2.1 Assignment: Numeric Operations

Instructions

Follow the instructions for submitting a Jupyter Notebook assignment in the submitting assignments documentation.

1. Numeric Operations (20 Points)

```
a = 402
b = 1855

x = 41.151309
y = -95.919741
```

Given the preceding variable definitions, answer complete the questions below.

a. Compute the absolute value of `y`

b. Add `x` and `y` and multiple the result by `a`

c. Calculate the remainder leftover after dividing `b` by `a` (i.e. `b/a`)

d. Calculate `a` to the power of `3`

e. Show how to convert `a` to a floating point number

f. Multiple `x` by `y` and round the result to two signficant digits

g. Compute the bitwise *or* of `a` and `b`

h. Compute `x` divided by negative `y`

i. Compute `a` added to `b` divided by `x` minus `y`

j. Compute the floored quotient of `b` and `x`

In [88]:
```
a = 402
b = 1855

x = 41.151309
y = -95.919741
```

In [89]:
```
# a
print('a=', abs(y))
# b
print ('b=', a*(x+y))
# c
print('c=', b%a)
# d
print('d=', a**3)
# e
print('e=', float(a))
# f
print('f=', round(x*y, 2))
# g
print('g=', a&b)
# h
print('h=', x/-y )
# i
print('i=', a+b/x-y )
# j
print('j=', b//x)
```

```
a= 95.919741
b= -22016.909664000003
c= 247
d= 64964808
e= 402.0
f= -3947.22
g= 274
h= 0.4290181413229629
i= 542.9972864068789
j= 45.0
```

2. Integer Division (2 Points)

What is the difference between dividing using the `//` operator and the `/` operator? For instance, what is the difference between `4/2` and `4//2` ?

The '/' operator means classic and true division that will give you a floating number after dividing but using the '//' operator means that the results from the operator means that you will be given the lowest number.

In [90]:
```
# 4/2 prints the floating number while 4//2 prints the floor number
(4/2), (4//2)
```

Out[90]: (2.0, 2)

3. Number Representations (4 Points)

Pick an integer number between 33 and 126. Print the following information about this number.

1. Its binary representation

2. Its hexadecimal representation
3. Its octal representation
4. The character corresponding to its Unicode point code.

In [91]:
```
# integer number is 36

# 1
bin(36)
```

Out[91]: '0b100100'

In [92]:
```
# integer number is 36

#2
hex(36)
```

Out[92]: '0x24'

In [93]:
```
# integer number is 36

#3
oct(36)
```

Out[93]: '0o44'

In [94]:
```
# integer number is 36

#4
chr(36)
```

Out[94]: '$'

4. Variable Assignment (4 Points)

Consider the following two Python code examples. In both cases, we assign a value to variable `a`, assign variable `b` to `a` and then make changes variable `a`. Why is it that in the first example, changes to `a` do not affect `b`, but in the second example they do?

Example 1:

```
In [1]:  a = 1
         b = a
         a += 1
         print(b)

Out [1]: 1
```

Example 2:

```
In [2]:   a = [1, 2, 3]
          b = a
          a.append(4)
          print(b)

Out [2]:  [1, 2, 3, 4]
```

The reason is because in the second example a was replaced with the object that it referenced in the list and b is referencing the list now. So, when 4 was added tothe list the new list was displyed for b. However, in the first list a was referenced to something else with the + and b was not referenced to that one so that is why no new result was displayed for b.

5. Dynamic Typing (6 Points)

Static typing vs. dynamic typing is one of computer programmings most bitter "holy wars (http://wiki.c2.com/?HolyWar)'. As a data scientist, it is important to understand the difference between static and dynamic typing and the pros/cons of each approach.

Answer each of the following questions in your own words.

a. What is the difference between static and dynamic typing?

The difference between static and dynamic typing is that in static typing to change a variable you will always have to compile this step where you will not in dynamic typing it does so automatically. Static typing is less open to change than dynamic typing.

b. What are the benefits of static typing over dynamic typing?

Some benefits of static typing is that it is less likely to have mistakes and errors than dynamic typing and the code is more solid in static typing,

c. What are the benefits of dynamic typing over static typing?

There is no compiling step when changing variables, it can be more adaptable, it does not require as much time to debug, and less code to write.

6. Garbage Collection (4 Points)

a. Explain what *garbage collection* means in connection to programming languages.

This means that when a variable is assigned to an object and then goes on to be reassigned to other objects, the previous ones will be reclaimed.

b. How does CPython implement garbage collection?

This is done through referencing, this is how objects are reclaimed with cyclic references.