Solve the following linear equations.

Q1. $\dfrac{x}{2} - \dfrac{1}{5} = \dfrac{x}{3} + \dfrac{1}{4}$

Ans: $\dfrac{x}{2} - \dfrac{1}{5} = \dfrac{x}{3} + \dfrac{1}{4}$

$\Rightarrow \dfrac{x}{2} - \dfrac{x}{3} = \dfrac{1}{4} + \dfrac{1}{5}$

$\Rightarrow \dfrac{3x - 2x}{6} = \dfrac{5 + 4}{20}$

$\Rightarrow \dfrac{x}{6} = \dfrac{9}{20}$

$\Rightarrow x = \dfrac{9 \times 6}{20} = \dfrac{27}{10}$

To check:

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

$\Rightarrow \dfrac{27}{10 \times 2} - \dfrac{1}{5} = \dfrac{27}{10 \times 3} + \dfrac{1}{4}$

$\Rightarrow \dfrac{27}{20} - \dfrac{1}{5} = \dfrac{9}{10} + \dfrac{1}{4}$

$\Rightarrow \dfrac{27 - 4}{20} = \dfrac{18 + 5}{20}$

$\Rightarrow \dfrac{23}{20} = \dfrac{23}{20}$

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

Q2. $\dfrac{n}{2} - \dfrac{3n}{4} + \dfrac{5n}{6} = 21$

Ans: $\dfrac{n}{2} - \dfrac{3n}{4} + \dfrac{5n}{6} = 21$

$\Rightarrow \dfrac{6n - 9n + 10n}{12} = 21$

$\Rightarrow \dfrac{7n}{12} = 21$

$\Rightarrow n = \dfrac{21 \times 12}{7}$

$\Rightarrow n = 36$

To check:

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

$\Rightarrow \dfrac{36}{2} - \dfrac{3 \times 36}{4} + \dfrac{5 \times 36}{6} = 21$

$\Rightarrow 18 - 27 + 30 = 21$

$\Rightarrow 21 = 21$

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

Q3. $x + 7 - \dfrac{8x}{3} = \dfrac{17}{6} - \dfrac{5x}{2}$

Ans: $x + 7 - \dfrac{8x}{3} = \dfrac{17}{6} - \dfrac{5x}{2}$

$\Rightarrow \dfrac{x}{1} - \dfrac{8x}{3} + \dfrac{5x}{2} = \dfrac{17}{6} - \dfrac{7}{1}$

$\Rightarrow \dfrac{6x - 16x + 15x}{6} = \dfrac{17 - 42}{6}$

$\Rightarrow \dfrac{5x}{6} = \dfrac{-25}{6}$

$\Rightarrow x = \dfrac{-25 \times 6}{6 \times 5}$

$\Rightarrow x = -5$

To check:

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

$$\Rightarrow -5 + 7 - \frac{8 \times (-5)}{3} = \frac{17}{6} - \frac{5 \times (-5)}{2}$$

$$\Rightarrow 2 + \frac{40}{3} = \frac{17}{6} + \frac{25}{2}$$

$$\Rightarrow \frac{6 + 40}{3} = \frac{17 + 75}{6}$$

$$\Rightarrow \frac{46}{3} = \frac{92}{6}$$

$$\Rightarrow \frac{46}{3} = \frac{46}{3}$$

$$\Rightarrow \text{L.H.S.} = \text{R. H. S.}$$

Therefore, it is correct.

Q4. $\frac{x-5}{3} = \frac{x-3}{5}$

Ans: $\frac{x-5}{3} = \frac{x-3}{5}$

$$\Rightarrow 5 \times (x-5) = 3(x-3)$$

$$\Rightarrow 5x - 25 = 3x - 9$$

$$\Rightarrow 5x - 3x = -9 + 25$$

$$\Rightarrow 2x = 16$$

$$\Rightarrow x = \frac{16}{2} = 8$$

To check:

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

$$\Rightarrow \frac{8-5}{3} = \frac{8-3}{5}$$

$$\Rightarrow \frac{3}{3} = \frac{5}{5}$$

$$\Rightarrow 1 = 1$$

$$\Rightarrow \text{L.H.S.} = \text{R. H. S.}$$

Therefore, it is correct.

Q5. $\dfrac{3t-2}{4} - \dfrac{2t+3}{3} = \dfrac{2}{3} - t$

Ans: $\dfrac{3t-2}{4} - \dfrac{2t+3}{3} = \dfrac{2}{3} - t$

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

$$\Rightarrow \frac{3(3t-2)-4(2t+3)+12t}{12} = \frac{2}{3}$$

$$\Rightarrow \frac{9t-6-8t-12+12t}{12} = \frac{2}{3}$$

$$\Rightarrow \frac{13t-18}{12} = \frac{2}{3}$$

$$\Rightarrow 3 \times (13t-18) = 2 \times 12$$

$$\Rightarrow 39t-54 = 24$$

$$\Rightarrow 39t = 24+54$$

$$\Rightarrow 39t = 78$$

$$\Rightarrow t = \frac{78}{39} = 2$$

To check:

