8th Grade Math Week 2

Dear Parent/Guardian,

During Week 2, we will review and support standards mastery of Equations and Expressions and Geometry. Your child will work towards understanding the connections between proportional relationships, lines and linear equations. They will use similar triangles to explain slope on a coordinate plane and derive the equation$y = mx + b$. The table below lists this week's tasks and practice problems. Each student task ends with a 'Lesson Summary' section; there, your child can find targeted support for the lesson.

Additionally, students can access the HMH GoMath textbook through ClassLink. The site offers instructional support through links in the online textbook. By selecting embedded links, students can access the Personal Math Trainer for step-by-step examples, Math on the Spot for real-world connections and more examples, and Animated Math to help support conceptual understanding.

We also suggest that students have an experience with math each day. Practicing at home will make a HUGE difference in your child's school success! Make math part of your everyday routine. Choose online sites that match your child's interests. Online math games, when played repeatedly, can encourage strategic mathematical thinking, help develop computational fluency, and deepen their understanding of numbers.

Links for additional resources to support students at home are listed below:
https://www.adaptedmind.com/index.php
https://www.engageny.org/educational-activities-for-parents-and-students
https://www.khanacademy.org/resources/teacher-essentials
https://www.multiplication.com/games/all-games
https://www.prodigygame.com/

Week 2 At A Glance	
Day 1	Unit 3, Lesson 8 - Translating to y=mx+b ☐ Student Tasks 8.1, 8.2, and 8.3 ☐ Practice Problems
Day 2	Unit 3, Lesson 9 - Slopes Don't Have to be Positive ☐ Student Tasks 9.1, 9.2, 9.3, and 9.4 ☐ Practice Problems
Day 3	Unit 3, Lesson 10 - Calculating Slope ☐ Student Tasks 10.1 and 10.2 ☐ Practice Problems
Day 4	Unit 3, Lesson 11 - Equations of All Kinds of Lines ☐ Student Tasks 11.1, 11.2, and 11.3 ☐ Practice Problems
Day 5	Review Slope In Tables and on Graphs ☐ Finding the Slope of a Line - iReady

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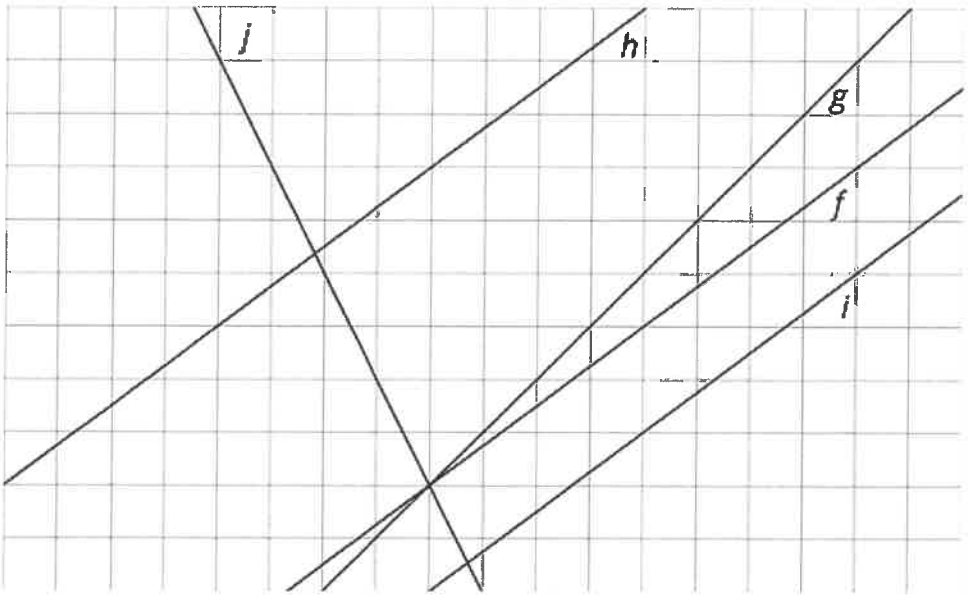
Unit 3, Lesson 8

Translating to y=mx+b

Let's see what happens to the equations of translated lines.

8.1 Lines that Are Translations



The diagram shows several lines. You can only see part of the lines, but they actually continue forever in both directions.

1. Which lines are images of line f under a translation?

2. For each line that is a translation of f, draw an arrow on the grid that shows the vertical translation distance.

8.2 Increased Savings

Interactive digital version available

a.openup.org/ms-math/en/s/ccss-8-3-8-2

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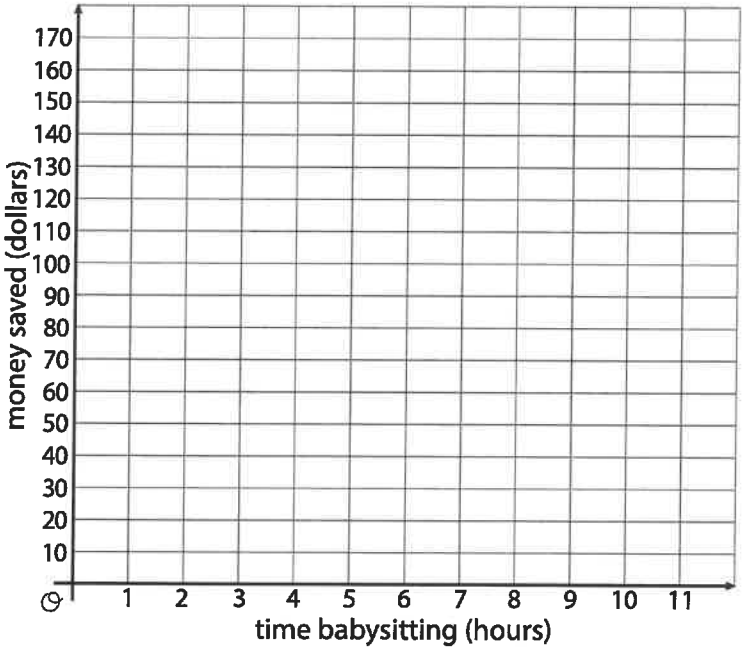

1. Diego earns $10 per hour babysitting. Assume that he has no money saved before he starts babysitting and plans to save all of his earnings. Graph how much money, y, he has after x hours of babysitting.

2. Now imagine that Diego started with $30 saved before he starts babysitting. On the same set of axes, graph how much money, y, he would have after x hours of babysitting.

3. Compare the second line with the first line. How much *more* money does Diego have after 1 hour of babysitting? 2 hours? 5 hours? x hours?

