32. How to not allow serialization of attributes of a class in Java?

Serialization in Java is a mechanism of *writing the state of an object into a byte-stream*. It is mainly used in Hibernate, RMI, JPA, EJB and JMS technologies.

The reverse operation of serialization is called *deserialization* where byte-stream is converted into an object. The serialization and deserialization process is platform-independent, it means you can serialize an object on one platform and deserialize it on a different platform.

- In order to achieve this, the attribute can be declared along with the usage of `transient` keyword as shown below:

```
public class MasaiSchoolExample {

    private transient String someInfo;
    private String name;
    private int id;
    // :
    // Getters setters
    // :
}
```

- In the above example, all the fields except `someInfo` can be serialized.

33. What happens if the static modifier is not included in the main method signature in Java?

There wouldn't be any compilation error. But then the program is run, since the JVM cant map the main method signature, the code throws “NoSuchMethodError” error at the runtime.

34. What happens if there are multiple main methods inside one class in Java?

The program can't compile as the compiler says that the method has been already defined inside the class.

35. What do you understand by Object Cloning and how do you achieve it in Java?

```
class Student18 implements Cloneable{
int rollno;
String name;

Student18(int rollno,String name){
this.rollno=rollno;
this.name=name;
}

public Object clone() throws CloneNotSupportedException{
return super.clone();
}

public static void main(String args[]){
try{
Student18 s1=new Student18(101,"amit");

Student18 s2=(Student18)s1.clone();

System.out.println(s1.rollno+" "+s1.name);
System.out.println(s2.rollno+" "+s2.name);

}catch(CloneNotSupportedException c){}

}
}
```

Advantage of Object cloning

Although Object.clone() has some design issues but it is still a popular and easy way of copying objects. Following is a list of advantages of using clone() method:

- You don't need to write lengthy and repetitive codes. Just use an abstract class with a 4- or 5-line long clone() method.
- It is the easiest and most efficient way for copying objects, especially if we are applying it to an already developed or an old project. Just define a parent

class, implement Cloneable in it, provide the definition of the clone() method and the task will be done.

- Clone() is the fastest way to copy array.

Disadvantage of Object cloning

Following is a list of some disadvantages of clone() method:

- To use the Object.clone() method, we have to change a lot of syntaxes to our code, like implementing a Cloneable interface, defining the clone() method and handling CloneNotSupportedException, and finally, calling Object.clone() etc.
- We have to implement cloneable interface while it doesn't have any methods in it. We just have to use it to tell the JVM that we can perform clone() on our object.
- Object.clone() is protected, so we have to provide our own clone() and indirectly call Object.clone() from it.
- Object.clone() doesn't invoke any constructor so we don't have any control over object construction.
- If you want to write a clone method in a child class then all of its superclasses should define the clone() method in them or inherit it from another parent class. Otherwise, the super.clone() chain will fail.
- Object.clone() supports only shallow copying but we will need to override it if we need deep cloning.

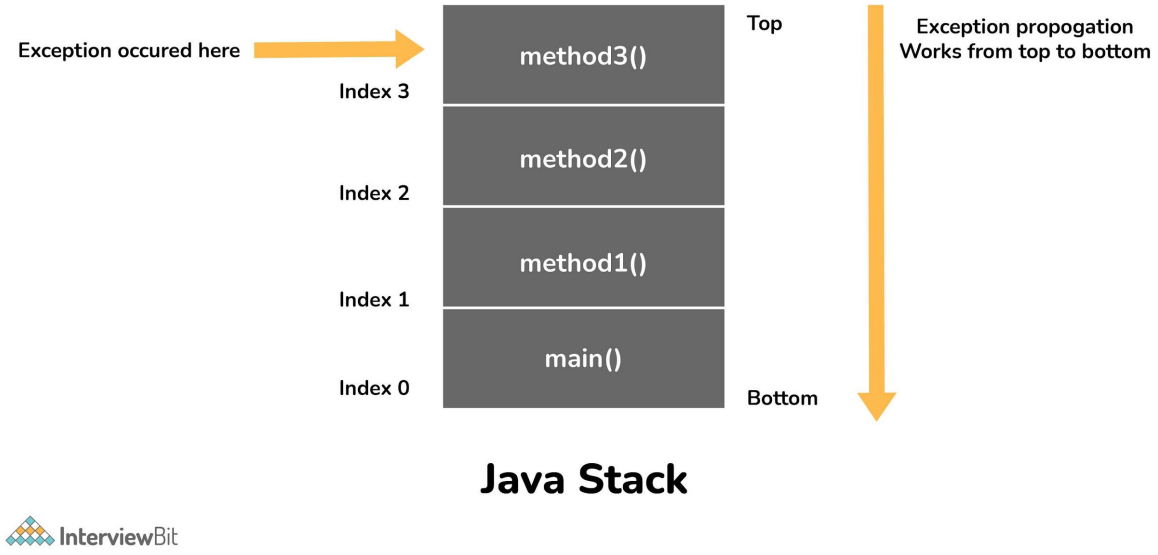
- It is the process of creating an exact copy of any object. In order to support this, a java class has to implement the Cloneable interface of java.lang package and override the clone() method provided by the Object class the syntax of which is:

```
protected Object clone() throws CloneNotSupportedException{
 return (Object)super.clone();
}
```

- In case the Cloneable interface is not implemented and just the method is overridden, it results in CloneNotSupportedException in Java.

