Linear equations: collect like terms — Teacher answers

Year 7, upper volume • text pp. 59–60 • foundation lesson 30

Keep the signs attached to the terms. Use the guided scaffold before independent work; ask learners to show the collected equation and a substitution check on paper. Brackets, denominator clearing and systems are outside this lesson.

Worked example 1

Solve 3x + 2x = 25. Explain what is added when like terms are collected.

$$3x + 2x = 25$$

Reference answer

x = 5.

1. The terms are like terms: 3x + 2x = 5x. The coefficients are added.
2. The equation becomes 5x = 25. Divide both sides by 5 to get x = 5.
3. Check: 3 × 5 + 2 × 5 = 15 + 10 = 25.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Guided attempt 2

Solve 7x − 3x + 6 = 22. Complete the three lines on paper before checking.

$$7x - 3x + 6 = 22$$

1. 7x − 3x = ____ x, so ____ x + 6 = 22.
2. Subtract 6 from both sides: ____ x = ____.
3. Divide both sides by ____: x = ____. Then substitute.

Reference answer

x = 4.

1. Collect the variable terms: 7x − 3x = 4x, so 4x + 6 = 22.
2. Subtract 6 from both sides: 4x = 16. Divide both sides by 4: x = 4.
3. Check: 7 × 4 − 3 × 4 + 6 = 28 − 12 + 6 = 22.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Prerequisite 3

Complete 3x − 5x = ____ x. Write only the coefficient.

$$3x - 5x = \underline{\quad\quad}x$$

Reference answer

The coefficient is −2: 3x − 5x = −2x.

1. The signed coefficients are 3 and −5.
2. 3 + (−5) = −2; keep x.

- Identify −5 as the second signed coefficient.
- Give −2 and retain the variable in the completed expression.

Prerequisite 4

For −4x = 20, what should both sides be divided by to make the coefficient of x equal to 1? State the solution and check it.

$$-4x = 20$$

Reference answer

Divide both sides by −4, not 4. Then x = −5 and −4 × (−5) = 20.

1. Divide both sides by −4: x = −5.
2. Check: −4 × (−5) = 20.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Independent practice 5

Solve 4x + 3x = 42.

$$4x + 3x = 42$$

Reference answer

x = 6.

1. Collect like terms: 7x = 42.
2. Divide both sides by 7: x = 6.
3. Check: 4 × 6 + 3 × 6 = 42.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Independent practice 6

Solve 9x − 5x − 3 = 13.

$$9x - 5x - 3 = 13$$

Reference answer

x = 4.

1. Collect the variable terms: 4x − 3 = 13.
2. Add 3 to both sides: 4x = 16. Divide by 4: x = 4.
3. Check: 9 × 4 − 5 × 4 − 3 = 13.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Independent practice 7

Solve 2x − 7x = 30.

$$2x - 7x = 30$$

Reference answer

x = -6.

1. 2 − 7 = −5, so −5x = 30.
2. Divide both sides by −5: x = −6.
3. Check: 2 × (−6) − 7 × (−6) = −12 + 42 = 30.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Independent practice 8

Solve −6x + x + 8 = −12.

$$-6x + x + 8 = -12$$

Reference answer

x = 4.

1. The coefficient of x alone is 1: −6x + x = −5x.
2. −5x + 8 = −12. Subtract 8: −5x = −20. Divide by −5: x = 4.
3. Check: −6 × 4 + 4 + 8 = −12.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Exit question 9

Solve −3x − 2x = 15. Include a substitution check.

$$-3x - 2x = 15$$

Reference answer

x = -3.

1. −3x − 2x = −5x, so −5x = 15.
2. Divide both sides by −5: x = −3.
3. Check: −3 × (−3) − 2 × (−3) = 9 + 6 = 15.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Exit question 10

For 4x − 7x = 18, a learner writes 3x = 18 and x = 6. Identify the first error, correct the solution and check it.

$$4x - 7x = 18$$

Reference answer

4 − 7 = −3, not 3. Thus −3x = 18 and x = −6. Substitution gives −24 + 42 = 18.

1. The first error is losing the sign when calculating 4 − 7.
2. Correct it to −3x = 18, then divide both sides by −3: x = −6.
3. Check the original equation: 4 × (−6) − 7 × (−6) = 18.

- Locate the error at 4x − 7x = 3x.
- Correct to −3x and x = −6, with a valid substitution check.

Further practice 11

Solve 8x − 2x = −24.

$$8x - 2x = -24$$

Reference answer

x = -4.

1. Collect: 6x = −24.
2. Divide both sides by 6: x = −4.
3. Check: 8 × (−4) − 2 × (−4) = −24.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Further practice 12

Solve 5x − 9x + 7 = 27.

$$5x - 9x + 7 = 27$$

Reference answer

x = -5.

1. Collect: −4x + 7 = 27.
2. Subtract 7: −4x = 20. Divide by −4: x = −5.
3. Check: 5 × (−5) − 9 × (−5) + 7 = 27.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Further practice 13

Solve −2x − 5x − 9 = 12.

$$-2x - 5x - 9 = 12$$

Reference answer

x = -3.

1. Collect: −7x − 9 = 12.
2. Add 9: −7x = 21. Divide by −7: x = −3.
3. Check: −2 × (−3) − 5 × (−3) − 9 = 12.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Further practice 14

Solve 10x − 6x + 3x = −14.

$$10x - 6x + 3x = -14$$

Reference answer

x = -2.

1. 10 − 6 + 3 = 7, so 7x = −14.
2. Divide both sides by 7: x = −2.
3. Check: 10 × (−2) − 6 × (−2) + 3 × (−2) = −14.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Extension 15

Solve 12x − 8x − 3x − 9 = 0. Explain why x remains after collecting the variable terms.

$$12x - 8x - 3x - 9 = 0$$

Reference answer

x = 9.

1. 12 − 8 − 3 = 1, so the variable terms combine to 1x = x.
2. x − 9 = 0. Add 9 to both sides: x = 9.
3. Check: 12 × 9 − 8 × 9 − 3 × 9 − 9 = 0.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.

Extension 16

Solve −2x − 4x + 3x + 17 = −1. Check without changing the original order of the terms.

$$-2x - 4x + 3x + 17 = -1$$

Reference answer

x = 6.

1. −2 − 4 + 3 = −3, so −3x + 17 = −1.
2. Subtract 17: −3x = −18. Divide by −3: x = 6.
3. Check: −2 × 6 − 4 × 6 + 3 × 6 + 17 = −12 − 24 + 18 + 17 = −1.

- Combine only like terms and keep both sides equal.
- Find the stated value and check it in the original equation.