Exercises for Day 5

Exercise 1. Using a `for` loop and a recursive assignment, write a script to calculate the value of y:

$$y = \sum_{x=0}^{5} x^2 = 0^2 + 1^2 + 2^2 + 3^2 + 4^2 + 5^2$$

Have your program print the final result to a file with appropriate words. (The answer is $y = 55$.)

Exercise 2. Using a `for` loop and a recursive assignment, write a script to compute the sum

$$\sum_{x=1}^{20} \frac{1}{2^x} = \frac{1}{2^1} + \frac{1}{2^2} + \frac{1}{2^3} + \cdots + \frac{1}{2^{20}}$$

Your program must print out a table that documents the calculation. The first few lines of the table will look like the following:

```
    x               1/2^x              Sum
-------          ---------          ---------
    1            0.500000           0.500000
    2            0.250000           0.750000
    3            0.125000           0.875000
```

If you have performed the calculation correctly, then you will notice that the sum converges to 1 as you approach $x = 20$. Make sure your headings and numbers line up properly, and that you have the correct number of decimal places. Print the table to a text file.

Exercise 3. Using a `for` loop and a recursive assignment, write a script to produce a table of the sum of the square roots of all positive integers that are divisible by 7 and less than 100. Using the following format, your code must print out a table that documents the calculation. The first few lines of the table will look like the following:

```
integer          square root          sum
-------          -----------          --------
    7               2.6458           2.6458
   14               3.7417           6.3874
   21               4.5826          10.9700
```

Again, make sure your headings and numbers line up properly, and that you have the correct number of decimal places. Print the table to a text file.

Exercise 4. The factorial of a positive integer n is defined by

$$\text{factorial}(n) = n! = 1 \times 2 \times 3 \times \cdots \times (n-1) \times (n)$$

Using a `for` loop and a recursive assignment, write a script to compute 16! Your script must print out a table that documents the calculation. The first few lines of the table will look like the following:

```
integer               factorial
-------               -----------
   1                       1
   2                       2
   3                       6
   4                      24
```

Again, make sure your headings and numbers line up properly, and that you have the correct number of decimal places. Print the table to a text file.