4. Write an equation for each line.

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8.3 Translating a Line

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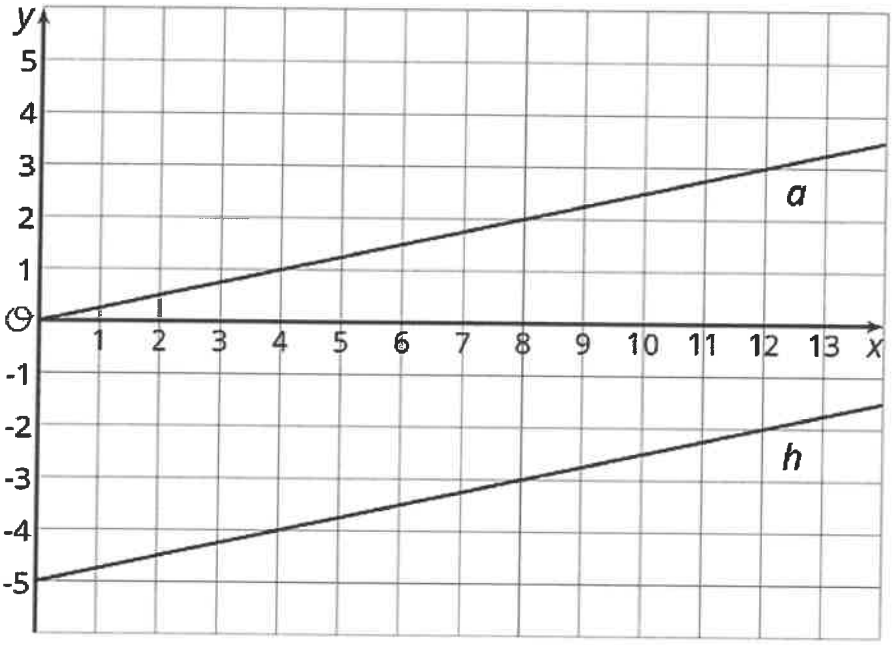
a.openup.org/ms-math/en/s/ccss-8-3-8-3

This graph shows two lines. Line a goes through the origin $(0, 0)$. Line h is the image of line a under a translation.



1. Select all of the equations whose graph is the line h.

   a. $y = \frac{1}{4}x - 5$

   b. $y = \frac{1}{4}x + 5$

   c. $\frac{1}{4}x - 5 = y$

   d. $y = -5 + \frac{1}{4}x$

   e. $-5 + \frac{1}{4}x = y$

   f. $y = 5 - \frac{1}{4}x$

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2. Your teacher will give you 12 cards. There are 4 pairs of lines, A–D, showing the graph, a, of a proportional relationship and the image, h, of a under a translation. Match each line h with an equation and either a table or description. For the line with no matching equation, write one on the blank card.

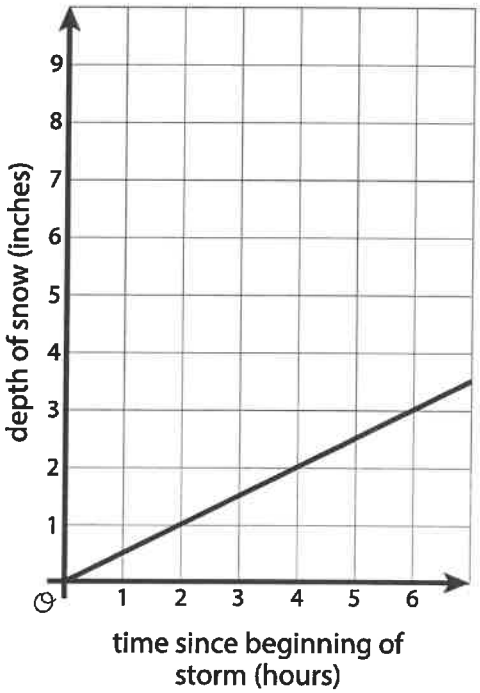
Are you ready for more?

A student says that the graph of the equation $y = 3(x + 8)$ is the same as the graph of $y = 3x$, only translated upwards by 8 units. Do you agree? Why or why not?

Lesson 8 Summary

During an early winter storm, the snow fell at a rate of $\frac{1}{2}$ inches per hour. We can see the rate of change, $\frac{1}{2}$, in both the equation that represents this storm, $y = \frac{1}{2}x$, and in the slope of the line representing this storm.

In addition to being a linear relationship between the time since the beginning of the storm and the depth of the snow, we can also call this as a proportional relationship since the depth of snow was 0 at the beginning of the storm.



During a mid-winter storm, the snow again fell at a rate of $\frac{1}{2}$ inches per hour, but this time there was already 5 inches of snow on the ground. We can graph this storm on the same axes as the first storm by taking all the points on the graph of the first storm and translating them up 5 inches.

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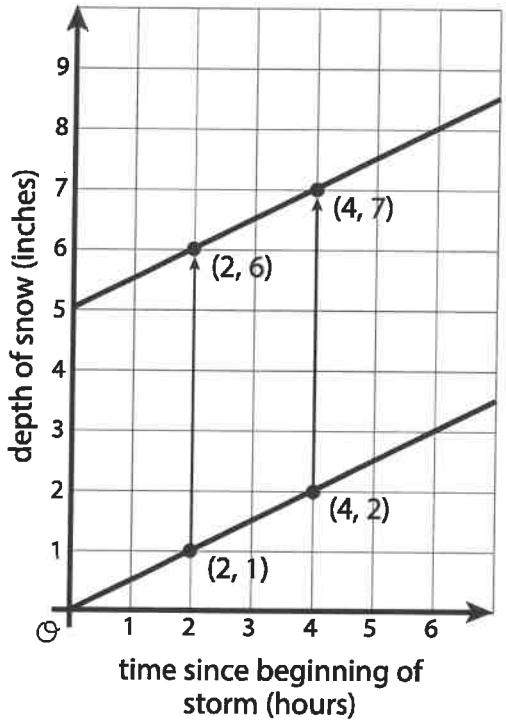

2 hours after each storm begins, 1 inch of new snow has fallen. For the first storm, this means there is now 1 inch of snow on the ground. For the second storm, this means there are now 6 inches of snow on the ground. Unlike the first storm, the second is not a proportional relationship since the line representing the second storm has a vertical intercept of 5. The equation representing the storm, $y = \frac{1}{2}x + 5$, is of the form $y = mx + b$, where m is the rate of change, also the slope of the graph, and b is the initial amount, also the vertical intercept of the graph.

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Unit 3, Lesson 8
Practice Problems

1. Select **all** equations that have graphs with the same y-intercept.

   A. $y = 3x - 8$
   B. $y = 3x - 9$
   C. $y = 3x + 8$
   D. $y = 5x - 8$
   E. $y = 2x - 8$
   F. $y = \frac{1}{3}x - 8$

2. Create a graph showing the equations $y = \frac{1}{4}x$ and $y = \frac{1}{4}x - 5$. Explain how the graphs are the same and how they are different.

3. A cable company charges $70 per month for cable service to existing customers.

   a. Find a linear equation representing the relationship between x, the number of months of service, and y, the total amount paid in dollars by an existing customer.
   b. For new customers, there is an additional one-time $100 service fee. Repeat the previous problem for new customers.
   c. When the two equations are graphed in the coordinate plane, how are they related to each other geometrically?

4. Match each graph to a situation.

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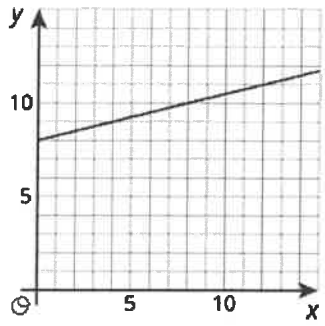
A



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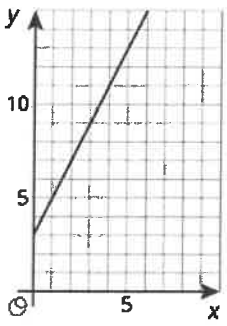

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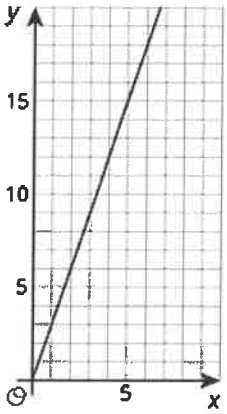
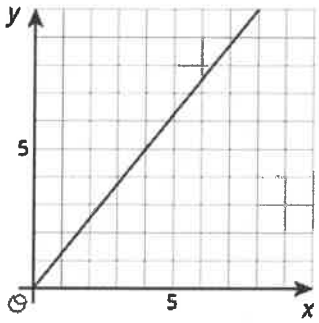


D



1. The graph represents the perimeter, y, in units, for an equilateral triangle with side length of x units. The slope of the line is 3.
2. The amount of money, y, in a cash box after x tickets are purchased for carnival games. The slope of the line is $\frac{1}{4}$.
3. The number of chapters read, y, after x days. The slope of the line is $\frac{5}{4}$.
4. The graph shows the cost in dollars, y, of a muffin delivery and the number of muffins, x, ordered. The slope of the line is 2.

