



$$x^3 = x \cdot x \cdot x$$



$$x^3 = x + x + x$$

 $a$  $=$  $\{ \}$  $x^3$ 

# AlgebraByExample

*Student Workbook*

Example Based  
Problem Sets

 $\leq$  $\pm$  $b$ 


*Analyzing. Explaining. Solving.*

# Introduction for students

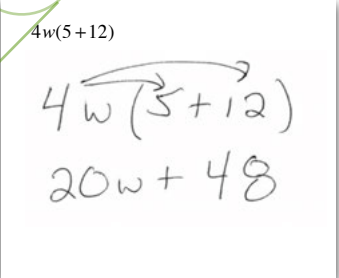
It's easy to make a mistake, but it's not always so easy to learn from one. This workbook is designed to help you learn from all kinds of math mistakes. Flip to any assignment in this book and you'll see something unusual. Every problem you need to solve is paired with an example that shows you how someone else tried to do a similar problem.


A ✓ or ✗ icon lets you know whether the example shows correct or incorrect work.


**SET 2** Using the distributive property, rewrite the expression in simplest form. SHOW ALL OF YOUR WORK.


 Pablo **didn't** rewrite this expression correctly. Here is what he wrote:

$4w(5+12)$



 What did Pablo forget when distributing the  $4w$ ?

 What should Pablo's final expression be?

 **Your Turn:**


$-4w(5+12)$

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## Step 1

You should first study the example **and** answer the questions about it.

## Step 2

Then try the "your turn"  problem on your own.

Each "set" or pair of example/your turn items has been strategically designed. Based on classroom and laboratory research, we've targeted the kinds of Algebra mistakes many students make. By studying the examples and answering questions about them you'll learn from mistakes others have made. Practicing correcting and understanding the way other people have done the math will help you better understand the math yourself. Plus, you'll learn how helpful it is to understand *why the wrong answer is wrong*. In that sense this workbook doesn't just help you make fewer math mistakes, it also helps you learn from those you do make.



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For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Chad simplified this expression **correctly**. Here is what he wrote:

$$\begin{array}{r} |-5| \\ 1-5| \\ 5 \end{array}$$

Why is the negative sign not included in the answer?



**Your Turn:**

$$|-7|$$

**SET 2** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Yapeng simplified this expression **correctly**. Here is what she wrote:

$$\begin{array}{r} |5-7| \\ |5-7| \\ |-2| \\ 2 \end{array}$$

Why did Yapeng subtract 7 from 5 as her first step?



**Your Turn:**

$$|2-7|$$

**SET 3** Write the following expressions in simplest form. **SHOW ALL OF YOUR WORK.**



George tried to simplify this expression but **didn't** do it correctly. Here is what he wrote:

$$|5| - |-7|$$

$$\rightarrow |5| - |-7|$$

$$5 + 7$$

$$12$$

What did George do wrong in the step marked with an arrow?



**Your Turn:**

$$-|5| - |-7|$$

**SET 4** Solve the equations. **SHOW ALL OF YOUR WORK.**



Jada solved this equation **correctly**. Here is what she wrote:

$$-5 = |x|$$

$$-5 = |x|$$

no solution

Why doesn't this equation have a solution?



**Your Turn:**

$$|x| = -15$$

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Helaina tried to simplify this expression, but she **didn't** do it correctly. Here is her first step:

$$5 - 4x + 2$$

$$5 - 4x + 2$$

$$4x - 5 + 2$$

What did Helaina do wrong in her first step?

Would it have been okay to write  $5+2-4x$ ? Explain why or why not.



**Your Turn:**

$$12x + 4 - 5x$$

**SET 2** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Joseph tried to simplify this problem but **didn't** do it correctly. Here is his first step:

$$(5 - 4x) + 12x$$

$$(5 - 4x) + 12x$$

$$5 - (4x + 12x)$$

$$5 - 16x$$

Why can't Joseph just move the parentheses in this problem?

If Joseph had combined like terms correctly, what should he have gotten as the answer in simplest form?



**Your Turn:**

$$(x + 12) - 5$$

**SET 3** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Ramon simplified this expression **correctly**. Here is what he wrote:

$$12x + 2 - 5$$

$$\begin{array}{l} 12x + 2 - 5 \\ 12x - 3 \end{array}$$

Why didn't Ramon combine the  $12x$  with the 2 or  $-5$ ?



**Your Turn:**

$$3x + 4 - 2$$

**SET 4** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Monica simplified this expression **correctly**. Here is what she wrote:

$$3x + 2 - 5x - 20x^2$$

$$\begin{array}{l} 3x + 2 - 5x - 20x^2 \\ 2 + 3x - 5x - 20x^2 \\ 2 - 2x - 20x^2 \end{array}$$

Why didn't Monica combine  $-2x$  and  $-20x^2$ ?



**Your Turn:**

$$3x + 4 - 6x^2 - 9$$

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Solve each problem. SHOW ALL OF YOUR WORK.



Joey solved this problem **correctly**. Here is his work:

Why did Joey rewrite the problem so that decimal points are aligned?



**Your Turn:**

$$3.785 + 24$$

$$\begin{array}{r} 3.785 \\ + 24.000 \\ \hline 27.785 \end{array}$$

When rewriting the problem Joey put a decimal point after the 4. If he put the decimal point after the 2, would it change the value of the number? Why or why not?

$$378.5 - 0.24$$

**SET 2** Solve each problem. SHOW ALL OF YOUR WORK.



Sally **didn't** put the decimal point in the right place. Here is her work:

Where should the decimal point go?



**Your Turn:**

$$\begin{array}{r} 3.7 \\ \times 1.4 \\ \hline \end{array}$$

$$\begin{array}{r} 3.7 \\ \times 1.4 \\ \hline 14.8 \\ 37.0 \\ \hline 51.8 \end{array}$$

When multiplying, how do you determine where the decimal point goes in the product?

$$\begin{array}{r} 0.37 \\ \times 0.14 \\ \hline \end{array}$$

**SET 3** Convert the fraction into a decimal. **SHOW ALL OF YOUR WORK.**



Carlos **didn't** convert the fraction to a decimal correctly. Here is his work:

$$\frac{1}{8}$$

$$\frac{1}{8} = 0.8$$

What operation should Carlos have used to convert the fraction into a decimal?

What part of the fraction tells you to use that operation?



**Your Turn:**

$$\frac{1}{5}$$

**SET 4** Convert the decimal into a fraction in simplest form. **SHOW ALL OF YOUR WORK.**



Kenisha converted the decimal to a fraction **correctly**. Here is her work:

$$0.75$$

$$\begin{aligned} 0.75 &= \frac{75}{100} \\ \frac{75 \div 25}{100 \div 25} \\ \frac{3}{4} \end{aligned}$$

Why did Kenisha first divide by 100?

Why did Kenisha divide the numerator and the denominator by 25?



**Your Turn:**

$$0.4$$

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Using the distributive property, rewrite the expression in simplest form. SHOW ALL OF YOUR WORK.



Makala rewrote this expression **correctly**. Here is what she wrote:



Why was it important for Makala to multiply the 5 by both the 4 and the 12?



**Your Turn:**

$$5(4 + 12)$$

$$5(4 + 12)$$

$$20 + 60$$

$$80$$



Is  $5(4) + 12$  the same expression as  $5(4 + 12)$ ? Explain.

$$4(12 - 5)$$

**SET 2** Using the distributive property, rewrite the expression in simplest form. SHOW ALL OF YOUR WORK.



Pablo **didn't** rewrite this expression correctly. Here is what he wrote:



What did Pablo forget when distributing the  $4w$ ?



**Your Turn:**

$$4w(5 + 12)$$

$$4w(5 + 12)$$

$$20w + 48$$



What should Pablo's final expression be?

$$-4w(5 + 12)$$

**SET 3** Using the distributive property, rewrite the expression in simplest form. SHOW ALL OF YOUR WORK.



Destiny **didn't** rewrite this expression correctly. Here is what she wrote:

What did Destiny do wrong when applying the distributive property?



**Your Turn:**

$$-5(w - 4)$$

$$-5(w - 4)$$

$$-5w - 20$$

You can change just one small part in Destiny's answer and make it correct. Explain what you can change.

$$-5(w + 4)$$

**SET 4** Using the distributive property, rewrite the expression in simplest form. SHOW ALL OF YOUR WORK.



Paul rewrote this expression **correctly**. Here is what he wrote:

Where did the +20 come from in the step marked with an arrow?



**Your Turn:**

$$12 - 5(w - 4)$$

$$12 - 5(w - 4)$$

$$12 - 5w + 20$$

$$-5w + 32$$

Would he have gotten the same answer if he first subtracted 5 from 12? Explain.

$$12 + 5(w - 4)$$

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Reduce each fraction to its simplest form. SHOW ALL OF YOUR WORK.



Yoshiaki **didn't** reduce this fraction to its simplest form correctly. Here is his work:

$$\frac{16}{24}$$

$$\frac{16}{24} = \frac{8}{12}$$



What is the greatest common factor of 16 and 24?



Why would knowing the greatest common factor be helpful when simplifying a fraction?



**Your Turn:**

$$\frac{18}{24}$$

**SET 2** Find the sum or difference for each expression and write the solution in simplest form. SHOW ALL OF YOUR WORK.



Yetta **didn't** find the sum correctly. Here is her work:

$$\frac{2}{5} + \frac{3}{4}$$

$$\frac{2}{5} + \frac{3}{4} = \frac{5}{9}$$



What did Yetta do wrong while adding the fractions?



Is Yetta's answer bigger or smaller than the correct answer? How can you tell?



**Your Turn:**

$$\frac{5}{2} - \frac{3}{4}$$

**SET 3** Find the product for each expression and write the solution in simplest form. SHOW ALL OF YOUR WORK.



John **didn't** solve this problem correctly.  
Here is his work:

$$-\frac{5}{2} \cdot \frac{3}{4}$$

$$-\frac{5}{2} \cdot \frac{3}{4} = \frac{-15}{-8} = \frac{15}{8}$$

What did John do wrong in the step marked with an arrow?



**Your Turn:**

$$-\frac{2}{5} \cdot -\frac{3}{4}$$

**SET 4** Find the quotient for each expression and write the solution in simplest form. SHOW ALL OF YOUR WORK.



Tierra solved this problem **correctly**.  
Here is her work:

$$-\frac{2}{5} \div \frac{3}{4}$$

$$-\frac{2}{5} \div \frac{3}{4}$$

$$= -\frac{2}{5} \cdot \frac{4}{3} = -\frac{8}{15}$$

Why did Tierra change  $\frac{3}{4}$  to  $\frac{4}{3}$ ?



**Your Turn:**

$$-\frac{2}{5} \div \frac{4}{3}$$

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Using the order of operations, write each expression in simplest form. SHOW ALL OF YOUR WORK.



Betsy simplified this expression **correctly**. Here is what she wrote:

$$8 - (2^2 - 6)$$

$$8 - (2^2 - 6)$$

$$8 - (4 - 6)$$

$$8 + 2$$

$$10$$

Why did she write +2 in her third line?



**Your Turn:**

$$8 \div (2^2 - 6)$$

**SET 2** Using the order of operations, write each expression in simplest form. SHOW ALL OF YOUR WORK.



Morgan **didn't** simplify this expression correctly.  
Here is her work:

$$5^2 - 5 \div 2 \cdot 4$$

$$5^2 - 5 \div 2 \cdot 4$$

$$25 - 5 \div 2 \cdot 4$$

$$20 \div 2 \cdot 4$$

$$10 \cdot 4$$

$$40$$

In the step marked with an arrow, Morgan subtracted. What operation should she have done instead of subtraction?



**Your Turn:**

$$5^2 + 6 \div 2 \cdot 4$$

**SET 3** Using the order of operations, write each expression in simplest form. SHOW ALL OF YOUR WORK.



John simplified this expression **correctly**. Here is his work:

Explain how John used the order of operations to do the step marked with an arrow correctly.



**Your Turn:**

$$\frac{-22 - 2^2}{5 - 3}$$

→

$$\frac{-22 - 2^2}{5 - 3}$$

$$\frac{-22 - 4}{5 - 3}$$

$$\frac{-26}{2}$$

$$-13$$

Explain why John's answer is not a fraction.

$$\frac{-22 + 2^2}{5 - 3}$$

**SET 4** Evaluate each expression. Write your answer in simplest form. SHOW ALL OF YOUR WORK.



Tyrone **didn't** simplify this expression correctly. Here is his work:

What did Tyrone do in the step marked with an arrow?



**Your Turn:**

Evaluate the following expression for  $y = 8$ :

Evaluate the following expression for  $y = 8$ :

$$2 + 5(y - 4)$$

$$2y + 5(y - 4)$$

$$2 + 5(y - 4)$$

→

$$2 + 5(8 - 4)$$

$$7(8 - 4)$$

$$56 - 28$$

$$28$$

What should Tyrone have done instead?

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Read each word problem and answer. Then **explain** if the given answer is reasonable.




Anya gave a **good** response for this problem. Here is what she wrote:

Word Problem: Smith makes \$14 per hour at his job. If he made \$77 on Wednesday, how many hours did he work that day?

Answer: 5 1/2 hours

Is the answer reasonable? Explain why or why not.

Yes, it is a reasonable answer. Working 1 hour would be \$14. 2 hours would be \$28, 3 hours would be \$42, 4 hours would be \$56 and 5 hours would be \$70. Only \$7 are left over and that's 1/2 an hour.

 Explain why 100 hours would have been an unreasonable answer.



**Your Turn:**

Word Problem: Amira is quilting blankets for gifts this year. She finishes 1/3 of a blanket each day. How many days will it take her to finish 6 blankets?

Answer: 2 days

Is the answer reasonable? Explain why or why not.

**SET 2** Read each word problem and answer. Then **explain** if the given answer is reasonable.




Preston **didn't** give a good response for this problem. Here is what he wrote:


Word Problem: Joel travels 10 miles at 55 miles per hour. How much time does Joel's drive take?

Answer: 5.5 hours

Is the answer reasonable? Explain why or why not.

yes, it is a reasonable answer because 55 divided by 10 is 5.5

 How could Preston have figured out that his answer didn't make sense?

 Without solving the problem, give a number that would be a more reasonable answer to the problem. Explain.



**Your Turn:**

Word Problem: Nina hopes to visit the capitals of all 50 U.S. states someday. After she visits 3 more state capitals, she will have been to over one quarter of the state capitals. How many capitals has she visited?

Answer: 11 capitals

Is the answer reasonable? Explain why or why not.

**SET 3** Read each word problem and answer. Then **explain** if the given answer is reasonable.

Serafina **didn't** give a good response for this problem. Here is what she wrote:

Word Problem: 277 students have signed up to go to the aquarium next week. How many buses does the trip coordinator need to order if each bus holds 50 students?