36. How does an exception propagate in the code?

When an exception occurs, first it searches to locate the matching catch block. In case, the matching catch block is located, then that block would be executed. Else, the exception propagates through the method call stack and goes into the caller method where the process of matching the catch block is performed. This propagation happens until the matching catch block is found. If the match is not found, then the program gets terminated in the main method.



37. Is it mandatory for a catch block to be followed after a try block?

No, it is not necessary for a catch block to be present after a try block. - A try block should be followed either by a catch block or by a finally block. If the exceptions likelihood is more, then they should be declared using the throws clause of the method.

38. Will the finally block get executed when the return statement is written at the end of try block and catch block as shown below?

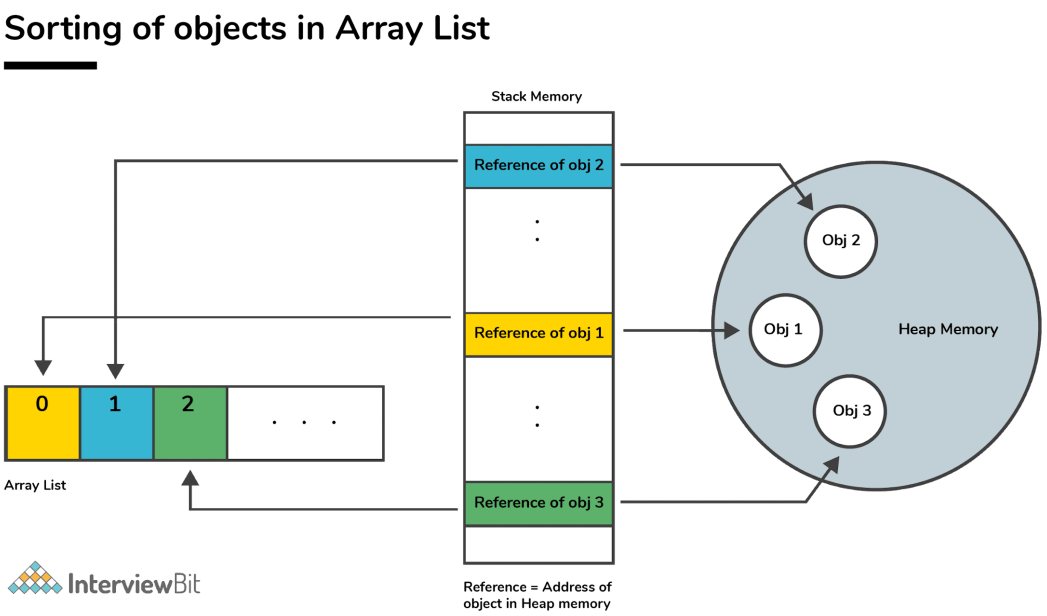
```
public int someMethod(int i){
    try{
        //some statement
        return 1;
    }catch(Exception e){
        //some statement
```

```
        return 999;
    }finally{
        //finally block statements
    }
}
```

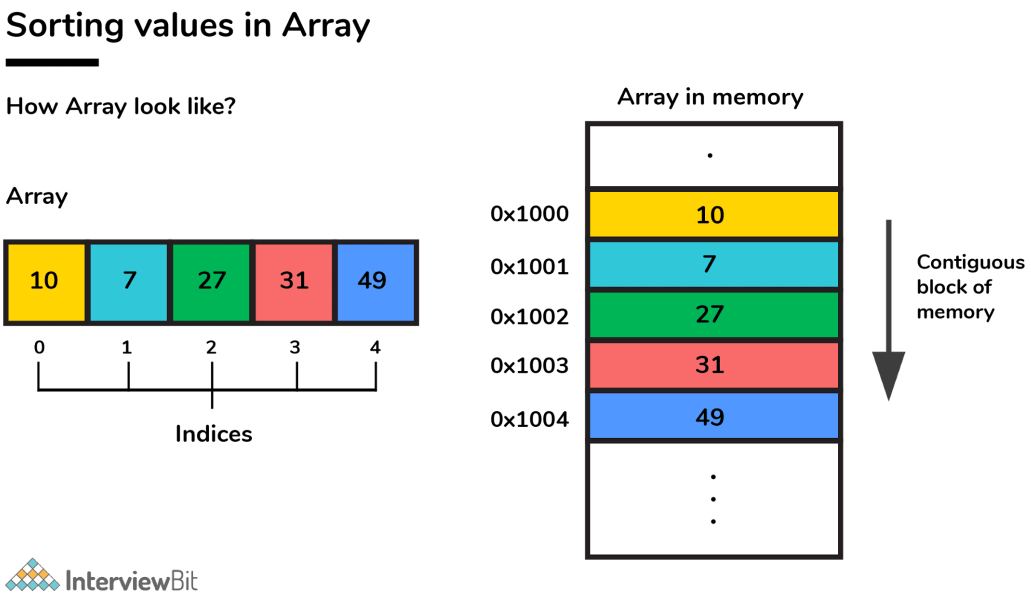
finally block will be executed irrespective of the exception or not. The only case where finally block is not executed is when it encounters 'System.exit()' method anywhere in try/catch block.

