Watson Chapel Jr. High School

Algebra 2 Curriculum Map

2019-2020

Watson Chapel Jr. High School

Algebra II at a Glance

2019-2020

Months	Topics	Standards	Days of Instruction
August/September	**Unit 1** Linear Functions and Equations	HSA.CED.A.1 – 3 HSA. REI.D.11 HSF-IF.B.4 – 6 HSA. REI.D.11 HSA. REI.C.6 HSA. IF.A.3 HSA.BF.A.1-3 HSA. LE.A.2. HSA. IF.C.7 HSA. ID.B.6.A	15 days
September/October	**Unit 2** **Quadratic Functions and Equations**	HSA.CED.A.2 HSA. REI.B.4 HSA. REI.D.11 HSA. REI.C.7 HSS.ID.B.6 HSF-SSE.A.2 HSA. SSE.B.3 HSA.APR.B.3 HSA. CN.A.1 -3 HSA. CN.C.7	15 days
Common Assessments : Unit 1 and Unit 2- October 7th, 2019			
October/November	**Unit 3** Polynomial Functions	HSA.APR.C.4-5 HSA. APR.A.1 HSA.APR.D.6 HSA. BF.A.1; B.3 HSF.IF.C.9 HSF. IF.C.7 HSA-SSE.A.2 HSA. SSE.B.3 HSA.APR.B.2-3 HSA.CN.C.8 - 9 HSF. IF.B.4	15 days
November/December	**Unit 4** Rational Functions	HSA.APR.D.7 HSA. CED.A. 1-2 HSA.APR.D.6 HSA. BF.B.3 HSF. IF.C.7 HSA-SSE.A.2 HSA. REI.A.1-3 HSA. REI.D.11	13 days
Common Assessments : All Five (5) Units- December 11, 2019			
End of 1st Semester December 20, 2019			

Months	Topics	Standards	Days of Instruction
January	**Unit 5** Rational Exponents and Radical Functions	HSN.RN.A.1-2 HSA. REI.A.1-2 HSA.APR.D.6 HSA. BF.A.1; B.4 HSF.IF.B.3-4 HSF. IF.C.7 HSA-SSE.A.1-2 HSA.CED.A.1; A-4	14 days
February	**Unit 6** Exponential and Logarithmic Functions	HSS. ID.B.6,HSF.IF.B.4, HSF.IF.B.5, , HSF.LE.A.2, HSF.LE.A.4, HSA,REI.A.1 HSA.SSE.A.1-3, HSA.SSE.B.4, HSA.CED.A.1, HSF.LE.A.2, HSF.LE.B.5, HSF.IF.B.5-6, HSF.BF.A.1-5, HSF.LE.A.4, HSF.IF.C.8-9, HSF.IF.C.7 HSF.IF.A.3	12-13 days
Common Assessments : Unit 5 and Unit 6 February 20, 2020			
March	**Unit 9** Solving Quadratics Equations	HSG.GPE.A.1 HSG.GPE.A.2 HSG.GPE.A.3 HSA.SSE.A.2 HSA.SSE.B.3. HSA.REI.C.7	16-17 days
April	**Unit 10** Working with Functions	HSN.VM.C.6-12 HSN.VM.A.1-3 HSN.VM.B.4-5 HSA.REI.C.8-9 HSA.CED.A.3	17 days
Common Assessments: All six(6) Units- April 23, 202			
May	**Unit 12** Data Analysis and Statistics	HSN.Q.A.2 HSS.IC.A.1-2 HSS.IC.B.3 HSS.IC.B.3-6 HSS. ID.A.2	14days
Unit 12 Assessments will be included in 9-weeks Examination			
End of 2nd Semester June 1, 2020			

Unit 1 Linear Functions and Systems

Algebra 2 Curriculum Map
Pacing: 15 days (September)

<table>
<tr><td colspan="3">From the previous year, students should know how to:</td></tr>
<tr><td colspan="3">• solve linear equations in two variables; models of linear, quadratic, absolute value functions; key features of the graphs of functions; solve linear systems; evaluate arithmetic/geometric sequences</td></tr>
<tr><td colspan="2">Enduring Understandings

A function can have different rules for different parts of its domain
Relationships between two quantities
Transformation of Graphs
Extend understanding of sequences to that of a series; use sigma notation
The intersection of graphs represents an approximate solution to a linear system</td><td>Essential Questions</td></tr>
<tr><td colspan="3">By the end of this unit, students should know:</td></tr>
<tr><td colspan="3">• A function models a relationship between two quantities; Key features/rules evident in the graph of a function; Identify patterns in Arithmetic and Geometric sequences; Identify and Solve Linear Systems; Demonstrate functional transformations graphically through manipulation of the constants:$f(x) = a * f[b(x - h)] + k$; Extend skill to Piecewise functions
• Increase Understanding to function applications, series, recursive/explicit rules, sigma notation; Master graphic and Algebraic solutions of systems of linear equations and inequalities; provide real-world models; Explore basic structure and function of matrices</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Vocabulary

domain, range, function, transformations, stretch, compression, translation, piecewise, sequence, series, recursive, explicit, sigma notation, matrices.</td><td>Resources

Graphing Utility
Student Text
enVision Algebra 2, Topic 1</td><td>Assessment

Post/Post Unit Assessment; Instructor created Formative assessments; Analysis of student work</td></tr>
</table>

Unit 2 Quadratic Functions and Equations

Algebra 2 Curriculum Map
Pacing: 15 days (Sept/Oct)

<table>
<tr><td colspan="3">From the previous year, students should have mastered:</td></tr>
<tr><td colspan="3">• graphing a quadratic function from the equation; standard and function form of a quadratic; identify key features of the graph of a quadratic; Solve simple quadratic equations with Real zeroes; Use quadratic equations to solve problems.</td></tr>
<tr><td colspan="2">Enduring Understandings

All quadratic functions are transformations of the parent function: $f(x) = x^2$. Use the quadratic formula to solve quadratic equations and identify complex solutions. Solve linear/quadratic systems
Describe the properties of and operations with complex numbers.</td><td>Essential Questions

What are the key features of the equation and graph of a quadratic function? What methods can be used to solve a quadratic equation?</td></tr>
<tr><td colspan="3">By the end of this unit, students should be able to:</td></tr>
<tr><td colspan="3">• graph and factor a quadratic function; know that the solutions of a quadratic function are called zeroes, or roots, and that some can be expressed by numbers that are not Real; perform operations with complex numbers and be able to describe complex numbers in terms of the Real Number System; use the quadratic formula and the process of completing the square to solve quadratic equations; Algebraically solve a linear – quadratic system</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Vocabulary