5. A mountain road is 5 miles long and gains elevation at a constant rate. After 2 miles, the elevation is 5500 feet above sea level. After 4 miles, the elevation is 6200 feet above sea level.

   a. Find the elevation of the road at the point where the road begins.

   b. Describe where you would see the point in part (a) on a graph where y represents the elevation in feet and x represents the distance along the road in miles.

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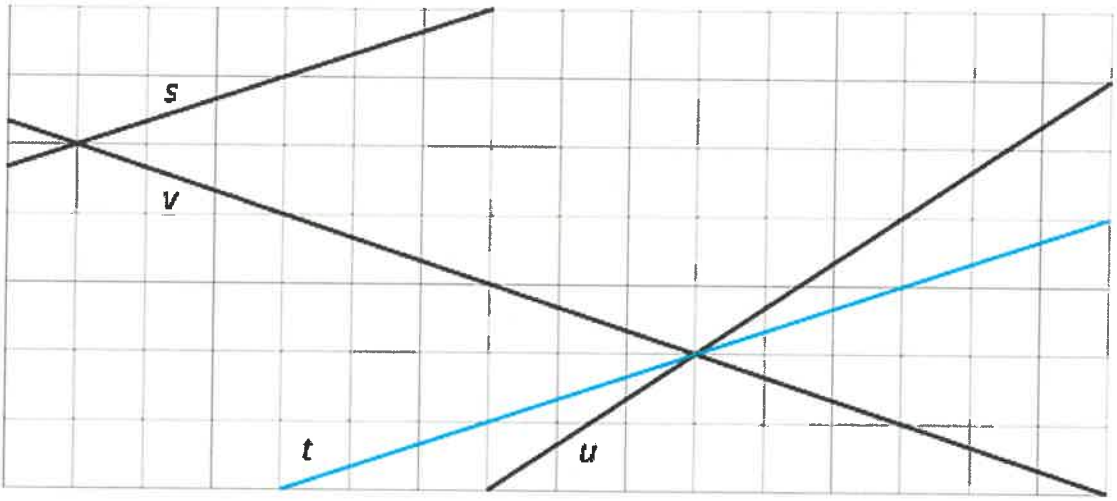
Unit 3, Lesson 9

Slopes Don't Have to be Positive

Let's find out what a negative slope means.

9.1 Which One Doesn't Belong: Odd Line Out

Which line doesn't belong?



9.2 Stand Clear of the Closing Doors, Please

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a.openup.org/ms-math/en/s/ccss-8-3-9-2

Noah put $40 on his fare card. Every time he rides public transportation, $2.50 is subtracted from the amount available on his card.

1. How much money, in dollars, is available on his card after he takes

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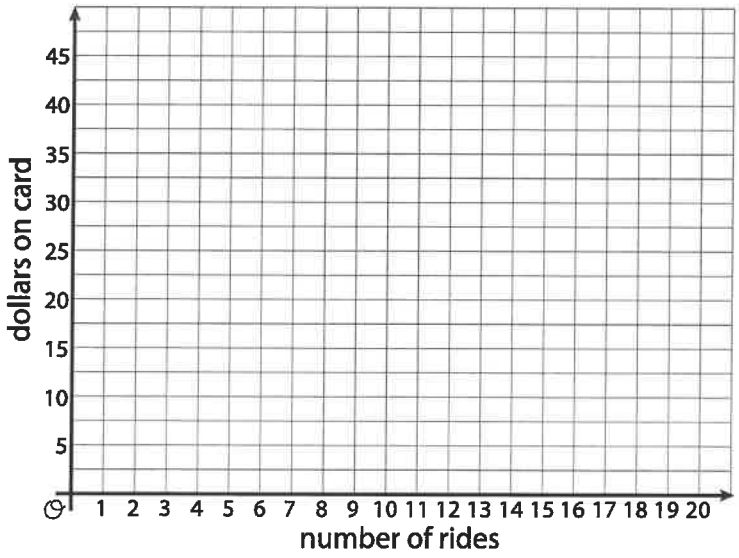
a. 0 rides?

b. 1 ride?

c. 2 rides?

d. x rides?

2. Graph the relationship between amount of money on the card and number of rides.



3. How many rides can Noah take before the card runs out of money? Where do you see this number of rides on your graph?

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9.3 Travel Habits in July

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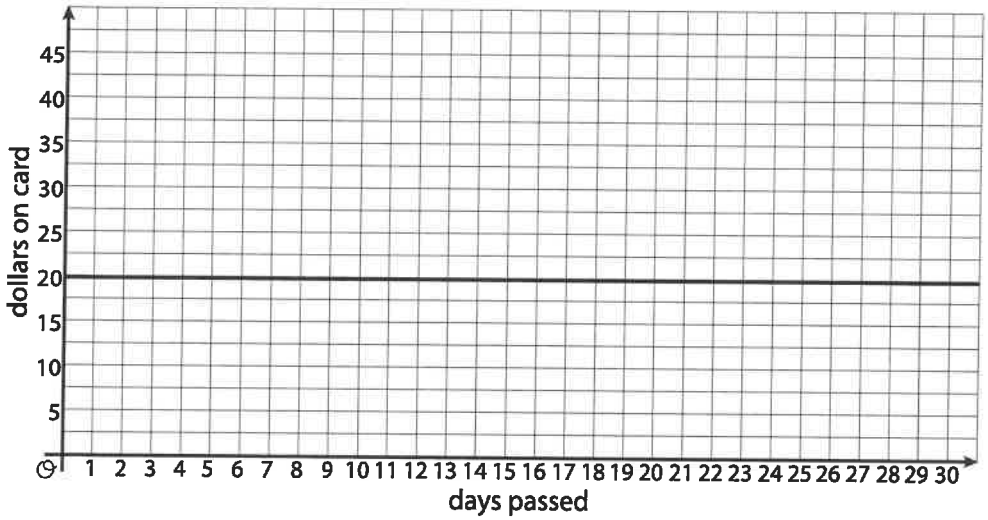
Here is a graph that shows the amount on Han's fare card for every day of last July.



1. Describe what happened with the amount on Han's fare card in July.

2. Plot and label 3 different points on the line.

3. Write an equation that represents the amount on the card in July, y, after x days.

4. What value makes sense for the slope of the line that represents the amounts on Han's fare card in July?

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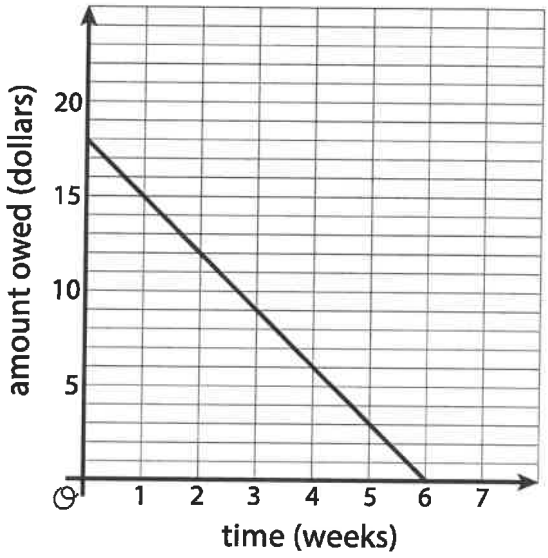
Are you ready for more?