40. Contiguous memory locations are usually used for storing actual values in an array but not in ArrayList. Explain.

In the case of ArrayList, data storing in the form of primitive data types (like int, float, etc.) is not possible. The data members/objects present in the ArrayList have references to the objects which are located at various sites in the memory. Thus, storing of actual objects or non-primitive data types (like Integer, Double, etc.) takes place in various memory locations.



However, the same does not apply to the arrays. Object or primitive type values can be stored in arrays in contiguous memory locations, hence every element does not require any reference to the next element.



Java Advanced Interview Questions

41. Although inheritance is a popular OOPs concept, it is less advantageous than composition. Explain.

Inheritance lags behind composition in the following scenarios:

- Multiple-inheritance is not possible in Java. Classes can only extend from one superclass. In cases where multiple functionalities are required, for example - to read and write information into the file, the pattern of composition is preferred. The writer, as well as reader functionalities, can be made use of by considering them as the private members.
- Composition assists in attaining high flexibility and prevents breaking of encapsulation.
- Unit testing is possible with composition and not inheritance. When a developer wants to test a class composing a different class, then Mock Object can be created for signifying the composed class to facilitate testing. This technique is not possible with the help of inheritance as the derived class cannot be tested without the help of the superclass in inheritance.

- The loosely coupled nature of composition is preferable over the tightly coupled nature of inheritance.

Let's take an example:

```
package comparison;
public class Top {
public int start() {
  return 0;
}
}
class Bottom extends Top {
 public int stop() {
  return 0;
 }
}
```

In the above example, inheritance is followed. Now, some modifications are done to the Top class like this:

```
public class Top {
 public int start() {
  return 0;
 }
 public void stop() {
 }
}
```

If the new implementation of the Top class is followed, a compile-time error is bound to occur in the Bottom class. Incompatible return type is there for the Top.stop() function. Changes have to be made to either the Top or the Bottom class to ensure compatibility. However, the composition technique can be utilized to solve the given problem:

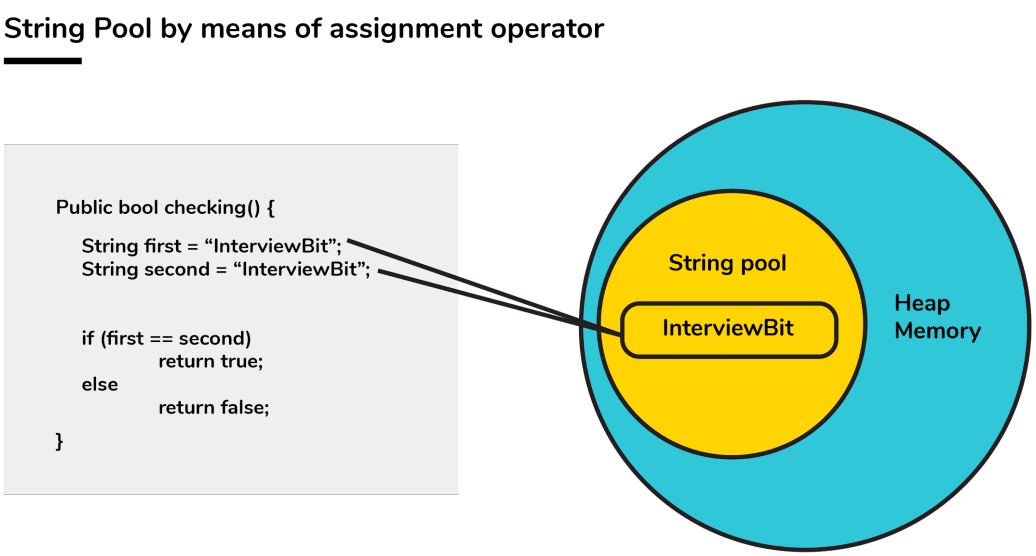
```
class Bottom {
 Top par = new Top();
 public int stop() {
  par.start();
  par.stop();
  return 0;
 }
}
User
```

42. How is the creation of a String using new() different from that of a literal?

When a String is formed as a literal with the assistance of an assignment operator, it makes its way into the String constant pool so that String Interning can take place. This same object in the heap will be referenced by a different String if the content is the same for both of them.

```
public bool checking() {
String first = "MasaiSchool";
String second = "MasaiSchool";
if (first == second)
 return true;
else
 return false;
}
```

The checking() function will return true as the same content is referenced by both the variables.

