

Floats, Expressions, and Modules

CAC 180

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Floats

- Why do you think decimal numbers are called floats?
- To write scientific notation (6.02×10^{23}), we can use a shortcut
 - The letter e can be used in place of the $\times 10$
 - $6.02e23$
 - This can also work for negative numbers. How would you write the number 0.002?

Floats

- Why do you think decimal numbers are called floats?
 - Because the decimal point can float around to any spot
- To write scientific notation (6.02×10^{23}), we can use a shortcut
 - The letter e can be used in place of the $\times 10$
 - $6.02e23$
 - This can also work for negative numbers. How would you write the number 0.002?
 - $2e-3$

**What is an overflow
error?**

Overflow Error

- Floats in Python can only hold so much
- When they are filled with too large of a number, the memory space overflows
- The limit is between 2.3×10^{-308} and 1.8×10^{308}
- If the number is smaller or larger than this range, it results in an overflow error

Formatting

- We may simply need to round a floating point number
- `round(number)` - this will round the number to a whole number
- We can also use `format`. `format(number, '.0f')`
- What is the difference between the following? Just put each of the following lines in a print statement.
 - `round(5.98)`
 - `format(5.98, '.0f')`
 - `int(5.98)`

Formatting

- What happens if you change the code a little?
 - `format(5.98, '.1f')`

Formatting

- There is an alternative way to use the format method.
 - `{:.2f}'.format(number)`
 - `{:.2f}'.format(5.98)`
- What do you think the following will do in a print statement?
 - `${:.2f}'.format(5.98)`

Symbols

Arithmetic operator	Description
+	The addition operator is + , as in $x + y$.
-	The subtraction operator is - , as in $x - y$. Also, the - operator is for negation , as in $-x + y$, or $x + -y$.
*	The multiplication operator is * , as in $x * y$.
/	The division operator is / , as in x / y .
**	The exponent operator is ** , as in $x ** y$ (x to the power of y).

Compound operator	Expression with compound operator	Equivalent expression
Addition assignment	<code>age += 1</code>	<code>age = age + 1</code>
Subtraction assignment	<code>age -= 1</code>	<code>age = age - 1</code>
Multiplication assignment	<code>age *= 1</code>	<code>age = age * 1</code>
Division assignment	<code>age /= 1</code>	<code>age = age / 1</code>
Modulo (operator further discussed elsewhere) assignment	<code>age %= 1</code>	<code>age = age % 1</code>

Large Numbers

- We can't write 1,000,000,000
- Is there another way we can write it so that it is easy to read?

Large Numbers

- We can't write 1,000,000,000
- Is there another way we can write it so that it is easy to read?
 - 1_000_000_000

Division vs. Modulo

- Division tells you exactly how many times a number can be divided by another
- Integer division tells you how many times a number can **EVENLY** be divided by another
- Modulo tells you the **REMAINDER** when dividing one number by another
- If you have 235 minutes, can you break that down to hours and minutes?

Modules

- Provides a method of writing blocks of code in different files
- This allows us to reuse these modules or portions of code in future programs
- Write a file as you typically would - include all the necessary code to accomplish your task
- In a second file that takes advantage of what you wrote, you must import it
- If you want to test out the code that you're writing within a file, you should use the following
 - `if __name__ == "__main__":`



repl

Math Module

- Module that has been written for you to include a variety of functions
 - Trigonometric functions
 - Square root
 - Exponent
 - Power
 - Constants: pi, e
- Must import it

Let's Write

- Let's calculate the hypotenuse of a triangle:
 - Ask the user for the side length of a
 - Ask the user for the side length of b
 - Print the hypotenuse
 - $a^2 + b^2 = c^2$

Group Worksheet: Formatting

For Next Time...

- Lab Friday: Posted on Moodle, welcome to start working on it
- First homework assignment posted. We don't know everything yet to complete it, but you can start looking at it and thinking through the problem.