Basic Java

Q1. Method vs Function.

Function is a concept of procedural and functional programming language. A function is independent of any object.

But method is a function which is always associated to a class. Therefore, a method is limited to operating on data that is within that class. Hence method is just an object-oriented word for a function.

Java is object oriented; you cannot have Java code to run without classes. Hence Java consists of methods only.

Parameters vs Arguments:

Parameters are fields that serve as variable names inside of a method signature.

Arguments are the values passed to the method when it is called.

Q2. Compiled languages vs Interpreted languages.

Interpreted languages:

In an interpreted language, the source code is not directly executed by the target machine. Instead, an intermediate program, aka the interpreter, reads and executes the code.

You trade faster speed of development for higher execution costs. Examples are Python, JavaScript, etc.

Compiled languages:

They use compilers to compile the code (into native machine code) before the processor can attempt to execute it. Results into the generation of an executable file that can be run by a computer without any extra dependencies. But you will need to rebuild the executable file every time you make changes to the code.

Here you trade higher development time for faster execution. Examples of purely compiled languages are C, C++.

Note: Java is both a compiled and interpreted programming language. A .java file is first compiled by Java Compiler into .class file and later interpreted by JIT into native machine code.

Q3. Scripting language vs Programming language.  
  
The basic difference between a scripting language and a programming language is that scripting languages do not need an additional step of compilation and rather they are interpreted, whereas programming languages are compiled and hence need a compilation step to convert the high-level language to machine code.

All the scripting languages are programming languages, but all programming languages are not scripting languages.

Q4. Can we have a static constructor in Java?

In Java, a constructor is not allowed to be abstract, final, static or native. So, there is no static constructor in Java.

Since each constructor is being called by its subclass during creation of the object of its subclass, so if you mark constructor as static the subclass will not be able to access the constructor of its parent class because it is marked static and thus belong to the class only. This will violate the whole purpose of inheritance concept and that is reason why a constructor cannot be static.

An alternative to static constructor is a static block, which can be used to initialize all static instance variables in a class.

Q5. Is Java a pure object-oriented programming language?

No. Any Object-oriented language must follow the following principals:

1. Encapsulation/Data Hiding
2. Inheritance
3. Polymorphism
4. Abstraction
5. All predefined types are objects
6. All user defined types are objects
7. All operations performed on objects must be only through methods exposed at the objects.

Java supports property 1, 2, 3, 4 and 6 but fails to support property 5 and 7 given above.

Smalltalk is a “pure” object-oriented programming language unlike Java and C++ as there is no difference between values which are objects and values which are primitive types. In Smalltalk, primitive values such as integers, booleans and characters are also objects. In Java, we have predefined types as non-objects (primitive types).

Even using Wrapper classes does not make Java a pure OOP language, as internally it will use the operations like Unboxing and Autoboxing. So, if you create Integer instead of int and do any mathematical operation on it, under the hoods Java is going to use primitive type int only.

Also, unlike top-level classes, inner classes can be static in Java. Such static classes can be used without the need of an object in Java, defying the object-oriented principal.

Also, several OOPs features like multiple inheritance and operator overloading is not supported by Java.

Q6. Is Java interpreted or compiled programming language? (How is Java a platform independent language?)

The Java source code first compiled into a .class file consisting of byte code (intermediate code) using Java compiler, then this byte code runs on the JVM (Java Virtual Machine), which is a software-based interpreter. So, Java is considered as both interpreted and compiled.

Just In Time compiler which is a part of JVM, performs another round of compilation (interpreting phase) of the byte code into native code of the corresponding platform. This native code can now be interpreted by the processor directly.

Working of JIT in detail:

Imagine that you have two methods; method a() and b(). This a() might be executing for 500th time. Hence, the JIT compiler sees that it is getting executed a lot. So what it does is, pre-compile that method to native code and optimize it further for fast execution. So when the method a() is triggered for the 501st time, instead of Interpreter interpreting the method line by line, the native code corresponding to the particular method (which is optimized) get executed. Now say this method get executed for 2000th time; then the JIT compiler performs another round of optimization on the native code.

But the method b() might not be like method a() and it may be executed for like 10 times. Then that method will be interpreted each time it was invoked.

To handle this process, JIT compiler has 4 parts:

1. Hotspot profiler: Detects and profiles the “Hot spots” i.e. frequently executed code snippets.
2. Intermediate code generator: Responsible for generating the intermediate code.
3. Code optimizer: Performing optimization on generated intermediate code.
4. Target code generator: Generates native code.

