

Algebra I

Notes 1.4 Order of Operations

Objective: Perform calculations in the proper order.

Try these operations on your calculator:

$$2 + 3 = \quad \times 4 =$$

$$2 + 3 \times 4 =$$

$$(2 + 3) \times 4 =$$

Explain the results. _____

The ORDER OF OPERATIONS:

1. Perform all operations enclosed in symbols of inclusion (parentheses $()$, brackets $[\]$, braces $\{ \}$, and fraction bars) from innermost outward.
2. Perform all operations with exponents.
3. Perform all multiplications and divisions from left to right.
4. Perform all additions and subtractions from left to right.

The following phrases will help you to remember the correct order of operations:

P - _____ Please

E - _____ Excuse

M - _____ My

D - _____ Dear

A - _____ Aunt

S - _____ Sally

The order of multiplication/division
and addition/subtraction is left to
right.

Evaluate these expressions using the correct order of operations:

1. $100 - 4 \div 2 \div 2 =$

4. $[(3 + 2 \cdot 3) + 3] - 3^2 =$

2. $[(12 + 3) - 3 \cdot 4] \div 3 =$

5. $\frac{6 \cdot 3 + 2}{10 - 5} =$

3. $8^2 + 4 \cdot 2 - 70 \div 2 =$

Evaluate each expression.

1. $16 + 4 \cdot 8 + 2$ _____ 2. $16 + 4 \cdot (8 + 2)$ _____
3. $(16 + 4) \cdot (8 + 2)$ _____ 4. $(16 + 4) \cdot 8 + 2$ _____
5. $\frac{12 + 6}{4 + 2}$ _____ 6. $12 + 6 \div 4 + 2$ _____

Place inclusion symbols using the correct order of operations to make each equation true.

7. $27 + 5 \cdot 8 - 6 = 37$ 8. $12 \cdot 1 + 5 \div 12 = 6$ 9. $4 \cdot 5 - 3 + 2 = 10$ 10. $3 \cdot 4 + 2 \div 6 = 3$
11. Jackie worked 3 hours, $2\frac{1}{3}$ hours, and $4\frac{2}{3}$ hours this week at a part-time job. Jackie is paid \$5.50 per hour. How much did Jackie earn this week? _____
12. Which expression is not the same as the others? _____
a. $5\frac{1}{2} + 7\frac{1}{2}$ b. $5 + \frac{1}{2} + 7 + \frac{1}{2}$ c. $5 + 1 \div 2 + 7 + 1 \div 2$ d. $5 \div 7 + 1 \div 2$

Carry out the following computations using the correct order of operations. Use a calculator with algebraic logic to check your results.

13. $16 + 8 \div 2$ _____ 14. $4 \cdot 6 \div 12 + 10$ _____
15. $\frac{5 + 3 \cdot 5}{5}$ _____ 16. $\frac{36 - 6 \cdot 3}{18 \div 3}$ _____
17. $\frac{[(9 - 3) \cdot (12 + 6)]}{[(4 + 2) \cdot (2 \cdot 3)]}$ _____ 18. $\frac{2 \cdot 3 \cdot 5}{2 + 3 + 5}$ _____
19. $[(3^2 - 2^2) \cdot (10 + 2 \cdot 5)] \div 100 - 1 =$ 20. $8 \{ 7 [6 (5 + 4) + 3] - 2 \} + 1 =$

Evaluate each expression for $x = 5$, $y = 4$, and $z = 3$.

21. $x^2y + z =$ 22. $xy + z^3 =$ 23. $2xz + 3y^2 =$
24. $x^2 + y^2 + z^2 =$ 25. $\{x + (3y \div z)\} \cdot x =$ 26. $x^2y^2z^2 =$

Use the numbers 2, 4, 6, and 8 once in the equation to make the equation true.

27. $(\underline{\quad} + \underline{\quad}) - (\underline{\quad} - \underline{\quad}) = 4$
28. $(\underline{\quad} \cdot \underline{\quad}) - (\underline{\quad} \cdot \underline{\quad}) = 40$
29. $(\underline{\quad} + \underline{\quad}) \div \underline{\quad} + \underline{\quad} = 9$