Basics of Scala

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Final Project

1. Question 1

Resources:

* Equals method: <https://www.geeksforgeeks.org/scala-string-equals-method-with-example/>
* hashCode method: <https://www.geeksforgeeks.org/scala-string-hashcode-method-with-example/>
* toString method: <https://www.geeksforgeeks.org/scala-int-tostring-method-with-example/>
* copy method: <https://www.educative.io/answers/what-is-copy-in-scala>

Observations:

* Synthetic Methods using equals(), hashCode(), toString, and copy(). All these methods are related to the class “Person”. The idea for this code comes from the copy method source.
* We proceed to create person 1 and person, which are instances, in order to compare them using the equals method.
* We end up having False as an answer as well as different hashcodes for each “person” as seen in the image below. We finally apply the toString method to get the string representation of the object.
* The copy method was used to create a new instance of the case class with modified fields. “Person2Modified” is the copy of person 2 and includes new values like age 30 and salary 6000.

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1. Question 2

Resources:

* Checking objects: <https://stackoverflow.com/questions/44454287/scala-how-to-check-whether-a-object-is-instance-of-array>
* Checking objects: <https://stackoverflow.com/questions/11290169/how-does-isinstanceof-work>
* Stack to list: <https://www.geeksforgeeks.org/scala-stack-tolist-method-with-example/>
* Arrays: <https://www.geeksforgeeks.org/scala-arrays/>
* Vectors: <https://www.geeksforgeeks.org/scala-vector/>
* toList: <https://www.geeksforgeeks.org/scala-map-tolist-method-with-example/>
* toVector: <https://www.geeksforgeeks.org/program-to-convert-java-list-to-a-vector-in-scala/>
* mkString: <https://www.geeksforgeeks.org/scala-list-mkstring-method-with-a-separator-with-example/>

Observations:

* Basic operations on Arrays, Lists, and Vector Methods.
* This code is very basic, we start by creating an array and proceed to create a list and eventually a vector from that array using the assign method.
* I decided to include the “isInstanceOf[Array[\_]]” to check whether the array is in fact and array. We do the same procedure for both the list and vector.
* Array, the chosen operation for this was to calculate the sum of all its element using a for loop.
* List, the operation was to find the maximum element within the list using the max method.
* Vector, we finalize the code by creating a new vector by merging two vectors together as shown in the above results.
* Operations and ideas came from Geek for Geeks sources and StackOverFlow sources above. You could also see the sources right above each code for this part.

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1. Question 3

* Modifiers: <https://www.geeksforgeeks.org/access-modifiers-in-scala/>
* New keyword: <https://stackoverflow.com/questions/9727637/new-keyword-in>

Observations:

* This code looks simply, but it was kind of tricky to put together. It shows the how the public, private, and protected modifiers interact with each other.
* The idea behind these codes came from Geeks for Geeks and it explains the use of each modifier. The public modifier can be access anywhere. The private can only be used inside the defining class or through one of its objects. The protected modifier can be access from sub classes of the base class in which the member has been defined.
* “class abc” contains public variable x.
* “class xyz” contains private variable y variable (access only via xyz) and protected variable x (access via xyz and subclass new1).
* Within “class xyz” the display() method has y = 5 and modifier() updates “e.x” (from class abc) to match “class xyz’s” x value.
* “class new1 extends xyz” contains method display2(). This class gets the values and methods from the “class xyz”. Display2() has its own x value of 10 and sets x value from the “class abc” to its own x value -> “e.x”. This code prints its own x value of 10 and it also updates the value of “e.x” which it’s also 10.
* Main method calls all methods to print results using the new instances from each class.

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1. Question 4

Resources:

* While Loop: <https://www.geeksforgeeks.org/while-and-do-while-loop-in-scala/>
* For Loop: <https://www.geeksforgeeks.org/for-loop-in-scala/>
* For Loop: <https://stackoverflow.com/questions/6833501/efficient-iteration-with-index-in-scala>
* Foreach: <https://stackoverflow.com/questions/45165065/foreach-loop-in-scala>
* Foreach: <https://www.baeldung.com/scala/foreach-collections>
* Java foreach: <https://www.geeksforgeeks.org/how-to-change-values-in-an-array-when-doing-foreach-loop-in-javascript/>

Observations:

* Code shows interaction between while loop, for loop, and foreach loop.
* While loop method continues as long as element is less than the length of the array. It adds +3 to the elements in position: 0, 3, 6, 9 etc. finally it adds +3 after the iterations.
* For loop method: use the element index and adds +5 for each element within the array.
* Foreach loop: this code came from the JAVA foreach loop updating elements source. Just like the for loop, it uses element indices and adds +7 to each element within the array.

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1. Question 5

Resources:

* Filter method: <https://alvinalexander.com/scala/how-to-use-filter-method-scala-collections-cookbook/>
* Yield method: <https://www.geeksforgeeks.org/scala-yield-keyword/>

Observations:

* This last code shows the basic usage of filter and yield methods. We initialize the code by creating an array named “numbers” and we proceed to filter this array in order to create the new “FilterMethod” array. This new array contains numbers that are greater than 9. “YieldKeyword” iterates over the elements from the above array and use the if statement to keep elements that are greater than 13.

