



MISSISSIPPI

EXEMPLAR

Units & Lessons

MATHEMATICS

Algebra I

Grant funded by:



Lesson 5: Performance Task—Who Needs a Calculator, Anyway? Not Me!

Focus Standard(s): F-IF.4, F-IF.7a, F-IF.8a, and A-APR.3

Standards for Mathematical Practice: SMP.1, SMP.2, SMP.3, SMP.4, SMP.5, SMP.6, SMP.7, SMP.8

Estimated Time: 60 minutes – 180 minutes

Resources and Materials:

- 4-color spinner
- Colored Pencils/Crayons (at home)
- Construction paper (at home)
- Plastic or Paper Cups
- Glue (at home)
- Pennies
- Scissors (at home)
- Handout 5.1: Who Needs A Calculator, Anyway? Not Me!
- Handout 5.2: Fun-Shapes Unit Summary

Lesson Target:

- Students will use their depth of knowledge of key features of a graph and graphing without a calculator to evaluate several functions and identify the function rule that represents them.

Guiding Question:

- What connections can be made between the linear factors of a quadratic function, the vertex, and the x-intercepts to facilitate writing the function rule for a quadratic function?

Vocabulary



Academic Vocabulary:

Note: Students are encouraged to use several of these words to construct their response for the Performance Task. The teacher should display these words on the Smart Board as students complete the Task.

- Axis of Symmetry
- Coordinate Point(s)
- Decreasing
- Domain
- End Behavior
- Equidistant
- Function
- Increasing
- Linear Function
- Maximum
- Midpoint
- Minimum
- Parabola
- Parent Function
- Quadratic Function
- Range
- Rate of change
- Satisfies
- Solution
- Standard Form
- Vertex
- x-intercept
- y-intercept

Instructional Strategies for Academic Vocabulary:

- Introduce academic vocabulary with student-friendly definitions and pictures
- Model how to use academic vocabulary in discussion
- Discuss the meaning of an academic vocabulary word in a mathematical context
- Justify responses and critique the reasoning of others algebraically, geometrically, and/or technologically using academic vocabulary
- Create pictures/symbols to represent academic vocabulary
Write or use literacy strategies involving academic vocabulary

Symbol	Type of Text and Interpretation of Symbol
	Instructional support and/or extension suggestions for students who are EL, have disabilities, or perform well below the grade level and/or for students who perform well above grade level
✓	Assessment (Pre-assessment, Formative, Self, or Summative)
	Arts and Crafts Project

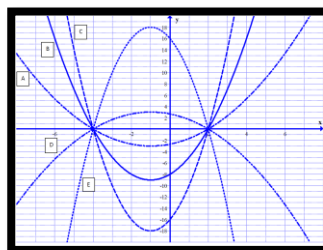
Instructional Plan

Understanding Lesson Purpose and Student Outcomes: Students will utilize what they have learned about the key features of a quadratic function, the impact of “ a ,” “ b ,” and “ c ” on the parent function, $y=x^2$, the zero-product property, and factoring to identify the function rule that defines five distinct graphs which have been graphed on the same Coordinate Plane. Students will justify their responses on several writing activities as they complete this performance task.

Anticipatory Set/Introduction to the Lesson: My Two Cents

Give each student two pennies as they enter the door and display ONLY the graph included on **Handout 5.1: Who Needs a Calculator, Anyway? Not Me!** Inform students that they have 2 minutes to review the graph silently. **[Figure 1]** As you walk around with a plastic/paper cup, instruct students to give their “two cents” (i.e. their observations) about the graph and drop their two pennies in the cup. Encourage students to use their academic vocabulary as they respond and to try not to repeat any of the responses that have already been given by their classmates (SMP.6).

Figure 1.



Activity 1: Performance Task

Distribute **Handout 5.1: Who Needs a Calculator, Anyway? Not Me!** to each student. Instruct them to work independently to complete the task. Collect all work upon completion (SMP.1-8).

For students who are EL, have disabilities, or perform well below grade level:

- Encourage them to:
 - use their highlighters to color each graph a different color.
 - work on one graph at a time.
 - keep a neat, running list of all graphical features for each graph.

- Consider using some of the questions that have been used throughout the unit (or a variation of them).
 - Will the x-intercept, y-intercept, and vertex always be at the same location/coordinate point?
 - What can you assume is the equation for the axis of symmetry?
 - Revisit the leading coefficient of our function. What role do you think the leading coefficient has on the direction and shape of the graph?
 - Revisit the leading coefficient of our function. What role do you think the leading coefficient has on the location of the vertex?
 - Revisit the constant term of our function. What role do you think the constant term has on the graph of our quadratic?

