Programming Fundamentals Using Python

2018

Problem Set 1 (for Day 1)

Last update: June 28, 2018

Objectives:

1. describe computation as data and operation
2. state Python basic data structures
3. use mathematical operators to calculates math expressions
4. draw flow chart for three basic structures
5. create custom data type

Note: You can solve some of the problems below using any Python interpreter. However, try to make your guesses first without trying out on the interpreter. Also, please **try not to copy and paste the code from this handout**. It is a good exercise to get used to typing code yourself (and you may discover that if you copy some of the code here and paste it into the interpreter verbatim, you'll run into errors. Bonus points for figuring out why.)

Problems: Cohort sessions

1. *Values and Data Types:* What are the outputs of the following statements?

   (a) `print(type("This is the first Week!"))`

   (b) `print("This is the first Week!")`

   (c) `print(type(24))`

   (d) `print(24)`

   (e) `print(type(2.4))`

   (f) `print(2.4)`

   (g) `print(type("24"))`

   (h) `print("24")`

   (i) `print(type(‘2.4‘))`

   (j) `print(type("""2.4"""))`

   (k) `print(type(‘‘‘2.4‘‘‘))`

   (l) `print(10300)`

   (m) `print(10,300)`

   (n) `print(10.300)`

   (o) `print(type(10.300))`

2. *Type conversion:* What are the outputs of the following statements?

   (a) `print(int(1.1))`

   (b) `print(int(9.81))`

   (c) `print(int(-9.81))`

   (d) `print(int("9.81"))`

   (e) `print(int("9.81m/s2"))`

   (f) `print(float("9.81"))`

   (g) `print(str(9.81))`

   (h) `print(type(str(9.81)))`

   (i) `print(str(int(9.81)))`

   (j) `print(type(str(int(9.81))))`

3. *Variables:* Given a Python script as follows.

```
1 message = "What's up, Doc?"
2 n = 17
3 pi = 3.14159
4 pi = 3.14
5
6 print(message)
7 print(n)
8 print(pi)
```

(a) When the program is run for the first time, what is the value of `pi` when the **program counter** is at:

i. line 2

ii. line 3

iii. line 4

iv. line 5

(b) What is the type of:

i. variable `message`

ii. variable `n`

iii. variable `pi`

4. *Variable Names:* Check whether the following variable names are valid:

(a) `23days`

(b) `days23`

(c) `day 23`

(d) `mymoney2`

(e) `mymoney$`

(f) `myclass`

(g) `class`

(h) `my_grade`

(i) `my_grade_is_B+`

Enter your answers in eDimension.

5. *Custom Data Type:* Given a Python script as follows.

```
class Coordinate:
    pass

p1 = Coordinate()
p1.x = -1.0
p1.y = 0.5
```

```
p2 = Coordinate()
p2.x = 0.3
p2.y = 1.0
```

What's the output when executing the following statements?

(a) `print(type(p1))`

(b) `print(type(p2))`

(c) `print(type(Coordinate))`

(d) `print(p1.x, p1.y)`

(e) `print(p2.x, p2.y)`

6. *Operators and Operands:* What are the outputs of the following statements?

   (a) `print(5 + 3)`

   (b) `print(5 - 3)`

   (c) `print(5 * 3)`

   (d) `print(5 ** 3)`

   (e) `print(5 / 3)`

   (f) `print(5 // 3)`

   (g) `print(5 % 3)`

7. *Operator Precedence:* What are the outputs of the following expressions?

   (a) `17-3*7//4+1`

   (b) `2**2**4*3`

8. *Updating Variables:* Write the following code in a Python script file. What are the outputs of the following code?

   (a)
   ```
   x = 3
   print(x,end=’ ’)
   x = x + 2
   print(x)
   ```

   (b)
   ```
   x = 3
   print(x,end=’ ’)
   x -= 2
   print(x)
   ```

   (c)
   ```
   x = 3
   print(x,end=’ ’)
   x *= 2
   print(x)
   ```

9. *Flowcharts and Pseudocode:* Draw flowcharts or write a Pseudocode for the following programs.

   (a) The program takes input of a student name, his or her student id, and his marks for a quiz, a project, and a final paper. The program then computes the average of the mark and displays the student's information and the average mark on the screen.

   (b) The program takes input of a student name, his or her student id, and his marks for a quiz, a project, and a final paper. The program then computes the average of the mark and determines whether the student pass or fail. If the average is equal to or greater than 50, the student passes, otherwise he fails. The program then displays the student's information, the average mark, and the status pass or fail on the screen.

   (c) The program takes input of a student name, his or her student id, and his marks for a quiz, a project, and a final paper. The program then computes the average of the mark and determines the grade of the students according to the following rules:

      - if average mark is greater or equal to 90, the grade is 'A'.
      - if average mark is greater or equal to 80 but less than 90, the grade is 'B'.
      - if average mark is greater or equal to 70 but less than 80, the grade is 'C'.
      - if average mark is greater or equal to 60 but less than 70, the grade is 'D'.
      - if average mark is less than 60, the grade is 'F'.

      The program then displays the student's information, the average mark, and the letter grade on the screen.

   (d) The program takes input of a student name, his or her student id, and his marks for a quiz, a project, and a final paper. The program then computes the average of the mark and determines the grade of the students according to the following rules:

      - if average mark is greater or equal to 90, the grade is 'A'.
      - if average mark is greater or equal to 80 but less than 90, the grade is 'B'.
      - if average mark is greater or equal to 70 but less than 80, the grade is 'C'.
      - if average mark is greater or equal to 60 but less than 70, the grade is 'D'.
      - if average mark is less than 60, the grade is 'F'.

      The program then displays the student's information, the average mark, and the letter grade on the screen. Do this for 40 students in a class.

End of Problem Set 1.