

Name:

Email id:

Pledge: On my honor, I pledge that I have neither given nor received help on this test.

Signature:

Notices

- Based on your past educational achievements, I expect you to do well on this test.
- You can answer the questions in any order that you want.
- You must hand in both the test and your answer sheet.

Test rules

- This pledged exam is closed notes. The only device you may access during the test is your laptop.
- Do not leave the room without checking that you uploaded your programs.
- Uploading after you leave the room means you are withdrawing from the class.
- Do not access class examples or your own past assignments during the test; that is, the only code you may access or view are ones that you develop for this test.
- The only windows to be open on your computer are PyCharm and a single browser with tabs reachable from the class website.
- PyCharm can be used for developing the programs to be submitted. It cannot be used for the short answer questions.
- Programs should follow class programming practices; e.g., header comments, whitespace, identifier naming, etc.
- Whether a program is runnable is important.
- Only output what is requested.
- Whenever a written answer is a string, surround the string with single quotes. Also, make sure the uppercase and lowercase letters are easily distinguishable.
- Whenever a written answer is a list, surround the elements with a pair of brackets. The elements in the list should be separated by commas.
- Whenever a written answer is a decimal, include at least one digit after the decimal point
- Whenever a written answer is an integer, do not include a decimal point.

Part I. Expression evaluation

1. (13 points) Suppose the following definitions are in effect

```
x = 9
y = 2
s = 'python'
t = 'A B C'
u = t.strip()
v = [ 'A3', 'A141', 'A59', 'A26' ]
w = [ 3, 1, 4 ]
```

- a. What is the value of `x // y`?
 - b. What is the value of `x / y`?
 - c. What is the value of `x % y`?
 - d. What is the value of `'1' + '2'`?
 - e. What is the value of `'x' + 'y'`?
 - f. What is the value of `s[1]`?
 - g. What is the value of `s[3 : 5]`?
 - h. What is the length of `u`?
 - i. How many lines of output does the following code segment produce?

```
for r in range( 1, 4 ) :
    for c in range( 1, 4 ) :
        print( r * c )
```
 - j. What is the value of `max(v)`?
 - k. Does the function invocation `random.randrange(1, 3)` sometimes, never, or always equal 3?
 - l. Suppose `a` and `b` are integer variables. Does `(a // b) * b` sometimes, never, or always equal `a`?
 - m. What is the value of `w` after function invocation `w.append('1')`?
2. (12 points) Short answers
- a. Why does Python have `math.pi` equal 3.141592653589793 rather than 3.141592653589793238?
 - b. How does a Python program gain access to trigonometric functions; e.g., `sin()`, `cos()`, and `tan()`?
 - c. What happens when Python executes the following assignment statement?

```
f1, f2 = float( '1.5 2.5' )
```
 - d. Write a statement that randomly assigns a variable `r` either the string `'yes'` or `'no'`?
 - e. Give an example of a Python style rule.

- f. Why do we say Python strings are immutable (i.e., unchanging)?

Part II. Programming

3. (15 points) Write a program `snake.py` that prints the word *python* in all lowercase. There is to be no other output. A run of the program would be

```
python
```

4. (15 points) A DNA strand is a sequence of adenine (A), cytosine (C), guanine (G), and thymine (T) nucleotides. The standard representation for a strand is a string composed of the characters A's, C's, G's and T's; e.g., ACTAGTCC.

Produce a program `stranded.py` that prompts its user for a single DNA sequence. The program prints on separate lines respectively, the number of A, C, G, and T nucleotides. As the below program run indicates, input letter case is not to make a difference in the counting.

```
Enter DNA strand: gaGA
2
0
2
0
```

Another possible program run could be.

```
Enter DNA strand: CATGAGTACTGATT
4
2
3
5
```

5. (15 points) An Egyptian pyramid has a square base with four matching triangular faces that slope up from the base to meet at a common point. The *sloping surface area* for an Egyptian pyramid equals

$$\frac{p}{2} \sqrt{h^2 + (p/8)^2}$$

where p and h are respectively the perimeter of the pyramid base and the pyramid height.

Produce a program `egypt.py` that separately prompts and gets two decimal values. The first value is the perimeter of a pyramid base and the second value is the height of the pyramid. The program outputs the sloping surface area for such a pyramid. There is to be no other output.

A possible program run could be.

```
Enter perimeter of pyramid base: 56.0
Enter height of the pyramid: 24.0
700.0
```

Another possible program run could be.

```
Enter perimeter of pyramid base: 64.0
Enter height of the pyramid: 15.0
544.0
```

6. (15 points) Produce a program `possum.py` that prompts its user to provide a list of integers. The program prints the sum of the absolute values of those integers. Python built-in function `abs()` should prove useful.

One possible program run could be.

```
Enter integers: 1 -2 -3 4 -5 -6 -7
28
```

Another possible program run could be.

```
Enter integers: 3 -1 -4 1 5 9 -2 -6 5 3 5
44
```

7. (15 points) Produce a program `webster.py` that prompts its user for the name of a CSV web file. The program prints on separate lines, both the length of the longest row of the dataset and the total number of data values in the dataset. There should be no other output. The dataset can be found in web folder.

<http://www.cs.virginia.edu/cs1112/datasets/csv/>

For dataset `stuff.csv`,

```
secret,of,life
aa,314
59.0,TruE
faLse,3.14,271
3,1,4,1,5,9
A,B,C
00,01,10,10
+,-,*,/
```

A program run would be.

```
Enter dataset: stuff.csv
6
27
```

For dataset `pups.csv`,

```
Asta,Bo  
Brian Griffin,Buck,Buddy  
Clifford,Cujo  
Farley,Fella  
Hachiko  
Laika,Lassie  
Petey,Pluto  
Rin Tin Tin,Ruff  
Snoopy,Spot,Superdog  
Toto,Tramp  
Underdog
```

A program run would be.

```
Enter dataset: pups.csv  
3  
22
```