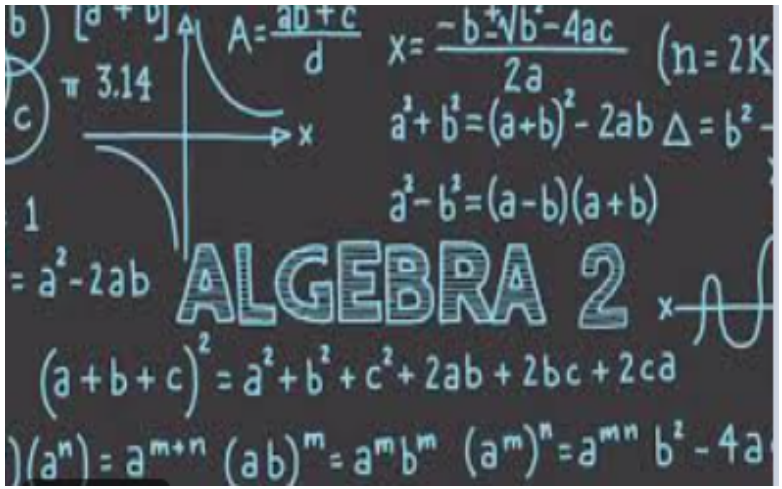
ALGEBRA 2 CURRICULUM



Grade Level(s): 10-12

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Course Description: Algebra 2 is the study of functions. Throughout the course of the year, students will perform operations with functions and study their behavior. Students will think critically to analyze graphs and model real-world applications to solve problems. This course includes the following topics:

- Functions: Relationships between inputs and outputs
- Systems and Linear Programming
- Quadratic equations: Factoring, graphing, and solving
- Polynomials: Operations, graphing, and proving identities
- Rational functions: Graphing functions with vertical or horizontal asymptotes
- Exponential and logarithmic functions: Understanding and solving equations while applying them to other topics
- Radicals: Simplifying and solving equations
- Statistics: Two-way frequency tables, sampling, and probability

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner "I Can" Statements**
Introduction to Functions	What is a relation and what characteristics make that relation a function?	Functions can be transformed through operations such as translations, reflections, dilations, and compositions, which affect their graphs in predictable ways.	TCC1(9-12); CCE2(9-12); CCE4(9-12); DE4(9-12)
Systems of Linear Functions and Inequalities	In what ways is a system of equations and/or inequalities be used to model and solve real-world problems?	A system of linear equations is an algebraic way to compare two equations that model a situation, find the breakeven point or choose the most efficient or economical plan.	TCC2(9-12); CCE1(9-12); DE1(9-12)' AA1(9-12)
Quadratic Functions	How do the different forms of quadratic equations (standard, vertex, and factored) provide insights into the properties of the quadratic function?	Quadratic functions can be used to model real world relationships, such as projectile motion, area problems, and optimization scenarios. The key features in quadratic functions have meaning in real-world contexts.	TCC1(9-12); P1(9-12); P4(9-12)
Polynomial Functions	What are the defining characteristics of polynomial functions and how do their degrees and coefficients affect their behavior?	Polynomial functions are expressions consisting of variables and coefficients, involving only non-negative integer powers of the variables.	TCC3(9-12); P2(9-12); P3(9-12); TI3(9-12)
Rational Functions	What is an asymptote and where does it occur in the graph of a rational function?	Rational functions have asymptotic behavior, which creates restrictions for both the domain and range.	TCC3(9-12); CCE1(9-12); P2(9-12); P3(9-12); TI3(9-12)

Radical Functions	What are the defining characteristics of radical functions and how do they differ from other types of functions?	Radical functions, which include expressions with roots such as square roots and cube roots, have unique properties and behaviors that differentiate them from polynomial and rational functions.	TCC1(9-12), TCC3(9-12), CCE2(9-12), TI3(9-12), AA1(9-12)
Exponential and Logarithmic Functions	How are exponential and logarithmic functions used to model real-world phenomena?	Exponential functions model situations involving growth or decay, such as population growth, radioactive decay, and interest calculations, while logarithmic functions are used to model phenomena like the Richter scale for earthquakes and pH in chemistry.	TCC4(9-12); CCE3(9-12); AA1(9-12); TI3(9-12)
Properties and Attributes of Functions	In what ways can understanding the property and attributes of functions enhance our ability to model and solve real-world problems?	The properties of functions and function operations are used to model, analyze, and predict real-world phenomena.	TCC3(9-12); AA4(9-12); CCE4(9-12); TI2(9-12)
Statistics	How can we determine information about a population when it is impossible, or impractical, to measure the entire population?	Evaluating data involves understanding methodologies, recognizing biases, and assessing the validity and reliability of the conclusions.	TCC2(9-12); TI3(9-12)

Unit 1 - Introduction to Functions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard; ★ indicates greater emphasis in the Honors sections)

- **A.CED.A.2** Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.REI.D.11** 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, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*
- **F.IF.A.1** Understand that a function 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. 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. The graph of f is the graph of the equation y = f(x).
- **F.IF.A.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
- **F.IF.B.4** 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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* ★
- **F.IF.B.5** Relate the domain of a function to its graph and, where applicable, 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.*
- **F.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
    - **F.IF.C.7.A** Graph linear and quadratic functions and show intercepts, maxima, and minima.*
    - **F.IF.C.7.B** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*
- **F.IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.
- **F.BF.A.1** Write a function that describes a relationship between two quantities.*
- **F.BF.B.3** 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 illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

- **F.LE.A.2** 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).
- **S.ID.B.6.A** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
- **S.ID.B.6.C** Fit a linear function for a scatter plot that suggests a linear association.

Standards for Mathematical Practice

- MP1: Make sense of problems and persevere in solving them.
- MP2: Reason abstractly and quantitatively.
- MP3: Construct viable arguments and critique the reasoning of others.
- MP4: Model with mathematics.
- MP5: Use appropriate tools strategically.
- MP6: Attend to precision.
- MP7: Look for and make use of structure.
- MP8: Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... ("I can" statements to be demonstrated)

- I can ask purposeful, insightful questions to find a variety of innovative solutions. **TCC1(9-12)**
- I can give and receive actionable and relevant feedback with openness to be able to determine meaningful revisions for success. **CCE2(9-12)**
- I can communicate and express my understanding in an authentic, respectful, and relevant way, using the most efficient mode of expression. **CCE4(9-12)**
- I can work respectfully with all members of my community and support the needs of others **DE4(9-12)**

Understandings: Students will understand that...

- Relations and functions can be represented numerically, graphically, algebraically, and/or verbally.
- Functions are essential models for describing relationships between quantities in mathematics and the real world.
- There are sets of functions, called families, in which each function is a transformation of a special function, called the parent function.
- Functions can be transformed through operations such as translations, reflections, dilations, and compositions, which affect their graphs in predictable ways.
- Graphical representations of functions can provide additional insight into a function's behavior.

Essential Questions:

- What is a relation and what characteristics make that relation a function?
- How are algebraic, numeric, and graphical representations of functions related?
- What is domain and range and how is the domain and range of a function determined by the graph?
- How does the transformation of the function impact the graph and its domain and range?
- How do the critical features of a function's graph, such as intercepts and asymptotes, inform us about the function's behavior?

Students will know...

