

Simplifying and Solving Linear Equations – ANSWERS

Note: There is often more than one way to solve an equation. The most obvious methods are shown here but you may have used another. That's fine provided that you do get a solution – a value that makes the equation true. Checks that show that these answers are solutions are not shown here. Also, no arithmetic working is shown.

$$\begin{array}{l} 1. \quad 4x - 7 = 9 \\ +7 \rightarrow 4x = 16 \\ \div 4 \rightarrow x = 4 \end{array}$$

$$\begin{array}{l} 2. \quad 20 + 2d = 12 \\ -20 \rightarrow 2d = -8 \\ \div 2 \rightarrow d = -4 \end{array}$$

$$\begin{array}{l} \text{OR} \\ 20 + 2d = 12 \\ \div 2 \rightarrow 10 + d = 6 \\ -10 \rightarrow d = -4 \end{array}$$

$$\begin{array}{l} 3. \quad 3x - 18 = 0 \\ +18 \rightarrow 3x = 18 \\ \div 3 \rightarrow x = 6 \end{array}$$

$$\begin{array}{l} \text{OR} \\ 3x - 18 = 0 \\ \div 3 \rightarrow x - 6 = 0 \\ +6 \rightarrow x = 6 \end{array}$$

$$\begin{array}{l} 4. \quad 10 - 7g = 31 \\ -10 \rightarrow -7g = 21 \\ \div -7 \rightarrow g = -3 \end{array}$$

$$\begin{array}{l} 5. \quad 0.5t + 1.25 = 2 \\ -1.25 \rightarrow 0.5t = 0.75 \\ \div 0.5 \rightarrow t = 5 \end{array}$$

$$\begin{array}{l} 6. \quad 100 - 18b = 28 \\ -100 \rightarrow -18b = -72 \\ \div -18 \rightarrow b = 4 \end{array}$$

$$\begin{array}{l} 7. \quad 200 = 56 + 0.0025x \\ -56 \rightarrow 144 = 0.0025x \\ \div 0.0025 \quad 57600 = x \end{array}$$

$$\begin{array}{l} 8. \quad -24 = 3w - 30 \\ +30 \rightarrow 6 = 3w \\ \div 3 \rightarrow 2 = w \end{array}$$

$$\begin{array}{l} \text{OR} \\ -24 = 3w - 30 \\ \div 3 \rightarrow -8 = w - 10 \\ +10 \rightarrow 2 = w \end{array}$$

$$\begin{array}{l} 9. \quad 4x - 5 = 9x \\ -4x \rightarrow -5 = 5x \\ \div 5 \rightarrow -1 = x \end{array}$$

$$\begin{array}{l} 10. \quad p - 8 = 3p - 20 \\ +20 \rightarrow p + 12 = 3p \\ -p \rightarrow 12 = 2p \\ \div 2 \rightarrow 6 = p \end{array}$$

$$\begin{array}{l} 11. \quad 5d = \frac{22 - d}{2} \\ \times 2 \rightarrow 10d = 22 - d \\ +d \rightarrow 11d = 22 \\ \div 11 \rightarrow d = 2 \end{array}$$

$$\begin{array}{l} 12. \quad \frac{2}{3}x = 10 \\ \times 3 \rightarrow 2x = 30 \\ \div 2 \rightarrow x = 15 \end{array}$$

$$\begin{array}{l} 13. \quad \frac{1}{8}k + 1 = 3 \\ -1 \rightarrow \frac{1}{8}k = 2 \\ \times 8 \rightarrow k = 16 \end{array}$$

$$\begin{array}{l} \text{OR} \\ \frac{1}{8}k + 1 = 3 \\ \times 8 \rightarrow k + 8 = 24 \\ -8 \rightarrow k = 16 \end{array}$$

$$14. \quad \begin{array}{l} 2(x-1) = 14 \\ \div 2 \rightarrow x-1 = 7 \\ +1 \rightarrow x = 8 \end{array}$$

$$\text{OR} \quad \begin{array}{l} 2(x-1) = 14 \\ \text{expand} \\ +2 \rightarrow 2x-2 = 14 \\ \div 2 \rightarrow 2x = 16 \\ x = 8 \end{array}$$

$$15. \quad \begin{array}{l} 3(3k+5) = 4k \\ \text{expand} \\ -4k \rightarrow 9k+15 = 4k \\ \div -4 \rightarrow 15 = -5k \\ -3 = k \end{array}$$

$$16. \quad \begin{array}{l} \frac{3}{8}z - \frac{3}{5} = 0 \\ \times 40 \rightarrow 15z - 24 = 0 \\ +24 \rightarrow 15z = 24 \\ \div 15 \rightarrow z = \frac{24}{15} \\ \text{reduce to} \\ \text{lowest terms} \\ z = \frac{8}{5} \\ z = 1\frac{3}{5} \text{ or } 1.6 \end{array}$$