Extensions for students with high interest or working above grade level:

- Allow them time to work with students that may be struggling.

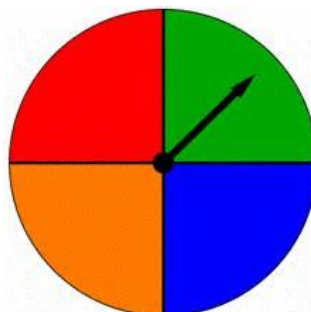
Reflection and Closing: Let the Spinner Decide

Instruct students to go to one of the four walls and stand in a circle. This will quickly form 4 large groups. Walk around to each group with a 4-color spinner and identify one student to spin. The color that the spinner lands on indicates the final conversation that each group will have related to the entire unit. **[Figure 2]** Upon completion, have a few students share out (SMP.2-4 and SMP.6).

Figure 2.

Graphing without
the calculator

Key Features of the
Graph



Academic
Vocabulary

Graphing with the
calculator

Homework



Extra Credit Project: Instruct students that they must select and cut out 5 shapes from the **Handout 5.2: Fun Shapes Unit Summary** that depict/illustrate their progression of learning over this unit. Encourage students to write in each shape, use cardstock/color paper, colored pencils/crayons, and other items to decorate their final product.

Note: (1) Shapes can be used multiple times/duplicated. (2) Determine your own point system for this project. (3) Display student work when completed. (4) Give students three school nights to complete this project.

Handout 5.1: Who Needs a Calculator, Anyway? Not Me!

