Phase I

1. **What is Scala? Is it a Language or Platform? Does it support OOP or FP? Who is the father of Scala?**
   Scala stands for **SCA**lable **LA**nguage. Martin Odersky is the father of Scala.

   Scala is a Multi-Paradigm Programming Language, which supports both Object-Oriented and Functional Programming concepts. It is designed and developed by Martin Odersky.

   Scala is a Type-Safe Object-Functional Programming JVM Language. Scala runs on JVM(Java Virtual Machine).

   Scala is a Hybrid Functional (Object-Oriented and Functional) Programming JVM Language. Scala has a Strong and Statically Type System. In Scala, all types are checked at compile-time

2. **Is Scala Statically-Typed Language? What is Statically-Typed Language and what is Dynamically-Typed Language? What is the difference between statically typed and dynamically typed languages? Yes, Scala is a Statically-Typed Language.**

   Statically-Typed Language means that Type checking is done at compile-time by compiler, not at run-time. The main Advantage of these kinds of Languages is: As a Developer, we should care about writing right code to avoid all compile-time errors. As Compiler checks many of the errors at compile-time, we don't get much issues or bugs at run-time.

   Examples: - Java, Scala, C, C++, Haskell etc.

   Dynamically-Typed Language means that Type checking is done at run-time, not at compile-time by compiler. As a compiler won't check any type checking at compile-time, we can expect more run-time issues or bugs.

   Example: - Groovy, JavaScript, Ruby, Python, Smalltalk etc.
3. **Is Scala a Pure OOP Language? Is Java a Pure OOP Language?**

   Pure Object-Oriented Programming Language means that everything should be an Object.

   Java is not a Pure Object-Oriented Programming (OOP) Language because it supports the following two Non-OOP concepts:

   Java supports primitive data types. They are not objects. (Includes byte, short, int, long, float, double, Boolean and char.)
   Java supports Static members. They are not related to objects.
   Yes, Scala is a Pure Object-Oriented Programming Language because in Scala, everything is an Object and everything is a value. Functions are values and values are Objects.

   Scala does not have primitive data types and also does not have static members.

4. **Does Scala support all Functional Programming concepts? Does Java 8 support all Functional Programming concepts?**
   Yes, Scala supports all Functional Programming (FP) concepts. Java 8 has introduced some Functional Programming constructs, but it does NOT support all Functional Programming concepts.

   For instance, Java 8 does not support Pattern Matching, Function Currying, Implicits etc.

5. **What are the major advantages of Scala Language? Are there any drawbacks of Scala Language?**
   If we use Scala Language to develop our applications, we can get the following benefits or advantages and drawbacks:
   Advantages of Scala Language:-
   - Simple and Concise Code
   - Very Expressive Code
   - More Readable Code
   - 100% Type-Safe Language

- Immutability and No Side-Effects
- More Reusable Code
- More Modularity
- Do More With Less Code
- Very Flexible Syntax
- Supports all OOP Features
- Supports all FP Features. Highly Functional.
- Less Error Prone Code
- Better Parallel and Concurrency Programming
- Highly Scalable and Maintainable code
- Highly Productivity
- Distributed Applications
- Full Java Interoperability
- Powerful Scala DSLs available
- REPL to learn Scala Basics

Drawbacks of Scala Language:-

- Less Readable Code
- Bit tough to understand the Code for beginners
- Complex Syntax to learn
- Less Backward Compatibility

NOTE: - We can write Scala Code either more readable or less readable way.

6. What is the Main drawback of Scala Language?

Apart from many benefits of Scala, it has one major Drawback: Backward Compatibility Issue. If we want to upgrade to latest version of Scala, then we need to take care of changing some package names, class names, method or function names etc.

For instance, If you are using old Scala version and your project is using BeanProperty annotation. It was available in "scala.reflect" like "scala.reflect.BeanProperty" in old versions. If we want to upgrade to new Scala versions, then we need to change this package from "scala.reflect" to "scala.beans".

7. What is the main motto of Scala Language?

Like Java's Motto "Write Once Run Anywhere", Scala has "Do More With Less" or "Do More With Less Code" Motto.
"Do More With Less" means that we can develop more complex program or logic with less code.

8. What are the popular JVM Languages available now?

Java, Scala, Groovy and Closure are most popular JVM (Java Virtual Machine) languages.

Scala, Groovy and Closure JVM languages supports both Object-Oriented Programming Features and Functional Programming Features.

Java SE 8 supports all Object-Oriented Programming Features. However, it supports very few Functional Programming Features like Lambda Expressions, Functions, Type Inference, Higher-Order Functions.