- A function is a specific type of relation in which each element in the domain is paired with a unique element of the range. Any situation that has a constant rate of change can be represented with a linear function.
- The terms domain, input and independent can be used interchangeably. The terms range, output and dependent variable can be used interchangeably. An independent variable is the controlling factor of the function. The dependent variable changes based on the value of the independent variable.
- A linear function is the graph of a line, while the absolute value function is the graph of two symmetrical linear branches that meet at a common point (vertex).
- A transformation is a mathematical operation performed on a parent function which changes a graph's size, shape, orientation or position.
- Connect slope to the vertical stretch/compression and/or reflection and the y-intercept to the translation up/down.
- Determining an output value for a particular input involves evaluating an expression.

Students will be able to...

- Determine if a relation is a function.
- Find the input of a function given the output and vice versa.
- Identify the domain and range of a function.
- Write equations of linear functions and identify their transformation.
- Sketch the parent function graph of each type of function (linear, absolute value, quadratic) under transformations discussed in the unit.
- Identify transformations on each function type of parent function discussed within the unit.
- Graph simple piecewise function. ★

Key Vocabulary:

Function
Input/Independent Variable
Output/Dependent Variable
Domain
Range
Interval Notation
Relation
Vertical Line Test

Continuous ★
Discrete ★
Absolute Value Function
Quadratic Function
Parabola
Square Root Function
Vertical Shift/Translation
Horizontal Shift/Translation

Vertical Stretch
Vertical Compression/shrink

Reflection over x-axis
Piecewise Function ★
Step Function ★

Assessment Evidence	
Performance Tasks: **Summative Unit Assessment CCE4(9-12)** Topics will include: ● Identify the transformation from a graph or equation. ● Write the equation of a transformed function using the verbal description. ● Graphing functions using their transformation. ● Identify the domain and range of the given function from a graph. ● Write a linear model. ● Evaluate and graph piecewise functions. ★	**Other Evidence:** **Activity**: **Famous Ages** This introductory activity will provide opportunities for students to guess the ages of various famous celebrities. Conversation about who is the better guesser, focused on different mathematical analysis will follow. Then students will begin to model this data using the graphing calculator to become familiar with its features. This activity helps to build a positive culture in the classroom environment by setting the tone that we are going to do difficult things in this room, and we can all persevere and be successful. It also helps to establish that mistakes are expected and respected. **DE4(9-12); TCC1(9-12)** **Interim:** ● Quiz on Functions (including domain and range) and their transformations (graphing and identifying the transformation from an equation) ● Quiz on Piecewise Functions ★ **Common Formative Assessments: CCE2(9-12)** ● Linear Functions (writing equations of lines, identifying the transformation, and graphing) ● Parent Functions

Learning Plan
Algebra 2 is the study of functions. The first unit of this course is designed to formally introduce the idea of what characteristics make a relation a function. Emphasis on beginning to create connections between the parent function, its graph, and the transformation of the function will occur throughout this unit. ● Famous Ages Activity (described above) **DE4(9-12); TCC1(9-12)** ● Transformations of Functions activity - students will use Desmos to investigate the different features of transformations of functions using the slider feature to explore what a, b, h, and k do for the generic function y=a(bx-h)+k. **TCC1(9-12)** ● Practice identifying the transformation of a given function and creating a graph. **CCE2(9-12)** ● Connect the idea of identifying the transformation to linear functions. Discuss how the slope is the vertical stretch/compression and/or reflection across the x-axis; and the y-intercept is the translation up or down. Students will also have the opportunity to review the

prerequisite skill of creating linear equations and graphing. **CCE4(9-12)**
- Piecewise Functions - Evaluate and graph piecewise functions ★

Teacher Resources: Algebra 2 Textbooks; Desmos; TI Smartview Software; Teacher created in-class notes, activities, and problem sets

Unit 2 - Systems of Linear Functions and Inequalities

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard; ★ indicates greater emphasis in the Honors sections)

- **N.Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.*
- **N.Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.*
- **N.Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*
- **A.CED.A.2** Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.CED.A.3** Create equations that describe numbers or relationships. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
- **A.REI.C.5** Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
- **A.REI.C.6** Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- **A.REI.D.11** 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, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*
- **A.REI.D.12** 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-planes.
- **F.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*

Standards for Mathematical Practice

- MP1: Make sense of problems and persevere in solving them.
- MP2: Reason abstractly and quantitatively.
- MP3: Construct viable arguments and critique the reasoning of others.
- MP4: Model with mathematics.
- MP5: Use appropriate tools strategically.

- MP6: Attend to precision.
- MP7: Look for and make use of structure.
- MP8: Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... ("I can" statements to be demonstrated)

- I can evaluate evidence from multiple perspectives, and recognize their limitations and implications, in order to justify new conclusions. **TCC2(9-12)**
- I can initiate discussions with my peers and teachers about a variety of topics, respecting differing viewpoints, and actively listening to others, and responding thoughtfully with peer-reviewed evidence that is free of bias. **CCE1(9-12)**
- I can acknowledge, process, and respond appropriately to others' comments and perspectives. **DE1(9-12)**
- I can evaluate different approaches and justify the best pathway to success. **AA1(9-12)**

Understandings: Students will understand that...

- A system of linear equations is an algebraic way to compare two equations that model a situation, find the breakeven point or choose the most efficient or economical plan.
- Solutions to systems can be interpreted algebraically, geometrically, and in terms of the context of an application.
- The graphical representation of a system provides a visual understanding of solutions, intersections, and the feasible region.
- Optimization is finding the best solution within given constraints.★

Essential Questions:

- In what ways is a system of equations and/or inequalities be used to model and solve real-world problems?
- What are the different methods to solve a system?
- When is it more appropriate to use one method of solving a system over another?
- How does linear programming (modeling) relate to optimizing situations in the real-world? ★

Students will know...

- There are situations that require two or more equations to be satisfied simultaneously.
- There are four methods to solve systems and equations – one graphic and three algebraic. All methods result in the same solution, but one method may be more efficient.
- The intersection of graphs is a solution to the system of equations represented by those graphs.
- Expressions can be substituted for variables.
- Multiplying equations to eliminate a variable creates an equivalent system to the original.

Students will be able to...

- Graph and solve a system of linear equations by graphing.
- Solve a system of linear equations by substitution.
- Solve a system of linear equations by elimination.
- Create and solve a linear system to represent a real world scenario.
- Graph and solve a system of linear inequalities.
- Create and solve a system of linear equations in three
- variables. ★
- Solve a linear programming problem from a set group of constraints and an objective function.★

• When a system has no solutions, its graph contains parallel lines, so there is no intersection point. When solving algebraically, it results in a mathematically untrue statement (i.e. 0 = 4).
• When a system has infinite solutions, the graph contains two or more lines that overlap entirely (same line), resulting in infinite intersection points. When solved algebraically, it results in a mathematically true statement (i.e. 4=4).
• The graph of a linear inequality divides the coordinate plane into two half planes. One side of the boundary line will represent solutions and is shaded to show this.
  ○ ≤,≥ have a solid boundary line
  ○ <.> have a dashed boundary line
• Many real life problems involve a process called optimization which means finding the maximum or minimum value of a specific quantity.
	• Differentiate between 1 solution, no solutions, or infinite solutions on a system of linear equations.