Parabola, function, quadratic, maximum, vertex, minimum, standard form, imaginary number, vertex form, imaginary unit "i", complex number, zero product property, complex conjugate, discriminant</td><td>Resources

EnVision Student Text Algebra II</td><td>Assessment

Practice and problem solving
Topic review
Mathematical Modeling in 3
Exam view
Diagnostic: Topic Readiness Assessment
Formative: Lesson Quizzes
Summative: Topic Assessment; Topic Performance Assessment</td></tr>
</table>

Unit 3 Polynomial Functions

Algebra 2 Curriculum Map
Pacing: 15 days (October)

<table>
<tr><td colspan="3">From the previous year, students should be able to:
• distinguish among monomial, binomial and polynomial expressions. Definition and classification of a polynomial function; perform basic operations: add, subtract, multiply polynomial expressions; Identify and describe terms, degree and coefficients of a polynomial expression. Identify a polynomial function.</td></tr>
<tr><td colspan="2">Enduring Understandings

The equation of a polynomial function is either a monomial, or the sum of two or more monomials; identify lead coefficient and degree; the zeroes of a polynomial function can be determined by factoring, long, or synthetic division; Given the graph of a polynomial, derive the equation; Simplify polynomials using properties of operations; Rational Root Theorem; Fundamental Theorem of Algebra; Pascal's Triangle; Odd and Even functions; End behavior
Identify and define the key features of a polynomial function; Use polynomial functions to represent and compare real world-situations.</td><td>Essential Questions

How can basic operations be used with polynomials? What tools can be used to determine and understand the zeroes (roots)of a polynomial function and how are roots are related to the lead coefficient and degree?</td></tr>
<tr><td colspan="3">By the end of this unit, students should be able to:
• graph polynomial functions and identify key features; add, subtract, multiply and divide polynomials; use binomial theorem to expand binomials into polynomials; identify the zeroes (roots) of a polynomial functions by factoring, long, and synthetic Division; use zeroes to graph and write the equation of a polynomial; determine Real and Complex solutions to polynomial functions</td></tr>
<tr><td>Vocabulary

Degree, roots, Leading coefficient, even/odd, Relative maximum/minimum, Binomial Theorem, Factor Theorem, Reminder Theorem, zeroes, Synthetic division</td><td>Resources

EnVision Student text Algebra 2
Mathematical modeling in 3</td><td>Assessment
Topic Review
Exam view
Answers and solutions
Assessment resource book
Diagnostic: Topic Readiness Assessment
Formative: Lesson quizzes
Summative: Topic Assessment; Topic Performance Assessment</td></tr>
</table>

Unit 4 Rational Functions

Algebra 2 Curriculum Map
Pacing: 12 Days (Oct/Nov)

<table>
<tr><td colspan="3">From the previous year, students should have mastered:</td></tr>
<tr><td colspan="3">• classifying an expression or function as rational; simplifying and evaluating rational expressions; comparing, ordering, performing operations with rational numbers.</td></tr>
<tr><td colspan="2">Enduring Understandings

Graph functions of the form: $f(x) = \frac{ax+b}{cx+d}$; perform operations upon rational expressions using properties of rational numbers; Identify the parent form of a rational function as $f(x) = \frac{1}{x}$.; and the transformative model: $f(x) = \frac{a}{x-h} + k$., to re-write, simplify and evaluate rational functions.</td><td>Essential Questions

How do the asymptotes of a rational function aid in the graphing of the function?
What properties of rational numbers are utilized when adding subtracting, multiplying and dividing rational expressions?
How are some solutions characterized as extraneous?
Why are rational functions often referred to as being reciprocal functions?</td></tr>
<tr><td colspan="3">By the end of this unit, students should be able to:</td></tr>
<tr><td colspan="3">• perform all arithmetical operations between rational expressions using the properties of rational numbers; graph rational functions to model real-life situations and specify the domain; Solve rational equations; Evaluate rational expressions and functions; be able to check actual and extraneous solutions by graphing.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Vocabulary

Rational, Asymptote, fraction, compound fraction, constant of variation, Inverse variation, reciprocal function, Extraneous solution</td><td>Resources

enVision Student text Algebra II
On-Line practice
Math modeling in three</td><td>Assessment

Topic review
Exam view
Assessment book
Lesson practice
Diagnostic: Topic Readiness assessment
Formative: Re-teach to build understanding; Lessons 1 – 5; Lesson quizzes
Summative: Topic Performance Assessment</td></tr>
</table>

Unit 5 Rational Exponents and Radical Functions

Algebra 2 Curriculum Map
Pacing: 14 days (Nov/Dec)

<table>
<tr><td colspan="3">From the previous year, students should have mastered:</td></tr>
<tr><td colspan="3">• properties and applications of square and cubic roots; perform operations with radical expressions, including simplification; simplify monomial expressions; evaluate monomial expressions with integer exponents; describe the domain and range of a given function; comprehend and apply the rules of exponents</td></tr>
<tr><td colspan="2">Enduring Understandings

Parent function of a radical function:$g(x) = \sqrt[n]{x}$, expands to a transformative model: $f(x) = a\sqrt[n]{x-h}+k$; rational exponents and roots represent the number of roots in a given polynomial function; use properties of radicals and exponents to rewrite and solve a radical equation; functions can be combined by arithmetic operations and functional composition

Explain the necessity of rewriting radical expressions that involve rational exponents; be able to explain the change in the domain from an original function to its composite.</td><td>Essential Questions

why can potential solutions to an equation not be actual solutions of the original equation?</td></tr>
<tr><td colspan="3">By the end of this unit, students should be able to:</td></tr>
<tr><td colspan="3">• understand the properties of rational exponents and radicals; graph radical functions; solve radical equations and combine functions; identify inverses and be able to write the equations of inverse functions</td></tr>
<tr><td colspan="3">.</td></tr>
<tr><td>Vocabulary
Index, nth root of exponents, Radicand, inverse relation, Composite function, inverse function, Radical function, radical</td><td>Resources

Student edition enVision Algebra 2
Math Modeling in three acts</td><td>Assessment

Assessment resource book
Topic review
Diagnostic: Topic readiness assessment
Formative: Lesson quizzes
Summative: Topic performance assessment.</td></tr>
</table>

Algebra I Curriculum Map

Unit 6: Exponents and Exponential Functions

Pacing: 12 – 13 Days ()