Let's say you have taken out a loan and are paying it back. Which of the following graphs have positive slope and which have negative slope?

1. Amount paid on the vertical axis and time since payments started on the horizontal axis.
2. Amount owed on the vertical axis and time remaining until the loan is paid off on the horizontal axis.
3. Amount paid on the vertical axis and time remaining until the loan is paid off on the horizontal axis.

9.4 Payback Plan

Elena borrowed some money from her brother. She pays him back by giving him the same amount every week. The graph shows how much she owes after each week.



Answer and explain your reasoning for each question.

1. What is the slope of the line?

2. Explain how you know whether the slope is positive or negative.

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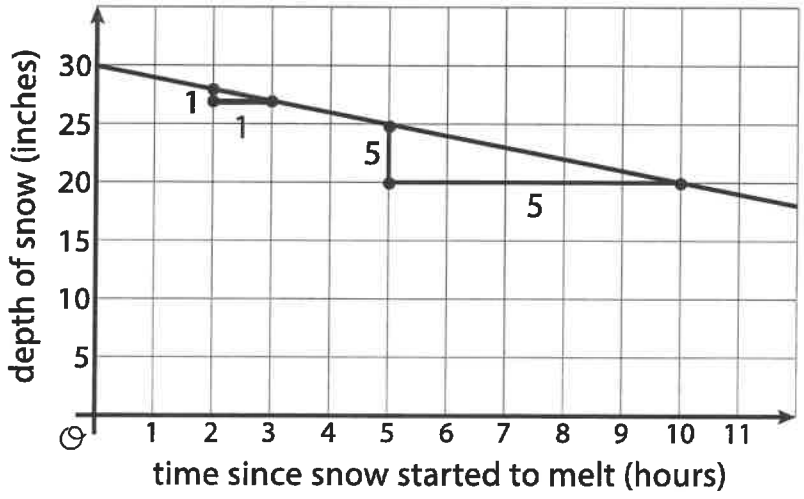
3. What does the slope represent in this situation?

4. How much did Elena borrow?

5. How much time will it take for Elena to pay back all the money she borrowed?

Lesson 9 Summary

At the end of winter in Maine, the snow on the ground was 30 inches deep. Then there was a particularly warm day and the snow melted at the rate of 1 inch per hour. The graph shows the relationship between the time since the snow started to melt and the depth of the snow.



The slope of the graph is -1 since the rate of change is -1 inch per hour. That is, the depth goes *down* 1 inch per hour. The vertical intercept is 30 since the snow was 30 inches deep when the warmth started to melt the snow. The two slope triangles show how the rate of change is constant. It just also happens to be negative in this case since after each hour that passes, there is 1 inch *less* snow.

Graphs with negative slope often describe situations where some quantity is decreasing over time, like the depth of snow on warm days or the amount of money on a fare card

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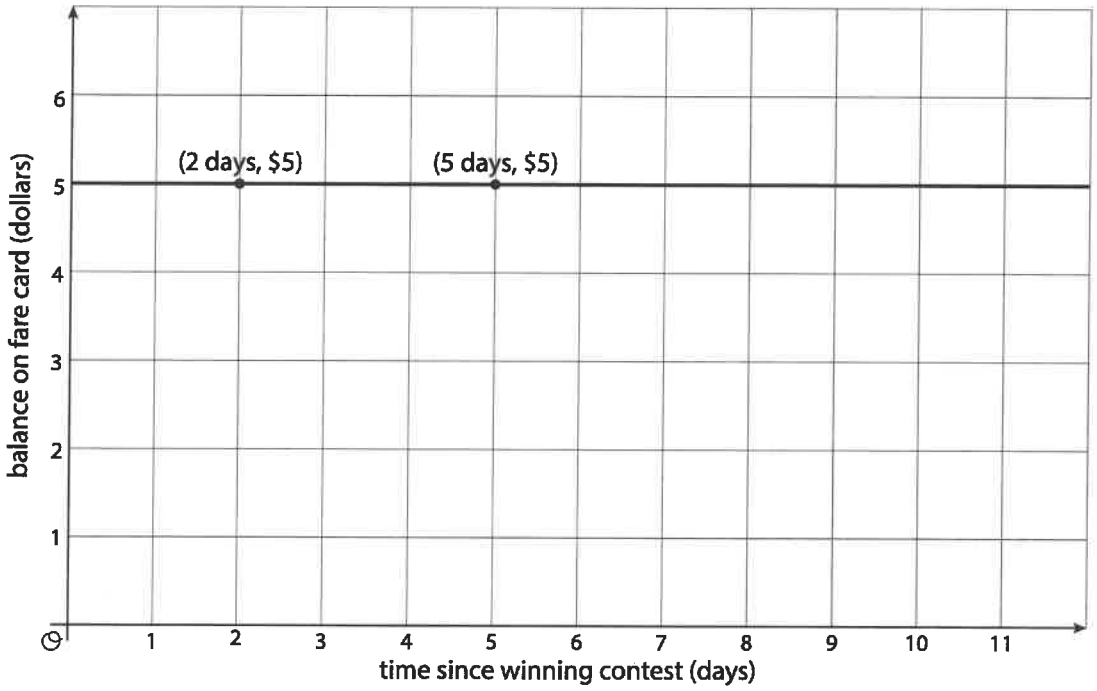
being used to take rides on buses.

Slopes can be positive, negative, or even zero! A slope of 0 means there is no change in the y-value even though the x-value may be changing. For example, Elena won a contest where the prize was a special pass that gives her free bus rides for a year. Her fare card had \$5 on it when she won the prize. Here is a graph of the amount of money on her fare card after winning the prize:



The vertical intercept is 5, since the graph starts when she has \$5 on her fare card. The slope of the graph is 0 since she doesn't use her fare card for the next year, meaning the amount on her fare card doesn't change for a year. In fact, all graphs of linear relationships with slopes equal to 0 are horizontal—a rate of change of 0 means that, from one point to the next, the y-values remain the same.

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Unit 3, Lesson 9
Practice Problems

1. Suppose that during its flight, the elevation e (in feet) of a certain airplane and its time t, in minutes since takeoff, are related by a linear equation. Consider the graph of this equation, with time represented on the horizontal axis and elevation on the vertical axis. For each situation, decide if the slope is positive, zero, or negative.

   a. The plane is cruising at an altitude of 37,000 feet above sea level.

   b. The plane is descending at rate of 1000 feet per minute.

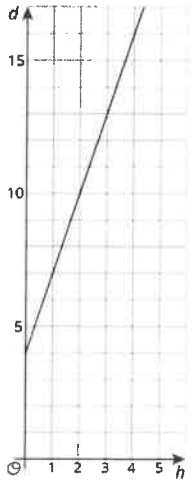
   c. The plane is ascending at a rate of 2000 feet per minute.

2. A group of hikers park their car at a trail head and hike into the forest to a campsite. The next morning, they head out on a hike from their campsite walking at a steady rate. The graph shows their distance in miles, d, from the car on the day of their hike after h hours.

   a. How far is the campsite from their car? Explain how you know.

   b. Write an equation that describes the relationship between d and h.

   c. After how many hours will the hikers be 16 miles from their car? Explain or show your reasoning.



