Model Answers for Module BUCI007H4

Birkbeck

(University of London)

BSc/FD EXAMINATION

Department of Computer Science and Information Systems

Introduction to Programming (BUCI007H4)

CREDIT VALUE: 15 credits

Summer 2018

Date of examination: XXXDAY ? MAY 2018
Duration of paper: 14:30 – 16:30

The programming language is PYTHON.

There are **ten** questions in this paper.

Answer all **ten** questions.

Each question carries **10** marks in total.

Calculators and other electronic devices are not permitted.

The examination is closed book.

No supplementary material is provided.

This paper is not prior disclosed.

The quote marks for strings are in this style ″string″.

1. (a) Which of the following are accepted by the compiler as names of variables and which are not accepted? (**5** marks)

    i)   ZZZZ
    ii) oscar_6
    iii) _dollar$
    iv) 0Ooo
    v)   O00oo

    (b) Consider the following code. (**5** marks)

```
a = 2
b = 7
c = 3
d = 4
e = 4
a = a + a * a
b = 3 * b // 4
c = round(400 / (300 / (200 / (11 % c))), 2)
d = 10 ** d * 3 ** 2
e = round(34 / e + 6)
```

    What are the values of a, b, c, d and e?

    Answer:

    (a) i)   ZZZZ: Accepted
         ii) oscar_6: Accepted
         iii) _dollar$: Not accepted
         iv) 0Ooo: Not accepted
         iv) _O00oo: Accepted
    (b) i)   a = 6
         ii) b = 5
         iii) c = 133.33
         iv) d = 90000
         v)   e = 14

2. (a) Explain the difference between compile-time error, run-time exception and run-time error. Give an example for each category. (**6** marks)

(b) A shop sells two kinds of cross-trainers Type A and B. The purchase price, marked price and discount for each type are listed below. (**4** marks)

Type	Purchase price	Marked price	Discount
A	£120	£190	10%
B	£200	£310	20%

Create necessary variables and write Python code to compare the profit made by selling one of the cross-trainers of each type. The Python output should be one of the following:

i) Selling one Type A cross-trainer makes more profit.

ii) Selling one Type B cross-trainer makes more profit.

iii) Both types make the same profit.

Answer:

(a) *i)* Compile-time error: an error in the syntax (grammar of Python) is detected by the compiler, e.g. print(Hello World!).

ii) Run-time exception: the program is compiled but the run time process stops when the error is encountered, e.g. print(1/0).

iii) Run-time error (but not an exception): the program runs but does not produce the desired result, e.g. print($''$Helo World!$''$).

1 mark for each explanation, 1 mark for each example.

(b)
```
purchasePriceA = 120
purchasePriceB = 200
markedPriceA = 190
markedPriceB = 310
discountA = 0.1
discountB = 0.2
profitA = markedPriceA*(1-discountA)-purchasePriceA
profitB = markedPriceB*(1-discountB)-purchasePriceB
if profitA > profitB:
    print("Selling one Type A cross-trainer makes more profit.")
elif profitA < profitB:
    print("Selling one Type B cross-trainer makes more profit.")
else:
```

```
                print("Both types make the same profit.")
```
1 mark for correctly defining the variables, 1 mark for correctly calculating profits, 2 marks for the comparison.

3. Find five errors in the following code. Include the line numbers to explain the errors.
(**10** marks)

```
1   originalPrice = input("Please enter the original price:")
2   if onSale:
3       discount = 0.9
4   sellPrice = trunc(originalPrice * discount, 0)
5   print("Original price (plus handling fee) is", originalPrice+1)
6   print("Sell price is" + sellPrice)
```

Answer: The five errors are:

(a)   Line 1: original is of string type and needs to be transformed into a floating point type.

(b)   Line 2: onSale is not created and initialised before use.

(c)   Line 4: function trunc is included in the math mode and needs to be imported first.

(d)   Line 4: function trunc does not need the second argument 0.

(e)   Line 4: discount is not defined if not onSale.

(f)   Line 6: Error: Can't convert 'int' object to str implicitly.

Find 5 out of the 6 errors. 2 marks each.

4. (a) Write Python code to read in from the keyboard the number of cans in a pack of cans and assign the value to the variable numCans. Set numCans to be 0 if the number entered is negative and include an error message. (**2** mark)

   (b) What is the value of numCans in your code if the user enters the following in the shell? (**3** marks)

      i) Please enter the number of cans in a pack: 5
      ii) Please enter the number of cans in a pack: 7.0
      iii) Please enter the number of cans in a pack: -4

   (c) What is printed when the following code is run? (**5** marks)

      i) print(float("3e1")+int(-7.6))
      ii) print("smart"[2] * 3 + 5 * 'kids'[-2])
      iii) print(len("\"come on!\"\\"))
      iv) print(float(str(-4*2)))
      v) bbk = ["Birkbeck", "University", "Of", "London"]
          print(bbk[1][-2])

   Answer:

   (a) numCans = int(input("Please enter the number of cans in a pack:"))
       if numCans < 0 :
           numCans = 0
           print("Error! The number cannot be negative.")

   (b) *i)* 5
       ii) Error message: ValueError: invalid literal for int() with base 10
       iii) 0

   (c) *i)* 23.0
       ii) aaaddddd
       iii) 11
       iv) -8.0
       v) t

5. (a) Consider the following statements. (**6** marks)

```
price = 1.229
print("Price per litre: %5.2f" % price)
```

Identify the format specifier, the format string and the string format operator.