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

$$\Rightarrow \frac{3 \times 2 - 2}{4} - \frac{2 \times 2 + 3}{3} = \frac{2}{3} - 2$$

$$\Rightarrow \frac{6-2}{4} - \frac{4+3}{3} = \frac{2-6}{3}$$

$$\Rightarrow \frac{4}{4} - \frac{7}{3} = \frac{-4}{3}$$

$$\Rightarrow \frac{1}{1} - \frac{7}{3} = \frac{-4}{3}$$

$$\Rightarrow \frac{3-7}{3} = \frac{-4}{3}$$

$$\Rightarrow \frac{-4}{3} = \frac{-4}{3}$$

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

Q6. $m - \frac{m-1}{2} = 1 - \frac{m-2}{3}$

Ans: $m - \frac{m-1}{2} = 1 - \frac{m-2}{3}$

$$\Rightarrow \frac{m}{1} - \frac{m-1}{2} + \frac{m-2}{3} = 1$$

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

$$\Rightarrow \frac{6m - 3m + 3 + 2m - 4}{6} = 1$$

$$\Rightarrow \frac{5m-1}{6} = 1$$

$$\Rightarrow 5m-1=6$$

$$\Rightarrow 5m=6+1$$

$$\Rightarrow 5m=7$$

$$\Rightarrow m=\frac{7}{5}$$

To check:

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

$$\Rightarrow \frac{7}{5}-\frac{\frac{7}{5}-1}{2}=1-\frac{\frac{7}{5}-2}{3}$$

$$\Rightarrow \frac{7}{5}-\frac{\frac{7-5}{5}}{2}=1-\frac{\frac{7-10}{5}}{3}$$

$$\Rightarrow \frac{7}{5}-\frac{2}{5\times 2}=1-\frac{-3}{5\times 3}$$

$$\Rightarrow \frac{7}{5}-\frac{1}{5}=1+\frac{1}{5}$$

$$\Rightarrow \frac{7-1}{5}=\frac{5+1}{5}$$

$$\Rightarrow \frac{6}{5}=\frac{6}{5}$$

$$\Rightarrow \text{L.H.S.} = \text{R. H. S.}$$

Therefore, it is correct.

Simplify and solve the following linear equation.

Q7. $3(t-3)=5(2t+1)$

Ans: $3(t-3)=5(2t+1)$

$$\Rightarrow 3t-9=10t+5$$

$$\Rightarrow 3t-10t=5+9$$

$$\Rightarrow -7t=14$$

$$\Rightarrow t=\frac{14}{-7}$$

$$\Rightarrow t=-2$$

To check:

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

$$\Rightarrow 3(-2-3)=5\{2\times(-2)+1\}$$

$$\Rightarrow 3\times-5=5(-4+1)$$

$$\Rightarrow -15=5\times(-3)$$

$$\Rightarrow -15=-15$$

$$\Rightarrow \text{L.H.S.} = \text{R. H. S.}$$

Therefore, it is correct.

Q8. $15(y-4)-2(y-9)+5(y+6)=0$

Ans: $15(y-4)-2(y-9)+5(y+6)=0$

$$\Rightarrow 15y-60-2y+18+5y+30=0$$

$$\Rightarrow 18y-12=0$$

$$\Rightarrow 18y=12$$

$$\Rightarrow y=\frac{12}{18}$$

$$\Rightarrow y=\frac{2}{3}$$

To check:

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

$\Rightarrow 15\left(\dfrac{2}{3}-4\right)-2\left(\dfrac{2}{3}-9\right)+5\left(\dfrac{2}{3}+6\right)=0$

$\Rightarrow 15\left(\dfrac{2-12}{3}\right)-2\left(\dfrac{2-27}{3}\right)+5\left(\dfrac{2+18}{3}\right)=0$

$\Rightarrow 15\times\dfrac{-10}{3}-2\times\dfrac{-25}{3}+5\times\dfrac{20}{3}=0$

$\Rightarrow -50+\dfrac{50}{3}+\dfrac{100}{3}=0$

$\Rightarrow -50+\dfrac{50+100}{3}=0$

$\Rightarrow -50+\dfrac{150}{3}=0$

$\Rightarrow -50+50=0$

$\Rightarrow$ 0 = 0

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

Q9. $3(5z-7)-2(9z-11)=4(8z-13)-17$

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

$\Rightarrow 15z-21-18z+22=32z-52-17$

$\Rightarrow -3z+1=32z-69$

$\Rightarrow -3z-32z=-69-1$

$\Rightarrow -35z=-70$

$\Rightarrow z=\dfrac{-70}{-35}=2$

To check:

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

$\Rightarrow 3(5\times 2-7)-2(9\times 2-11)=4(8\times 2-13)-17$

$\Rightarrow 3(10-7)-2(18-11)=4(16-13)-17$

$\Rightarrow 3\times 3-2\times 7=4\times 3-17$

$\Rightarrow 9-14=12-17$

$\Rightarrow -5=-5$

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

Q10. $0.25(4f-3)=0.05(10f-9)$

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

$\Rightarrow 1.00f-0.75=0.50f-0.45$

$\Rightarrow 1.00f-0.50f=-0.45+0.75$

$\Rightarrow 0.50f=0.3$

$\Rightarrow f=\dfrac{0.3}{0.50}$

$\Rightarrow f=0.6$

To check:

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

$\Rightarrow 0.25(4\times0.6-3)=0.05(10\times0.6-9)$

$\Rightarrow 0.25(2.4-3)=0.05(6.0-9)$

$\Rightarrow 0.25\times(-0.6)=0.05\times(-3)$

$\Rightarrow -0.150=-0.150$

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

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