3. Elena's aunt pays her $1 for each call she makes to let people know about her aunt's new business. The table shows how much money Diego receives for washing windows for his neighbors.

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number of windows	number of dollars
27	30
45	50
81	90

Select **all** the statements about the situation that are true.

A. Elena makes more money for making 10 calls than Diego makes for washing 10 windows.

B. Diego makes more money for washing each window than Elena makes for making each call.

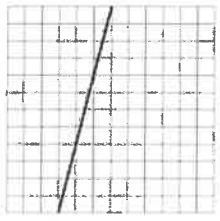
C. Elena makes the same amount of money for 20 calls as Diego makes for 18 windows.

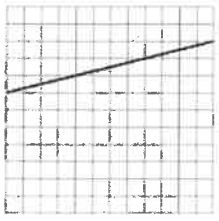
D. Diego needs to wash 35 windows to make as much money as Elena makes for 40 calls.

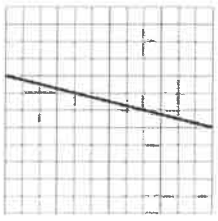
E. The equation $y = \frac{9}{10}x$, where y is number of dollars and x is number of windows, represents Diego's situation.

F. The equation $y = x$, where y is the number of dollars and x is the number of calls, represents Elena's situation.

4. Each square on a grid represents 1 unit on each side. Match the numbers with the slopes of the lines.

A 

B 

C 

1. $-\frac{1}{4}$
2. $\frac{1}{4}$
3. 4

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Unit 3

Lesson 10: Calculating Slope

Let's calculate slope from two points.

10.1: Integer Operations Review

Find values for a and b that make each side have the same value.

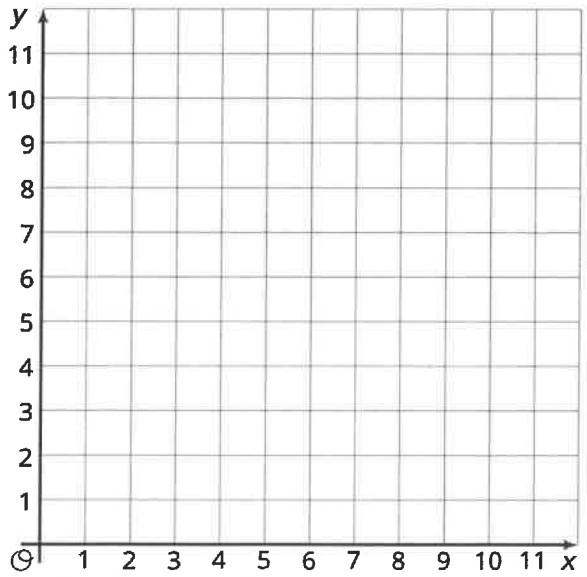
1. $\frac{a}{b} = -2$

2. $\frac{a}{b} = 2$

3. $a - b = -2$

10.2: Toward a More General Slope Formula

1. Plot the points $(1,11)$ and $(8,2)$, and use a ruler to draw the line that passes through them.



2. Without calculating, do you expect the slope of the line through $(1,11)$ and $(8,2)$ to be positive or negative? How can you tell?

3. Calculate the slope of this line.

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Are you ready for more?

Find the value of k so that the line passing through each pair of points has the given slope.

1. $(k, 2)$ and $(11,14)$, slope = 2

2. $(1, k)$ and $(4,1)$, slope = -2

3. $(3,5)$ and $(k, 9)$, slope = $\frac{1}{2}$

4. $(-1,4)$ and $(-3, k)$, slope = $\frac{-1}{2}$

5. $(\frac{-15}{2}, \frac{3}{16})$ and $(\frac{-13}{22}, k)$, slope = 0

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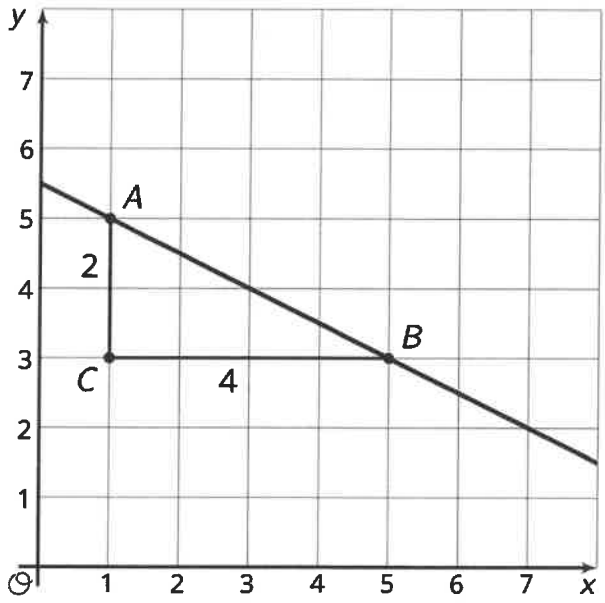
Lesson 10 Summary

We learned earlier that one way to find the slope of a line is by drawing a slope triangle. For example, using the slope triangle shown here, the slope of the line is $-\frac{2}{4}$, or $-\frac{1}{2}$ (we know the slope is negative because the line is decreasing from left to right).



But slope triangles are only one way to calculate the slope of a line. Let's compute the slope of this line a different way using just the points $A = (1,5)$ and $B = (5,3)$. Since we know the slope is the vertical change divided by the horizontal change, we can calculate the change in the y-values and then the change in the x-values. Between points A and B, the y-value change is $3 - 5 = -2$ and the x-value change is $5 - 1 = 4$. This means the slope is $-\frac{2}{4}$, or $-\frac{1}{2}$, which is the same as what we found using the slope triangle.

Notice that in each of the calculations, We subtracted the value from point A from the value from point B. If we had done it the other way around, then the y-value change would have been $5 - 3 = 2$ and the x-value change would have been $1 - 5 = -4$, which still gives us a slope of $-\frac{1}{2}$. But what if we were to mix up the orders? If that had happened, we would think the slope of the line is *positive* $\frac{1}{2}$ since we would either have calculated $\frac{-2}{-4}$ or $\frac{2}{4}$. Since we already have a graph of the line and can see it has a negative slope, this is clearly incorrect. It we don't have a graph to check our calculation, we could think about how the point on the left, $(1,5)$, is higher than the point on the right, $(5,3)$, meaning the slope of the line must be negative.