9. **Like Java's java.lang.Object class, what is the super class of all classes in Scala?**

As we know in Java, the super class of all classes (Java API Classes or User Defined Classes) is java.lang.Object. In the same way in Scala, the super class of all classes or traits is "Any" class.

Any class is defined in Scala package like "Scala. Any".

10. What is default access modifier in Scala? Does Scala have "public" keyword?

In Scala, if we don't mention any access modifier to a method, function, trait, object or class, the default access modifier is "public". Even for Fields also, "public" is the default access modifier.

Because of this default feature, Scala does not have "public" keyword.

11. What is "Type Inference" in Scala?

Types can be inferred by the Scala Compiler at compile-time. It is known as "Type Inference". Types means Data type or Result type. We use Types at many places in Scala programs like Variable types, Object types, Method/Function Parameter types, Method/Function return types etc.

In simple words, determining the type of a variable or expression or object etc at compile-time by compiler is known as "Type Inference".

12. What are the similarities and differences between Scala's Int and Java's java.lang.Integer? What is the relationship between Int and RichInt in Scala?

Similarities between Scala's Int and Java's java.lang.Integer:

Both are classes.
Both are used to represent integer numbers.
Both are 32-bit signed integers.
Differences between Scala's Int and Java's java.lang.Integer:

Scala's Int class does not implement Comparable interface.
Java's java.lang.Integer class implements Comparable interface.
Java's Integer is something similar to Scala's Int and RichInt. RichInt is a final class defined in scala.runtime package like "scala.runtime.RichInt".

In Scala, the Relationship between Int and RichInt is that when we use Int in a Scala program, it will automatically convert into RichInt to utilize all methods available in that Class. We can say that RichInt is an Implicit class of Int.

13. What is Nothing in Scala? What is Nil in Scala? What is the relationship between Nothing and Nil in Scala?

In Scala, Nothing is a Type (final class). It is defined at the bottom of the Scala Type System that means it is a subtype of anything in Scala. There are no instances of Nothing.

Use Cases of Nothing In Scala:-
If Nothing does not have any instances, then when do we use this one in Scala Applications?

Nil is defined using Nothing (See below for example).
None is defined using Nothing.

```
Example:-
object None extends Option[Nothing]
scala> Nil
res5: scala.collection.immutable.Nil.type = List()
scala> Nil.length
res6: Int = 0
```

14. What is Null in Scala? What is null in Scala? What is difference between Null and null in Scala?

Null is a Type (final class) in Scala. Null type is available in "scala" package as "scala.Null". It has one and only one instance that is null.
In Scala, "null" is an instance of type scala.Null type.

```
Example:-
scala> val myNullRef : Null = null
myNullRef: Null = null
```

We cannot assign other values to Null type references. It accepts only 'null' value.

Null is a subtype of all Reference types. Null is at the bottom of the Scala Type System. As it is NOT a subtype of Value types, we can assign "null" to any variable of Value type.
Example:-

```
scala> val myInt : Int = null
10: error: an expression of type Null is ineligible for implicit conversion
val myInt : Int = null
```

Here type mismatch error. Found: Null(null) but required: Int. The implicit conversions between Null and Int are not applicable because they are ambiguous.

15. What is Unit in Scala? What is the difference between Java's void and Scala's Unit?

In Scala, Unit is used to represent "No value" or "No Useful value". Unit is a final class defined in "scala" package that is "scala.Unit".
Unit is something similar to Java's void. But they have few differences.
Java's void does not any value. It is nothing.
Scala's Unit has one value ()
() is the one and only value of type Unit in Scala. However, there are no values of type void in Java.
Java's void is a keyword. Scala's Unit is a final class.
Both are used to represent a method or function is not returning anything.

16. What is the difference between val and var in Scala?

In Scala, both val and var are used to define variables. However, they have some significant differences.

var stands for variable.
val stands for value.
As we know, variable means changeable and value means constant.
var is used to define Mutable variables that means we can reassign values once its created.
val is used to define Immutable variables that means we cannot reassign values once its created.
In simple Java terminology, var means 'variable' and val means 'final variable'.

