

Solving Equations Algebraic Fractions

GCSE Maths · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Solve $(x + 3)/4 - (x - 1)/3 = 1$.

Step 1 · LCD of 4 and 3 is 12; multiply every term by 12

$$3(x + 3) - 4(x - 1) = 12$$

Step 2 · Expand — careful with the minus

$$3x + 9 - 4x + 4 = 12$$

Step 3 · Simplify and solve

$$-x + 13 = 12, \text{ so } x = 1$$

Answer: $x = 1$

Check: $(1 + 3)/4 - (1 - 1)/3 = 1 - 0 = 1$ ✓

2. Now try one with the steps

Solve $5/(x + 2) = 3/(x - 2)$.

Step 1 · Multiply both sides by $(x + 2)(x - 2)$ — 'cross-multiply'

Step 2 · Expand

Step 3 · Solve

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Solve $x/3 + 2 = 7$. [2]

2. Solve $(x + 4)/5 = 3$. [2]

3. Solve $x/2 + x/3 = 10$. [2]

4. Solve $(2x - 1)/3 = (x + 4)/2$. [3]

5. Solve $(x + 1)/2 - (x - 3)/5 = 3$. Give your answer fraction. [3]

6. Solve $12/x = 3$. [1]

7. Solve $6/(x + 1) = 2$. [2]

8. Solve $3/(x - 1) = 5/(x + 3)$. [3]

9. Solve $4/(2x + 1) = 1/(x - 1)$. Give your answer fraction. [3]

10. Solve $x + 6/x = 5$. [3]

11. Solve $1/x + 1/(x + 2) = 4/3$. [4]

12. Solve $3/(x + 1) - 1/x = 1/2$. [4]

13. Show that $2/(x - 3) + 5/(x + 1) = 1$ can be written $x^2 - 9x + 10 = 0$. [3]

14. Solve $x^2 - 9x + 10 = 0$, giving your answers to 2 decimal places. [3]

15. Lea cycles 30 km at x km/h, then 20 km at $(x - 5)$ km/h. Altogether she takes 4 hours. Show that $2x^2 - 35x + 75 = 0$ and find her first speed. [5]

4. Before you hand it in

$$(x + 3)/4 - (x - 1)/3 = 1 \rightarrow 3(x + 3) - 4(x - 1) = 1$$

Every term on BOTH sides is multiplied by the LCD: the 1 becomes 12.

$$- 4(x - 1) \text{ expanded as } -4x + 4$$

Put the numerator in brackets before expanding: $-4(x - 1) = -4x + 4$.

$$(x + 6)/x = 7 \rightarrow \text{'cancel the x'} \rightarrow 6 = 7$$

Only whole factors cancel. Multiply both sides by x instead: $x + 6 = 7x$, so $x = 1$.

Keeping a solution that makes a denominator zero

If $x = 2$ appears and the equation contains $1/(x - 2)$, $x = 2$ must be rejected. Always substitute back.