

Equation Evidence

Solve equations and justify every move.

GRADE 7 • TEKS 7.1.G

7.1.G "display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication."

NAME _____

DATE _____

KEEP IT BALANCED

An equation is balanced when both sides have the same value. To solve for x , use inverse operations on both sides and name each operation so another reader can check why equality is preserved.

WORKED EXAMPLE

Solve $5x - 7 = 28$.

1. Add 7 to both sides: $5x = 35$.
2. Divide both sides by 5: $x = 7$.
3. Check: $5(7) - 7 = 28$.

Answer: $x = 7$

PRACTICE 6 problems

- 1** Solve $3x + 4 = 22$. Show each operation on both sides. In one sentence, explain why your steps keep the equation balanced.

ANSWER _____

- 2** Solve $x/6 - 2 = 4$. Show each operation on both sides. In one sentence, explain why your steps keep the equation balanced.

ANSWER _____

- 3** Solve $-4x + 9 = -15$. Show each operation on both sides. In one sentence, explain why your steps keep the equation balanced.

ANSWER _____

- 4** Solve $2(x - 3) = 18$. Show each operation on both sides. In one sentence, explain why your steps keep the equation balanced.

ANSWER _____

- 5** Solve $24 = 3x - 12$. Show each operation on both sides. In one sentence, explain why your steps keep the equation balanced.

ANSWER _____

- 6** Solve $-3(x + 2) = -24$. Show each operation on both sides. In one sentence, explain why your steps keep the equation balanced.

ANSWER _____

APPLY IT Show your work

- 1** An esports club charges a \$6 entry fee and \$4 for each round played. Maya paid \$42. Write an equation for x , the number of rounds. Solve it, and explain why the first operation in your solution is valid.

WORK SPACE

ANSWER _____

- 2** At the start of a mobile game, Kai has 68 energy points. Each challenge uses 8 points. After x challenges, Kai has 20 points. Write and solve an equation. Explain why adding $8x$ to both sides is valid.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve $4(x + 3) - 6 = 2x + 18$. Show your steps. Then write at least two complete sentences that justify your use of the distributive property and the operations used to isolate x .

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Solve $3x + 4 = 22$. Show each operation on both sides. In one sentence, explain why your steps keep the equation balanced.	$3x = 18$, $x = 6$. Subtracting 4 from both sides and then dividing both sides by 3 keeps both sides equal.
2	Solve $x/6 - 2 = 4$. Show each operation on both sides. In one sentence, explain why your steps keep the equation balanced.	$x/6 = 6$, $x = 36$. Adding 2 to both sides and then multiplying both sides by 6 keeps both sides equal.
3	Solve $-4x + 9 = -15$. Show each operation on both sides. In one sentence, explain why your steps keep the equation balanced.	$-4x = -24$, $x = 6$. Subtracting 9 from both sides and then dividing both sides by -4 keeps both sides equal.
4	Solve $2(x - 3) = 18$. Show each operation on both sides. In one sentence, explain why your steps keep the equation balanced.	$x - 3 = 9$, $x = 12$. Dividing both sides by 2 and then adding 3 to both sides keeps both sides equal.
5	Solve $24 = 3x - 12$. Show each operation on both sides. In one sentence, explain why your steps keep the equation balanced.	$36 = 3x$, $x = 12$. Adding 12 to both sides and then dividing both sides by 3 keeps both sides equal.
6	Solve $-3(x + 2) = -24$. Show each operation on both sides. In one sentence, explain why your steps keep the equation balanced.	$x + 2 = 8$, $x = 6$. Dividing both sides by -3 and then subtracting 2 from both sides keeps both sides equal.

PART 2 • APPLY IT

- $6 + 4x = 42$; $4x = 36$; $x = 9$.** Subtracting 6 from both sides is valid because subtracting the same amount from equal values keeps them equal. Use $6 + 4x = 42$ because the total includes the entry fee and the cost of x rounds. Subtract 6, then divide by 4.
- $68 - 8x = 20$; $68 = 20 + 8x$; $48 = 8x$; $x = 6$.** Adding $8x$ to both sides preserves equality because the same quantity is added to equal values. Use $68 - 8x = 20$ because each challenge decreases the starting energy by 8 points. Add $8x$ to both sides, subtract 20, and divide by 8.

CHALLENGE

$4x + 12 - 6 = 2x + 18$ $4x + 6 = 2x + 18$ $2x + 6 = 18$ $2x = 12$ $x = 6$ The distributive property changes $4(x + 3)$ to $4x + 12$ without changing its value. Subtracting $2x$ from both sides, subtracting 6 from both sides, and dividing both sides by 2 keep the equation balanced, so $x = 6$.