2.2 General Linear Equations

The same rules that applied to simpler equations in the previous section apply here. However, you should use the distributive law to eliminate any parenthesis. You should also clear any fractions unless you are at the final stage with a single variable term on one side and a number on the other side.

Here is the expanded process:

1. Remove parenthesis applying the distributive law if needed.
2. Clear fractions by multiplying both sides by the least common denominator.
3. Add and subtract to get variables on one side, numbers on the other side.
4. Combine all like terms for each side.
5. Divide or multiply to cancel the coefficient of the variable.

Example Solve $5x - 7 = 5 - 2x$

$$\begin{array}{rcl} 5x-7 & = & 5-2x \\ 2x & & 2x \\ \hline 7x-7 & = & 5 \\ +7 & & +7 \\ \hline 7x & = & 12 \\ \frac{7x}{7} & = & \frac{12}{7} \\ x & = & \frac{12}{7} \end{array}$$

Example Solve $3(5-7x) = 2(x+8)$.

$3(5-7x) = 2(x+8)15 - 21x$
$2x + 16 - 2x \qquad -2x$height

15-23x = 16
-15 -15

-23x = 1
$-23x$ $-23 = \frac{1}{-23}x = -\frac{1}{23}$

Solve $\frac{x}{3} - \frac{5}{6} = \frac{2}{3}(5x-9)$.

We need to remove parenthesis, yet it would be convenient to clear the fractions first. The LCD is 6, the smallest number divisible evenly by 2, 3, and 6.

$$\begin{array}{rcl} \frac{x}{3} - \frac{5}{6} & = & \frac{2}{3}(5x-9) \\ 6\left(\frac{x}{3} - \frac{5}{6}\right) & = & 6 \cdot \frac{2}{3}(5x-9) \\ \frac{6x}{3} - \frac{30}{6} & = & \frac{12}{3}(5x-9) \\ 2x-5 & = & 4(5x-9) \\ 2x-5 & = & 20x-36 \\ -20x & & -20x \\ \hline -18x-5 & = & -36 \\ +5 & & +5 \\ \hline -18x & = & -31 \\ \frac{-18x}{-18} & = & \frac{-31}{-18} \\ x & = & \frac{31}{18} \end{array}$$

Exercises Solve for the variable.

1. $5x + 2 = 12$
2. $4x - 1 = 37$
3. $6 - 2x = 10$
4. $14x - 7 = 7x + 10$
5. $7 - 2(3x + 5) = 4 - 7x$
6. $3.17x - 8.05 = 16.92$
7. $4.1(3.1x - 8.2) = 8.5 - 19.2x$
8. $b + \frac{3}{4} = \frac{5}{8}$
9. $\frac{-3}{4}y = \frac{-5}{8}$
10. $3x - 5 = 7$
11. $\frac{3}{4}y - 2 = 6$
12. $\frac{x}{7} + 2\frac{x}{7} = 8$
13. $2x - 3 - 5x = 8 + 2x - 10$
14. $2[x - (2 - 2x) - 4] = x - 5$
15. $\frac{x}{3} + \frac{x}{5} = \frac{3}{15}$
16. $\frac{1}{2}x - \frac{5}{6} = 3$
17. $\frac{x}{4} - \frac{3x}{8} = \frac{7}{2}$
18. $3x - 8 = 2(7 - x)$
19. $12x + 7 = 14 - 3x$
20. Is -2 a solution of $x^2 - 3x = 2x - 6$?