

Exercise 2.5

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Solve the following linear equations.

1. $\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$

Solution:

$$\begin{aligned} \frac{x}{2} - \frac{1}{5} &= \frac{x}{3} + \frac{1}{4} \\ \Rightarrow \frac{x}{2} - \frac{x}{3} &= \frac{1}{4} + \frac{1}{5} \\ \Rightarrow \frac{(3x-2x)}{6} &= \frac{(5+4)}{20} \\ \Rightarrow 3x - 2x &= \frac{9}{20} \times 6 \\ \Rightarrow x &= \frac{54}{20} \\ \Rightarrow x &= \frac{27}{10} \end{aligned}$$

2. $\frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} = 21$

Solution:

$$\begin{aligned} \frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} &= 21 \\ \Rightarrow \frac{(6n-9n+10n)}{12} &= 21 \\ \Rightarrow \frac{7n}{12} &= 21 \\ \Rightarrow 7n &= 21 \times 12 \\ \Rightarrow n &= \frac{252}{7} \\ \Rightarrow n &= 36 \end{aligned}$$

3. $x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{2}$

Solution:

$$\begin{aligned} x + 7 - \frac{8x}{3} &= \frac{17}{6} - \frac{5x}{2} \\ \Rightarrow x - \frac{8x}{3} + \frac{5x}{2} &= \frac{17}{6} - 7 \\ \Rightarrow \frac{6x-16x+15x}{6} &= \frac{17-42}{6} \end{aligned}$$

$$\begin{aligned}\Rightarrow \frac{5x}{6} &= \frac{-25}{6} \\ \Rightarrow 5x &= -25 \\ \Rightarrow x &= -5\end{aligned}$$

4. $\frac{x-5}{3} = \frac{x-3}{5}$

Solution:

$$\begin{aligned}\frac{x-5}{3} &= \frac{x-3}{5} \\ \Rightarrow 5(x-5) &= 3(x-3) \\ \Rightarrow 5x-25 &= 3x-9 \\ \Rightarrow 5x-3x &= -9+25 \\ \Rightarrow 2x &= 16 \\ \Rightarrow x &= 8\end{aligned}$$

5. $\frac{3t-2}{4} - \frac{2t+3}{3} = \frac{2}{3} - t$

Solution:

$$\begin{aligned}\frac{3t-2}{4} - \frac{2t+3}{3} &= \frac{2}{3} - t \\ \Rightarrow \frac{3t}{4} - \frac{1}{2} - \left(\frac{2t}{3} + 1\right) &= \frac{2}{3} - t \\ \Rightarrow \frac{3t}{4} - \frac{1}{2} - \frac{2t}{3} - 1 &= \frac{2}{3} - t \\ \Rightarrow \frac{3t}{4} - \frac{2t}{3} + t &= \frac{2}{3} + 1 + \frac{1}{2} \\ \Rightarrow \frac{(9t-8t+12t)}{12} &= \frac{2}{3} + \frac{3}{2} \\ \Rightarrow \frac{13t}{12} &= \frac{4+9}{6} \\ \Rightarrow \frac{13t}{12} &= \frac{13}{6} \\ \Rightarrow t &= \frac{12}{6} = 2\end{aligned}$$

6. $m - \frac{(m-1)}{2} = 1 - \frac{(m-2)}{3}$

Solution:

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

$$\begin{aligned} &\Rightarrow m - \left(\frac{m}{2} - \frac{1}{2}\right) \\ &= 1 - \left(\frac{m}{3} - \frac{2}{3}\right) \\ &\Rightarrow m - \frac{m}{2} + \frac{1}{2} = 1 - \frac{m}{3} + \frac{2}{3} \\ &\Rightarrow m - \frac{m}{2} + \frac{m}{3} = 1 + \frac{2}{3} - \frac{1}{2} \\ &\Rightarrow \frac{m}{2} + \frac{m}{3} = \frac{1}{2} + \frac{2}{3} \\ &\Rightarrow \frac{(3m+2m)}{6} = \frac{(3+4)}{6} \\ &\Rightarrow \frac{5m}{6} = \frac{7}{6} \\ &\Rightarrow m = \frac{7}{6} \times \frac{6}{5} \\ &\Rightarrow m = \frac{7}{5} \end{aligned}$$

Simplify and solve the following linear equations.

7. $3(t - 3) = 5(2t + 1)$

Solution:

$$\begin{aligned} 3(t - 3) &= 5(2t + 1) \\ \Rightarrow 3t - 9 &= 10t + 5 \\ \Rightarrow 3t - 10t &= 5 + 9 \\ \Rightarrow -7t &= 14 \\ \Rightarrow t &= \frac{14}{-7} \\ \Rightarrow t &= -2 \end{aligned}$$

8. $15(y - 4) - 2(y - 9) + 5(y + 6) = 0$

Solution:

$$\begin{aligned} 15(y - 4) - 2(y - 9) + 5(y + 6) &= 0 \\ \Rightarrow 15y - 60 - 2y + 18 + 5y + 30 &= 0 \\ \Rightarrow 15y - 2y + 5y &= 60 - 18 - 30 \\ \Rightarrow 18y &= 12 \\ \Rightarrow y &= \frac{12}{18} \\ \Rightarrow y &= \frac{2}{3} \end{aligned}$$

9. $3(5z - 7) - 2(9z - 11) = 4(8z - 13) - 17$

Solution:

$$\begin{aligned}3(5z - 7) - 2(9z - 11) &= 4(8z - 13) - 17 \\ \Rightarrow 15z - 21 - 18z + 22 &= 32z - 52 - 17 \\ \Rightarrow 15z - 18z - 32z &= -52 - 17 + 21 - 22 \\ \Rightarrow -35z &= -70 \\ \Rightarrow z &= \frac{-70}{-35} \\ \Rightarrow z &= 2\end{aligned}$$

10. $0.25(4f - 3) = 0.05(10f - 9)$

Solution:

$$\begin{aligned}0.25(4f - 3) &= 0.05(10f - 9) \\ \Rightarrow f - 0.75 &= 0.5f - 0.45 \\ \Rightarrow f - 0.5f &= -0.45 + 0.75 \\ \Rightarrow 0.5f &= 0.30 \\ \Rightarrow f &= \frac{0.30}{0.5} \\ \Rightarrow f &= \frac{3}{5} = 0.6\end{aligned}$$