Answer: 5.54

Is the answer reasonable? Explain why or why not.

*yes, it is reasonable.  
I divided 277 by 50  
and that's what I got.*

Serafina did the calculations correctly and got 5.54, so why is her response not reasonable?

Would 5 buses be a reasonable answer? Why or why not?

**Your Turn:**

Word Problem: Ms. Lina is hosting a pottery-making party for her students. She needs to pay \$12 for pottery clay for each student, but her own pottery clay will be free. If she had \$200 to spend on the party, how many students can Ms. Lina invite?

Answer: 16 students

Is the answer reasonable? Explain why or why not.

**SET 4** Read each word problem and answer. Then **explain** if the given answer is reasonable.

Lakin **didn't** give a very good response for this problem. Here is what he wrote:

Word Problem: Tanya found sneakers online for \$24. She ordered 4 pairs and had to pay an additional \$5.75 for shipping and handling. How much did the whole order cost Tanya?

Answer: \$47

Is the answer reasonable? Explain why or why not.

*yes, it's a reasonable answer  
because \$5.75 times 4 is \$23,  
plus \$24 for the sneakers is \$47.*

If one pair of sneakers costs \$24, does it make sense that four would cost \$47? Explain.

Without solving the problem, give a number that would be a more reasonable answer for the problem, and explain why it is reasonable.

**Your Turn:**

Word Problem: Joohyung and Rhonda made 32 cupcakes together. They each ate 3 cupcakes and then packed the rest up for the class bake sale. How many cupcakes did they take to the bake sale?

Answer: 26 cupcakes

Is the answer reasonable? Explain why or why not.

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Find the slope for each line using the slope formula. SHOW ALL OF YOUR WORK.



Kaemon found the slope **correctly**. Here is his work:

x	-2	0	2	4	6
y	-6	-3	0	3	6

$$\frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{-6 - 3}{-2 - 4} = \frac{-9}{-6} = \frac{3}{2}$$

Slope is  $\frac{3}{2}$

If Kaemon had done  $\frac{3 - (-6)}{4 - (-2)}$  would he still have been correct? Why or why not?

Why did Kaemon put  $-6 - 3$  in the numerator rather than in the denominator?



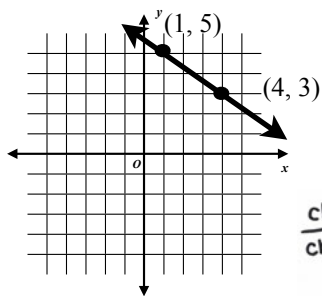
**Your Turn:**

x	-4	-1	2	5	8
y	-2	0	2	4	6

**SET 2** Find the slope for each line using the slope formula. SHOW ALL OF YOUR WORK.



Akemi **didn't** find the slope correctly. Here is her work:



$$\frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{4 - 1}{3 - 5} = \frac{3}{-2} = -\frac{3}{2}$$

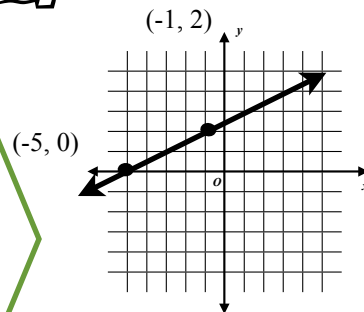
slope is  $-\frac{3}{2}$

What did Akemi do wrong when plugging the points into the slope formula?

Using the graph, how could she have checked her work?



**Your Turn:**

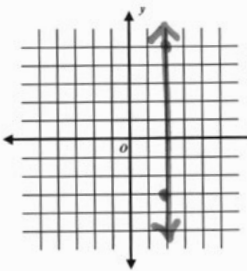


**SET 3** Graph the line and then find the slope for that line using the slope formula. SHOW ALL OF YOUR WORK.



Phil **didn't** identify the slope of this line correctly. Here is his work:

The line contains the points (2, 5) and (2, -3).



$$\begin{aligned}\frac{\text{change in } y}{\text{change in } x} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{5 - (-3)}{2 - 2} \\ &= \frac{5 + 3}{2 - 2} \\ &= \frac{8}{0} \\ \text{Slope is } 0\end{aligned}$$

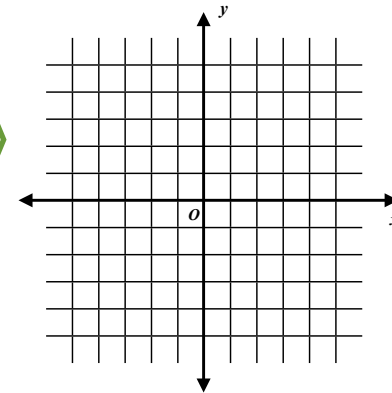
Phil graphed this line correctly, however the slope is not zero. What is the correct slope of this line?

How do you know that  $\frac{8}{0}$  is not equal to 0?



**Your Turn:**

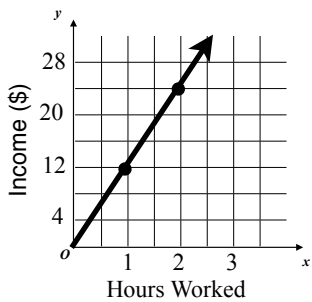
The line contains the points (5, 2) and (-3, 2).



**SET 4** Find the slope for each line using the slope formula and describe the meaning of the slope. SHOW ALL OF YOUR WORK.



Stephanie solved this problem **correctly**. Here is her work:



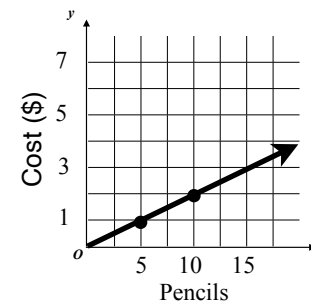
$$\begin{aligned}&(1, 12) \text{ and } (2, 24) \\ \frac{\text{Change in } y}{\text{change in } x} &= \frac{y_2 - y_1}{x_2 - x_1} \\ \frac{24 - 12}{2 - 1} &= \frac{12}{1} = 12 \\ \text{Slope: } 12 \\ \text{meaning of slope: The} & \\ \text{Person makes } \$12 \text{ an} & \\ \text{hour} &\end{aligned}$$

How did Stephanie know what the slope represented?



**Your Turn:**

Slope:



Meaning of slope:

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Rewrite the equation in **slope-intercept form**. Then identify the **slope** and **y-intercept**. SHOW ALL OF YOUR WORK.



Jaslene rewrote this equation **correctly**. Here is her work:

$$3x + y = -14$$

$$\begin{array}{r} 3x + y = -14 \\ -3x \quad -3x \end{array}$$

$$y = -14 - 3x$$

$$y = -3x - 14$$

$$\text{slope} = -3$$

$$\text{y-intercept} = -14$$

When an equation is in slope-intercept form, how can you tell the difference between the slope and the y-intercept?



**Your Turn:**

$$-2x + y = 12$$

a. Rewrite the equation.

b. What is the slope?

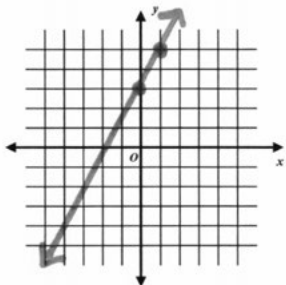
c. What is the y-intercept?

**SET 2** Graph each equation. SHOW ALL OF YOUR WORK.



Mark **didn't** graph this equation correctly. Here is his work:

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



Mark incorrectly graphed this slope. What slope did he graph?

How many times up and to the right from point (1, 3) should have Mark gone when graphing this slope?

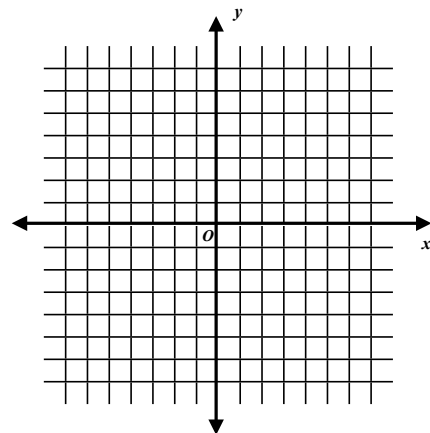
up \_\_\_\_\_

right \_\_\_\_\_



**Your Turn:**

$$y = 2x - 3$$

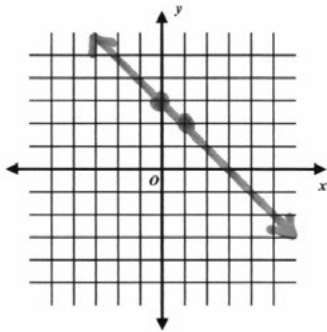


**SET 3** Graph each equation. SHOW ALL OF YOUR WORK.



Daiquan graphed this equation **correctly**. Here is his work:

$$y = -x + 3$$



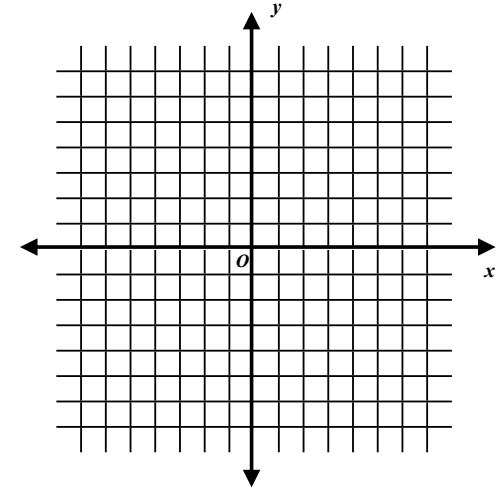
How did the negative sign in this equation affect the graph?

How did Daiquan know what the slope was when there is no coefficient in front of  $x$ ?



**Your Turn:**

$$y = x + 3$$



**SET 4** Answer all questions about each word problem. SHOW ALL OF YOUR WORK.



Monica **didn't** identify the slope and y-intercept correctly. Here is her work:

A caterer charges a \$100 fee plus \$15 per person. The equation that represents the total cost is  $y = 100 + 15x$ . Identify the slope and y-intercept.

$$y = 100 + 15x$$

$$\text{slope} = 100$$

$$\text{y-intercept} = 15$$

What is the correct slope and y-intercept?

slope \_\_\_\_\_

y-intercept \_\_\_\_\_

What does the y-intercept represent in this word problem?

What does the slope represent in this word problem?



**Your Turn:**

To rent a truck, a moving company charges \$30 plus \$2 per mile. The equation that represents the total cost is  $y = 2x + 30$ .

a. What is the slope and y-intercept?

slope \_\_\_\_\_

y-intercept \_\_\_\_\_

b. What does the slope represent in this word problem?

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

### SET 1 Write an equation in **slope-intercept form** using the information provided. SHOW ALL OF YOUR WORK.



Eddie **didn't** write this equation correctly. Here is his work:

The line has a slope of  $\frac{1}{5}$  and a y-intercept of -3.

$$y = mx + b$$

$$y = -3x + \frac{1}{5}$$



Which variable ( $m$  or  $b$ ) does Eddie think represents the slope in the equation?



Rewrite the equation correctly.



**Your Turn:**

The line has a slope of  $-\frac{1}{5}$  and a y-intercept of 3.

### SET 2 Write an equation in **slope-intercept form** using the information provided. SHOW ALL OF YOUR WORK.



Sarah wrote this equation **correctly**. Here is her work:

The line has a slope of  $\frac{1}{2}$  and contains the point (2, -3).

$$y = mx + b$$

$$-3 = \frac{1}{2}(2) + b$$

$$-3 = 1 + b$$

$$-1 = -1 + b$$

$$-4 = b$$

$$y = \frac{1}{2}x - 4$$



How did Sarah know she had to solve for  $b$  first?



**Your Turn:**

The line has a slope of 3 and contains the point (2, 2).

**SET 3** Write an equation in **slope-intercept form** using the information provided. **SHOW ALL OF YOUR WORK.**

Bao wrote this equation **correctly**. Here is his work:

The line contains the points (3, 1) and (-3, -1).

$$m = \frac{\text{change in } y}{\text{change in } x}$$

$$= \frac{-1 - 1}{-3 - 3}$$

$$= \frac{-2}{-6}$$

$$= \frac{1}{3}$$

$$y = mx + b$$

$$y = \frac{1}{3}x + b$$

$$1 = \frac{1}{3}(3) + b$$

$$1 = 1 + b$$

$$\begin{array}{r} -1 \\ -1 \end{array}$$

$$0 = b$$

$$y = \frac{1}{3}x + 0$$

In the step marked with an arrow, which coordinates did Bao use in this equation?

If Bao had used the other point, would he have come up with the same equation? Explain your reasoning.



**Your Turn:**

The line contains the points (2, 3) and (6, 4).

**SET 4** Write an equation in **slope-intercept form** using the information provided. **SHOW ALL OF YOUR WORK.**

Rasheena **didn't** write this equation correctly. Here is her work:

The line has an x-intercept of 3 and a y-intercept of -2.

$$y = mx + b$$

$$0 = m(3) + 2$$

$$\begin{array}{r} -2 \\ -2 \end{array}$$

$$\begin{array}{r} -2 = m(3) \\ \div 3 \quad \div 3 \end{array}$$

$$-2/3 = m$$

$$y = -\frac{2}{3}x + 2$$

Rasheena substituted correctly for  $x$  and  $y$ . Which point did she use to replace  $x$  and  $y$  in this equation?

Rasheena did not substitute correctly for  $b$ . What value should she have put in for  $b$ ?

If Rasheena substituted the point (3, -2) for  $x$  and  $y$ , would she have been correct? Why or why not?



**Your Turn:**

The line has an x-intercept of -2 and a y-intercept of 3.

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

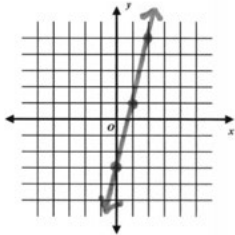
**SET 1** Write an equation in **slope-intercept form** using the information provided. Then **graph** the line. SHOW ALL OF YOUR WORK.



Andrew solved this problem **correctly**. Here is his work:

The line contains the point (2, 5) and has a slope of 4.

$$\begin{aligned} y &= mx + b \\ 5 &= 4(2) + b \\ 5 &= 8 + b \\ -3 &-1 \\ -3 &= b \\ \boxed{y &= 4x - 3} \end{aligned}$$



What about the point (0, -3) indicates that it should be drawn on the y-axis instead of the x-axis?



How could he have checked whether he graphed the line correctly?