Q7. Does Java support Operator Overloading?

Java doesn’t support operator overloading except for one instance, where the + operator is used to add numeric types as well as to append strings.

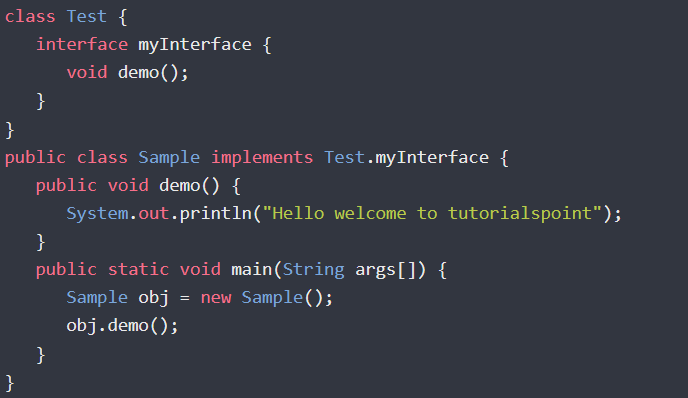
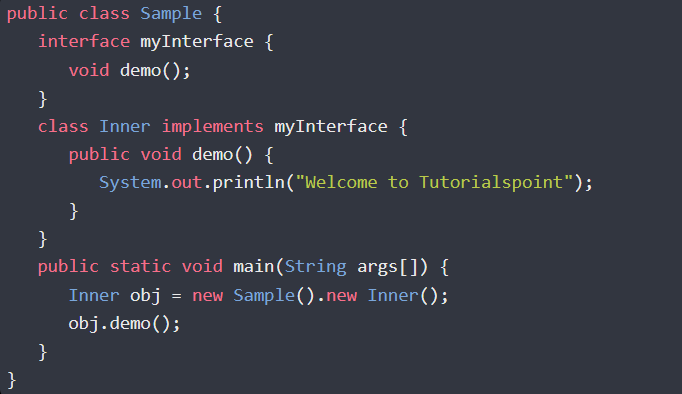
Overloading operators causes faults in the software. Operator overloading causes programmers to become perplexed. Also, compared to other languages, dealing with languages that offer operator overloading has a higher risk of error. Method overloading is a feature of Java. Method Overloading performs the same function as operator overloading while removing the possibility of errors.

Q8. Why do we need Generic Types in programming?

We need generics to implement type-safety and avoid type-casting while using collection classes. Generics was added to java after 1.5 version update.

Q9. Can we define an interface within a Java class?

Yes, you can define an interface inside a class and it is known as a nested interface. But you can’t access a nested interface directly; you need to implement the nested interface using the inner class or you can access it by using the name of the class holding this nested interface.

Q10. Can we define a class inside a Java interface?

Yes, you can define a class inside an interface. In general, if the methods of the interface use this class and if we are not using it anywhere else, we will declare a class within an interface.

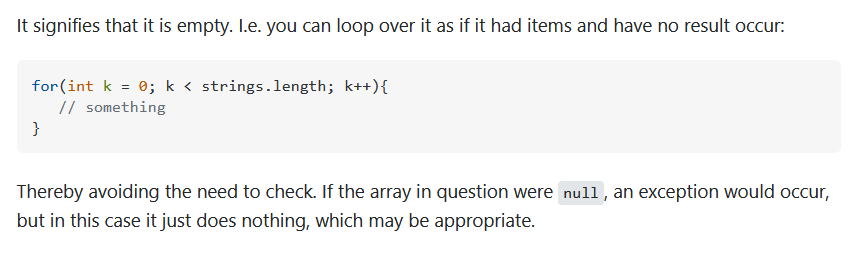


We can also provide default implementation for the methods of interface within this inner class.

Q11. Why does Java allow an array of size 0?

Let’s suppose you have an algorithm where you pop out an element from array and then you trim down the array to get rid of unoccupied positions. And later on, at some point you want to iterate over this array.

Now at some point if all the elements from that array are removed, the iteration part of the program should not throw an error for trying to iterate over an empty array.



Q12. Explain target-type inference in Java.

Type Inference was introduced in Java 5 to complement the introduction of generics. Type inference**is the process of automatically deducing unspecified data types of an expression based on the contextual information.**

Map<String, List<String>> myMap = new HashMap<>();