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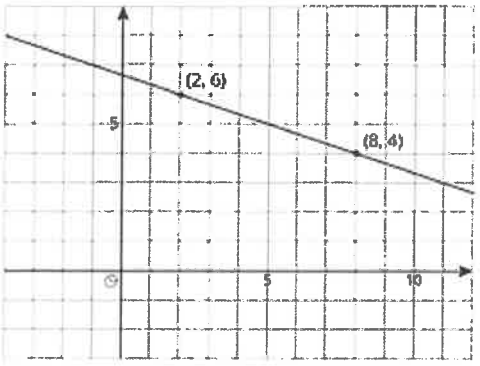
Unit 3, Lesson 10
Practice Problems

1. For each graph, calculate the slope of the line.

A



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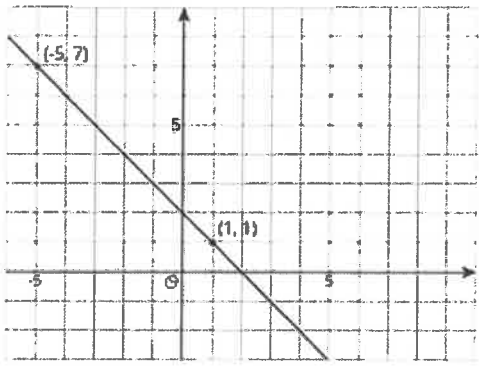

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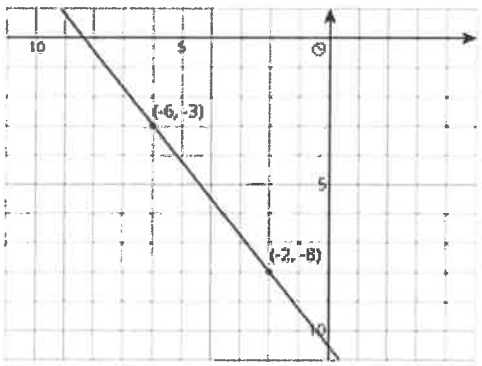

2. Match each pair of points to the slope of the line that joins them.

A. (9, 10) and (7, 2)
B. (-8, -11) and (-1, -5)
C. (5, -6) and (2, 3)
D. (6, 3) and (5, -1)
E. (4, 7) and (6, 2)

1. 4
2. -3
3. $-\frac{5}{2}$
4. $\frac{6}{7}$

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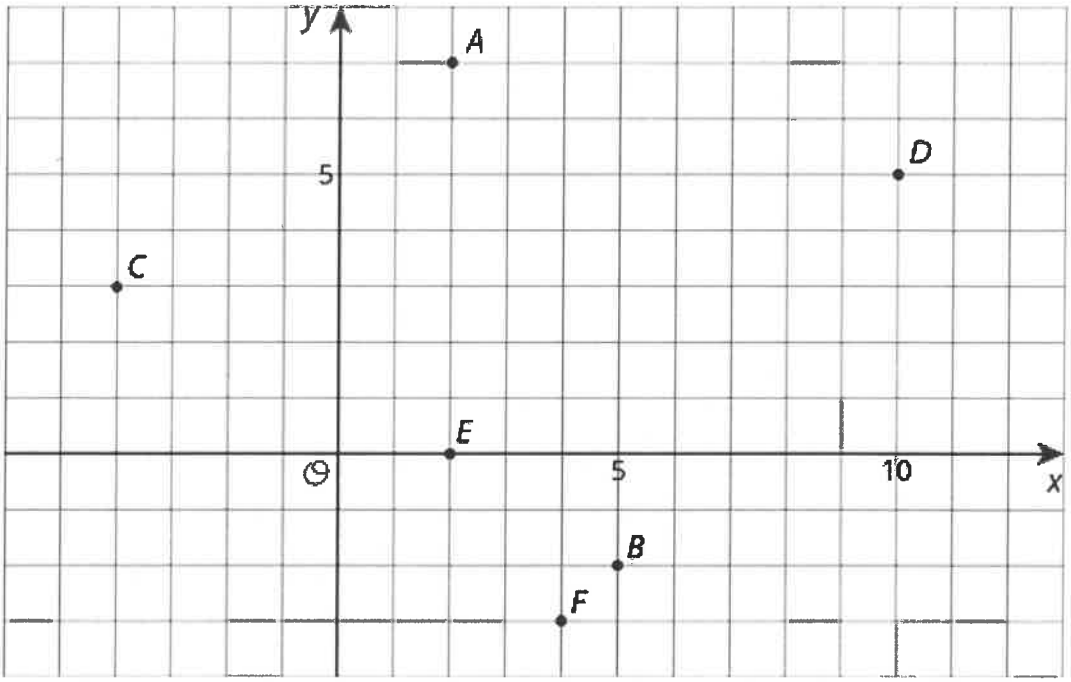
3. Draw a line with the given slope through the given point. What other point lies on that line?



a. Point A, slope = -3

b. Point A, slope = $\frac{-1}{4}$

c. Point C, slope = $\frac{-1}{2}$

d. Point E, slope = $\frac{-2}{3}$

4. Make a sketch of a linear relationship with a slope of 4 and a negative y-intercept. Show how you know the slope is 4 and write an equation for the line.

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Unit 3, Lesson 11

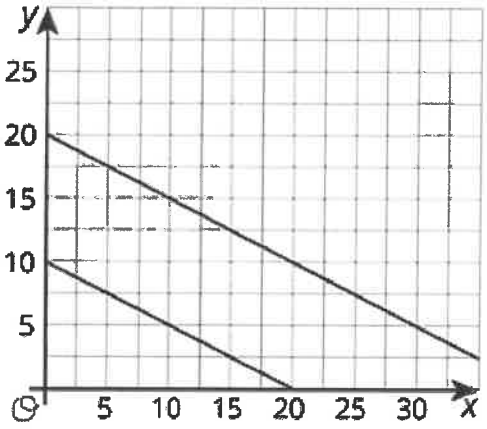
Equations of All Kinds of Lines

Let's write equations for vertical and horizontal lines.

11.1 Which One Doesn't Belong: Pairs of Lines

Which one doesn't belong?

A



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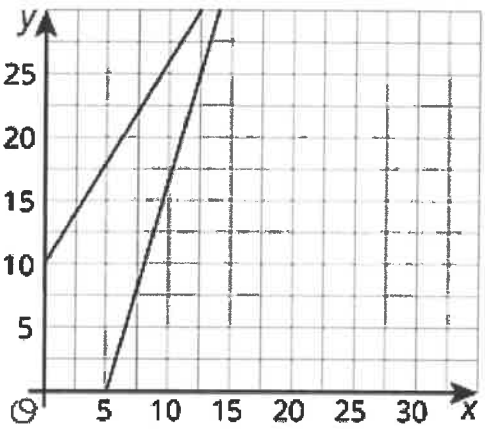

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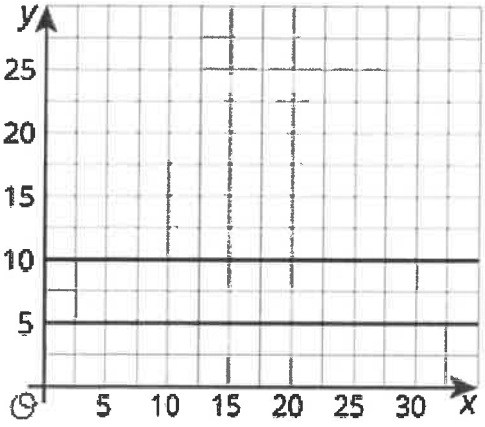

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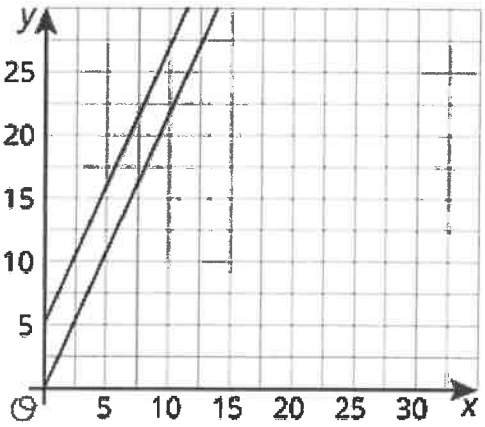