17. What is REPL in Scala? What is the use of Scala's REPL? How to access Scala REPL from CMD Prompt?

REPL stands for Read-Evaluate-Print Loop. We can pronounce it as 'ripple'. In Scala, REPL is acts as an Interpreter to execute Scala code from command prompt. That's why REPL is also known as Scala CLI(Command Line Interface) or Scala command-line shell.
The main purpose of REPL is that to develop and test small snippets of Scala code for practice purpose. It is very useful for Scala Beginners to practice basic programs.
We can access REPL by using "scala" command. When we type "scala" command at CMD Prompt, we will get REPL shell where we can type and execute scala code.

```
D:¥> scala
scala>
```

18. What are the Scala Features?

Scala Language supports the following features:

- Supports both OOP-style(Imperative-Style) and Functional-Style Programming
- Pure Object-Oriented Programming Language
- Supports all Functional Features
- REPL(Read-Evaluate-Print Loop) Interpreter
- Strong Type System
- Statically-Typed Language
- Type Inference
- Supports Pattern Matching
- Supports Closures
- Supports Persistent Data Structures
- Uses Actor Model to develop Concurrency Applications

- Interoperable with Java
- Available all development tools – IDEs, Build Tools, Web Frameworks, TDD and BDD Frameworks

19. How do we implement loops functionally? What is the difference between OOP and FP style loops?

We know how to implement loops in Object-Oriented style: Using Mutable Temporary variables, update the variable value and use Loop constructs. It is very tedious and unsafe approach. It is not Thread-Safe.

Object-Oriented style uses the following constructs to implement Loops:

- Loop Constructs
- Mutability
- Side Effects

We can implement same Loops differently in Functional way. It is Thread-Safe. We can use the following two techniques to implement the loops in functional style:

- Recursion
- Tail-Recursion
- Immutability
- No Side-Effects

20. What is "Application" in Scala or What is Scala Application? What is "App" in Scala? What is the use of Scala's App?

Scala Application:

In Scala, App is a trait defined in scala package like "scala.App". It defines main method. If an Object or a Class extends this trait, then they will become as Scala Executable programs automatically because they will inherit main method from Application.

The main advantage of using App is that we don't need to write main method. The main drawback of using App is that we should use same name "args" to refer command line argument because scala.App's main() method uses this name.

```
Example:-
Without Scala App:

object MyApp {
    def main( args: Array[String]){
        println("Hello World!")
    }
}
With Scala App:
object MyApp extends App{
   println("Hello World!")
}
```

If we observe above two examples, in second example we have not defined main method because we have inherited from Scala App(Application).

Before Scala 2.9, we have scala.Application trait. But it is deprecated by scala.App since Scala 2.9 version.

21. Does Scala support Operator Overloading? Does Java support Operator Overloading?

Java does not support Operator Overloading. Scala supports Operator Overloading.

The reason is that Java does not want to support some misleading method names like "+*/". Scala has given this flexibility to Developer to decide which methods/functions name should use.

When we call 2 + 3 that means '+' is not an operator, it is a method available in Int class (or its implicit type). Internally, this call is converted into "2. + (3)".

22. What is an Expression? What is a Statement? Difference between Expression and Statement?

Expression:

Expression is a value that means it will evaluate to a Value. As an Expression returns a value, We can assign it to a variable.

Example: - Scala's If condition, Java's Ternary operator.

Statement:

Statement defines one or more actions or operations. That means Statement performs actions. As it does not return a value, we cannot assign it to a Variable.

Example: - Java's If condition.

23. What is the difference between Java's "If..Else" and Scala's "If..Else"?

Java's "If..Else":

In Java, "If..Else" is a statement, not an expression. It does not return a value and cannot assign it to a variable.

```
Example:-
int year;
if( count == 0)
   year = 2014;
else
   year = 2015;
```

Scala's "If..Else":

In Scala, "If..Else" is an expression. It evaluates a value i.e. returns a value. We can assign it to a variable.

val year = if(count == 0) 2014 else 2015

NOTE:-Scala's "If..Else" works like Java's Ternary Operator. We can use Scala's "If..Else" like Java's "If..Else" statement as shown below:

```
val year = 0
if( count == 0)
   year = 2014
else
   year = 2015
```

24. Is Scala an Expression-Based Language or Statement-Based Language? Is Java an Expression-Based Language or Statement-Based Language?

In Scala, everything is a value. All Expressions or Statements evaluates to a Value. We can assign Expression, Function, Closure, Object etc. to a Variable. So Scala is an Expression-Oriented Language.

In Java, Statements are not Expressions or Values. We cannot assign them to a Variable. So Java is not an Expression-Oriented Language. It is a Statement-Based Language.

25. Tell me some features which are supported by Java, but not by Scala and Vice versa?

Java does not support Operator Overloading, but Scala supports it.

Java supports ++ and — operators, but Scala does not support them.

Java has checked and Unchecked Exceptions, but Scala does not have Checked Exceptions.

