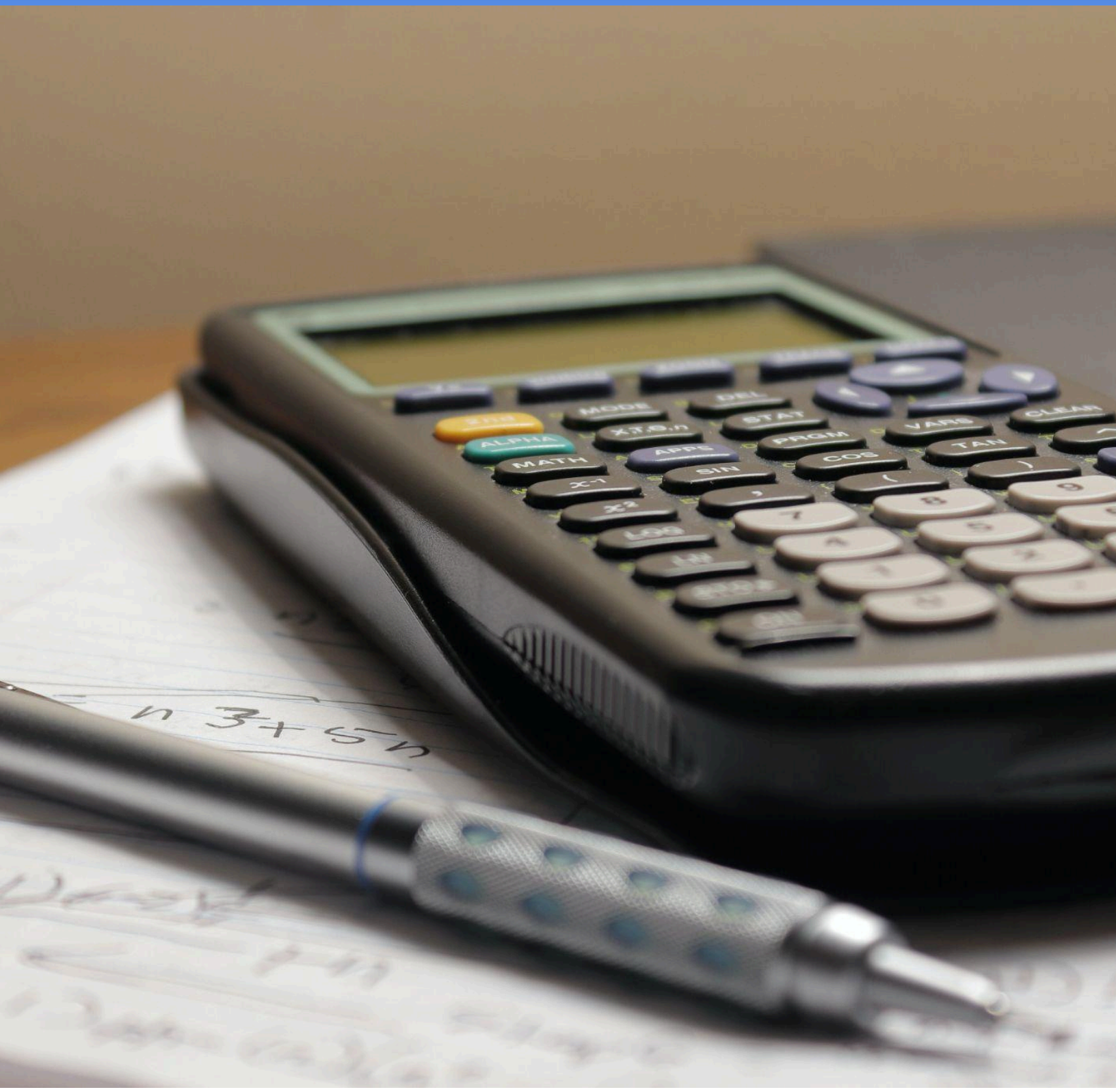
ACCELERATED MATH 8

Course Overview Documents



A+ EDUCATION PARTNERSHIP

A Program of the A+ Education Partnership
In partnership with the Alabama State Dept. of Education

ACCELERATED MATH 8

Course Overview

1ST 9-WEEKS

Unit 1: Pythagorean Theorem

Unit 2: Inequalities

Unit 3: Functions

2ND 9-WEEKS

Unit 4: Systems of Equations & Inequalities

Unit 5: Absolute Value Functions

Unit 6: Exponential Functions

3RD 9-WEEKS

Unit 7: Sequences

Unit 8: Statistics

Unit 9: Probability

Unit 10: Polynomials

Unit 11: Introduction to Quadratic Functions

Unit 11 may be started at the end of the 3rd 9-Weeks

4TH 9-WEEKS

Unit 11: Introduction to Quadratic Functions

Unit 12: Graphing and Solving Quadratic Functions

Unit 13: Mathematical Modeling

STANDARDS CHECKLIST					
ALCOS	**1ST 9-WEEKS**	**2ND 9-WEEKS**	**3RD 9-WEEKS**	**4TH 9-WEEKS**	**UNITS**
1			X		10
2			X		10
3				X	12
4	X	X	X	X	2, 6, 11, 12
5				X	12
6a				X	12
6b				X	12
6c			X		6
7			X		10
8	X			X	2, 13
9		X			4
10	X				3
11				X	12
12		X			4
13	X	X	X	X	2, 3, 5, 6, 10, 11, 12
14	X	X	X	X	2, 3, 5, 6, 10, 11, 12, 13
15	X	X	X	X	2, 3, 5, 6, 10, 11, 12, 13
16	X	X	X	X	2, 3, 6, 11, 12, 13
17	X	X	X	X	2, 3, 5, 6, 10, 11, 12, 13
18	X				2