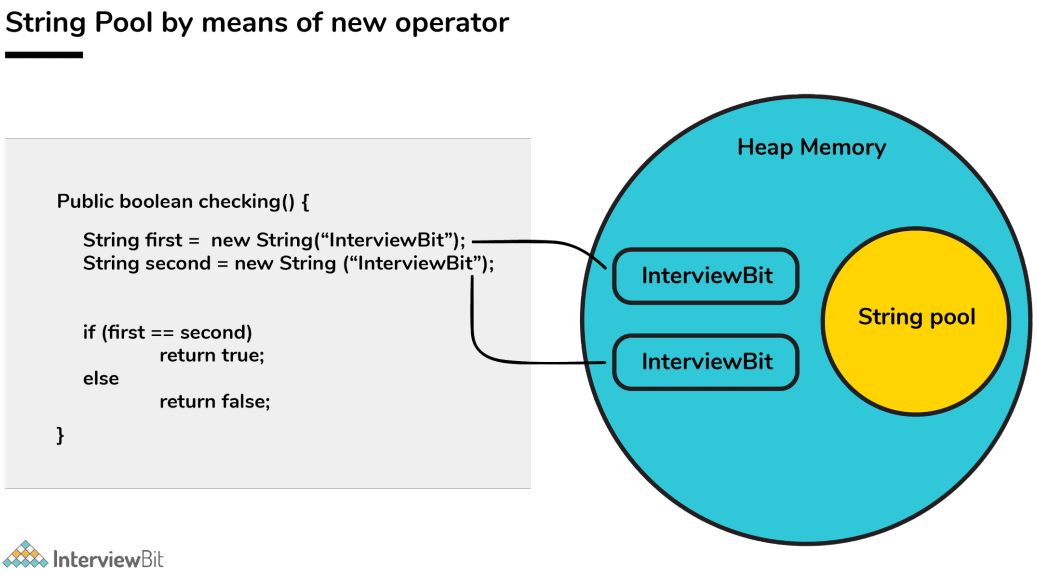


Conversely, when a String formation takes place with the help of a new() operator, interning does not take place. The object gets created in the heap memory even if the same content object is present.

```
public bool checking() {
String first = new String("MasaiSchool");
String second = new String("MasaiSchool");
```

```
if (first == second)
 return true;
else
 return false;
}
```

The checking() function will return false as the same content is not referenced by both the variables.



43. Is exceeding the memory limit possible in a program despite having a garbage collector?

Yes, it is possible for the program to go out of memory in spite of the presence of a garbage collector. Garbage collection assists in recognizing and eliminating those objects which are not required in the program anymore, in order to free up the resources used by them.

In a program, if an object is unreachable, then the execution of garbage collection takes place with respect to that object. If the amount of memory required for creating a new object is not sufficient, then memory is released for those objects which are no longer in the scope with the help of a garbage collector. The memory limit is exceeded for the program when the memory released is not enough for creating new objects.

Moreover, exhaustion of the heap memory takes place if objects are created in such a manner that they remain in the scope and consume memory. The developer should make sure to dereference the object after its work is accomplished. Although the garbage collector endeavors its level best to reclaim memory as much as possible, memory limits can still be exceeded.

Let's take a look at the following example:

```
List<String> example = new LinkedList<String>();
while(true){
example.add(new String("Memory Limit Exceeded"));
}
```

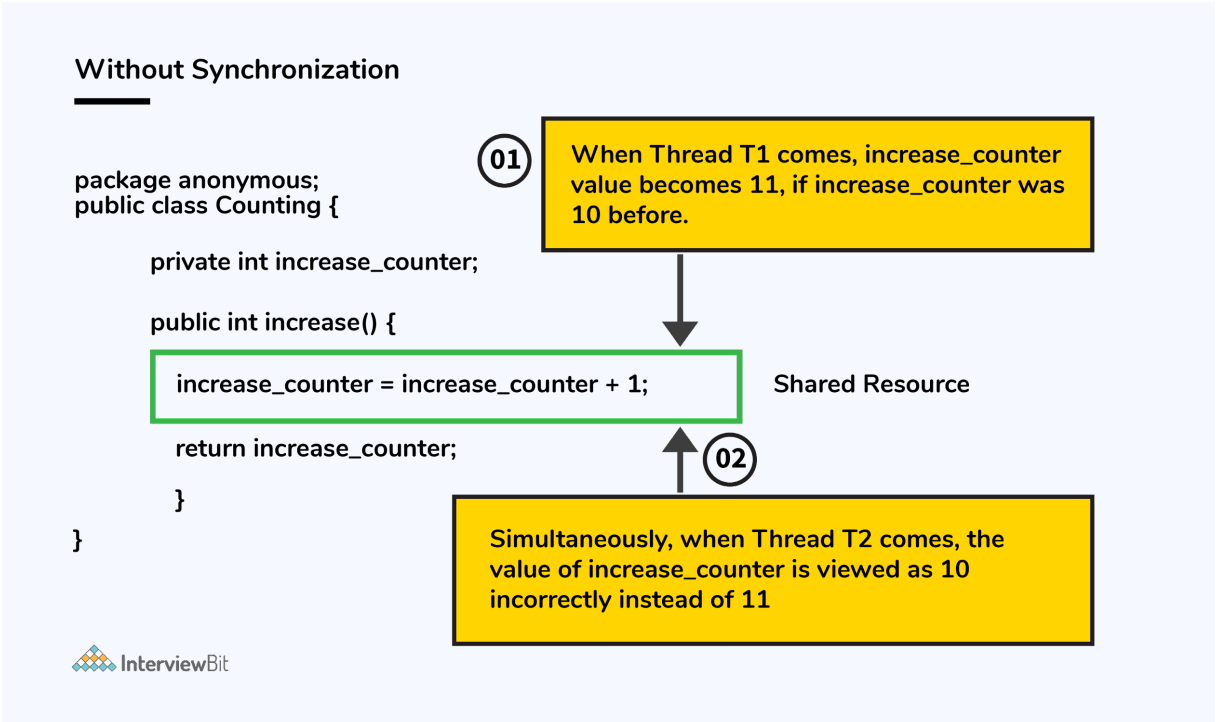
44. Why is synchronization necessary? Explain with the help of a relevant example.