Scala does not support break and continue statements, but Java uses them.

Scala does not have explicit Type casting, but Java supports this feature.

Scala supports Pattern Matching, but Java does not.

Java uses Primitive Data types, but Scala does not have.

Java supports static members, but Scala does not have static member's concept.

Scala supports Implicit and Traits, Java does not support them.

NOTE:-This list goes beyond one page. However, these are some important points to remember about differences in Scala and Java features to face Scala Interviews.

26. What is the difference between Function and Method in Scala?

Scala supports both functions and methods. We use same syntax to define functions and methods, there is no syntax difference.

However, they have one minor difference:

We can define a method in a Scala class or trait. Method is associated with an object (An instance of a Class). We can call a method by using an instance of a Class. We cannot use a Scala Method directly without using object.

Function is not associated with a class or trait. It is defined in a Scala Package. We can access functions without using objects, like Java's Static Methods.

NOTE: - We will discuss about Class, Trait,Package, Object etc in my coming posts.

27. **How many public class files are possible to define in Scala source file?**
In Java, we can define at-most one public class/interface in a Source file. Unlike Java, Scala supports multiple public classes in the same source file.
We can define any number of public classes/interfaces/traits in a Scala Source file.

28. **Like Java, what are the default imports in Scala Language?**
We know, java.lang is the default package imported into all Java Programs by JVM automatically. We don't need to import this package explicitly.
In the same way, the following are the default imports available in all Scala Programs:

```
java.lang package
scala package
scala.PreDef
```

29. **How many operators are there in Scala and Why?**
Unlike Java and like C++, Scala supports Operator Overloading. Scala has one and only operator that is "=" (equalto) operator. Other than this all are methods only.
For instance 2 + 3, here "+" is not an Operator in Scala. "+" is method available in Int class. Scala Compiler observes 2 and 3 are Integers and tries to find that "+" method in Int class. So Scala Compiler converts "2 + 3" expression into "2.+(3)" and make a call to "+" method on integer object "2" and pass integer object "3" as parameter to "+" method.
Both "2 + 3" and "2.+(3)" are equal. It's just Scala's syntactic sugar to write programs in Functional style.

30. **Mention some keywords which are used by Java and not required in Scala? Why Scala does not require them?**
Java uses the following keywords extensively:
'public' keyword – to define classes, interfaces, variables etc.
'static' keyword – to define static members.
Scala does not required these two keywords. Scala does not have 'public' and 'static' keywords.
In Scala, default access modifier is 'public' for classes,traits, methods/functions, fields etc. That's why, 'public' keyword is not required.
To support OOP principles, Scala team has avoided 'static' keyword. That's why Scala is a Pure-OOP Langauge. It is very tough to deal static members in Concurrency applications.

31. **h3>what is PreDef in Scala? What is the main purpose of PreDef in Scala?**

In Scala, PreDef is an object defined in scala package as "scala.PreDef". It is an utility object.
It defines many utility methods as shown below:
Console IO (print,println etc)
Collection utility methods
String utility methods
Implicit conversion methods
Assertion utility methods etc.
For instance, print, println, readLine, readInt, require etc methods are defined in PreDef object.

In Scala, PreDef is available to use its methods without importing in all Scala Programs because Scala Compiler imports this object into all compilation units like Class, Object, Trait etc. automatically.

Phase II

32. **What is Primary Constructor? What is Secondary or Auxiliary Constructor in Scala? What is the purpose of Auxiliary Constructor in Scala? Is it possible to overload constructors in Scala?**
Scala has two kinds of constructors:
Primary Constructor
Auxiliary Constructor
Primary Constructor

In Scala, Primary Constructor is a constructor which is defined with class definition itself. Each class must have one Primary Constructor: Either Parameter constructor or Parameterless constructor.

Example:-

```
class Person
```

Above Person class has one Zero-parameter or No-Parameter or Parameterless Primary constructor to create instances of this class.

```
class Person (firstName: String, lastName: String)
```

Above Person class has a two Parameters Primary constructor to create instances of this class.

Auxiliary Constructor

Auxiliary Constructor is also known as Secondary Constructor. We can declare a Secondary Constructor using 'def' and 'this' keywords as shown below:

```
class Person (firstName: String, middleName:String, lastName: String){
  def this(firstName: String, lastName: String){
      this(firstName, "", lastName)
  }
}
```

33. **What is the use of Auxiliary Constructors in Scala?Please explain the rules to follow in defining Auxiliary Constructors in Scala?**

In Scala, The main purpose of Auxiliary Constructors is to overload constructors. Like Java, We can provide various kinds of constructors so that use can choose the right one based on his requirement.