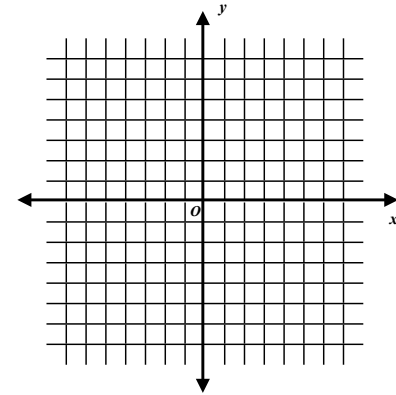


**Your Turn:**

The line contains the point (-2, 5) and has a slope of -4.

a. Write an equation in slope-intercept form.

b. Graph the line.



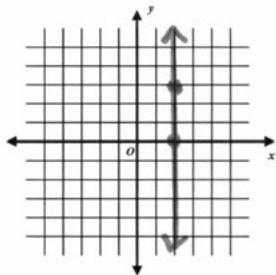
**SET 2** Graph the line. SHOW ALL OF YOUR WORK.



Reza graphed this equation **correctly**. Here is her work:

$$x = 2$$

x	y
2	0
2	3



Would the point (3, 2) ever be on the line  $x = 2$ ? Explain.

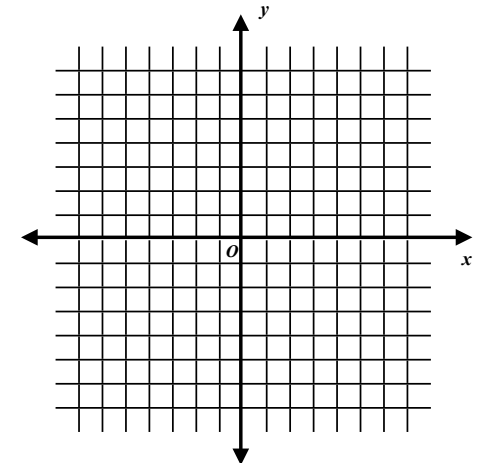


What is the slope of the line?



**Your Turn:**

$$y = -2$$

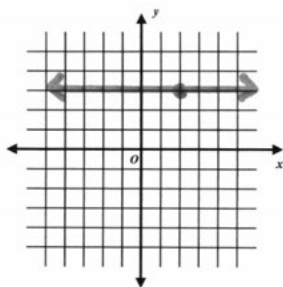


**SET 3** Graph the line. SHOW ALL OF YOUR WORK.



Mao **didn't** graph this line correctly. Here is his work:

The line contains the point (2, 3) and has an undefined slope.

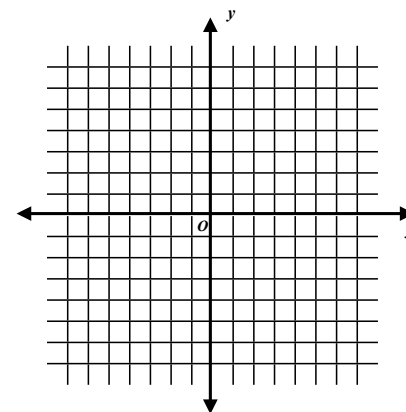


What slope did Mao use?



**Your Turn:**

The line contains the point (-3, 1) and has a slope of  $\frac{0}{1}$ .

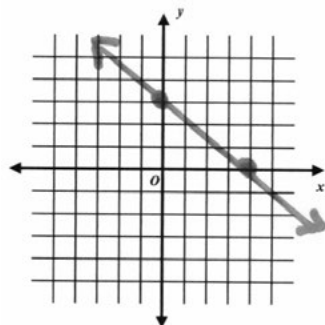


**SET 4** Write the ordered pair for each intercept. Then **graph** the line. SHOW ALL OF YOUR WORK.



Callie forgot to write the ordered pairs and **didn't** graph this line correctly. Here is her work:

The line has an x-intercept of 3 and a y-intercept of 4.



What intercepts did Callie graph?

x-intercept \_\_\_\_\_

y-intercept \_\_\_\_\_

Callie might have graphed the points correctly if she had written them out first. Write the **correct** points of an x-intercept of 3 and a y-intercept of 4.

x-intercept	( __ , __ )
y-intercept	( __ , __ )



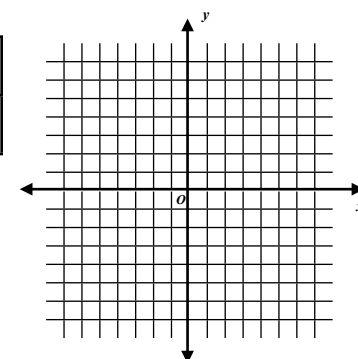
**Your Turn:**

The line has an x-intercept of 4 and a y-intercept of -3.

a. Use the information above to write the points of the x-intercept and y-intercept.

x-intercept	( __ , __ )
y-intercept	( __ , __ )

b. Graph the line.



For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Solve each equation. SHOW ALL OF YOUR WORK.



Marvin **didn't** solve this problem correctly. Here is his work:

$$k - 6 = 3$$

$$\begin{array}{r} k - 6 = 3 \\ -6 \quad -6 \\ \hline k = -3 \end{array}$$

Why is Marvin's work incorrect?

How could Marvin have checked whether -3 was the correct answer?



**Your Turn:**

$$k + 6 = 3$$

**SET 2** Solve each equation. SHOW ALL OF YOUR WORK.



Hannah solved this problem **correctly**. Here is her work:

$$6k = 3$$

$$\begin{array}{r} 6k = 3 \\ \div 6 \quad \div 6 \\ \hline k = \frac{1}{2} \end{array}$$

Why couldn't Hannah just subtract 6 to get the  $k$  by itself?



**Your Turn:**

$$\frac{k}{6} = 3$$

**SET 3** Solve each equation. SHOW ALL OF YOUR WORK.

Mackenzie **didn't** solve this problem correctly. Here is her work:

$$6 = 3 + 2k$$

$$\frac{6}{2} = 3 + \frac{2k}{2}$$

$$3 = 3 + k$$

If Mackenzie wanted to start by getting rid of the 2 in  $2k$ , what should she have done differently?



**Your Turn:**

$$6 = -3 + 2k$$

**SET 4** Solve each equation. SHOW ALL OF YOUR WORK.

Eliza solved this problem **correctly**. Here is her work:

$$6 - k = -3$$

$$\begin{array}{r} 6 - k = -3 \\ -6 \quad -6 \\ \hline -k = -9 \\ \div -1 \quad \div -1 \\ \hline k = 9 \end{array}$$

Why did Eliza subtract 6 from both sides of the equation?

Why did Eliza divide by -1?



**Your Turn:**

$$-6 - k = 3$$


For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Solve each equation. SHOW ALL OF YOUR WORK.

Ken solved this problem **correctly**. Here is his work:

$$6x + 5x + 3 = 11 + 14$$

$$\begin{array}{r} 6x + 5x + 3 = 11 + 14 \\ 11x + 3 = 25 \\ -3 \quad -3 \\ 11x = 22 \\ \div 11 \quad \div 11 \\ x = 2 \end{array}$$

 In the first step, Ken combined  $6x$  and  $5x$ . Why didn't he also add the 3 to get  $14x$ ?



**Your Turn:**

$$-11 = -6x - 3x - 2$$

**SET 2** Solve each equation. SHOW ALL OF YOUR WORK.



Jackson **didn't** solve this problem correctly.  
Here is his first step:


$$3 + 6x = 4 - 5x$$


$$3 + 6x = 4 - 5x$$
$$9x = 4 - 5x$$



**Your Turn:**

$$-6x + 3 = 4 - 5x$$

 Which terms did Jackson incorrectly combine to get  $9x$ ?

 Give an example of two terms that would correctly add to  $9x$ .

**SET 3** Solve each equation. SHOW ALL OF YOUR WORK.



Umi **didn't** solve this problem correctly.  
Here is her first step:

$$3x = 4x - 6 + 5$$

$$3x = 4x - 6 + 5$$


-5   -5


$$3x = 4x - 11$$



**Your Turn:**

$$6x = 3x - 5 - 4$$

 What did Umi do as her first step?

 What should Umi have done on the right side of the equation in order to solve?

**SET 4** Solve each equation. SHOW ALL OF YOUR WORK.



Lupe solved this problem **correctly**. Here is her work:

$$6(x + 3) = 12 + 4x$$

$$\begin{array}{r} 6x + 18 = 12 + 4x \\ -4x \qquad -4x \end{array}$$

$$\begin{array}{r} 2x + 18 = 12 \\ -18 \quad -18 \end{array}$$

$$\begin{array}{r} 2x = -6 \\ \div 2 \quad \div 2 \end{array}$$

$$x = -3$$

Where did Lupe get  $6x + 18$  from?



**Your Turn:**

$$-3(x + 6) = 4 - 5x$$


For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Solve each equation. SHOW ALL OF YOUR WORK.

Pablo **didn't** solve this problem correctly. Here is his work:

$$\frac{6-4x}{3} = 5$$

$$3\left(\frac{6-4x}{3}\right) = (5)3$$


$$\begin{array}{r} 6-4x = 15 \\ -6 \quad -6 \end{array}$$


$$\begin{array}{r} 4x = 9 \\ \div 4 \quad \div 4 \end{array}$$

$$x = \frac{9}{4}$$



**Your Turn:**

$$\frac{4x-6}{3} = 6$$

 What did Pablo forget to do in the step marked with an arrow?

**SET 2** Solve each equation. SHOW ALL OF YOUR WORK.

Inez solved this problem **correctly**.  
Here is her work:

$$\frac{4}{3}x + 6 = \frac{10}{3}$$

$$3\left(\frac{4}{3}x + 6\right) = \left(\frac{10}{3}\right)3$$

$$4x + 18 = 10$$
$$\quad -18 \quad -18$$

$$4x = -8$$


$$\div 4 \quad \div 4$$

$$x = -2$$



**Your Turn:**

$$\frac{4}{3}x - 6 = \frac{10}{3}$$

 Why do you think Inez multiplied all terms in the equation by 3 instead of subtracting 6 from both sides?

**SET 3** Solve each equation. SHOW ALL OF YOUR WORK.


Maggie solved this problem **correctly**.  
Here is her work:

$$\begin{aligned} \frac{3}{4x-6} &= 5 \\ \frac{3}{4x-6} &= 5 \\ (4x-6) \cdot \frac{3}{4x-6} &= 5 \cdot (4x-6) \\ 3 &= 5(4x-6) \\ 3 &= 20x - 30 \\ +30 &\quad +30 \\ 33 &= 20x \\ \div 20 &\quad \div 20 \\ \frac{33}{20} &= x \end{aligned}$$



**Your Turn:**

$$\frac{6}{6x-4} = 3$$

 In the step marked with an arrow, why did Maggie multiply both sides by  $(4x-6)$ ?

**SET 4** Solve each equation. SHOW ALL OF YOUR WORK.

Troy **didn't** solve this problem correctly. Here is his work:

$$\frac{1}{3}(3x-6) = 4-5x$$

$$\begin{aligned} \frac{1}{3}(3x-6) &= 4-5x \\ 9x-18 &= 4-5x \\ +5x & \quad +5x \\ 14x-18 &= 4 \\ +18 & \quad +18 \\ 14x &= 22 \\ \div 14 & \quad \div 14 \\ x &= 1\frac{4}{7} \end{aligned}$$

In the step marked with an arrow, by what number did Troy incorrectly multiply  $(3x-6)$ ?

How can Troy check his answer?



**Your Turn:**

$$-\frac{1}{3}(x-6) = 4-5x$$

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Write a proportion to represent the words. **You do not need to solve the proportions.**



Vinnie **didn't** write this proportion correctly. Here is what he wrote:

6 is to  $y$  as 7 is to 5

$$\frac{y}{6} = \frac{7}{5}$$



What did Vinnie do wrong when setting up the proportion?



Show two different ways to write the proportion correctly.



**Your Turn:**

6 is to 7 as  $y$  is to 5

**SET 2** Write a proportion to represent the words. **You do not need to solve the proportions.**



Nancy wrote this proportion **correctly**. Here is what she wrote:

$x$  is to 24 as 5 is to 6

$$\frac{x}{24} = \frac{5}{6}$$



Why did Nancy set the two fractions as equal?



Will  $x$  be more or less than 24? How can you tell?



**Your Turn:**

6 is to 24 as 5 is to  $x$

**SET 3** Write a proportion to represent the words. **You do not need to solve the proportions.**



Kim **didn't** write this proportion correctly. Here is what she wrote:

When James read 1 magazine, he read 16 pages in 25 minutes. At this rate, how many pages can he read in 45 minutes?

$$\frac{16}{25} = \frac{x}{1}$$

Kim forgot to include the 45 minutes in the equation. What number should be replaced with the 45?

What would the question need to have asked for Kim's proportion to be correct?



**Your Turn:**

Giselle bought 4 pineapples for \$9. How many pineapples can she buy if she has \$45?

**SET 4** Write a proportion to represent the words. **You do not need to solve the proportions.**



Dan wrote this proportion **correctly**. Here is what he wrote:

There are 25 games in a football season. A football team scores 6 field goals in the first 5 games. At this rate, how many more field goals can you expect them to score in the remaining 20 games?

$$\frac{5}{6} = \frac{20}{x}$$

What does  $x$  represent in Dan's equation?

What would Dan have to do to find the total number of field goals scored during the entire season?



**Your Turn:**

Joe found out that after working for 10 months at his new job he earned 7 days off. How many days off will he have earned after working for 12 months?

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

### SET 1 Solve each proportion. SHOW ALL OF YOUR WORK.



Roxanne **didn't** solve this proportion correctly. Here is her work:

$$\frac{5}{6} = \frac{m}{2}$$

$$\frac{5}{6} = \frac{m}{2}$$

$$\frac{1}{2} \cdot \frac{5}{6} = \frac{m}{2} \cdot \frac{1}{2}$$

$$\frac{5}{12} = m$$

In the step marked with an arrow, what did Roxanne forget when she multiplied?

In the original problem, what should Roxanne have multiplied by to get  $m$  by itself?



**Your Turn:**

$$\frac{2}{6} = \frac{5}{m}$$

### SET 2 Solve each proportion. SHOW ALL OF YOUR WORK.



Jamila solved this proportion **correctly**. Here is her work:

$$\frac{5}{6} = \frac{2}{m+3}$$

$$\frac{5}{6} = \frac{2}{m+3}$$

$$5(m+3) = 6(2)$$

$$5m + 15 = 12$$

$$-15 \quad -15$$

$$5m = -3$$

$$\div 5 \quad \div 5$$

$$m = -3/5$$

Look at Jamila's work in the step marked with an arrow. Why did she multiply 5 by both  $m$  and 3?



