Amplifying an Instructional Task – Algebra II Example

Original Task

The student is expected to write the equation of a parabola using given attributes, including vertex, focus, directrix, axis of symmetry, and direction of opening. 2A(4)(B)

Write the equations of the parabolas described below.

1. A parabola with a focus of $(0,2)$ and a directrix of $y = -4$.
2. A parabola with a vertex at $(4,-6)$ and a focus of $(4,8)$.

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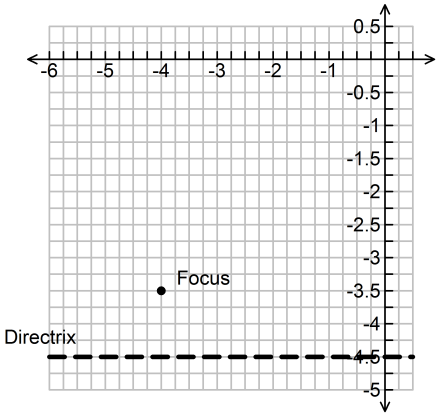
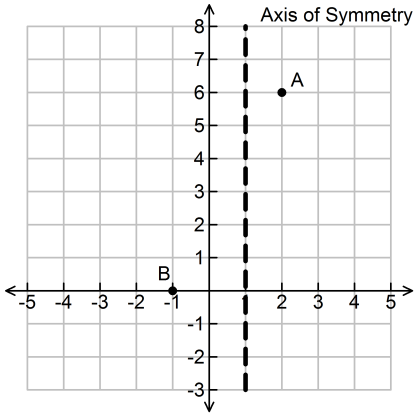
Amplified Task

The cards below describe three different parabolas or quadratic functions. Cut out the cards, and match the pairs of cards that describe the same function. Points A and B are on the parabola.

A parabola that opens downward with an axis of symmetry at $x = 4$, a directrix at $y = 4.25$, and the distance between the directrix and the focus is 0.5 units.





The quadratic function that contains the points below:

x	$f(x)$
−8	4
−2	−2
0	4

At an amusement park, a children's ride goes along the ground for 2 seconds, and then it goes over a small hill. It takes an additional 2 seconds to reach a height of 4 feet, which is the top of the hill. The height of the ride vs. time for the small hill can be modeled with a quadratic function. Find the quadratic function.

The function $f(x) = -2x^2$ translated one unit to the right and shifted up 8 units.

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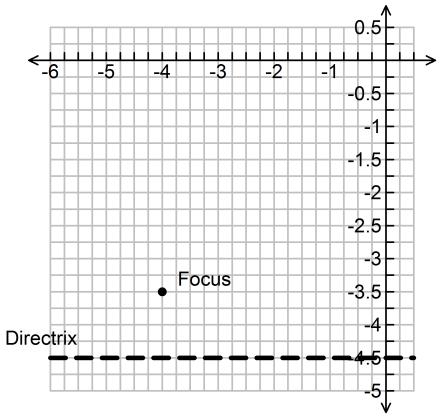
Task B (Scaffolded Task):

The cards below describe three different parabolas or quadratic functions. Cut out the cards, and match the pairs of cards that describe the same function. Points A and B are on the parabola. The shaded portion of each card contains questions to guide your thinking.

- How could you determine the *x*-coordinate of the vertex if given the focus?
- What is the relationship between the vertex, focus, and directrix?



- Create a table of values for the quadratic function.
- How could you use symmetry to determine additional points on the graph of the quadratic function?

At an amusement park, a children's ride goes along the ground for 2 seconds, and then it goes over a small hill. It takes an additional 2 seconds to reach a height of 4 feet, which is the top of the hill. The height of the ride vs. time for the small hill can be modeled with a quadratic function. Find the quadratic function.

- How do transformations effect the equation of the quadratic?

The function $f(x) = -2x^2$ translated one unit to the right and shifted up 8 units.

- How could you determine the vertex from the table?
- How could you use the vertex and an additional point to determine the equation for the quadratic function?

The quadratic function that contains the points below:

x	$f(x)$
−6	−2
−4	−4
−2	−2
0	4

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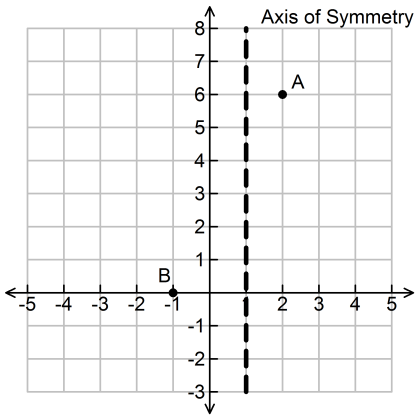
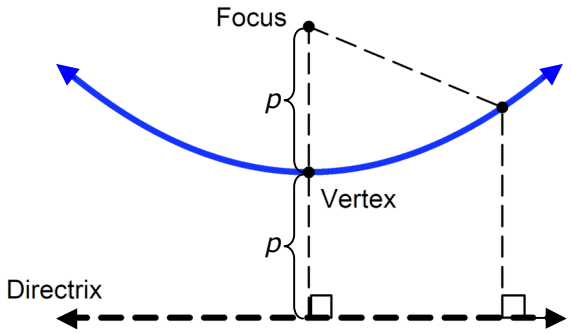
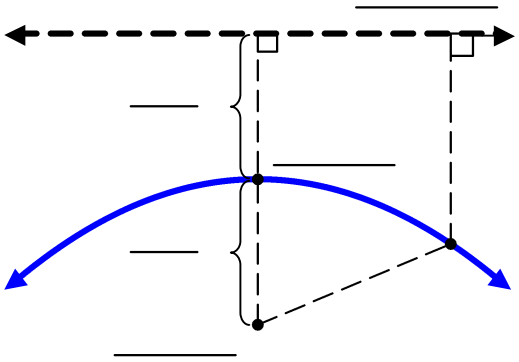
• How could you use symmetry to determine additional points on the graph of the quadratic function? • How could you use the *x*-intercepts to write the equation of the quadratic?	• How does the axis of symmetry relate to the vertex and the focus of the quadratic function? • What is the relationship between the vertex, focus, and directrix?
	A parabola that opens downward with an axis of symmetry at $x = 4$, a directrix at $y = 4.25$, and the distance between the directrix and the focus is 0.5 units.

