Unit 4, Lesson 10

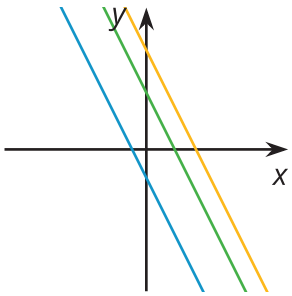
On or Off the Line?

Let's interpret the meaning of points in a coordinate plane.

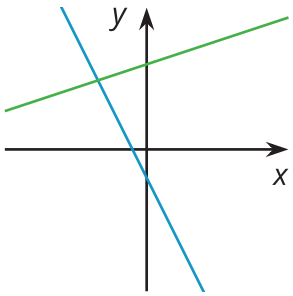
10.1 Which Three Go Together: Lines in the Plane

Which three go together? Why do they go together?

A



B



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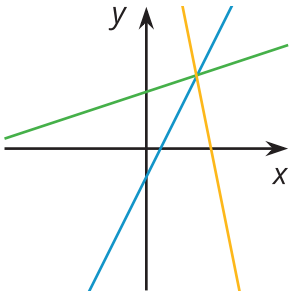

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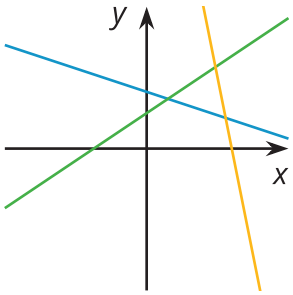

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10.2 Pocket Full of Change

Jada told Noah that she has $2 worth of quarters and dimes in her pocket and 17 coins all together. She asked him to guess how many of each type of coin she has.

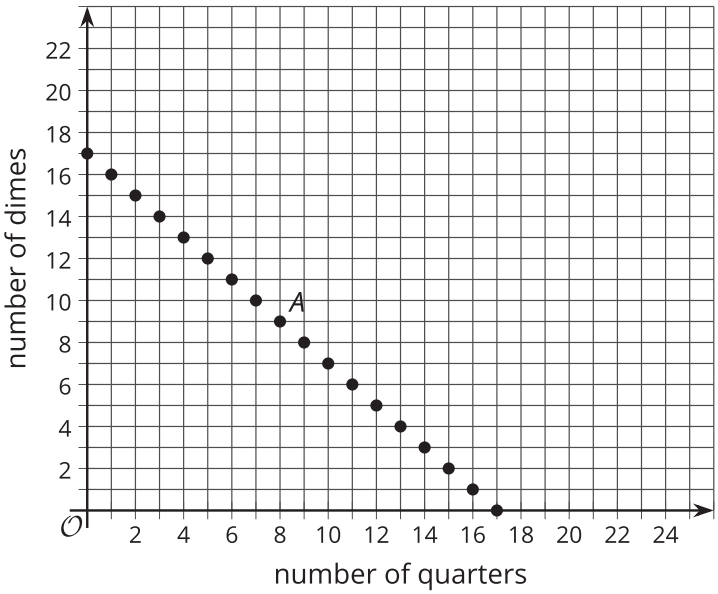
1. Here is a table that shows some combinations of quarters and dimes that are worth $2. Complete the table.

number of quarters	number of dimes
0	20
4	
	0
	5

2. Here is a graph of the relationship between the number of quarters and the number of dimes when there are a total of 17 coins.

   a. What does Point A represent?

   b. How much money, in dollars, is the combination represented by Point A worth?



3. Is it possible for Jada to have 4 quarters and 13 dimes in her pocket? Explain how you know.

4. How many quarters and dimes must Jada have? Explain your reasoning.

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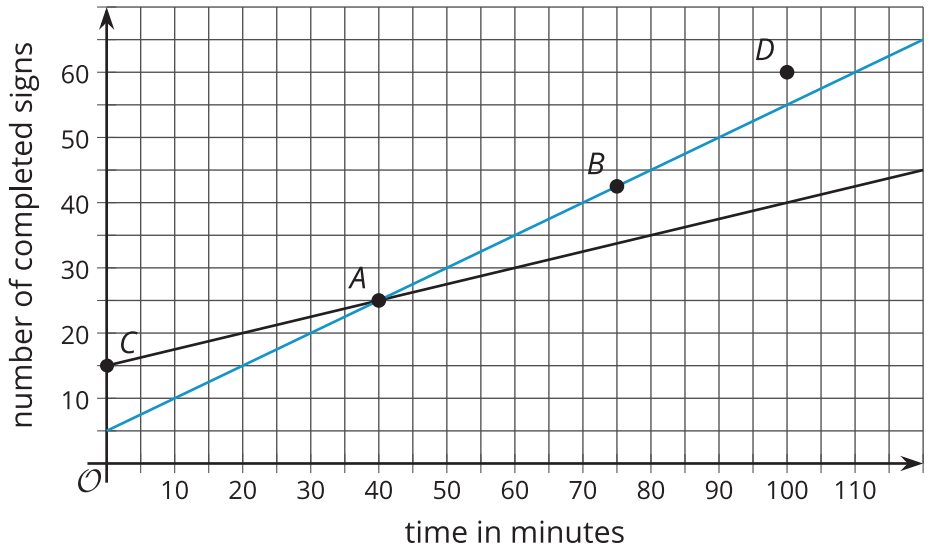
10.3 Making Signs

Clare and Andre are making signs for all the lockers as part of the decorations for the upcoming spirit week. Yesterday, Andre made 15 signs and Clare made 5 signs. Today, they need to make more signs. Each person's progress today is shown in the coordinate plane.



