## 3.3: Solve Multi-Step Equations

**Goals:** *Solve multi-step equations by combining like terms
*Solve multi-step equations using the distributive property
*Solve multi-step equations by multiplying by reciprocals

## Steps to Solving Multi-Step Equations

**S** – Simplify

**D** – Distribute

**C** – Combine

**B** – Balance (reverse PEMDAS)

**A** – Answer

**Ex**: $8x - 3x - 10 = 20$

$$5x - 10 = 20$$
$$\underline{+10 \quad +10}$$
$$\frac{5x}{5} = \frac{30}{5}$$

$$x = 6$$

**Ex:** $9x + x - 7 = 13$

$$10x - 7 = 13$$
$$\underline{+7 \quad +7}$$
$$\frac{10x}{10} = \frac{20}{10}$$

$$x = 2$$

**Use the distributive property:** Simplify each side by distributing and combining like terms. Then solve.

**Ex:** $7x + 2(x + 6) = 39$

$$7x + 2x + 12 = 39$$
$$9x + 12 = 39$$
$$\underline{-12 \quad -12}$$
$$\frac{9x}{9} = \frac{27}{9}$$
$$x = 3$$

**Ex:** $4x + 3(x - 5) = 6$

$$4x + 3x - 15 = 6$$
$$7x - 15 = 6$$
$$\underline{+15 \quad +15}$$
$$\frac{7x}{7} = \frac{21}{7}$$
$$x = 3$$

**Ex:** $4x - 7(x - 2) = 26$

$$4x - 7x + 14 = 26$$
$$-3x + 14 = 26$$
$$\underline{-14 \quad -14}$$
$$\underline{-3x} = \underline{12}$$
$$-3 \quad -3$$
$$x = -4$$

**Ex:** $5x - 4(x - 3) = 17$

$$5x - 4x + 12 = 17$$
$$x + 12 = 17$$
$$\underline{-12 \quad -12}$$
$$x = 5$$

**Using Reciprocals:**

**Ex:** $\frac{4}{3} \cdot \frac{3}{4}(z - 6) = 12 \cdot \frac{4}{3}$

$$z - 6 = 16$$
$$z = 22$$

**Ex:** $\frac{2}{3} \cdot \frac{3}{2}(3x + 5) = -24 \cdot \frac{2}{3}$

$$3x + 5 = -16$$
$$3x = -21$$
$$x = -7$$

**Ex:** $\frac{5}{2} \cdot \frac{2}{5}(r + 4) = 10 \cdot \frac{5}{2}$

$$r + 4 = 25$$
$$r = 21$$

**Ex:** $-\frac{5}{4} \cdot -\frac{4}{5}(4a - 1) = 28 \cdot -\frac{5}{4}$

$$4a - 1 = -35$$
$$4a = -34$$
$$a = -\frac{17}{2}$$