Concurrent execution of different processes is made possible by synchronization. When a particular resource is shared between many threads, situations may arise in which multiple threads require the same shared resource.

Synchronization assists in resolving the issue and the resource is shared by a single thread at a time. Let's take an example to understand it more clearly. For example, you have a URL and you have to find out the number of requests made to it. Two simultaneous requests can make the count erratic.

No synchronization:

```
package anonymous;
public class Counting {
        private int increase_counter;
        public int increase() {
                increase_counter = increase_counter + 1;
                return increase_counter;
        }
}
```

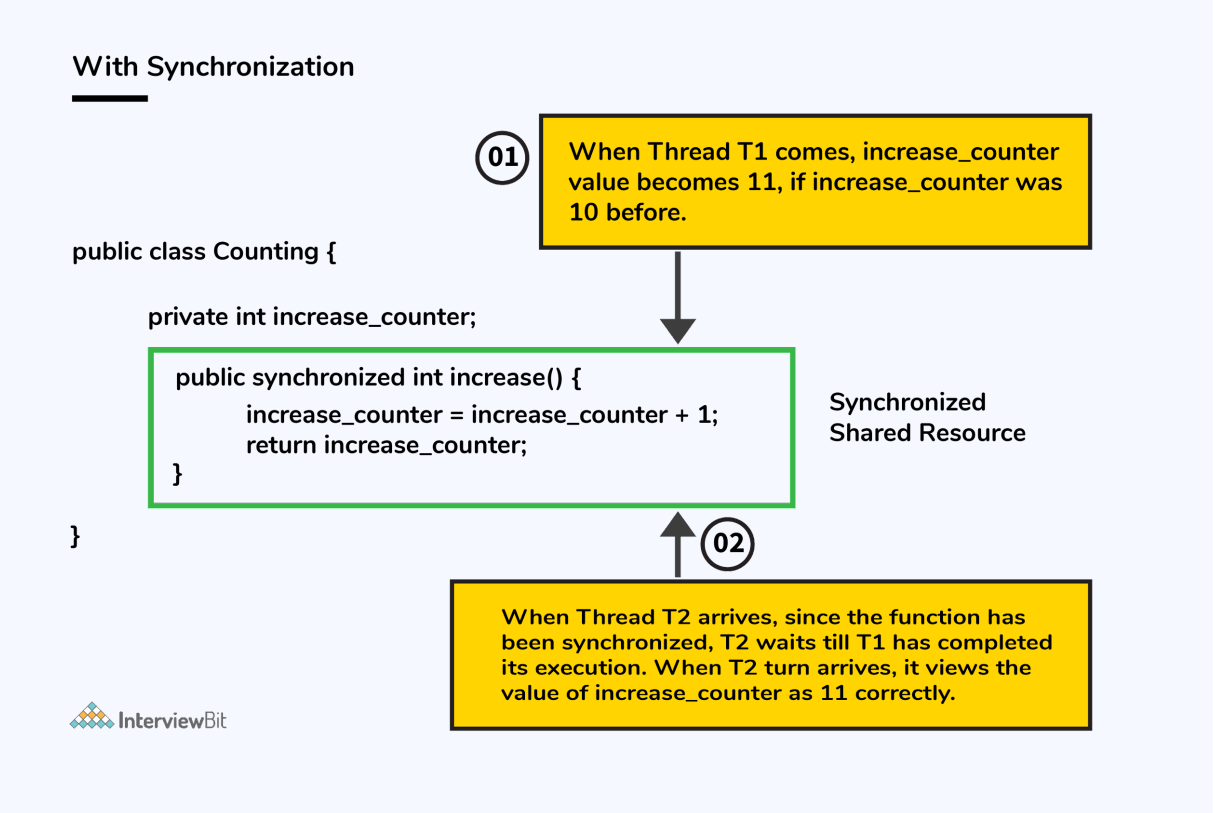


If a thread Thread1 views the count as 10, it will be increased by 1 to 11. Simultaneously, if another thread Thread2 views the count as 10, it will be increased by 1 to 11. Thus, inconsistency in count values takes place because the expected final value is 12 but the actual final value we get will be 11.