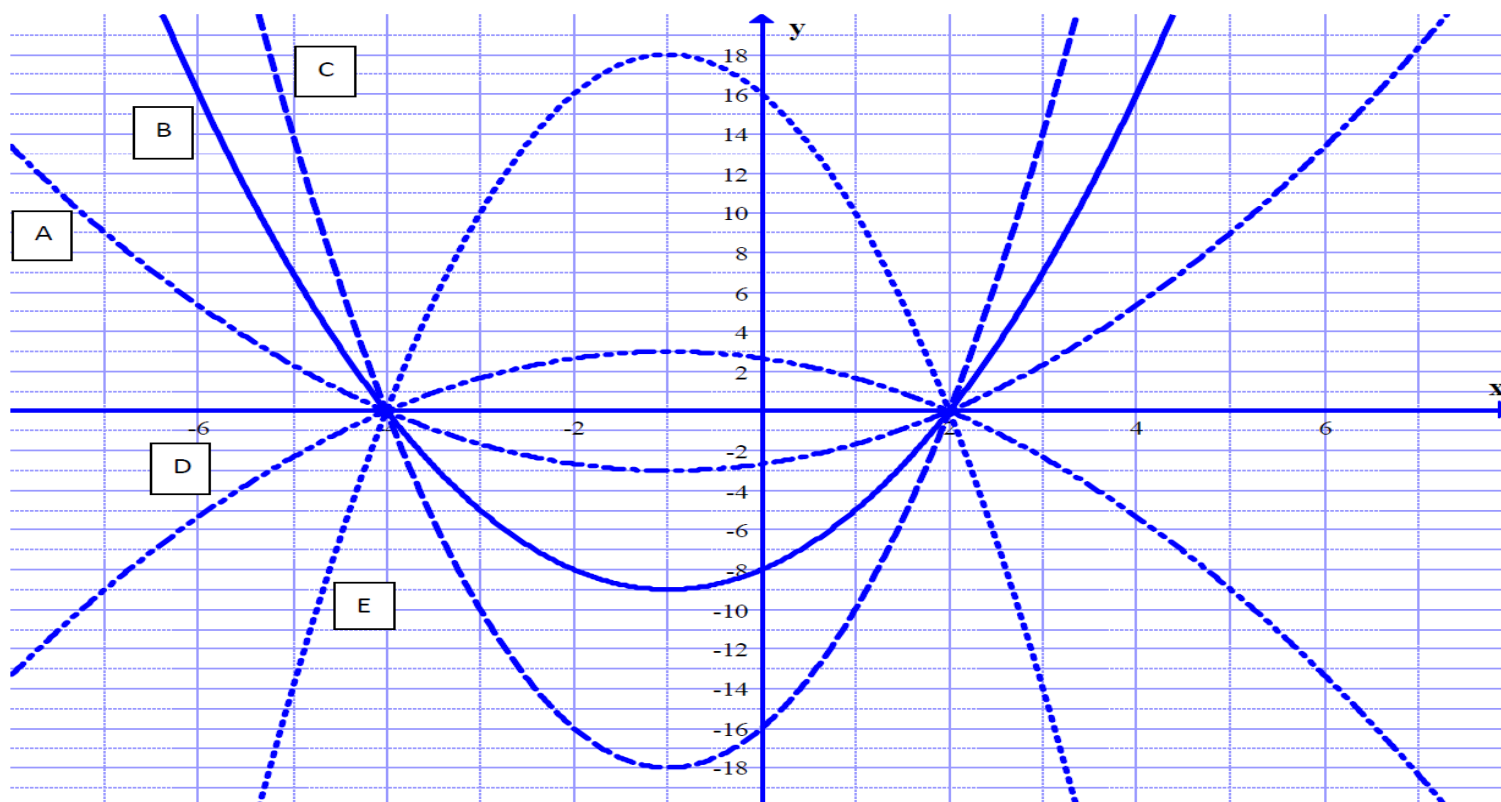
Name _____

Due Date _____

You MAY NOT use a calculator on this activity.

Directions:

1. Examine the following quadratic functions.
2. Determine the function rule (in standard form) for each quadratic function shown below.
3. Use the space provided on the next page to record your work.



Handout 5.1: Who Needs a Calculator, Anyway? Not Me!

	Graph A	Graph B	Graph C	Graph D	Graph E
