

# Balance Your Proof

*Solve equations and justify each move with precise math language.*

**GRADE 6 • TEKS 6.1.G**

**6.1.G** “display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.”

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## SHOW WHY IT WORKS

An equation is balanced because both sides have the same value. To solve an equation, use inverse operations on both sides, then check by replacing  $x$  with your answer. In your justification, name each operation and explain that doing it to both sides preserves equality.

## WORKED EXAMPLE

Solve and justify:  $7x - 6 = 29$

1. Add 6 to both sides:  $7x = 35$ .
2. Divide both sides by 7:  $x = 5$ .
3. Check:  $7(5) - 6 = 29$ .

**Answer:  $x = 5$ . Adding 6 and dividing by 7 on both sides keeps the equation balanced.**

## PRACTICE 6 problems

- 1** Solve  $3x + 4 = 28$ . Then write one sentence that names the operations you used and explains why  $x$  is the solution.

**ANSWER** \_\_\_\_\_

- 2** Solve  $x/4 + 3 = 9$ . Then write one sentence that names the operations you used and explains why  $x$  is the solution.

**ANSWER** \_\_\_\_\_

- 3** Solve  $2(x + 8) = 22$ . Then write one sentence that names the operations you used and explains why  $x$  is the solution.

**ANSWER** \_\_\_\_\_

- 4** Solve  $4x - 9 = 27$ . Then write one sentence that names the operations you used and explains why  $x$  is the solution.

**ANSWER** \_\_\_\_\_

- 5** Solve  $15 = x/3 + 11$ . Then write one sentence that names the operations you used and explains why  $x$  is the solution.

**ANSWER** \_\_\_\_\_

- 6** Solve  $4(x - 2) = 32$ . Then write one sentence that names the operations you used and explains why  $x$  is the solution.

**ANSWER** \_\_\_\_\_

## APPLY IT Show your work

- 1** Four sticker packs cost  $x$  dollars each, and a notebook costs \$3. The total cost is \$39. Write an equation, solve it, and explain your steps in one or two sentences.

WORK SPACE

**ANSWER** \_\_\_\_\_

- 2** Jordan has \$12 saved for a concert ticket. Jordan saves  $x$  dollars each week for 8 weeks and ends with \$44. Write an equation, solve it, and explain your steps in one or two sentences.

WORK SPACE

**ANSWER** \_\_\_\_\_

## CHALLENGE One step up

Solve  $3x + 8 = 2x + 19$ . Explain in one or two sentences why subtracting  $2x$  from both sides is valid.

WORK SPACE AND ANSWER

## PART 1 • PRACTICE

| # | PROBLEM                                                                                                                  | ANSWER                                                                                                                         |
|---|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 1 | Solve $3x + 4 = 28$ . Then write one sentence that names the operations you used and explains why $x$ is the solution.   | <b><math>x = 8</math>. I subtracted 4 from both sides and divided both sides by 3, so the equation stayed balanced.</b>        |
| 2 | Solve $x/4 + 3 = 9$ . Then write one sentence that names the operations you used and explains why $x$ is the solution.   | <b><math>x = 24</math>. I subtracted 3 from both sides and multiplied both sides by 4, so both sides remained equal.</b>       |
| 3 | Solve $2(x + 8) = 22$ . Then write one sentence that names the operations you used and explains why $x$ is the solution. | <b><math>x = 3</math>. I divided both sides by 2 and subtracted 8 from both sides, which preserved equality.</b>               |
| 4 | Solve $4x - 9 = 27$ . Then write one sentence that names the operations you used and explains why $x$ is the solution.   | <b><math>x = 9</math>. I added 9 to both sides and divided both sides by 4, so the equation stayed balanced.</b>               |
| 5 | Solve $15 = x/3 + 11$ . Then write one sentence that names the operations you used and explains why $x$ is the solution. | <b><math>x = 12</math>. I subtracted 11 from both sides and multiplied both sides by 3, so both sides kept the same value.</b> |
| 6 | Solve $4(x - 2) = 32$ . Then write one sentence that names the operations you used and explains why $x$ is the solution. | <b><math>x = 10</math>. I divided both sides by 4 and added 2 to both sides, which kept the equation balanced.</b>             |

## PART 2 • APPLY IT

- $4x + 3 = 39$ , so  $x = 9$ . Subtracting 3 and dividing by 4 on both sides shows that each sticker pack costs \$9.** Use  $4x + 3 = 39$ . Subtract 3 to get  $4x = 36$ , then divide by 4.
- $8x + 12 = 44$ , so  $x = 4$ . Subtracting 12 and dividing by 8 on both sides shows that Jordan saves \$4 each week.** Use  $8x + 12 = 44$ . Subtract 12 to get  $8x = 32$ , then divide by 8.

## CHALLENGE

**$x = 11$ . Subtracting  $2x$  from both sides preserves equality and leaves  $x + 8 = 19$ , so subtracting 8 gives  $x = 11$ .**

Accept equivalent equations and solution paths when each operation is applied to both sides correctly. For written justifications, accept clear statements that name the inverse operations and explain that equality is preserved.