(b) Consider the following statements.

```
percentage = 69.9763
print("A:", "%d" % percentage)
print("B:", "%.f" % percentage)
print("C:", "%s" % percentage)
print("D:", "%06.2f" % percentage)
```

Describe the print out when the above statements are executed. (**4** marks)

Answer:

(a) The format specifier is %5.2f, the format string is ″Price per litre: %5.2f″ and the string format operator is the second occurrence of %.
2 marks each.

(b) A: 69
B: 70
C: 69.9763
D: 069.98
1 mark each.

6. (a) Evaluate the following expressions.

   i) $4 > 7$

   ii) $4 == 4$

   iii) $2 < 5 > 6$

   iv) $4 \mathrel{!=} 5$

   (**2** marks)

   (b) Define a Boolean expression that has the value True if at least one of the three variables x, y, z has a value 0. Otherwise the expression has the value False. An if statement is not accepted. (**4** marks)

   (c) Write out the truth table for the Boolean expression A and not(B). (**4** marks)

   Answer:

   (a) False, True, False, True. 1/2 mark for each correct answer.

   (b) (x == 0 or y == 0 or z == 0). Any reasonable version accepted.

   (c)

A	B	A and not(B)
0	0	0
0	1	0
1	0	1
1	1	0

   One mark for each correct row.

7. (a) What is printed when the following code is executed, firstly with x equal to 4 and secondly with x equal to 5? Justify your answer.

```
if x == 4 :
    print("a")
else :
    if x == 5 :
        print("b")
        print("c")
```

(**2** marks)

(b) What is printed when the following code is executed, firstly with x equal to 4 and secondly with x equal to 5? Justify your answer.

```
if x == 4 :
    print("a")
else :
    if x == 5 :
        print("b")
print("c")
```

(**2** marks)

(c) Write out the code for an if statement that prints True if the variable x has a value of type float in the range 0 to 4 inclusive and that prints False if x has a value of type float strictly outside the range 0 to 4. (**6** marks)

Answer:

(a) If x is equal to 4 then the expression x == 4 has the value True and $"a"$ is printed. If x is equal to 5 then the expression x == 4 is False, thus the second block in the outer if statement is executed. The expression x == 5 is True thus $"b"$ and $"c"$ are printed on consecutive lines. One mark for the correct answer and one mark for the justification.

(b) If x is equal to 4 then x == 4 is True and $"a"$ is printed. The if statement is quitted and the statement print($"c"$), which is outside the if statements, is executed. The string $"c"$ is printed on the next line. If x == 5, then the expression x == 4 is False, thus the second block in the outer if statement is executed. The statement x == 5 is True thus $"b"$ is printed. Then the statement print($"c"$), which is outside the if statements, is executed. The string $"c"$ is printed on the next line. One mark for the correct answer and one mark for the justification.

(c)
```
if (x >= 0 and x <= 4) :    # Six marks. One mark deducted for each error
    print(True)
else :
    print(False)
```

8. (a) What is printed when the following code is executed? Justify your answer.

```
i = 0
sum = 0
while (i <= 2) :
   sum = sum+i
   i = i+1
print(sum)
```

(**4** marks)

   (b) Rewrite the code in part (a) of this question in order to replace the while loop by a for loop. (**4** marks)

   (c) Describe one application in which a while loop is preferable to a for loop. (**2** marks)

   Answer:

   (a) 0+1+2 = 3. The variable i has an initial value of 0. Each time round the loop, i is added to the running total sum and then the value of i is increased by 1. When i is equal to 3 the loop is quit without adding this value of i to the variable sum. Two marks for the correct answer and two marks for the justification.

   (b)
```
sum = 0
for i in range(3) :
   sum = sum+i
print(sum)
```

   (c) A while loop is preferred when reading in a sequence with unknown length from the keyboard. Any reasonable answer accepted. Two marks.

9. (a) Identify the function header and the function body in the following code.

```
def cubeVolume(sideLength) :
    if (sideLength <= 0) :
        return 0
    volume = sideLength**3
    return volume
```

(**2** marks)

(b) The function cubeVolume is as defined in part (a) of this question. What is printed when the following code is executed?

```
sideLength = 2
print(cubeVolume(-1))
sideLength = 3
print(cubeVolume(sideLength))
```

(**4** marks)

(c) Rewrite the function cubeVolume in part (a) of this question to obtain a new function cubeVolume2. The new function has no argument or parameter. Instead, it requests a value of sideLength from the keyboard using the prompt

Please enter the side length:

and then returns the volume of the cube. Write out the code for cubeVolume2 in full. (**4** marks)

Answer:

(a) The function header is def cubeVolume(sideLength) :. The function body is the remaining four lines of the code for cubeVolume. One mark for each correct answer.

(b) 0 and 27 on consecutive lines. A justification is not requested.

(c) def cubeVolume2() :
   sideLength = float(input("Please enter the side length:"))
   if (sideLength <= 0) :
      return 0
   volume = sideLength**3
   return volume

sideLength = int(input("Please enter the side length:")) also accepted.

10. (a) Consider the list ls = [3, 1, 7, 2]. Write out the full set of values of i such that the statement print(ls[i]) is executed without error. (**4** marks)

   (b) The list ls is as defined in part (a) of this question. List the value or values of i such that i and ls[i] have the same value, i.e. the expression i == ls[i] has the value True.

   (**2** marks)

   (c) What is printed when the following code is executed?

```
ls = [3, 1, 7, 2]
ls.insert(2,3)
print(ls)
```

   (**4** marks)

   Answer:

   (a) -4, -3, -2, -1, 0, 1, 2, 3. 1/2 mark for each correct answer. 1/2 mark deducted for each incorrect answer with a lower threshold of 0.

   (b) 1. One mark deducted for each incorrect answer, with a lower threshold of 0.

   (c) $[3, 1, 3, 7, 2]$.