed as an embedded programming language, which would enable embedded system application, Java is available as jdk and it is an opensource software.

Ans 1 2) Final Keyword: It is used to restrict the user. It can be applied

with the variables, a final variable that have no value it is called blank final variable. It can be initialized in the constructor only. The blank ~~final~~ final variable can be static also which will be initialized in the static block only.

~~Ex: final int x;~~

If we make any variable as final, we can't change the value of final variable.

If we make any method as final, you can't override it.

If we make any class as final, we can't extend it.

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Ans 1 3) JVM, JDK and JRE

JVM : Java virtual machine, interprets the byte code into the machine code depending upon the underlying OS and hardware combination. JVM is platform dependent.

JDK : Java development kit, contains one or more JRE's along with the various development tools, debuggers, development libraries, etc.

JRE : Java Runtime environment, which implements JVM, and provides all class libraries and other facilities necessary to execute Java programming.

Ans 1 4) JAR format

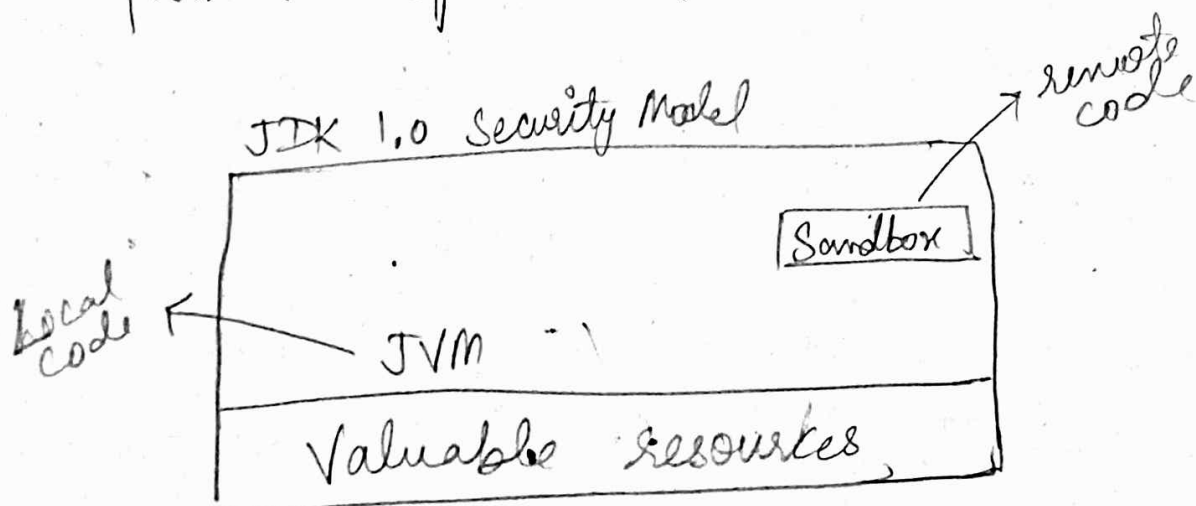
JAR stands for Java Archive. It is a file format based on the popular ZIP file format and is used for aggregating many files into one.

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Ans 15) Sandbox Model

Sandbox is set of rules that are used when creating an applet that prevents certain functions when the applet is sent as part of a web page. This helps to establish a base set of security guarantees.

Sandbox model is the original security model provided by the Java platform, which existed in order to provide a very restricted environment in which to run untrusted code obtained from the open network.



Ans 2 Operators in Java

Operators are symbol that is used to perform operations.

There are various operators used in java:

a) Arithmetic Operators: These are used to perform addition, multiplication, subtraction and division. They are used to perform basic mathematical operations.

Arithmetic operators are

'+' : Addition operator

'-' : Subtraction or minus operator

'*' : Multiplication operator

'/' : Division operator

'%' : Modulo operator. It helps to find the remainder.

Code:

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

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```
int a = 15;
```

```
int b = 05;
```

```
System.out.println(a+b);
```

```
System.out.println(a*b);
```

```
System.out.println(a-b);
```

```
System.out.println(a%b);
```

```
System.out.println(a/b);
```

```
}  
}
```

Output:

20
75
10
0
3

b) Unary Operator: It is performed on the one operand/variable only. There are different unary operators such as increment or decrement operator, negation operator etc.

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Example:

- '++' : Increment operator
- '--' : Decrement operator
- '~' : Negation operator
- '!' : Boolean operator

Code:

```
public class Main {  
    public static void main(String args[]) {  
        int a = 5;  
        System.out.println(a++);  
        System.out.println(++a);  
        System.out.println(--a);  
        System.out.println(a--);  
        System.out.println(~a);  
    }  
}
```

Output:

5
7
6
6
-6

c) Left Shift Operator : It is used to shift all of the bits in a value to the left side of a specified number of time. Symbol is "<<".

Code :

```
public class Main {  
    public static void main (String args[]) {  
        System int a = 10;  
        System.out.println(a << 3);  
        System.out.println(a << 2);  
    }  
}
```

Output:
80
40

d) Right Shift Operator : It is used to shift all the bits in a value to the right side of a specified number of time. Symbol of right shift operator is ">>".

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Code: public class Main2
public static void main (String args[]) {

