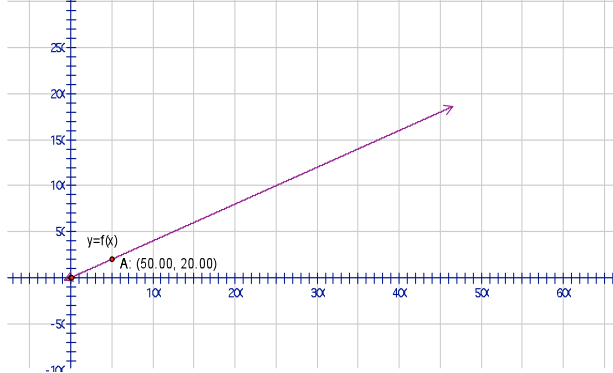


Linear Relationships: Correct and Connect!

- Each card contains information regarding a linear function. However, your four cards do not describe the same function. Can you revise the 4 pieces of information so that they all describe the same function? Justify why each card describes the same function with clear work.

Mr. Thill's phone plan gives him 800 minutes a month, and then charges him a fee for \$0.40 every minute over 800 minutes. Let "x" be number of minutes over 800, and let y be the total amount charged for the month. If Mr. Thill uses 1000 minutes for the month, he gets charged \$130 dollars.

A graph of our function is below:



A table of values for x and $f(x)$:

x	$f(x)$
0	50
200	130
400	210
600	290
800	370

$$10y + 4x = 500$$

Open - ended problem: **Connect and Correct: Linear Functions**

1. ***This problem is designed to have students pursue connections between different representations of linear functions.*** We chose this topic because students struggle greatly to understand the connections between different representations of the same function. This happens frequently with students who are studying linear functions for the first time. This lesson can easily be adapted to work in an Algebra 1 or Algebra 2 classroom. The level of difficulty of the problem can be modified by changing any of the following:
 - a. change the number of different functions represented by the different cards
 - b. Pick representations where the connections are easier to make
 - c. Pick functions with simpler/more complex features.
 - d. Increase/decrease the number of “cards”

2. ***Because each of the four cards actually represents a different function, students have multiple ways to make corrections and “align” the cards to all describe the same relationship.*** Hence, multiple entry points *and* multiple solutions. We anticipate that some students will struggle to apply certain “connecting” techniques, like: changing form of the equations, see connection between slope and the rate of change in the word problem, reversing +/- signs in standard form,

3. ***Purpose:*** We wanted students to work simultaneously with different representations of a function: graphically, numerically, analytical, real-world, etc... In order to do this effectively, they must figure out which techniques are necessary to make clear connections.

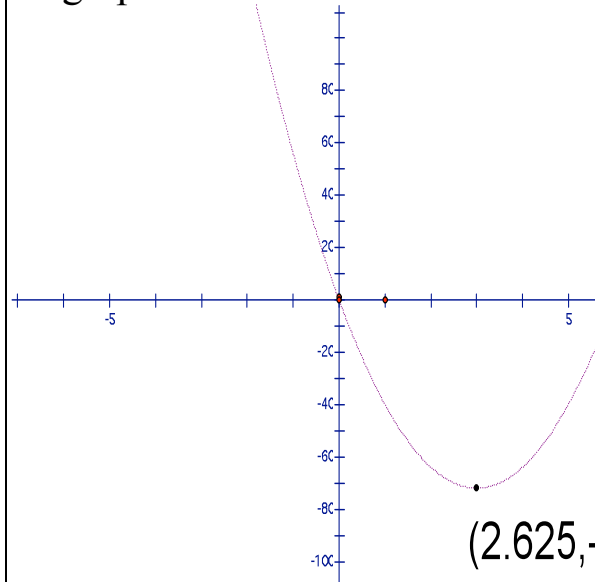
4. ***We are very pleased with how versatile the “correct and connect” lesson is.*** You can use this lesson for linear equations, polynomial functions, or any topic which requires integrating multiple representations of the same mathematical relationship. It encourages group discussion, allows for different difficulty levels, but always remains *open-ended*.

Quadratic Relationships: Correct and Connect!

- Each card contains information regarding a quadratic function. However, your four cards do not show consistent information. Can you revise the 4 pieces of information so that they all describe the same function? Your group should be able to show why each card describes the same function with clear work.

A rectangular sheet of paper of size 9” by 12” is used to make an open box. We cut congruent squares of length “x” from each corner, then fold up the corners to make a box. Our function gives us the surface area of the four sides of the box (not including the bottom) as a function of x.

A graph of our function is below:



A table of values for x and $f(x)$:

x	$f(x)$
0	0
1	38
2	68
3	90
4	104

$$f(x) = 8x^2 + 42x$$

Open - ended problem: **Connect and Correct:**

1. ***Our problem is designed to have students pursue connections between different representations of quadratic functions.*** We chose this topic because students struggle greatly to understand the connections between different representations of the same function. This happens frequently with students who are studying quadratic functions for the first time. This lesson can easily be adapted to work in an Algebra 1 or Algebra 2 classroom. The level of difficulty of the problem can be modified by changing any of the following:
 - a. Reduce the number of different functions represented by the different cards
 - b. Pick representations where the connections are easier to make
 - c. Pick functions with irrational zeroes, imaginary zeroes, or integer zeroes
 - d. Increase/decrease the number of “cards”

2. ***Because each of the four cards actually represents a different function, students have multiple ways to make corrections and “align” the cards to all describe the same function.*** Hence, multiple entry points *and* multiple solutions. We anticipate that some students will struggle to apply certain “connecting” techniques, like: completing the square, using finite differences, translating words to math, factoring, etc...

3. ***Purpose:*** We wanted students to work simultaneously with different representations of a function: graphically, numerically, analytical, real-world, etc... In order to do this effectively, they must figure out which techniques are necessary to make clear connections.

4. ***We are very pleased with how versatile the “correct and connect” lesson is.*** You can use this lesson for linear equations, polynomial functions, or any topic which requires integrating multiple representations of the same mathematical relationship. It encourages group discussion, allows for different difficulty levels, but always remains *open-ended*.

Quadratic Relationships: Correct and Connect!

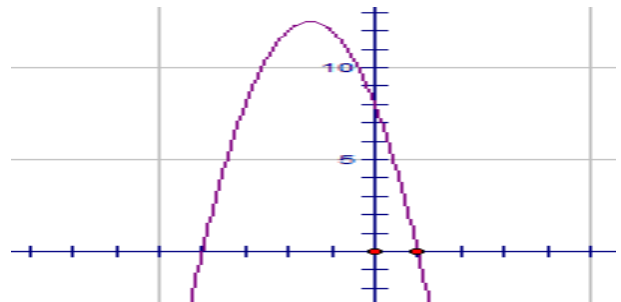
Each box contains information regarding a quadratic function. However, each piece of information describes a different function.

Task:

1. Explain how you would modify the information in the boxes so that each box describes the same quadratic function. Justify why your changes explain the same function.

The graph of our quadratic function contains the points (0, -8), (4,0) and (0,-1).

A graph of our function is below:



$$f(x) = 2x^2 - 6x - 8$$

$$f(x) = -2(x - 4)(x + 1)$$

2. Describe **another way** to represent this function that is different than the ones from above. Be sure to justify why this new representation matches the work in part 1.

Learning goals for this task:

- To understand the connections between five different representations of a quadratic function (graphical, verbal description, factored form, polynomial form, vertex form).
- To use this understanding to detect and resolve inconsistencies in different representations
- To justify their reasoning with clear communication.