

LARSON—MATH 255—CLASSROOM WORKSHEET 05
Python, Strings, Booleans.

1. Create a Cocalc/Sage Cloud account.
 - (a) Start the Chrome browser.
 - (b) Go to `http://cocalc.com`
 - (c) “Create new account” using **your VCU email address** .
 - (d) You should see an existing Project for our class. Click on that.
 - (e) Click “New”, then “Sage Worksheet”, then call it **c05**.
 - (f) For each problem number, label it in the SAGE cell where the work is. So for Problem 1, the first line of the cell should be **#Problem 1**.

Review

- `solve` is SAGE’s powerful and flexible command for solving systems of one or more equations.
2. Define variables a , b and c . One way to do this is with the command `var("a b c")`. Solve $ax^2 + bx + c = 0$ by evaluating `solve(a*x**2+b*x+c, x)`.
 3. Consider the following system. Sketch the graphs of these equations on the same coordinate system (by hand and then with `plot`), then `solve` to get the exact points of intersection.
$$\begin{cases} x^2 + y^2 = 4 \\ y = x + 1 \end{cases}$$

Python

4. Type in the following program and evaluate. (Note that there are *exactly* four spaces before the word “print”).

```
def write_string(string_name):  
    print(string_name)
```

Now type `write_string("hello world!")` and evaluate.

In order to do sophisticated calculations, or to allow for multiple inputs, you will need to write *programs*. Our “hello world!” program was the first example. It included a `print` statement. Other program features, in almost any language, include *conditional statements* (if..then..) and *loops*.

5. Type in the following function definition and evaluate.

```
def absolute(x):  
    if x>=0:  
        return x  
    else:  
        return -x
```

6. Now test it. Try `absolute(4)`, `absolute(-4)`, etc.
7. The hashtag and what follows it is a *comment*. These are useful explanations or reminders and are ignored by the compiler. Add your own comment using “#” in the cell where you defined `absolute(x)` like “Math is fun!”. Evaluate to check that Sage ignores it.
8. Now *use* the program you just wrote in another program. Evaluate and test the following.

```
def abs_plus_five(x):  
    return absolute(x)+5
```

9. You don’t have to add five, you can add *any* number by adding a *parameter*.

```
def abs_plus(x,y):  
    return absolute(x)+y
```

10. Now test it. Try `abs_plus(4,5)`, `abs_plus(-4,5)`, `abs_plus(-4,23)`, etc.

String formatting.

A *string* is a sequence of *characters* (letters, numerals, symbols, etc). If you put a sequence of characters between quotes, you are telling Sage to treat what’s between the quotes as a string (instead of as a *keyword*). Strings can be manipulated, and have places that can be filled in.

11. Type and evaluate `print('This string has {}'.format('17 characters'))`. Now try replacing ‘17 characters’ with any other string.
12. Type and evaluate the following program.

```
def superstring(x):  
    print('This string has {}'.format(x))
```

13. Now test your function. Type and evaluate `superstring('black letters')`.

Boolean Expressions in Sage

A *boolean expression* is one that evaluates to True or False.

14. Evaluate `3==4`.
15. Evaluate `3==3`.
16. Evaluate `3>3`.
17. Evaluate `3>=-3`.
18. Evaluate `13%2==1`.
19. Evaluate `13%2==0`.

20. Evaluate $5!=7$.
21. Evaluate $5!=5$.
22. We will *assign* a value to a variable “a”. Then we will use that variable in a boolean expression. (These two lines can be typed in one cell, or each in its own cell). Type and evaluate:

a=5

a>2

Boolean expressions can be combined with *boolean operators* like “and” and “or”.

23. Evaluate: $3==3$ and $3==4$.
24. Evaluate: $3==3$ or $3==4$.

Getting your classwork recorded

When you are done, before you leave class...

- (a) Click the “Make pdf” (Adobe symbol) icon and make a pdf of this worksheet. (If CoCalc hangs, click the printer icon, then “Open”, then print or make a pdf using your browser).
- (b) Send me an email with an informative header like “Math 255 - c05 worksheet attached” (so that it will be properly recorded).
- (c) Remember to attach today’s classroom worksheet!