**Mathematics**

Time to address one of the cornerstones of programming: mathematics. In order to carry out mathematical operations we should first take a look at what operators are available:

* + add
* - subtract
* \* multiply
* / divide
* // floor division
* \*\* exponential
* % modulus

Let's write a short script to test each of these operators and see what they do.

**Maths.py**

print("24 + 8 =", 24 + 8)

print("88 - 17 =", 88 - 17)

print("6 \* 12 =", 6 \* 12)

print("50 / 2 =", 50 / 2)

print("81.7 // 12 =", 81.7 // 12)

print("5 \*\* 3 =", 5 \*\* 3)

print("25 % 4 =", 25 % 4)

The first four operators should come naturally to you, though the other three may not be so clear.

Floor division simply rounds down the result from a division operation, so while 81.7 / 12 would normally result in 6.8083333333333…, 81.7 // 12 will return 6.0. Exponential simply multiplies a number to a given power, so 5 \*\* 3 here is equivalent to 5 \* 5 \* 5. What modulus does is return the remainder of a division operation. So with 25 % 4, 4 goes into 25 six times with 1 left over.

Save the above code and open a new file. Now we'll try something a bit harder.

**More\_maths.py**

my\_int = 18

result = (my\_int + 6) \* 3

print("Result:", result)

apples = 7

oranges = 12

bananas = 5

average = int((apples + oranges + bananas) / 3)

print("Average fruit quantity:", average)

operation = 3 + 2 + 1 - 5 + 4 % 2 - 1 / 4 + 6

print("Operation:", operation)

minute = 1

hour = minute \* 60

minutes\_in\_12\_weeks = ((hour \* 24) \* 7) \* 12

print("Minutes in a 12 week period:", minutes\_in\_12\_weeks)

One thing to point out before we continue is the use of 'int()' when calculating an average of 3 values. 'int()' forces the result of the operation to be an integer rather than a float, basically removing the decimal point and any numbers following it. It depends on the situation, but there are times when you may want to force your variable data types for consistency. Maintaining control over data types can also help prevent unwanted results.

As you can see we can create some rather long operations. Knowing the order of operations will help you understand and predict the results of these operations:

* Parenthesis
* Exponentials
* Multiplication
* Division
* Addition
* Subtraction

This is known as PEMDAS. Operations within parenthesis are done first, then exponentials. Multiplication and division share equal priority as do Addition and subtraction which are done last.

Try solving the following problem on paper first before typing it into the editor and seeing if you got the same result:

(5 + 3 - 1) \* (21 / 3) + 6

**A note on operators**

I would recommend typing out operators with a space around them. It looks neater and is easier to read which is important when you move on to writing longer, more complex scripts.