```
    int a = 20;  
    System.out.println(a >> 3);  
    System.out.println(a >> 2);  
}
```

Output: 2
5

e) AND operator : It doesn't check the second condition if the first condition is false. It checks the second condition only if the first one is true. It is denoted with the symbol "&&".

Code: public class Main2
public static void main (String args[]) {

```
int a = 15 ;  
int b = 10 ;  
int c = 20 ;  
System.out.println(a < b & a < c);  
System.out.println(a > b & a < c);  
}
```

Output : False
True

f) Bitwise and operator : It checks both condition whether first condition is true or false. Symbol used is "&".

Code !

```
public class Main {  
    public static void main (String args[]) {  
        int a = 15 ;  
        int b = 10 ;  
        int c = 20 ;  
        System.out.println(a < b & a < c);  
    }  
}
```

Output : False .

- g) OR operator: It doesn't check the second condition if the first condition is true. It checks the second condition iff the first condition is false. Symbol is "||".
- h) Bitwise OR operator: It always checks both condition whether first condition is true or false.
- i) Ternary Operator: It is used as one line replacement for if-else statement and used a lot in java programming. It is the only conditional operator which takes three operands.

Code:

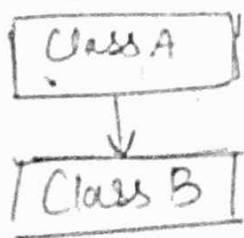
```
public class Main {  
    public static void main(String args[]) {  
        int a = 5;  
        int b = 10;  
        int c = (a < b) ? a : b;  
        System.out.println(c);  
    }  
}
```

Output: 5

Ques 3 Inheritance in Java

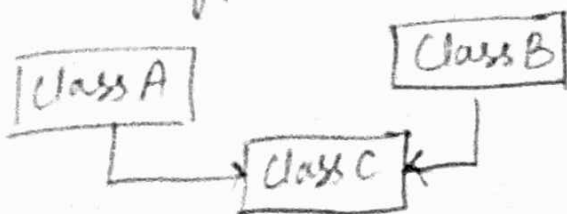
Inheritance: It is a mechanism in which one class acquires the property of another class. Example: Child class inherits the property of parent class. We can use methods and fields of the existing class using inheritance. There are various types of inheritance in java such as:

- i) Single Inheritance: In this, one class extends another class.



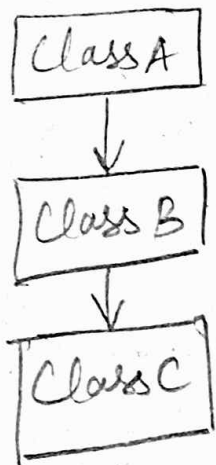
In this example, class B extends only class A. "A" class is a super class and class B is sub-class.

- ii) Multiple Inheritance: It is one of the inheritance in java types where one class extending more than one class. Java does not support multiple inheritance.



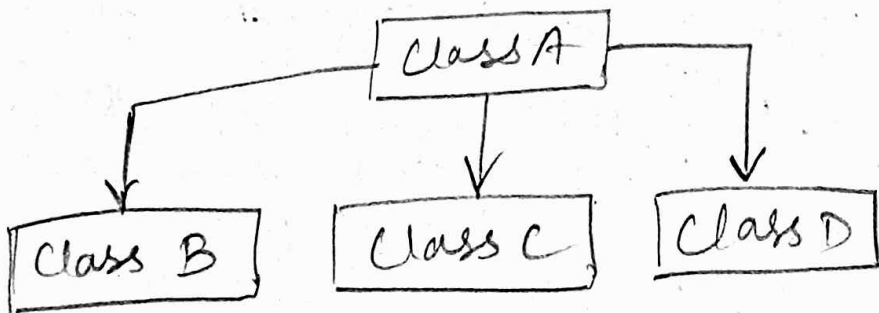
Class C extends class A & class B both.

iii) Multilevel Inheritance: In this, one class can inherit from a derived class. Hence, the derived class becomes the base class for new class.



In this, class C is subclass of B and B is a subclass of A. So, class C is new class therefore it can also inherit from derived class i.e., class B. Hence class B is base class for class C.

iv) Hierarchical Inheritance: In this one class is inherited by many sub classes.



In this; class B, class C and class D inherits from class A.

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In java the keyword "extends" is used by the subclass to inherit the features of superclass.

Java Inheritance Syntax :

```
class subclass extends  
    superclass  
{  
    // methods  
}
```

Example : Suppose programmer is the subclass and employee is superclass. The relationship between two classes is programmer is a employee. This means programmer is a type of employee.

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Code :

```
class Employee {  
    float salary = 40000;  
}  
class Programmer extends Employee {  
    int bonus = 10000;  
    public static void main (String args[]) {  
        Programmer p = new Programmer();  
        System.out.println("Programmer salary:"  
                             + p.salary);  
    }  
}
```

Output :

Programmer salary : 40000.0