Key Vocabulary:

Linear Equations	Solution	Inequality
Linear	No Solution (Parallel Lines)	Feasible Region ★
Slope	Consistent	Infinitely Many Solutions
Y-intercept	Independant	Linear Programming
X-intercept	Dependent	Constraint ★
Systems of Equations	Inconsistent	Objective Function ★
System of Inequalities		

Assessment Evidence

Performance Tasks: **Summative Unit Assessment: AA1(9-12); TCC3(9-12)** • Solve system of equations using appropriate method (Graphing, Elimination, Substitution) • Create and solve applications of systems of linear equations and inequalities, such as ticket sales. • Graph systems of inequalities and interpret its solution.	**Other Evidence:** **Activity: CCE1(9-12), DE1(9-12)** As we review solving systems of linear equations, students will discuss the most-efficient method for solving. **Interim Assessment: AA1(9-12)** • Solving Systems of equations by graphing, substitution,

• Create and evaluate systems of 3-variable equations given a word problem ★ • Apply learning to solve Linear Programming applications in regards to maximizing and minimizing, such as the Cookie Problem.★	Elimination, and applications. • Solving and applications of 3-variable systems ★ **Common Formative Assessments: TCC3(9-12)** • Graphing and solving systems of inequalities

Learning Plan

Solving linear systems of equations and inequalities reviews critical concepts from Algebra 1 of writing equations of lines and reviewing how to solve in two variables. Connection between the intersection point(s) on graphs and algebraic solving will be extended. Students will discern the best approach for solving based on the form of the given system.

- We will review solving systems graphically and algebraically using substitution and elimination. A Solving Systems 3 ways graphic organizer will help students begin to organize their thinking and reasoning. **AA1(9-12)**
- We will then extend graphing systems of linear equations to linear inequalities to develop an understanding of the feasible region. This will include the Graphing Systems of inequalities zombie activity. **DE1(9-12), CCE1(9-12)**
- In honors, students will extend solving systems from two variables to three variables and solve a 3-variable systems Mathlib. **TCC2(9-12)**
- Finally, linear systems will be applied using linear programming, which involves optimization and utilizing various constraints. Activities will include a linear programming around the room stations activity. **TCC2(9-12), CCE1(9-12), AA1(9-12)**

Teacher Resources: Algebra 2 Textbooks; Desmos; TI Smartview Software; Teacher created in-class notes, activities, and problem sets; mini white boards

Unit 3 - Quadratic Functions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard; ★ indicates greater emphasis in the Honors sections)

- **N.Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.*
- **N.Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.*
- **N.Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*
- **N.CN.A.1** 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.
- **N.CN.A.2** Use the relation i^2 = –1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
- **N.CN.A.3 (+)** Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.
- **N.CN.C.7** Solve quadratic equations with real coefficients that have complex solutions.
- **N.CN.C.9 (+)** Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.
- **A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it. For example, see 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).
- **A.SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*
    - **A.SSE.B.3.A** Factor a quadratic expression to reveal the zeros of the function it defines.
- **A.CED.A.2** Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.CED.A.3** Create equations that describe numbers or relationships. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
- **A.REI.B.4** Solve quadratic equations in one variable.
    - **A.REI.B.4.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. Derive the quadratic formula from this form.
    - **A.REI.B.4.B** Solve quadratic equations by inspection (e.g., for x^2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.
- **A.REI.C.7** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line y = –3x and the circle x^2 + y^2 = 3.
- **A.REI.D.10** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often

forming a curve (which could be a line).

- **A.REI.D.11** 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, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*
- **F.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
    - **F.IF.C.7.A** Graph linear and quadratic functions and show intercepts, maxima, and minima.*
- **F.IF.C.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
    - **F.IF.C.8.A** Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
- **F.BF.B.3** 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 illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
- **S.ID.B.6** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
    - **S.ID.B.6.A** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
- **G.GPE.A.1** Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

Standards for Mathematical Practice

- MP1: Make sense of problems and persevere in solving them.
- MP2: Reason abstractly and quantitatively.
- MP3: Construct viable arguments and critique the reasoning of others.
- MP4: Model with mathematics.
- MP5: Use appropriate tools strategically.
- MP6: Attend to precision.
- MP7: Look for and make use of structure.
- MP8: Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... (“I can” statements to be demonstrated)

- I can ask purposeful, insightful questions to find a variety of innovative solutions.**TCC1(9-12)**
- I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others. **P1(9-12)**
- I can take-on challenges and continuously engage in my own long-term strategies to overcome them to demonstrate through personal experience that failures are more instructive than discouraging. **P4(9-12)**

Understandings: Students will understand that...	**Essential Questions:**
• There are three forms of quadratics: standard form, vertex form, and intercept form. Each expression has unique properties that aid in creating the graph and/or solving. All quadratics can be expressed in these three forms. • The graphical representation of quadratic functions aids in understanding their properties, such as intercepts, maximum or minimum values, and symmetry. • If the product of two quantities equals zero, at least one of the quantities equals zero • There are a variety of methods to solve a quadratic equation. • The discriminant of a quadratic equation provides critical information about the nature and number of its roots, helping in predicting whether solutions are real or complex. • Complex numbers are numbers of the form *a+bi*, where a and b are real numbers and i = sqrt(-1). • When solving, complex numbers must be in pairs, called complex conjugates. • There are various methods of solving a quadratic, each with their own strengths and difficulties depending on the structure of the equation. • Quadratic functions can be used to model real world relationships, such as projectile motion, area problems, and optimization scenarios. The key features in quadratic functions have meaning in real-world contexts.	• How do the characteristics of a quadratic equation affect its graphical representation? • What are the essential characteristics of quadratic functions and how can they be identified from the equation and graph? • How do transformations affect the graph of a quadratic function, and how can these be represented algebraically? • How is a linear equation different from a quadratic equation? • How do the different forms of quadratic equations (standard, vertex, and factored) provide insights into the properties of the quadratic function? • How does the form of a quadratic determine the way it is graphed and/or solved? • What are the different methods of solving quadratic equations and when is it appropriate to use each method? • How do you determine the most efficient method to solve a quadratic? • What determines the nature (real or complex) of the solutions to a quadratic equation? • What does the discriminant reveal about the solutions of a quadratic equation, and how can it be used to predict the nature of the roots? • How are quadratic functions used to model and solve real-world phenomena? • Why are complex numbers necessary?
Students will know…	**Students will be able to...**
• Quadratic functions can be represented graphically, algebraically, or numerically. • Quadratic equations take on various forms and represent the same graphical picture. • The quadratic equation represents the graph of a parabola. The characteristics/transformation of a quadratic equation determine the size and direction of the parabola. • Quadratic functions have an axis of symmetry through the vertex.	• Graph quadratic functions (both equations and inequalities) in standard, intercept, and vertex form. • Interpret the key features of the graph and apply to real-world situations. • Factor quadratic functions/equations to find x-intercepts/ solutions • Factor using the Greatest Common Factor (GCF), difference of two squares, grouping, a=1, and a>1. • Factor using sum and difference of cubes★

• The y-value of the vertex is the maximum or minimum of the quadratic function. • The x-intercepts of the graph are the solutions of the equation. • The structure of a quadratic equation or function informs best practices for solving or graphing. We can convert between structures (i.e. standard to intercept form). • Factoring is the inverse of multiplication. • The form of the quadratic equation determines which solution method (factoring, square roots, completing the square, and quadratic formula) is most efficient or appropriate. • The discriminant is used to determine the number and type of solutions to a quadratic equation. • Complex numbers arise when the solution includes the square root of a negative number. • The best method for solving a quadratic equation depends on the original format of the equation. • Using the given information can be substituted into one of the forms of a quadratic equation to create the equation. • Quadratic functions model real-world data that is parabolic in nature. • The general equation that models an object's vertical motion. • Previous knowledge (for example, area is length x width, revenue is product x price, etc.) can be represented by/applied to quadratic equations/functions.	• Solve quadratic equations using square roots, factoring, completing the square, and the quadratic formula. • Defend/justify the most efficient approach to solving a quadratic equation. • Connect the solutions of the equations with the x-intercepts of the function. • Analyze the number and type of solution using the discriminant and/or interpreting the graph. • Create quadratic equations. • Analyze quadratic functions in different forms to find vertex, y-intercept, and solutions. • Perform operations on complex numbers. • Solve vertical motion applications. • Use quadratic reasoning (for example, area is length x width, revenue is product x price, maximum = vertex, etc.) to solve problems. • Use technology to generate a quadratic model fitting a set of data (given or generated).