Auxiliary Constructor Rules:

They are like methods only. Like methods, we should use 'def' keyword to define them.

We should use same name 'this' for all Auxiliary Constructors.

Each Auxiliary Constructor should start with a call to previous defined another Auxiliary Constructor or Primary Constructor. Otherwise compile-time error.

Each Auxiliary Constructor should differ with their parameters list: may be by number or types.

Auxiliary Constructors cannot call a super class constructors. They should call them through Primary Constructor only.

All Auxiliary Constructors call their Primary Constructor either directly or indirectly through other Auxiliary Constructors.

NOTE:- If you want to learn about Scala's Constructors, please refer my Scala posts at: Primary Constructor and Auxiliary Constructor.

34. **What are the differences between Array and ArrayBuffer in Scala?**

Differences between Array and ArrayBuffer in Scala:

Array is fixed size array. We cannot change its size once its created.

ArrayBuffer is variable size array. It can increase or decrease it's size dynamically.

Array is something similar to Java's primitive arrays.

ArrayBuffer is something similar to Java's ArrayList.

35. **What is case class? What is case object? What are the Advantages of case class?**

Case class is a class which is defined with "case class" keywords. Case object is an object which is defined with "case object" keywords. Because of this "case" keyword, we will get some benefits to avoid boilerplate code.

We can create case class objects without using "new" keyword. By default, Scala compiler prefixes "val" for all constructor parameters. That's why without using val or var, Case class's constructor parameters will become class members, it is not possible for normal classes.

Advantages of case class:

By default, Scala Compiler adds toString, hashCode and equals methods. We can avoid writing this boilerplate code.

By default, Scala Compiler adds companion object with apply and unapply methods that's why we don't need new keyword to create instances of a case class.

By default, Scala Compiler adds copy method too.

We can use case classes in Pattern Matching.

By default, Case class and Case Objects are Serializable.

36. **What is the difference between Case Object and Object(Normal Object)?**

Normal object is created using "object" keyword. By default, It's a singleton object.

object MyNormalObject

Case Object is created using “case object” keywords.By default, It’s also a singleton object

case object MyCaseObject

By Default, Case Object gets toString and hashCode methods. But normal object cannot.

By Default, Case Object is Serializable. But normal object is not.

When compare to Normal Class, What are the major advantages or benefits of a Case-class?

The following are the major advantages or benefits of a Case class over Normal Classes:

Avoids lots of boiler-plate code by adding some useful methods automatically.

By default, supports Immutability because it’s parameters are ‘val’

Easy to use in Pattern Matching.

No need to use ‘new’ keyword to create instance of Case Class.

By default, supports Serialization and Deserialization.

37. What is the usage of isInstanceOf and asInstanceOf methods in Scala? Is there anything similar concept available in Java?

Both isInstanceOf and asInstanceOf methods are defined in Any class. So no need import to get these methods into any class or object.

“isInstanceOf” method is used to test whether the object is of a given type or not. If so, it returns true. Otherwise returns false.

```
    scala> val str = "Hello"
    scala>str.isInstanceOf[String]
    res0: Boolean = false
```

“asInstanceOf” method is used to cast the object to the given a type. If the given object and type are of same type, then it cast to given type. Otherwise, it throws java.lang.ClassCastException.

```
scala> val str = "Hello".asInstanceOf[String]
str: String = Hello
```

In Java, ‘instanceof’ keyword is similar to Scala’s ‘isInstanceOf’ method. In Java, the following kind of manual type casting is similar to Scala’s ‘asInstanceOf’ method.

```
AccountService service = (AccountService)
context.getBean("accountService");
```

38. How do you prove that by default, Case Object is Serializable and Normal Object is not?

Yes, By Default, Case Object is Serializable. But normal object is not. We can prove this by using isInstanaceOf method as shown below:

```
scala> object MyNormalObject
defined object MyNormalObject
scala> MyNormalObject.isInstanceOf[Serializable]
res0: Boolean = false
scala> case object MyCaseObject
defined object MyCaseObject
scala> MyCaseObject.isInstanceOf[Serializable]
res1: Boolean = true
```

39. Difference between Array and List in Scala?

Arrays are always Mutable where as List is always Immutable.

Once created, We can change Array values where as we cannot change List Object.

Arrays are fixed-size data structures where as List is variable-sized data structures. List’s size is automatically increased or decreased based on it’s operations we perform on it.

Arrays are Invariants where as Lists are Covariants.

