Name & Surname: _____ Class: _____ Date: _____

BALANCED MOVES

Solve linear equations step by step

About 45 minutes Level ★★★☆☆



SOLVING IN BALANCE

An **equation** is balanced: both sides stay equal. To find the **solution**, use the **inverse operation** to get x on its own.

- Undo + and - first, then undo **multiplication** and division.
- If x is on both sides, move all **x-terms** to one side first.
- If there are **brackets**, expand first, then collect like terms.
- **Check** by substituting the answer back in.

TASK A

/14

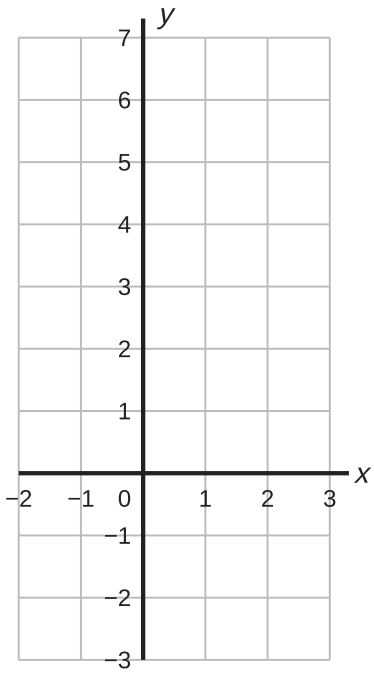
Complete the tables for each equation, draw both lines, then read values from your graph.

y = 2x + 1

x	−2	−1	0	1	2	3
y						

y = 5 − x

x	−2	−1	0	1	2	3
y						



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TWO-STEP PRACTICE

Practise undoing steps in order and checking answers.

TASK B

/12

Practise solving equations in order and check each answer by substitution.

WARM UP

1 Solve the **equation** x + 7 = 18

Answer: _____

2 Solve the **equation** x - 5 = 12

Answer: _____

3 Solve the **equation** 4x = 20

Answer: _____

4 Solve the **equation** $\frac{x}{3} = 9$

Answer: _____

PRACTISE

5 Solve the **equation** 2x + 5 = 13

Answer: _____

6 Solve the **equation** 3x + 8 = 20

Answer: _____

7 Solve the **equation** 8x - 3 = 37

Answer: _____

8 Solve the **equation** 7m - 10 = 39

Answer: _____

PROBLEM SOLVING

9 A taxi firm charges a £5 **flat rate** plus £2 per mile. A ride costs £17. How many **miles** is the ride?

Answer: _____

10 The **perimeter** of a square is 20 cm. Each side is (x + 3) cm. Find the **value** of x.

Answer: _____

11 Explain how you **know** x = 4 is the **solution** to 2x + 5 = 13.

Answer: _____

12 A student thinks of a **number**, multiplies it by 8 and subtracts 12 to get 60. Find the **number**.

Answer: _____

KEY WORDS

equation: two expressions made equal with =

inverse operation: opposite move that undoes a step

substitution: putting the answer back in to check

variable: letter standing for an unknown number

solution: value that makes both sides balance

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FIND THE MISTAKE

Spot the wrong step and put it right.

TASK C

/6

Find the first wrong step in each solution and explain the fix.



Student A

Solve the **equation** 5x + 11 = 22

1. 5x + 11 = 22
2. 5x = 22 + 11
3. 5x = 33
4. $x = \frac{33}{5}$

The mistake is in step: _____

What went wrong?

.....

Correct answer: _____



Student B

Solve the **equation** 13x - 2 = 11x + 17

1. 13x - 2 = 11x + 17
2. 24x - 2 = 17
3. 24x = 19
4. $x = \frac{19}{24}$

The mistake is in step: _____

What went wrong?

.....

Correct answer: _____



Student C

Solve the **equation** 3(x + 4) = 27

1. 3(x + 4) = 27
2. 3x + 4 = 27
3. 3x = 23
4. $x = \frac{23}{3}$

The mistake is in step: _____

What went wrong?