**Your Turn:**

$$\frac{6}{5} = \frac{3}{m+2}$$

**SET 3** Write a proportion for each problem then solve the proportion. Write your answer in sentence form including the correct unit. SHOW ALL OF YOUR WORK.



Alejandro **didn't** complete this problem correctly. Here is his work:

A bus is traveling at 20 miles per hour. At this rate, how many hours will it take to reach a destination that is 200 miles away?

$$\frac{20 \text{ miles}}{1 \text{ hour}} = \frac{200 \text{ miles}}{x \text{ hours}}$$

$$\frac{20}{1} = \frac{200}{x}$$

$$\begin{array}{r} 20x = 200 \\ \div 20 \quad \div 20 \\ x = 10 \end{array}$$

Alejandro is incorrect because he didn't write his answer in a sentence and didn't include units in his answer. Does his answer refer to the number of miles or hours? Explain your reasoning.

Write the answer in sentence form.



**Your Turn:**

It took 10 minutes to download 30 songs to your computer. At this rate, how long will it take to download 42 songs?

**SET 4** Write a proportion for each problem then solve the proportion. Write your answer in sentence form including the correct unit. SHOW ALL OF YOUR WORK.



Steve **didn't** solve this proportion correctly. Here is his work:

10 pounds of soil are needed to plant 6 flower beds. A family wants to plant 8 flower beds. Assuming all flower beds are the same size, how many pounds of soil do they need?

$$\frac{10}{6} = \frac{8}{x} \quad \leftarrow$$

$$\begin{array}{r} 10x = 48 \\ \div 10 \quad \div 10 \\ x = 4.8 \end{array}$$

They will need 4.8 pounds of soil.

In the step marked with an arrow, Steve didn't set up his proportion correctly. Explain which part of the proportion he did not set up correctly.

Why should Steve know that his answer should be larger than 10?



**Your Turn:**

Scott spends 20 hours in a 4-week period practicing his juggling skills. If he continues at the same rate, how many hours will he practice in 5 weeks?

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Write an expression or equation to represent the situation. **You do not need to solve any equations.**



Cedric wrote this equation **correctly**.  
Here is what he wrote:

Myron got his paycheck of \$40 this week.  
He had \$11 left after he spent  $m$  dollars on  
a new video game. How much did the  
video game cost?

$$40 - m = 11$$



How did Cedric know that this was an  
equation and not an expression?



Why subtract  $m$  from 40 rather than add  
 $m$  to 40?



**Your Turn:**

The Potts family is moving today. It took 30 boxes to pack all  
of their children's possessions. Mrs. Potts put 3 boxes in the  
truck. How many boxes,  $b$ , still need to be put into the truck?

**SET 2** Write an expression or equation to represent the situation. **You do not need to solve any equations.**



Gabriel **didn't** write this expression  
correctly. Here is what he wrote:

Zach is 6 inches shorter than two times his  
cousin's height,  $c$ . How tall is Zach?

$$6 - 2c$$



To see what Gabriel did wrong, consider  
that  $c = 40$  inches. Then, how tall is Zach?



Is  $6 - 80$  the same as  $80 - 6$ ? Explain why or  
why not.



**Your Turn:**

There are 6 members in Sonia's chorus. They made 95 copies  
of their new CD and each member sold  $x$  copies. Assuming  
every member sold the same number of copies, how many  
CD's does the chorus have left?

**SET 3** Write an expression or equation to represent the situation. **You do not need to solve any equations.**

Olga **didn't** write this equation correctly. Here is what she wrote:

Three siblings baked  $b$  brownies together this weekend. They threw away the 24 burned brownies and split the rest evenly, each taking home 10 brownies. How many cookies did they bake?

$$b - 24 = 10$$

What information from the word problem did Olga forget to include in her equation?

What should the equation look like?

**Your Turn:**

The scarf team at the factory made \$500 this week. All 10 members each received \$40 and put the rest in the holiday dinner party fund. How much total money did they put in the holiday dinner party fund?

**SET 4** Write an expression or equation to represent the situation. **You do not need to solve any equations.**

Melinda wrote this equation **correctly**. Here is what she wrote:

Guillaume works as a parking attendant and made \$30 in tips each night he worked this week. He gave \$15 of his week's tips to the parking assistant and had \$135 left for himself. How many days did he work this week?

$$30x - 15 = 135$$

What does the  $x$  stand for in Melinda's equation?

How did she know to subtract 15 rather than add 15?

**Your Turn:**

Eva planted 22 vegetables in her garden. She planted an equal number of three types of tomatoes, as well as 7 bean plants. How many of each type of tomatoes did Eva plant?

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Determine whether the ordered pair is a solution to the given system. SHOW ALL OF YOUR WORK.



Juan solved this system **correctly**. Here is his work:



How does Juan prove that  $(5, -1)$  is a solution for this system?



**Your Turn:**

$$(5, -1) \begin{cases} x + 4y = 1 \\ 2x - 6y = 16 \end{cases}$$

$$\begin{array}{lcl} 5 + 4(-1) = 1 & 2(5) - 6(-1) = 16 & \\ 5 - 4 = 1 & 10 + 6 = 16 & \\ 1 = 1 & 16 = 16 & \\ \text{yes} & & \end{array}$$



If Juan had graphed the two lines how could he tell if  $(5, -1)$  was the solution?

$$(6, 5) \begin{cases} 3x + y = 23 \\ -x + 3y = -21 \end{cases}$$

**SET 2** Use the graph to determine the solution to the system of equations.



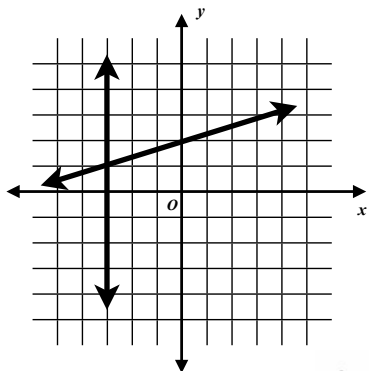
Erin solved this system **correctly**. Here is her work:



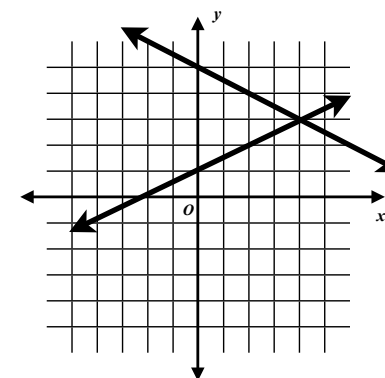
Why aren't  $(0, 2)$  and  $(-3, 0)$  also solutions?



**Your Turn:**



$(-3, 1)$



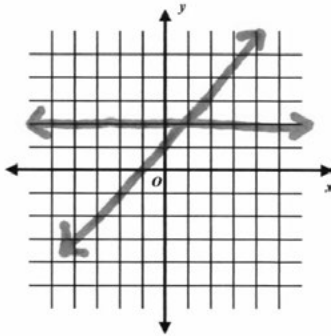
**SET 3** Solve each system of equations by graphing.



Salim **didn't** solve this system correctly. Here is his work:

$$\begin{cases} x = 2 \\ y = x + 1 \end{cases}$$

(1, 2)



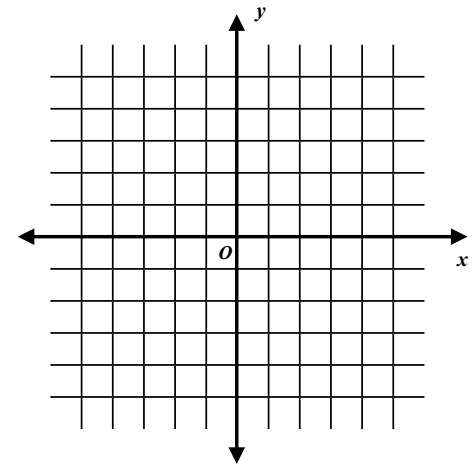
Salim graphed one of the lines incorrectly. By looking at the system of equations and graphs, how can you tell which line it is?

What is another way Salim could have checked his answer?



**Your Turn:**

$$\begin{cases} y = -x - 1 \\ y = 2 \end{cases}$$



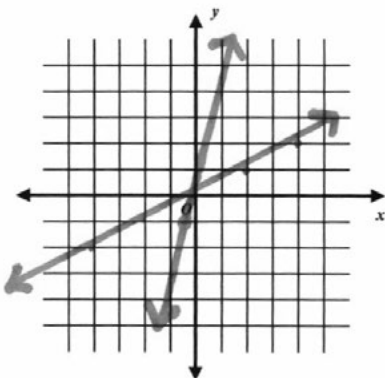
**SET 4** Solve each system of equations by graphing.



Francesca solved this system **correctly**. Here is her work:

$$\begin{cases} y = \frac{1}{2}x \\ y = 4x \end{cases}$$

(0, 0)

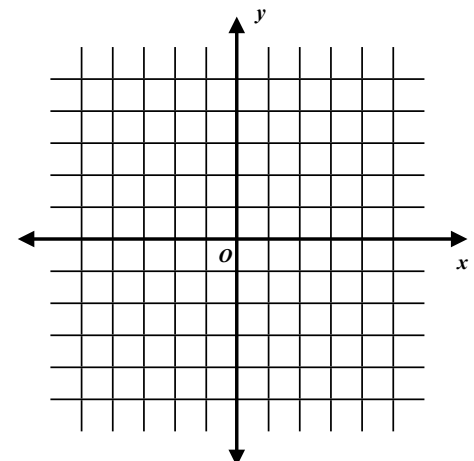


How could Francesca have known that the origin (0, 0) was the solution without graphing the lines?



**Your Turn:**

$$\begin{cases} y = \frac{1}{3}x + 1 \\ y = 3x + 1 \end{cases}$$



For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

### SET 1 Solve the system of equations using the substitution method. SHOW ALL OF YOUR WORK.



Domingo **didn't** solve this system correctly. Here is his work:

$$\begin{aligned} \begin{cases} y = x - 1 \\ 2x + y = 5 \end{cases} & \quad 2x + (x - 1) = 5 \\ & \quad 2x + x - 1 = 5 \\ & \quad 3x - 1 = 5 \\ & \quad \quad +1 \quad +1 \\ & \quad 3x = 6 \\ & \quad \div 3 \quad \div 3 \\ & \quad \quad \boxed{x = 2} \end{aligned}$$

 What else must Domingo do to solve the system of equations?



**Your Turn:**

$$\begin{cases} x = 1 - y \\ 2x - y = 5 \end{cases}$$


### SET 2 Solve the system of equations using the substitution method. SHOW ALL OF YOUR WORK.



Sasha solved this system **correctly**. Here is her work:

$$\begin{aligned} \begin{cases} x + y = 1 \\ 2x + 3y = 5 \end{cases} & \quad \begin{aligned} x + y &= 1 \\ -y &-y \\ \hline x &= 1 - y \end{aligned} \\ 2(1 - y) + 3y &= 5 & \quad \begin{aligned} x &= 1 - y \\ x &= 1 - 3 \\ \hline x &= -2 \end{aligned} \\ 2 - 2y + 3y &= 5 \\ 2 + y &= 5 \\ -2 &-2 \\ \hline y &= 3 \end{aligned}$$

$(-2, 3)$

 Sasha's first step was to solve  $x + y = 1$  for  $x$ . Her friend Jonah's first step was to solve  $x + y = 1$  for  $y$ . Do you think that Jonah got the same answers as Sasha? Explain.



**Your Turn:**

$$\begin{cases} x + 5y = 1 \\ 2x + 3y = 9 \end{cases}$$

**SET 3** Solve the system of equations using the substitution method. SHOW ALL OF YOUR WORK.

Mark solved this system **correctly**.  
Here is his work:

$$\begin{array}{l} \begin{cases} 3x = y + 11 \\ 5y - 7x = 1 \end{cases} \\ 5y - 7x = 1 \\ 5(3x - 11) - 7x = 1 \\ 15x - 55 - 7x = 1 \\ 8x - 55 = 1 \\ +55 \quad +55 \\ 8x = 56 \\ \frac{8x}{8} = \frac{56}{8} \\ x = 7 \end{array} \quad \begin{array}{l} 3x = y + 11 \\ -11 \quad -11 \\ 3x - 11 = y \\ 3x - 11 = 4 \\ 3(7) - 11 = 4 \\ 21 - 11 = 4 \\ 10 = 4 \end{array}$$

Would Mark have found the same answer if he had solved both equations for  $y$ , and then set them equal to each other? Explain.

**Your Turn:**

$$\begin{cases} 3x = y + 11 \\ 4y - 6x = -2 \end{cases}$$

**SET 4** Write and solve the system of equations using the substitution method. Write your answer in sentence form. SHOW ALL OF YOUR WORK.

Zalika **didn't** solve this system correctly.  
Here is her work:

The museum charges \$8 for each adult ticket and \$6 for each child ticket. This morning, 200 tickets were sold and the museum collected \$1,340. How many of each type of ticket were sold?

$$\begin{array}{l} a = \# \text{ of adult tickets} \\ c = \# \text{ of child tickets} \\ a + c = 1340 \\ 8a + 6c = 200 \\ a + c = 1340 \\ -c \quad -c \\ a = 1340 - c \end{array} \quad \begin{array}{l} 8a + 6c = 200 \\ 8(1340 - c) + 6c = 200 \\ 10720 - 8c + 6c = 200 \\ 10720 - 2c = 200 \\ -10720 \quad -10720 \\ -2c = -10520 \\ \frac{-2c}{-2} = \frac{-10520}{-2} \\ c = 5260 \end{array} \quad \begin{array}{l} a + c = 1340 \\ a + 5260 = 1340 \\ -5260 \quad -5260 \\ a = -3920 \end{array}$$

The museum sold 5,260 child tickets and -3920 adult tickets.

Does Zalika's answer make sense? Why or why not?

**Your Turn:**

Augie's chess team raised money for charity by washing cars. They washed a total of 80 vehicles and raised a total of \$486. If they charged \$5 to wash a car and \$7 to wash a truck, how many of each type of car did they wash?

How should she write the system?

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Solve each system of equations using the elimination with addition and subtraction method. SHOW ALL OF YOUR WORK.



Sian solved this system **correctly**. Here is her work:



Sian decided to add the equations together. Why did she decide to add rather than subtract?



Sian first solved for  $x$ . Why does she need to still do work after that?



**Your Turn:**

$$\begin{cases} 2x + y = 5 \\ 2x - y = 3 \end{cases}$$

$$\begin{cases} 2x + 3y = 5 \\ x - 3y = 4 \end{cases}$$

$$\begin{array}{r} 2x + 3y = 5 \\ + \quad x - 3y = 4 \\ \hline 3x = 9 \\ \div 3 \quad \div 3 \\ x = 3 \end{array}$$

$$\begin{array}{r} x - 3y = 4 \\ 3 - 3y = 4 \\ -3 \quad -3 \\ \hline -3y = 1 \\ \div 3 \\ y = -1/3 \end{array}$$

$(3, -1/3)$

**SET 2** Solve each system of equations using the elimination with addition and subtraction method. SHOW ALL OF YOUR WORK.



