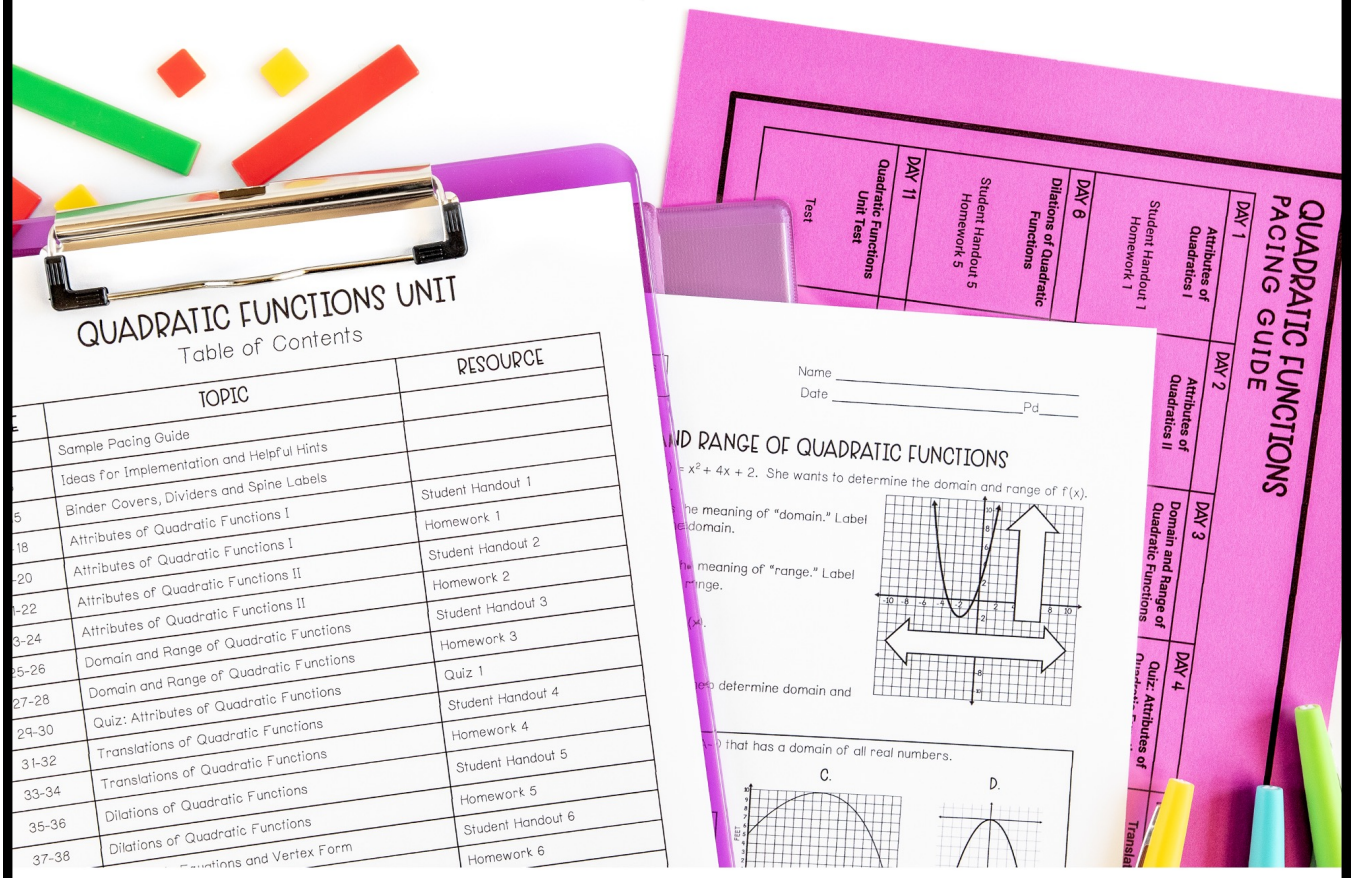
learning focus:

