

3.4 and 4.3 Explain – Graphing and Writing Linear Equations in Standard Form - Notes

Essential Question: How can you describe the graph of the equation  $Ax + By = C$ ? How can you write the equation of a line in standard form?

Main Ideas/ Questions	Notes/Examples
What You Will Learn	<ul style="list-style-type: none"> <li>To find x-intercepts, y-intercepts, and zeros of functions.</li> <li>To graph linear equations in standard form.</li> <li>To use linear equations to solve real-life problems.</li> </ul>

**LINEAR EQUATIONS**

(8th grade) **Slope-intercept Form**  
 $y = mx + b$

**Point-slope Form**  
 $y - y_1 = m(x - x_1)$

**Standard Form** ← (Today)  
 $Ax + By = C$

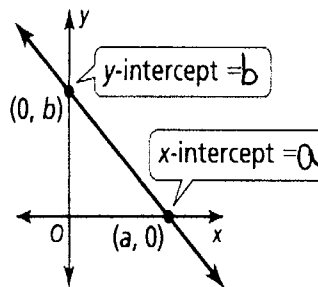
\*\*Linear Equations can be written in 3 different forms, but all are EQUIVALENT (same line)\*\*

**Vocabulary**

**x-intercept:**  $(x, 0)$   
 a#

x-coordinate of a point where the graph crosses the x-axis. It occurs when  $y = 0$ .  
 Also called a **zero** of a function.

The zero is the x-value when  $y = 0$  or  $(f(x) = 0)$ .



**y-intercept:**  $(0, y)$   
 a#

y-coordinate of a point where the graph crosses the y-axis. It occurs when  $x = 0$ .

**Practice:** Identify the x-intercept, y-intercept, and zero of the following equations.

1.

x-intercept:  $(30, 0)$   
 y-intercept:  $(0, 25)$   
 zero: 30  
 (x-int.)

2. 

x	y
-1	-6
0	-4
1	-2
2	0

x-intercept:  $(2, 0)$   
 y-intercept:  $(0, -4)$   
 zero: 2

3.

x-intercept:  $(2, 0)$   
 y-intercept:  $(0, -2)$   
 zero: 2

**Practice:** Find the zero (X - intercept) of the given function. (Plug in 0 for Y.)

4.  $2x + 3y = -9$   
 $2x + 3(0) = -9$   
 $2x = -9$   
 $\frac{2x}{2} = \frac{-9}{2}$   
 $x = -\frac{9}{2}$  (or -4.5)

5.  $3x - y = 24$   
 $3x - (0) = 24$   
 $3x = 24$   
 $\frac{3x}{3} = \frac{24}{3}$   
 $x = 8$

6.  $f(x) = 2x + 8$   
 $y = 2x + 8$   
 $(0) = 2x + 8$   
 $-8 = 2x$   
 $\frac{-8}{2} = \frac{2x}{2}$   
 $-4 = x$

3.4 and 4.3 Explain – Graphing and Writing Linear Equations in Standard Form - Notes

7. An artist rents a booth at an art show for \$300. The function  $f(x) = 50x - 300$  represents the artist's profit, where  $x$  is the number of paintings the artist sells.

- a. Find the zero of the function.  $f(x) = 50x - 300$   
 $0 = 50x - 300$   
 $+300$   
 $300 = 50x$   
 $\frac{300}{50} = \frac{50x}{50}$   
 $X = 6$  (6 paintings)
- b. Explain what the zero means in this situation. artist must sell 6 paintings to break even after renting the booth.

8. The school band is selling sweatshirts and baseball caps to raise \$9000 to attend a band competition. Sweatshirts cost \$25 each and baseball caps cost \$10 each. The equation  $25x + 10y = 9000$  models this situation, where  $x$  is the number of sweatshirts sold and  $y$  is the number of baseball caps sold.

a. Find and interpret the intercepts.

x-intercept:  $25x + 10(0) = 9000$   
 $\frac{25x}{25} = \frac{9000}{25}$   
 $x = 360$   
 Represents: (360, 0)

y-intercept:  $25x + 10y = 9000$   
 $0 + 10y = 9000$   
 $y = 900$   
 Represents: (0, 900)

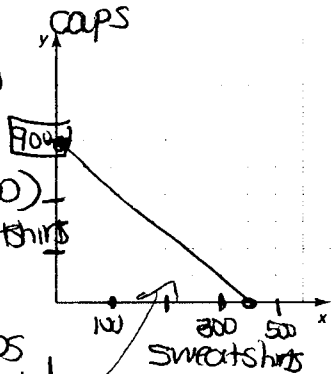
Can sell 360 sweatshirts to raise \$9000

can sell 900 caps & 0 sweatshirts

b. If 258 sweatshirts are sold, how many baseball caps are sold?

(258, y)  $y: 25(258) + 10y = 9000$   
 $6450 + 10y = 9000$   
 $10y = 2550$   
 $y = 255$

255 caps were sold



c. Graph the equation.

d. Find two more possible solutions in the context of the problem.

any ordered pair on the line.

total Writing Equations in Standard Form -  $Ax + By = C$

9. 144 students are going on a trip to the library. They will travel in small and large vans. A small van holds 8 people, and a large van holds 12 people. Write an equation in standard form that represents the number of small and large vans that your class can fill.

Let  $s = \#$  small vans Equation:  $8s + 12l = 144$   
 Let  $l = \#$  large vans

10. A banquet room has large and small tables. A small table seats 4 people and a large table seats 6 people. 60 people plan to attend the banquet, write an equation in standard form that models the number of small and large tables needed for the banquet.

