

## 0.1 Order of Operations

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### Order of Operations

Chapter 0 — Absolute Foundations

*Show all work. Rewrite subtraction as “add the opposite” when helpful. Use parentheses to keep your steps organized.*

Name: \_\_\_\_\_ Date: \_\_\_\_\_

#### Key Idea — Order of Operations (PEMDAS)

Always do operations in this order:

1. **P**arentheses (grouping symbols)
2. **E**xponents
3. **M**ultiplication and **D**ivision *from left to right*
4. **A**ddition and **S**ubtraction *from left to right*

**Important:** Multiplication and division are a *pair* (same priority). Addition and subtraction are a *pair* (same priority).

#### Common Mistakes to Avoid

- Doing addition before multiplication. Example:  $3 + 2 \cdot 5$  is  $3 + 10 = 13$ , not  $(3 + 2) \cdot 5$ .
- Forgetting left-to-right for  $\div$  and  $\times$ . Example:  $24 \div 3 \cdot 2$  is  $(24 \div 3) \cdot 2 = 16$ .
- Losing negative signs. Rewrite subtraction as addition:  $a - b = a + (-b)$ .
- Forgetting parentheses after a minus sign:  $-(x - 7) = -x + 7$ .

## Worked Examples (follow the order)

**Example 1.** Evaluate:  $6 + 3 \cdot 4$

$$6 + 3 \cdot 4 = 6 + 12 = 18.$$

**Example 2.** Evaluate:  $24 \div 3 \cdot 2$

$$24 \div 3 \cdot 2 = (24 \div 3) \cdot 2 = 8 \cdot 2 = 16.$$

**Example 3.** Evaluate:  $-(5 - 12) + 3^2$

$$-(5 - 12) + 3^2 = -(-7) + 9 = 7 + 9 = 16.$$

**Example 4.** Simplify:  $2(3x - (x - 4))$

$$2(3x - (x - 4)) = 2(3x - x + 4) = 2(2x + 4) = 4x + 8.$$

**Mini-check.** Evaluate:  $10 - 2 \cdot (3 + 1)$   $\Rightarrow$  \_\_\_\_\_

## Practice A — Evaluate (Warm-Up)

Evaluate.

1.  $8 + 2 \cdot 6$

2.  $30 - 5 \cdot 4$

3.  $18 \div 3 + 7$

4.  $4^2 - 3 \cdot 5$

5.  $12 \div 2 \cdot 3$

6.  $36 \div (6 \cdot 3)$

7.  $7(5 - 2) + 1$

8.  $9 - (2 + 4)^2$

## Practice B — Parentheses & Negatives

Evaluate.

1.  $-(8 - 13) + 6$

2.  $-3(2 - 7)$

3.  $5 - (3 - 9)$

4.  $2(4 - (1 - 6))$

5.  $-2^3 + 10$

6.  $(-2)^3 + 10$

## Practice C — Simplify (Variables)

Simplify completely.

1.  $3x + 2x \cdot 4$

2.  $10 - 2(3x + 1)$

3.  $4(x + 2) - 3(x - 5)$

4.  $2(3x - (x - 7))$

5.  $6 - 2(4 - x)$

6.  $-(2x - 3) + 5(x - 1)$

## Challenge (optional)

Take your time. Organize with parentheses.

1. Evaluate:  $48 \div 6 \cdot 2 + 3^2$

2. Simplify:  $2(5 - (3x - 2)) - (x - 4)$

3. Explain in one sentence why  $24 \div 3 \cdot 2 \neq 24 \div (3 \cdot 2)$ .