

LESSON 9 | MEET THE IDEA

Writing linear equations in three forms

Tuesday, November 10, 2026 . 6:00–7:00 PM Central

By the end, I can...

Write an equation from a point and slope, two points, a table, a graph or words, then change its form without changing its line.

Form	Equation	Useful when...
Slope-intercept	$y = mx + b$	You know slope m and y -intercept b .
Point-slope	$y - y_1 = m(x - x_1)$	You know m and a point (x_1, y_1) .
Standard	$Ax + By = C$	You want to organize both variables on the left.

In standard form, A and B cannot both be zero. We will usually use integer coefficients. A , B and C here are constants; they are not point coordinates.

Example 1 | Slope 3 through (2, 7)

$y - 7 = 3(x - 2)$

Place the point coordinates in point-slope form.

$y - 7 = 3x - 6$

Distribute the slope across the parentheses.

$y = 3x + 1$

Add 7. The y -intercept is $(0, 1)$.

Check the given point: $3(2) + 1 = 7$. Standard form is $3x - y = -1$.

LESSON 9 | POINTS AND TABLES

Two points give you a route

Example 2 | Through (-1, 5) and (3, -3)

$m = (-3 - 5)/(3 - (-1))$	Keep the order consistent in both differences.
$m = -8/4 = -2$	Use either point with this slope.
$y - 5 = -2(x + 1)$	$x - (-1)$ becomes $x + 1$.
$y = -2x + 3$	Distribute, then add 5.

Standard form: $2x + y = 3$. Both points satisfy this equation.

A table follows the same method

x	0	2	5
y	4	10	19

The slopes are $(10 - 4)/(2 - 0) = 3$ and $(19 - 10)/(5 - 2) = 3$. Since $x = 0$ gives $y = 4$, the equation is **$y = 3x + 4$** .

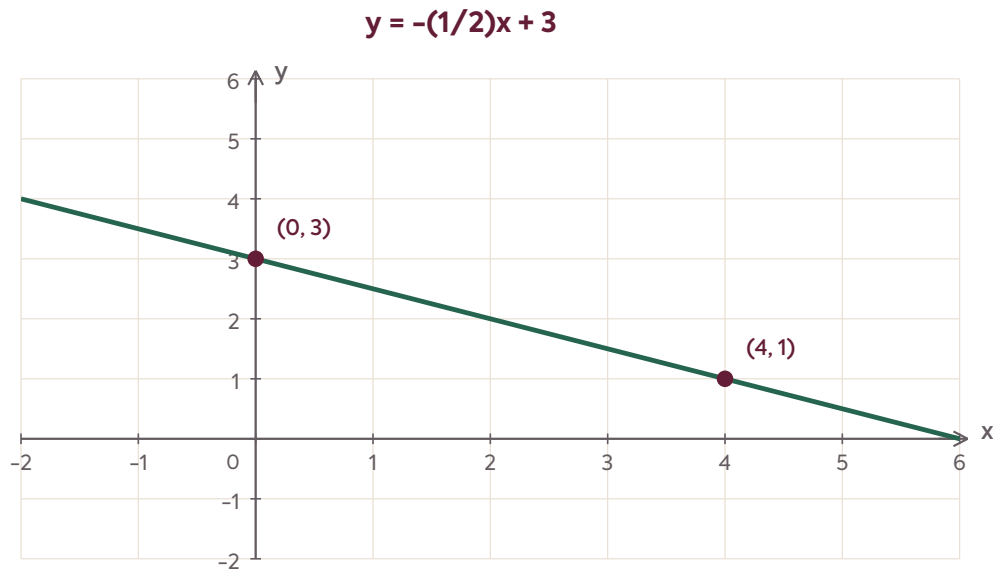
Do not guess b from any output

b is the output at **$x = 0$** . If your table has no zero input, use a known point in $y = mx + b$ and solve for b.

LESSON 9 | REPRESENT THE SAME RELATIONSHIP

From a graph or a sentence

Use exact labeled points on a supplied graph. Here $(0, 3)$ and $(4, 1)$ give $m = (1 - 3)/(4 - 0) = -1/2$ and $b = 3$.



Example 3 | Bike rental: \$5 to start plus \$2 per hour

$$C = 2h + 5$$

h is rental time in hours; C is the total cost in dollars.

$$C = 2(3) + 5 = 11$$

For 3 hours, the model gives a total cost of \$11.

The slope is \$2 per hour. The fixed starting charge is \$5. Assume time is billed proportionally, with $h \geq 0$.

A sensible equation answers two questions: **what changes per unit?** and **what is the starting amount?** Define the variables and their units before substituting.

LESSON 9 | EQUIVALENT EQUATIONS

Change the form, keep the line

Example 4 | Find the slope in $6x + 3y = 12$

$3y = -6x + 12$
 $y = -2x + 4$
 $m = -2; b = 4$

Subtract 6x from both sides.

Divide every term by 3.

Read the slope only after y is isolated.

The same line	What this form reveals
$y = -2x + 4$	Slope -2 and y-intercept (0, 4).
$y - 2 = -2(x - 1)$	Slope -2 and a point (1, 2).
$2x + y = 4$	Both variables grouped on the left.

Two checks serve different purposes

Substituting a given point checks that the line goes through it. To show two equations describe the **same entire line**, rearrange one into the other with valid algebra. Sharing just one point is not enough.

Most of today’s examples are nonvertical lines. A vertical line has the form **x = constant**, which cannot be written as $y = mx + b$. Class 10 handles that special case.

LESSON 9 | SHORT CHECKS

Your turn

1. Write the line with slope 2 through (3, 8). Give point-slope, slope-intercept and standard forms.

2. Find the equation through (-2, 7) and (2, -1).

3. A table gives (1, 5), (3, 11), (4, 14). Find its linear rule.

4. Convert $3x + 2y = 8$ to slope-intercept form. State the slope and y-intercept.

5. An art studio charges a \$7 entry fee plus \$4 per project. Write a cost rule, define the variables and find the cost of 3 projects.

6. Do $y - 5 = 2(x - 1)$ and $y = 2x + 3$ represent the same line? Show why.

Choose a starting point

Point and slope: use point-slope form. Two points: find m first. Table or graph: find m and a point.
Words: identify the rate and the starting value.

LESSON 9 | WORKED ANSWERS AND RECAP

Check your thinking

1. $y - 8 = 2(x - 3)$; expanding gives $y = 2x + 2$. One standard form is $2x - y = -2$. Check: $2(3) + 2 = 8$.
2. $m = (-1 - 7)/(2 - (-2)) = -8/4 = -2$. Using $(2, -1)$: $-1 = -2(2) + b$, so $b = 3$. The equation is $y = -2x + 3$.
3. $m = (11 - 5)/(3 - 1) = 3$. Then $5 = 3(1) + b$ gives $b = 2$. The rule is $y = 3x + 2$; it also gives 14 when $x = 4$.
4. $2y = -3x + 8$, so $y = -(3/2)x + 4$. Slope: $-3/2$. y-intercept: $(0, 4)$.
5. Let n be the number of projects and C the cost in dollars. $C = 4n + 7$, where n is a nonnegative whole number. For $n = 3$: $C = 12 + 7 = \$19$.
6. Yes. Distribute: $y - 5 = 2x - 2$. Add 5: $y = 2x + 3$. Valid rearrangement shows that all solutions agree.

I can...

- ☐ Choose a form that matches the information.
- ☐ Write a rule from points, a graph, a table or words.
- ☐ Show that two line equations are equivalent.

Next class: compare parallel and perpendicular lines. Curriculum focus: A.2B, A.2C, A.3A.