

## 1.2: Apply Order of Operations

**Goals:** \*Use order of operations to evaluate algebraic expressions

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What are the order of operations? What is the most common mistake made from using this acronym?

**PEMDAS - \*Multiplication is NOT always before division. Addition is NOT always before subtraction!**

**\*\*THINGS TO REMEMBER\*\***

- Multiply and divide in order from left to right
- Add and subtract in order from left to right
- Grouping symbols (parenthesis) work most inside to outside. Parenthesis cannot go away until there is only 1 number inside!)
- After performing one step, rewrite entire problem

**Evaluate the following expressions:**

**Ex:**  $27 \div 3^2 \cdot 2 - 3$

$$\begin{array}{r} 27 \div 9 \cdot 2 - 3 \\ 3 \cdot 2 - 3 \\ 6 - 3 \\ 3 \end{array}$$

**Ex:**  $20 - 4^2$

$$\begin{array}{r} 20 - 16 \\ 4 \end{array}$$

**Ex:**  $2 \cdot 3^2 + 4$

$$\begin{array}{r} 2 \cdot 9 + 4 \\ 18 + 4 \\ 22 \end{array}$$

**Ex:**  $32 \div 2^3 + 6$

$$\begin{array}{r} 32 \div 8 + 6 \\ 4 + 6 \\ 10 \end{array}$$

**Ex:**  $15 + 6^2 - 4$

$$\begin{array}{r} 15 + 36 - 4 \\ 51 - 4 \\ 47 \end{array}$$

**Ex:**  $7(13 - 8)$

$$\begin{array}{r} 7(5) \\ 35 \end{array}$$

**Ex:**  $24 - (3^2 + 1)$

$$\begin{array}{r} 24 - (9 + 1) \\ 24 - (10) \\ 14 \end{array}$$

**Ex:**  $2[30 - (8 + 13)]$

$$\begin{array}{r} 2[30 - (21)] \\ 2[9] \\ 18 \end{array}$$

**Ex:**  $6 + 12 \div 3 \cdot 4^2$

$$\begin{aligned} &6 + 12 \div 3 \cdot 16 \\ &6 + 4 \cdot 16 \\ &6 + 64 \\ &70 \end{aligned}$$

**Ex:**  $24 \div (4 - 1)$

$$\begin{aligned} &24 \div (3) \\ &8 \end{aligned}$$

**Ex:**  $48 - (6 + 5^2)$

$$\begin{aligned} &48 - (6 + 25) \\ &48 - (31) \\ &17 \end{aligned}$$

**Ex:**  $3[32 \div (2 + 6)]$

$$\begin{aligned} &3[32 \div (8)] \\ &3[4] \\ &12 \end{aligned}$$

**Ex:** What is the answer to:  $\frac{8+4}{5-2}$  ? 4

Can you rewrite that same expression using  $\div$  for division rather than a fraction bar and get the same answer?

$$(8 + 4) \div (5 - 2)$$

\*Fraction bars act like parenthesis. Group things on top, then on bottom.

**Evaluate the expression:**

**Ex:**  $\frac{9x}{3(x+2)}$  when  $x = 4$

$$\frac{9(4)}{3(4+2)}$$

$$\frac{36}{3(6)}$$

$$\frac{36}{18}$$

$$2$$

**Ex:**  $y^2 - 3$  when  $y = 8$

$$8^2 - 3$$

$$64 - 3$$

$$61$$

**Ex:**  $12 - y - 1$  when  $y = 8$

$$12 - 8 - 1$$

$$4 - 1$$

$$3$$

**Ex:**  $\frac{10y+1}{y+1}$  when  $y = 8$

$$\frac{10(8)+1}{8+1}$$

$$\frac{80+1}{9}$$

$$\frac{81}{9}$$

$$9$$

**Ex:**  $\frac{10x}{2(x+2)}$  when  $x = 3$

$$\frac{10(3)}{2(3+2)}$$

$$\frac{30}{2(5)}$$

$$\frac{30}{10}$$

$$3$$

**Ex:** John had 4 copies of a science report made to give his lab partners. In each copy there were 20 black-and-white pages and 5 color pages. He paid a copy center to make of a color page and  $b$  is the cost of a black-and-white page. What is the total cost for John and bind the copies? His cost, in dollars, is given by the expression  $4(5c + 20b)$  where  $c$  is the cost if a color page costs \$2 and a black-and-white page costs \$0.05?

$$4[5(2) + 20(0.05)]$$

$$4[10 + 1]$$

$$4[11]$$

$$\$44$$

How much did each report cost? How do you know?

**\$11.** If the total cost for 4 reports is \$44, then each report must cost \$11.