STANDARDS CHECKLIST					
ALCOS	**1ST 9-WEEKS**	**2ND 9-WEEKS**	**3RD 9-WEEKS**	**4TH 9-WEEKS**	**UNITS**
19	X	X	X	X	2, 3, 6, 11, 12, 13
20		X	X		3, 6, 12
21		X			5
22		X		X	4, 12
23	X	X	X	X	2, 3, 6, 11, 12, 13
24			X		7
25	X	X	X	X	2, 3, 6, 11, 12, 13
26		X			6
27	X	X	X		2,6,7
28				X	12
29	X	X	X	X	2, 3, 6, 11, 12, 13
30	X	X	X	X	2, 3, 6, 11, 12, 13
31	X	X		X	2, 6, 11, 13
32	X	X	X	X	2, 3, 6, 11, 12, 13
33	X	X		X	2, 3, 6, 13
34			X		8
35			X		8
36			X		8
37			X		8
38			X		8

STANDARDS CHECKLIST					
ALCOS	**1ST 9-WEEKS**	**2ND 9-WEEKS**	**3RD 9-WEEKS**	**4TH 9-WEEKS**	**UNITS**
39			X		8
40			X		8
41			X		8
42			X		8
43			X		9
44			X		9
45			X		9
46			X		9
47			X		9
48	X				1
49	X				1
50	X				1

ACCELERATED MATH 8

Scope and Sequence – 1st 9 Weeks

UNIT 1: Pythagorean Theorem	UNIT 2: Inequalities	UNIT 3: Functions

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
WEEK 1	Classroom Rules & Procedures	Lonesome Llama and Group Norms	[1] Discovering the Pythagorean Theorem	[1] Discovering the Pythagorean Theorem	[2] Practicing the Pythagorean Theorem
WEEK 2	[3] Using the P.T. to Find the Distance between Two Points	[3] Using the P.T. to Find the Distance between Two Points	[4] Applying the Pythagorean Theorem	[5] Applications of the Pythagorean Theorem	[5] Applications of the Pythagorean Theorem
WEEK 3			[1] Graph and Solve Simple Inequalities	[1] Graph and Solve Simple Inequalities	[2] Compound Inequalities
WEEK 4	[2] Compound Inequalities	[3] Linear Inequalities			[1] Introduction to Functions
WEEK 5	[1] Introduction to Functions	[1] Introduction to Functions	[2] Introduction to Function Notation	[2] Introduction to Function Notation	[2] Introduction to Function Notation
WEEK 6	[3] Connecting a Verbal Description to Table and Graph	[4] Connecting Tables, Graphs, and Function Notation	[5] Evaluating Functions	Mid Unit Assessment	[6] Domain and Range
WEEK 7	[7] Linear Modeling	[7] Linear Modeling	[8] Discrete and Continuous Data	[9] Determining Domain and Range from a Graph	[10] Linear vs Nonlinear Functions
WEEK 8	[10] Linear vs Nonlinear Functions	[11] Qualitative Descriptions	[11] Qualitative Descriptions	[12] Step Functions	[13] Function Composition
WEEK 9					

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Scope and Sequence – 2nd 9 Weeks

UNIT 4: Systems of Equations & Inequalities	UNIT 5: Absolute Value Functions	UNIT 6: Exponential Functions

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
WEEK 1	[1] Introduction to Systems of Equations	[2] Solving Systems Graphically	[2] Solving Systems Graphically	[2] Solving Systems Graphically	[3] Introduction to Substitution
WEEK 2	[3] Introduction to Substitution	[4] Substitution Practice & Solve Equations w/ the Distributive Prop.	[4] Substitution Practice & Solve Equations w/ the Distributive Prop.	[4] Substitution Practice & Solve Equations w/ the Distributive Prop.	[5] Applications of Systems of Equations
WEEK 3	[5] Applications of Systems of Equations	[6] Solve Systems of Eq. using Linear Combinations & Elimination	[6] Solve Systems of Eq. using Linear Combinations & Elimination	[7] Solving Systems – Putting It All Together	[7] Solving Systems – Putting It All Together
WEEK 4	[8] Solving Systems of Linear Equations	[8] Solving Systems of Linear Equations	[9] Maximizing Profit	[9] Maximizing Profit	
WEEK 5		[1] Introduction to Absolute Value Functions	[2] Revisit Transformational Form of Linear Functions	[3] Graphing Absolute Value Functions	[3] Graphing Absolute Value Functions
WEEK 6	[4] Solve Absolute Value Equations & Inequalities	[4] Solve Absolute Value Equations & Inequalities		[1] Introduction to Exponential Functions	[1] Introduction to Exponential Functions
WEEK 7	[2] Exponential Functions Exploration	[3] Structure of an Exponential Function	[4] Exponential Growth	[4] Exponential Growth	[5] How do you start and how do you change?
WEEK 8	[5] How do you start and how do you change?	[6] Exponential Decay	[6] Exponential Decay	[7] Cool It!	[8] Linear and Exponential Systems
WEEK 9	[8] Linear and Exponential Systems	[8] Linear and Exponential Systems			

