

Solving Linear Equations Containing Fractions

Steps to solving equations with fractions:

1. Determine the common denominator between all given fractions.
2. Multiply each term in the equation by the common denominator. Put the common denominator over 1 to make reducing the fractions easy.
3. Reduce the fractions.
4. Solve the "new" linear equation that does not have any fractions.
5. Check your work!

Example:
$$\frac{2}{3}x + \frac{1}{4} = \frac{5}{6}x - \frac{5}{12}$$

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

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

$$8x + 3 = 10x - 5$$

$$8 = 2x$$

$$4 = x$$

Try the following problems:

$$\frac{x}{2} - \frac{5x}{6} = \frac{1}{9}$$

$$\frac{x}{3} + 2 = \frac{x}{2} + 8$$

$$\frac{3}{4}x + \frac{4}{5}x = 2$$

$$11x + \frac{2}{7} - 10x = -\frac{13}{14}$$

$$\frac{5}{4}y = \frac{1}{2} - \frac{7}{10}$$

$$\frac{x}{12} + \frac{5}{6} = -\frac{3}{4}$$

$$\frac{x}{2} - \frac{5x}{6} = \frac{1}{9}$$

$$\frac{x}{2} \left(\frac{18}{1} \right) - \frac{5x}{6} \left(\frac{18}{1} \right) = \frac{1}{9} \left(\frac{18}{1} \right)$$

$$\frac{x}{\cancel{2}^1} \left(\frac{\cancel{18}^9}{1} \right) - \frac{5x}{\cancel{6}^1} \left(\frac{\cancel{18}^3}{1} \right) = \frac{1}{\cancel{9}^1} \left(\frac{\cancel{18}^2}{1} \right)$$

$$9x - 15x = 2$$

$$-6x = 2$$

$$x = -\frac{1}{3}$$

$$\frac{3}{4}x + \frac{4}{5}x = 2$$

$$\frac{3}{4} \left(\frac{20}{1} \right) x + \frac{4}{5} \left(\frac{20}{1} \right) x = 2 \left(\frac{20}{1} \right)$$

$$\frac{3}{\cancel{4}^1} \left(\frac{\cancel{20}^5}{1} \right) x + \frac{4}{\cancel{5}^1} \left(\frac{\cancel{20}^4}{1} \right) x = 2 \left(\frac{20}{1} \right)$$

$$15x + 16x = 40$$

$$31x = 40$$

$$x = \frac{40}{31}$$

$$\frac{5}{4}y = \frac{1}{2} - \frac{7}{10}$$

$$\frac{5}{4} \left(\frac{20}{1} \right) y = \frac{1}{2} \left(\frac{20}{1} \right) - \frac{7}{10} \left(\frac{20}{1} \right)$$

$$\frac{5}{\cancel{4}^1} \left(\frac{\cancel{20}^5}{1} \right) y = \frac{1}{\cancel{2}^1} \left(\frac{\cancel{20}^{10}}{1} \right) - \frac{7}{\cancel{10}^1} \left(\frac{\cancel{20}^2}{1} \right)$$

$$25y = 10 - 14$$

$$25y = -4$$

$$y = -\frac{4}{25}$$

$$\frac{x}{3} + 2 = \frac{x}{2} + 8$$

$$\frac{x}{3} \left(\frac{6}{1} \right) + 2 \left(\frac{6}{1} \right) = \frac{x}{2} \left(\frac{6}{1} \right) + 8 \left(\frac{6}{1} \right)$$

$$\frac{x}{\cancel{3}^1} \left(\frac{\cancel{6}^2}{1} \right) + 2 \left(\frac{6}{1} \right) = \frac{x}{\cancel{2}^1} \left(\frac{\cancel{6}^3}{1} \right) + 8 \left(\frac{6}{1} \right)$$

$$2x + 12 = 3x + 48$$

$$12 = x + 48$$

$$-36 = x$$

$$11x + \frac{2}{7} - 10x = -\frac{13}{14}$$

$$11 \left(\frac{14}{1} \right) x + \frac{2}{7} \left(\frac{14}{1} \right) - 10 \left(\frac{14}{1} \right) x = -\frac{13}{14} \left(\frac{14}{1} \right)$$

$$154x + 4 - 140x = 13$$

$$14x + 4 = 13$$

$$14x = 9$$

$$x = \frac{9}{14}$$

$$\frac{x}{12} + \frac{5}{6} = -\frac{3}{4}$$

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

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

$$x + 10 = -9$$

$$x = -19$$