

Order of Operations (Pages 8–13)

Use the properties of numbers and the **order of operations** to find the correct value of an expression. When **evaluating** an expression, replace the variables with known values and then use the order of operations.

Order of Operations	<ol style="list-style-type: none"> 1. Find the values of expressions inside grouping symbols, such as parentheses (), brackets [], and as indicated by fraction bars. 2. Do all multiplications and/or divisions from left to right. 3. Do all additions and/or subtractions from left to right.
----------------------------	---

Additive Identity	The sum of any number and 0 is equal to that number. For any number a , $a + 0 = 0 + a = a$.
Multiplicative Identity	The product of any number and 1 is equal to that number. For any number a , $a \cdot 1 = 1 \cdot a = a$.
Multiplicative Property of Zero	For any number a , $a \cdot 0 = 0 \cdot a = 0$.
Reflexive Property of Equality	Any number is equal to itself. For any number a , $a = a$.
Symmetric Property of Equality	For any numbers a and b , if $a = b$, then $b = a$.
Transitive Property of Equality	For any numbers a , b , and c , if $a = b$ and $b = c$, then $a = c$.
Substitution Property of Equality	If $a = b$, then a may be replaced by b .

EXAMPLE

Find the value of $5[4 - (9 \div 3)]$. Identify the properties used.

Simplify within the innermost grouping symbols first.

$$\begin{aligned}
 &5[4 - (9 \div 3)] \\
 &= 5[4 - 3] && \text{Substitution Property of Equality} \\
 &= 5(1) && \text{Substitution Property of Equality} \\
 &= 5 && \text{Multiplicative Identity}
 \end{aligned}$$

PRACTICE

Find the value of each expression.

1. $\frac{8}{4} + 3$

2. $12 - 6 + 2 \cdot 3$

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

Name the property of equality shown by each statement.

4. $\frac{15}{3} + 4 = 5 + 4$

5. $11 - 2 = 11 - 2$

6. If $13 = 4 + 9$, then $4 + 9 = 13$.

Find the value of each expression. Identify the property used in each step.

7. $2(12 - 4 \cdot 3)$

8. $4 + (7 - 21 \div 3)$

9. $3(2 + 1) \div 9 \cdot 5$

Evaluate each expression if $a = 4$ and $b = 5$.

10. $a + \frac{10}{b} \cdot 2$

11. $(a - 2) + 25 \div b$

12. $3(a + b) - b$

13. Standardized Test Practice Find the value of the expression $2 + (3 + 4)2 + 6 - 5(2)$.

A 10

B 11

C 12

D 13

Answers: 1. 5 2. 12 3. 12 4. Substitution 5. Substitution 6. Reflexive 7. Symmetric 8. Symmetric 9. See Answer Key 10. 8 11. 7 12. 22 13. C