Lesson 13

Foundations of College Algebra

Addition and Subtraction Properties of Equality

Definition - Linear equations

A **linear equation in one variable** has one variable and:

- No exponents on the variable
- No variables in a denominator.

Subtraction Property of Equality

For any numbers a, b, and c, if $a = b$, then $a - c = b - c$.

That is, when you subtract the same quantity from both sides of an equation, you still have equality.

Addition Property of Equality

For any numbers a, b, and c, if $a = b$, then $a + c = b + c$.

That is, when you add the same quantity to both sides of an equation, you still have equality.

Examples

Solve each equation using the Subtraction and Addition Properties of Equality.

1. $y + 45 = -66$
2. $a - 45 = 76$

Examples

Solve each equation using the Subtraction and Addition Properties of Equality.

1. $x + 24 = 35$
2. $m - 18 = -200$
3. $a + \frac{1}{4} = \frac{3}{4}$

Multiplication and Division Properties of Equality

Division Property of equality

For any numbers a, b, and c, and $c \neq 0$, if $a = b$, then $\frac{a}{c} = \frac{b}{c}$.

That is, when you divide both sides of an equation by any non-zero number, you still have equality.

Multiplication Property of equality

For any numbers a, b, and c, and $c \neq 0$, if $a = b$, then $ac = bc$.

That is, when you multiply both sides of an equation by any non-zero number, you still have equality.

Examples

Solve the following equation using the Division and Multiplication Properties of Equality.

1. $8x = 56$
2. $20 = \frac{q}{-5}$

You Try It

Solve the following equation using the Division and Multiplication Properties of Equality.

1. $-5c = 55$
2. $\frac{z}{2} = 54$
3. $-807 = 15y$

Simplify Equations and Then Solve

Examples

Solve each equation.

1. $9x + 5 - 8x + 14 = 20$
2. $6(y - 2) - 5y = 4(y + 3) - 4(y - 1)$

3. $100 - 16 = 4p - 10p - p$

4. $0.25d + 0.10d = 6 - 0.75$

Examples

Solve each equation.

1. $c + 31 - 10 = 46$

2. $6x + 8 - 5x + 16 = 32$

3. $5(y - 6) - 4y = -6$

4. $0.05p - 0.01p = 2 + 0.24$

Translate to and Equation and Solve

How To - Translate an English Sentence to an Algebraic Equation

1. Locate the "equals" word(s). Translate to an equals sign (=).
2. Translate the words to the left of the "equals" word(s) into an algebraic expression.
3. Translate the words to the right of the "equals" word(s) into an algebraic expression.

Examples

Translate and solve.

1. The sum of $-4n$ and $5n$ is -82.

2. Avril rode her bike a total of 18 miles, from home to the library and then to the beach. The distance from Avril's house to the library is 7 miles. What is the distance from the library to the beach?

3. Aiden is 27 inches tall. He is $\frac{3}{8}$ as tall as his father. How tall is his father?

Examples

Translate and solve.

1. Three less than y is -19.

2. Mollie paid $36.25 for 5 movie tickets. What was the price of each ticket?