**03: FILE PROCESSING**

**1: What is the primary difference between for and while loops? When might you use each?**

The main difference between for and while loops is when and how they terminate. In a for loop, the number of iterations required is specified before the loop has been run. The loop iterates for that given amount of times, and then stops. Meanwhile, in a while loop, the number of iterations depends on when a specific parameter or case is met. The while loop keeps on iterating until a certain condition is met, then ceases. There must be a mechanism within the loop to change the condition on which the while loop iteration is based. Otherwise, the code will either a) never run or b) continue to iterate indefinitely (infinite loop).

**2: How many iterations did you need to accurately calculate π out to the sixth decimal place? Twelfth? 24th? How accurate is your estimate of π after 2 iterations?**

Only one iteration (using Srinivasa Ramanujan’s infinite series for π) was needed to accurately calculate pi to the sixth decimal place (difference between math.pi and the value obtained using the series was on the order of 10-8).

Two iterations were required to accurately calculate pi to the twelfth decimal place.

After three iterations the difference between math.pi and the value obtained was displayed as 0.0. In other words, the difference between math.pi and the value returned by the series was on an order smaller than the number of bits/digits that make up floats in Python (typically 32 or 64 bits).

After two iterations, the estimate of pi deviate from the stored value of math.pi by a number on the order of 10-16. In other words, it was correct to 15 decimal places.

**3: What are the difference ways you can access a file, and why would you use each?**

You can open a file by assigning a variable to open(filename, ‘r’), access the data from the file (perhaps by adding it to a list or dictionary) and then closing the file. Alternatively, you can use with open(filename, ‘r’): and read/access the data. The advantage of the latter method is that you don’t need to use the close function to close the file; it closes automatically. Forgetting to close a file uses memory unnecessarily. However, the first method of opening a file is more straightforward to read, understand and use.

**4: Explain why using with statements are safer for working with files.**

With statements are safer for working with files because, as mentioned above, you do not need to carry out the extra step of closing the file once the data has been accessed; one you break out of the indentation (within the ‘with’ statement), the file closes automatically. Leaving a file open wastes memory and may slow processing speeds.

**5: What is an iterable? Why are they helpful?**

An iterable is any object you can loop over in a for loop. They are useful because they can be used to relate numbers in data sets to one another by iterating through them all; for example, iterating through data stored in an iterable (eg. a list, a tuple or a dictionary) can be used to find many parameters relating to the dataset as a whole, such as the mean, minimum/maximum and mode of the values (as just some examples).