Naveen **didn't** solve this system correctly. He got stuck and couldn't finish the problem. Here is his work:



Naveen should have subtracted the equations. How would that have gotten him closer to solving the system?



**Your Turn:**

$$\begin{cases} 3x + 3y = 15 \\ 2x + 3y = 12 \end{cases}$$

$$\begin{cases} 2x + y = 5 \\ -x + y = 3 \end{cases}$$

$$\begin{array}{r} 2x + y = 5 \\ + \quad -x + y = 3 \\ \hline x + 2y = 8 \end{array}$$

more

solving systems of equations by elimination with addition and subtraction

4.3

**SET 3** Solve each system of equations using the elimination with addition and subtraction method. **SHOW ALL OF YOUR WORK.**



Felipe solved this system **correctly**. Here is his work:

$$\begin{cases} 4x = 2y + 4 \\ 2x + 2y = 14 \end{cases}$$

$$\begin{aligned} 4x &= 2y + 4 \\ -2y &\quad -2y \\ \hline 4x - 2y &= 4 \end{aligned}$$

$$\begin{aligned} 4x - 2y &= 4 \\ + 2x + 2y &= 14 \\ \hline 6x &= 18 \\ \div 6 &\quad \div 6 \\ x &= 3 \end{aligned}$$

(3, 4)

$$\begin{aligned} 4(3) - 2y &= 4 \\ 12 - 2y &= 4 \\ -12 &\quad -12 \\ \hline -2y &= -8 \\ \div 2 &\quad \div 2 \\ y &= 4 \end{aligned}$$

Why did Felipe reorder the equation before solving?



**Your Turn:**

$$\begin{cases} 3x = y + 10 \\ 3x + 4y = -20 \end{cases}$$

**SET 4** Write and solve each system using the elimination with addition and subtraction method. **Write your answer in sentence form. SHOW ALL OF YOUR WORK.**



Terrance **didn't** solve this system correctly. Here is his work:

Sammy and Cam went to a concert and each bought one ticket and some snacks. Sammy bought 3 snacks and spent \$22, while Cam bought 5 snacks and spent \$29.50. Assuming all snacks cost the same price, how much did the concert ticket and each snack cost?

$c$  = cost of snacks

$$\begin{aligned} 3c &= 22.00 \\ 5c &= 29.50 \\ \hline 8c &= 51.50 \end{aligned}$$

$$c = \$6.44$$

The snacks will cost \$6.44.

What other cost from the problem is missing from Terrance's system of equation?

Write the system of equations by including the missing variable.



**Your Turn:**

Tiffany and Brianna each bought a pair of headphones and some new songs. Tiffany bought 12 songs and spent \$44, while Brianna bought 20 songs and spent \$50. How much did the headphones and each song cost?

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

### SET 1 Solve each system of equations using the elimination with multiplication method. SHOW ALL OF YOUR WORK.




Scott solved this system **correctly**. Here is his work:

$$\begin{cases} 5x + y = 9 \\ 10x - 7y = -18 \end{cases}$$

$$\begin{array}{r} 2(5x + y) = 2(9) \\ 10x + 2y = 18 \\ \underline{-(10x - 7y = -18)} \\ 9y = 36 \\ \div 9 \div 9 \\ y = 4 \end{array} \quad \begin{array}{r} 5x + y = 9 \\ 5x + 4 = 9 \\ \underline{-4 \quad -4} \\ 5x = 5 \\ \div 5 \div 5 \\ x = 1 \end{array}$$

(1, 4)

 What would Scott have had to do if he wanted to solve for  $x$  first?



**Your Turn:**

$$\begin{cases} 2y - 3x = -4 \\ 6y + x = 8 \end{cases}$$

### SET 2 Solve each system of equations using the elimination with multiplication method. SHOW ALL OF YOUR WORK.




Danielle solved this system **correctly**. Here is her work:

$$\begin{cases} 2x + 4y = 2 \\ 3x + 5y = 1 \end{cases} \quad \begin{array}{l} 3(2x + 4y) = 3(2) \\ 6x + 12y = 6 \end{array} \quad \begin{array}{l} 2(3x + 5y) = 2(1) \\ 6x + 10y = 2 \end{array}$$

$$\begin{array}{r} 6x + 12y = 6 \\ \underline{-(6x + 10y = 2)} \\ 2y = 4 \\ \div 2 \div 2 \\ y = 2 \end{array} \quad \begin{array}{r} 2x + 4(2) = 2 \\ 2x + 8 = 2 \\ \underline{-8 \quad -8} \\ 2x = -6 \\ \div 2 \div 2 \\ x = -3 \end{array}$$

(-3, 2)

 Why did Danielle multiply the first equation by 3 and the second equation by 2 in the step marked with an arrow?



**Your Turn:**

$$\begin{cases} 3x + 4y = -1 \\ 4x - 3y = 7 \end{cases}$$

more

solving systems of equations by elimination with multiplication

4.4

**SET 3** Solve each system of equations using the elimination with multiplication method. **SHOW ALL OF YOUR WORK.**



Claudio **didn't** solve this system correctly. He got stuck and couldn't finish. Here is his work:

$$\begin{cases} 3x - 5y = -8 \\ 2x = 3y - 2 \end{cases}$$

$$\begin{aligned} 2(3x - 5y) &= 2(-8) & -3(2x) &= -3(3y - 2) \\ 6x - 10y &= -16 & -6x &= -9y + 6 \end{aligned}$$

$$\begin{array}{r} 6x - 10y = -16 \\ -6x = -9y + 6 \\ \hline 0 = -19y - 10 \end{array}$$

What did Claudio do wrong when he combined the equations in the step marked with an arrow?



**Your Turn:**

$$\begin{cases} 3x - 9y = 15 \\ 2x = 4y + 12 \end{cases}$$

**SET 4** Write and solve the system of equations using the elimination with multiplication method. **Write your answer in sentence form. SHOW ALL OF YOUR WORK.**



Natasha **didn't** solve this system correctly. She got stuck and couldn't finish. Here is her work:

Javier paid \$16.30 for 4 binders and 6 pencils. Coco paid \$26.10 for 6 binders and 12 pencils. How much did each item cost?

$$\begin{aligned} \text{Javier} &= 4b + 6p = \$16.30 \\ \text{Coco} &= 6b + 12p = \$26.10 \end{aligned}$$

$$\begin{array}{r} -4(6b + 12p) = 26.10 \\ -24b - 48p = 26.10 \end{array}$$

$$\begin{aligned} 6(4b + 6p) &= 16.30 \\ 24b - 36p &= 16.30 \end{aligned}$$

Each pencil costs \$-3.50.

Does Natasha's price for a pencil seem reasonable? Why or why not?

In the steps marked with an arrow, Natasha multiplied the left side of the equation by -4. What should she have done to keep the equation equivalent?



**Your Turn:**

The Williams family has only one oven. It takes 310 minutes to bake 4 pies and 3 loaves of bread. It takes 400 minutes to bake 5 pies and 4 loaves of bread. Assuming they can only cook 1 item at a time, how long does each item take to cook?

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

### SET 1 Solve each inequality. SHOW ALL OF YOUR WORK.



Dylan **didn't** solve this inequality correctly. Here is his work:

$$9 + x < -3$$

$$\begin{array}{r} 9 + x < -3 \\ -9 \quad -9 \end{array}$$

$$x = -12$$



Dylan should not have used an equals sign in his solution. What symbol should he have used?



-13 is a possible solution for this inequality. List another possible correct solution.



**Your Turn:**

$$-9 + x \geq -3$$

### SET 2 Solve each inequality. SHOW ALL OF YOUR WORK.



Maria **didn't** solve this inequality correctly. Here is her work:

$$9 \geq x - 3$$

$$\begin{array}{r} 9 \geq x - 3 \\ +3 \quad +3 \end{array}$$

$$12 \geq x$$

$$x \geq 12$$



Maria wanted to write the  $x$  first in her solution. What did she forget to change in order to keep the answer correct?



$12 \geq x$  and  $x \geq 12$  mean two different things. Explain the meaning of both.



**Your Turn:**

$$-9 < x - 3$$

**SET 3** Solve each inequality. SHOW ALL OF YOUR WORK.

Tyrese solved this inequality **correctly**.  
Here is his work:

$$x - 3 + 1 \geq 9$$

$$\begin{array}{r} x - 3 + 1 \geq 9 \\ x - 2 \geq 9 \\ +2 \quad +2 \\ x \geq 11 \end{array}$$

Why did Tyrese combine -3 and +1 before adding something to both sides?



**Your Turn:**

$$x - 3 - 1 > 9$$

**SET 4** Solve each inequality. SHOW ALL OF YOUR WORK.

Walt solved this inequality **correctly**.  
Here is his work:

$$3x + 9 \geq 2x - 4$$

$$\begin{array}{r} 3x + 9 \geq 2x - 4 \\ -2x \quad -2x \\ x + 9 \geq -4 \\ -9 \quad -9 \\ x \geq -13 \end{array}$$

Would Walt's answer have been the same if he had first subtracted  $3x$  from both sides? Explain.

Would Walt's answer have been the same if he had first subtracted 9 from both sides? Explain.



**Your Turn:**

$$3x - 9 \geq 2x - 4$$

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Solve each inequality. SHOW ALL OF YOUR WORK.



Jaren solved this inequality **correctly**.  
Here is his work:

$$\begin{array}{l} \frac{x}{3} < 6 \\ \rightarrow \frac{x}{3} < 6 \\ \rightarrow 3\left(\frac{x}{3}\right) < 3(6) \\ \rightarrow x < 18 \end{array}$$

Why did Jaren multiply both sides by 3 in the step marked with an arrow?



**Your Turn:**

$$\frac{x}{2} \geq 9$$

**SET 2** Solve each inequality. SHOW ALL OF YOUR WORK.



Chantal **didn't** solve this inequality correctly. Here is her work:

$$\begin{array}{l} 3x \geq -9 \\ \div 3 \quad \div 3 \\ x \leq -3 \end{array}$$

Chantal incorrectly switched the sign. When should you switch the sign?



**Your Turn:**

$$-3x \geq -9$$

How could Chantal have checked to see if her answer was right or wrong?

**SET 3** Solve each inequality. SHOW ALL OF YOUR WORK.



Sohrob solved this inequality **correctly**. Here is his work:

$$-9 < \frac{x}{3}$$

$$\begin{aligned} 3(-9) &< 3\left(\frac{x}{3}\right) \\ -27 &< x \end{aligned}$$

Why didn't Sohrob switch the sign after he multiplied 3 by -9?



**Your Turn:**

$$\frac{x}{-9} \leq 3$$

**SET 4** Solve each inequality. SHOW ALL OF YOUR WORK.



Yasir **didn't** solve this inequality correctly. Here is his work:

$$\frac{-2}{6} < \frac{x}{-9}$$

$$\begin{aligned} -\frac{2}{6} &< -\frac{x}{9} \\ 9\left(-\frac{2}{6}\right) &< 9\left(-\frac{x}{9}\right) \\ -\frac{18}{6} &< -x \\ -3 &< -x \\ 3 &< x \end{aligned}$$

Explain why it's not okay to just cancel out the negative signs in the step marked with an arrow.

What is the correct answer?



**Your Turn:**

$$\frac{-2}{4} \leq \frac{x}{-6}$$

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Graph each inequality on the number line.



Lina graphed this inequality **correctly**.  
Here is her work:

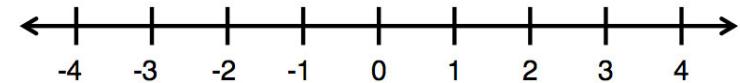


How did Lina know which way to draw her arrow?



**Your Turn:**

$$x \geq -3$$



$$x < 3$$



Why did Lina make the circle around the 3 open instead of closed?

**SET 2** Graph each inequality on the number line.



Terrance **didn't** graph this inequality correctly. Here is his work:

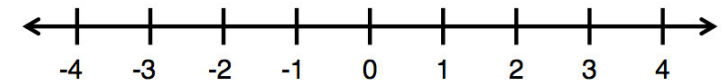


How do you know that Terrance's arrow is pointed in the wrong direction?



**Your Turn:**

$$2 < x$$



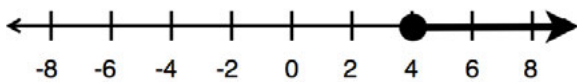
$$-2 \geq x$$



**SET 3** Write an inequality represented by the graph.



Nevaeh **didn't** write the inequality correctly. Here is her work:

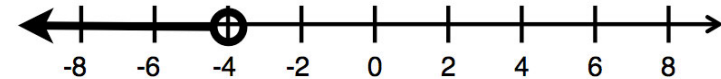


$$x > 4$$

What part of the inequality that Nevaeh wrote is incorrect?



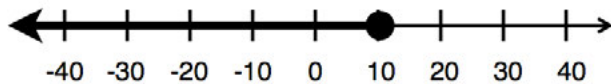
**Your Turn:**



**SET 4** Write an inequality represented by the graph.



Franco wrote this inequality **correctly**. Here is his work:



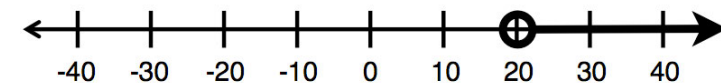
$$x \leq 10$$

How did Franco know that the inequality sign should open towards the 10?

If Franco had written  $10 \geq x$ , would his answer still be correct? Explain.



**Your Turn:**



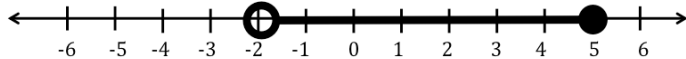
For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Write a compound inequality for each graph shown below.