<table>
<tr><td colspan="2">From the previous year, students should have mastered:</td></tr>
<tr><td colspan="2">Creating and solving linear equations. How to graph coordinate pairs and linear equations written in different forms.</td></tr>
<tr><td>Enduring Understandings</td><td>Essential Questions</td></tr>
<tr><td>• Solving equations with rational exponents.
• Writing formulas for geometric sequences.
• Creating and solving exponential models for real-world problems.
• Applying their knowledge when they graph exponential functions.
• Writing exponential functions using function notation and transform exponential functions.</td><td>• How do you use exponential functions to model situations and solve problems?</td></tr>
<tr><td colspan="2">By the end of this unit, students should be able to:</td></tr>
<tr><td colspan="2">• Extend the properties of integer exponents to rational exponents to rewrite radical expressions using rational exponents.
• Solve equations with rational exponents using the properties of exponents.
• Sketch graphs showing key features of exponential exponents.
• Write exponential functions using tables and graphs.
• Compare linear and exponential functions.
• Construct exponential growth and decay functions given a description of a relationship.
• Recognize if a situation can be modeled with exponential growth or exponential decay, and interpret the parameters of the model in context.
• Find explicit and recursive formulas for geometric sequences.
• Translate between recursive and explicit formulas for geometric sequences.
• Construct exponential functions to represent geometric sequences.
• Translate the graph of an exponential function vertically and horizontally, identifying the effect different values of h and k have on a graph of the function.
• Compare characteristics of two exponential functions represented in different ways, such as tables and graphs.
• Use mathematical modeling to represent a problem situation and to propose a solution.
• Test and verify the appropriateness of their math models.
• Explain why the results from a mathematical model might not align exactly with the problem situation.</td></tr>
</table>

Learning Standards

HSN.RN.A.1 – HSN.RN.A.2 – HSF.IF.B.4 - HSF.IF.B.5 – HSF.BF.A.1 – HSF.LE.A.1 - HSF.LE.A.1.A – HSN.Q.A.3 – HSA.SSE.A.1.B - HSA.SSE.B.3.C – HSA.CED.A.2 - HSF.LE.A.2 - HSF.LE.B.5 - HSF.IF.A.3 – HSF.BF.A.2 - HSF.LE.A.2 - HSF.IF.C.9 - HSA.SSE.B.3

- **F-IF.B:** edited the "Interpreting Functions" cluster heading to clarify the model Algebra I course is limited to interpreting linear, quadratic, and exponential functions.

MP.1: Make sense of problems and persevere in solving them and MP.8: Look for and express regularity and repeated reasoning.

Vocabulary	Resources	Assessment
rational exponent asymptote constant ratio exponential function component interest decay factor exponential decay exponential growth growth factor geometric sequence	enVision Algebra 1 – Volume 1 - Topic 6 Math modeling in 3 acts Vocabulary support Topic Review Graphing technology activities Formative assessments (admit and exit tickets) Reteach and build understandings Additional practice Readiness assessment Lesson quizzes Assessments Form A and B enVision STEM	Topic Review Topic Readiness Assessment Topic Performance Assessment Topic Assessment Forms A and B Formative assessments (admit and exit tickets) Lesson quizzes Topic assessment

Unit 9 Conic Sections

Algebra 2 Curriculum Map
Pacing: 10 days (Feb/Mar)

<table>
<tr><td colspan="3">From the previous year, students should have mastered:</td></tr>
<tr><td colspan="3">• characteristics of a circle; Characteristics of a parabola; Parabolic(Quadratic) equations.</td></tr>
<tr><td colspan="2">Enduring Understandings

Standard forms of a second-degree equation and the graphs; classification of second-degree equations; real-worldexamples and features of specific conic sections: circle, ellipse, parabola, hyperbola…wheel, planetary orbit, parabolic reflector, telescope w/double mirrors, e.g.

Through a diagram of conic sections: circle, ellipse, parabola, hyperbola create a table to classify the equations of such as second –degree equations in general form; define and categorize conic sections in descriptive language, symbolic (Algebraic) format, graphic representation, and numerical examples.</td><td>Essential Questions</td></tr>
<tr><td colspan="3">By the end of this unit, students should be able to:
• derive the equations of conic sections when given specific values for the key features of a designated conic section; Create a graph of a circle, ellipse, parabola, and hyperbola, labeling key features; connect the equation and diagram of a conic section with real –world referents.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Vocabulary

Conic section, directrix, focal length, major/minor axis, foci, focus (parabola), Ellipse, transverse axis, conjugate axis, vertex</td><td>Resources

Student version EnVision text Ch. 9
Lessons 9.1 – 9.4
Math modeling in 3; lesson 9.2</td><td>Assessment
Topic review
Answers and solution
Graphing utility
Exam view
Diagnostic: Topic readiness assessment
Formative: Lesson quizzes
Summative: Topic performance assessment</td></tr>
</table>

Unit 10 Matrices

Algebra 2 Curriculum Map
Pacing: 12 days (March)

From the previous year, students should have mastered:

- arithmetical operations with Integers and signed rational numbers; solve linear systems in two variables, three methods: graphing, substitution, combination

Enduring Understandings	Essential Questions
Add, subtract and multiply matrices; perform arithmetical operations with and transform vectors; Solve linear systems using Cramer's rule and augmented matrices; use matrices as a method of displaying and organizing data Use a determinant to create inverse and identity matrices. The use of matrices is a fourth method applied to solve linear systems. Employ a matrix to organize and display data.	What are the constraints on arithmetic operations when applied to matrix operations?

By the end of this unit, students should be able to:

- use matrices to organize data; perform operations with matrices: add, subtract, multiply, multiply by a scalar factor; solve a linear system in two or three variables; Know that a vector in the plane has two qualities: direction and magnitude; perform arithmetical operations with vectors; prove that a matrix is the inverse of another by obtaining an identity matrix when both are multiplied.