NOTE:- If you are not sure about Invariant and Covariant, please read my next post on Scala Interview Questions.

40. What is the difference between “val” and “lazy val” in Scala? What is Eager Evaluation? What is Lazy Evaluation?

As we discussed in my Basic Scala Interview Questions, “val” means value or constant which is used to define Immutable variables.

There are two kinds of program evaluations:

Eager Evaluation

Lazy Evaluation

Eager Evaluation means evaluating program at compile-time or program deployment-time irrespective of clients are using that program or not.
Lazy Evaluation means evaluating program at run-time on-demand that means when clients access the program then only its evaluated.
The difference between “val” and “lazy val” is that “val” is used to define variables which are evaluated eagerly and “lazy val” is also used to define variables but they are evaluated lazily.

41. What is the Relationship between equals method and == in Scala? Differentiate Scala’s == and Java’s == Operator?

In Scala, we do NOT need to call equals() method to compare two instances or objects. When we compare two instances with ==, Scala calls that object’s equals() method automatically.
Java’s == operator is used to check References Equality that is whether two references are pointing to the same object or not. Scala’s == is used to check Instances Equality that is whether two instances are equal or not.

42. Difference between Scala’s Inner class and Java’s Inner class?

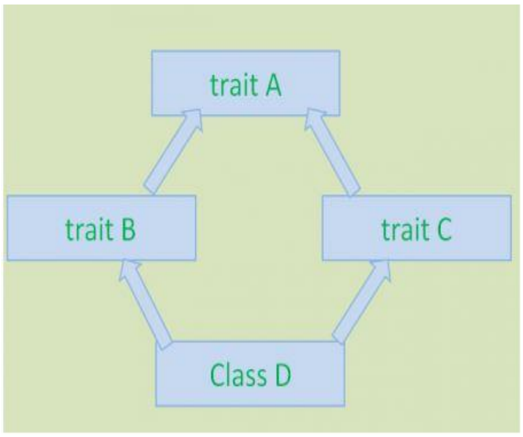
In Java, Inner class is associated with Outer class that is Inner class a member of the Outer class.
Unlike Java, Scala treats the relationship between Outer class and Inner class differently. Scala’s Inner class is associated with Outer class object.

43. What is Diamond Problem? How Scala solves Diamond Problem?

A Diamond Problem is a Multiple Inheritance problem. Some people calls this problem as Deadly Diamond Problem.
In Scala, it occurs when a Class extends more than one Traits which have same method definition as shown below.
Unlike Java 8, Scala solves this diamond problem automatically by following some rules defined in Language. Those rules are called “Class Linearization”.
Example:-

```
trait A{
  def display(){ println("From A.display")   }
}
trait B extends A{
  override def display() { println("From B.display") }
}
trait C extends A{
  override def display() { println("From C.display") }
}
class D extends B with C{ }

object ScalaDiamonProblemTest extends App {
    val d = new D
    d display
}
```



Here output is “From C.display” form trait C. Scala Compiler reads “extends B with C” from right to left and takes “display” method definition from lest most trait that is C.
NOTE:- See my post on “Scala Traits in Depth” to know this with clear explanation.

44. Why Scala does NOT have “static” keyword? What is the main reason for this decision?

As we know, Scala does NOT have “static” keyword at all. This is the design decision done by Scala Team.
The main reason to take this decision is to make Scala as a Pure Object-Oriented Language. “static” keyword means that we can access that class members without creating an object or without using an object. This is completely against with OOP principles.
If a Language supports “static” keyword, then that Language is not a Pure Object-Oriented Language. For instance, as Java supports “static” keyword, it is NOT a Pure Object-Oriented Language. But Scala is a Pure Object-Oriented Language.

45. What is the use of “object” keyword in Scala? How to create Singleton objects in Scala?

In Scala, object keyword is used the following purposes:
It is used to create singleton object in Scala.

```
object MySingletonObject
```

Here, MySingletonObject becomes singleton object automatically.

```
object keyword is used to define Scala Applications that is executable Scala programs.
object MyScalaExecutableProgram{
   def main(args: Array[String]){
       println("Hello World")
   }
}
```

When we define main method in object as shown above (its same as main() method in Java), it becomes automatically as a executable Scala program.

It is used to define static members like static variables and static methods without using 'static' keyword.

```
object MyScalaStaticMembers{
  val PI: Double = 3.1414
  def add(a: Int, b: Int) = a + b
}
```

By def PI variable and add methods will become as static members. That means we can call them without creating a separate object like MyScalaStaticMembers.add(10,20).

It is used to define Factory methods. Please see my next question about this.

