

Solving Linear Equations

$$x + 4 = 7 \Rightarrow \text{Equation}$$

$x \Rightarrow \text{unknown (variable)}$

$\text{values of } x \Rightarrow \text{solutions (roots)}$

$\text{finding the solution} \Rightarrow \text{solving the equation}$

Properties of equality

- $A = B \Leftrightarrow A + C = B + C$
- $A = B \Leftrightarrow CA = CB \ (C \neq 0)$

Solving Linear Equations

A linear equation in one variable is

$$ax + b = 0$$

where **a** and **b** are real numbers and **x** is the variable.

Linear equations

$$4x - 5 = 3$$

$$2x = \frac{1}{2}x - 7$$

$$x - 6 = \frac{x}{3}$$

Nonlinear equations

$$x^2 + 2x = 8$$

$$\sqrt{x} - 6x = 0$$

$$\frac{3}{x} - 2x = 1$$

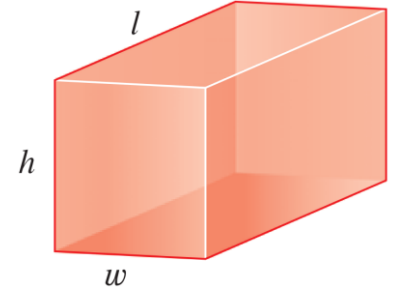
Example 1: solve the equation

$$7x - 4 = 3x + 8$$



Solving for One Variable in Terms of Others

Example 2: The surface area A of the closed rectangular box can be calculated from the length l , the width w , and the height h according to the formula



$$A = 2lw + 2wh + 2lh$$

Solve for w in terms of the other variables in this equation.

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Example 3: Determine whether the given value is a solution of the equation.

- $4x + 7 = 9x - 3$
(a) $x = -2$
(b) $x = 2$

- $\frac{1}{x} - \frac{1}{x-4} = 1$
(a) $x = 2,$
(b) $x = 4$



Example 4: The given equation is either linear or equivalent to a linear equation. Solve the equation.

- $2x + 3 = 7 - 3x$
- $2(1 - x) = 3(1 + 2x) + 5$
- $\frac{4}{x-1} + \frac{2}{x+1} = \frac{35}{x^2-1}$
- $(t - 4)^2 = (t + 4)^2 + 32$

Example 5: Solve the equation for the indicated variable.

- $PV = nRT$; for R
- $\frac{a+1}{b} = \frac{a-1}{b} + \frac{b+1}{a}$; for a
- $\frac{ax+b}{cx+d} = 2$; for x

