

4.3b Solve Equations Involving Fractions

You can simplify equations involving one fraction by multiplying both sides of the equation by the denominator of the fraction.

When eliminating more than 1 fraction, find the lowest common denominator of all the fractions and then multiply both sides of the equation by this value to eliminate the fractions.

Cross Multiplication:

- 1)** Multiply the numerator of the left fraction with the denominator of the right fraction. Put the product on either side of the equation.
- 2)** Multiply the numerator of the right fraction with the denominator of the left fraction. Put the product on the other side of the equation.
- 3)** Solve for the variable

Note: Cross-multiplication can only be used if you have two rational expressions equal to each other. If you have more than two expressions, you must clear denominators using the lowest common denominator.

1) $\frac{1}{3}(x - 2) = 5$

$$\cancel{3}(\cancel{\frac{1}{3}})(x-2) = 3(5)$$

$$1(x-2) = 3(5)$$

$$x-2 = 15$$

$$x = 15 + 2$$

$$x = 17$$

2) $-14 = \frac{2(x-3)}{5}$

$$5(-14) = \cancel{5}\left[\frac{2(x-3)}{\cancel{5}}\right]$$

$$-70 = 2(x-3)$$

$$-70 = 2x - 6$$

$$-70 + 6 = 2x$$

$$\frac{-64}{2} = \frac{\cancel{2x}}{\cancel{2}}$$

$$x = -32$$

$$3) \quad 3 = \frac{2}{5}(n + 7)$$

$$5(3) = \cancel{5} \left(\frac{2}{\cancel{5}} \right) (n+7)$$

$$15 = 2(n+7)$$

$$15 = 2n + 14$$

$$15 - 14 = 2n$$

$$\frac{1}{2} = \frac{2n}{2}$$

$$n = \frac{1}{2}$$

LCD is 12

$$4) \quad \frac{1}{4}(x - 3) = \frac{1}{3}(x - 2)$$

$$3 \cancel{12} \left(\frac{1}{\cancel{4}} \right) (x-3) = 4 \cancel{12} \left(\frac{1}{\cancel{3}} \right) (x-2)$$

$$3(x-3) = 4(x-2)$$

$$3x - 9 = 4x - 8$$

$$-9 + 8 = 4x - 3x$$

$$-1 = x$$

$$x = -1$$

4) $\frac{1}{4}(x-3) = \frac{1}{3}(x-2)$

$$\frac{x-3}{4} = \frac{x-2}{3}$$

$$3(x-3) = 4(x-2)$$

$$3x-9 = 4x-8$$

$$-9+8 = 4x-3x$$

$$-1 = x$$

$$x = -1$$

5) $\frac{3x-2}{5} = \frac{2x-1}{3}$

$$3(3x-2) = 5(2x-1)$$

$$9x-6 = 10x-5$$

$$-6+5 = 10x-9x$$

$$-1 = x$$

$$x = -1$$

LCD is 15

$$6) \quad \frac{2}{3}(5x - 1) = -\frac{3}{5}(x + 2)$$

$$\cancel{5} \cancel{15} \left(\frac{2}{\cancel{3}} \right) (5x - 1) = \cancel{3} \cancel{15} \left(\frac{-3}{\cancel{5}} \right) (x + 2)$$

$$5(2)(5x - 1) = 3(-3)(x + 2)$$

$$10(5x - 1) = -9(x + 2)$$

$$50x - 10 = -9x - 18$$

$$50x + 9x = -18 + 10$$

$$\frac{\cancel{59}x}{\cancel{59}} = \frac{-8}{\cancel{59}}$$

$$x = \frac{-8}{59}$$

$$6) \quad \frac{2}{3}(5x - 1) = -\frac{3}{5}(x + 2)$$

$$\frac{\cancel{2}(5x - 1)}{\cancel{3}} = \frac{-\cancel{3}(x + 2)}{\cancel{5}}$$

$$5(2)(5x - 1) = 3(-3)(x + 2)$$

$$10(5x - 1) = -9(x + 2)$$

$$50x - 10 = -9x - 18$$

$$50x + 9x = -18 + 10$$

$$\frac{\cancel{59}x}{\cancel{59}} = \frac{-8}{\cancel{59}}$$

$$x = \frac{-8}{59}$$

LCD is 12

$$7) \quad \frac{p}{2} = \frac{3}{4} + \frac{p}{3}$$

$$12\left(\frac{p}{2}\right) = 12\left(\frac{3}{4} + \frac{p}{3}\right)$$

$$6\cancel{12}\left(\frac{p}{2}\right) = \overset{3}{\cancel{12}}\left(\frac{3}{4}\right) + \overset{4}{\cancel{12}}\left(\frac{p}{3}\right)$$

$$6p = 3(3) + 4p$$

$$6p - 4p = 9$$

$$\cancel{2}p = 9$$
$$\cancel{2} \quad \cancel{2}$$

$$p = \frac{9}{2}$$

LCD is 12

$$8) \quad \frac{3x}{4} + \frac{x-5}{3} = \frac{1}{2}$$

$$3\cancel{12}\left(\frac{3x}{4}\right) + \overset{4}{\cancel{12}}\left(\frac{x-5}{3}\right) = \overset{6}{\cancel{12}}\left(\frac{1}{2}\right)$$

$$3(3x) + 4(x-5) = 6(1)$$

$$9x + 4x - 20 = 6$$

$$\cancel{13}x = 26$$
$$\cancel{13} \quad \cancel{13}$$

$$x = 2$$