**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)
  }
}
```

**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.

**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.

**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.

**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.

**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");
```

**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
```

**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.

**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.

**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.

**Difference between Scala's Inner class and Java's Inner class?**

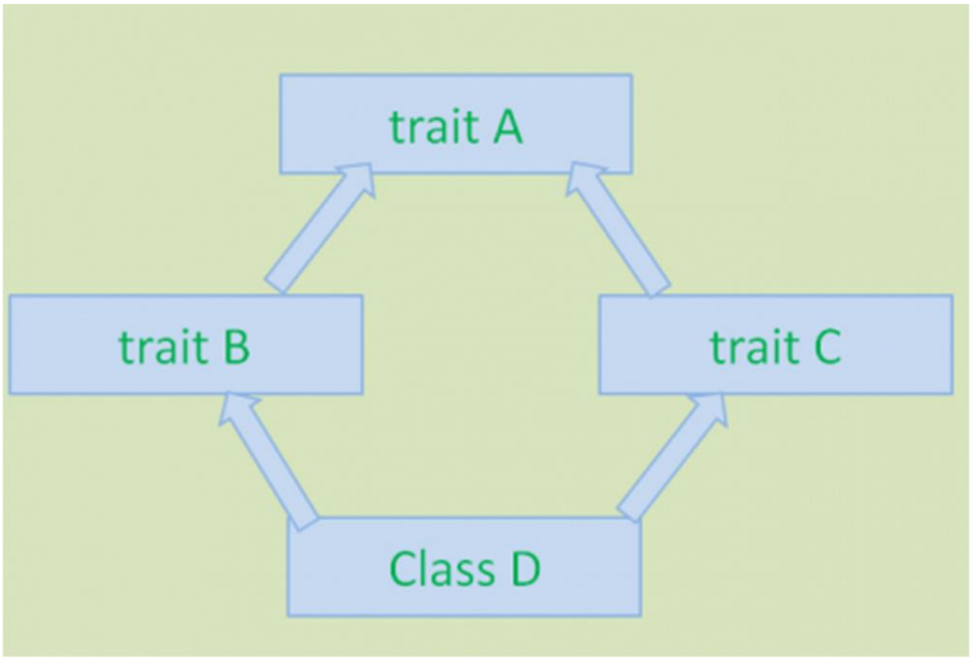
In Java, Inner class is associated with Outer class that is Inner class a member of the Outer class.

Unlike Java, Scala treats the relationship between Outer class and Inner class differently. Scala's Inner class is associated with Outer class object.

**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.

**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.

**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")
```

**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)

}
```

**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.

**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.

**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.

**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.

**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.

**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.

**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.

**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)
```

**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.

**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 ().

**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> 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.

**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.

**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)
```

**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)
```

**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.