

Using Algebraic, Distributive Properties of Equality

Lesson Objective

INBAT write algebraic proofs and identify properties of $=$ and $\cong$

Algebraic Properties

Let a , b , and c be real numbers.

Name of Algebraic Property of Equality	Description of Algebraic Property
Addition Property of Equality add. prop. =	If $a = b$, then... $a + c = b + c$
Subtraction Property of Equality subtr. prop. =	If $a = b$, then... $a - c = b - c$
Multiplication Property of Equality mult. prop. =	If $a = b$, then... $a \cdot c = b \cdot c$
Division Property of Equality div. prop. =	If $a = b$, then... $\frac{a}{c} = \frac{b}{c} \quad c \neq 0$
Substitution Property of Equality subst. prop. =	If $a = b$, then <u>a</u> can be substituted for <u>b</u> (or <u>b</u> for <u>a</u>) in any equation or expression.

Name of Property of Equality	Real Numbers	Segment Lengths	Angle Measures
Reflexive Property of Equality reflex. prop. =	$a = a$	$AB = AB$	$m\angle A = m\angle A$
Symmetric Property of Equality Symm. prop. =	if $a = b$, then $b = a$	if $AB = CD$ and then $CD = AB$	if $m\angle A = m\angle B$, then $m\angle B = m\angle A$
Transitive Property of Equality trans. prop. =	if $a = b$ and $b = c$, then $a = c$	if $AB = CD$ and $CD = EF$ then $AB = EF$	if $m\angle A = m\angle B$ and $m\angle B = m\angle C$, then $m\angle A = m\angle C$

Example:

- Solve $3x + 2 = 23 - 4x$ for x . Justify each step.

$$3x + 2 = 23 - 4x$$

$$3x = 21 - 4x$$

$$7x = 21$$

$$x = 3$$

given

subtr. prop. =

add. prop. =

div. prop. =

The Distributive Property: Let a , b , and c be real numbers.

Sum: $a(b+c) = ab+ac$ Difference: $a(b-c) = ab-ac$

Example:

2. Solve $-5(7w+8) = 30$ for w . Justify each step.

$$-5(7w+8) = 30 \quad \text{given}$$

$$7w+8 = -6 \quad \text{div. prop. =}$$

$$7w = -14 \quad \text{subtr. prop. =}$$

$$w = -2 \quad \text{div. prop. =}$$

$$-5(7w+8) = 30 \quad \text{given}$$

$$-35w - 40 = 30 \quad \text{dist. prop.}$$

$$-35w = 70 \quad \text{add. prop. =}$$

$$w = -2 \quad \text{div. prop. =}$$

3. Solve the formula $A = \frac{1}{2}bh$ for b . Justify each step. Then find the base of a triangle whose area is 952 ft^2 and whose height is 56 ft .

↑
isolate this variable

$$A = \frac{1}{2}bh \quad \text{given}$$

$$2A = bh$$

$$\text{mult. prop. =}$$

$$\frac{2A}{h} = b$$

$$\text{div. prop. =}$$

$$b = \frac{2(952)}{56} = \boxed{34 \text{ ft}}$$