2.1 Linear Equations in One Variable

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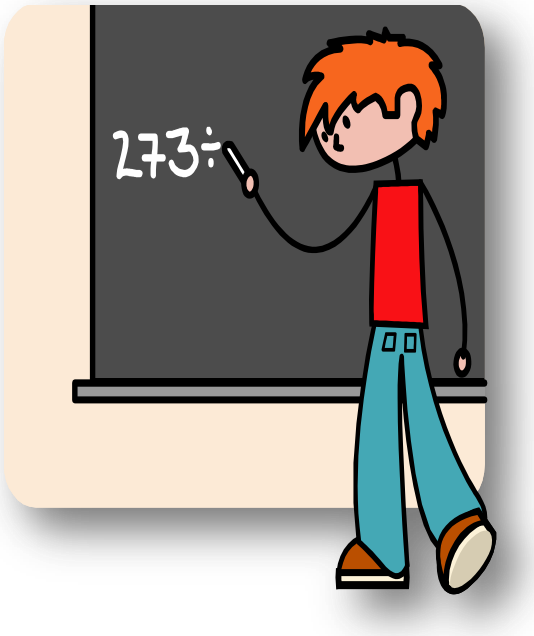

Objectives:

- **Distinguish between expressions and equations.**
- **Identify linear equations, and decide whether a number is a solution of a linear equation.**
- **Solve linear equations by using the addition and multiplication properties of equality.**
- **Solve linear equations by using the distributive property.**
- **Solve linear equations with fractions or decimals.**
- **Identify conditional equations, contradictions, and identities.**

- Expression
- Equation

Example 1

- Decide whether each of the following is an ***equation*** or an ***expression.***

$$9x + 10 = 0$$

$$9x + 10$$

Linear Equations

Linear Equation in One Variable

A linear equation in one variable can be written in the form

where A, B, and C are real numbers, with $A \neq 0$.

Addition Property of Equality

Addition Property of Equality

For all real numbers A, B, and C the equations

are equivalent.

The same number may be added to each side of an equation without changing the solution set.

Multiplication Property of Equality

Multiplication Property of Equality

For all real numbers A and B, and for $C \neq 0$, the equations

are equivalent.

Each side of the equation may be multiplied by the same nonzero number without changing the solution set.

Example 2

- Solve:

$$\mathbf{5}\boldsymbol{x} - \mathbf{9}\boldsymbol{x} = \mathbf{19} - \mathbf{7}\boldsymbol{x} - \mathbf{1}$$

Steps for Solving Linear Equations in One Variable

- Step 1:
- Step 2:
- Step 3:
- Step 4:
- Step 5:

Example 3

- Solve:

$$\boldsymbol{6-(4+x)=8x-2(3x+5)}$$

Example 4

- Solve:

$$\frac{x-4}{4}+\frac{2x+4}{8}=5$$

Example 5

- Solve:

$$\mathbf{0.02(60) + 0.04}\boldsymbol{x} = \mathbf{0.03(50 +}\ \boldsymbol{x}\mathbf{)}$$

Example 6

- Solve:

$$\mathbf{5}(\boldsymbol{x}+\mathbf{2})-\mathbf{2}(\boldsymbol{x}+\mathbf{1})=\mathbf{3}\boldsymbol{x}+\mathbf{1}$$

Example 7

- Solve:

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

Example 8

- Solve:

$$\mathbf{5(3}\boldsymbol{x}\mathbf{+1)=}\boldsymbol{x}\mathbf{+5}$$

Type of Linear Equation	Number of Solutions	Indication when Solving