

LESSON 16 | MEET THE IDEA

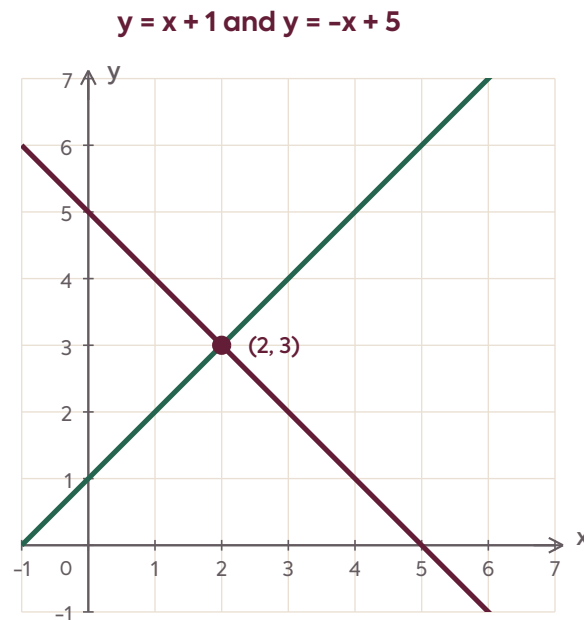
Writing and graphing systems of equations

Thursday, December 10, 2026 . 6:00–7:00 PM Central

By the end, I can...

Write two equations for the same situation and use their graphs to find and interpret a shared solution.

A **system** is a set of equations that must be true at the same time. For two lines, a shared solution is a point on **both** lines.



Rising line: $y = x + 1$. Falling line: $y = -x + 5$.

The intersection is the answer

The graph suggests **(2, 3)**. Check both equations:

$3 = 2 + 1$, and $3 = -2 + 5$. Both are true, so the coordinates are exact.

Report an ordered pair, not just $x = 2$. The input and output describe the same point.

LESSON 16 | TABLES, GRAPHS AND WORDS

Build the two rules

These tables describe two **linear** relationships. Use each row of outputs to find its own slope and intercept.

x	0	1	2
First output	1	3	5
Second output	7	6	5

From the table to a system

$$y = 2x + 1$$

$$y = -x + 7$$

Shared point: (2, 5)

First output: add 2 per input unit; start at 1.

Second output: subtract 1 per input unit; start at 7.

Both tables give $y = 5$ when $x = 2$. Check both rules.

From a graph

On the opening graph, one line passes through (0, 1) and (2, 3), so its slope is 1. The other passes through (0, 5) and (2, 3), so its slope is -1. Write **one equation for each line**.

From words

A club has 12 tickets to sell: adult tickets a and student tickets s . Adult tickets cost \$8 and student tickets cost \$5. Total sales are \$78.

$a + s = 12$ counts tickets.

$8a + 5s = 78$ counts dollars.

Keep the meaning consistent

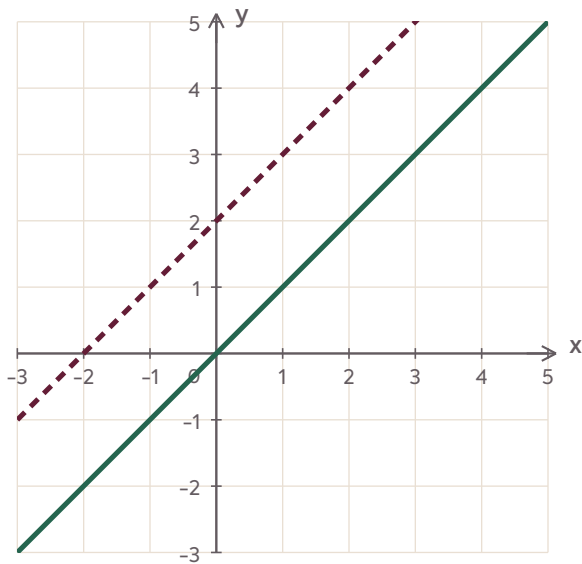
The same variable must mean the same quantity in both equations. Do not add a ticket count to a dollar amount.

LESSON 16 | WHAT THE LINES SHOW

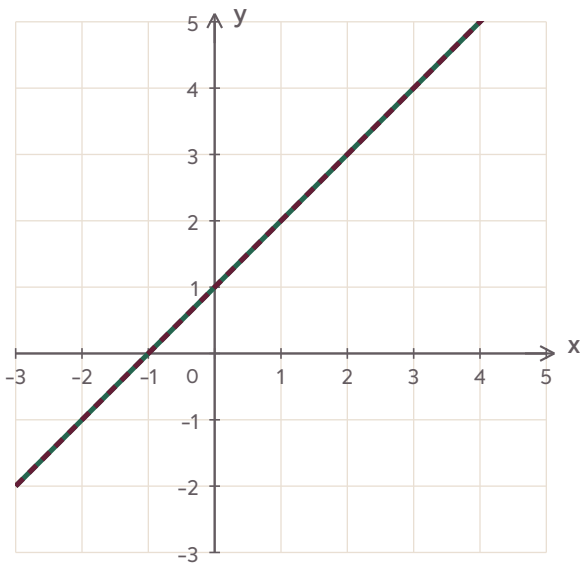
One, none or infinitely many?

Two straight lines can cross once, stay separate forever, or lie exactly on top of each other. The picture tells you how many shared solutions they have.

Distinct parallel lines: none



Same line: infinitely many



Case	Equations	Shared solutions
Cross once	$y = x + 1$; $y = -x + 5$	One: $(2, 3)$.
Same slope, different intercepts	$y = x$; $y = x + 2$	None: there is no intersection.
Equivalent equations	$y = x + 1$; $2y = 2x + 2$	Every point on their shared line.

