LARSON—MATH 255–CLASSROOM WORKSHEET 08
Programming Control Flow—*for* and *while* loops.

1. (a) Start the Chrome browser.
   (b) Go to `http://cocalc.com`
   (c) You should see an existing Project for our class. Click on that.
   (d) Click “New”, then “Sage Worksheet”, then call it **c08**.
   (e) For each problem number, label it in theSage cell where the work is. So for Problem 1, the first line of the cell should be `#Problem 1`.

   Review

   A *for loop* is what we use when we want our code to run through every item x in a list.

2. Write a function list_primes(n) that **returns a list** of all the primes up to n. Test it.

3. Write a function count_primes(n) that **returns a count** of all the primes up to n. Test it.

4. Write a function count_prime_list(L) that **returns a count** of all the primes in an input list L. Test it.

5. **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.

   First idea: Try a *for loop* and for each text x check if it has remainder 0 when you divide it by 1,2,3,..,10. (See is you can get 2520 on a case where you know the answer. Then you could try for all the marbles.

   (What seems wrong about a *for loop* here? It will turn out that a *while loop* is a more natural programming control structure).

6. Can you think of ways to tweak this code, to speed it up—especially using your mathematical knowledge? **Hack away!**

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.

7. Here's a cute *program* (which is just code that does something you need done—and doesn't have to contain any function definitions):

```
n = 5
while n > 0:
    print(n)
    n = n - 1
print('Blastoff!')
```

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

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

9. 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.

Exercises

10. Rewrite your First Challenge code using a while loop.

11. Write a function `to_fahrenheit(C)` that takes a temperature C in degrees *Celsius* and converts it to degrees *Fahrenheit.*

12. Write a function `to_celsius(F)` that takes a temperature F in degrees *Fahrenheit* and converts it to degrees *Celsius.*

13. Write a function `to_polar(x,y)` that takes any pair (x, y) in Cartesian coordinates and converts it to polar coordinates (r, θ).

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 - c08 worksheet attached" (so that it will be properly recorded).

(c) Remember to attach today's classroom worksheet!