Key Vocabulary:

Quadratic	Standard Form	Binomial
Quadratic Function	Intercept Form	Quadratic Formula
Parabola	Vertex Form	Discriminant
Axis of symmetry	Solution	Complex Number
Vertex	Zero/Root	Imaginary Number
Maximum	X-intercept	Real Number
Maximum value	Radical	Conjugate
Minimum	Square Rooting	Complex Conjugate
Minimum value	Completing the Square	Center

Assessment Evidence	
Performance Tasks: **Summative Unit Assessment TCC1(9-12)** Topics include: ● Quadratics Test #1: Solving Quadratics by factoring ○ Graphing in all three forms ○ GCF ○ Grouping ○ Trinomial a=1 ○ Trinomial a≠1 ○ Difference of Squares ○ Sum/Difference of Cubes★ ● Quadratics Test #2: Solving all methods **P4(9-12)** ○ Factoring ○ Applications with solving by factoring, ie) area ○ Square root method ○ Completing the square ○ Quadratic formula ○ Using graphing calculator ○ Applications: modeling a falling object and/or a thrown projectile.	**Other Evidence:** **In Class Activity: P1(9-12)** ● Desmos Explore activities ● Google slides activities ● Zombie Factoring flip book ● Escape room reviews ● Around the room scavenger hunt applications ● Guided notes ● Graphic organizer: completing the square **Common Formative Assessments/Interim Assessments:** ● Quiz on Graphing: including the following forms of quadratic ○ Vertex form ○ Standard Form ○ Intercept form ○ Applications: maximum/minimum, area, picture frame, revenue★ ● Quiz on simplify polynomials, factor by GCF, grouping, a=1 and a≠1 with GCF, and difference of Perfect Squares. Solve with a sketch of x-intercept ● Quiz on simplifying radicals, rationalizing denominators, solving by square root property, vertical motion dropping problems ● Quiz on Complex number system: adding, subtracting, multiplying, dividing, simplifying and solving by completing the square. (CP classes might make this 2 separate quizzes) ● Quiz on solving using the quadratic formula and using the discriminant to find number of real solutions

Learning Plan
In this unit, students will explore different strategies for graphing and solving quadratic equations and functions. We will look to connect key features of the graph of the function with the equation in a variety of forms. This structure then helps to inform students of the most efficient method for solving quadratic equations. Additionally, time will be emphasized on learning the skill of factoring. Factoring is a necessary structure for students to learn in order to be able to apply and efficiently solve more challenging problems throughout the remainder of the year.

- Students will learn that the zeros/x-intercepts of the graph are the solutions to the quadratic equation. Students will explore a variety of techniques for solving and compare each to the structure of the given equation to determine the most efficient method for solving. **TCC1(9-12)**
- Students will review the structure of factoring. Factoring helps students to see structure and problem solve more efficiently. We will review a variety of techniques for factoring depending on the structure of the expression.**P1(9-12)**
- Students will learn the three forms of quadratic equations (standard, intercept, and vertex forms). They will explore the graphs of each type of form and make connections between the key features.
- Students will explore projectile motion problems using the vertical motion model. **P4(9-12)**

Teacher Resources: Algebra 2 Textbooks; Desmos; TI Smartview Software; Teacher created in-class notes, activities, and problem sets

Unit 4 - Polynomial Functions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard; ★ indicates greater emphasis in the Honors sections)

- **A.SSE.A.1** Interpret expressions that represent a quantity in terms of its context.*
  - **A.SSE.A.1.A** Interpret parts of an expression, such as terms, factors, and coefficients.
- **A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it. For example, see 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).
- **A.SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*
  - **A.SSE.B.3.A** Factor a quadratic expression to reveal the zeros of the function it defines.
- **A.APR.A.1** Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
- **A.APR.B.2** Know and apply the Remainder Theorem: 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).
- **A.APR.B.3** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
- **A.CED.A.2** Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.REI.D.11** 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, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*
- **F.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
  - **F.IF.C.7.C** Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.*
- **F.IF.C.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
  - **F.IF.C.8.A** Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
- **F.BF.B.3** 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 illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
- **N.CN.C8 (+)** Extend polynomial identities to the complex numbers. For example, rewrite x^2 + 4 as (x + 2i)(x – 2i). ★

Standards for Mathematical Practice

- MP1: Make sense of problems and persevere in solving them.
- MP2: Reason abstractly and quantitatively.
- MP3: Construct viable arguments and critique the reasoning of others.
- MP4: Model with mathematics.
- MP5: Use appropriate tools strategically.
- MP6: Attend to precision.
- MP7: Look for and make use of structure.
- MP8: Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... ("I can" statements to be demonstrated)

- I can integrate relevant information to produce multiple valid solutions. **TCC3(9-12)**
- I can strengthen my weaknesses by identifying, initiating, and practicing appropriate strategies to become confident in my abilities to overcome my challenges. **P2(9-12)**
- I can accept constructive feedback and use setbacks to adjust my learning journey in order to reach my goals. **P3(9-12)**
- I can formulate and investigate probing questions to further my learning. **TI3(9-12)**

Understandings: Students will understand that...

- Polynomial functions are expressions consisting of variables and coefficients, involving only non-negative integer powers of the variables.
- Polynomial functions can be classified by their degree, which determines their general shape and the maximum number of roots they can have.
- The degree and leading coefficient determine the end behavior of a polynomial function, which helps in sketching and analyzing graphs.
- The zeros/roots of a polynomial function correspond to the x-intercepts of its graph. The multiplicity of a zero affects the behavior of the graph at that intercept, such as whether it touches or crosses the x-axis.
- Polynomial functions model various real-world phenomena, from projectile motion to economics.

Essential Questions:

- What are the two ways we classify polynomials and why are these important?
- What are the defining characteristics of polynomial functions and how do their degrees and coefficients affect their behavior?
- What is the relevance of the zeros, maximum, and minimum values?
- What makes an accurate sketch of a polynomial function?
- Why do we factor polynomials and how do we decide what is the best method to factor?
- Why are there different methods of finding the zeros of a polynomial and how do we decide which method is appropriate?
- For a polynomial function, how are the factors and roots related?
- How can polynomial functions represent real-life situations?