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Codes:

// Question 1 (Synthetic Methods)

object FPQuestion1 {

private case class Person(name: String, age: Int, salary: Int)

def main(args: Array[String]): Unit = {

val person1 = Person("Carolina", 28, 5000) // creating instance person 1

val person2 = Person("Vicente", 27, 5000) // creating instance person 2

// Using the Equals() method

val EqualsMethod = person1.equals(person2) // lets compare them

println(s"Are person1 and person2 equal? $EqualsMethod")

// hashCode() method

val HashCode1 = person1.hashCode() // integer

val HashCode2 = person2.hashCode() // integer

println(s"hashCode for person1 is: $HashCode1")

println(s"hashCode for person2 is: $HashCode2")

// toString method

val toString1 = person1.toString // no need to use () -> toString() string representation

val toString2 = person2.toString // no need to use () -> toString() string representation

println(s"The string representation of person1 is: $toString1")

println(s"The string representation of person2 is: $toString2")

// Copy() method

val person2Modified = person2.copy(age = 30, salary = 6000) // new instance along with new values

println(s"Applying the copy() method to person2: $person2Modified") // should be Vicente, 30, 6000

}

}

// Question 2

object FPQuestion2 {

def main(args: Array[String]): Unit = {

val array1 = Array(3.0, 5.0, 5.5, 7.5, 9.0) // Creating array with elements

if (array1.isInstanceOf[Array[\_]]) // checking if it's an array

println("array1 is an Array")

println("The array elements are: ")

for (elem <- array1) {

println(elem)

}

println("\n")

val list1 = array1.toList // Converting array to list using the toList method

if (list1.isInstanceOf[List[\_]]) // checking if it's a list

println("list1 is a List")

print("Check the list: ")

println(list1)

println("\n")

val vector1 = list1.toVector // Converting list to vector using the toVector method

if (vector1.isInstanceOf[Vector[\_]]) // checking if it's a vector

println("vector1 is a Vector")

print("Check the vector: ")

println(vector1)

println("\n")

// Basic operations -> Array (calculate the sum of all array elements)

// total: https://www.tutorialspoint.com/scala/scala\_arrays.htm

var total = 0.0

for (elem <- array1) {

total += elem

}

println("The total number of elements in the Array is: " + total)

// Basic operations -> Lists (maximum element of list)

// max: https://www.geeksforgeeks.org/scala-list-max-method-with-example/

val MaxList = list1.max

println("The largest of all the elements in the list is: " + MaxList)

// Basic operations -> Vector (creating a new vector by merging two vectors together)

// vector: https://www.geeksforgeeks.org/scala-vector/

val vector2 = Vector(50.0, 100.0)

val NewVector = vector1 ++ vector2

println("Merging Vector 1 and Vector 2:")

println(NewVector.mkString(" "))

}

}

// Question 3

class abc { // public modifier

var x: Int = 222 // variable x -> public member

}

class xyz {

private var y: Int = 579 // variable y -> private member (accessed via class xyz)

protected var x: Int = 999 // variable x -> protected member (accessed via class xyz and subclass new1)

// class xyz contains functions/methods display() and modifier()

def display(): Unit = {

y = 5

println(y)

}

def modifier(e: abc): Unit = {

e.x = x

println(e.x)

}

}

// Class that extends to xyz

class new1 extends xyz {

// contains function/method display2()

def display2(e: abc): Unit = {

x = 10

println(x)

e.x = x

println(e.x)

}

}

object FPQuestion3 {

def main(args: Array[String]): Unit = {

val NewAbc = new abc()

val NewXyz = new xyz()

val New1 = new new1()

NewXyz.display()

NewXyz.modifier(NewAbc)

New1.display2(NewAbc)

}

}

// Question 4

object FPQuestion4 {

private val numbers = Array(5, 7, 9, 11, 13, 15) // lets create an Array

private def WhileLoop(): Unit = { // While Loop method

var elem = 0

while (elem < numbers.length) { // loop continues as long as element is less than length of array

numbers(elem) = numbers(elem) + 3 // adding + 3 to elements in position 0, 3, 6, 9 etc

elem += 3 // adding + 3 after iteration

}

}

private def ForLoop(): Unit = { // For Loop method

for (elem <- numbers.indices) {

numbers(elem) = numbers(elem) + 5 // adding +5 of each element within the array

}

}

// Foreach Loop: https://www.baeldung.com/scala/foreach-collections

// Java Foreach Loop updating elements: https://www.geeksforgeeks.org/how-to-change-values-in-an-array-when-doing-foreach-loop-in-javascript/

private def ForeachLoop(): Unit = { // JAVA - foreach loop

numbers.indices.foreach(elem => numbers(elem) = numbers(elem) + 7) // add +7 to each element within the array

}

def main(args: Array[String]): Unit = {

WhileLoop()

println(s"The While Loop results are: ${numbers.mkString(", ")}") // format suggestion IntelliJ

ForLoop()

println(s"The For Loop results are: ${numbers.mkString(", ")}") // format suggestion IntelliJ

ForeachLoop()

println(s"The Foreach Loop results are: ${numbers.mkString(", ")}") // format suggestion IntelliJ

}

}

// Question 5

object FPQuestion5 {

def main(args: Array[String]): Unit = {

val numbers = Array(5, 7, 9, 11, 13, 15, 17, 20, 22) // Creating Array

val FilterMethod = numbers.filter(\_ > 9) // filters elements greater than 9

// YieldKeyword: iterates over the elements from the FilterMethod array and uses if statement to keep elements greater than 13

val YieldKeyword = for (elem <- FilterMethod if elem > 13) yield elem // yield method

println(s"The elements inside the array are: ${numbers.mkString(", ")}") // format suggestion IntelliJ

println(s"Numbers that are greater than 9: ${FilterMethod.mkString(", ")}") // format suggestion IntelliJ

println(s"Getting numbers greater than 13: ${YieldKeyword.mkString(", ")}") // format suggestion IntelliJ

}

}