.....

Correct answer: _____

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BOTH SIDES FIRST

Solve equations with unknowns on both sides and brackets.

TASK D

/12

Solve equations with x on both sides and with brackets, showing each move.

WARM UP

1 Solve the **equation** 3a + 11 = 2a + 19

Answer: _____

2 Solve the **equation** 5x + 12 = 3x + 20

Answer: _____

3 Solve the **equation** 7y + 15 = 4y + 33

Answer: _____

4 Solve the **equation** 10z + 3 = 3z + 31

Answer: _____

PRACTISE

5 Solve the **equation** 3(4x + 1) = 51

Answer: _____

6 Solve the **equation** 4(2m - 5) = 3(m + 5)

Answer: _____

7 Solve the **equation** 7c - 22 = 10 - c

Answer: _____

8 Solve the **equation** 12a = 3(3a + 9)

Answer: _____

PROBLEM SOLVING

9 Three friends share 65 **sweets**. One friend takes 5 more than a second friend. A third friend takes four times as many as the second friend. How many **sweets** does the second friend take?

Answer: _____

10 An electrician charges a £120 **call-out fee** plus an hourly rate. A 6-hour job costs £480. Find the **hourly rate**.

Answer: _____

11 A student thinks of a **number**. Multiplying it by 6 and subtracting 24 gives the same **answer** as multiplying it by 4 and adding 6. Find the **number**.

Answer: _____

12 Explain how you **know** you must expand the **brackets** first in 4(2m - 5) = 3(m + 5).

Answer: _____

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MACHINES AND SORTING

Use function machines and sort the undo order.

TASK E

/9

Find the missing inputs and outputs by working forwards and backwards.

1 IN → × 2 → + 5 → OUT

In	Out
1	
4	
10	
	11
	19

2 IN → × 3 → − 2 → OUT

In	Out
5	
7	
	19
	4

TASK F

Example done for you

/5

Sort each inverse move into the order you undo it.

× 3 ÷ 2 ~~+ 11~~ × 5 - 5 + 4

Undo first	Undo last
+ 11	

HOW DID I DO?

Circle a face for each line.

I can solve two-step equations and check my answer ☹ 😐 ☺

I can expand brackets and collect like terms to solve ☹ 😐 ☺

I can solve equations with unknowns on both sides ☹ 😐 ☺

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Answer sheet: Balanced Moves

Task A

y = 2x + 1: y = −3, −1, 1, 3, 5, 7; a straight line through these points

y = 5 − x: y = 7, 6, 5, 4, 3, 2; a straight line through these points

---

Task B

1. x = 11
2. x = 17
3. x = 5
4. x = 27
5. x = 4
6. x = 4
7. x = 5
8. m = 7
9. 6 miles
10. x = 2
11. Substituting 4 gives 2 × 4 + 5 = 13, so both sides balance.
12. x = 9

Task C

1. Step 2 is wrong: They added 11 instead of subtracting. Undo +11 by subtracting 11 from both sides to keep balance. Correct answer: x = $\frac{11}{5}$
2. Step 2 is wrong: They added 11x instead of subtracting. Subtract 11x from both sides so the x-terms are together. Correct answer: x = $\frac{19}{2}$
3. Step 2 is wrong: They did not expand the bracket fully. 3 × 4 = 12, so the line should be 3x + 12 = 27. Correct answer: x = 5

Task D

1. a = 8
2. x = 4
3. y = 6
4. z = 4
5. x = 4
6. m = 7
7. c = 4
8. a = 9
9. 10 sweets
10. £60 per hour
11. x = 15
12. The brackets hide the x-terms, so expand to 8m - 20 = 3m + 15 before collecting like terms.

Task E

1. 1 → 7; 4 → 13; 10 → 25; 3 → 11; 7 → 19
2. 5 → 13; 7 → 19; 7 → 19; 2 → 4

Task F

Undo first: + 11, - 5, + 4

Undo last: × 3, ÷ 2, × 5

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