Students will know…	Students will be able to...
• There are differences between linear, quadratic, and polynomial functions. • Polynomials are classified by the degree and number of terms (Monomial, Binomial, Trinomial, Polynomial, Constant, Linear, Quadratic, Cubic, Quartic, Quintic). • Polynomial expressions should be written using standard form. • Binomial expansion can be used to multiply a binomial by itself. • There are various methods that can be used to factor polynomials. • Factoring polynomial functions is a key technique for finding their roots. Students should be familiar with methods such as grouping, synthetic division, and using the quadratic formula. • Recognize that the sum of two squares cannot be factored under the real numbers. • If (x-a) is a factor of a polynomial, then the polynomial has value 0 when x = a. If “a” is a real number, then the graph of the polynomial has (a, 0) as an x-intercept. • Dividing polynomials can produce the zeros of a function. • Synthetic division is a preferred method of long division of polynomials, but may only be used when the divisor is of the form x $\pm k$. • The Fundamental Theorem of Algebra tells us that the degree of the polynomial indicates the number of solutions of the polynomial. • The Rational Zero Theorem (rational root theorem) helps to find a zero/root of a polynomial. • The remainder theorem, along with synthetic division, provides a handy shortcut for evaluating polynomials. • Key characteristics such as continuity, zeros, multiplicity of zeros, and end behavior are important because they describe the behavior of the outputs. These characteristics can be used to sketch a graph of the polynomial. • Polynomials can represent real-life situations, including simple financial modeling and wooden roller coasters.	• Classify a polynomial based on the degree and number of terms. • Write polynomial expressions in standard form. • Recognize when an expression is not a polynomial. • Add, subtract, multiply polynomial expressions. • Divide polynomial expressions using both long division and synthetic division. • Factor polynomials of the following types: common factors, $ax^2 + bx + c$, difference of two perfect squares, perfect square trinomials, factoring completely, and factoring by grouping. • Extend factoring to the sum and difference of cubes. ★ • Apply the Fundamental Theorem of Algebra to write the simplest polynomial with the given roots. • Solve for all of the zeros of a polynomial function, given one of the zeros. • Use the rational zero theorem to find all the zeros. ★ • Sketch the graph of a polynomial using the end behavior, zeros, multiplicities, and y-intercept. • Solve application problems that involve representing a real life situation with a polynomial function. • Create a model and make predictions for real-world phenomena.

Key Vocabulary:

Degree	Binomial	Multiplicities
Exponent	Trinomial	End Behavior
Polynomial	Standard Form	Long Division
Cubic	Leading coefficient	Synthetic Division
Quartic	Zeros of a polynomial	Prime Factorization
Quintic	Rational Root Theorem	Sum of Two Cubes
Monomial	Remainder Theorem	

Assessment Evidence

Performance Tasks:

Summative Unit Assessment TCC3(9-12) Topics include:

- Add, subtract, and multiply polynomials
- Divide polynomials using both long division and synthetic
- Factor polynomials
- Find all the zeros of a polynomial given one zero
- Find all zeros using the Rational Zero Theorem ★
- Sketch the graph of a polynomial function
- Solve application problems that may include modeling financial scenarios.

Other Evidence:

Interim: P3(9-12)

- Quiz on factoring
- Quiz on finding zeros of polynomials including using synthetic division

Common Formative Assessments: P3(9-12)

- Operations of polynomial functions (adding, subtracting, multiplying, and dividing [synthetic and long division])
- Graphing polynomial functions
- Application problems: modeling volume, open box problem.

Learning Plan

Polynomial functions extend students' knowledge to higher-degree expressions. Students will begin to make connections between odd degree polynomials vs even degree polynomials.

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- Students will investigate to discover that odd degree polynomial functions have the same end behavior, as well as even degree polynomial functions. **TI3(9-12)**
- Students will continue to apply their skills of factoring and extend it to Polynomial Functions. This assists students in being able to then graph, solve, and apply the roots/solutions. **TCC3(9-12); P2(9-12)**
- Students will sketch graphs of polynomial function using its end behavior and by factoring to find its x-intercepts. **P3(9-12)**

Teacher Resources: Algebra 2 Textbooks; Desmos; TI Smartview Software; Teacher created in-class notes, activities, and problem sets; mini white boards

Unit 5 - Rational Functions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard; ★ indicates greater emphasis in the Honors sections)

- **A.APR.D.6** Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) 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.
- **A.APR.D.7** (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.
- **A.CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- **A.CED.A.2** Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.REI.A.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
- **A.REI.D.11** Represent and solve equations and inequalities graphically. 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, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*
- **F.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
- **F.IF.C.7d** (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.*
- **F.BF.B.3** 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 illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

Standards for Mathematical Practice

- MP1: Make sense of problems and persevere in solving them.
- MP2: Reason abstractly and quantitatively.
- MP3: Construct viable arguments and critique the reasoning of others.
- MP4: Model with mathematics.
- MP5: Use appropriate tools strategically.
- MP6: Attend to precision.

- MP7: Look for and make use of structure.
- MP8: Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... ("I can" statements to be demonstrated)

- I can integrate relevant information to produce multiple valid solutions. **TCC3(9-12)**
- I can initiate discussions with my peers and teachers about a variety of topics, respecting differing viewpoints, actively listening to others, and responding thoughtfully with peer-reviewed evidence that is free of bias. **CCE1(9-12)**
- I can strengthen my weaknesses by identifying, initiating, and practicing appropriate strategies to become confident in my abilities to overcome my challenges. **P2(9-12)**
- I can accept constructive feedback and use setbacks to adjust my learning journey in order to reach my goals. **P3(9-12)**
- I can formulate and investigate probing questions to further my learning. **TI3(9-12)**

Understandings: Students will understand that...

- Direct, inverse, and joint variations describe relationships between variables allowing us to analyze how one quantity changes in relation to another and predict and control outcomes in various fields such as physics, economics, biology, and engineering.
- Asymptotes are critical features of the graph and indicate domain and range restrictions.
- If a rational function is in simplified form and the polynomial in the denominator is not a constant, the graph of the rational function features asymptotic behavior.
- The rules for operations with fractions can be extended to rational expressions

Essential Questions:

- How are direct, inverse, and joint variations used in the real-world?
- What is an asymptote and where does it occur in the graph of a rational function?
- What are rational expressions and how do we perform operations on them?
- Why should you factor a rational function before simplifying, graphing, and/or solving?
- Why is it important to find as much information as possible about the graph of a function from its equation?

Students will know...

- A rational function is the ratio of two polynomial functions.
- The operations of rational expressions are similar to numerical operations with fractions. For example, when simplifying, you need to factor out the common part. When adding and subtracting rational expressions, students must find a common denominator.
- Solving rational equations expands our capabilities to solve equations whose domain does not include all real numbers.
- The denominator of a rational expression cannot equal zero.

Students will be able to…

- Simplify rational expressions using variation models.
- Graph the rational function y=1/x using transformations.
- Graph a rational function expressed as a linear/linear.
- Determine the asymptotes of the function.
- Identify the domain and range of the rational function.
- Perform operations (add, subtract, multiply and divide) of rational expressions.
- Perform operations with complex fractions.
- Solve rational equations.
- Check for extraneous solutions when solving a rational

	equation. ● Apply rational equations to real-world applications (if time permits).