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Scope and Sequence – 3rd 9 Weeks

UNIT 7: Sequences	UNIT 8: Statistics	UNIT 9: Probability	UNIT 10: Polynomials	UNIT 11: Intro to Quadratic Functions

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
WEEK 1	[1] Recognizing Visual Patterns	[2] Arithmetic and Geometric Sequences	[3] Sequence Formulas	[3] Sequence Formulas	
WEEK 2		[1] Design an Experiment	[1] Design an Experiment	[2] Associations with Two Categorical Variables	[2] Associations with Two Categorical Variables
WEEK 3	[3] Simpson's Paradox	[4] Guess My Age	[5] Desmos: Fit Fights	[6] Monopoly – Spaces from Go vs. Rent	[7] Scatterplots: Interpreting Slopes and Y-Intercepts
WEEK 4	[8] Observing More Patterns in Scatterplots	[9] Design an Experiment - Finale			[1] Probability Introduction
WEEK 5	[1] Probability Introduction	[2] Probability and Independence	[3] Independence Practice	[4] Probability and Tree Diagrams	[4] Probability and Tree Diagrams
WEEK 6	[5] Probability Wrap Up			[0] Exponent Properties Review	[1] Rational Number Exponents
WEEK 7	[2] Naming and Classifying Polynomials	[3] Adding and Subtracting Polynomials	[4] Multiplying Polynomials	[4] Multiplying Polynomials	[5] Multiplying Polynomials – Special Products
WEEK 8	[6] Polynomial Application Problems	[6] Polynomial Application Problems	[7] Closure with Polynomials		
WEEK 9	[1] Quadratic Growth	[2] Quadratic Growth Day 2	[3] Quadratic vs. Exponential Growth	[4] Parabola Introduction	[5] Parabola Vocabulary

ACCELERATED MATH 8

Scope and Sequence – 4th 9 Weeks

UNIT 11: Introduction to Quadratic Functions	UNIT 12: Graphing and Solving Quadratic Functions	UNIT 13: Mathematical Modeling

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
WEEK 1	[6] Factored Form of Quadratic Functions	[6] Factored Form of Quadratic Functions	[6] Factored Form of Quadratic Functions	[7] Modeling with Quadratic Functions – Area Optimization	[7] Modeling with Quadratic Functions – Area Optimization
WEEK 2	[8] Modeling with Quadratic Functions – Projectile Motion	[8] Modeling with Quadratic Functions – Projectile Motion			[1] Axis of Symmetry for a Quad. Function in Standard Form
WEEK 3	[2] Solving Quadratic Equations by Inspection	[3] Rewriting Quad. Expressions in Factored Form Part 1	[4] Rewriting Quad. Expressions in Factored Form Part 2	[5] Vertex Form of Quadratic Functions	[5] Vertex Form of Quadratic Functions
WEEK 4	[6] Rewriting Quadratic Expressions in Vertex Form	[7] Solving Quad. Equations by Completing the Square	[8] Solving Quad. Equations with Irrational Solutions	[9] Solving Quad. Equations with the Quadratic Formula	[9] Solving Quad. Equations with the Quadratic Formula
WEEK 5	[10] Comparing Different Forms of Quadratic Functions	[11] Linear and Quadratic Systems	[12] Introduction to the Complex Number System	[13] The Number "I"	
WEEK 6		[1] Analysis of Functions	[1] Analysis of Functions	[2] Piecewise Defined Functions	[3] Piecewise Functions
WEEK 7	[4] Transformation of Functions	[5] Characteristics of Functions	[6] Operations with Combining Functions	[7] Choosing a Mathematical Model (Verbal Description)	[8] Choosing a Mathematical Model (Graph or Table)
WEEK 8	[9] Choose/Build an Appropriate Mathematical Model				
WEEK 9					

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Unit Overview

UNIT 1: Pythagorean Theorem	RECOMMENDED TIME FRAME: 10 days

UNIT OVERVIEW

In this unit, students learn how to use and apply the Pythagorean Theorem and its converse. The unit begins with a discovery lesson using tilted squares before students practice and apply the Pythagorean Theorem to real world problems.

STANDARDS

48. Informally justify the Pythagorean Theorem and its converse. [*Grade 8, 26*]
49. Apply the Pythagorean Theorem to find the distance between two points in a coordinate plane. [*Grade 8, 27*]
50. Apply the Pythagorean Theorem to determine unknown side lengths of right triangles, including real-world applications. [*Grade 8, 28]*

RESOURCES

Unit 1 Student Progress Monitoring Document

Unit 1 Proficiency Scale

Unit 1 Sample Summative Assessment

Unit 1 Sample Summative Assessment Key

ACCELERATED MATH 8

Unit Overview

UNIT 2: Inequalities	RECOMMENDED TIME FRAME: 7 days

UNIT OVERVIEW

In this unit, students will expand on their ability to solve inequalities. Students should have a solid understanding of how to graph equations in slope-intercept form as well as standard form. It is also necessary for students to understand the meanings of the inequality symbols and the vocabulary associated. Students will build upon their prior knowledge of solving and graphing equations by developing more sophisticated understandings about what the solution to an inequality means in context.