1. Which line represents Andre and which represents Clare?
2. Based on the lines, mark the statements as true or false for each person.

point	what it says	Clare	Andre
A	At 40 minutes, I have 25 signs completed.		
B	At 75 minutes, I have 42 and a half signs completed.		
C	At 0 minutes, I have 15 signs completed.		
D	At 100 minutes, I have 60 signs completed.		

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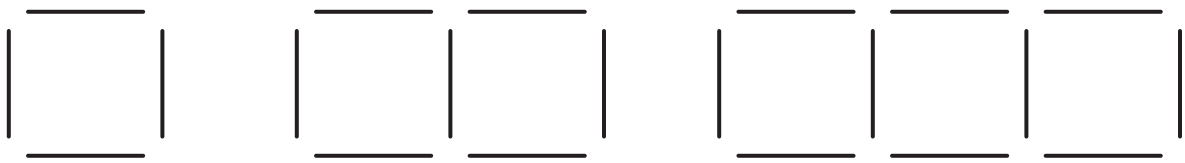
Are you ready for more?



- 4 toothpicks make 1 square
- 7 toothpicks make 2 squares
- 10 toothpicks make 3 squares

Do you see a pattern? If so, how many toothpicks would you need to make 10 squares according to your pattern? Can you represent your pattern with an expression?

Lesson 10 Summary

We studied linear relationships in an earlier unit. We learned that values of x and y that make an equation true correspond to points (x, y) on the graph.

For example, let's plan the base rocks for a terrarium. We have x pounds of river rocks that cost \$0.80 per pound and y pounds of unpolished rocks that cost \$0.50 per pound, and the total cost is \$9.00, so we can write an equation like this to represent the relationship between x and y : $0.8x + 0.5y = 9$

Because 5 pounds of river rocks cost \$4.00 and 10 pounds of unpolished rocks cost \$5.00, we know that $x = 5$, $y = 10$ is a solution to the equation, and the point $(5, 10)$ is a point on the graph.

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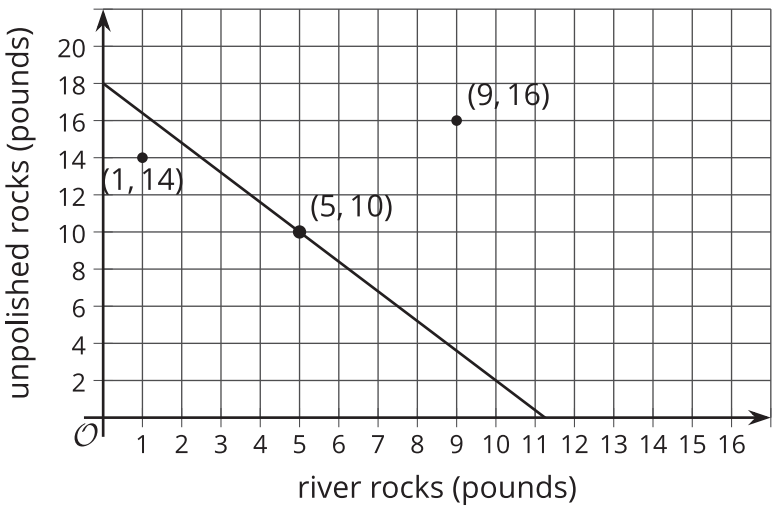
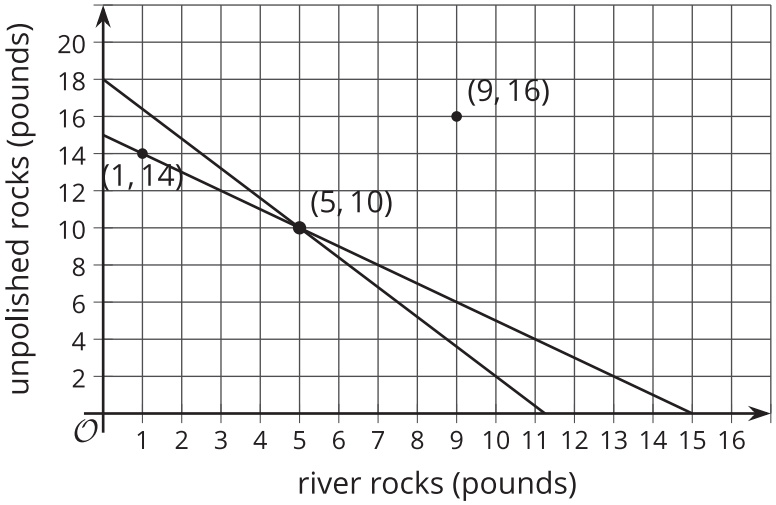
The line shown is the graph of the equation. Notice that there are 2 points shown that are not on the line. What do they mean in the context?



The point $(1, 14)$ means that there is 1 pound of river rock and 14 pounds of unpolished rocks. The total cost for this is $0.8 \cdot 1 + 0.5 \cdot 14$ or \$7.80. Because the cost is not \$9.00, this point is not on the line. Likewise, 9 pounds of river rocks and 16 pounds of unpolished rocks cost $0.8 \cdot 9 + 0.5 \cdot 16$ or \$15.20, so the other point is not on the line either.

Suppose we also know that the river rocks and unpolished rocks together weigh 15 pounds. That means that $x + y = 15$.

If we draw the graph of this equation on the same coordinate plane, we see it passes through 2 of the 3 labeled points:



The point $(1, 14)$ is on the graph of $x + y = 15$ because $1 + 14 = 15$. Similarly, $5 + 10 = 15$. But $9 + 16 \neq 15$, so $(9, 16)$ is not on the graph of $x + y = 15$.

In general, if we have 2 lines in the coordinate plane and we have their corresponding equations,

- The coordinates of a point on a line make that equation true.
- The coordinates of a point off of a line make that equation false.
- The coordinates of a point that is the intersection of the 2 lines make both equations true.

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