Order of Operation

Common Mistakes
Order of Operation – PEMDAS

Parenthesis

Exponents

Multiply and Divide
In the order you see it from left to right!

Add and Subtract
PEMDAS – Parenthesis Common Mistakes

How to work: Parenthesis

- Add/Subtract, apply exponent rules, multiply/divide **inside** the parenthesis first.
  - Step 1: Multiply 6 and 2
  - Step 2: Subtract -4 and 12
  - Step 3: Multiply 3 and 8

- Ex. \(3(-4 + 6 \cdot 2)\)
  = \(3(-4 + 12)\)
  = \(3(8)\)
  = 24

Common Mistakes

- Distributing before simplifying inside the parenthesis.
  - Incorrect: \(3(-4 + 6 \cdot 2)\)
    = \(-12 + 18 \cdot 6\)
    = \(-12 + 108\)
    = 96

- Incorrectly working the inside of the parenthesis. In this case the student subtracted the -4 and 6 first instead of multiplying the 6 and 2 first.
  - Incorrect: \(3(-4 + 6 \cdot 2)\)
    = \(3(2 \cdot 2)\)
    = \(3(4)\)
    = 12

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PEMDAS – Exponents

How to work Exponents

- **Definition:** \( a x^n \)
  - \( a \) is the coefficient
  - \( x \) is the variable
  - \( n \) is the exponent

- The exponent represents the number of times you multiply the number by itself.

- **Ex.**
  
  \[
  3^3 = 3 \cdot 3 \cdot 3 = 27 \\
  4^2 = 4 \cdot 4 = 16 \\
  (-5)^2 = -5 \cdot -5 = 25 \\
  -8^2 = -1(8 \cdot 8) = -64
  \]

Common Mistakes

- Multiplying the exponent by the coefficient.
  - Incorrect: \( 4^2 = 4 \cdot 2 = 8 \)
  - Correct: \( 4^2 = 4 \cdot 4 = 16 \)

- Applying the exponent rule incorrectly with negative numbers.
  - Incorrect: \( -3^2 = -3 \cdot -3 = 9 \) \( -6^2 = -6 \cdot -6 = 36 \)
  - Correct: \( -3^2 = -1(3 \cdot 3) = -9 \) \( -6^2 = -1(6 \cdot 6) = -36 \) \( (-6)^2 = -6 \cdot -6 = 36 \)

*Remember: In order to square a negative number, the number MUST be inside the parenthesis.*

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PEMDAS – Multiplying and Dividing

How to Multiply and Divide

Multiply and divide in the order that you see it left to right.

- Ex. $-8 \cdot 2 \div 4 = -16 \div 4 = -4$
  
  $30 \div 6 \cdot 5 = 5 \cdot 5 = 25$
  
  $16 \div 8 \cdot 2 = 2 \cdot 2 = 4$

Common Mistakes

- Always multiplying first.
  - Incorrect:
    
    $16 \div 8 \cdot 2 = 16 \div 16 = 1$
    
    $-12 \div 4 \cdot 4 = -12 \div 16 = \frac{12}{16} = \frac{3}{4}$
  
  - Correct:
    
    $16 \div 8 \cdot 2 = 2 \cdot 2 = 4$
    
    $-12 \div 4 \cdot 4 = -3 \cdot 4 = -12$

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PEMDAS – Adding and Subtracting

How to add and subtract

- Add and subtract real numbers in any order.
  - Helpful hint:
    - Add up all the positive numbers
    - Add up all the negative numbers
    - Subtract once
  - Ex.
    
    \[
    -5 + 20 - 8 + 2
    = -13 + 22
    = 9
    \]

Common Mistakes

- Adding and subtracting incorrectly.
  - Incorrect:
    \[
    -15 + 6
    = 9
    \]
  - Correct:
    \[
    -15 + 6
    = -9
    \]

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