

Basic Python

Lab Exercise 3

1. Lists, Tuples, and Sets

A. Examine the program *lab3.py*. In this program, there is a variable called *cartesian* which is a list of tuples containing cartesian (x,y) coordinate points.

Using this data please do the following:

A. Create a new list that converts these cartesian points to polar coordinates.

Note that the formulas for converting x,y coordinates to polar coordinates are as follows:

Calculating r

$$\sqrt{(x^2 + y^2)}$$

Calculating θ

$$\theta = \text{atan}(y/x)$$

The square root and arc tangent functions are part of the Math python module. Access them by using *Math.sqrt()* and *Math.atan()*.

B. Some of the elements in the cartesian list are duplicates. Before calculating the polar coordinates, remove all duplicate entries from the cartesian list. Hint: Use a set to help check for unique values.

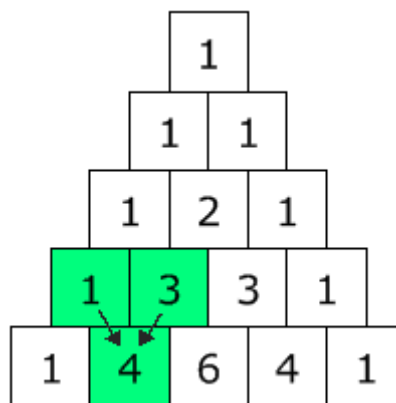
C. Using the *range* function in Python. Create a list of the first 10000 integers. Calculate all of those integers that are *perfect* numbers.

A perfect number is one that for every positive divisor of that number (excluding the actual number itself), the sum of those divisors add up to the number. For example, the number 6 is a perfect number, as the positive divisors of 6 are 1,2, and 3.

Summing the divisors $3+2+1 = 6$.

1A. Calculate Pascal's Triangle

Blaise Pascal was a French mathematician that invented, among other things the concept of *Pascal's Triangle*. Pascal's Triangle is a number pattern in the shape of a triangle where each number is the sum of the numbers directly above it. So, for example a Pascal's triangle might look like this:



Prompt the user for a size for the triangle, then print out each row of the triangle. Consider using the *zip* built-in function to help you achieve this.