Jasmine wrote this compound inequality **correctly**. Here is her work:

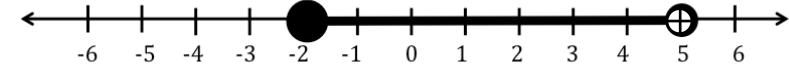
Describe the solution set in words.



$$-2 < x \leq 5$$



**Your Turn:**

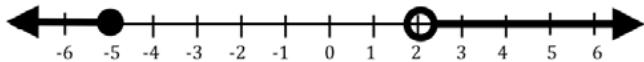


**SET 2** Write a compound inequality for each graph shown below.



Sung **didn't** write this compound inequality correctly. Here is his work:

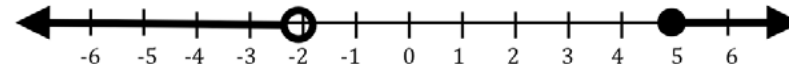
Sung used the right numbers and symbols, so why is his answer wrong?



$$x \leq -5 \text{ AND } x > 2$$



**Your Turn:**



**SET 3** Solve each inequality and graph the solution. Label your graph. SHOW ALL OF YOUR WORK.



Rosario's graph correctly represents her answer. However, she **didn't** solve it correctly. Here is her work:

$$-1 \leq p + 2 < 8$$



$$\begin{array}{rcl} -1 \leq p + 2 < 8 \\ -2 & -2 & \end{array}$$

$$-1 \leq p < 6$$

Rosario should have also subtracted 2 from -1. Why?



**Your Turn:**

$$-2 < p + 1 \leq 6$$

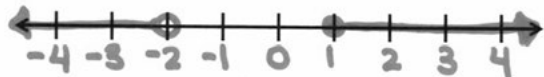


**SET 4** Solve each inequality and graph the solution. Label your graph. SHOW ALL OF YOUR WORK.



Malik solved and graphed this inequality **correctly**. Here is his work:

$$-3p + 2 \leq -1 \quad \text{or} \quad 2p - 4 < -8$$



$$\begin{array}{rcl} -3p + 2 \leq -1 \\ -2 & -2 & \end{array}$$

$$\begin{array}{rcl} -3p \leq -3 \\ \div -3 & \div -3 & \end{array}$$

$$p \geq 1$$

$$\begin{array}{rcl} 2p - 4 < -8 \\ +4 & +4 & \end{array}$$

$$\begin{array}{rcl} 2p < -4 \\ \div 2 & \div 2 & \end{array}$$

$$p < -2$$

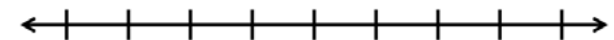
Is  $p = -1$  a possible correct solution for this inequality? Explain.

Why did Malik have to switch the symbol in the first inequality, but not in the second?



**Your Turn:**

$$-3p - 2 \geq 1 \quad \text{or} \quad 3p + 2 > 8$$



For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Write an inequality that describes each situation.



Dave wrote this inequality **correctly**.  
Here is his work:

$x$  is negative

$$x < 0$$

What does the sign that Dave used mean?



**Your Turn:**

$t$  is positive

**SET 2** Write an inequality that describes each situation.



Rita **didn't** write this inequality  
correctly. Here is her work:

$r$  is at least 2

$$r \leq 2$$

Even though the problem says "least," why  
shouldn't Rita have used  $\geq$  in her answer?



**Your Turn:**

$s$  is at most 4

**SET 3** Write an inequality that describes each situation.

Lance **didn't** write this inequality correctly. Here is his work:

At least 100 parents attended the lacrosse game. Let  $p$  represent the number of parents.

$$p > 100$$

Lance should have written  $\geq$ . Which words in the problem show that Lance's answer is wrong? Explain.



**Your Turn:**

The candy store has no more than 24 flavors of jellybeans. Let  $f$  represent the number of flavors.

**SET 4** Write an inequality that describes each situation.

Ann-Elise wrote this inequality **correctly**. Here is her work:

The elevator can hold 20 people and there are more than 5 people in the elevator at the moment. Let  $p$  represent the number of people.

$$5 < p \leq 20$$

Why did Ann-Elise need to use two inequality symbols?



**Your Turn:**

Gerard has less than 16 trains in his box, but the box is not empty. Let  $t$  represent the number of trains.

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Brock **didn't** simplify this expression correctly. Here is his work:

$$c \cdot c \cdot c \cdot k \cdot k$$

$$c \cdot c \cdot c \cdot k \cdot k$$

$$3c2k$$



What is wrong with the placement of the 3 and the 2 in Brock's answer?



**Your Turn:**

$$j \cdot j \cdot j \cdot j \cdot g \cdot g \cdot g$$

**SET 2** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Karin simplified this expression **correctly**. Here is her work:

$$a^5 \cdot a^2$$

$$a^5 \cdot a^2$$

$$a^7$$



Explain why Karin was able to add the exponents together in order to get the correct answer.



**Your Turn:**

$$b^4 \cdot b^4$$

**SET 3** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.

Joshua simplified this expression **correctly**. Here is his work:

$$4^7 \cdot \frac{1}{4^2}$$

$$\frac{4^7}{4^2}$$

$$4^5$$

$$4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$$

$$1024$$

Explain why  $\frac{4^7}{4^2}$  equals  $4^5$ .



**Your Turn:**

$$2^5 \cdot \frac{1}{2^3}$$

**SET 4** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.

Lila **didn't** simplify this expression correctly. Here is her work:

$$\frac{c^6}{c^2}$$

$$c^6 \div 2$$

$$c^3$$

Lila divided her exponents to get her answer. What operation should Lila have used to get the correct answer?



**Your Turn:**

$$\frac{b^6}{b^3}$$

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Min **didn't** simplify this expression correctly. Here is her work:

$$(ab^5)^2$$

$$(ab^5)^2$$

$$ab^{10}$$

Min used the correct exponent for  $b$ , so why is her final expression wrong?



**Your Turn:**

$$(cj^3)^5$$

**SET 2** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Liz simplified this expression **correctly**. Here is her work:

$$b^3(b^2)^4$$

$$b^3(b^2)^4$$

$$b^3 \cdot b^{2 \cdot 4}$$

$$b^3 \cdot b^8$$

$$\rightarrow b^{3+8}$$

$$b^{11}$$

In the step marked with an arrow, why did Liz add instead of multiply?



**Your Turn:**

$$(r^5)^2 r^3$$

**SET 3** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.

Jamal simplified this expression **correctly**. Here is his work:

$$\begin{aligned}
 &(-10a^6)^2 \cdot a^2 \\
 &(-10a^6)^2 \cdot a^2 \\
 &(-10)^2 \cdot (a^6)^2 \cdot a^2 \\
 &100 \cdot a^{12} \cdot a^2 \\
 &100 \cdot a^{14} \\
 &100a^{14}
 \end{aligned}$$

Does Jamal really need parentheses for  $(-10)^2$ ? Why or why not?

Why does  $(a^6)^2 = a^{12}$ , while  $a^{12}a^2 = a^{14}$ ? (Why do you multiply exponents in one case and add exponents in the other?)



**Your Turn:**

$$(-2b^2)^2 \cdot b^4$$

**SET 4** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.

James **didn't** simplify this expression correctly. Here is his work:

$$\begin{aligned}
 &\left(\frac{5x}{y}\right)^2 & \left(\frac{5x}{y}\right)^2 \\
 & & \frac{5x^2}{y^2}
 \end{aligned}$$

James' answer should not have a 5 in it. What number should there be instead?



**Your Turn:**

$$\left(\frac{3a}{b}\right)^4$$

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Ashley **didn't** simplify this expression correctly. Here is her work:

$$4^{-2}$$

$$4^{-2}$$

$$-16$$



How does a negative exponent affect its base?



What is the correct answer to this problem?



**Your Turn:**

$$5^{-3}$$

**SET 2** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Andy simplified this expression **correctly**. Here is his work:

$$\frac{1}{3b^{-2}}$$

$$\frac{1}{3b^{-2}}$$

$$\frac{b^2}{3}$$



Why did the negative sign disappear when Andy wrote his solution?



Why did the 3 stay in the denominator?



**Your Turn:**

$$\frac{2}{x^{-3}}$$

**SET 3** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Carlos **didn't** simplify this expression correctly. Here is his work:

$$\begin{array}{l} 5 \cdot a^0 \\ 5 \cdot a^0 \\ 5 \cdot 0 \\ 0 \end{array}$$

What does anything to the power of zero always equal?

What is the correct answer to this problem?



**Your Turn:**

$$(-4)^0 \cdot b$$

**SET 4** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Danice simplified this expression **correctly**. Here is her work:

$$\begin{array}{l} x^0 y^{-2} \\ x^0 y^{-2} \\ 1 \cdot \frac{1}{y^2} \\ \frac{1}{y^2} \end{array}$$

Why was  $x$  not included in Danice's answer?



**Your Turn:**

$$a^{-4} b^0$$

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Maya simplified this expression **correctly**. Here is her work:

$$\begin{array}{l} (3ab^{-5})^2 \\ 9a^2b^{-10} \\ \frac{9a^2}{b^{10}} \end{array}$$

Where did the 9 come from in Maya's expression?

The original expression did not contain a fraction. Why did Maya's answer contain a fraction?



**Your Turn:**

$$(5a^{-3}b)^2$$

**SET 2** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.



Riyo simplified this expression **correctly**. Here is his work:

$$\begin{array}{l} \frac{2^3 \cdot 3}{2 \cdot 3^3} \\ \frac{2^3 \cdot 3}{2 \cdot 3^3} \\ \frac{2^2}{3^2} \\ \frac{4}{9} \end{array}$$

Could Riyo have multiplied the base numbers first and then simplified? Why or why not?



**Your Turn:**

$$\frac{2^2 \cdot 3^2}{3^5 \cdot 2}$$

**SET 3** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.

Julian **didn't** simplify this expression correctly. Here is his work:

$$\begin{array}{l}
 (a^3b^2)^0 \\
 \leftarrow (a^3b^2)^0 \\
 (a^3)^0 \cdot (b^2)^0 \\
 a^{3+0} \cdot b^{2+0} \\
 a^3 \cdot b^2 \\
 a^3b^2
 \end{array}$$

Julian made a mistake in the step that is marked with an arrow. What operation should he have used for the exponents instead?

Julian could have figured out the correct answer without showing any work. What rule about the power of zero did Julian forget?

**Your Turn:**

$$(c^0b^{-3})^2$$

**SET 4** Write the following expressions in simplest form. SHOW ALL OF YOUR WORK.

Kelly **didn't** simplify this expression correctly. Here is her work:

$$\begin{array}{l}
 -3x^{-2} \\
 -3x^{-2} \\
 \frac{1}{-3x^2}
 \end{array}$$

The -3 should have stayed in the numerator in order for Kelly's final answer to be correct. Why does the -3 belong in the numerator?

**Your Turn:**

$$(-2c)^{-4}$$

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

### SET 1 Evaluate each exponential function by completing the tables for the given domains.



Lorena evaluated this function correctly for  $n=1$ , but she **wasn't** successful for  $n=2$  and  $n=3$ . Here is her work:

$$f(n) = 4 \cdot 3^n \text{ for the domain } [1, 2, 3]$$

$n$	$4 \cdot 3^n$	$f(n)$
1	$4 \cdot 3^1$	12
2	$4 \cdot 3^2$	144
3	$4 \cdot 3^3$	1728

Why are  $f(n) = 4 \cdot 3^n$  and  $f(n) = (4 \cdot 3)^n$  the same when  $n = 1$ ?

Why are the solutions different for  $f(n) = 4 \cdot 3^n$  and  $f(n) = (4 \cdot 3)^n$  when  $n \neq 1$ ?



**Your Turn:**

$$f(n) = 2(3)^x \text{ for the domain } [1, 2, 3]$$

$n$	$2(3)^x$	$f(n)$
1		
2		
3		

### SET 2 Evaluate each exponential function by completing the tables for the given domains.



Marcus evaluated this function **correctly**. Here is his work:

$$y = (2)^x \text{ and } y = -(2)^x \text{ for the domain } [0, 1, 2]$$

$x$	$(2)^x$	$y$
0	$2^0$	1
1	$2^1$	2
2	$2^2$	4

$x$	$-(2)^x$	$y$
0	$-(2)^0$	-1
1	$-(2)^1$	-2
2	$-(2)^2$	-4

How would the second table have differed if the equation given was  $y = (-2)^x$ ?



**Your Turn:**

$$y = (5)^x \text{ and } y = -(5)^x \text{ for the domain } [0, 1, 2]$$

$x$	$(5)^x$	$y$
0		
1		
2		

$x$	$(-5)^x$	$y$
0		
1		
2		

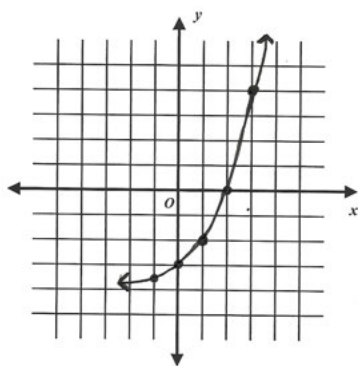
**SET 3** Graph each exponential function.



Dmitri completed this graph **correctly**. Here is his work:

$$y = 2^x - 4$$

$x$	$2^x - 4$	$y$
-1	$2^{-1} - 4$	-3.5
0	$2^0 - 4$	-3
1	$2^1 - 4$	-2
2	$2^2 - 4$	0
3	$2^3 - 4$	4



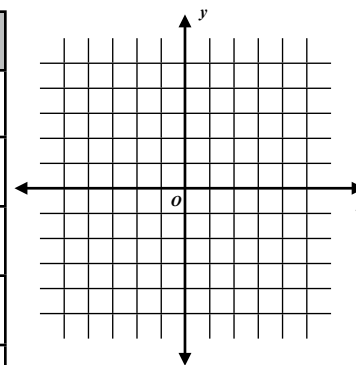
Does this function represent growth or decay? How can you tell by looking at the graph?



**Your Turn:**

$$y = 2^x - 3$$

$x$	$2^x - 3$	$y$
-1	$2^{-1} - 3$	-2.5
0	$2^0 - 3$	-2
1	$2^1 - 3$	-1
2	$2^2 - 3$	1
3	$2^3 - 3$	5



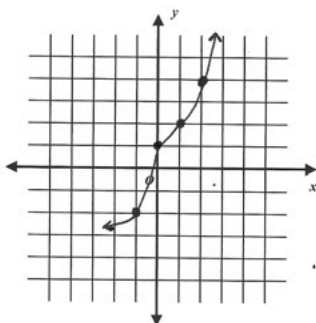
**SET 4** Evaluate each exponential function by completing the tables. Then graph the functions.



Kyle **didn't** complete this problem correctly. Here is his work:

$$f(x) = 2^x \text{ for the domain } [-1, 0, 1, 2]$$

$x$	$(2)^x$	$f(x)$
-1	$2^{-1}$	-2
0	$2^0$	1
1	$2^1$	2
2	$2^2$	4



Which of the points is incorrect?

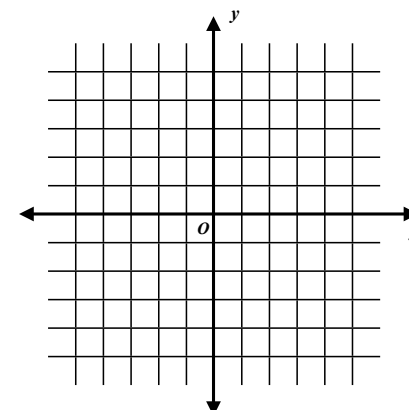
Why will  $f(x)$  never reach or go below zero?