- ✓ write and graph quadratic functions and identify key attributes
- ✓ find domain and range of quadratic functions
- ✓ determine the effects on the graph of the parent function $f(x) = x^2$

QUADRATIC FUNCTIONS UNIT

ALG 1

11 DAY TEKS-ALIGNED UNIT



A MANEUVERING THE MIDDLE ® RESOURCE

QUADRATIC FUNCTIONS

an 11 day TEKS-aligned unit

TEKS: A.6A, A.6B, A.7A, A.7C, A.8B

ready-to-go, scaffolded student materials

QUADRATIC FUNCTIONS UNIT

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student friendly + real-world application

graphic organizers

Unit: Quadratic Functions
Student Handout 4

Name _____
Date _____ Pd_____

TRANSLATIONS OF QUADRATIC FUNCTIONS

A _____ function is the most basic function of a certain type. While the linear parent function is _____, the quadratic parent function is _____. Complete a-c to see how changes to the parent function will change the function's graph as well.

1. Complete the table for f(x) and graph
Then repeat the steps for g(x) and h(x)

x	f(x) = x²	g(x) = x² + 2
-2		
-1		
0		
1		
2		

a. Describe how the equation and the gr

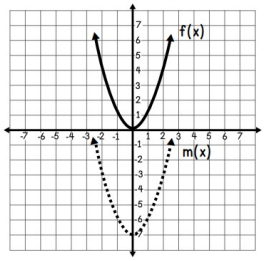
b. Describe how the equation and the gr

Summarize your findings by completing t

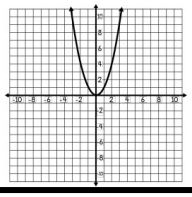
VERTICAL TRANSLATIONS

- If f(x) = x², th
- If d > 0, f(x)
- If d > 0, f(x)

2. Lorenzo translated f(x) to create m(x



The parent function f(x) = x² is shown at the right. In a-b, observe how transforming a function using f(x − c) affects the graph of f(x).



a. Enter the function p(x) = (x − 2)² into your calculator. Sketch its graph at the right and describe how the equation and the graph compare to f(x).

b. Predict how the graph of r(x) = (x
graphing calculator and sketch the g

HORIZONTAL TRANSLATIONS

- If f(x) = x²,
- If c > 0, f(
- If c > 0, f(

3. Complete the table to compare the features of f(x) and p(x) above. Then, circle the features that a horizontal shift will change.

f(x)	
p(x)	

The graph of f(x) = x² was transform

A. g(x) = f(x) − 2.5

B. h(x) = (

4. Describe each transformation in y
words.

A: _____

B: _____

C: _____

D: _____

5. Which cards have functions with...

- the same axis of symmetry as f(x)
- the same range as f(x)?
- the same vertex as f(x)?

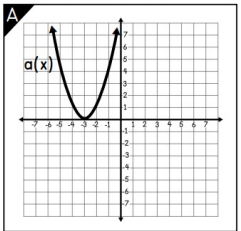
Unit: Quadratic Functions
Homework 4

Name _____
Date _____ Pd_____

TRANSLATIONS OF QUADRATIC FUNCTIONS

Representations A-E show a transformation of the parent function f(x) = x². Use the representations to mark each statement in the table as true or false. Justify your choices.

A

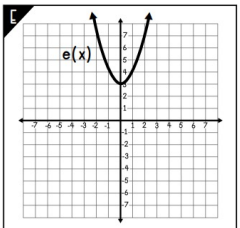


B: b(x) = (x + 4)²

C: c(x) = x² − 8.5

D: d(x) = (x − 1.5)²

E



STATEMENT	T/F?	JUSTIFY
1. Function a(x) can be represented by a(x) = x² − 3.		
2. Function b(x) represents a vertical shift 4 units up.		
3. Function c(x) will have the same axis of symmetry as the parent function.		
4. Function d(x) will not have the same range as the parent function f(x).		
5. Function e(x) can be represented by e(x) = x² + 3.		