Vocabulary		Resources	Assessment
Matrix	square matrix		
Identity matrix	initial point	Mathematical modeling in 3	Topic review
Vector	terminal point	EnVision Student text Algebra 2	Lessons 10.1 – 10.5
Direction	determinant		Exam view
Magnitude	constant matrix		Diagnostic: Topic Readiness
Inverse matrix	variable matrix		Assessment
Zero matrix	scalar		Formative: Assessment book; Lesson Quizzes
			Summative: Topic Performance Assessment

Unit 12 Probability

Algebra 2 Curriculum Map
Pacing: 14 days (April/May)

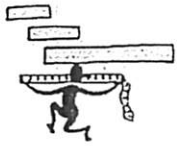
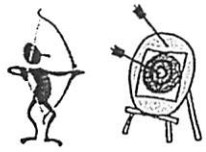
<table>
<tr><td colspan="3">From the previous year, students should have mastered:</td></tr>
<tr><td colspan="3">• theoretical and experimental probability; counting principle to determine all possible events; concept of dependent and independent events; calculate odds; represent probability of an event numerically as a ratio.</td></tr>
<tr><td colspan="2">Enduring Understandings

Comprehend and describe the difference among dependent, independent, and mutually exclusive events; Define theoretical probability in terms of experimental probability; interpret independent events in terms of conditional probability

Utilize mathematical notation to express whether an event is dependent or independent; compare and contrast permutation and combination, demonstrate models of each; understand that expected value is the average of all possible values of a variable, interpreted as the average outcome for many trials of an experiment.</td><td>Essential Questions</td></tr>
<tr><td colspan="3">By the end of this unit, students should be able to:</td></tr>
<tr><td colspan="3">• explain the dependence of events; discuss and demonstrate the probability of the union and intersection of two independent events; use mathematical modeling to represent conditional probability; calculate the number of permutations and combinations in mathematical and real-world contexts; evaluate, calculate and graph probability distribution;
• calculate expected value in situations involving chance.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Vocabulary
Independent/dependent events, Conditional/binomial probability, Combination, permutation, factorial, expected value, fundamental counting principle</td><td>Resources

Mathematical modeling in three
Re-teach for understanding
EnVision student text</td><td>Assessment

Topic review
Assessment book
Exam view
Diagnostic: Topic Readiness assessment
Formative: Lesson Quizzes, 12.1 – 12.6
Summative: Topic performance assessment</td></tr>
</table>

Standard for Mathematical Practice	Student Friendly Language
1. Make sense of problems and persevere in solving them. 	• I can try many times to understand and solve a math problem.
2. Reason abstractly and quantitatively. 	• I can think about the math problem in my head, first.
3. Construct viable arguments and critique the reasoning of others. 	• I can make a plan, called a strategy, to solve the problem and discuss other students' strategies too.
4. Model with mathematics. 	• I can use math symbols and numbers to solve the problem.
5. Use appropriate tools strategically. 	• I can use math tools, pictures, drawings, and objects to solve the problem.
6. Attend to precision. 	• I can check to see if my strategy and calculations are correct.
7. Look for and make use of structure 	• I can use what I already know about math to solve the problem.
8. Look for and express regularity in repeated reasoning. 	• I can use a strategy that I used to solve another math problem.

Mathematics Practices		Students:	Teacher(s):
Modeling and Using Tools	4. Model with mathematics	☐ Apply prior knowledge to solve real world problems ☐ Identify important quantities and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts, and/or formulas ☐ Use assumptions and approximations to make a problem simpler ☐ Check to see if an answer makes sense within the context of a situation and change a model when necessary Comments:	☐ Use mathematical models appropriate for the focus of the lesson ☐ Encourage student use of developmentally and content-appropriate mathematical models (e.g., variables, equations, coordinate grids) ☐ Remind students that a mathematical model used to represent a problem's solution is 'a work in progress,' and may be revised as needed Comments:
	5. Use appropriate tools strategically	☐ Make sound decisions about the use of specific tools (Examples might include: calculator, concrete models, digital technologies, pencil/paper, ruler, compass, protractor) ☐ Use technological tools to visualize the results of assumptions, explore consequences, and compare predications with data ☐ Identify relevant external math resources (digital content on a website) and use them to pose or solve problems ☐ Use technological tools to explore and deepen understanding of concepts Comments:	☐ Use appropriate physical and/or digital tools to represent, explore and deepen student understanding ☐ Help students make sound decisions concerning the use of specific tools appropriate for the grade level and content focus of the lesson ☐ Provide access to materials, models, tools and/or technology-based resources that assist students in making conjectures necessary for solving problems Comments:
Seeing structure and generalizing	7. Look for and make use of structure	☐ Look for patterns or structure, recognizing that quantities can be represented in different ways ☐ Recognize the significance in concepts and models and use the patterns or structure for solving related problems ☐ View complicated quantities both as single objects or compositions of several objects and use operations to make sense of problems Comments:	☐ Engage students in discussions emphasizing relationships between particular topics within a content domain or across content domains ☐ Recognize that they quantitative relationships modeled by operations and their properties remain important regardless of the operational focus of a lesson ☐ Provide activities in which students demonstrate their flexibility in representing mathematics in a number of ways e.g., 76 = (7 x 10) + 6; discussing types of quadrilaterals, etc. Comments:
	8. Look for and express regularity in repeated reasoning	☐ Notice repeated calculations and look for general methods and shortcuts ☐ Continually evaluate the reasonableness of intermediate results (comparing estimates), while attending to details, and make generalizations based on findings Comments:	☐ Engage students in discussion related to repeated reasoning that may occur in a problem's solution ☐ Draw attention to the prerequisite steps necessary to consider when solving a problem ☐ Urge students to continually evaluate the reasonableness of their results Comments:

Engaging in the Mathematical Practices (Look-fors)

	Mathematics Practices	Students:	Teachers:
Overarching habits of mind of a productive math thinker	1. Make sense of problems and persevere in solving them	☐ Understand the meaning of the problem and look for entry points to its solution ☐ Analyze information (givens, constrains, relationships, goals) ☐ Make conjectures and plan a solution pathway ☐ Monitor and evaluate the progress and change course as necessary ☐ Check answers to problems and ask, "Does this make sense?" Comments:	☐ Involve students in rich problem-based tasks that encourage them to persevere in order to reach a solution ☐ Provide opportunities for students to solve problems that have multiple solutions ☐ Encourage students to represent their thinking while problem solving Comments:
	6. Attend to precision	☐ Communicate precisely using clear definitions ☐ State the meaning of symbols, carefully specifying units of measure, and providing accurate labels ☐ Calculate accurately and efficiently, expressing numerical answers with a degree of precision ☐ Provide carefully formulated explanations ☐ Label accurately when measuring and graphing Comments:	☐ Emphasize the importance of precise communication by encouraging students to focus on clarity of the definitions, notation, and vocabulary used to convey their reasoning ☐ Encourage accuracy and efficiency in computation and problem-based solutions, expressing numerical answers, data, and/or measurements with a degree of precision appropriate for the context of the problem Comments:
Reasoning and Explaining	2. Reason abstractly and quantitatively	☐ Make sense of quantities and relationships in problem situations ☐ Represent abstract situations symbolically and understand the meaning of quantities ☐ Create a coherent representation of the problem at hand ☐ Consider the units involved ☐ Flexibly use properties of operations Comments:	☐ Facilitate opportunities for students to discuss or use representations to make sense of quantities and their relationships ☐ Encourage the flexible use of properties of operations, objects, and solution strategies when solving problems ☐ Provide opportunities for students to decontextualize (abstract a situation) and/or contextualize (identify referents for symbols involved) the mathematics they are learning Comments:
	3. Construct viable arguments and critique the reasoning of others	☐ Use definitions and previously established causes/effects (results) in constructing arguments ☐ Make conjectures and use counterexamples to build a logical progression of statements to explore and support ideas ☐ Communicate and defend mathematical reasoning using objects, drawings, diagrams, and/or actions ☐ Listen to or read the arguments of others ☐ Decide if the arguments of others make sense and ask probing questions to clarify or improve the arguments Comments:	☐ Provide and orchestrate opportunities for students to listen to the solution strategies of others, discuss alternative solutions, and defend their ideas ☐ Ask higher-order questions which encourage students to defend their ideas ☐ Provide prompts that encourage students to think critically about the mathematics they are learning Comments:

