

Equations with fractions

Starter

1. (Review of last lesson)

Solve: (a) $5x - 3(x - 1) = 39$ (b) $7 - (x + 1) = 9 + 4(2x - 1)$

2. Solve the equation $\frac{2x - 5}{3} = 12$.

Notes

Cross-multiplication

If your working reaches a point where two fractions are equal to each other, use cross-multiplication to get rid of the fractions.

E.g. $\frac{2x}{3} = \frac{5}{7} \Rightarrow 2x \times 7 = 3 \times 5 \Rightarrow 14x = 15 \Rightarrow x = \frac{15}{14}$

E.g. 1 Solve: (a) $\frac{x + 1}{3} = \frac{x - 1}{5}$ (b) $\frac{12}{2x - 3} = \frac{7}{x}$
 (c) $\frac{7x + 3}{2} = \frac{2x - 9}{5}$ (d) $\frac{5}{x - 1} = \frac{10}{4x + 3}$

Working: (a)

Cross-multiply:
Expand the brackets:
Subtract 3x from both sides:
Subtract 5 from both sides:
Divide both sides by 2:

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

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

$$5x + 5 = 3x - 3$$

$$2x + 5 = -3$$

$$2x = -8$$

$$x = -4$$

N.B. $\frac{2}{3}(5x - 1)$ is the same as $\frac{2(5x - 1)}{3}$

E.g. 2 Solve: (a) $\frac{1}{7}(2x - 1) = \frac{1}{2}x$ (b) $\frac{1}{5}(2x - 1) = \frac{3}{4}(x + 7)$

Working: (a)

Cross-multiply:
Expand the brackets:
Subtract 4x from both sides:
Divide both sides by 3:

$$\frac{1}{7}(2x - 1) = \frac{1}{2}x$$

$$\frac{2x - 1}{7} = \frac{x}{2}$$

$$2(2x - 1) = 7x$$

$$4x - 2 = 7x$$

$$-2 = 3x$$

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

Make sure the unknown is on the LHS:

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

If fractions are involved in the equation, rearrange so that you are in a position to cross-multiply.

N.B. $\frac{2}{3}x$ is the same as $\frac{2x}{3}$

E.g. 3 Solve:

(a) $\frac{3}{4}x + 6 = 18$

(b) $\frac{4}{x} + 2 = 13$

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

(d) $\frac{x}{5x} - 3 = 7$

Working:

(a)

$$\frac{3}{4}x + 6 = 18$$

$$\frac{3x}{4} + 6 = 18$$

$$\frac{3x}{4} = 12$$

$$3x = 48$$

$$x = 16$$

Subtract 6 from both sides:

Multiply both sides by 4:

Divide both sides by 3:

Video:

[Linear equations with fractions](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:

p161 M6.3 Qu 1-33 odd

A*-G class textbook:

p151 M6.3 Qu 1-33 odd

9-1 homework book:

p56 M6.3 Qu 1-23 odd

A*-G homework book:

p41 M6.3 Qu 1-23 odd

Summary

Cross-multiplication:

When two fractions are equal to each other, cross-multiply to get rid of the fractions.

E.g. $\frac{2x}{3} = \frac{5}{7} \Rightarrow 2x \times 7 = 3 \times 5 \Rightarrow 14x = 15 \Rightarrow x = \frac{15}{14}$

If fractions are involved in the equation, rearrange so that you are in a position to cross-multiply.

$$\frac{2}{3}(5x - 1) \text{ is the same as } \frac{2(5x - 1)}{3} \quad \text{and} \quad \frac{2}{3}x \text{ is the same as } \frac{2x}{3}$$