Use your knowledge of translations to answer 6-10.

6. The graph of f(x) = x² was transformed to create g(x) = f(x) − 9. Which of the following represents the vertex of g(x)?

a. (0, 9)
b. (9, 0)
c. (0, -9)
d. (-9, 0)

7. Angel believes that a vertical shift of the parent function f(x) = x² will always change the domain of the function. Do you agree or disagree? Explain.

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error analysis

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streamline your planning process with unit overviews

QUADRATIC FUNCTIONS
OVERVIEW

STANDARD

READINESS	SUPPORTING
A.6A determine domain and range of quadratic functions and represent using inequalities **A.7A** graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including x-intercept, y-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry **A.7C** determine the effects on the graph of the parent function $f(x) = x^2$ when f(x) is replaced by af(x), f(x) + d, f(x − c), f(bx) for specific values of a, b, c, and d	**A.6B** write equations of quadratic functions given the vertex and another point on the graph, write the equation in vertex form $(f(x) = a(x - h)^2 + k)$, and rewrite the equation from vertex form to standard form $(f(x) = ax^2 + bx + c)$ **A.8B** write, using technology, quadratic functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems

BIG IDEAS

- Quadratic functions form pa characteristics depending o
- The graphs of the quadratic to the original function.
- Vertex form is another way t another point on the graph.

ESSENTIAL QUESTIONS

- How can attributes be used
- What are the real-world mea
- Which attributes are change
- What advantages are there t

✓ key vocabulary

✓ vertical alignment

sample pacing calendar

QUADRATIC FUNCTIONS
PACING GUIDE

DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
Attributes of Quadratics I Student Handout 1 Homework 1	Attributes of Quadratics II Student Handout 2 Homework 2	Domain and Range of Quadratic Functions	Quiz: Attributes of Quadratic Functions	Translations of Quadratic Functions
DAY 6	**DAY 7**			
Dilations of Quadratic Functions Student Handout 5 Homework 5	Quadratic Equations and Vertex Form Student Handout 6 Homework 6			
DAY 11				
Quadratic Functions Unit Test Test				

QUADRATIC FUNCTIONS
OVERVIEW

TOPIC	TEACHING TIPS
Attributes of Quadratics	• Search desmos.com for "Polygraph: Parabolas" for a fun, interactive game that students can play. Students will try and correctly guess the parabola by asking yes or no questions about the attributes of the graph to narrow down their choices. • Reinforcing that a parabola with a negative a-value will always open down will be helpful when students transform quadratics later in the unit, specifically with reflections.
Transformations of Quadratics	• Desmos.com has a graphing calculator feature that can be especially helpful for demonstrating transformations to your class. You will be able to easily manipulate functions and see the effects on the graph in a way that is easy for students to observe. Consider the following to help students grasp and practice transforming quadratics: • Print a large copy of the parent function on a coordinate grid and laminate for each student. • Students can then use a dry erase marker to practice transformations easily. • Other than using dry erase markers, students could line up a pipe cleaner or wiki stix in the shape of the parent function and transform on the paper using their model. This would be especially helpful to establish the vocabulary of "compressing" and "stretching" both vertically and horizontally with dilations.
Vertex Form	• Keeping track of all the variables in vertex form can be challenging. Have students form the habit of always labeling the x and y-values of the given point as well as "h" and "k" of the vertex to help them substitute the correct variables in the correct places of the formula. • Have students practice using and referencing their formula chart to find vertex form so they are familiar with it when it comes time for standardized testing.
Quadratic Functions and Data	• Students will need extra time on this topic to become familiar with entering data into a list on their graphing calculators and running a quadratic regression.

