

# Day 2, Session 1: Order of operations and negative numbers

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# Evaluating expressions

- Example expression:  $3(1 + 2) + 5$
- How do we evaluate the above expression? In other words:
  - Which terms do we compute first?
  - Are there rules for evaluating expressions?

# Order of operations

- Rules for evaluating expressions:
  1. Parentheses
  2. Exponents
  3. Multiplication and division
  4. Addition and subtraction
- A handy memory device: PEMDAS — Please Excuse My Dear Aunt Sally

## Example 1: order of operations in action!

- Example from slide 2:  $3(1 + 2) + 5$
- This notation is equivalent to  $3 \times (1 + 2) + 5$

- Apply PEMDAS:

1. Parentheses: add 1 and 2

2. Exponents: none

3. Multiplication: multiply 3 and 3

4. Division: none

5. Addition: add 9 and 5

6. Subtraction: none

Current Expression

$3(3) + 5$

$3(3) + 5$

$9 + 5$

$9 + 5$

14

- The final answer is 14!

## Example 2: order of operations with exponents!

- Expression:  $\frac{(2^2 + 5)^2}{3 \times 3} + 5$

- Apply PEMDAS:

1. Parentheses:  $2^2 + 5$ .

- Need to apply PEMDAS again!

- 1.1 Parentheses: none

- 1.2 Exponents:  $2^2 = 4$

- 1.3 Multiplication/division: none

- 1.4 Addition/subtraction:  $4 + 5 = 9$

2. Exponents:  $9^2 = 81$

3. Multiplication:  $3 \times 3 = 9$

4. Division:  $81/9 = 9$

5. Addition/subtraction:  $9 + 5 = 14!$

Current Expression

$$\frac{(2^2+5)^2}{3 \times 3} + 5$$

$$\frac{(2^2+5)^2}{3 \times 3} + 5$$

$$\frac{(4+5)^2}{3 \times 3} + 5$$

$$\frac{(4+5)^2}{3 \times 3} + 5$$

$$\frac{(9)^2}{3 \times 3} + 5$$

$$\frac{81}{3 \times 3} + 5$$

$$\frac{81}{9} + 5$$

$$9 + 5$$