

1-4 Properties of Real Numbers

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Commutative
Property

Associative
Property

Identity Property
for Addition or
Multiplication

Inverse Property
for Addition or
Multiplication

Zero Product
Property

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Multiplication Property of -1 : The product of -1 and a is $-a$.

Ex. $-1 \cdot a = -a$ $-1 \cdot 9 = -9$

What property is illustrated by each statement?

- A. $42 \cdot 0 = 0$ Zero Product Property
- B. $(y + 2.5) + 28 = y + (2.5 + 28)$ Associative Property of Addition
- C. $10x + 0 = 10x$ Identity Property for Addition
- D. $4x \cdot 1 = 4x$ Identity Property of Multiplication
- E. $x + (\sqrt{y} + z) = x + (z + \sqrt{y})$ Commutative Property of Addition

Using Properties for Mental Calculations

A movie ticket costs \$7.75. A drink costs \$2.40. Popcorn costs \$1.25. What is the total cost for a ticket, a drink, and popcorn?

Use mental math.

$$\begin{aligned} (7.75 + 2.40) + 1.25 &= (2.40 + 7.75) + 1.25 && \text{Commutative Prop. of Addition} \\ &= 2.40 + (7.75 + 1.25) && \text{Associative Prop. of Addition} \\ &= 2.40 + 9 && \text{Simplify inside parenthesis} \\ &= 11.40 && \text{Add} \end{aligned}$$

A can holds 3 tennis balls. A box holds 4 cans. A case holds 6 boxes. How many tennis balls are in 10 cases? Use mental math.

$$(3 \times 4 \times 6) \times 10$$

$$72 \times 10 = 720 \text{ tennis balls}$$

Writing Equivalent Expressions

Steps:

- 1) Group numbers that can be simplified
- 2) Use properties to group or reorder parts of the expression.

$$\begin{aligned} \text{A. } 5(3n) &= (5 \cdot 3)n && \text{Associative Prop. of Mult.} \\ &= 15n && \text{Simplify} \end{aligned}$$

$$\begin{aligned} \text{B. } (4 + 7b) + 8 &= (7b + 4) + 8 && \text{Commutative Prop. of Add.} \\ &= 7b + (4 + 8) && \text{Associative Prop. of Add.} \\ &= 7b + 12 && \text{Simplify} \end{aligned}$$

$$\begin{aligned} \text{C. } \frac{6x}{y} &= \frac{6x \cdot y}{1 \cdot y} && \text{Rewrite denominator using} \\ & && \text{Identity Property of Multiplication} \\ &= \frac{6x}{1} \cdot \frac{y}{y} && \text{Simplify} \\ &= 6x \cdot 1 && \text{Identity Property of Multiplication} \\ &= 6x \end{aligned}$$