**Your Turn:**

$$f(x) = -2^x \text{ for the domain } [-1, 0, 1, 2]$$

$x$	$-2^x$	$f(x)$
-1		
0		
1		
2		



For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

### SET 1 Determine if the given table represents an exponential function. JUSTIFY YOUR REASONING.



Gio completed this problem **correctly**. Here is his work:

$x$	$y$
-1	-1
0	1
1	3
2	5

The function isn't exponential because the  $y$ -values increased by adding 2.

What pattern would he see in an exponential function?



**Your Turn:**

$x$	$y$
0	1
1	2
2	4
3	8

### SET 2 Identify the following from the given equation: the initial amount ( $a$ ), the growth rate ( $r$ ), and time ( $t$ ).



Julia **didn't** complete this problem correctly. Here is her work:

$$y = 12(1 + .07)^2$$

$$a = 12$$

$$r = 1.07 \text{ or } 107\%$$

$$t = 2$$

Julia did not identify the growth rate correctly. What did she do wrong?

What is the actual growth rate (as a percent)?



**Your Turn:**

$$y = 4(1 + .90)^3$$

**SET 3** Complete the following problems using the growth rate formula. WRITE YOUR FINAL ANSWER IN A COMPLETE SENTENCE.



Mateo completed this problem **correctly**. Here is his work:

If you put \$400 in the bank at 3% interest compounded annually, how much money will be in the account after 5 years?

$$\begin{aligned} P &= a(1+r)^t \\ P &= 400(1+.03)^5 \\ P &= 400(1.03)^5 \\ P &= 463.71 \end{aligned}$$

\$463.71 will be in the account.

Why is there a 1 in the formula?



**Your Turn:**

If you put \$600 in a savings account at a 3% interest rate compounded annually, how much money will be in the savings account after 4 years?

**SET 4** Complete the following problems using what you know about growth rate.



Francine completed this problem **correctly**. Here is her work:

If the population triples each year, what is the growth rate?

If the population triples, the growth rate is 200% per year.

Why isn't the growth rate 300% per year?



**Your Turn:**

The price of an item doubles each year. What is the growth rate?

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

### SET 1 Write an equation that represents the data in the table using the decay formula. SHOW ALL OF YOUR WORK.



Michelle completed this problem **correctly**.  
Here is her work:

x	y
-1	4
0	1
1	$\frac{1}{4}$
2	$\frac{1}{16}$

$\begin{aligned} &+1 < &> x \frac{1}{4} \\ &+1 < &> x \frac{1}{4} \\ &+1 < &> x \frac{1}{4} \end{aligned}$

When  $x=0, y=1$   
 $y = a \cdot b^x$   
 $1 = a \cdot b^0$   
 $1 = a \cdot 1$   
 $\div 1 \quad \div 1$   
 $1 = a$   
 $y = 1 \cdot b^x$   
 $y = 1(\frac{1}{4})^x$   
 $y = (\frac{1}{4})^x$

Do you always need to use the y-intercept when solving for  $a$ ?  
Explain why or why not.



**Your Turn:**

x	y
-1	4
0	2
1	1
2	$\frac{1}{2}$

### SET 2 Find the decay rate. JUSTIFY YOUR REASONING.



Enid **didn't** complete this problem correctly. Here is her work:

$$y = 4(0.97)^x$$

The decay rate is 0.97 because that is what is raised to a power.

Enid has correctly identified the decay factor. What is the decay rate?



**Your Turn:**

$$y = -2(0.30)^x$$

**SET 3** Identify the decay factor in each given situation.



Sam **didn't** complete this problem correctly. Here is his work:

A 6% decrease

The number you would multiply by is 94 because you want to decrease by 6.

What is wrong with the decimal placement in Sam's answer?



**Your Turn:**

A 53% decrease

**SET 4** Identify the original amount, decay rate, and decay factor for each situation. Then write a function for the rate of decay. **SHOW ALL OF YOUR WORK.**



Micah completed this problem **correctly**. Here is his work:

A population of 300,000 decreases by 7% each year.

Original amount: 300,000

Decay Rate: .07

Decay Factor: .93

Function:  $y = a(1-r)^t$   
 $y = 300,000(1-.07)^t$   
 $y = 300,000(.93)^t$

Why did Micah say the decay rate was .07 and not .93?



**Your Turn:**

A computer's value decreases by 20% each year. The initial cost was \$2,000.

Original amount: \_\_\_\_\_

Decay Rate: \_\_\_\_\_

Decay Factor: \_\_\_\_\_

Function: \_\_\_\_\_

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Identify each function as exponential growth or exponential decay. JUSTIFY YOUR ANSWER.



Janae completed this problem **correctly**. Here is her work:

$$y = 0.45(3)^x$$

This is a growth function because the base is greater than 1.

What is the growth factor?

Why is it important that the base is greater than 1?



**Your Turn:**

$$y = 3(0.45)^x$$

**SET 2** Identify each function as exponential growth or exponential decay. JUSTIFY YOUR ANSWER.



Ari **didn't** complete this problem correctly. Here is his work:

$$y = \frac{1}{16}(4)^x$$

This is a decay function because the base is  $\frac{1}{16}$ , which is less than 1.

What is the base?

What does the  $\frac{1}{16}$  represent?



**Your Turn:**

$$y = 3\left(\frac{1}{15}\right)^x$$

**SET 3** Solve the problems using the exponential growth OR the exponential decay formula. Write your answer in sentence form. SHOW ALL OF YOUR WORK.



Nicki **didn't** complete this problem correctly. Here is her work:

If a ticket to a theme park cost \$70 in 2008 and has increased each year by 4%, how much did it cost in 2012? Round to the nearest cent.

$$\begin{aligned} P &= a(1+r)^t \\ P &= 70(1+4)^4 \\ P &= 70(5)^4 \\ P &= 70(625) \\ P &= 43,750 \\ \text{each ticket costs } \$43,750. \end{aligned}$$

Nicki's calculations are correct, but she made a mistake when substituting for the formula. What was it?

How could Nicki have known that her answer was not reasonable?



**Your Turn:**

A subway pass was \$50 per month in 2001. If the price increased by 6% each year, how much does a monthly pass cost in 2013? Round to the nearest cent.

**SET 4** Solve the problems using the exponential growth OR the exponential decay formula. Write your answer in sentence form. SHOW ALL OF YOUR WORK.



Juan completed this problem **correctly**. Here is his work:

Three years ago a person bought a used boat for \$5,000. Today, someone else offered to buy it for \$3,500. If the value of the boat decreased by 6% each year, should the person sell the boat for \$3,500? Round to the nearest cent.

$$\begin{aligned} P &= a(1-r)^t \\ P &= 5000(1-.06)^3 \\ P &= 5000(.94)^3 \\ P &= \$4,152.92 \end{aligned} \quad \text{Don't sell the boat.}$$

Why did Juan say that the boat should not be sold?

How did Juan know to substitute 3 for  $t$ ?



**Your Turn:**

Cars lose value over time. If you bought a used car 4 years ago for \$3,000, how much is the car worth today? Assume it loses 15% of its value each year. Round to the nearest cent.

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Find the sum for each of the polynomials. SHOW ALL OF YOUR WORK.



Kassandra found the sum **correctly**. Here is her work:

$$\begin{aligned} &(4x^2 - x + 3) + (x^2 + 3x - 1) \\ &(4x^2 - x + 3) + (x^2 + 3x - 1) \\ &4x^2 + x^2 - x + 3x + 3 - 1 \\ &5x^2 + 2x + 2 \end{aligned}$$

Where did the  $+2x$  come from in Kassandra's answer?



**Your Turn:**

$$(4x^2 + 3x - 6) + (8x^2 + 3x + 9)$$

**SET 2** Find the difference for each of the polynomials. SHOW ALL OF YOUR WORK.



Alta tried to subtract these polynomials but **didn't** do it correctly. Here is her work:

$$\begin{aligned} &(3x^2 - 4x + 8) - (x^2 - 4) \\ &\rightarrow (3x^2 - 4x + 8) - (x^2 - 4) \\ &3x^2 - x^2 - 4x + 8 - 4 \\ &2x^2 - 4x + 4 \end{aligned}$$

In the step marked with an arrow, Alta did not change the signs correctly. Which term does not have the correct sign attached to it?

Why should the sign be positive?



**Your Turn:**

$$(3x^2 + 4x - 8) - (x^2 - 4x)$$

**SET 3** Find the sum for each of the polynomials. SHOW ALL OF YOUR WORK.

Eric tried to add these polynomials but **didn't** do it correctly. Here is his work:

$$(-3x^3 + 6x^2 + 4) + (8x^3 + 3x - 9)$$

$$\begin{array}{r} (-3x^3 + 6x^2 + 4) + (8x^3 + 3x - 9) \\ 5x^3 + 9x^2 - 5 \end{array}$$



Eric made a mistake when adding the terms. What did he add incorrectly?



What could Eric have done to help him figure out what terms to combine?



**Your Turn:**

$$(-3x^3 + 6x^2 + 4) + (8x^3 - 3x + 9)$$

**SET 4** Find the difference for each of the polynomials. SHOW ALL OF YOUR WORK.

Jean-Paul subtracted these polynomials **correctly**. Here is his work:

$$(x^3 + 6x^2 - x + 2x) - (9x^3 - 8x^2 + 3x)$$

$$\begin{array}{r} (x^3 + 6x^2 - x + 2x) - (9x^3 - 8x^2 + 3x) \\ (x^3 + 6x^2 + x) - (9x^3 - 8x^2 + 3x) \\ \rightarrow x^3 + 6x^2 + x - 9x^3 + 8x^2 - 3x \\ -8x^3 + 14x^2 - 2x \end{array}$$



Where did the  $-3x$  come from in the step marked with an arrow?



**Your Turn:**

$$(x^3 + 6x^2 - x^2 + 2x) - (9x^3 - 8x^2 + 3x)$$

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.


**SET 1** Find the product. SHOW ALL OF YOUR WORK.



Michael found the product **correctly**. Here is his work:

$$x(x - 4)$$

$$\begin{array}{r} x(x-4) \\ x^2 - 4x \end{array}$$

 Where did the  $x^2$  come from in Michael's answer?



**Your Turn:**

$$3x(x - 4)$$


**SET 2** Find the product. SHOW ALL OF YOUR WORK.



Hugo **didn't** find the product correctly. Here is his work:

$$-3x(6x - 4)$$

$$\begin{array}{r} -3x(6x-4) \\ -18x^2 - 12x \end{array}$$

 The correct answer is  $-18x^2 + 12x$ . What multiplication rule did Hugo forget?



**Your Turn:**

$$-3x(6x^2 - 4x)$$

**SET 3** Find the product. SHOW ALL OF YOUR WORK.

Alicia found the product **correctly**. Here is her work:

$$-3x(6x^2 - 4x + 1)$$

$$\begin{array}{l} -3x(6x^2 - 4x + 1) \\ -18x^3 + 12x^2 - 3x \end{array}$$

Why is  $-18x$  cubed instead of squared?



**Your Turn:**

$$-3x(6 - 4x + x^2)$$

**SET 4** Find the product. SHOW ALL OF YOUR WORK.

Mora found the product **correctly**. Here is her work:

$$4x^2(3x^2 + 6x + 1)$$

$$\begin{array}{l} 4x^2(3x^2 + 6x + 1) \\ 12x^{2+2} + 24x^{2+1} + 4x^2 \\ 12x^4 + 24x^3 + 4x^2 \end{array}$$

Why did Mora add the exponents instead of multiplying them?



**Your Turn:**

$$-4x^2(3x^2 + 6x + 1)$$

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Factor each binomial completely. SHOW ALL OF YOUR WORK.



Fei factored this polynomial **correctly**.  
Here is her work:

$$-4x - 2$$

$$\begin{array}{l} -4x - 2 \\ -2(2x + 1) \end{array}$$

Where did the +1 come from in Fei's factored expression?



**Your Turn:**

$$-9x^2 - 3x$$

**SET 2** Factor each binomial completely. SHOW ALL OF YOUR WORK.



Caroline tried to factor this polynomial  
but she **didn't** do it completely. Here  
is her work:

$$12x^2 + 8x$$

$$\begin{array}{l} 12x^2 + 8x \\ 4(3x^2 + 2x) \end{array}$$

Why is Caroline's polynomial not factored completely?



**Your Turn:**

$$12x^2 - 8x$$

**SET 3** Factor each binomial completely. SHOW ALL OF YOUR WORK.



Tristan tried to factor this polynomial but **didn't** do it completely. Here is his work:

$$-4x^2 - 2x$$

$$\begin{array}{l} -4x^2 - 2x \\ 2x(-2x - 1) \end{array}$$

Tristan did not factor this out completely. What else can be factored out?



**Your Turn:**

$$-3x^3 - 12x^2$$

**SET 4** Factor each binomial completely. SHOW ALL OF YOUR WORK.



Demarcus factored out this polynomial **correctly**. Here is his work:

$$16x^4 + 20x^2$$

$$\begin{array}{l} 16x^4 + 20x^2 \\ 4x^2(4x^2 + 5) \end{array}$$

Why can't Demarcus factor out an  $x^3$ ?



**Your Turn:**

$$20x^4 - 4x$$

For each set, first examine the problem on the left and answer the question(s) about it.  
Then complete the similar problem on the right.

**SET 1** Multiply the binomials. SHOW ALL OF YOUR WORK.



Ebony tried to find the product but she **didn't** do it correctly. Here is her work:

$$(x+4)(x+3)$$

$$\begin{array}{l} (x+4)(x+3) \\ x^2 + 3 + 4x + 12 \\ x^2 + 4x + 15 \end{array}$$

In the step marked with an arrow, what mistake did Ebony make?



**Your Turn:**

$$(x+4)(x-3)$$

**SET 2** Multiply the binomials. SHOW ALL OF YOUR WORK.



Letizia multiplied **correctly**. Here is her work:

$$(x-3)(x-4)$$

$$\begin{array}{l} (x-3)(x-4) \\ x^2 - 4x - 3x + 12 \\ x^2 - 7x + 12 \end{array}$$

In the step marked with an arrow, where did the + sign come from?



**Your Turn:**

$$(x-3)(x-6)$$

**SET 3** Multiply the binomials. SHOW ALL OF YOUR WORK.



Chuck tried to find the product but **didn't** do it correctly. Here is his work:

$$(x-4)^2$$

$$\begin{aligned} (x-4)^2 \\ x^2 + 16 \end{aligned}$$

What is another way that Chuck could have written  $(x-4)^2$ ?

