How Many Solutions?

One solution: different slopes. None: parallel (same m, different b), algebra ends false.
Infinitely many: the same line (same m and b), algebra ends true. Compare m and b to predict.

1 THE VOCABULARY
Words we use

One solution different slopes: cross once; algebra gives x = a number.

No solution parallel: same m, different b; algebra ends in a false line (0 = 5).

Infinitely many the same line: same m, same b; algebra ends in a true line (0 = 0).

Predict rewrite both as y = mx + b and compare.

Strange final line not a mistake: false means none, true means infinitely many.

- Watch out for these.
- Comparing before rewriting. 2y = 4x + 2 has slope 2, not 4.
- Reading 0 = 5 as a mistake and starting over. It is the answer: no solution.
- Saying no solution for 0 = 0. That is infinitely many.
- Thinking same b alone means something. Same b with different m is one solution at (0, b).

2 THE METHOD
Predict, then confirm

1. **REWRITE BOTH AS** y = mx + b so m and b can be read.
2. **COMPARE** m different: one solution. Solve it if asked.
3. **SAME** m: **COMPARE** b different b: parallel, no solution. Same b: the same line, infinitely many.
4. **CONFIRM** graph, or solve and read the ending: a number, a false line, or a true line.

WHY THE VARIABLE DISAPPEARS

Same slopes mean the x terms are identical, so subtracting one equation from the other wipes them out. What remains is the two y-intercepts compared: unequal gives a false statement, equal gives a true one.

3 THE THREE ENDINGS
y = 2x + 1 against three second equations

with y = –x + 5: 2x + 1 = –x + 5, x = 4/3	different slopes: one solution
with y = 2x – 3: 2x + 1 = 2x – 3, so 1 = –3	false line: parallel, no solution
with 2y = 4x + 2: 2(2x + 1) = 4x + 2, so 2 = 2	true line: the same line, infinitely many
predicted from m and b	2 and –1 differ; 2 and 2 with b 1 and –3; 2 and 2 with b 1 and 1

ON THE GRID

One crossing, two parallel lines, or one line drawn twice. The picture matches the ending every time.

SAY IT OUT LOUD

Different m: one. Same m, different b: none. Same m, same b: infinitely many. False line means none, true line means all.