Scratch Work and Justification					
Function Rule					

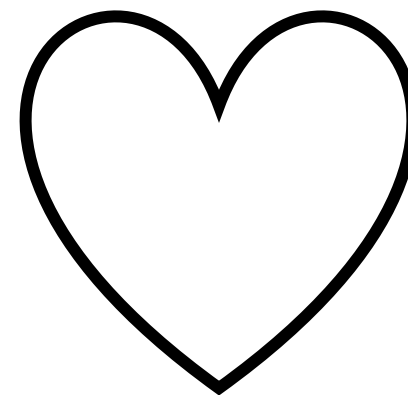
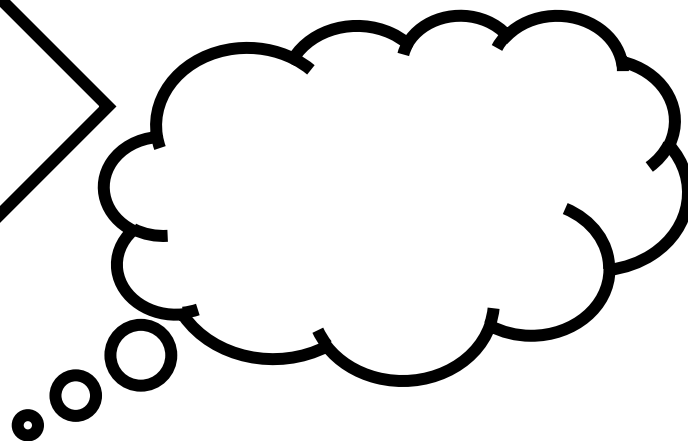
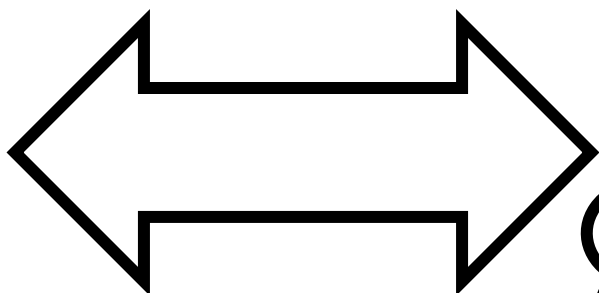
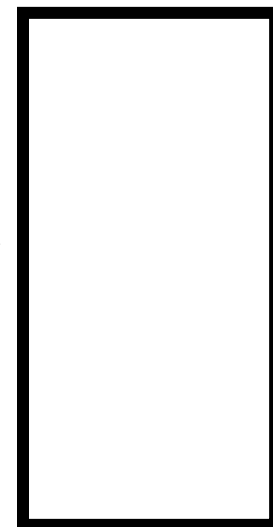
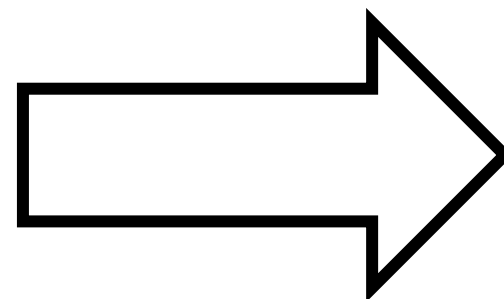
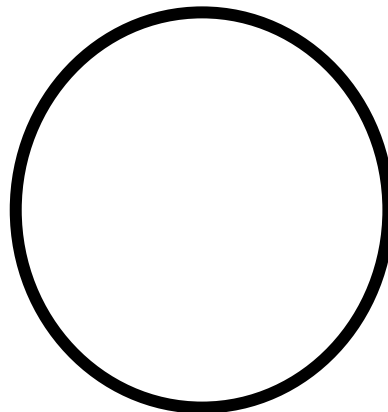
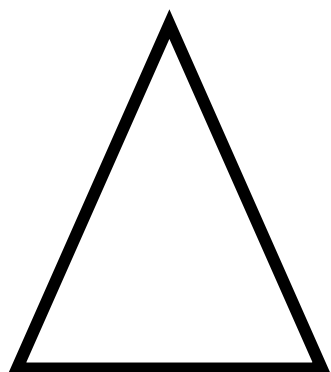
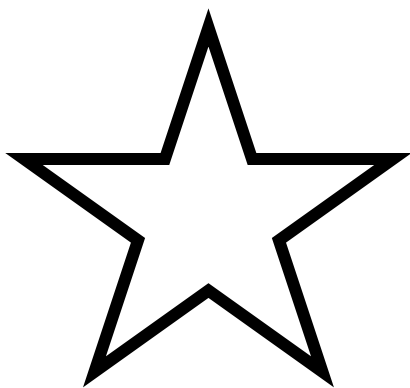
Handout 5.2: Fun Shape Unit Summary