How would that have helped him get the correct answer?



**Your Turn:**

$$(x+4)^2$$

**SET 4** Multiply the binomials. SHOW ALL OF YOUR WORK.



Shu-Ju multiplied **correctly** to find the product. Here is her work:

$$(6x+4)(x-3)$$

$$\begin{aligned} (6x+4)(x-3) \\ 6x^2 - 18x + 4x - 12 \\ 6x^2 - 14x - 12 \end{aligned}$$

Where did the  $-14x$  come from in Shu-Ju's answer?

Would the same answer be correct if the problem was  $(x-3)(6x+4)$ ? Explain why or why not.



**Your Turn:**

$$(6x^2 + 4x)(x-3)$$

For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Solve each equation using the quadratic formula. SHOW ALL OF YOUR WORK.


Denzel **didn't** solve the equation correctly. Here is his work:


$$\begin{array}{l}
 w^2 + 6w + 8 = 0 \\
 w = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
 w = \frac{-6 \pm \sqrt{6^2 - 4(1)(8)}}{2(1)} \\
 w = \frac{-6 \pm \sqrt{36 - 32}}{2} \\
 w = \frac{-6 \pm \sqrt{4}}{2} \\
 w = \frac{-6 \pm 2}{2} \\
 w = \frac{-6 + 2}{2} \\
 w = \frac{-4}{2} \\
 w = -2
 \end{array}$$



**Your Turn:**

$$w^2 + 2w - 8 = 0$$

 How did Denzel know to substitute +1 for  $a$ ?

 Denzel forgot that there was a  $\pm$  in the formula and therefore only found one solution. What is the other solution for  $w$  and how do you find it?

**SET 2** Solve each equation using the quadratic formula. SHOW ALL OF YOUR WORK.



Abdalla solved this equation **correctly**. Here is his work.

$$\begin{aligned}
 4w^2 - 4w &= -1 \\
 4w^2 - 4w + 1 &= 0 \\
 w &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
 w &= \frac{4 \pm \sqrt{(-4)^2 - 4(4)(1)}}{2(4)} \\
 w &= \frac{4 \pm \sqrt{16 - 16}}{8} \\
 w &= \frac{4 \pm \sqrt{0}}{8} \\
 w &= \frac{4}{8} = \frac{1}{2}
 \end{aligned}$$

Why did Abdalla +1 to both sides before applying the quadratic formula?

Why is there only one solution to this equation?



**Your Turn:**

$$9w^2 + 12w = -4$$

**SET 3** Solve each equation **using the quadratic formula**. SHOW ALL OF YOUR WORK.



Maya solved this equation **correctly**. Here is her work:

$$-5 = x^2 + 5x$$

$$\begin{array}{r} -5 = x^2 + 5x \\ +5 \quad +5 \end{array}$$

$$0 = x^2 + 5x + 5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(1)(5)}}{2(1)}$$

$$x = \frac{-5 \pm \sqrt{25 - 20}}{2}$$

$$x = \frac{-5 \pm \sqrt{5}}{2}$$

$$x = \frac{-5 + \sqrt{5}}{2} \quad \text{or} \quad x = \frac{-5 - \sqrt{5}}{2}$$

$$x \approx -1.38$$

$$x \approx -3.62$$



**Your Turn:**

$$1 + 3x^2 = -5x$$

Would Maya have gotten the same answer if she had moved  $x^2$  and  $5x$  to the left hand side in the first step instead of moving  $-5$  to the right hand side? Explain why or why not.

Why are  $-1.38$  and  $-3.62$  approximate solutions ( $\approx$ )?

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For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Solve each equation by **factoring**. SHOW ALL OF YOUR WORK.

Bethanne **didn't** solve this equation correctly. Here is her work:

$$x^2 - 3x = 0$$

$$\begin{aligned}x^2 - 3x &= 0 \\x(x - 3) &= 0 \\x - 3 &= 0 \\+3 \quad +3 \\x &= 3\end{aligned}$$

  $x = 3$  is one of the answers. Bethanne did not finish solving the problem. What is the other answer? Explain your reasoning.



**Your Turn:**

$$x^2 + 25x = 0$$

**SET 2** Solve each equation by **factoring**. SHOW ALL OF YOUR WORK.

Himanshu **didn't** solve this equation correctly. Here is his work:

$$x^2 + 8x - 48 = 0$$

$$x^2 + 8x - 48 = 0$$

$$(x + 24)(x - 2) = 0$$

$$x + 24 = 0 \quad \text{or} \quad x - 2 = 0$$

$$\quad -24 \quad -24 \quad \quad +2 \quad +2$$

$$x = -24 \quad \text{or} \quad x = 2$$



When factoring, Himanshu did not use the correct factors of -48. Why can't Himanshu use 24 and -2?



**Your Turn:**

$$x^2 + x - 12 = 0$$

**SET 3** Solve each equation by **factoring**. SHOW ALL OF YOUR WORK.

Mark solved this equation **correctly**. Here is his work:

$$x^2 + 9x + 8 = 0$$

$$x^2 + 9x + 8 = 0$$

$$(x+8)(x+1) = 0$$

$$x+8=0 \quad \text{or} \quad x+1=0 \quad \leftarrow$$

$$-8 \quad -8$$

$$-1 \quad -1$$

$$x = -8 \quad \text{or} \quad x = -1$$



**Your Turn:**

$$x^2 + 3x - 28 = 0$$



Why can you set both factors equal to zero in the step marked with an arrow?

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For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

**SET 1** Solve each equation by using the square root. SHOW ALL OF YOUR WORK.

Osvaldo **didn't** solve the equation correctly. Here is his work:

$$(n + 2)^2 = 9$$

$$\begin{aligned}(n+2)^2 &= 9 \\ \sqrt{(n+2)^2} &= \sqrt{9} \\ n+2 &= 3 \\ -2 \quad -2 \\ n &= 1\end{aligned}$$



Osvaldo did not completely solve the problem. He found the first answer correctly. What did he need to do to find the second answer?



**Your Turn:**

$$(n - 5)^2 = 100$$

**SET 2** Solve each equation by using the square root. SHOW ALL OF YOUR WORK.

Jasmine solved this equation **correctly**. Here is her work:

$$(n - 6)^2 = 0$$

$$\begin{aligned}(n - 6)^2 &= 0 \\ \sqrt{(n - 6)^2} &= \sqrt{0} \\ n - 6 &= 0 \\ +6 \quad +6 \\ n &= 6\end{aligned}$$



Why does this problem have one solution when the problems in the first set have two solutions?



**Your Turn:**

$$(n + 25)^2 = 0$$

**SET 3** Solve each equation by **using the square root**. SHOW ALL OF YOUR WORK.

Lacey solved this equation **correctly**. Here is her work:

$$(n + 3)^2 = -7$$

$$\begin{aligned} (n+3)^2 &= -7 \\ \sqrt{(n+3)^2} &= \sqrt{-7} \\ \text{no solution} \end{aligned}$$



**Your Turn:**

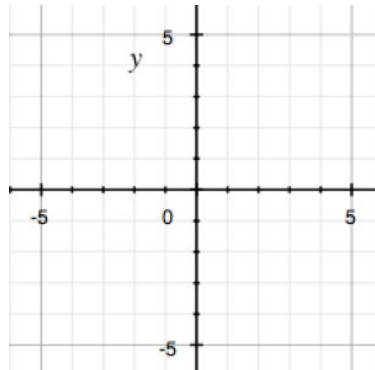
$$(n - 3)^2 = -4$$



Why is there no solution to this equation?



Without plotting points, draw a quick sketch of what the graph of this equation might look like on the graph to the right.



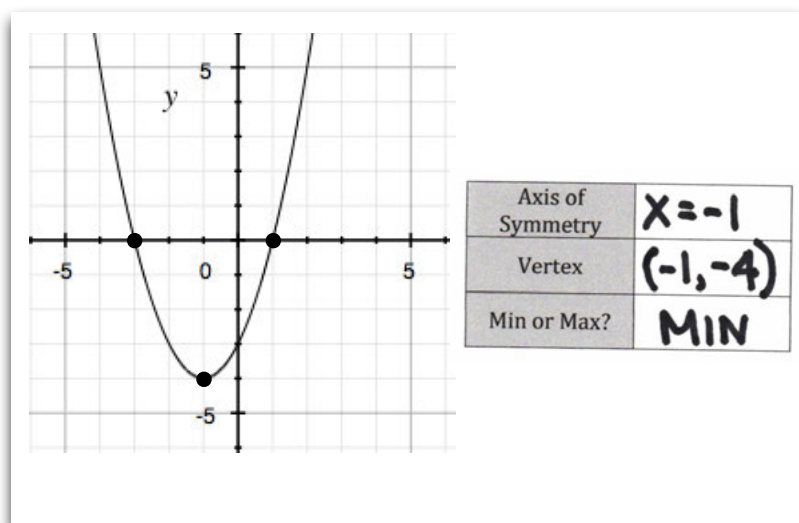
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For each set, first examine the problem on the left and answer the question(s) about it. Then complete the similar problem on the right.

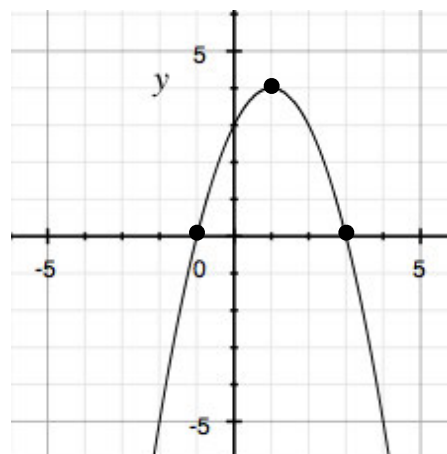
**SET 1** Identify the axis of symmetry, the vertex, and whether the vertex is a minimum or maximum value.



Imani found the characteristics of the function **correctly**. Here is her work:



**Your Turn:**



Why is the axis of symmetry always the same as the  $x$  value of the vertex?

Axis of Symmetry	
Vertex	
Min or Max?	

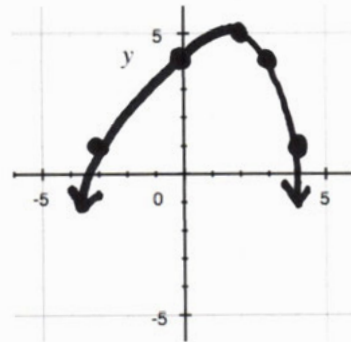
**SET 2** Identify the axis of symmetry, the vertex, and whether the vertex is a minimum or maximum value. **Then graph the function.**



Bernardo found the characteristics of the function correctly, but he **didn't** finish his graph correctly. Here is his work:

$$y = -x^2 + 4x + 1$$

Axis of Symmetry	<b><math>x=2</math></b>
Vertex	<b><math>(2,5)</math></b>
Min or Max?	<b>max</b>



Axis of symmetry  
 $x = \frac{-b}{2a} = \frac{-4}{2(-1)} = 2$

vertex  
 $y = -(2)^2 + 4(2) + 1$   
 $y = -4 + 8 + 1$   
 $y = 5$   
 $(2, 5)$

other points

$x=3$   
 $y = -(3)^2 + 4(3) + 1$   
 $y = -9 + 12 + 1$   
 $y = 4$   
 $(3, 4)$

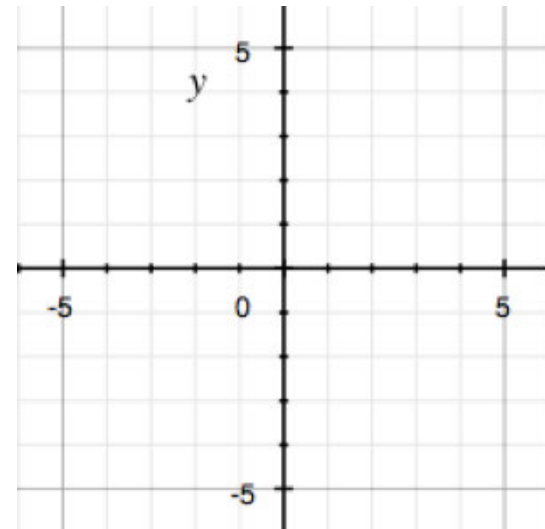
$x=4$   
 $y = -(4)^2 + 4(4) + 1$   
 $y = -16 + 16 + 1$   
 $y = 1$   
 $(4, 1)$



**Your Turn:**

$$y = x^2 - 4x + 1$$

Axis of Symmetry	
Vertex	
Min or Max?	



Bernardo found the axis of symmetry correctly. What equation did he use?

By looking at the graph, how could Bernardo have figured out that it was incorrect?

**SET 3** Identify the axis of symmetry, the vertex, and whether the vertex is a minimum or maximum value. **Then graph the function.**



Lourdes **didn't** find the characteristics of the function correctly. Here is her work:

$y = -x^2 - 2x - 1$

Axis of Symmetry	$x = 1$
Vertex	$(1, -2)$
Min or Max?	min

axis of symmetry  
 $x = \frac{2}{2(1)} = \frac{2}{2} = 1$

vertex  
 $y = (1)^2 - 2(1) - 1$   
 $y = 1 - 2 - 1$   
 $y = -2$   
 $(1, -2)$

other points

$x = 0$ $y = 0^2 - 2(0) - 1$ $y = 0 - 0 - 1$ $y = -1$ $(0, -1)$	$x = 2$ $y = 2^2 - 2(2) - 1$ $y = 4 - 4 - 1$ $y = -1$ $(2, -1)$
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Lourdes left out a part of the quadratic function when solving the problem. What did she forget?

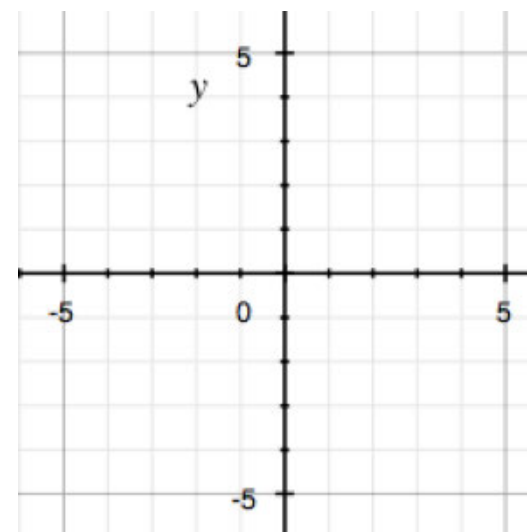
What part of the quadratic function will always affect the direction of the graph?



**Your Turn:**

$$y = x^2 - 2x - 1$$

Axis of Symmetry	
Vertex	
Min or Max?	



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