 * All indicators are not necessary for providing full evidence of practice(s). Each practice may not be evident during every lesson.

Algebra II
Content Standards
2016

Compiled using the Arkansas Mathematics Standards

Course Title:	Algebra II
Course/Unit Credit:	1
Course Number:	432000
Teacher Licensure:	Please refer to the Course Code Management System (https://adedata.arkansas.gov/ccms/) for the most current licensure codes.
Grades:	9-12
Prerequisite:	Algebra I or Algebra A/B

Course Description: "Building on their work with linear, quadratic, and exponential functions, students extend their repertoire of functions to include polynomial, rational, and radical functions. Students work closely with the expressions that define the functions, and continue to expand and hone their abilities to model situations and to solve equations, including solving quadratic equations over the set of complex numbers and solving exponential equations using the properties of logarithms.

This document was created to delineate the standards for this course in a format familiar to the educators of Arkansas. For the state-provided Algebra A/B, Algebra I, Geometry A/B, Geometry, and Algebra II documents, the language and structure of the Arkansas Mathematics Standards (AMS) have been maintained. The following information is helpful to correctly read and understand this document.

> "**Standards** define what students should understand and be able to do.
> **Clusters** are groups of related standards. Note that standards from different clusters may sometimes be closely related, because mathematics is a connected subject.
> **Domains** are larger groups of related standards. Standards from different domains may sometimes be closely related." - http://www.corestandards.org/

Standards do not dictate curriculum or teaching methods. For example, just because topic A appears before topic B in the standards for a given grade, it does not necessarily mean that topic A must be taught before topic B. A teacher might prefer to teach topic B before topic A, or might choose to highlight connections by teaching topic A and topic B at the same time. Or, a teacher might prefer to teach a topic of his or her own choosing that leads, as a byproduct, to students reaching the standards for topics A and B.

Notes:

1. Teacher notes offer clarification of the standards.
2. The Plus Standards (+) from the Arkansas Mathematics Standards may be incorporated into the curriculum to adequately prepare students for more rigorous courses (e.g., Advanced Placement, International Baccalaureate, or concurrent credit courses).
3. Italicized words are defined in the glossary.
4. All items in a bulleted list must be taught.
5. Asterisks (*) identify potential opportunities to integrate content with the modeling practice.

The following abbreviations are for the conceptual categories and domains for the Arkansas Mathematics Standards. For example, the standard HSN.RN.B.3 is in the High School Number and Quantity conceptual category and in The Real Number System domain.

High School Number and Quantity – HSN
- The Real Number System – RN
- Quantities – Q
- The Complex Number System – CN
- Vectors and Matrix Quantities – VM

High School Algebra – HSA
- Seeing Structure in Expressions – SSE
- Arithmetic with Polynomials and Rational Expressions – APR
- Creating Equations – CED
- Reasoning with Equations and Inequalities – REI

High School Functions – HSF
- Interpreting Functions – IF
- Building Functions – BF
- Linear, Quadratic and Exponential Models – LE
- Trigonometric Functions – TF

High School Geometry – HSG
- Congruence – CO
- Similarity, Right Triangles, and Trigonometry – SRT
- Circles – C
- Expressing Geometric Properties with Equations – GPE
- Geometric Measurement and Dimension – GMD
- Modeling with Geometry – MG

High School Statistics and Probability – HSS
- Interpreting Categorical and Quantitative Data – ID
- Making Inferences and Justifying Conclusions – IC
- Conditional Probability and the Rules of Probability – CP
- Using Probability to Make Decisions – MD

Domain	Cluster
The Real Number System	
	1. Extend the properties of exponents to rational exponents
	2. Use properties of rational and irrational numbers
Quantities	
	3. Reason quantitatively and use units to solve problems
The Complex Number System	
	4. Perform arithmetic operations with complex numbers
	5. Use complex numbers in polynomial identities and equations
Vector and Matrix Quantities	
	6. Perform operations on matrices and use matrices in applications
Seeing Structure in Expressions	
	7. Interpret the structure of expressions
	8. Write expressions in equivalent forms to solve problems
Arithmetic with Polynomials and Rational Expressions	
	9. Perform arithmetic operations on polynomials
	10. Understand the relationship between zeros and factors of polynomials
	11. Use polynomial identities to solve problems
	12. Rewrite rational expressions
Creating Equations	
	13. Create equations that describe numbers or relationships
Reasoning with Equations and Inequalities	
	14. Understand solving equations as a process of reasoning and explain the reasoning
	15. Solve equations and inequalities in one variable
	16. Solve systems of equations and inequalities graphically.
	17. Solve systems of equations
Interpreting Functions	
	18. Understand the concept of a function and use function notation
	19. Interpret functions that arise in applications in terms of the context
	20. Analyze functions using different representations
Building Functions	
	21. Build a function that models a relationship between two quantities
	22. Build new functions from existing functions
Linear, Quadratic, and Exponential Models	
	23. Construct and compare linear, quadratic, and exponential models and solve problems

Expressing Geometric Properties with Equations	
	24. Translate between the geometric description and the equation of a conic section
Interpreting Categorical and Quantitative Data	
	25. Summarize, represent, and interpret data on a single count or measurement variable
	26. Summarize, represent, and interpret data on two *categorical* and quantitative variables
Making Inferences and Justifying Conclusions	
	27. Understand and evaluate random processes underlying statistical experiments
	28. Make inferences and justify conclusions from sample surveys, experiments and observational studies