Key Vocabulary:

Ratio	Rational Function	Extraneous Solution
Proportion	Reciprocal	Vertical Asymptote
Direct Variation	Least Common Denominator (LCD)	Horizontal Asymptote
Inverse Variation	Least Common Multiple (LCM)	Slant Asymptote ★
Joint Variation	Complex Fraction	Hole ★
Constant of Variation/Proportionality		

Assessment Evidence

Performance Tasks:

Summative Unit Assessment TCC3(9-12) Topics will include:

- Solve direct, inverse, and joint variation application problems (could include inheritance questions, purchasing power, and SAT practice questions).
- Graph rational functions
- Perform operations with rational functions including add, subtract, multiply, divide, and simplify complex fractions.
- Solve rational equations

Other Evidence:

Activity: Stations activity on graphing rational functions. Students will collaborate to match the equation to its characteristics/features of the function and its graph. **CCE1(9-12); P2(9-12)**

Interim: Quiz on variation and graphing rational functions **P3(9-12)**

Common Formative Assessments: P3(9-12)

- Graphing Rational Functions and identifying its features
- Adding and subtracting rational expressions
- Multiplying and dividing rational expressions
- Solving rational equations

Learning Plan

Students begin this unit with extending the properties of exponents to rational exponents. Attention converting between radical and rational exponent forms is emphasized here in preparation for Pre-Calc.

- Simplify expressions using the properties of rational exponents and radicals. Student discourse about when a simplifying problem is “complete” and how the context it is used in may produce a different result. **P2(9-12); CCE1(9-12)**
- Graphing radical functions and using their transformations. Students will examine the similarities and differences between quadratic and

square root functions, as well as cubic vs cube root functions.**P3(9-12)**

- Students will solve radical equations. Radical functions highlight the need for using inverse operations when solving problems, including polynomial functions. Additionally, students will be introduced to the idea of extraneous solutions, which answers that occur while solving that do not satisfy the original domain of the problem. We will apply rational equations to real-world problems to solve in a given context (i.e. work and unified motion problems) **TI3(9-12); TCC3(9-12)**

Teacher Resources: Algebra 2 Textbooks; Desmos; TI Smartview Software; Teacher created in-class notes, activities, and problem sets; Visual models and diagrams.

Unit 6 - Radical Functions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard; ★ indicates greater emphasis in the Honors sections)

- **N.RN.A.1** Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define 5^(1/3) to be the cube root of 5 because we want [5^(1/3)]^3 = 5^[(1/3) x 3] to hold, so [5^(1/3)]^3 must equal 5.
- **N.RN.A.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- **A.CED.A.2** Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.CED.A.3** Create equations that describe numbers or relationships. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*
- **A.REI.A.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
- **F.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
- **F.IF.C.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
- **F.BF.B.3** 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 illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

Standards for Mathematical Practice

- MP1: Make sense of problems and persevere in solving them.
- MP2: Reason abstractly and quantitatively.
- MP3: Construct viable arguments and critique the reasoning of others.
- MP4: Model with mathematics.
- MP5: Use appropriate tools strategically.
- MP6: Attend to precision.
- MP7: Look for and make use of structure.
- MP8: Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... (“I can” statements to be demonstrated)

- I can ask purposeful, insightful questions to find a variety of innovative solutions. **TCC1(9-12)**

- I can integrate relevant information to produce multiple valid solutions. **TCC3(9-12)**
- I can give and receive actionable and relevant feedback with openness to be able to determine meaningful revisions for success. **CCE2(9-12)**
- I can formulate and investigate probing questions to further my learning. **TI3(9-12)**
- I can evaluate different approaches and justify the best pathway to success. **AA1(9-12)**

Understandings: Students will understand that...

- Radical functions, which include expressions with roots such as square roots and cube roots, have unique properties and behaviors that differentiate them from polynomial and rational functions.
- Rational exponents and radicals are different ways of expressing the same quantities.
- Radicals and the Rules of Exponents are used to create meaning for rational exponents.
- Methods for solving radical equations expand our capability to solve equations whose domain does not include all real numbers.

Essential Questions:

- What are the defining characteristics of radical functions and how do they differ from other types of functions?
- What is the meaning of an exponent that is not positive and/or not an integer?
- How can we rewrite radical expressions in simpler ways?
- What is the importance of learning to solve radical equations?
- How do transformations affect the graphs of square root and cube root parent functions? ★

Students will know...

- Radical expressions include square roots, cubic roots, and roots of any other index.
- Radical expressions can be simplified by identifying powers under the radical with the same exponent as the index of the radical.
- Radical expressions can be solved by isolating a radical and taking a power on both sides of the equation equal to the index of the radical.
- When solving a radical equation, we must be mindful of the possibility of extraneous solutions.
- Knowledge of a parent function, and the various ways to transform a function, f(x), is sufficient for graphing any radical function.

Students will be able to...

- Evaluate nth roots and simplify rational exponents.
- Simplify radical expressions.
- Perform function operations and composition (include nth roots and rational exponents).
- Graph square root and cube root functions with transformations.★
- Solve radical equations.

Key Vocabulary:

Rational exponent | Index | Cube Root Function

Radical function N^{th} root	Extraneous Solutions Square Root Function	Restricted Domain ★ Power function

Assessment Evidence

Performance Tasks:	**Other Evidence:**
Summative Unit Assessment TCC3(9-12) Topics will include: ● Simplify Radical expressions with and without variables. ● Rewrite expressions with rational exponents as radical expressions and vice versa. ● Solve radical equations and identify/check for extraneous solutions. ● Graph radical functions with transformations ★	**Common Formative assignments**: ● Rational Exponents and Simplifying N^{th} Root Radicals ● Simplifying Expressions with Rational Exponents Activity ● Simplifying and Rewriting Radical Expressions Activity ● Solving Radical Equations Practice Problems **TCC1(9-12)** ● Graphing Radical Functions with Transformations Activity ★ **Interim: AA1(9-12)** ● Quiz on Simplifying and rewriting Radical Expressions ● Quiz on Solving Radical Equations

Learning Plan

In this unit, students expand their knowledge of types of functions to include radical functions. Restrictions on the domain, that were seen with rational functions, come into play in this unit as well. Students come to understand that the numerator and denominator of a rational exponent coincide with the power and index of a radical in an equivalent expression.

- Students will practice translating between radicals and rational exponents forms. With this, they will also be practicing simplifying these expressions using the Properties of Exponents. **CCE2(9-12), TI3(9-12),TCC1(9-12), AA1(9-12)**
- Students will apply their prior solving skills with the properties of rational exponents to solve radical equations. Attention to checking for extraneous solutions will be emphasized in this lesson - including some tips as to when extraneous solutions will occur. The graphical representation for the visual of the equation, as a system, will be used to emphasize how extraneous solutions occur. **TI3(9-12), AA1(9-12)**
- Graphing Radical Functions with Transformations Activity - Students will extend their knowledge of transformations by applying them to graph radical functions. ★ **AA1(9-12)**

Teacher Resources: Algebra 2 Textbooks; Desmos; TI Smartview Software; Teacher created in-class notes, activities, and problem sets

Unit 7 - Exponential and Logarithmic Functions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard; ★ indicates greater emphasis in the Honors sections)

- **A.SSE.A.1** Interpret expressions that represent a quantity in terms of its context.*
  - **A.SSE.A.1.B** 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.
- **A.SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*
  - **A.SSE.B.3.C** 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) ≈ 1.012^(12t) to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.
- **A.CED.A.2** Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.REI.D.11** 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, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*
- **F.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
  - **F.IF.C.7.E** Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.*
- **F.IF.C.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
  - **F.IF.C.8.B** Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)^t, y = (0.97)^t, y = (1.01)^(12t), y = (1.2)^(t/10), and classify them as representing exponential growth and decay.
- **F.BF.A.1** Write a function that describes a relationship between two quantities.*
- **F.BF.B.5 (+)** Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
- **F.LE.A.1** Distinguish between situations that can be modeled with linear functions and with exponential functions.
  - **F.LE.A.1.C** Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
- **F.LE.A.2** 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).