How to define Factory methods using object keyword in Scala? What is the use of defining Factory methods in object?

In Scala, we use 'object' keyword to define Factory methods. The main purpose of these Factory methods in Scala is to avoid using 'new' keyword. Without using 'new' keyword we can create objects.

To define Factory methods:

We can use apply method to define Factory methods in Scala. If we have Primary Constructor and Multiple Auxiliary constructors, then we need to define multiple apply methods as shown below.

```
class Person(val firstName: String, val middleName: String, val lastName: String){
  def this(firstName: String, lastName: String){
    this(firstName,"",lastName)
  }
}
object Person{
  def apply(val firstName: String, val middleName: String, val lastName: String)
        = new Person(firstName,middleName,lastName)

  def apply(val firstName: String, val lastName: String)
        = new Person(firstName, lastName)
}
```

Now we can create Person objects without using new keyword or with new keyword upto your wish.

```
val p1 = new Person("Scala","Java")
or
val p1 = Person("Scala","Java")
```

46. What is apply method in Scala? What is unapply method in Scala? What is the difference between apply and unapply methods in Scala?

In Scala, apply and unapply methods play very important role. They are also very useful in Play Framework in mapping and unmapping data between Form data and Model data.

In simple words,

apply method: To compose or assemble an object from it's components.

unapply method: To decompose or dis-assemble an object into it's components.

Scala's apply method:

It is used to compose an object by using its components. Suppose if we want to create a Person object, then use firstName and laststName two components and compose Person object as shown below.

```
class Person(val firstName: String, val lastName: String)
```

```
object Person{
  def apply(firstName: String, lastName: String)
          = new Person(firstName, lastName)
}
```

Scala’s unapply method:
It is used to decompose an object into its components. It follows reverse process of apply method. Suppose if we have a Person object, then we can decompose this object into it’s two components: firstName and laststName as shown below.

```
class Person(val firstName: String, val lastName: String)
object Person{
  def apply(firstName: String, lastName: String)
          = new Person(firstName, lastName)
      def unapply(p: Person): (String,String)
          = (p.firstName, p.lastName)
}
```

47. How does it work under-the-hood, when we create an instance of a Class without using ‘new’ keyword in Scala? When do we go for this approach? How to declare private constructors in Scala?

In Scala, when we create an instance of a Class without using ‘new’ keyword, internally it make a call to appropriate apply method available in Companion object. Here appropriate apply method means that matched with parameters.
When do we choose this option: When we need to provide private private constructor and we need to avoid using ‘new’ keyword, we can implement only apply method with same set of parameters and allow our class users to create it without new keyword.

48. How do we declare a private Primary Constructor in Scala? How do we make a call to a private Primary Constructor in Scala?

In Scala, we can declare a private Primary Constructor very easily. Just define a Primary Constructor as it is and add ‘private’ just after class name and before parameter list as shown below:

```
class Person private (name: String)
object Person{
 def apply(name: String) = new Person(name)
}
```

As it’s a private constructor, we cannot call it from outside. We should provide a factory method (that is apply method) as shown above and use that constructor indirectly.

49. Does a Companion object access private members of it’s Companion class in Scala?

Generally, private members means accessible only within that class. However Scala’s Companion class and Companion Object has provided another feature.
In Scala, a Companion object can access private members of it’s Companion class and Companion class can access it’s Companion object’s private members.

50. What is the main design decision about two separate keywords: class and object in Scala? How do we define Instance members and Static members in Scala?

In Scala, we use class keyword to define instance members and object keyword to define static members. Scala does not have static keyword, but still we can define them by using object keyword.

The main design decision about this is that the clear separation between instance and static members. Loosely coupling between them. And other major reason is to avoid static keyword so that Scala will become a Pure-OOP Language.

51. What is object in Scala? Is it a singleton object or instance of a class?

Unlike Java, Scala has two meanings about ‘object’. Don’t get confuse about this, I will explain it clearly. In Java, we have only one meaning for object that is “An instance of a class”.
Like Java, the first meaning of object is “An instance of a class”.

```
val p1 = new Person("Scala","Java")
or
```

```
val p1 = Person("Scala","Java")
```

Second meaning is that object is a keyword in Scala. It is used to define Scala Executable programs, Companion Objects, Singleton Objects etc.

52. **What is a Companion Object in Scala? What is a Companion Class in Scala? What is the use of Companion Object in Scala?**

In simple words, if a Scala class and object shares the same name and defined in the same source file, then that class is known as "Companion Class" and that object is known as "Companion Object".