STANDARDS

13. Create equations and inequalities in one variable and use them to solve problems in context, either exactly or approximately. Extend from contexts arising from linear functions ~~to those involving quadratic, exponential, and absolute value functions~~.
15. Represent constraints by equations and/or inequalities, ~~and solve systems of equations and/or inequalities,~~ interpreting solutions as viable or nonviable options in a modeling context. Limit to contexts arising from linear, ~~quadratic, exponential, absolute value, and linear piecewise functions.~~
21. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), ~~and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-plane~~s, using technology where appropriate.

RESOURCES

Unit 2 Student Progress Monitoring Document

Unit 2 Proficiency Scale

Unit 2 Sample Summative Assessment

Unit 2 Sample Summative Assessment Key

ACCELERATED MATH 8

Unit Overview

UNIT 3: Functions	RECOMMENDED TIME FRAME: 23 days

UNIT OVERVIEW

This unit starts with the introduction of what makes a relation a function. Students discover the relationships between the independent/dependent variables and function notation. The students will take real world situations and show the relationships between a verbal description, a table, and a pattern that can be derived from that table, function notation, and a graph. They will be introduced to how to determine the reasonable domain and range for discrete and continuous functions. Identifying domain and range of functions is an important skill that will be used in every type of function. Lessons 2 - 6 build upon each other and reference the skills from previous lessons within each new lesson. For students to thoroughly understand function notation and the associated vocabulary, it is best to complete the lessons in the order listed.

STANDARDS

4. Interpret linear, quadratic, and exponential expressions in terms of a context by viewing one or more of their parts as a single entity. [*Algebra I with Probability, 4*]
   Example: Interpret the accrued amount of investment $P(1 + r)^t$ *, where* P *is the principal and* r *is the interest rate, as the product of* P *and a factor depending on time* t.
14. Create equations in two or more variables to represent relationships between quantities in context; graph equations on coordinate axes with labels and scales and use them to make predictions. Limit to contexts arising from linear, ~~quadratic, exponential, absolute value, and linear piecewise functions~~. (Algebra 1 with Probability, 12)
15. Represent constraints by equations and/or inequalities, and solve systems of equations and/or inequalities, interpreting solutions as viable or nonviable options in a modeling context. Limit to contexts arising from linear, ~~quadratic, exponential, absolute value, and linear piecewise function~~s. [*Algebra I with Probability, 13*]
16. Define a function as a mapping from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range. [*Grade 8, 13, edited for added content*]
    a. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. [*Grade 8, 14, edited for added content*]
    b. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. [Grade 8, 14, edited for added content]

STANDARDS

c. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. [Grade 8, 14, edited for added content]
Note: If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x.

d. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. Limit to linear, quadratic, exponential, and absolute value functions. [Algebra I with Probability, 15]

17. Given a relation defined by an equation in two variables, identify the graph of the relation as a set of all its solutions plotted in the coordinate plane. Note: The graph of a relation often forms a curve (which could be a line). (Algebra 1 with Probability, 14)
18. Compare and contrast relations and functions represented by equations, graphs, or tables that show related values; determine whether a relation is a function. Identify that a function f is a special kind of relation defined by the equation y = f(x). (Algebra 1 with Probability, 16)
19. Combine different types of standard functions to write, evaluate, and interpret functions in context. Limit to linear, ~~quadratic, exponential, and absolute value~~ functions. (Algebra 1 with Probability, 17)
    b. Use function composition to combine different types of standard functions to write and evaluate functions.
23. Compare properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Include linear, quadratic, exponential, absolute value, and linear piecewise. [*Algebra I with Probability, 21, edited*]
    a. Distinguish between linear and non-linear functions. [*Grade 8, 15a*]
26. Distinguish between situations that can be modeled with linear functions and those that can be modeled with exponential functions.
    a. Show that linear functions grow by equal differences over equal intervals, while exponential functions grow by equal factors over equal intervals.
    b. Define linear functions to represent situations in which one quantity changes at a constant rate per unit interval relative to another.
29. Interpret the parameters of functions in terms of a context. Extend from linear functions, written in the form $mx + b$, to exponential functions, written in the form ab^x. [*Algebra I with Probability*, *27*]
    Example: If the function $V(t) = 19885(0.75)^t$ *describes the value of a car after it has been owned for* t *years, 19885 represents the purchase price of the car when* t *= 0, and 0.75 represents the annual rate at which its value decreases.*

STANDARDS

30. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Note: Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; symmetries; and end behavior.* Extend from relationships that can be represented by linear functions to ~~quadratic, exponential, absolute value, and linear piecewise functions.~~ (Algebra 1 with Probability, 28)
31. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. Limit to linear, ~~quadratic, exponential, and absolute value functions~~. [*Algebra I with Probability, 29*]
32. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (Algebra 1 with Probability, 30)
    b. Graph ~~piecewise-defined functions,~~ including step functions and ~~absolute value functions.~~
33. Use the mathematical modeling cycle to solve real-world problems involving linear, quadratic, exponential, absolute value, and linear piecewise functions. [*Algebra I with Probability*, *31*]

RESOURCES

Unit 3 Student Progress Monitoring Document

Unit 3 Proficiency Scale

Unit 3 Sample Summative Assessment

Unit 3 Sample Summative Assessment Key

ACCELERATED MATH 8

Unit Overview

UNIT 4: Systems of Equations & Inequalities	RECOMMENDED TIME FRAME: 21 days

UNIT OVERVIEW

This unit begins with a lesson where students fill in a table, write equations to represent the problem situation, graph the equations, and then use the table and graph to answer questions. Students then discover that the point of intersection of the graphs of the equations representing the problem situation is the same as the point where the two equations are equal, which is also the solution to a system of equations. At this point, the lessons have not used the term "system of equations," but it is a good point to introduce it. Students progress between the three methods for solving systems – graphically, substitution, and elimination – as they discover the need or usefulness of each of the methods. Time is given for students to practice each of the methods individually before asking them to solve a system while choosing which method is more appropriate. Attention should be given to the form of the equation used so that students will see the different forms (slope-intercept and standard form) they will be exposed to in current and future math classes.

