$2 + 3 * 4 = 14$, because PEMDAS = "order of operations"

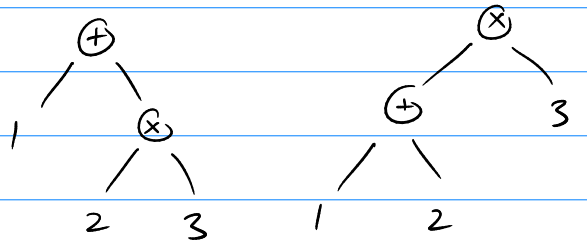
X = order you should do operations.

$0 * (2^{9736}) = 0$

$1 + 2x = 5$ $= 1+(2x)$ not $(1+2)x$.

"order of operations" has to do w/ what an expression means, not order in which to do things.

$1 + 2 \times 3$



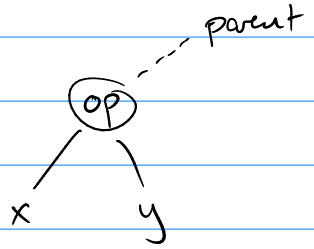

$(1 + (2 \times 3))$ $((1+2) \times 3)$

Expressions are trees — but we represent them as strings, which introduces ambiguity. Parens + operator precedence rules allow us to disambiguate.

(Could use postfix notation — operators written after their arguments).

e.g. $123\times+$ $12+3\times$

To decide whether parentheses are needed:

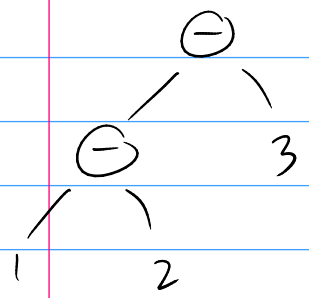


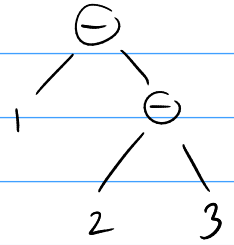

when printing $x$ op $y$, need parens if precedence of op < precedence of parent.

$(1+2+3+4)$ $(((1-2)-3)-4)$

+, −, × etc. are left-associative

i.e. a sequence of them has parens inserted L→R.




$1-2-3$ $1-(2-3)$

If parent has same precedence, and we are on the opposite side from current operator's associativity, we need parens.