Domain: The Real Number System

Cluster(s): 1. Extend the properties of exponents to rational exponents
2. Use properties of rational and irrational numbers

HSN.RN.A.1	1	Explain how extending the properties of integer exponents to rational exponents provides an alternative notation for radicals For example: We define $5^{4/3}$ to be the cube root of 5^4 because we want $(5^{4/3})^{3/4} = 5$ to hold.
HSN.RN.A.2	1	Rewrite expressions involving radicals and rational exponents using the properties of exponents
HSN.RN.B.4	2	• Simplify *radical expressions* • Perform operations (add, subtract, multiply, and divide) with *radical expressions* • Rationalize denominators and/or numerators

Domain: Quantities

Cluster(s): 3. Reason quantitatively and use units to solve problems

HSN.Q.A.2	3	Define appropriate quantities for the purpose of descriptive modeling (i.e., use units appropriate to the problem being solved)

Domain: The Complex Number System

Cluster(s): 4. Perform arithmetic operations with complex numbers

5. Use complex numbers in polynomial identities and equations

HSN.CN.A.1	4	Know there is a *complex number i* such that $i^2 = -1$, and every *complex number* has the form $a + bi$ with a and b real
HSN.CN.A.2	4	Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply *complex numbers*
HSN.CN.A.3	4	• Find the conjugate of a *complex number* • Use conjugates to find quotients of *complex numbers*
HSN.CN.C.7	5	Solve quadratic equations with real coefficients that have real or complex solutions
HSN.CN.C.8	5	(+) Extend polynomial identities to the *complex numbers* For example: Rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$.
HSN.CN.C.9	5	• (+) Know the Fundamental Theorem of Algebra • (+) Show that it is true for quadratic polynomials

Domain: Vector and Matrix Quantities

Cluster(s): 6. Perform operations on matrices and use matrices in applications

HSN.VM.C.6	6	(+) Use matrices to represent and manipulate data (e.g., to represent payoffs or incidence relationships in a network)
HSN.VM.C.7	6	(+) Multiply matrices by scalars to produce new matrices (e.g., as when all of the payoffs in a game are doubled)
HSN.VM.C.8	6	(+) Add, subtract, and multiply matrices of appropriate dimensions
HSN.VM.C.9	6	(+) Understand that, unlike multiplication of numbers, *matrix* multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties
HSN.VM.C.10	6	Understand that: • (+) The zero and identity matrices play a role in *matrix* addition and multiplication similar to the role of 0 and 1 in the real numbers • (+)The *determinant* of a square *matrix* is nonzero if and only if the *matrix* has a multiplicative inverse
HSN.VM.C.12	6	(+) Work with 2 × 2 matrices as transformations of the plane, and interpret the absolute value of the *determinant* in terms of area

Domain: Seeing Structure in Expressions
Cluster(s): 7. Interpret the structure of expressions
8. Write expressions in equivalent forms to solve problems

HSA.SSE.A.1	7	Interpret expressions that represent a quantity in terms of its context • Interpret parts of an expression using appropriate vocabulary, such as terms, factors, and coefficients • Interpret complicated expressions by viewing one or more of their parts as a single entity For example: Interpret $P(1 + r)^n$ as the product of P and a factor not depending on P.
HSA.SSE.A.2	7	Use the structure of an expression to identify ways to rewrite it For example: See that $(x + 3)(x + 3)$ is the same as $(x + 3)^2$ or $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.
HSA.SSE.B.3	8	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression • Factor a quadratic expression to reveal the *zeros* of the function it defines • Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines Note: Students should be able to identify and use various forms of a quadratic expression to solve problems. o Standard Form: $ax^2 + bx + c$ o Factored Form: $a(x - r_1)(x - r_2)$ o Vertex Form: $a(x - h)^2 + k$ • Use the properties of exponents to transform expressions for exponential functions For example: The expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is *15%*.

Domain: Arithmetic with Polynomials and Rational Expressions

Cluster(s): 9. Perform arithmetic operations on polynomials
10. Understand the relationship between zeros and factors of polynomials
11. Use polynomial identities to solve problems
12. Rewrite rational expressions

HSA.APR.A.1	9	• Add, subtract, and multiply polynomials • Understand that polynomials, like the integers, are **closed** under addition, subtraction, and multiplication Note: If p and q are polynomials $p + q$, $p - q$, and pq are also polynomials
HSA.APR.B.2	10	Know and apply the Factor and Remainder Theorems: for a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$
HSA.APR.B.3	10	• Identify *zeros* of polynomials when suitable factorizations are available • Use the *zeros* to construct a rough graph of the function defined by the polynomial Note: Algebra I is limited to the use of quadratics.
HSA.APR.C.4	11	Prove polynomial identities and use them to describe numerical relationships Note: Examples of Polynomial Identities may include but are not limited to the following: • $(a + b)^2 = a^2 + 2ab + b^2$ (Algebra 1) • $a^2 - b^2 = (a - b)(a + b)$ (Algebra 1) • $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples (Algebra 2).
HSA.APR.D.6	12	Rewrite simple *rational expressions* in different forms; write $^{a(x)}/_{b(x)}$ in the form $q(x) + {}^{r(x)}/_{b(x)}$, (where $a(x)$ is the dividend, $b(x)$ is the divisor, $q(x)$ is the quotient, and $r(x)$ is the remainder) are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system For example: $\frac{3x^3-5x^2+10x-3}{3x+1} = x^2-2x+4+\frac{-7}{3x+1}$ Note: Students should understand that this method of dividing polynomials can be used for any polynomial expression, but that synthetic division should only be used when the divisor is a first-degree polynomial. Students should also recognize that when using synthetic division with a first-degree polynomial divisor that has a leading coefficient other than one, (such as $3x + 1$, where $x = -1/3$ is the "synthetic divisor" as in the example above), that the denominator of the "synthetic divisor" must be factored out of the quotient and multiplied by the divisor after the synthetic division has taken place.
HSA.APR.D.7	12	• Add, subtract, multiply, and divide by nonzero *rational expressions* • Understand that *rational expressions*, like the integers, are closed under addition, subtraction, and multiplication