STANDARDS

9. Solve systems of two linear equations in two variables by graphing and ~~substitution.~~ [*Grade 8, 12*]
    a. Explain that the solution(s) of systems of two linear equations in two variables corresponds to points of intersection on their graphs because points of intersection satisfy both equations simultaneously.
    b. Interpret and justify the results of systems of two linear equations in two variables (one solution, no solution, or infinitely many solutions) when applied to real-world and mathematical problems.
12. Select an appropriate method to solve a system of two linear equations in two variables.
    a. Solve a system of two equations in two variables by using linear combinations; contrast situations in which use of linear combinations is more efficient with those in which substitution is more efficient.
    b. Contrast solutions to a system of two linear equations in two variables produced by algebraic methods with graphical and tabular methods. [*Algebra I with Probability, 10*]
14. Create equations in two or more variables to represent relationships between quantities in context; graph equations on coordinate axes with labels and scales and use them to make predictions. Limit to contexts arising from linear, ~~quadratic, exponential, absolute value, and linear piecewise functions.~~

STANDARDS

15. Represent constraints by equations and/or inequalities, and solve systems of equations and/or inequalities, interpreting solutions as viable or nonviable options in a modeling context. Limit to contexts arising from linear, ~~quadratic, exponential, absolute value, and linear piecewise functions.~~ [*Algebra I with Probability, 13*]
20. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$.
    a. Find the approximate solutions of an equation graphically, using tables of values, or finding successive approximations, using technology where appropriate. [*Algebra I with Probability, 19*]

RESOURCES

Unit 4 Student Progress Monitoring Document

Unit 4 Proficiency Scale

Unit 4 Sample Summative Assessment

Unit 4 Sample Summative Assessment Key

ACCELERATED MATH 8

Unit Overview

UNIT 5: Absolute Value Functions	RECOMMENDED TIME FRAME: 7 days

UNIT OVERVIEW

Students will graph absolute value functions using the transformational form and explain the meaning of absolute value functions in terms of distance. The students will use that knowledge to write, define, solve, and graph absolute value equations and inequalities.

STANDARDS

10. Explain why extraneous solutions to an equation involving absolute values may arise and how to check to be sure that a candidate solution satisfies an equation. (Algebra 1 with Probability, 8)
13. Create equations and inequalities in one variable and use them to solve problems in context, either exactly or approximately. Extend from contexts arising from linear functions to those involving ~~quadratic, exponential, and~~ absolute value functions. (Algebra 1 with Probability, 11)
14. Create equations in two or more variables to represent relationships between quantities in context; graph equations on coordinate axes with labels and scales and use them to make predictions. Limit to contexts arising from linear, quadratic, exponential, absolute value, and linear piecewise functions. (Algebra 1 with Probability, 12)
16. Define a function as a mapping from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range. [Grade 8, 13, edited for added content]
    b. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. Limit to ~~linear, quadratic, exponential~~, and absolute value functions. [*Algebra I with Probability, 15*].
18. Compare and contrast relations and functions represented by equations, graphs, or tables that show related values; determine whether a relation is a function. Identify that a function f is a special kind of relation defined by the equation y = f(x). (Algebra 1 with Probability, 16)
23. Compare properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Extend from linear to ~~quadratic, exponential~~, and absolute value, and general piecewise. (Algebra 1 with Probability, 21)
25. Identify the effect on the graph of replacing f(x) by f(x) + k, k · f(x), f(k · x), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and explain the effects on the graph, using technology as appropriate. Limit to linear, ~~quadratic, exponential~~, absolute value, ~~and linear piecewise functions.~~ (Algebra 1 with Probability, 23)

STANDARDS

30. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Note: Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; symmetries; and end behavior. Extend from relationships that can be represented by linear functions to ~~quadratic, exponential~~, absolute value, ~~and linear piecewise functions~~. (Algebra 1 with Probability, 28)
32. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. [Algebra I with Probability, 30]
    b. Graph piecewise-defined functions, including ~~step functions~~ and absolute value functions

RESOURCES

Unit 5 Student Progress Monitoring Document

Unit 5 Proficiency Scale

Unit 5 Sample Summative Assessment

Unit 5 Sample Summative Assessment Key

ACCELERATED MATH 8

Unit Overview

UNIT 6: Exponential Functions	RECOMMENDED TIME FRAME: 16 days

UNIT OVERVIEW

In this unit, students are introduced to exponential relationships. Students learn that exponential relationships are characterized by a constant quotient over equal intervals while linear relationships are characterized by a constant difference over equal intervals. They encounter contexts that change exponentially. These contexts are presented verbally and with tables and graphs. They construct equations and use them to model situations and solve problems. Students investigate these exponential relationships without using function notation and language so that they can focus on gaining an appreciation for critical properties and characteristics of exponential relationships.