Here, a dashed stroke helps distinguish one **equation** from the other; both equation graphs include every point on their lines. Only an **inequality** uses a dashed boundary to exclude equality.

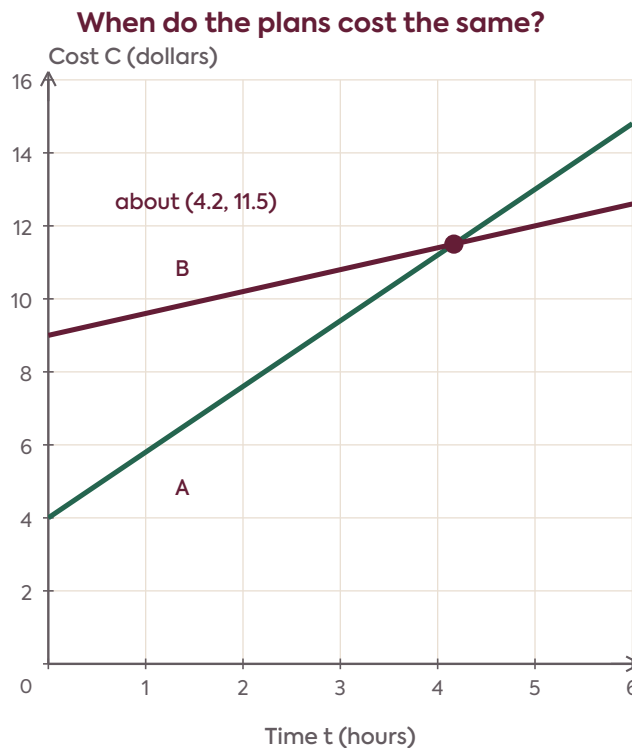
LESSON 16 | A BREAK-EVEN EXAMPLE

An intersection can be an estimate

Two fictional equipment-rental plans charge by time used. With t in hours and C in dollars:

Plan A: $C = 1.8t + 4$; **Plan B:** $C = 0.6t + 9$.

Assume time can include fractions of an hour; both models apply for $0 \leq t \leq 6$.



Read the graph as **about 4.2 hours and \$11.50**. The coordinates mean equal cost at the same rental time. Before the crossing, A costs less; after it, B costs less in this interval.

Use $\approx$ when the graph gives an estimate

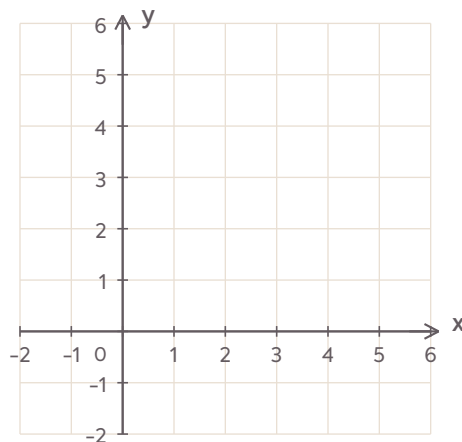
At $t = 4.2$, A gives \$11.56 and B gives \$11.52: close, but not identical because t was rounded. A graph estimate is not an exact algebraic solution. The next two lessons develop exact methods.

LESSON 16 | SHORT CHECKS

Your turn

1. Graph $y = x - 1$ and $y = -x + 3$. Give the intersection, then check it in both equations.

Two lines on the same axes



2. For $x = 0, 1, 2$, one linear table has $y = 2, 5, 8$; the other has $y = 4, 6, 8$. Write the system and its shared point.

3. Classify each system: (a) $y = 2x + 1$ and $y = 2x - 3$; (b) $y = 3x - 2$ and $2y = 6x - 4$.

4. Plan P charges \$20 plus \$3 per visit. Plan Q charges \$5 per visit. Define variables and write two equations. Check whether (10, 50) is their break-even point.

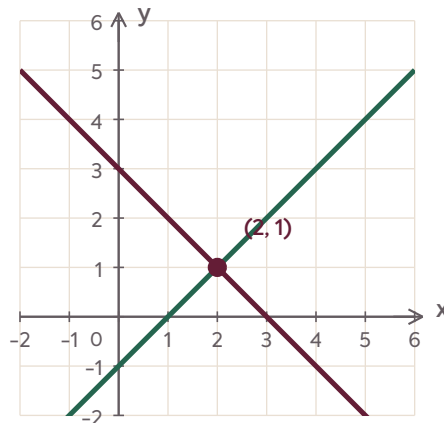
5. A graph suggests an intersection at (1.7, 4.3). Why should you use $\approx$ until you verify both equations?

LESSON 16 | WORKED ANSWERS

Check both relationships

1. The intersection is **(2, 1)**. Both $1 = 2 - 1$ and $1 = -2 + 3$ are true.

Answer 1: intersection (2, 1)



2. $y = 3x + 2$ and $y = 2x + 4$. The shared point is **(2, 8)**: $3(2) + 2 = 8$ and $2(2) + 4 = 8$.

3. **(a) No solution:** same slope, different intercepts. **(b) Infinitely many:** dividing the second equation by 2 gives the first. Solutions lie on $y = 3x - 2$.

4. Let v be visits and C be dollars. $C = 20 + 3v$; $C = 5v$. At $v = 10$, both give \$50, so **(10, 50)** is the break-even point. Here v is a nonnegative whole number.

5. The grid may only support an approximate reading. Rounded coordinates can be close to both lines without satisfying both equations exactly.

I can...

- ☐ Write one equation for each relationship.
- ☐ Interpret and check an intersection.

Next class: substitution finds exact coordinates without relying on a graph. Curriculum focus: A.2I, A.3F, A.3G.