

**LARSON—MATH 255—CLASSROOM WORKSHEET 09**  
**Control—*while* loops.**

1.
  - (a) Start the Chrome browser.
  - (b) Go to `http://cocalc.com`
  - (c) Login using **your VCU email address** .
  - (d) Click on our class Project.
  - (e) Click “New”, then “Worksheets”, then call it **c09**.
  - (f) For each problem number, label it in the Sage cell where the work is. So for Problem 2, the first line of the cell should be `#Problem 2`.
2. **Warm-ups.** What will the following commands return in Sage? Answer and then use Sage to check.
  - (a) `is_prime(245); is_prime(23)`
  - (b) `even = lambda x: x%2==0; even(6); even(7)`
  - (c) `L=[2..10]; len(L)`
  - (d) `[k**2 for k in L]`

**2<sup>nd</sup> Chance.** If you didn't get these last class, make sure you can do them now.

3. Write a function `list_primes(n)` that **returns a list** of all the primes up to  $n$ . Test it.
4. Write a function `count_primes(n)` that **returns a count** of all the primes up to  $n$ . Test it.
5. Write a function `count_prime_list(L)` that **returns a count** of all the primes in an input list  $L$ . Test it.
6. **First Challenge.** You won't learn just by typing in code examples. It helps. Put you've got to solve stuff—if you are to develop real skills you can use in your other classes.

2520 is the smallest number that can be divided by each of the numbers from 1 to 10 without any remainder. What is the smallest positive number that is evenly divisible by all of the numbers from 1 to 20.

7. **Matrices Review.** Consider the system: 
$$\begin{cases} 9a + 3b + 1c = 32 \\ 4a + 2b + 1c = 15 \\ 1a + 1b + 1c = 6 \end{cases}$$
 Find a matrix that represents this system, find the row-reduced echelon form of this matrix, rewrite this as an equivalent system of linear equations and interpret.

## 8. Programming.

A *while loop* runs a block of code while a condition is still satisfied. A common way to use a while loop is in a test where you don't know precisely when the test condition will be met.

9. Type in and evaluate the function `while_test()`.

```
def while_test():
    i=0
    while i<5:
        print(i^2)
        i=i+1
```

10. A common way to use a while loop is in a test where you don't know precisely when the test condition will be met. Here we will write a function that finds which letter of a word is the first occurrence of the letter "a". The program prints "no a's when there is no "a" in the word.

```
def find_first_a(word):
    length=len(word)
    i=0
    while i<length:
        if word[i]=="a":
            return i
        else:
            i=i+1
    print("{} contains no a's".format(word))
```

Test your function with a variety of strings/words.

11. Write a definition for a function that prints the lists `[1..i]` for `i=0` to `i=4`. Use a while loop. Evaluate and test. Then try to write a definition for a function that prints the lists `[1..i]` for `i=0` to `i=n`.

## Getting your classwork recorded

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

- 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).
- Send me an email with an informative header like "Math 255—c09 worksheet attached" (so that it will be properly recorded).
- Remember to attach today's classroom worksheet!