STANDARDS

4. Interpret linear, ~~quadratic~~, and exponential expressions in terms of a context by viewing one or more of their parts as a single entity.
5. Use the structure of an expression to identify ways to rewrite it.
6. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
   c. Use the properties of exponent to transform expressions for exponential functions.
13. Create equations and inequalities in one variable and use them to solve problems in context, either exactly or approximately. Extend from contexts arising from linear functions to those involving quadratic, exponential, and absolute value functions.
14. Create equations in two or more variables to represent relationships between quantities in context; graph equations on coordinate axes with labels and scales and use them to make predictions. Limit to contexts arising from linear, quadratic, exponential, absolute value, and linear piecewise functions.
16. Define a function as a mapping from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range.
   b. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. Limit to linear, ~~quadratic~~, exponential, ~~and absolute value functions~~.
17. Given a relation defined by an equation in two variables, identify the graph of the relation as a set of all its solutions plotted in the coordinate plane. Note: The graph of a relation often forms a curve (which could be a line).
19. Combine different types of standard functions to write, evaluate, and interpret functions in context. Limit to linear, quadratic, exponential, and absolute value functions.
   a. Use arithmetic operations to combine different types of standard functions to write and evaluate functions.

STANDARDS

20. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x)
    a. Find the approximate solutions of an equation graphically, using tables of values, or finding successive approximations, using technology where appropriate. Note: Include cases where f(x) is linear, ~~quadratic~~, exponential, or ~~absolute value function~~, and g(x) is constant or linear.
23. Compare properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Extend from linear to quadratic, exponential, absolute value, and general piecewise.
25. Identify the effect on the graph of replacing f(x) by f(x) + k, k · f(x), f(k · x), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and explain the effects on the graph, using technology as appropriate. Limit to linear, quadratic, exponential, absolute value, and linear piecewise functions.
26. Distinguish between situations that can be modeled with linear functions and those that can be modeled with exponential functions.
    a. Show that linear functions grow by equal differences over equal intervals, while exponential functions grow by equal factors over equal intervals.
    b. Define linear functions to represent situations in which one quantity changes at a constant rate per unit interval relative to another.
    c. Define exponential functions to represent situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
27. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
28. Use graphs and tables to show that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.
29. Interpret the parameters of functions in terms of a context. Extend from linear functions, written in the form mx + b, to exponential functions, written in the form ab^x.
30. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Note: Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; symmetries; and end behavior. Extend from relationships that can be represented by linear functions to quadratic, exponential, absolute value, and linear piecewise functions.
31. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. Limit to linear, ~~quadratic~~, exponential, and ~~absolute value functions.~~
32. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
    c. Graph exponential functions, showing intercepts, and end behavior.

RESOURCES
Unit 6 Student Progress Monitoring Document
Unit 6 Proficiency Scale
Unit 6 Sample Summative Assessment
Unit 6 Sample Summative Assessment Key

ACCELERATED MATH 8

Unit Overview

UNIT 7: Sequences	RECOMMENDED TIME FRAME: 6 days

UNIT OVERVIEW

The connection between arithmetic sequences to linear functions and geometric sequences to exponential functions should be stressed throughout this unit. This will be the first-time students are introduced to recursive forms of functions or sequences. The Alabama Course of Study requires students to use function notation when writing and defining sequences.

STANDARDS

24. Define sequences as functions, including recursive definitions, whose domain is a subset of the integers.
    a. Write explicit and recursive formulas for arithmetic and geometric sequences and connect them to linear and exponential functions.
27. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

RESOURCES

Unit 7 Student Progress Monitoring Document

Unit 7 Proficiency Scale

Unit 7 Sample Summative Assessment

Unit 7 Sample Summative Assessment Key

ACCELERATED MATH 8

Unit Overview

UNIT 8: Statistics	RECOMMENDED TIME FRAME: 13 days

UNIT OVERVIEW

This unit plays an important role in students' developing statistical habits of mind, developing statistical literacy, and becoming educated consumers and citizens. To encourage statistical habits of mind, teachers should ensure students consider the context of data, consider the best measure of an attribute of interest, anticipate, look for, and describe variation, embrace uncertainty while building confidence in interpretations, use several visual and numerical representations to make sense of data and encourage skepticism[2]. Every morning, the newspaper and other media confront us with statistical information on topics ranging from the economy to education, from movies to sports, from food to medicine, and from public opinion to social behavior. Students should use newspapers and other media with statistical information to guide decisions in their personal lives which enables them to be responsible citizens[1]. Citizens informed by polls and studies need to understand how the results were determined which directly impact the reliability of the results[1].

[1]The Guidelines for Assessment and Instruction in Statistics Education (Franklin et al., 2007, https://www.amstat.org/asa/files/pdfs/GAISE/GAISEPreK-12_Full.pdf) serves as an excellent resource to help teachers understand the development of statistical standards and statistical habits of mind in the K-12 setting.
[2]Lee, H. S., & Tran, D. (2015). Statistical habits of mind. Teaching statistics through data investigations MOOC-Ed, Friday Institute for Educational Innovation: NC State University, Raleigh, NC.A calculator is needed to do some of the computations.

