

15-110: Principles of Computing, Spring 2018

Problem Set 2 (PS2)

Due: Friday, February 2 by 2:30PM on Gradescope

HANDIN INSTRUCTIONS

Download a copy of this PDF file. You have two ways to fill in your answers:

1. Just edit (preferred) - Use any PDF editor (e.g., Preview on Mac, iAnnotate on mobile, Acrobat Pro on pretty much anything) to typeset your answers in the given spaces. You can even draw pictures or take a picture of a drawing and import it in the correct place in the document. That's it. (Acrobat Pro is available on all cluster machines.)
2. Print and Scan - Alternatively, print this file, write your answers neatly by hand, and then scan it into a PDF file. This is labor-intensive and must be done by the deadline.

Once you have prepared your submission, submit it on Gradescope. A link to Gradescope is provided in our course website. **DO NOT SUBMIT TO AUTOLAB!**

Fill in your answers **ONLY** in the spaces provided. Any answers entered outside of the spaces provided may not be graded. Do not add additional pages. We will only score answers in the given answer spaces provided. If we cannot read your answer or it contains ambiguous information, you will not receive credit for that answer.

Be sure to enter your full name below along with your section letter (A, B, C, etc.) and your Andrew ID. Submit your work on Gradescope by 2:30PM on the Friday given above.

REMINDER: Sharing your answers with another student who is completing the assignment, even in another semester, is a violation of the academic integrity policies of this course. Please keep these answers to yourself.

Name (First Last) _____

Section _____ Andrew ID _____

1. (1.5 pts) For each of the following Python expressions, show how they are evaluated by evaluating one operation at a time in the correct order and showing the reduced expression each time until you have a final answer. For example, if the Python expression is

$$3 * 4 + 5$$

then your answer would look like this:

$$\begin{array}{l} 12 + 5 \\ 17 \end{array}$$

(a) $41 - 5 * 6 / 3 + 2$

Answer: _____

(b) $3 ** 2 ** 3$

Answer: _____

(c) $23456 \% 1000 + 23456 \% 1000$

Answer: _____

2. (2 pts) For each of the following invalid Python expressions, run them in python3, write the error you get and explain the error in one sentence.

a) `True + "True"`

Answer: _____

b) `import math
math.sqrt(-1)`

Answer: _____

c) `def = 43`

Answer: _____

d) `100 % 0`

Answer: _____

3. (2 pts) A simple pendulum consists of a mass suspended by a cord with a specific length. The period of this simple pendulum can be computed using the following Python method (function) which requires the length of the cord and the acceleration due to gravity:

$$2\pi\sqrt{\frac{L}{g}}$$

```
import math
def compute_period(length, gravity_accel):
    # computes period of simple pendulum given the cord length
    # and the acceleration due to gravity
    return 2 * math.pi * math.sqrt(length / gravity_accel)
```

- (a) Suppose we use this function to compute the period of a pendulum with a cord length of 3.5 yards and an acceleration due to gravity of 32 feet/second²:

```
compute_period(3.5, 32)
```

We will get an answer but is it correct? Why or why not?

Answer: _____

- (b) Suppose we want to do the computation in part (a) but we call our function with the length of the cord only:

```
compute_period(3.5)
```

Does the method use a default value for the acceleration due to gravity (since it's a known constant) or does Python complain about this function call? Explain.

Answer: _____

- (c) Suppose we want to compute the period of a pendulum but we call our function with the arguments in reverse order so that we supply the acceleration first, for example:

```
compute_period(32, 3.5)
```

Does Python report an error? Why or why not?

Answer: _____

- (d) Suppose we replace the `return` statement from the original function with a `print` statement as shown below:

```
import math
def compute_period(length, gravity_accel):
    # computes period of simple pendulum given the cord length
    # and the acceleration due to gravity
    print(2 * math.pi * math.sqrt(length / gravity_accel))
```

What value is stored in the variable `period` if we execute the following instruction:
`period = compute_period(10.5, 32)`

Answer: _____

4. (2.5 pts) Consider the following Python method definition that uses a loop:

```
def mystery(n):
    value = 1
    for i in range(1, n+1):
        value = value * 3
    return value
```

- a) What does this method return if we call it as follows: `mystery(6)` ?
Show your work by tracing the loop as we did in class. You may not need all rows.

i	value
1	

Answer:

It returns _____

for $n = 6$.

- b) What common mathematical function is this Python method computing in general for $n > 0$? Answer: _____

- c) Suppose we replace the instruction inside the loop with the following:

```
value = value * i
```

What does this revised method return if we call it as follows: `mystery(6)`

Again, show your work by tracing the loop as we did in class. You may not need all rows.

i	value
1	

Answer:

It returns _____

for $n = 6$.

- d) What mathematical function is the revised Python method computing in general for $n > 0$? Either give its common name or write it out as a function of n .

Answer: _____

- e) Using `python3`, see what happens in the original function if we indent the `return` statement:

```
def mystery(n):  
    value = 1  
    for i in range(1, n+1):  
        value = value * 3  
    return value
```

Store the function in a file, then load it in `python3` and call it with different positive integers and observe the results. What gets returned for $n > 0$? Why?

Answer: _____

5. (2 pts) Besides learning how to use computational devices to solve a problem, we should understand what happens once the device solves the problem for us. **Read Chapter 2 (pages 19-42) of *Blown To Bits*** and answer the following questions about the digital data you generate and how all of this digital data affects your privacy.

- a. Donald takes a picture of the answer key for the next exam and posts it anonymously online. In your own words, explain how Donald could be identified, and state what example in the reading supports your answer.

Answer: _____

- b. Melania is driving down the Pennsylvania Turnpike (a toll road), and when she exits the turnpike through the EZ-Pass lane, she is immediately pulled over and issued a ticket for speeding, even though the police never saw her speeding on the highway. Based on the reading, state how this scenario might be possible.

Answer: _____
