

2.4 Equations with Variables on Both Sides

Ex 1) Solve.

$$\begin{array}{r}
 7 - 8x = 4x - 17 \\
 +8x \quad +8x \\
 \hline
 7 = 12x - 17 \\
 +17 \quad \quad +17 \\
 \hline
 24 = 12x \\
 \frac{24}{12} = \frac{12x}{12} \\
 \boxed{x = 2}
 \end{array}$$

$$\begin{array}{r}
 24 - 3m = 5m \\
 +3m \quad +3m \\
 \hline
 24 = 8m \\
 \frac{24}{8} = \frac{8m}{8} \\
 \boxed{m = 3}
 \end{array}$$

$$\begin{array}{r}
 5z - 2 = 2(3z - 4) \\
 5z - 2 = 6z - 8 \\
 \frac{5z}{5z} \quad \quad \frac{-5z}{-5z} \\
 \hline
 -2 = z - 8 \\
 +8 \quad \quad +8 \\
 \hline
 6 = z \\
 \boxed{z = 6}
 \end{array}$$

$$\begin{array}{r}
 10 - (-2x - 4) = -2x \\
 10 + 2x + 4 = -2x \\
 \frac{14 + 2x}{-2x} = \frac{-2x}{-2x} \\
 \hline
 14 = -4x \\
 \frac{14}{-4} = \frac{-4x}{-4} \\
 \boxed{x = -\frac{7}{2}}
 \end{array}$$

$$\begin{array}{r}
 4(9x - 5) = \frac{1}{4}(16x + 60) \cdot 4 \\
 36x - 20 = 16x + 60 \\
 \frac{-16x}{-16x} \quad \quad \frac{-16x}{-16x} \\
 \hline
 20x - 20 = 60 \\
 +20 \quad +20 \\
 \hline
 20x = 80 \\
 \frac{20x}{20} = \frac{80}{20} \\
 \boxed{x = 4}
 \end{array}$$

$$\begin{array}{r}
 3(8y - 6) = \frac{2}{3}(5y + 15) \cdot 3 \\
 24y - 18 = 2(5y + 15) \\
 24y - 18 = 10y + 30 \\
 \frac{-10y}{-10y} \quad \quad \frac{-10y}{-10y} \\
 \hline
 14y - 18 = 30 \\
 +18 \quad +18 \\
 \hline
 14y = 48 \\
 \frac{14y}{14} = \frac{48}{14} \\
 \boxed{y = \frac{24}{7}}
 \end{array}$$

Not all equations have a solution!

Identity: When an equation is the same on both sides of the = sign.

Ex 2) Solve the following equations, if possible.

$$\begin{array}{l} 3x = 3(x+4) \\ \cancel{3x} = \cancel{3x} + 12 \\ \underline{} = 12 \\ \boxed{\text{NS}} \end{array}$$

$$\begin{array}{l} 2x+10 = 2(x+5) \\ \cancel{2x} + 10 = \cancel{2x} + 10 \\ \underline{} = 10 \\ \boxed{\text{ID}} \\ \text{\textcircled{R}} \end{array}$$

$$\begin{array}{l} 7w+1 = 8w+1 \\ \cancel{7w} + 1 = \cancel{7w} + 1 \\ \underline{-1} = \underline{-1} \\ \boxed{w=0} \end{array}$$

Homework:

2.4 WS