Let  $s = \#$  small tables Equation:  $4s + 6l = 60$   
 Let  $l = \#$  large tables

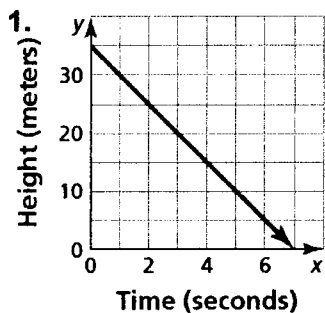
11. A dog kennel charges \$25 per night to board your dog. The kennel also sells dog treats for \$5 each. If you have \$100 to spend, write an equation in standard form that models the possible combination of nights at the kennel and treats that you can buy.

Let  $x = \#$  nights boarded Equation:  $25x + 5y = 100$   
 Let  $y = \#$  of treats

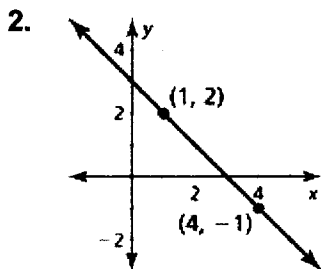
**3.4 & 4.3**

**Writing & Graphing in Standard Form**

In Exercises 1 - 4, find the x-intercept, y-intercept, and zero of the linear equation.



x-intercept:  
y-intercept:  
zero:



x-intercept:  
y-intercept:  
zero:

3. 

x	y
-4	0
0	1
4	2

x-intercept:  
y-intercept:  
zero:

4. 

x	y
1	2
2	0
3	-2
4	-4

x-intercept:  
y-intercept:  
zero:

In Exercises 5 - 7, find the zero of the linear function.

5.  $2x - 5y = 10$

6.  $-6x - 4y = 24$

7.  $b(x) = -8x + 4$

8. The function  $f(x) = -200x + 1000$  represents the balance (in dollars) in a checking account after  $x$  months.

- a. Find the zero of the function.
- b. Explain what the zero means in this situation.

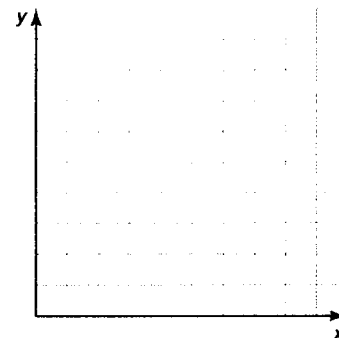
9. You lose track of how many 2-point baskets and 3-point baskets a team makes in a basketball game. The team misses all the 1-point baskets and still scores 54 points. The equation  $2x + 3y = 54$  models the total points scored, where  $x$  is the number of 2-point baskets made and  $y$  is the number of 3-point baskets made.

- a. Find the intercepts and zero. Interpret the intercepts.

x-intercept:  
Represents:

Zero:

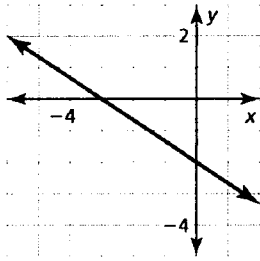
y-intercept:  
Represents:



- b. Graph the equation.
- c. Find one more possible solutions in the context of the problem.

In Exercises 10 and 11, match the graph with its correct equation in standard form.

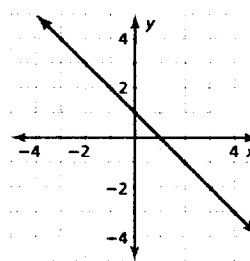
10.



a.  $2x + 3y = -6$

b.  $2x - 3y = 6$

11.



a.  $x - y = 1$

b.  $x + y = 1$

12. You sold a total of \$48 worth of cheese. You forgot how many pounds of each type of cheese you sold. Swiss cheese costs \$8 per pound. Cheddar cheese costs \$6 per pound. Write an equation in standard form that models the number of pounds of cheddar cheese sold,  $x$ , and the number of pounds of swiss cheese sold,  $y$ .

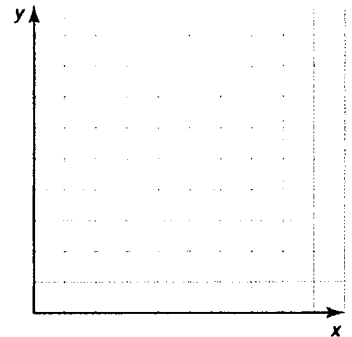
13. You sold a total of \$16 worth of tickets to a fundraiser. Adult tickets are \$4 each. Child tickets are \$2 each. Write an equation in standard form that represents the number of adult tickets sold,  $x$ , and the number of child tickets sold,  $y$ .

14. You make a large pot of soup containing 84 ounces. You freeze the soup in small and medium containers. A small container holds 4 ounces, and a medium container holds 6 ounces.

a. Write an equation in standard form that models the possible combinations of small and medium containers that the soup can fill.

b. Graph the equation from part (a).

c. Find two possible combinations.



**Review:**

15. Write an equation of a horizontal line that passes through the point (4, 1).

16. Write an equation of a vertical line that passes through the point (10, -2).

17. At a company, the number  $h$  of vacation hours an employee earns varies directly with the number  $w$  of weeks the employee works. An employee who works 2 weeks earns 3 vacation hours. Find the number of vacation hours an employee earns for working 8 weeks.