

# Properties

**Commutative Property of Addition**  
(does NOT work with subtraction)

$$a + b = b + a \text{ (where } a \text{ and } b \text{ are real numbers)}$$

**Commutative Property of Multiplication**

$$a \times b = b \times a \text{ (does NOT work with division)}$$

**Associative Property of Addition**

$$a + (b + c) = (a + b) + c \text{ (does NOT work with subtraction)}$$

**Associative Property of Multiplication**

$$a \times (b \times c) = (a \times b) \times c \text{ (does NOT work with division)}$$

**Distributive Property**

$$a(b + c) = ab + ac$$

**Additive Identity Property**

$$a + 0 = a \quad 0 + a = a$$

**Additive Inverse Property**

$$a + -a = 0 \quad -a + a = 0$$

**Multiplicative Identity Property**

$$a \times 1 = a \quad 1 \times a = a$$

**Multiplicative Inverse Property**

$$a \times \frac{1}{a} = 1 \quad \frac{1}{a} \times a = 1$$

**Additive Property of Equality**

$$\text{If } a=b \text{ then } a + c = b + c$$

(you can add or subtract the same quantity from both sides and retain the equality).

**Multiplicative Property of Equality**

$$\text{If } a=b \text{ then } (a)(c) = (b)(c)$$

(you can multiply or divide by the same quantity on both sides and retain the equality).

Solve for  $x$  and justify each step with a reason:  $3(x - 2) + 5x = 9x - 24$

Steps:	Justification (Reasons):
$3(x - 2) + 5x = 9x - 24$	Given
$3x - 6 + 5x = 9x - 24$	Distributive Property
$3x + 5x - 6 = 9x - 24$	Commutative Property of Addition
$8x - 6 = 9x - 24$	Combine Like Terms
$8x - 8x - 6 = 9x - 8x - 24$	Subtraction Property of Equality
$0 - 6 = x - 24$	Additive Inverse Property (left) Combine Like Terms (right)
$-6 = x - 24$	Additive Identity Property
$-6 + 24 = x - 24 + 24$	Addition Property of Equality
$18 = x + 0$	Addition (left) Additive Inverse Property (right)
$18 = x$	Additive Identity Property