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teaching ideas

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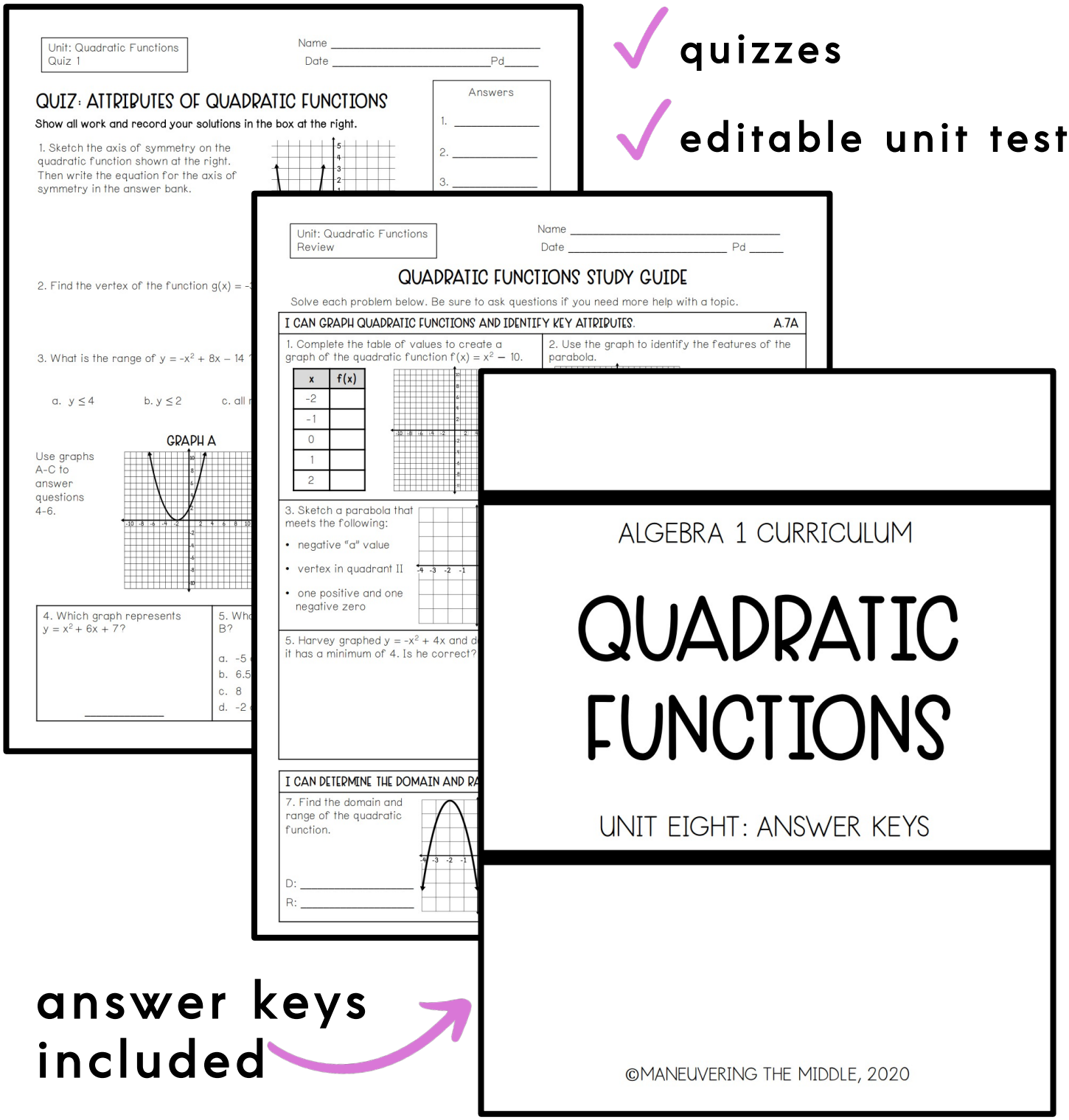
unit study guide + assessments



✓ quizzes

✓ editable unit test

answer keys included

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