Equations: brackets and constant denominators — Teacher answers

Year 7, upper volume • text pp. 63–66 • foundation lessons 32–33

Use the prerequisite checks to choose support, project the worked and guided items, then let learners work on paper. Select supplements or extensions as needed. No learner answers are saved by this presentation.

Worked example 1

Remove brackets, solve and check the original equation.

$$4(x-3)=2x+6$$

Reference answer

x = 9.

$$x=9$$

1. Distribute: 4x − 12 = 2x + 6.
2. Subtract 2x and add 12 on both sides: 2x = 18, so x = 9.
3. Check: 4(9 − 3) = 24 and 2 × 9 + 6 = 24.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Guided attempt 2

Multiply both sides by 3 first, then solve and check.

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

1. 3 × [(x + 1)/3] = 3 × ____.
2. x + 1 = ____, so x = ____.
3. Original check: (____ + 1)/3 = ____.

Reference answer

x = 14.

$$x=14$$

1. Multiply both complete sides by 3: x + 1 = 15.
2. Subtract 1: x = 14.
3. Check: (14 + 1)/3 = 5.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Prerequisite 3

Expand the product; no equation needs to be solved.

$$2(x-4)$$

Reference answer

2x−8.

$$2x-8$$

1. 2 × x = 2x and 2 × (−4) = −8.
2. The result is 2x − 8.

- Keep each sign and collect only terms with the same variable powers.
- Give an equivalent simplified expression.

Prerequisite 4

Calculate the product used when clearing a denominator of 2.

$$6 \times \frac{1}{2}$$

Reference answer

The value is 3.

$$3$$

1. 6 divided by 2 is 3.
2. Thus multiplying 1/2 by 6 gives 3.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Independent practice 5

Solve and verify.

$$2(x + 4) - 3 = x + 9$$

Reference answer

x = 4.

$$x = 4$$

1. Expand: 2x + 8 − 3 = x + 9, or 2x + 5 = x + 9.
2. Subtract x and 5 on both sides: x = 4.
3. Check: 2(4 + 4) − 3 = 13 = 4 + 9.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Independent practice 6

Solve, taking care with the negative multiplier.

$$5 - 2(x - 1) = 3x - 8$$

Reference answer

x = 3.

$$x = 3$$

1. Expand: 5 − 2x + 2 = 3x − 8.
2. 7 − 2x = 3x − 8 gives 15 = 5x, so x = 3.
3. Check: 5 − 2(3 − 1) = 1 and 3 × 3 − 8 = 1.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Independent practice 7

Clear the denominator and solve. Do not leave the standalone 1 unchanged.

$$\frac{x}{2} + 1 = 4$$

Reference answer

x = 6.

$$x = 6$$

1. Multiply every term by 2: x + 2 = 8.
2. x = 6; check 6/2 + 1 = 4.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Independent practice 8

Use a common multiplier for 3 and 5, then solve.

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

Reference answer

x = 11.

$$x=11$$

1. Multiply both sides by 15: 5(x − 2) = 3(x + 4).
2. 5x − 10 = 3x + 12 gives 2x = 22 and x = 11.
3. Check: (11 − 2)/3 = 3 and (11 + 4)/5 = 3.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Exit question 9

Solve and check in the original fractional equation.

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

Reference answer

x = 7.

$$x=7$$

1. Multiply all terms by 3: 2x + 1 − 3 = 12.
2. 2x = 14, so x = 7.
3. Check: (2 × 7 + 1)/3 − 1 = 5 − 1 = 4.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Exit question 10

A learner multiplies (x + 2)/4 − 3 = 1 by 4 but writes x + 2 − 3 = 4. Identify the first error and solve correctly.

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

Reference answer

The −3 must also be multiplied by 4. Correct: x + 2 − 12 = 4, so x = 14.

$$x=14$$

1. The multiplier applies to the complete left side, including −3.
2. x + 2 − 12 = 4 gives x − 10 = 4 and x = 14.
3. Check: (14 + 2)/4 − 3 = 1.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Further practice 11

Solve after expanding both sides.

$$3(x+2)=2(x+5)$$

Reference answer

x = 4.

$$x=4$$

1. 3x + 6 = 2x + 10.
2. x = 4; both original sides are 18.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Further practice 12

Solve with the outside minus applied to both enclosed terms.

$$-(x-5)=2x-1$$

Reference answer

x = 2.

$$x=2$$

1. Expand to −x + 5 = 2x − 1.
2. 6 = 3x, so x = 2; both sides are 3.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Further practice 13

Clear both denominators using 6, then solve.

$$\frac{x}{3}+\frac{x}{6}=5$$

Reference answer

x = 10.

$$x=10$$

1. Multiplying by 6 gives 2x + x = 30.
2. 3x = 30, so x = 10. Check 10/3 + 10/6 = 5.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Further practice 14

Multiply both sides by 4, then solve.

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

Reference answer

x = 6.

$$x=6$$

1. 3x − 2 = 2(x + 2).
2. 3x − 2 = 2x + 4, so x = 6.
3. Both original sides equal 4.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Extension 15

Solve, showing both distributive steps before collecting.

$$2(x-1)-3(x+2)=4-2x$$

Reference answer

x = 12.

$$x=12$$

1. Expand: 2x − 2 − 3x − 6 = 4 − 2x.
2. −x − 8 = 4 − 2x. Add 2x and 8: x = 12.
3. Check: 2 × 11 − 3 × 14 = −20 and 4 − 24 = −20.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.

Extension 16

Use 6 as a common multiplier and retain the subtraction of the entire second numerator.

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

Reference answer

x = 11.

$$x = 11$$

1. Multiply by 6: 3(x + 1) − 2(x − 2) = 18.
2. 3x + 3 − 2x + 4 = 18, so x + 7 = 18 and x = 11.
3. Check: 12/2 − 9/3 = 6 − 3 = 3.

- Use the original equality and apply each operation to both sides.
- Obtain the solution and check it in the original equation or situation.