Now, the function increase() is made synchronized so that simultaneous accessing cannot take place.

With synchronization:

```
package anonymous;
public class Counting {
        private int increase_counter;
        public synchronized int increase() {
                increase_counter = increase_counter + 1;
                return increase_counter;
        }
}
```



If a thread Thread1 views the count as 10, it will be increased by 1 to 11, then the thread Thread2 will view the count as 11, it will be increased by 1 to 12. Thus, consistency in count values takes place.

45. In the given code below, what is the significance of ... ?

```
public void fooBarMethod(String... variables){
    // method code
}
```

- Ability to provide `...` is a feature called varargs (variable arguments) which was introduced as part of Java 5.
- The function having `...` in the above example indicates that it can receive multiple arguments of the datatype String.
- For example, the fooBarMethod can be called in multiple ways and we can still have one method to process the data as shown below:

```
fooBarMethod("foo", "bar");
fooBarMethod("foo", "bar", "boo");
fooBarMethod(new String[]{"foo", "var", "boo"});
public void myMethod(String... variables){
    for(String variable : variables){
        // business logic
    }
```

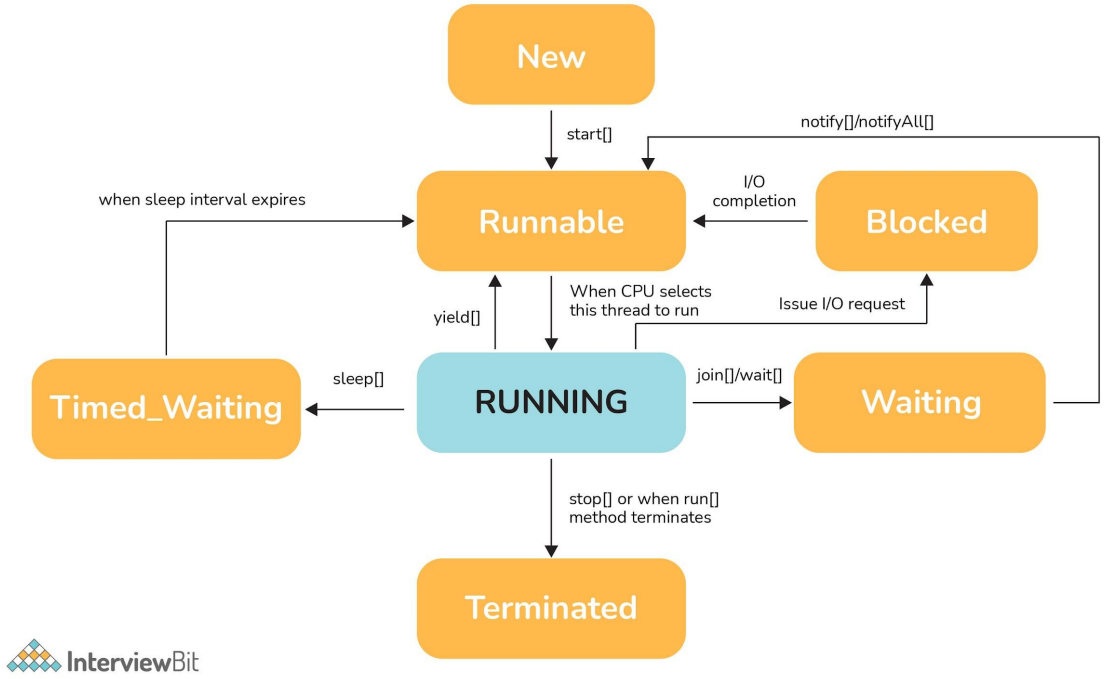
```
}
```

46. Can you explain the Java thread lifecycle?

Java thread life cycle is as follows:

- New – When the instance of the thread is created and the start() method has not been invoked, the thread is considered to be alive and hence in the NEW state.
- Runnable – Once the start() method is invoked, before the run() method is called by JVM, the thread is said to be in RUNNABLE (ready to run) state. This state can also be entered from the Waiting or Sleeping state of the thread.
- Running – When the run() method has been invoked and the thread starts its execution, the thread is said to be in a RUNNING state.
- Non-Runnable (Blocked/Waiting) – When the thread is not able to run despite the fact of its aliveness, the thread is said to be in a NON-RUNNABLE state. Ideally, after some time of its aliveness, the thread should go to a runnable state.
    - A thread is said to be in a Blocked state if it wants to enter synchronized code but it is unable to as another thread is operating in that synchronized block on the same object. The first thread has to wait until the other thread exits the synchronized block.
    - A thread is said to be in a Waiting state if it is waiting for the signal to execute from another thread, i.e it waits for work until the signal is received.
- Terminated – Once the run() method execution is completed, the thread is said to enter the TERMINATED step and is considered to not be alive.

The following flowchart clearly explains the lifecycle of the thread in Java.