When we create a Class by using Scala "class" keyword and Object by using Scala "object" keyword with same name and within the same source file, then that class is known as "Companion Class" and that object is known as "Companion Object".

```
Example:-
Employee.scala
class Employee{ }
object Employee{ }
```

In Scala, The main purpose of Companion Object is to define apply methods and avoid using new keyword in creating an instance of that Companion class object.

53. **How to implement interfaces in Scala?**

As we know from Java background, we use interface to define contact.

However, there is no interface concept in Scala. Even, Scala doesn't have interface keyword. Scala has a more powerful and flexible concept i.e. trait for this purpose.

54. **What is Range in Scala? How to create a Range in Scala?**

Range is a Lazy Collection in Scala. Range is a class available in 'scala' package like 'scala.Range'. It is used to represent a sequence of integer values. It is an ordered sequence of integers.

```
Example:-
scala> 1 to 10
res0: scala.collection.immutable.Range.Inclusive = Range(1, 2, 3, 4, 5, 6, 7, 8, 9, 10)
scala> 1 until 10
res1: scala.collection.immutable.Range = Range(1, 2, 3, 4, 5, 6, 7, 8, 9)
```

55. **How many values of type Nothing have in Scala?**

In Scala, Nothing type have no values that is zero. It does not have any values. It is a subtype of all Value classes and Reference classes.

56. **How many values of type Unit have in Scala?**

In Scala, Unit is something similar to Java's void keyword. It is used to represent "No value exists". It has one and only one value that is ().

57. **What is a pure function?**

A pure function is a function without any observable side-effects. That means it returns always same results irrespective how many times we call it with same inputs.

A pure function always gives same output for the same inputs.

For Example:-

```
scala> 10 + 20
res0: Int = 30
scala>
scala> 10 + 20
res0: Int = 30
```

Here "+" a pure function available in Int class. It gives same result 30 for same inputs 10 and 30, irrespective how many times we call it.

In FP, What is the difference between a function and a procedure?

Both are used to perform computation, however they have one major difference in Functional Programming world.

A function is a computation unit without side-effect where as a Procedure is also a computation unit with side-effects.

58. **What are the major differences between Scala's Auxiliary constructors and Java's constructors?**

Scala's Auxiliary constructor is almost similar to Java's constructor with few differences.

Compared to Java's constructors, Auxiliary constructors have the following few differences:

The auxiliary constructors are called using "this" keyword.

All auxiliary constructor are defined with the same name that is "this". In Java, we use class name to define constructors.

Each auxiliary constructor must start with a call to a previously defined auxiliary constructor or the primary constructor.
We use 'def' keyword to define auxiliary constructors like method/function definition. In Java, constructor definition and Method definition is different.

59. What is the use of 'yield' keyword in Scala's for-comprehension construct?

We can use 'yield' keyword in Scala's for-comprehension construct. 'for/yield' is used to iterate a collection of elements and generates new collection of same type. It does not change the original collection. It generates new collection of same type as original collection type.
For example, if we use 'for/yield' construct to iterate a List then it generates a new List only.

```
scala> val list = List(1,2,3,4,5)
list: List[Int] = List(1, 2, 3, 4, 5)
scala> for(l <- list) yield l*2
res0: List[Int] = List(2, 4, 6, 8, 10)
```

60. What is guard in Scala's for-comprehension construct?

In Scala, for-comprehension construct has an if clause which is used to write a condition to filter some elements and generate new collection. This if clause is also known as "Guard".
If that guard is true, then add that element to new collection. Otherwise, it does not add that element to original collection.
Example:- For-comprehension Guard to generate only Even numbers into new collection.

```
scala> val list = List(1,2,3,4,5,6,7,8,9,10)
list: List[Int] = List(1, 2, 3, 4, 5 , 6 , 7 , 8 , 9 , 10)
scala> for(l <- list if l % 2 =0 ) yield l
res0: List[Int] = List(2, 4, 6, 8, 10)
```

61. How Scala solves Inheritance Diamond Problem automatically and easily than Java 8?

If we use Java 8's Interface with Default methods, we will get Inheritance Diamond Problem. Developer has to solve it manually in Java 8. It does not provide default or automatic resolution for this problem.
In Scala, we will get same problem with Traits but Scala is very clever and solves Inheritance Diamond Problem automatically using Class Linearization concept.
In Scala, Pattern Matching follows which Design Pattern? In Java, 'isinstanceof' operator follows which Design Pattern?
In Scala, Pattern Matching follows Visitor Design Pattern. In the same way, Java's 'isinstanceof' operator also follows Visitor Design Pattern.