STANDARDS

34. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities, describing patterns in terms of positive, negative, or no association, linear and non-linear association, clustering, and outliers.
35. Given a scatter plot that suggests a linear association, informally draw a line to fit the data, and assess the model fit by judging the closeness of the data points to the line.
36. Use a linear model of a real-world situation to solve problems and make predictions.
    a. Describe the rate of change and y-intercept in the context of a problem using a linear model of a real-world situation.
37. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects, using relative frequencies calculated for rows or columns to describe possible associations between the two variables.
38. Distinguish between quantitative and categorical data and between the techniques that may be used for analyzing data of these two types.

STANDARDS

39. Analyze the possible association between two categorical variables.
    a. Summarize categorical data for two categories in two-way frequency tables and represent using segmented bar graphs.
    b. Interpret relative frequencies in the context of categorical data (including joint, marginal, and conditional relative frequencies).
    c. Identify possible associations and trends in categorical data.
40. Generate a two-way categorical table in order to find and evaluate solutions to real-world problems.
    a. Aggregate data from several groups to find an overall association between two categorical variables.
    b. Recognize and explore situations where the association between two categorical variables is reversed when a third variable is considered (Simpson's Paradox).
41. Use mathematical and statistical reasoning with bivariate categorical data in order to draw conclusions and assess risk.
42. Design and carry out an investigation to determine whether there appears to be an association between two categorical variables, and write a persuasive argument based on the results of the investigation.

RESOURCES

Unit 8 Student Progress Monitoring Document

Unit 8 Proficiency Scale

Unit 8 Sample Summative Assessment

Unit 8 Sample Summative Assessment Key

ACCELERATED MATH 8

Unit Overview

UNIT 9: Probability	RECOMMENDED TIME FRAME: 9 days

UNIT OVERVIEW

In this unit, students will find simple, compound, and conditional probabilities. They will explain whether two events are independent using two-way tables and tree diagrams. Two events are independent if the occurrence of the one event does not affect the probability of the second event.

STANDARDS

43. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
44. Explain whether two events, A and B, are independent, using two-way tables or tree diagrams.
45. Compute the conditional probability of event A given event B, using two-way tables or tree diagrams.
46. Recognize and describe the concepts of conditional probability and independence in everyday situations and explain them using everyday language.
47. Explain why the conditional probability of A given B is the fraction of B's outcomes that also belong to A, and interpret the answer in context.

RESOURCES

Unit 9 Student Progress Monitoring Document

Unit 9 Proficiency Scale

Unit 9 Sample Summative Assessment

Unit 9 Sample Summative Assessment Key

ACCELERATED MATH 8

Unit Overview

UNIT 10: Polynomials	RECOMMENDED TIME FRAME: 12 days

UNIT OVERVIEW

This unit helps prepare students for work they will do in the following units on quadratic functions as well as prepare them for future work they will do with polynomials in Algebra II and beyond. Polynomials will be covered more in-depth in Algebra II, so students in Accelerated Math 8 should get a solid understanding of addition, subtraction, and multiplication with linear and quadratic polynomials.

STANDARDS

1. Explain how the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for an additional notation for radicals using rational exponents.
2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.
7. Add, subtract, and multiply polynomials, showing that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication.

RESOURCES

Unit 10 Student Progress Monitoring Document

Unit 10 Proficiency Scale

Unit 10 Sample Summative Assessment

Unit 10 Sample Summative Assessment Key

ACCELERATED MATH 8

Unit Overview

UNIT 11: Introduction to Quadratic Functions	RECOMMENDED TIME FRAME: 14 days

UNIT OVERVIEW

This unit introduces students to quadratic functions and their graphs. They will start by analyzing growth patterns to determine characteristics of quadratic growth. Students will understand that quadratic functions are often formed by multiplying two linear expressions, and therefore are not linear. They will compare and contrast quadratic growth to linear and exponential growth they studied earlier. They will learn the graph of a quadratic function forms a parabola. They will work with the factored form of quadratic functions and then move into standard and vertex form in the next units. Throughout the unit, get students to convert quadratic expressions in factored form to standard form to show they are equivalent and use the skill of multiplying polynomials that they just learned in the previous unit.

STANDARDS

5. Use the structure of an expression to identify ways to rewrite it.
6. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
11. Create equations and ~~inequalities~~ in one variable and use them to solve problems in context, either exactly or approximately. Extend from contexts arising from linear functions to those involving quadratic, exponential, ~~and absolute value~~ functions.
12. Create equations in two or more variables to represent relationships between quantities in context; ~~graph equations on coordinate axes with labels and scales and use them to make predictions.~~ Limit to contexts arising from linear, quadratic, ~~exponential, absolute value, and linear piecewise functions.~~
26. Use graphs and tables to show that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.
28. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Note: Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; symmetries; and end behavior. Extend from relationships that can be represented by linear functions to quadratic, ~~exponential, absolute value, and linear piecewise functions.~~

RESOURCES
Unit 11 Student Progress Monitoring Document
Unit 11 Proficiency Scale
Unit 11 Sample Summative Assessment
Unit 11 Sample Summative Assessment Key

ACCELERATED MATH 8

Unit Overview

UNIT 12: Graphing and Solving Quadratic Functions	RECOMMENDED TIME FRAME: 17 days

UNIT OVERVIEW

This unit builds off students' experience with quadratic functions. Students have been introduced to the factored form of quadratic functions and will be introduced to standard and vertex form in this unit. Students will make connections between the three forms. They will learn how to solve quadratic equations using a variety of methods including inspection, factoring, completing the square, and using the quadratic formula. They will also be introduced to a number, i, as a solution to the equation, $x^2 = -1$.