- **F.LE.A.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
- **F.LE.A.4** For exponential models, express as a logarithm the solution to ab^(ct) = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.
- **F.LE.B.5** Interpret the parameters in a linear or exponential function in terms of a context.
- **S.ID.B.6** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
    - **S.ID.B.6.A** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

Standards for Mathematical Practice

- MP1: Make sense of problems and persevere in solving them.
- MP2: Reason abstractly and quantitatively.
- MP3: Construct viable arguments and critique the reasoning of others.
- MP4: Model with mathematics.
- MP5: Use appropriate tools strategically.
- MP6: Attend to precision.
- MP7: Look for and make use of structure.
- MP8: Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... (“I can” statements to be demonstrated)

- I can integrate my learning to adapt to experiences in the classroom, career and life. **TCC4(9-12)**
- I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products. **CCE3(9-12)**
- I can evaluate different approaches and justify the best pathway to success. **AA1(9-12)**
- I can formulate and investigate probing questions to further my learning. **TI3(9-12)**

Understandings: Students will understand that…

- Exponential functions model situations which grow or decline at a constant percent rate.
- Graphing exponential functions and logarithmic functions will result in asymptotic behavior. Transformations (shifts, stretches, reflections) will affect the graphs.
- Logarithms can be used to solve exponential functions; and conversely, exponents are used to solve logarithmic equations.
- Logarithms can be used to solve equations for which no other algebraic method exists.

Essential Questions:

- How can exponential functions be used to model growth and decay?
- How do you model a quantity that changes regularly over time by the same percentage?
- What is the purpose of logarithms?
- How are exponential and logarithmic functions related to each other?
- How do the properties of exponents extend to the properties of logarithms?
- How do you graph exponential and logarithmic functions by

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- Exponential functions model situations involving growth or decay, such as population growth, radioactive decay, and interest calculations, while logarithmic functions are used to model phenomena like the Richter scale for earthquakes and pH in chemistry.

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analyzing intercepts and end behavior?
- How are exponential and logarithmic functions used to model real-world phenomena?

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Students will know…

- The graph of exponential growth and decay functions has a horizontal asymptote.
- Exponential functions to model real-world situations, such as student loan interest, car depreciation, and
- The constant *e* is an irrational number that appears in many different areas of mathematics, including continuous interest.
- Expressions can be translated between exponential and logarithmic forms.
- The common log has base 10 and the natural log has base *e*.
- Exponential and logarithmic functions have restrictions on the value of the base *b*. This then influences the range or domain.
- The graph of a logarithmic function has a vertical asymptote.
- Condensing and expanding logarithmic expressions are techniques used when solving.
- Solving exponential and logarithmic equations involves applying properties of exponents and logarithms, such as the power rule, product rule, and change of base formula, to isolate the variable and find solutions.
- Techniques for solving equations involving exponential and logarithmic functions include using properties of logarithms, isolating the exponential or logarithmic expression, and applying logarithms to both sides of the equation.
- The exponential function $y=b^x$ is one-to-one, so its inverse $x=b^y$ is a function. To express “y as a function of x” for the inverse you write y=logb x.
- Logistic growth is a model used when there is an upper limit on the size of a population, called the carrying capacity. ★

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Students will be able to…

- Graph exponential growth and decay functions.
- Identify the asymptote and transformation and solve for the intercepts of the graph.
- Apply transformations with exponential and logarithmic functions to graph
- Interpret graphs of exponential and logarithmic functions.
- Model exponential functions for both growth (e.g. population growth and compound interest).and decay (e.g. depreciation and half-life).
- Use compound interest to discover the number *e*.
- Evaluate logarithms
- Expand and condense logarithms
- Solve exponential and logarithmic equations.
- Solve real-world problems involving the common base *e*.
- Model practical uses of logarithms (e.g., measuring sound intensity, pH scale).
- Create and apply exponential and logarithmic functions to model and make predictions.
- Solve problems using Newton’s Law of Cooling. ★
- Model functions using logistic growth and solve application problems. ★

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Key Vocabulary:

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Exponential Growth	Compounded monthly, quarterly, etc.	Logarithmic Regression
Exponential Decay	Asymptote	Common Logarithm
Exponential Function	Base	Natural Logarithm
Exponential Regression	Natural base e	Power Function
Growth Factor	Compounded continuously	Logarithmic Equation
Decay Factor	Logarithm	Extraneous Solution

Assessment Evidence

Performance Tasks:

Summative: Students will research colleges in state and out of state specifically focused on tuition prices over the years. Through the use of graphing calculators they will use the data to create an exponential regression model to make predictions for the future. Students will work collaboratively in small groups and will present their findings to the class. **TCC4(9-12)**, **CCE3(9-12)**

Summative Unit Assessment TCC4(9-12) Topics will include:

- Graphing exponential and logarithmic functions.
- Identifying key features of the graph.
- Simplify logarithms
- Expand and condense logarithmic expressions
- Solve exponential and logarithmic equations.
- Model real-world application.

Other Evidence:

- **Activity - Which will grow faster?** Introduction to exponential growth. If you double a penny every day for 30 days what will happen? **AA1(9-12), TI3(9-12)**
- **Activity - Discovery of the number e:** Students will explore the number e through a discovery based lesson to attempt to see what happens when you increase the compounding interest. They will discuss practical applications of e in various fields like finance, population growth, and physics. **AA1(9-12), TI3(9-12)**
- **Interim:** Graphing exponential functions, comprehension of key features such as growth/decay factor, growth/decay rate, asymptote and transformations.
- **Interim:** Applications involving compound growth/decay including continuously. Simplifying with the number e.
- **Interim:** Evaluating logarithms, comprehension of natural logs, common logs and expanding and condensing. Using logarithms to solve exponential equations, which may have extraneous solutions. **AA1(9-12)**

Learning Plan

In this unit, students will extend their knowledge of exponential functions to model growth and decay in numerous applications. Students will explore how transformations (translations, reflections, stretches and compressions) affect exponential and logarithmic functions. Students will learn and apply the fundamental properties of logarithms including the production, quotient, and power rules. Students will solve complex logarithmic and exponential equations and apply them to real world problems and make predictions.

