README Chapter 3 Programming Exercises

All programming work is done in *chapter3.py,* including the extra credit

*1.Write a program to take in the radius and calculate the surface area and the volume of the sphere with that radius.* There is only one input, the radius of the sphere. From that, there are two processes that I need to go through. I need to calculate the sphere's surface area and the volume. To calculate them, I need to plug them into two formulas. Then, I output one statement that contains the surface area and volume.

*4.Write a program that calculates the distance to a lightning strike based on time between lightning and thunder.* There is only one input in this, which is the time between the lightning and thunder in seconds. Then, I multiply it by 1100 which is the distance sound travels per second. Then I output the number.

6.*Write a program that calculates the slope of a line through 2 points.* There are 4 inputs for this problem. I need to take in the first and second coordinates (x1, y1) (x2, y2). Each coordinate is made up of two variables (the x is one, y is the other), so I have 4 variables. To calculate the slope, I have to calculate the change in y divided by the change in x. Then, I output the slope with a print() statement.

7.*Write a program that calculates the distance between 2 points using the distance formula*. Like the previous problem, there are 4 inputs (the coordinates). To calculate the distance, I plug the coordinates into the distance formula, which is a formula used to calculate the distance between two points in the coordinate plane. Then, I output the output from the formula.

8. *Calculate the Gregorian Epact*. To solve this problem, I took in the input of the year. Then I plugged it into the given formula and outputted it.

9. *Write a calculator to calculate the area of a triangle given the length of the three sides using some formulas.* The inputs are the three sides of the triangles. After I get the inputs, I plug them into the formula given in the book and output the result from the formulas.

10.*Write a program to determine the length of a ladder required to reach a given height when leaned against a house.* There are two inputs. The height of the ladder and the angle measure. The first step to solving this is to convert the angle to radians because the trigonometric functions in Python math require radians. Using basic trigonometry, I know that the length of the ladder is the height of the ladder on the house divided by the sine of the angle in radians. Then, after plugging a value in, I can output the resulting length.

11.*Write a program to find the sum of the first n natural numbers.* The input is n, the number of natural numbers. I wrote this program considering that the first n natural numbers is all integers greater than or equal to 1. I know that because there is a sum, I need to use an accumulator variable. Then, I need to have a loop where it adds the loop counter (the i in for i in range()) to the accumulator. Because natural numbers are all integers greater than or equal to zero, I have to add 1 to my loop iterations because the loop starts counting at 0. Then, I output the accumulator.

12. *Write a program that finds the sum of the cubers of the first n natural numbers.* I used almost the exact same process as number 11. The only difference is instead of adding the loop counter to the accumulator, I add the loop counter cubed to the accumulator. Everything else is the same.

13. *Write a program to sum a series of numbers given by the user*. This problem has an indefinite number of inputs. To solve this, I need to get the number of elements in the list. After that, I have a for loop that gets input that many times and adds it to an accumulator. Then I print out the value of the accumulator at the end.

14. *Write a program that finds the average of a series of numbers.* This problem has a near identical process to problem 13. The only difference is instead of printing out the accumulator, I print out the accumulator divided by the number of inputs.

15. *Write a program that estimates pi with the formula 4/1 - 4/3 + 4/5 …* There is one input which is the precision of pi. To solve this, I broke down the formula. I see that each new number is added or subtracted and it switches each time. I also see that the denominator of the fractions increases by 2 each time. All together, to solve, I wrote a loop that does three things. It adds the quantity of 4 divided by a number that increments 2 each time times an inverter which changes between 1 and -1 (to achieve the plus then minus…). Second, it inverts the next multiplier so it switches between adding and subtracting. Third, it adds 2 to the amount that divides 4. Then, I output the accumulator variable.

16. *Write a program to calculate the nth fibonacci number*. To solve this, I wrote a program that first sets the second number to another storing variable. Then, I add together the number and the previous number. Then I set the first number to the previous second number. This all goes in a loop that gets iterated n times. Lastly, I print the value of the first stored number, which is the nth fibonacci number.