EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

Mathematisch-Naturwissenschaftliche Fakultät

Programmiersprachen

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Object Meets Function

Assignment 2 – Winter Semester 23/24

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Handin Please submit this homework until Tuesday, December 5th 2023 via email to Steven Lolong (steven.lolong@uni-tuebingen.de) before 23:59.

Email Format Use this format for email's subject: **OmF-W23/24-Assign**[no]**-**[YourName]

File Use scala source code format (.scala) and for the explanation please use the comment (single line or multi line comment format).

Task 1: Function (33 Points)

1.1 Nested function (8 Points)

1. What is a closure? Give an example to justify your explanation! (4 points)
2. What is lexical scoping? Give an example! (4 points)

1.2 First-class function (FcF) and Higher-order function (HoF). Please explain the function abstraction and function application below. Is it FcF or HoF? (10 Points)

1.2.1 Function abstraction (5 points):

1. def multiply(a: Int, b: => Int) : Int = a * b
2. def multiply(a: Int, b: Int)(c: (Int, Int) => Int) : Int = c(a,b)
3. def multiply(a: Int, b: Int) = a * b
4. def multiply(a: Int) : (Int => Int) = (b: Int) => a * b
5. def multiply(a: Int) (b: Int) = a * b

1.2.2 Function application (5 points):

1. multiply(3)(2)
2. multiply(3)(2)((a: Int, b: Int) => a * b)
3. multiply(3, (b: Int) => b * 3)
4. multiply(3, (b: => Int) => b * 3)
5. multiply(3, doubleIt(3))

1.3 Currying Function. Refer to Task 1.2.1 and Task 1.2.2. Could you find where is a currying function and not a currying function? Please explain your answer! (10 points)

1.4 . Refer to Task 1.2.1. Could you find out where is the function that has Call-by-Name and where Call-by-Value is? Please explain your answer! (5 points)

Task 2: Callback function(4 Points)

The idea is to create a callback function to print "Hello"to the user. There is a function like:

```
def execXTimes(callback: () => Unit, numTimes: Int) =
  for
    i <- 1 to numTimes
  do
    callback()
```

Please make a new function named sayHello so when I call

```
execXTimes(sayHello, 4)
```

it will print on terminal

```
Hello
Hello
Hello
Hello
```

Task 3: Complete the code (6 Points)

3.1 What is '???'? (3 points)

```
scala> val sum = (a: Int, b: Int, c: Int) => a + b + c
scala> val f = sum(???)
scala> f(3)
res0: Int = 6
```

Please replace the '???' mark so it will not show an error when you call f(3); otherwise, it will return 6

3.2 What is '!!!'? (3 points)

```
def saySomeThing(prefix: String) = { !!! }
val sayHello = saySomeThing("Hello")
sayHello("Steven") // the result is: "Hello Steven"
```

Please replace the '!!!' mark so it will not show an error when you call sayHello("Steven"); otherwise, it will return "Hello Steven".

Task 4: Mini Project (6 Points)

1. Write a program with a function that will find the minimum and the maximum value from numbers input by the user until the user typing-in "quit". (4 points)
2. Write a function to take a string from the user and return the inverse of the input string. Note: you can't use Scala's primitive (built-in) reverse function. (3 points)