STANDARDS

3. Define the imaginary number i such that i^2 = -1.
4. Interpret ~~linear~~, quadratic, and ~~exponential~~ expressions in terms of a context by viewing one or more of their parts as a single entity.
5. Use the structure of an expression to identify ways to rewrite it.
6. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
   a. Factor quadratic expressions with leading coefficients of one and use the factored form to reveal the zeros of the function it defines.
   b. Use the vertex form of a quadratic expression to reveal the maximum or minimum value and the axis of symmetry of the function it defines; complete the square to find the vertex form of quadratics with a leading coefficient of one.
11. Select an appropriate method to solve a quadratic equation in one variable.
   a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – p)^2 = q that has the same solutions. Explain how the quadratic formula is derived from this form.
   b. Solve quadratic equations by inspection (such as x^2 = 49), taking square roots, completing the square, the quadratic formula, and factoring, as appropriate to the initial form of the equation, and recognize that some solutions may not be real.
13. Create equations and ~~inequalities~~ in one variable and use them to solve problems in context, either exactly or approximately. Extend from contexts arising from linear functions to those involving quadratic, exponential, ~~and absolute value~~ functions.
14. Create equations in two or more variables to represent relationships between quantities in context; ~~graph equations on coordinate axes with labels and scales and use them to make predictions.~~ Limit to contexts arising from linear, quadratic, ~~exponential, absolute value, and linear piecewise functions.~~

STANDARDS

15. Represent constraints by equations and/or inequalities, and solve systems of equations and/or inequalities, interpreting solutions as viable or nonviable options in a modeling context. Limit to contexts arising from linear, quadratic, ~~exponential, absolute value, and linear piecewise functions.~~

16.b. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. Limit to linear, quadratic, exponential, and absolute value functions.

20. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x).
    a. Find the approximate solutions of an equation graphically, using tables of values, or finding successive approximations, using technology where appropriate.

22. Solve systems consisting of linear and/or quadratic equations in two variables graphically, using technology where appropriate.

23. Compare properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Include ~~linear~~, quadratic, ~~exponential, absolute value, and linear piecewise.~~

25. Identify the effect on the graph of replacing f (x) by f (x) + k, k·f (x), f (kx), and f (x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and explain the effects on the graph, using technology as appropriate. Extend from linear to quadratic, ~~exponential~~, ~~absolute value, and linear piecewise functions.~~

30. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Note: Key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; symmetries; and end behavior. Extend from relationships that can be represented by linear functions to quadratic, exponential, absolute value, and linear piecewise functions.

32. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
    a. Graph ~~linear and~~ quadratic functions and show intercepts, maxima, and minima.

RESOURCES

Unit 12 Student Progress Monitoring Document

Unit 12 Proficiency Scale

Unit12 Sample Summative Assessment

Unit 12 Sample Summative Assessment Key

ACCELERATED MATH 8

Unit Overview

UNIT 13: Mathematical Modeling	RECOMMENDED TIME FRAME: 12 days

UNIT OVERVIEW

This is a culminating unit for Accelerated Math 8. Students will synthesize all previous work with different types of functions studied during the year. Students will use their knowledge of Linear, Exponential, Absolute Value, Quadratic, and learn about Piecewise Functions. Students will also complete a task that requires students to use the Mathematical Modeling Cycle. More information on the Mathematical Modeling Cycle can be found in the appendix of the Alabama Course of Study.

Students begin this unit by describing behaviors of piecewise functions. Students should already be familiar with how to write the domains using inequalities. Students will then combine their knowledge of writing domains and writing equations of lines from Unit 2 to write linear piecewise functions.

STANDARDS

14. Create equations in two or more variables to represent relationships between quantities in context; graph equations on coordinate axes with labels and scales and use them to make predictions. Limit to contexts arising from linear, quadratic, exponential, absolute value, and linear piecewise functions.

16b. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. Limit to linear, quadratic, exponential, and absolute value functions.

19a. Combine different types of standard functions to write, evaluate, and interpret functions in context. Limit to linear, quadratic, exponential, and absolute value functions. a. Use arithmetic operations to combine different types of standard functions to write and evaluate functions.

25. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k \cdot f(x)$, $f(k \cdot x)$, and $f(x + k)$ for specific values of k. (both positive and negative); find the value of k given the graphs. Experiment with cases and explain the effects on the graph, using technology as appropriate. Limit to linear, quadratic, exponential, absolute value, and linear piecewise functions.

30. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Note: Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; symmetries; and end behavior. Extend from relationships that can be represented by linear functions to quadratic, exponential, absolute value, and linear piecewise functions.

STANDARDS

31. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. Limit to linear, quadratic, exponential, and absolute value functions.
32. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
    a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
    b. Graph piecewise-defined functions, including step functions and absolute value functions.
    c. Graph exponential functions, showing intercepts and end behavior.
33. Use the mathematical modeling cycle to solve real-world problems involving linear, quadratic, exponential, absolute value, and linear piecewise functions.

RESOURCES

Unit 13 Student Progress Monitoring Document

Unit 13 Proficiency Scale

Unit 13 Sample Summative Assessment

Unit 13 Sample Summative Assessment Key