10.009 The Digital World

Term 3. 2020

Problem Set 1 (for Week 1)

Last update: January 28, 2020

Due dates:

- **Problems: Cohort sessions**: Following week: Tuesday 11:59pm.

- **Problems: Homework**: Same as for the cohort session problems.

- **Problems: Exercises**: These are practice problems and will not be graded. You are encouraged to solve these to enhance your programming skills. Being able to solve these problems will likely help you prepare for the midterm examination.

Objectives:

1. Identify different data types

2. Assign and use variables

3. Create basic custom data type

4. Display values to screen

5. Use operators in expressions

6. Evaluate the order of operators

7. State input, output, and computation process given a problem

8. Draw three basic flow-chart: sequential, conditionals, and iterative

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? Enter your answers in eDimension. **Note: Please enter an exact string. eDimension will match the string. You can use copy and paste to ensure that the string is matched. Enter `Error` if you expect an error as the answer.**

   (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? Enter your answers in eDimension. **Note: Please enter an exact string. eDimension will match the string. You can use copy and paste to ensure that the string is matched. Enter `Error` if you expect an error as the answer.**

   (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

Enter your answers in eDimension.

(b) What is the type of:

    i. variable `message`

    ii. variable `n`

    iii. variable `pi`

Enter your answers in eDimension.

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.

```
1 class Coordinate:
2     x = 3.2
3     y = -1.5
4
5 p1 = Coordinate()
6 p2 = Coordinate()
7 p2.x = 0.3
8 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)`

Enter your answers in eDimension. **Note: Please enter an exact string. eDimension will match the string. You can use copy and paste to ensure that the string is matched.**

6. *Operators and Operands:* What are the outputs of the following statements? Enter your answers in eDimension. **Note: Please enter an exact string. eDimension will match the string. You can use copy and paste to ensure that the string is matched. Enter `Error` if you expect an error as the answer.**

(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 / 3.0)`

(h) `print(5.0 / 3)`

(i) `print(5 % 3)`

7. *Operator Precedence:* What are the outputs of the following expressions? Enter your answers in eDimension. **Note: Please enter an exact string. eDimension will match the string. You can use copy and paste to ensure that the string is matched. Enter `Error` if you expect an error as the answer.**

   (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? Enter your answers in eDimension. **Note: Please enter an exact string. eDimension will match the string. You can use copy and paste to ensure that the string is matched. Enter `Error` if you expect an error as the answer.**

   (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. **Afterwhich, go to eDimension Week 1 to answer some questions on Flowchart.**

   (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.

Problems: Homework

There are no homework submission for Week1. However, you are required to do the following:

1. Do online materials for Week 1 if you have not done so. Go to eDimension to access.

2. Do online materials for Week 2. Go to eDimension to access.

End of Problem Set 1.