Task C (Scaffolded Task):

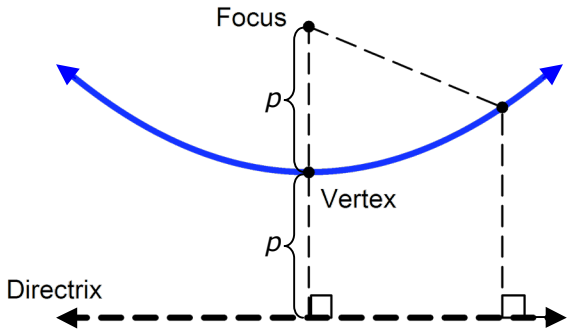
Use the vocabulary terms in the diagram on the left to complete the diagram on the right.

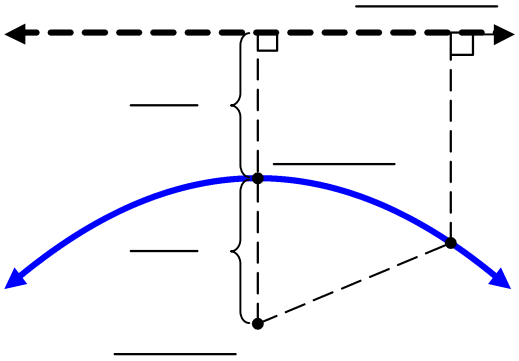




Forms of quadratic equations:		
$y = ax^2 + bx + c$	$y = a(x-h)^2 + k$	$y = a(x-p)(x-q)$

Use the vocabulary terms in the diagram on the left to complete the diagram on the right.





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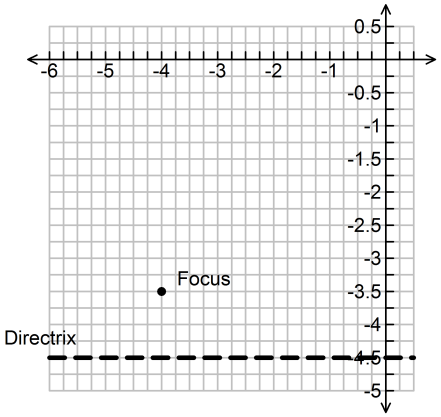

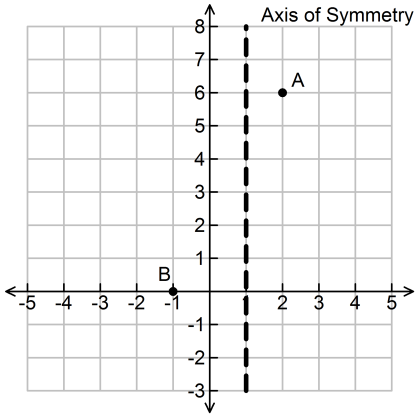

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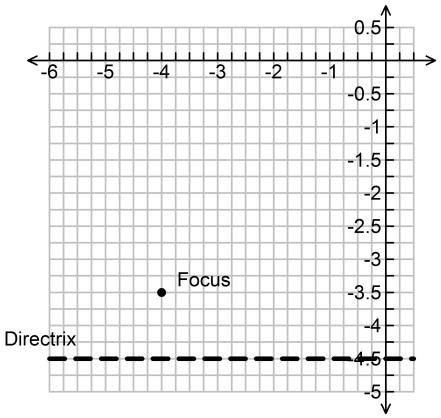
The function $f(x) = -2x^2$ translated one unit to the right and shifted up 8 units.

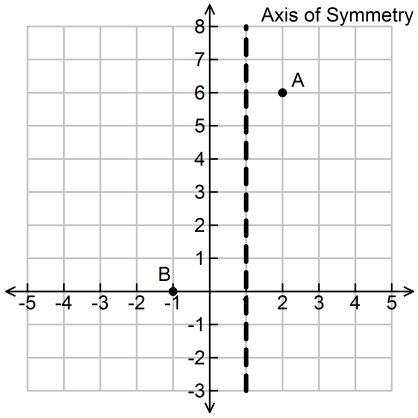
Task D (Enriched Task):

The cards below describe three different parabolas or quadratic functions. Cut out the cards, and match the pairs of cards that describe the same function. Points A and B are on the parabola.

For the two blank cards, create a description that would match the unmatched cards. Verify that your description is accurate.

A parabola that opens downward with an axis of symmetry at $x = 4$, a directrix at $y = 4.25$, and the distance between the directrix and the focus is 0.5 units.





The quadratic function that contains the points below:

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0	4

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At an amusement park, a children's ride goes along the ground for 2 seconds, and then it goes over a small hill. It takes an additional 2 seconds to reach a height of 4 feet, which is the top of the hill. The height of the ride vs. time for the small hill can be modeled with a quadratic function. Find the quadratic function.	The function $f(x) = x^2$ reflected across the x-axis, translated 3 units to the left and shifted down 4 units.
Your Description:	Your Description: