JUNIOR CYCLE MATHS · FREE REVISION SHEET

Linear equations

↗ Léim

Learning outcomes (2018 specification): AF.2c, AF.4, U.3. Play the game: **leim.ie/balance-it.html**

1. Keep it balanced



3x + 2 = 14

"=" means both sides have the **same value**. Do the **same thing to both sides** and it stays balanced.

2. Undo, last thing first

4x − 7 = 21

4x = 28 (+7 both sides)

x = 7 (÷4 both sides)

Check: 4(7) − 7 = 21 ✓

+ undoes −, × undoes ÷: x + 9 = 4 → x = −5; −3x = 18 → x = −6; x/4 = 5 → x = 20.

3. Letters on both sides

5x + 3 = 2x + 18

3x + 3 = 18 (−2x both sides)

3x = 15 → x = 5

A term that moves across the = changes its sign.

4. Brackets: expand first

3(x − 4) = 2(x + 1)

3x − 12 = 2x + 2 → x = 14

5. Fractions: clear them first

Multiply **every term** by the LCM of the bottom numbers.

x/2 + x/3 = 10 (LCM 6)

3x + 2x = 60 → 5x = 60 → x = 12

(x + 2)/5 = 3 → x + 2 = 15 → x = 13

Don't forget the number on its own: the 10 becomes 60.

6. Equations from words

Say what x stands for, write the other amounts using x, find what is equal, solve, then answer in words.

"I think of a number, multiply it by 4 and add 7. The answer is 31."

4x + 7 = 31 → 4x = 24 → x = 6

Consecutive numbers: x, x + 1, x + 2 · angles in a triangle: 180° · perimeter: add all the sides.

7. Always check

Put your answer into the **original** equation: both sides must give the same number.

Exam tip: show every step on its own line (method marks), do the same to both sides and to **every** term, and watch the signs when you expand a bracket or move a term. In word problems, say what x is and answer with units.

PRACTICE · 34 QUESTIONS

Have a go

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A. One and two steps

1. $x + 9 = 4$ _____
2. $x - 6 = 11$ _____
3. $7x = 42$ _____
4. $-3x = 18$ _____
5. $x/4 = 5$ _____
6. $3x + 5 = 26$ _____
7. $5x - 8 = 17$ _____
8. $20 - 3x = 2$ _____

B. Letters on both sides, brackets

9. $5x + 2 = 3x + 14$ _____
10. $7x - 4 = 2x + 21$ _____
11. $4x + 9 = x - 3$ _____
12. $2x - 5 = 6x + 15$ _____
13. $3(x + 4) = 27$ _____
14. $5(x - 2) = 3x + 4$ _____
15. $4(x + 1) = 2(x + 7)$ _____
16. $3(2x - 1) - 2(x + 3) = 11$ _____

C. Fractions

17. $x/3 + 4 = 9$ _____
18. $(x + 4)/5 = 3$ _____
19. $x/2 - 3 = 5$ _____
20. $(2x - 1)/3 = 5$ _____
21. $x/2 + x/3 = 15$ _____
22. $x/4 - x/6 = 2$ _____
23. $(x + 3)/2 = (x + 9)/4$ _____
24. $(x + 1)/3 + (x - 1)/2 = 4$ _____

D. From words (write an equation first)

25. I think of a number, multiply it by 5 and subtract 3. The answer is 32. Find the number. _____
26. I think of a number, add 4, then double the result. The answer is 26. Find the number. _____
27. Three consecutive whole numbers add up to 72. Find them. _____
28. Aoife is 4 years older than Cian. Their ages add up to 30. How old is each? _____
29. The angles of a triangle are $x°$, $2x°$ and $(x + 40)°$. Find x. _____
30. A rectangle is $(x + 6)$ cm long and x cm wide. Its perimeter is 40 cm. Find x and the area. _____

Questions 31–34 are on the next page.

EXAM-STYLE · THEN CHECK

Exam corner + answers

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E. Exam-style questions (show your work)

31. Solve 2(3x − 4) − (x − 3) = 3(x + 5).

32. A taxi charges €4 plus €2 for every km. (a) Write an expression for the cost of an x km trip. (b) Liam's trip cost €28. Write an equation and find how far he went.

33. Solve (x − 2)/3 − (x − 4)/5 = 2.

34. Niamh has €x. Ciara has €15 more than Niamh, and Seán has twice as much as Niamh. Together they have €95. (a) Write an equation. (b) How much does each person have?

Answers

A	1. x = −5 · 2. x = 17 · 3. x = 6 · 4. x = −6 · 5. x = 20 · 6. x = 7 · 7. x = 5 · 8. x = 6
B	9. x = 6 · 10. x = 5 · 11. x = −4 · 12. x = −5 · 13. x = 5 · 14. x = 7 · 15. x = 5 · 16. x = 5
C	17. x = 15 · 18. x = 11 · 19. x = 16 · 20. x = 8 · 21. x = 18 · 22. x = 24 · 23. x = 3 · 24. x = 5
D	25. 5x − 3 = 32 → 7 · 26. 2(x + 4) = 26 → 9 · 27. x + (x + 1) + (x + 2) = 72 → 23, 24, 25 · 28. x + (x + 4) = 30 → Cian 13, Aoife 17 · 29. x + 2x + (x + 40) = 180 → 35 (angles 35°, 70°, 75°) · 30. 2(x + 6) + 2x = 40 → x = 7; 13 cm × 7 cm = 91 cm²
E	31. 6x − 8 − x + 3 = 3x + 15 → 5x − 5 = 3x + 15 → 2x = 20 → **x = 10** (check: 45 = 45) · 32. (a) **2x + 4** (b) 2x + 4 = 28 → 2x = 24 → **12 km** · 33. × 15: 5(x − 2) − 3(x − 4) = 30 → 5x − 10 − 3x + 12 = 30 → 2x + 2 = 30 → **x = 14** (check: 4 − 2 = 2) · 34. (a) **x + (x + 15) + 2x = 95** (b) 4x + 15 = 95 → x = 20: **Niamh €20, Ciara €35, Seán €40**

Got one wrong? Put your answer back into the question: do both sides match? Did you do the same to **both** sides? Multiply **every** term in a bracket, and every term (the whole numbers too) when you clear fractions? Change the sign of a term that moved across the =? Then play **Balance It** at leim.ie/balance-it.html: the "Go back over these" list at the end shows the rule for each mistake.

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