Domain: Creating Equations

Cluster(s): 13. Create equations that describe numbers or relationships

HSA.CED.A.1	13	Create equations and inequalities in one variable and use them to solve problems Note: Including but not limited to equations arising from: • *Linear functions* • *Quadratic functions* • Simple *rational functions* • *Exponential functions* • *Absolute value functions*
HSA.CED.A.2	13	• Create equations in two or more variables to represent relationships between quantities • Graph equations, in two variables, on a coordinate plane
HSA.CED.A.3	13	• Represent and interpret constraints by equations or inequalities, and by *systems of equations* and/or inequalities • Interpret solutions as viable or nonviable options in a modeling and/or real-world context
HSA.CED.A.4	13	Rearrange *literal equations* using the properties of equality

Domain: Reasoning with Equations and Inequalities

Cluster(s): 14. Understand solving equations as a process of reasoning and explain the reasoning
15. Solve equations and inequalities in one variable
16. Solve systems of equations and inequalities graphically.
17. Solve systems of equations

HSA.REI.A.1	14	Assuming that equations have a solution, construct a solution and justify the reasoning used Note: Students are not required to use only one procedure to solve problems nor are they required to show each step of the process. Students should be able to justify their solution in their own words.
HSA.REI.A.2	14	Solve simple rational and radical equations in one variable, and give examples showing how *extraneous solutions* may arise For example: The area of a square equals 49 square inches. The length of the side is 7 inches. Although -7 is a solution to the equation, $x^2 = 49$, -7 is an extraneous solution.
HSA.REI.B.4	15	Solve quadratic equations in one variable • 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 Note: This would be a good opportunity to demonstrate/explore how the quadratic formula is derived. This standard also connects to the transformations of functions and identifying key features of a graph (F-BF3). Introduce this with a leading coefficient of 1 in Algebra I. Finish mastery in Algebra II. • Solve quadratic equations (as appropriate to the initial form of the equation) by: o Inspection of a graph o Taking square roots o Completing the square o Using the quadratic formula o Factoring Recognize complex solutions and write them as $a \pm bi$ for real numbers a and b

Domain: Reasoning with Equations and Inequalities
Cluster(s): 14. Understand solving equations as a process of reasoning and explain the reasoning
15. Solve equations and inequalities in one variable
16. Solve systems of equations and inequalities graphically.
17. Solve systems of equations

HSA.REI.C.5	16	• Solve *systems of equations* in two variables using substitution and elimination • Understand that the solution to a system of equations will be the same when using substitution and elimination
HSA.REI.C.6	16	Solve *systems of equations* algebraically and graphically
HSA.REI.C.7	16	Solve *systems of equations* consisting of linear equations and nonlinear equations in two variables algebraically and graphically For example: Find the points of intersection between $y = -3x$ and $y = x^2 + 2$.
HSA.REI.C.8	16	(+) Represent a system of linear equations as a single matrix equation in a vector variable
HSA.REI.C.9	16	(+) Find the inverse of a *matrix (matrix inverse)* if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater)
HSA.REI.D.11	17	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 $f(x) = g(x)$; Find the solutions approximately by: • Using technology to graph the functions • Making tables of values • Finding successive approximations Include cases (but not limited to) where $f(x)$ and/or $g(x)$ are: • *Linear* • *Polynomial* • *Rational* • *Exponential* (Introduction in Algebra 1, Mastery in Algebra 2) • *Logarithmic functions* Teacher notes: Modeling should be applied throughout this standard.
HSA.REI.D.12	17	Solve linear inequalities and systems of linear inequalities in two variables by graphing

Domain: Interpreting Functions

Cluster(s): 18. Understand the concept of a function and use function notation
19. Interpret functions that arise in applications in terms of the context
20. Analyze functions using different representations

HSF.IF.A.3	18	Recognize that sequences are functions, sometimes defined *recursively*, whose domain is a subset of the integers. For example: The Fibonacci sequence is defined *recursively* by $f(0) = f(1) = 1$, $f(n + 1) = f(n) + (n - 1)$ *for* $n \geq 1$.
HSF.IF.B.4	19	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 may include but not limited to: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; *end behavior*; and periodicity.
HSF.IF.B.6	19	• Calculate and interpret the average rate of change of a function (presented algebraically or as a table) over a specified interval • Estimate the rate of change from a graph
HSF.IF.C.7	20	Graph functions expressed algebraically and show key features of the graph, with and without technology: • Graph *polynomial functions*, identifying *zeros* when suitable factorizations are available, and showing *end behavior* • (+) Graph *rational functions*, identifying *zeros* and asymptotes when suitable factorizations are available, and showing *end behavior* • Graph *exponential* and *logarithmic functions*, showing intercepts and *end behavior* • (+) Graph *trigonometric functions*, showing *period*, *midline*, and *amplitude*
HSF.IF.C.8	20	Write expressions for functions in different but equivalent forms to reveal key features of the function • Use the properties of exponents to interpret expressions for *exponential functions* Note: Connection to A.SSE.B.3 Note: Various forms of exponentials might include representing the base as $1 \pm r$, where r is the rate of growth or decay.

Domain: Building Functions

Cluster(s): 21. Build a function that models a relationship between two quantities
22. Build new functions from existing functions

HSF.BF.A.1	21	Write a function that describes a relationship between two quantities • From a context, determine an explicit expression, a recursive process, or steps for calculation • Combine standard function types using arithmetic operations. (e.g., given that *f(x)* and *g(x)* are functions developed from a context, find *(f + g)(x), (f – g)(x), (fg)(x), (f/g)(x),* and any combination thereof, given *g(x)* ≠ 0.*)* • Compose functions
HSF.BF.A.2	21	• Write *arithmetic* and *geometric sequences* both *recursively* and with an explicit formula, and translate between the two forms • Use *arithmetic* and *geometric sequences* to model situations
HSF.BF.B.3	22	• Identify the effect on the graph of replacing *f(x)* by *f(x) + k, kf(x), f(kx)* and *f(x + k)* for specific values of *k* (*k.* a constant both positive and negative); • Find the value of *k* given the graphs of the transformed functions • Experiment with multiple transformations and illustrate an explanation of the effects on the graph with or without technology Note: Include recognizing *even* and *odd functions* from their graphs and algebraic expressions for them.
HSF.BF.B.4	22	Find *inverse* functions. • Solve an equation of the form *y = f(x)* for a simple function *f* that has an *inverse* and write an expression for the *inverse* For example, $f(x) = 2x^2$ *or* $f(x) = (x+1)/(x-1)$ for $x \neq 1$. • Verify by *composition* that one function is the *inverse* of another (Algebra II) • Read values of an inverse function from a graph or a table, given that the function has an *inverse* (Algebra II) • (+) Produce an invertible function from a non-invertible function by restricting the domain
HSF.IF.B.5	22	• Relate the domain of a function to its graph • Relate the domain of a function to the quantitative relationship it describes For example: If the function *h(n)* gives the number of person-hours it takes to assemble *n* engines in a factory, then the positive integers would be an appropriate domain for the function.