47. What could be the tradeoff between the usage of an unordered array versus the usage of an ordered array?

- The main advantage of having an ordered array is the reduced search time complexity of `O(log n)` whereas the time complexity in an unordered array is `O(n)`.
- The main drawback of the ordered array is its increased insertion time which is O(n) due to the fact that its element has to reordered to maintain the order of array during every insertion whereas the time complexity in the unordered array is only O(1).
- Considering the above 2 key points and depending on what kind of scenario a developer requires, the appropriate data structure can be used for implementation.

48. Is it possible to import the same class or package twice in Java and what happens to it during runtime?

It is possible to import a class or package more than once, however, it is redundant because the JVM internally loads the package or class only once.

49. In case a package has sub packages, will it suffice to import only the main package? e.g. Does importing of com.myMainPackage.* also import com.myMainPackage.mySubPackage.*?

This is a big NO. We need to understand that the importing of the sub-packages of a package needs to be done explicitly. Importing the parent package only results in the import of the classes within it and not the contents of its child/sub-packages.

50. Will the finally block be executed if the code System.exit(0) is written at the end of try block?

NO. The control of the program post `System.exit(0)` is immediately gone and the program gets terminated which is why the finally block never gets executed.

51. What do you understand by marker interfaces in Java?

Marker interfaces, also known as tagging interfaces are those interfaces that have no methods and constants defined in them. They are there for helping the compiler and JVM to get run time-related information regarding the objects.

52. Explain the term “Double Brace Initialisation” in Java?

This is a convenient means of initializing any collections in Java. Consider the below example.

```
import java.util.HashSet;
import java.util.Set;

public class IBDoubleBraceDemo{
   public static void main(String[] args){
        Set<String> stringSets = new HashSet<String>()
        {
            {
                add("set1");
                add("set2");
                add("set3");
            }
        };

        doSomething(stringSets);
   }

   private static void doSomething(Set<String> stringSets){
        System.out.println(stringSets);
   }
```

```
}
```

In the above example, we see that the stringSets were initialized by using double braces.

- The first brace does the task of creating an anonymous inner class that has the capability of accessing the parent class's behavior. In our example, we are creating the subclass of HashSet so that it can use the add() method of HashSet.
- The second braces do the task of initializing the instances.

Care should be taken while initializing through this method as the method involves the creation of anonymous inner classes which can cause problems during the garbage collection or serialization processes and may also result in memory leaks.

53. Why is it said that the length() method of String class doesn't return accurate results?

- The length method returns the number of Unicode units of the String. Let's understand what Unicode units are and what is the confusion below.
- We know that Java uses UTF-16 for String representation. With this Unicode, we need to understand the below two Unicode related terms:
    - Code Point: This represents an integer denoting a character in the code space.
    - Code Unit: This is a bit sequence used for encoding the code points. In order to do this, one or more units might be required for representing a code point.
- Under the UTF-16 scheme, the code points were divided logically into 17 planes and the first plane was called the Basic Multilingual Plane (BMP). The BMP has classic characters - U+0000 to U+FFFF. The rest of the characters- U+10000 to U+10FFFF were termed as the supplementary characters as they were contained in the remaining planes.
    - The code points from the first plane are encoded using one 16-bit code unit
    - The code points from the remaining planes are encoded using two code units.

Now if a string contained supplementary characters, the length function would count that as 2 units and the result of the length() function would not be as per what is expected.

In other words, if there is 1 supplementary character of 2 units, the length of that SINGLE character is considered to be TWO - Notice the inaccuracy here? As per the java documentation, it is expected, but as per the real logic, it is inaccurate.

54. What is the output of the below code and why?

```
public class MasaiSchool{
   public static void main(String[] args)
    {
        System.out.println('b' + 'i' + 't');
    }
}
```

“bit” would have been the result printed if the letters were used in double-quotes (or the string literals). But the question has the character literals (single quotes) being used which is why concatenation wouldn't occur. The corresponding ASCII values of each character would be added and the result of that sum would be printed.

The ASCII values of ‘b’, ‘i’, ‘t’ are:

- ‘b’ = 98
- ‘i’ = 105
- ‘t’ = 116

```
98 + 105 + 116 = 319
```

Hence 319 would be printed.

55. What are the possible ways of making object eligible for garbage collection (GC) in Java?

First Approach: Set the object references to null once the object creation purpose is served.

```
public class IBGarbageCollect {
  public static void main (String [] args){
        String s1 = "Some String";
            // s1 referencing String object - not yet eligible for
GC
        s1 = null; // now s1 is eligible for GC
    }
 }
```

Second Approach: Point the reference variable to another object. Doing this, the object which the reference variable was referencing before becomes eligible for GC.

```
public class IBGarbageCollect {
 public static void main(String [] args){
     String s1 = "To Garbage Collect";
     String s2 = "Another Object";
     System.out.println(s1); // s1 is not yet eligible for GC
     s1 = s2; // Point s1 to other object pointed by s2
     /* Here, the string object having the content  "To Garbage
Collect" is not referred by any reference variable. Therefore, it
is eligible for GC */
 }
}
```

