Python Programming

Operator Precedence

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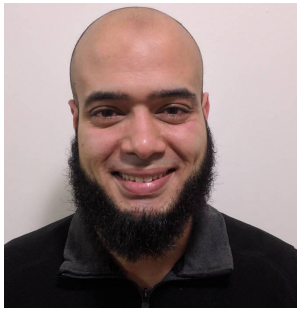

Remember math rules

- How do you solve: 2 + **3 * 4** - 6/2
  - * applied first so ⇒ 2 + 12 - **6/2**
  - / division applied ⇒ **2 + 12** - 3
  - Then left to right ⇒ 14 - 3 ⇒ 11
  - In general: * / are applied first before - +
- What about 2 + **3 * (4** - 6/2)
  - Inside parentheses first
  - So solve 4-6/2 ⇒ 4-3 ⇒ 1
  - Now: 2 + 3 * 1 ⇒ 2 + 3 ⇒ 5
- Math defines for us the order of operations
  - E.g. () is first. * / are before + -
  - This is called precedence

Operator Precedence

Precedence	Operator Sign	Operator Name
Highest	**	Exponentiation
	+X, -X, ~X	Unary positive, unary negative, bitwise negation
	*, /, //, %	Multiplication, division, floor, division, modulus
	+, -	Addition, subtraction

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Examples

- 1 + 2 * 3 = 1 + 6 = 7
- 2 * 3 ** 4 * 5
  - 3 ** 4 evaluated first to 81
  - Now: 2 * 81 * 5 = 810
- -2 ** 4
  - Tricky. -2^4 = -2 * -2 * -2 * -2 = 16
  - But according to rules ** applied before -
  - So it is actually - **2**4** = -16

Parentheses () first

- Expressions in parentheses are always **performed first**, before expressions that are not parenthesized
- Use parentheses to force order / resolve ambiguity
- 2 + 3 * (7 - 6) / 2 : First (7-6)
  - 2 + **3 * 1** / 2
  - 2 + **3** / 2
  - 2 + 1.5 ⇒ 3.5

Several Parentheses

- How to solve?
  - Find some deepest parentheses, compute its expression: and so on till no parentheses
- (a + (b - (d * e))) / (a + c) + ((1+((x+y)*2)) * z)
  - Let a = 1, b = 2, c = 3, d = 4, e = 5, x = 6, y = 7, z = 1
  - (x+y) ⇒ (a + (b - (d * e))) / (a + c) + ((1+**(13*2)**) * z)
  - (13*2) ⇒ (a + (b - (d * e))) / (a + c) + (**(1+26)** * z)
  - (1+26) ⇒ (a + (b - (d * e))) / (a + c) + **(27 * z)**
  - (27 * z) ⇒ (a + (b - (d * e))) / **(a + c)** + 27
  - (a+c) ⇒ (a + (b - **(d * e)**)) / 4 + 27
  - (d * e) ⇒ (a + **(b - 20)**) / 4 + 27
  - (b - 20) ⇒ **(a + -18)** / 4 + 27
  - (a - 18) ⇒ **-17 / 4** + 27 ⇒ **-4.25 + 27** ⇒ **22.75**

"Acquire knowledge and impart it to the people."

"Seek knowledge from the Cradle to the Grave."