

1.1 Linear Equations

Equation in 1 Variable - a statement made up of two expressions that are equal, and in the statement, at least one of the expressions contains the variable.

Some examples:

$$2y + 5 = 0$$

$$4x + 5 = -2x + 10$$

$$\frac{3}{z+2} = 9$$

Linear equation in 1 variable- is an equation that has one unknown and the unknown is written to the first power.

$$ax + b = 0$$

Examples

$$4x - 3 = 12$$

$$\frac{2}{3}y + \frac{1}{5} = \frac{2}{15}$$

$$-.73p + 1.23 = 1.34p + 8.05$$

$$4x = 15$$

$$x = \frac{15}{4} \text{ or } 3.75$$

Equations can be solved expressions can not. expressions can only be simplified.

Ex 1 which of the following numbers are a solution.

$$3(x - 1) = -2x + 12$$

a) $x=5$ b) $x=3$

$$3(5-1) = -2(5) + 12$$

$$12 \neq 2$$

You do these two

$$-5x + 3 = -2$$

a) $x=-2$

$$-5(-2) + 3 = -2$$

$$13 \neq -2$$

b) $x=1$

$$-5(1) + 3 = -2$$

$$-2 = -2$$

$$3x + 2 = 2x - 5$$

a) $x=0$

b) $x=-7$

To solve an equation is to find ALL the solutions of the equation.
The solutions are called a solution set.

Addition Property of Equality

if $a = b$, then $a + c = b + c$

Multiplication Property of Equality

if $a = b$, then $ac = bc$

Use the properties to solve.

$$2x + 9 = 15$$

$$2x = -6$$

$$x = -3$$

$$3y - 2 + 5y = 2y + 5 + 4y + 3$$

$$8y - 2 = 6y + 8$$

$$-6y + 2 \quad -4y + 2$$

$$2y = 10$$

$$y = 5$$

You try

$$2x + 3 + 5x + 1 = 4x + 10$$

Solving using the distributive property

$$4(x + 3) = x - 3(x - 2)$$

$$4x + 12 = x - 3x + 6$$

$$4x + 12 = -2x + 6$$

$$+2x \quad -12 \quad +2x \quad -6$$

$$6x = -6$$

$$x = -1$$

you try

$$4(x + 3) - 8x = 3(x + 2) + x$$

Steps for solving a linear equation

Step 1: Remove any parentheses using the Distributive Property.

Step 2: Combine like terms on each side of the equation.

Step 3: Use the Addition Property to get all variables on one side of the equation and all constants on the other.

Step 4: Use multiplication Property to get the coefficient of the variable to equal 1.

Step 5: Check your answer to be sure that it satisfies the original equation.

Solving a linear equation that contains fractions.

$$\frac{9y}{6} + \frac{y}{6} = \frac{10}{6}$$

$$\left(\frac{9y}{6} + \frac{y}{6}\right) = \left(\frac{10}{6}\right) \cdot 6$$

$$9y + y = 10$$

$$\frac{5(y+1) + 2(y-2)}{20} = \frac{y+7}{20}$$

$$5y + 5 + 2y - 4 = y + 7$$

$$\begin{array}{r} 7y + 1 = y + 7 \\ -y \quad -1 \quad -y \quad -1 \\ \hline 6y = 6 \\ \textcircled{y=1} \end{array}$$

$$\frac{0.5x - 0.4}{-0.3x + 0.4} = \frac{0.3x + 0.2}{-0.3x + 0.4}$$

$$\frac{0.2x}{0.2} = \frac{0.6}{0.2}$$

$$x = 3$$

conditional equation- an equation that is true for some values but not others.

$$x + 7 = 10$$

Contradiction- an equation that is false for all values.

$$3x + 8 = 3x + 6$$

identity - an equation that is true for all values.

$$2x + 3 + x + 8 = 3x + 11$$

$$\begin{aligned} & \overbrace{-4(x-2)} + \overbrace{3(4x+2)} = 2(4x+7) \\ & -4x + 8 + 12x + 6 = 8x + 14 \\ & 8x + 14 = 8x + 14 \\ & 0 = 0 \end{aligned}$$

Mathman
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