Third Approach: Island of Isolation Approach: When 2 reference variables pointing to instances of the same class, and these variables refer to only each other and the objects pointed by these 2 variables don't have any other references, then it is said to have formed an “Island of Isolation” and these 2 objects are eligible for GC.

```
public class IBGarbageCollect {
   IBGarbageCollect ib;
   public static void main(String [] str){
        IBGarbageCollect ibgc1 = new IBGarbageCollect();
        IBGarbageCollect ibgc2 = new IBGarbageCollect();
        ibgc1.ib = ibgc2; //ibgc1 points to ibgc2
        ibgc2.ib = ibgc1; //ibgc2 points to ibgc1
        ibgc1 = null;
        ibgc2 = null;
        /*
        * We see that ibgc1 and ibgc2 objects refer
        * to only each other and have no valid
        * references- these 2 objects for island of isolcation -
eligible for GC
        */
   }
}
```

Java Interview Programs

56. Check if a given string is palindrome using recursion.

```
/*
* Java program to check if a given inputted string is palindrome
or not using recursion.
*/
import java.util.*;
public class MasaiSchool {
```

```
    public static void main(String args[]) {
        Scanner s = new Scanner(System.in);
        String word = s.nextLine();
        System.out.println("Is "+word+" palindrome? -
"+isWordPalindrome(word));
    }


    public static boolean isWordPalindrome(String word){
        String reverseWord = getReverseWord(word);
        //if word equals its reverse, then it is a palindrome
        if(word.equals(reverseWord)){
            return true;
        }
        return false;
    }

    public static String getReverseWord(String word){
        if(word == null || word.isEmpty()){
            return word;
        }

        return word.charAt(word.length()- 1) +
getReverseWord(word.substring(0, word.length() - 1));
    }
}
```

57. Write a Java program to check if the two strings are anagrams.

The main idea is to validate the length of strings and then if found equal, convert the string to char array and then sort the arrays and check if both are equal.

```
import java.util.Arrays;
import java.util.Scanner;
public class MasaiSchool {
 public static void main(String[] args) {
    Scanner s = new Scanner(System.in);
    //Input from two strings
    System.out.print("First String: ");
    String string1 = s.nextLine();
    System.out.print("Second String: ");
    String string2 = s.nextLine();
    // check for the length
    if(string1.length() == string2.length()) {
      // convert strings to char array
      char[] characterArray1 = string1.toCharArray();
      char[] characterArray2 = string2.toCharArray();
```

```
        // sort the arrays
        Arrays.sort(characterArray1);
        Arrays.sort(characterArray2);
        // check for equality, if found equal then anagram, else not
an anagram
        boolean isAnagram = Arrays.equals(characterArray1,
characterArray2);
        System.out.println("Anagram: "+ isAnagram);
    }
}
```

58. Write a Java Program to find the factorial of a given number.

```
public class FindFactorial {
    public static void main(String[] args) {
        int num = 10;
        long factorialResult = 1l;
        for(int i = 1; i <= num; ++i)
        {
            factorialResult *= i;
        }
        System.out.println("Factorial: "+factorialResult);
    }
}
```

59. Given an array of non-duplicating numbers from 1 to n where one number is missing, write an efficient java program to find that missing number.

Idea is to find the sum of n natural numbers using the formula and then finding the sum of numbers in the given array. Subtracting these two sums results in the number that is the actual missing number. This results in O(n) time complexity and O(1) space complexity.

```
public class IBMissingNumberProblem {

    public static void main(String[] args) {

        int[] array={4,3,8,7,5,2,6};
        int missingNumber = findMissingNum(array);
        System.out.println("Missing Number is "+ missingNumber);
    }

    public static int findMissingNum(int[] array) {
        int n=array.length+1;
        int sumOfFirstNNums=n*(n+1)/2;
        int actualSumOfArr=0;
```

```
        for (int i = 0; i < array.length; i++) {
            actualSumOfArr+=array[i];
        }
        return sumOfFirstNNums-actualSumOfArr;
    }
}
```

60. Write a Java Program to check if any number is a magic number or not. A number is said to be a magic number if after doing sum of digits in each step and inturn doing sum of digits of that sum, the ultimate result (when there is only one digit left) is 1.

Example, consider the number:

- Step 1: 163 => 1+6+3 = 10
- Step 2: 10 => 1+0 = 1 => Hence 163 is a magic number

```
public class IBMagicNumber{

   public static void main(String[] args) {
        int num = 163;
        int sumOfDigits = 0;
        while (num > 0 || sumOfDigits > 9)
        {
            if (num == 0)
            {
                num = sumOfDigits;
                sumOfDigits = 0;
            }
            sumOfDigits += num % 10;
            num /= 10;
        }

        // If sum is 1, original number is magic number
        if(sumOfDigits == 1) {
            System.out.println("Magic number");
        }else {
            System.out.println("Not magic number");
        }
    }
}
```

References:
interviewbit.com
https://stackoverflow.com/a/37497111
Javatpoint.com