

Equations & Inequalities — Think & Model

“Translate words \rightarrow math, keep both sides balanced, and watch those negatives!”

Mini-Review (Equations)

To solve a linear equation: **(1)** Distribute, **(2)** combine like terms on each side, **(3)** move variables to one side and constants to the other, **(4)** undo multiplication/division last.

Mini-Review (Inequalities)

Doing the same steps works for inequalities, *except*: when you **multiply or divide both sides by a negative number, flip the inequality sign**. Adding/subtracting or multiplying by a positive does *not* flip it.

1. Solve for x :

$$\frac{3}{4}(x - 2) - \frac{1}{2}(x + 6) = 5.$$

2. **(Percent discount)** After a 20% discount, a jacket costs \$48. Let p be the original price. Write and solve an equation to find p .

3. **(Travel time)** A student bikes to school at 12 mph and rides a bus home at 24 mph. If the total travel time for the round trip is 1 hour and the school is d miles from home, write and solve an equation to find d .

4. (**Average jump**) After 5 quizzes the average is 86. After a 6th quiz, the average rises to 88. Let x be the score on quiz 6. Write and solve an equation to find x .

5. (**Perimeter modeling**) A rectangle has perimeter 48 cm. The length is 3 more than twice the width. Let w be the width. Write and solve an equation to find w (and the length too).

6. (**Consecutive integers**) The sum of three consecutive integers is 51. Let the smallest be n . Write and solve an equation to find all three integers.

7. (**Balance the machine**) “Triple a number and subtract 8; you get the same as doubling the number plus 7.” Let the number be x . Write and solve the equation.

8. (**Height requirement**) A ride requires you to be at least 72 inches tall. Your shoes add 1.5 inches. If your barefoot height is h , write an inequality that guarantees you can ride, then solve for h .

9. (**Arcade budget**) You have \$30. Each game costs \$1.25 and a locker rental is a one-time \$0.25. If you play g games, write and solve an inequality to find the maximum whole number of games you can play.

10. Solve the inequality and *state where/why* the sign flips (if it does):

$$-3(2x - 5) < 9.$$

11. Solve the inequality (careful with fractions):

$$\frac{1}{4}(5 - 2x) \geq 3.$$

12. (**Bank balance**) Your account starts at \$10 and you spend \$2 per day. After d days your balance is $B = 10 - 2d$. Write and solve an inequality so your balance is at most \$-14. How many days until you are *below or equal to* \$-14?

13. Solve (decimals + flipping):

$$-0.5(4x + 6) \geq 7.$$

14. Solve:

$$\frac{x}{3} + \frac{5}{6} = \frac{2x}{3} - \frac{1}{2}.$$

15. Solve:

$$7 - 2(3x - 4) = 5x + 1.$$