NAME DATE PERIOD

11.2 All the Same

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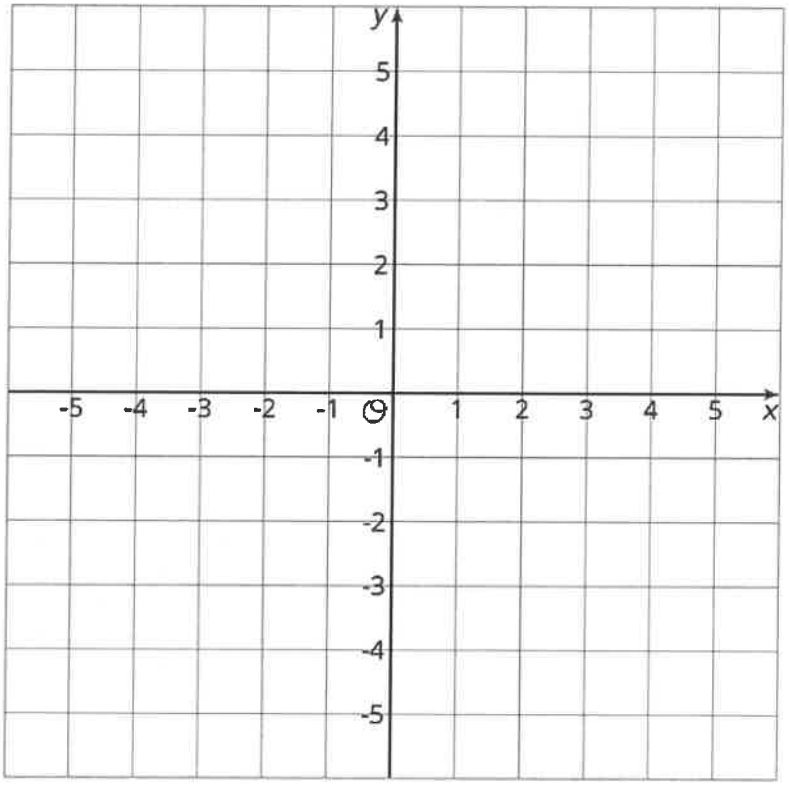

1. Plot at least 10 points whose y-coordinate is -4. What do you notice about them?

2. Which equation makes the most sense to represent all of the points with y-coordinate -4? Explain how you know.

$x = -4$ $y = -4x$ $y = -4$ $x + y = -4$

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3. Plot at least 10 points whose x-coordinate is 3. What do you notice about them?

4. Which equation makes the most sense to represent all of the points with x-coordinate 3? Explain how you know.

   $x = 3$ $y = 3x$ $y = 3$ $x + y = 3$

5. Graph the equation $x = -2$.

6. Graph the equation $y = 5$.

Are you ready for more?

1. Draw the rectangle with vertices $(2, 1), (5, 1), (5, 3), (2, 3)$.
2. For each of the four sides of the rectangle, write an equation for a line containing the side.
3. A rectangle has sides on the graphs of $x = -1, x = 3, y = -1, y = 1$. Find the coordinates of each vertex.

11.3 Same Perimeter

Interactive digital version available

a.openup.org/ms-math/en/s/ccss-8-3-11-3

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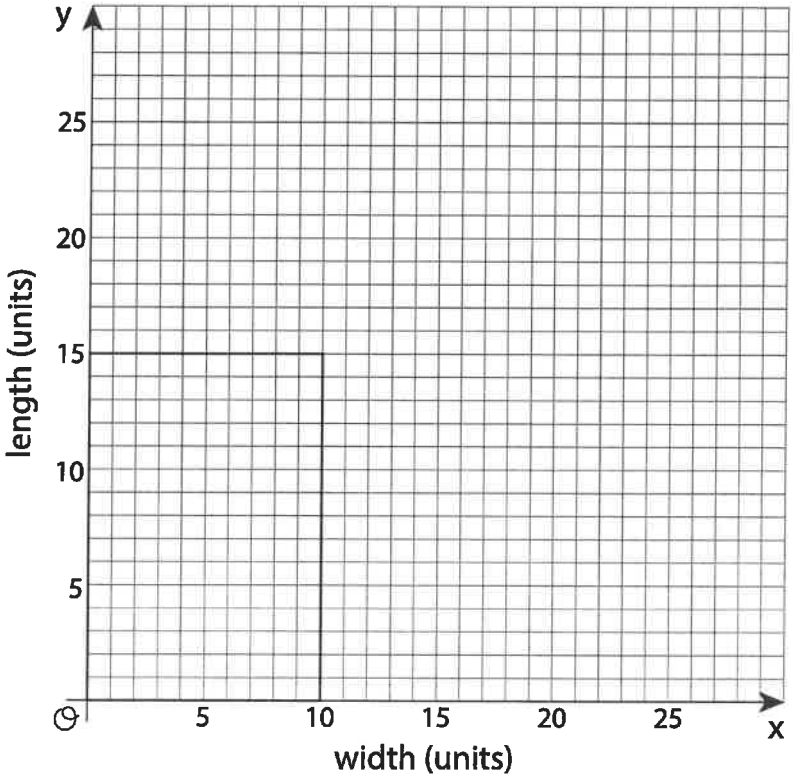
1. There are many possible rectangles whose perimeter is 50 units. Complete the table with lengths, ℓ, and widths, w, of at least 10 such rectangles.

ℓ										
w										

2. The graph shows one rectangle whose perimeter is 50 units, and has its lower left vertex at the origin and two sides on the axes. On the same graph, draw more rectangles with perimeter 50 units using the values from your table. Make sure that each rectangle has a lower left vertex at the origin and two sides on the axes.



3. Each rectangle has a vertex that lies in the first quadrant. These vertices lie on a line. Draw in this line and write an equation for it.

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4. What is the slope of this line? How does the slope describe how the width changes as the length changes (or vice versa)?

Lesson 11 Summary

Horizontal lines in the coordinate plane represent situations where the y value doesn't change at all while the x value changes. For example, the horizontal line that goes through the point $(0, 13)$ can be described in words as "for all points on the line, the y value is always 13." An equation that says the same thing is $y = 13$.

Vertical lines represent situations where the x value doesn't change at all while the y value changes. The equation $x = -4$ describes a vertical line through the point $(-4, 0)$.

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Unit 3, Lesson 11
Practice Problems

1. Suppose you wanted to graph the equation $y = -4x - 1$.

   a. Describe the steps you would take to draw the graph.

   b. How would you check that the graph you drew is correct?

