

1.2 Connecting $Ax + By = C$ and $y = mx + b$

There are two common forms of linear equations with two variables.

- When the values of one variable depend on those of another, it is common to express the relationship as $y = mx + b$. This equation is in **slope-intercept form**.
- When the values of the two variables combine to produce a fixed third quantity, you can express the relationship as $Ax + By = C$. This equation is in **standard form**. The equations in Problem 1.1 are in standard form.

The graph of each type of equation is a straight line. Since you know a lot about the graphs of **linear functions**, it is natural to ask: Given an equation in one form, can you rewrite the equation in the other form?

As you work on this Problem, look for connections between the two forms of linear equations.



Problem 1.2

- A** Four students tried to write $12x + 3y = 9$ in equivalent $y = mx + b$ form. Did each student get an equation equivalent to the original $Ax + By = C$ form? If so, explain the reasoning for each step. If not, tell what errors the student made.

Jared

$$\begin{aligned} 12x + 3y &= 9 \\ 3y &= -12x + 9 & (1) \\ y &= -4x + 3 & (2) \end{aligned}$$

Molly

$$\begin{aligned} 12x + 3y &= 9 \\ 3y &= 9 - 12x & (1) \\ y &= 3 - 12x & (2) \\ y &= -12x + 3 & (3) \end{aligned}$$

Mia

$$\begin{aligned} 12x + 3y &= 9 \\ 4x + y &= 3 & (1) \\ y &= 3 - 4x & (2) \\ y &= -4x + 3 & (3) \end{aligned}$$

Ali

$$\begin{aligned} 12x + 3y &= 9 \\ 3y &= 9 - 12x & (1) \\ y &= 3 - 4x & (2) \\ y &= 4x - 3 & (3) \end{aligned}$$

Problem 1.2 *continued*

B Write each equation in $y = mx + b$ form.

1. $x - y = 4$

2. $2x + y = 9$

3. $8x + 4y = -12$

4. $c = ax + dy$

C Write each equation in $Ax + By = C$ form.

1. $y = 5 - 3x$

2. $y = \frac{3}{4}x + \frac{1}{4}$

3. $x = 2y - 3$

4. $fy + 3 = gx - 15$

D Write a linear equation in slope-intercept form or standard form to represent each situation. Then, explain why your choice is the best representation.

1. Mary is selling popcorn for \$5.00 per bucket and hotdogs for \$4.75 each. After one hour, she makes \$72.50.
2. Matt is in charge of selling roses for the Valentine's Day dance. The roses sell for \$3.75 each. He estimates that the expenses for the roses are \$25.00. Matt wants to write an equation for the profit.
3. Kaylee is mixing paint for an art project. She mixes 5 ounces of green paint with every 3 ounces of white paint. She needs 50 ounces of the paint mixture.

A C E Homework starts on page 13.

1.3 Booster Club Members

Intersecting Lines

At a school band concert, Christopher and Celine sell memberships for the band's booster club. An adult membership costs \$10, and a student membership costs \$5. At the end of the evening, the students had sold 50 memberships for a total of \$400. The club president asked,

- How many of the new members are adults and how many are students?

You can answer the question by writing and solving equations that represent the question and the given information.