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.

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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

Algebra II

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