Unit 5, Lesson 9

Calculating Slope

Let's calculate slope from two points.

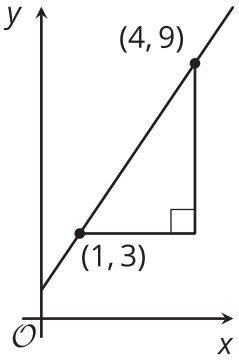
9.1 Math Talk: Integer Operations

Mentally find values for a and b that make each equation true.

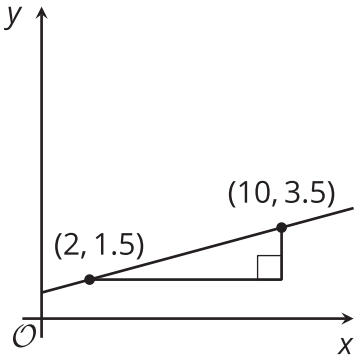
- $a + b = -2$
- $a - b = -2$
- $\frac{a}{b} = 2$
- $\frac{a}{b} = -2$

9.2 Toward a More General Slope Formula

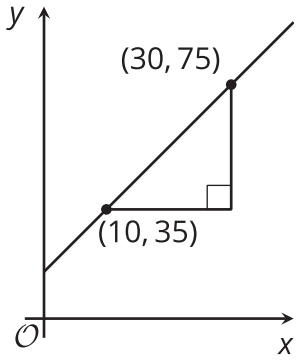
A



B



C



1. For each graph, record:

	vertical change	horizontal change	slope
A			
B			
C			

2. Describe a procedure for finding the slope between any two points on a line.

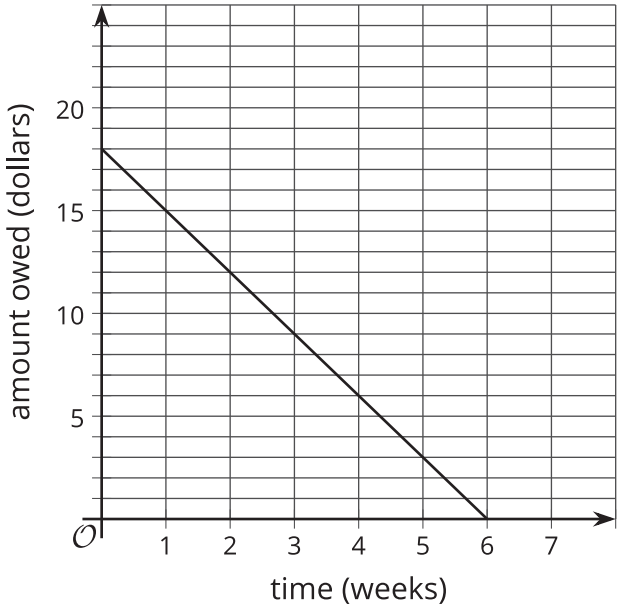
Are you ready for more?

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. $(\text{-}1, 4)$ and $(\text{-}3, k)$, slope = $\frac{\text{-}1}{2}$
5. $\left(\frac{\text{-}15}{2}, \frac{3}{16}\right)$ and $\left(\frac{\text{-}13}{22}, k\right)$, slope = 0

9.3 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.

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?

9.4 Making Designs

Your teacher will give you either a design or a blank graph. Do not show your card to your partner.

If your teacher gives you the design:

1. Look at the design silently and think about how you could communicate what your partner should draw. Think about ways that you can describe what a line looks like, such as its slope or points that it goes through.
2. Describe each line, one at a time, and give your partner time to draw them.
3. Once your partner thinks they have drawn all the lines you described, only then should you show them the design.

If your teacher gives you the blank graph:

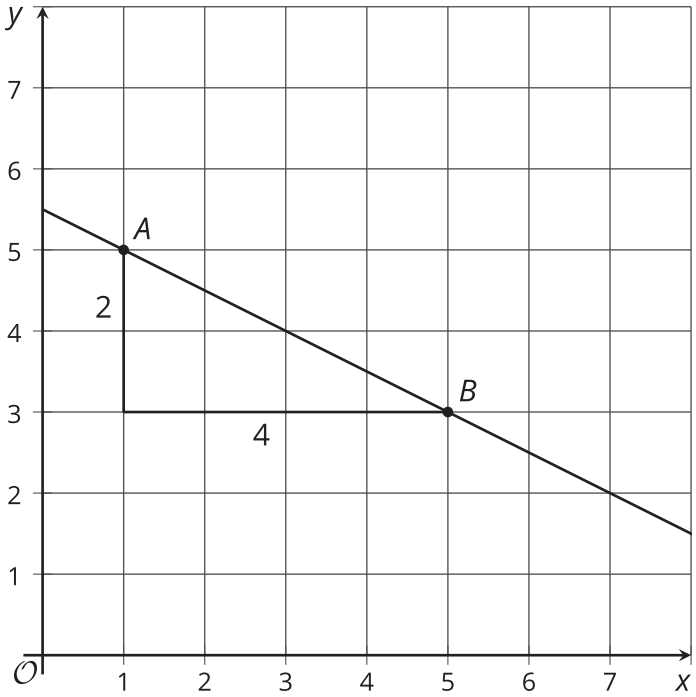
1. Listen carefully as your partner describes each line, and draw each line based on their description.
2. You are not allowed to ask for more information about a line than what your partner tells you.
3. Do not show your drawing to your partner until you have finished drawing all the lines they describe.

When finished, place the drawing next to the card with the design so that you and your partner can both see them. How is the drawing the same as the design? How is it different? Discuss any miscommunication that might have caused the drawing to look different from the design.

Pause here so your teacher can review your work. When your teacher gives you a new set of cards, switch roles for the second problem.

Lesson 9 Summary

One way to calculate the slope of a line is by drawing a slope triangle. For example, using this slope triangle, the slope of the line is $-\frac{2}{4}$, or $-\frac{1}{2}$. The slope is negative because the line is decreasing from left to right.



Another way to calculate the slope of this line uses just the points $A : (1, 5)$ and $B : (5, 3)$. The slope is the vertical change divided by the horizontal change, or the change in the y-values divided by 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 value as the slope calculated using a slope triangle.

Notice that in each of the calculations, the value from point A was subtracted from the value from point B. If it had been done 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 a slope of $-\frac{1}{2}$.

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