$$17. \quad \begin{array}{l} 2c - 10 = \frac{3}{4}c \\ \times 4 \rightarrow 8c - 40 = 3c \\ -3c \rightarrow 5c - 40 = 0 \\ +40 \rightarrow 5c = 40 \\ \div 5 \rightarrow c = 8 \end{array}$$

$$18. \quad \begin{array}{l} \frac{3}{5}x = \frac{1}{2}x + 1 \\ \times 10 \rightarrow 6x = 5x + 10 \\ -5x \rightarrow x = 10 \end{array}$$

$$19. \quad \begin{array}{l} \frac{3}{4}e = 0.125 \\ \text{convert} \\ \div 0.75 \rightarrow 0.75e = 0.125 \\ e = 0.1\dot{6} \end{array}$$

$$\text{OR} \quad \begin{array}{l} \frac{3}{4}e = 0.125 \\ \text{convert} \\ \times 8 \rightarrow 6e = 1 \\ \div 6 \rightarrow e = \frac{1}{6} \end{array}$$

$$20. \quad \begin{array}{l} 10 + \frac{1}{2}y = 0.6y \\ \times 2 \rightarrow 20 + y = 1.2y \\ -y \rightarrow 20 = 0.2y \\ \div 0.2 \rightarrow 100 = y \end{array}$$

$$21. \quad \begin{array}{l} \frac{x-5}{3} = 4 \\ \times 3 \rightarrow x-5 = 12 \\ +5 \rightarrow x = 17 \end{array}$$

$$22. \quad \begin{array}{l} \frac{t+5}{8} = 2t \\ \times 8 \rightarrow t+5 = 16t \\ -t \rightarrow 5 = 15t \\ \div 15 \rightarrow \frac{1}{3} = t \end{array}$$

$$23. \quad \begin{array}{l} 9-z = \frac{z}{2} + 3 \\ \times 2 \rightarrow 18-2z = z+6 \\ +2z \rightarrow 18 = 3z+3 \\ -3 \rightarrow 15 = 3z \\ \div 3 \rightarrow 5 = z \end{array}$$

$$24. \quad \begin{array}{l} \frac{5}{x} + 1 = \frac{20}{x} \\ \times x \rightarrow 5+x = 20 \\ -5 \rightarrow x = 15 \end{array}$$

$$25. \quad \begin{array}{l} \frac{1}{t-5} = 3 \\ \times (t-5) \rightarrow 1 = 3(t-5) \\ \text{expand} \rightarrow 1 = 3t-15 \\ +15 \rightarrow 16 = 3t \\ \div 3 \rightarrow \frac{16}{3} = t \\ t = 5\frac{1}{3} \text{ or } 5.\dot{3} \end{array}$$

$$26. \quad \begin{array}{l} \frac{2x+1}{10-x} = 5 \\ \times (10-x) \rightarrow 2x+1 = 5(10-x) \\ \text{expand} \\ +5x \rightarrow 7x+1 = 50 \\ -1 \rightarrow 7x = 49 \\ \div 7 \rightarrow x = 7 \end{array}$$

These are shown in a little more detail so you can see how the denominators are removed.

$$27. \quad \frac{k}{k-1} = \frac{3}{5}$$

$$\times 5(k-1) \rightarrow \frac{5(k-1) \times k}{k-1} = \frac{3 \times 5(k-1)}{5}$$

cancel common factors $5k = 3(k-1)$

expand $5k = 3k - 1$

$$-3k \rightarrow 2k = -1$$

$$\div 2 \rightarrow k = -\frac{1}{2} \text{ or } -0.5$$

$$28. \quad \frac{1}{5+w} = \frac{1}{2w+1}$$

$$\times (5+w)(2w+1) \rightarrow \frac{(5+w)(2w+1)}{5+w} = \frac{(5+w)(2w+1)}{2w+1}$$

cancel common factors $2w+1 = 5+w$

$$-w \rightarrow w+1 = 5$$

$$-1 \rightarrow w = 4$$

$$29. \quad \frac{1}{n+2} + \frac{5}{n-1} = 0$$

$$\times (n+2)(n-1) \rightarrow \frac{(n+2)(n-1)}{n+2} + \frac{5(n+2)(n-1)}{n-1} = 0$$

cancel common factors $n-1 + 5(n+2) = 0$

expand $n-1 + 5n + 10 = 0$

collect terms $6n + 9 = 0$

$$-9 \rightarrow 6n = -9$$

$$\div 6 \rightarrow n = -\frac{9}{6}$$

reduce to lowest terms $n = -\frac{3}{2}$

convert $n = -1\frac{1}{2} \text{ or } -1.5$

$$30. \quad 7.5 - 10\left(1 - \frac{0.1}{x}\right) = 0$$

expand $7.5 - 10 + \frac{1}{x} = 0$

collect terms $-2.5 + \frac{1}{x} = 0$

$$\times x \rightarrow -2.5x + 1 = 0$$

$$-1 \rightarrow -2.5x = -1$$

$$\div -2.5 \rightarrow x = 0.4$$