

## 1.3 ORDER OF OPERATIONS

Essential Question: How can you use the order of operations to evaluate expressions

NUMERICAL EXPRESSION -> An expression that contains only numbers and operations.

EVALUATE -> To find the value of a numerical expression.

### ORDER OF OPERATIONS

1) Parenthesis

2) Exponents

3) Multiplication and Division from left to right.

4) Addition and Subtraction from left to right.

### EXAMPLE 1

Evaluate the expression.

1)  $12 - 2 \times 4$

$$\begin{array}{r} 12 - 8 \\ 4 \end{array}$$

2)  $7 + 60 \div (3 \times 5)$

$$\begin{array}{r} 7 + 60 \div 15 \\ 7 + 4 \\ 11 \end{array}$$

3)  $30 \div (7 + 2^3) \times 6$

$$\begin{array}{r} 30 \div (7 + 8) \times 6 \\ 30 \div 15 \times 6 \\ 2 \times 6 \\ 12 \end{array}$$

### ON YOUR OWN

1)  $7 \cdot 5 + 3$

$$\begin{array}{r} 35 + 3 \\ 38 \end{array}$$

2)  $(28 - 20) \div 4$

$$\begin{array}{r} 8 \div 4 \\ 2 \end{array}$$

3)  $6 \times 15 - 10 \div 2$

$$\begin{array}{r} 90 - 10 \div 2 \\ 90 - 5 \\ 85 \end{array}$$

4)  $6 + 2^4 - 1$

$$\begin{array}{r} 6 + 16 - 1 \\ 22 - 1 \\ 21 \end{array}$$

5)  $4 \cdot 3^2 + 18 - 9$

$$\begin{array}{r} 4 \cdot 9 + 18 - 9 \\ 36 + 18 - 9 \\ 54 - 9 \\ 45 \end{array}$$

6)  $16 + (5^2 - 7) \div 3$

$$\begin{array}{r} 16 + (25 - 7) \div 3 \\ 16 + 18 \div 3 \\ 16 + 6 \\ 22 \end{array}$$

**EXAMPLE 2**

Evaluate the expression.

1)  $9 + 7(5 - 2)$

$$\begin{aligned} &9 + 7(3) \\ &9 + 21 \\ &30 \end{aligned}$$

2)  $15 - 4(6 + 1) \div 2^2$

$$\begin{aligned} &15 - 4(6 + 1) \div 4 \\ &15 - 4(7) \div 4 \\ &15 - 28 \div 4 \\ &15 - 7 \\ &8 \end{aligned}$$

**ON YOUR OWN**

1)  $50 + 6(12 \div 4) - 8^2$

$$\begin{aligned} &50 + 6(12 \div 4) - 64 \\ &50 + 6(3) - 64 \\ &50 + 18 - 64 \\ &68 - 64 = 4 \end{aligned}$$

2)  $5^2 - 5(10 - 5)$

$$\begin{aligned} &25 - 5(10 - 5) \\ &25 - 5(5) \\ &25 - 25 \\ &0 \end{aligned}$$

3)  $\frac{8(3+4)}{7}$

$$\begin{aligned} &\frac{8(7)}{7} \\ &1 \\ &\frac{56}{1} = 8 \end{aligned}$$

4)  $\frac{6 \cdot 4}{4 + 3^2 - 1}$

$$\begin{aligned} &\frac{24}{4 + 3^2 - 1} \\ &\frac{24}{4 + 9 - 1} \\ &\frac{24}{12} \\ &2 \end{aligned}$$

5)  $\frac{5^2 \cdot 2}{1 + 6^2 - 12}$

$$\begin{aligned} &\frac{25 \cdot 2}{1 + 6^2 - 12} \\ &\frac{50}{1 + 36 - 12} \\ &\frac{50}{25} \\ &2 \end{aligned}$$

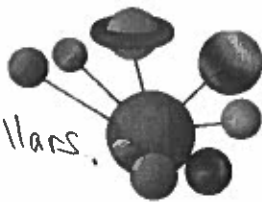
6)  $\frac{13 - 4}{18 - 4^2 + 1}$

$$\begin{aligned} &\frac{9}{18 - 4^2 + 1} \\ &\frac{9}{18 - 16 + 1} \\ &\frac{9}{2 + 1} \\ &\frac{9}{3} \\ &3 \end{aligned}$$

**EXAMPLE 3**

You buy foam spheres, paint bottles, and wooden rods to construct a model of our solar system. What is your total cost?

The total cost is 44 dollars.



Item	Quantity	Cost per item
Spheres	9	\$2
Paint	6	\$3
Rods	8	\$1

$$\begin{aligned} &\text{Cost of 9 spheres} + \text{Cost of 6 paint bottles} + \text{cost of 8 rods} \\ &2 \cdot 9 + 6 \cdot 3 + 8 \cdot 1 \\ &18 + 18 + 8 \\ &36 + 8 \\ &44 \end{aligned}$$