## 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 Like Terms

**B –** Balance using reverse PEMDAS

**A –** Answer

**Combine Like Terms:** Find and combine all like terms on each side of the equals sign separately first

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

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

$x = 6$

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

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

$x = 2$

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

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

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

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

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

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

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

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

$5x - 4x + 12 = 17$
$x + 12 = 17$
$-12 \quad -12$
$x = 5$

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

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

**Ex:** A flock of cranes migrate from Canada to Texas. The cranes take 14 days (336 hours) and fly at an average speed of 25 miles per hour. They travel a total of 2500 miles. How many hours of migration are the cranes **not** flying?

$d = rt$
$2500 = (25)t$
$100 = t$

100 hours are spent flying so 236 hours spent **not** flying