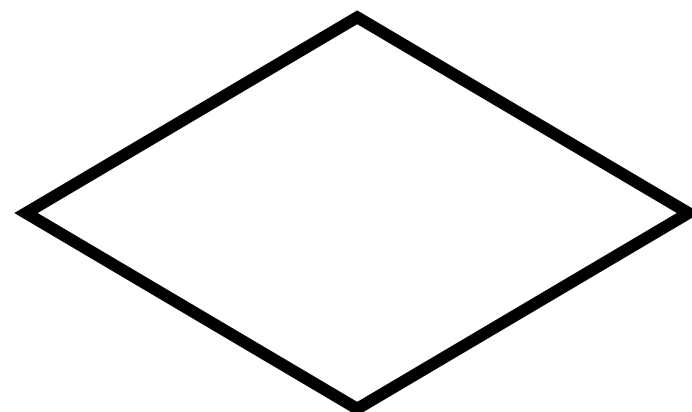
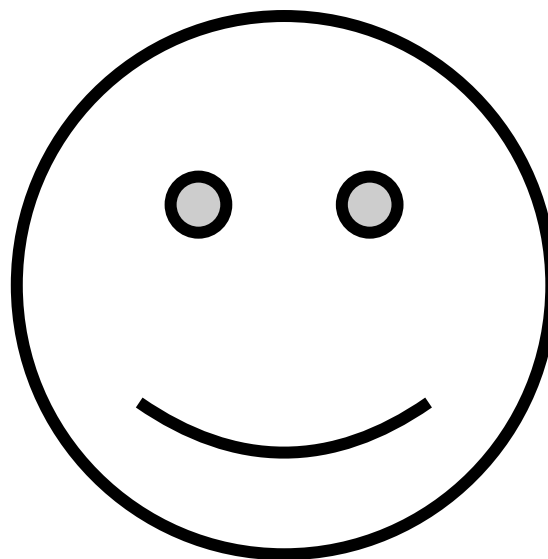
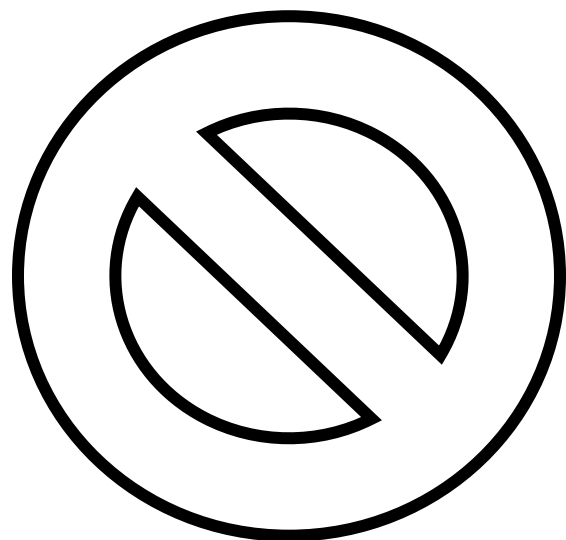
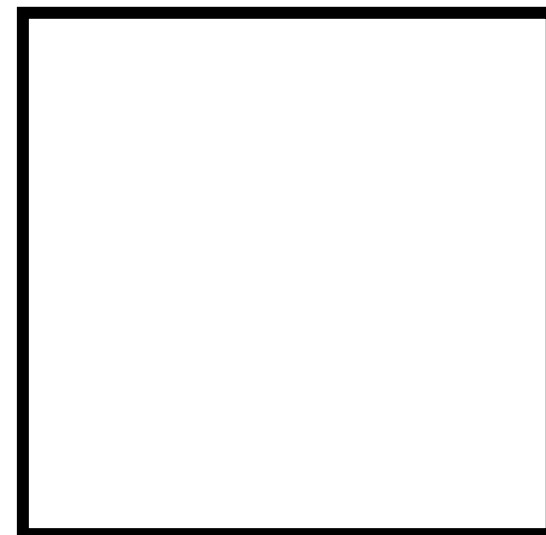
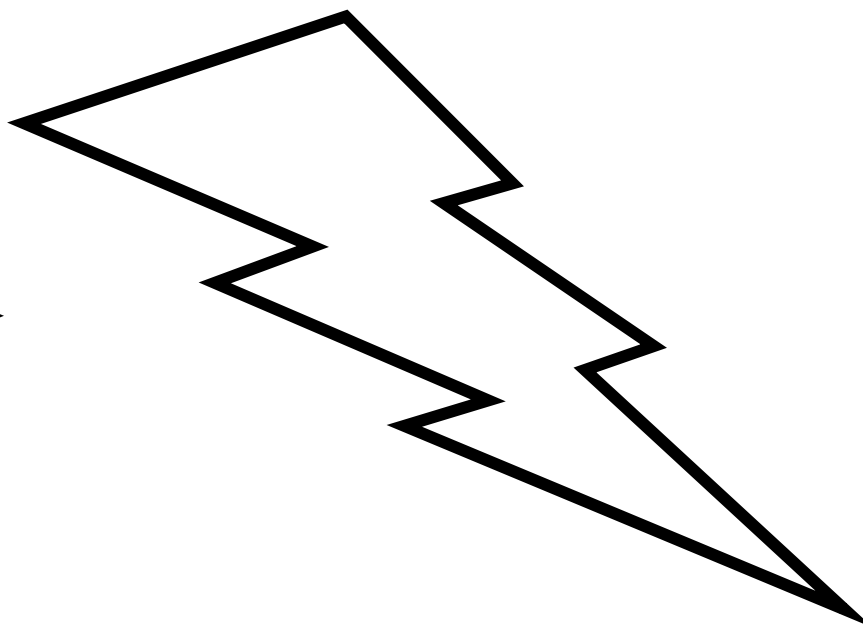
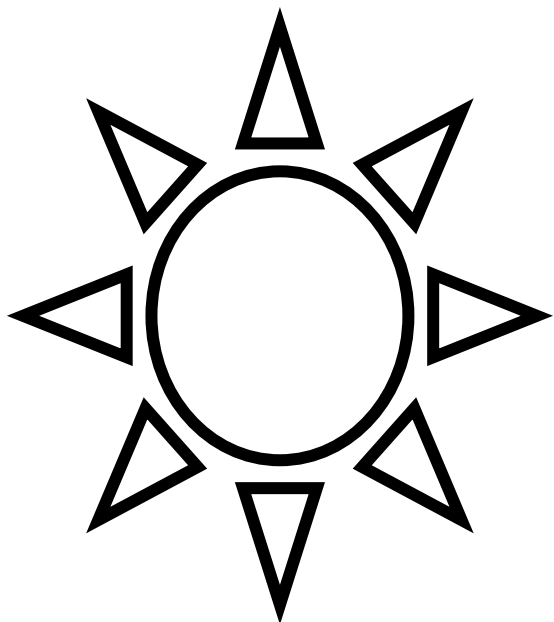
Name _____

Due Date _____

Directions:

1. Select and cut out 5 shapes that tell your progression of learning over this unit.
2. You may use cardstock/color paper, colored pencils/crayons, and other items to decorate your final product.
3. Shapes can be used multiple times/duplicated.







For training or questions regarding this unit,
please contact:

exemplarunit@mdek12.org