2. Draw the following lines and then write an equation for each.

   a. Slope is 0, y-intercept is 5

   b. Slope is 2, y-intercept is -1

   c. Slope is -2, y-intercept is 1

   d. Slope is $\frac{-1}{2}$, y-intercept is -1

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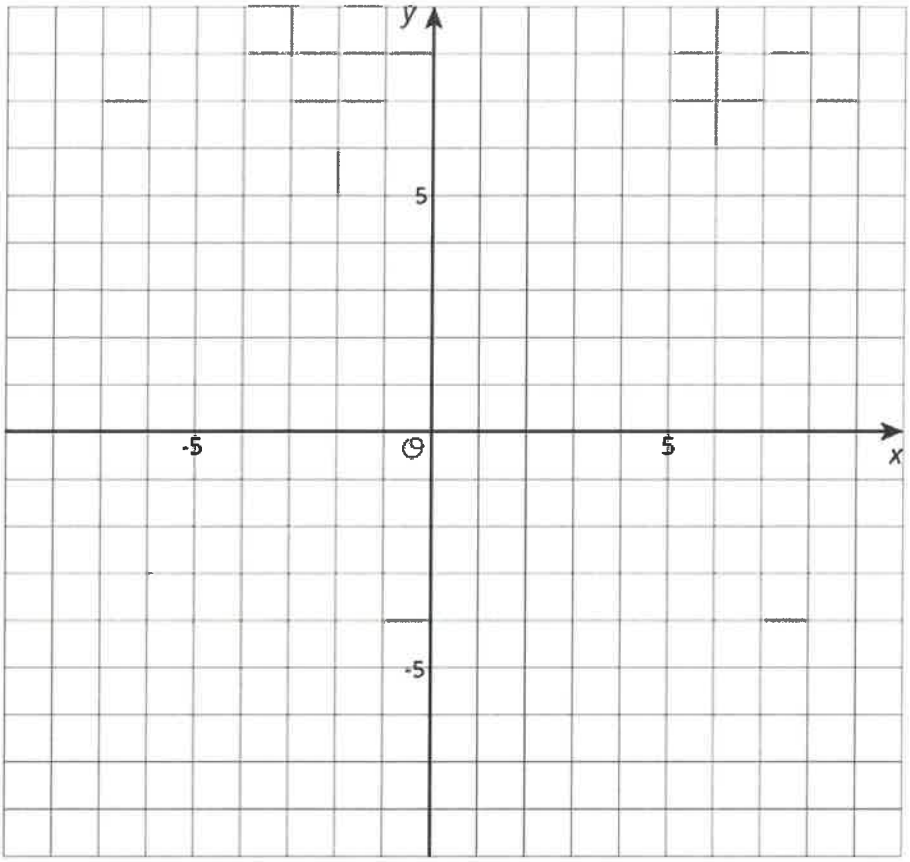
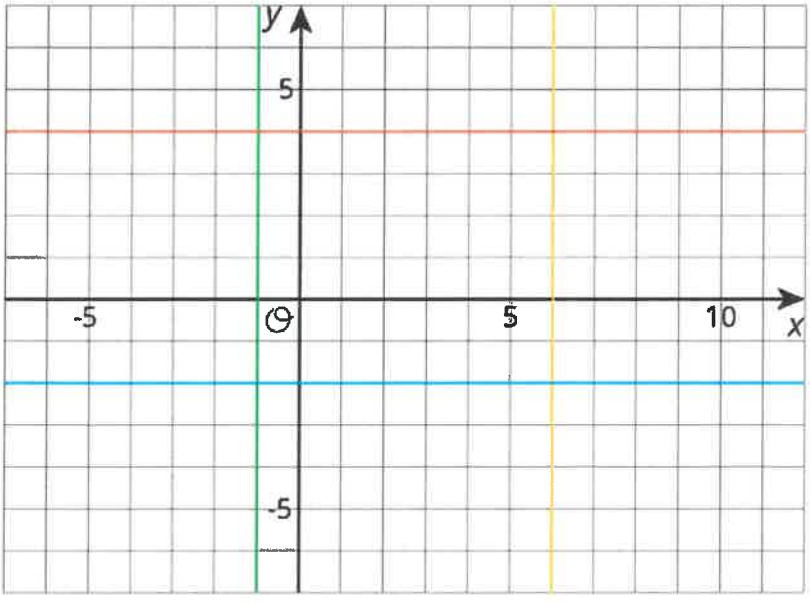


3. Write an equation for each line.



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4. A publisher wants to figure out how thick their new book will be. The book has a front cover and a back cover, each of which have a thickness of $\frac{1}{4}$ of an inch. They have a choice of which type of paper to print the book on.

   a. Bond paper has a thickness of $\frac{1}{4}$ inch per one hundred pages. Write an equation for the width of the book, y, if it has x hundred pages, printed on bond paper.

   b. Ledger paper has a thickness of $\frac{2}{5}$ inch per one hundred pages. Write an equation for the width of the book, y, if it has x hundred pages, printed on ledger paper.

   c. If they instead chose front and back covers of thickness $\frac{1}{3}$ of an inch, how would this change the equations in the previous two parts?

Finding the Slope of a Line

➤ **Use the information provided to find the slope of each line. State what the slope represents.**

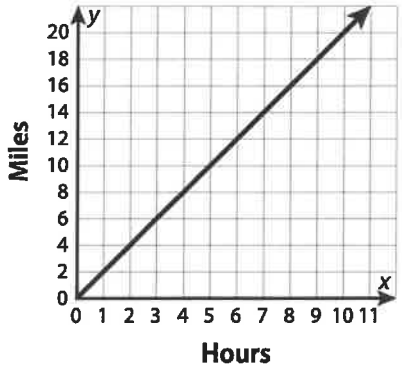
1

Seconds	0	5	10
Feet	0	30	60

2

Hours	0	2	5
Dollars	0	18	45

3



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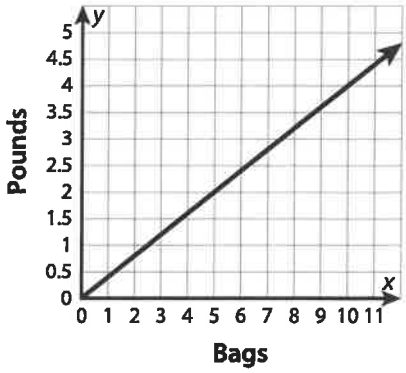

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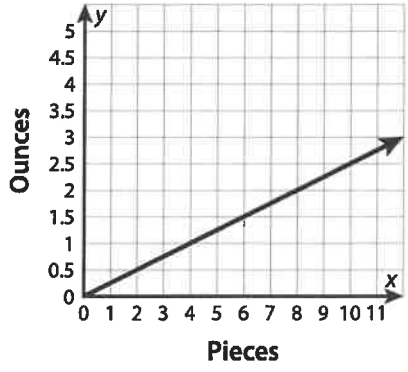

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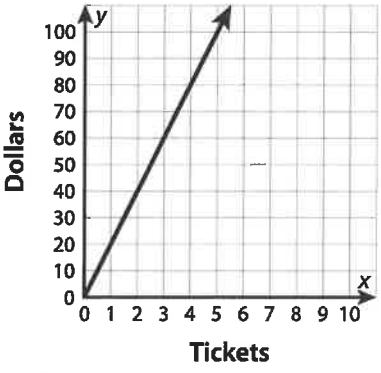

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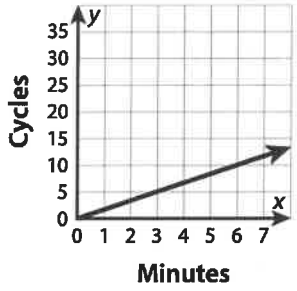
Finding the Slope of a Line *continued*

7



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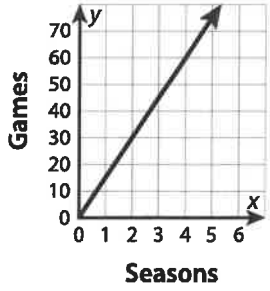

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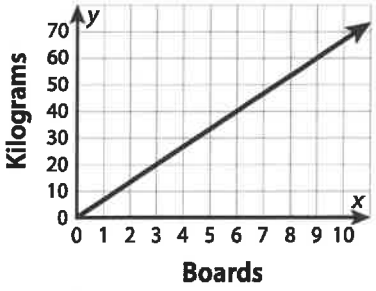

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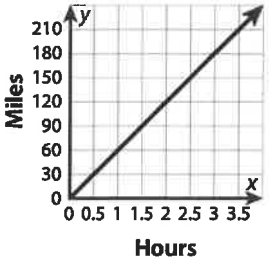

11 Compare finding the slope using a table and using a graph.

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