

10.009 The Digital World

Term 3. 2017

Problem Set 1 (for Week 1)

Last update: January 16, 2017

Due dates:

- **Problems: Cohort sessions:** Following week: Monday 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 Tutor. **Note: Please enter an exact string. Tutor 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 Tutor. **Note: Please enter an exact string. Tutor 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) 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 Tutor. **Note: Please enter an exact string. Tutor will match the string. You can use copy and paste to ensure that the string is matched.**

(b) What is the type of:

- i. variable `message`
- ii. variable `n`
- iii. variable `pi`

Enter your answers in Tutor.

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 Tutor.

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

```
1 class Coordinate(object):
2     x = 3.2
3     y = -1.5
4 p1 = Coordinate()
5 p2 = Coordinate()
6 p2.x = 0.3
7 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 Tutor. **Note: Please enter an exact string. Tutor 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 Tutor. **Note: Please enter an exact string. Tutor 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 Tutor. **Note: Please enter an exact string. Tutor 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 Tutor. **Note: Please enter an exact string. Tutor 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,
x = x + 2
print x
```

(b)

```
x = 3
print x,
x -= 2
print x
```

(c)

```
x = 3
print x,
x *= 2
print x
```

9. *Flowcharts and Pseudocode:* Draw flowcharts or write a Pseudocode for the following programs. **Checkoff: Show your flowcharts and/or pseudocode to an instructor to get a checkoff point (10 points).**

- (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 Tutor homeworks for Week1. However, you are required to do the following:

1. Read Chapters 1 and 2 of [the textbook](#) if you have not done so. This covers topics in week 1.
2. Do online materials for Week 1 if you have not done so. Go to <http://10-009.wikispaces.com/Class+Calendar> to access.
3. Read Chapter 3 on Functions and 5.11 on Keyboard input from [the textbook](#).
4. Do online materials for Week 2. Go to <http://10-009.wikispaces.com/Class+Calendar> to access.

End of Problem Set 1.