Domain: Linear, Quadratic, and Exponential Models
Cluster(s): 23. Construct and compare linear, quadratic, and exponential models and solve problems

HSF.LE.A.2	23	Construct linear and exponential equations, including *arithmetic* and *geometric sequences*, • given a graph, • a description of a relationship, or • two input-output pairs (include reading these from a table)
HSF.LE.A.4	23	• Express exponential models as logarithms • Express logarithmic models as exponentials • Use properties of logarithms to simplify and evaluate logarithmic expressions (expanding and/or condensing logarithms as appropriate) • Evaluate logarithms with or without technology Note: For exponential models, express the solution to $ab^{ct} = d$ where *a*, *c*, and *d* are constants and *b* is the base (Including, but not limited to: 2, 10, or *e*) as a logarithm; then evaluate the logarithm with or without technology. Connection to F.BF.B.5

Domain: Expressing Geometric Properties with Equations
Cluster(s): 24. Translate between the geometric description and the equation of a conic section

HSG.GPE.A.2	24	(+) Derive the equation of a parabola given a focus and directrix

Domain: Interpreting Categorical and Quantitative Data

Cluster(s): 25. Summarize, represent, and interpret data on a single count or measurement variable
26. Make inferences and justify conclusions from sample surveys, experiments and observational studies

HSS.ID.A.4	25	• Use the mean and *standard deviation* of a data set to fit it to a normal distribution and to estimate population percentages • Recognize that there are data sets for which such a procedure is not appropriate. • Use calculators and/or spreadsheets to estimate areas under the normal curve Note: Limit area under the curve to the empirical rule (68-95-99.7) to estimate the percent of a normal population that falls within 1, 2, or 3 *standard deviations* of the mean. Also, recognize that normal distributions are only appropriate for unimodal and symmetric shapes.
HSS.ID.B.6	26	Represent data on two *quantitative variables* on a scatter plot, and describe how the variables are related • Fit a function to the data; use functions fitted to data to solve problems in the context of the data Note: Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. The focus of Algebra I should be on linear and exponential models while the focus of Algebra II is more on quadratic and exponential models.

Domain: Making Inferences and Justifying Conclusions

Cluster(s): 27. Understand and evaluate random processes underlying statistical experiments

28. Make inferences and justify conclusions from sample surveys, experiments and observational studies

HSS.IC.A.1	27	Recognize statistics as a process for making inferences about population parameters based on a random sample from that population
HSS.IC.A.2	27	Compare *theoretical* and *empirical probabilities* using simulations (e.g. such as flipping a coin, rolling a number cube, spinning a spinner, and technology)
HSS.IC.B.3	28	• Recognize the purposes of and differences among sample surveys, experiments, and observational studies • Explain how randomization relates to sample surveys, experiments, and observational studies
HSS.IC.B.6	28	Read and explain, in context, the validity of data from outside reports by • Identifying the variables as *quantitative* or *categorical*. • Describing how the data was collected. • Indicating any potential biases or flaws. • Identifying inferences the author of the report made from sample data Note: As a strategy, students could collect reports published in the media and ask students to consider the source of the data, the design of the study, and the way the data are analyzed and displayed.

Absolute value function	Any function in the family with parent function $f(x) = \|x\|$
Amplitude	Half the distance of the maximum and minimum values of a periodic function
Arithmetic sequence	A sequence such as $1, 5, 9, 13, 17, \ldots$ or $12, 7, 2, -3, -8, -13, -18, \ldots$ which has a constant difference between terms
Complex number	A number with a real part and an imaginary part; i is the imaginary unit, $\sqrt{-1}$
Composition of functions	The process of using the output of one function as the input of another function; $f(g(x))$
Determinant	The difference of the products of the entries along the diagonals of a square matrix
Empirical probability	The ratio of the number of outcomes in which a specified even occurs to the total number of tries (actual experiment)
End behavior	The behavior of a graph of $f(x)$ as x approaches positive or negative infinity
Even function	A function symmetric with respect to the y-axis; $f(-x) = f(x)$ for all x in the domain of f
Exponential function	A function in which a variable appears in the exponent; $f(x) = 2^x$
Extraneous solution	A solution that emerges from the process of solving an equation but is not a valid solution to the original problem
Geometric sequence	A sequence such as $2, 6, 18, 54, 162, \ldots$ or $3, 1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \frac{1}{81}, \ldots$ which has a constant ratio between terms
Inverse	The relationship that reverses the independent and dependent variables of a relation
Linear function	A function characterized by a constant rate of change (slope)
Literal equation	An equation where variables represent known values' $V=lwh$, $C=2\pi r$, $d=rt$
Logarithmic function	A function in the family with parent function $y = \log_b x$
Matrix	A rectangular array of numbers of expressions, enclosed in brackets
Matrix inverse	The matrix, symbolized by $[A]^{-1}$, the produces an identity matrix when multiplied by [A]
Midline	A horizontal axis that is used as the reference line about which the graph of a trigonometric function oscillates
Odd function	A function symmetric with respect to the origin; $f(-x) = -f(x)$
Period	the minimum amount of change of the independent variable needed for a pattern in a periodic function to repeat
Polynomial function	A function in which a polynomial expression is set equation to a second variable, such as y or $f(x)$
Quadratic function	Any function in the family with parent function $f(x) = x^2$
Qualitative (categorical) variable	Variables that take on values that are names or labels
Quantitative variable	Variables that are numerical and represent a measurable quantity
Radical expression	An expression containing a root symbol; $\sqrt{\ }$
Rational expression	A ratio of two polynomial expressions with a non-zero denominator; $\frac{3x+1}{x+2}$
Rational function	A function that can be written has a quotient, $f(x) = \frac{p(x)}{q(x)}$, where $p(x)$ and $q(x)$ are polynomial expressions and $q(x)$ is a degree of 1 or higher
Recursive rule	Defines the nth term of a sequence in relation to the previous term

Standard deviation	A numerical value used to indicate how widely individuals in a group vary
Systems of Equations	A set of two or more equations with the same variables
Theoretical probability	The number of favorable outcomes divided by the number of possible outcomes
Trigonometric function	A periodic function that uses one of the trigonometric ratios to assign values to angles with any measure
Zeros	The values of the independent (x-value) that makes the corresponding values of the function equal to zero