- Students will model exponential growth and decay models involving applications with simple interest, compound interest, depreciation. As they explore which model grows faster and complete the discovery activity for the number *e*, students will work on collaborating and adjusting to meet their learning needs. **TI3(9-12)** Then students will complete the College Tuition Project (described above) **TCC4(9-12); CCE3(9-12)**
- Students will extend their knowledge of transformations of functions by graphing exponential and logarithmic functions. Discussion around similarities and differences both between these two functions and compared to those previously studied will occur. **CCE3(9-12)**
- Students will evaluate different approaches when solving exponential and logarithmic equations. This may include needing to use the properties of expanding and condensing, as well as utilizing their previous skills for solving and checking for extraneous solutions. **AA1(9-12)**

Teacher Resources: Algebra 2 Textbooks; Desmos; TI Smartview Software; Teacher created in-class notes, activities, and problem sets

Unit 8 - Properties and Attributes of Functions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard; ★ indicates greater emphasis in the Honors sections)

- **A.CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.CED.A.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*
- **F.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
- **F.IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal description). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*
- **F.BF.A.1** Write a function that describes a relationship between two quantities.*
    - **F.BF.A.1.B** Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*
    - **F.BF.A.1c** (+) Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the weight of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.*
- **F.BF.B.3** 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 illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
- **F.BF.B.4** Find inverse functions.
    - F.BF.B.4.A Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x3 or f(x) = (x+1)/(x–1) for x ≠ 1.
    - F.BF.B.4.B (+) Verify by composition that one function is the inverse of another.
    - F.BF.B.4.C (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.
- **F.BF.B.5** (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Standards for Mathematical Practice

- MP1: Make sense of problems and persevere in solving them.

- MP2: Reason abstractly and quantitatively.
- MP3: Construct viable arguments and critique the reasoning of others.
- MP4: Model with mathematics.
- MP5: Use appropriate tools strategically.
- MP6: Attend to precision.
- MP7: Look for and make use of structure.
- MP8: Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... ("I can" statements to be demonstrated)

- I can integrate relevant information to produce multiple valid solutions. **TCC3(9-12)**
- I can create opportunities to extend my learning by remaining open-minded in any situation. **AA4(9-12)**
- I can communicate and express my understanding in an authentic, respectful and relevant way, using the most efficient mode of expression. **CCE4(9-12)**
- I can evaluate my objectives and a variety of credible resources to find the best solutions for any challenge. **TI2(9-12)**

Understandings: Students will understand that...

- Functions can be combined through addition, subtraction, multiplication, division, and composition to create new functions with distinct properties.
- The concept of inverse functions is critical for solving equations and understanding the reversibility of processes.
- All functions have an inverse; however, the domain restrictions are critical when determining if the inverse is a function.
- The properties of functions and function operations are used to model, analyze, and predict real-world phenomena.

Essential Questions:

- How do different types of functions (linear, quadratic, etc) differ in their properties and attributes?
- In what ways can understanding the property and attributes of functions enhance our ability to model and solve real-world problems?
- When is it more appropriate to analyze a function algebraically vs graphically?
- How can combining functions create new functions and what are the implications?
- How do you find the inverse of a function and what is its significance?

Students will know...

- There are multiple representations, most common are equations, tables, and graphs.
- End behavior describes the movement if the graph were to continue to extend beyond the given window.
- Performing operations on functions can restrict the domain of the resulting expression.
- Composition of functions is the process of finding the output of one function and then using it as the input for a second function.

Students will be able to...

- Identify key features of the graph, including its domain, range, asymptotes, intercepts, and transformations.
- Identify the end behavior of the function.
- Graph functions and their inverse.
- Create equations using function operations, including composition.
- Solve for the inverse of a function and identify any domain restrictions.

• Composition of functions is not commutative. • Functions are inverses of each other if and only if their compositions both simplify to x. • Technology and analyzing the correlation coefficient can assist in modeling.	• Verify two given functions are inverses of each other through composition. • Create equations to model real-world phenomena (data) using technology.

Key Vocabulary:

Relation	Composition	Horizontal Line Test
Function	Composition of Functions	Inverse
Representations of Functions	Piecewise Function	Inverse Function
End Behavior	Vertical Line Test	One-to-one

Assessment Evidence

Performance Tasks:

Summative Unit Assessment TCC3(9-12) Topics will include:

- Describe the end behavior of the indicated function
- Perform the indicated operation. State any domain restrictions.
- Identify the composition performed.
- Verify that the two functions are inverses.
- Graph piecewise functions
- Determine if the given graph will have an inverse that is a function.
- Find the inverse of the function. State its domain and range.

Function Family Project CCE4(9-12); TI2(9-12)

- Students will create and present the critical attributes of one of the function families studied throughout the year. Their presentation should include examples of applications of this function to real-world phenomena.

Other Evidence:

Common Formative Assessments AA4(9-12)

- Representations of Functions
- End behavior
- Graphing Piecewise Functions
- Operations with Functions
- Finding the inverse of a function and its domain and range

Learning Plan

Algebra 2 is the study of functions. In this unit, students will summarize their learning regarding all function types discussed throughout the year and their various representations (i.e.: table, graph, equation, verbal description). Similarities and differences between function families will be

emphasized, along with connecting the visual representation of the graph to its end behavior.

- Review the definition of a function and its multiple representations (table, graph, equation, and verbal description) **TCC3(9-12); CCE4(9-12)**
- Discuss similarities and differences for all of the parent functions studied throughout the course of the year and describe their end behavior. This includes modeling with real-world data and data analysis.**TCC3(9-12); CCE4(9-12)**
- Use function notation to perform operations with functions. Attention to domain restrictions when dividing and performing composition of functions (greater emphasis and more challenging questions in honors ★ **AA4(9-12)**
- Solve for the inverse function. **AA4(9-12)**

Teacher Resources: Algebra 2 Textbooks; Desmos; TI Smartview Software; Teacher created in-class notes, activities, and problem sets

Unit 9 - Statistics

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard; ★ indicates greater emphasis in the Honors sections)

- **S.ID.B.5** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
- **S.IC.A.1** Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
- **S.IC.B.3** Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
- **S.IC.B.4** Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
- **S.IC.B.5** Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
- **S.IC.B.6** Evaluate reports based on data.

Standards for Mathematical Practice

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- MP4: Model with mathematics.
- MP5: Use appropriate tools strategically.
- MP6: Attend to precision.
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- MP8: Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... (“I can” statements to be demonstrated)

- I can evaluate evidence from multiple perspectives, and recognize their limitations and implications, in order to justify new conclusions. **TCC2(9-12)**
- I can formulate and investigate probing questions to further my learning. **TI3(9-12)**

Understandings: Students will understand that...	**Essential Questions:**

• Two-way frequency tables are essential tools for displaying data. • Statistical practices allow us to make conclusions. • Care must be taken to generate a sample that is representative of an entire population. • Evaluating data involves understanding methodologies, recognizing biases, and assessing the validity and reliability of the conclusions.	• How can two-way frequency tables and relative frequencies help identify associations and trends in categorical data? • How can we determine information about a population when it is impossible, or impractical, to measure the entire population? • How does knowledge of some attribute affect the likelihood of some other attribute? • Which criteria should be used to critically evaluate the credibility and accuracy of data reports?
Students will know... • A sample can be used to make conclusions about an entire population. • Bias can impact the results of a study or experiment. • A treatment is a deliberate change made to a subject as part of an experiment. • Two way tables organize data from some sample or measured on two different variables.	**Students will be able to...** • Identify potential sources of bias in data collection and reflect on their impact in generalizing from a sample to a population. • Discern between observational studies and experiments. • Determine the likelihood of an event based on the knowledge of drawing a result from a subset of data(conditional probability).

Key Vocabulary:

Sample	Cluster Sample	
Population	Multistage Sample	Treatment
Representative Sample	Bias	Placebo
Sampling Methods	Undercoverage Bias	Control Group
Census	Voluntary Response Bias	Blinding
Convenience Sample,	Response Bias	Two-way table
Simple Random Sample	Non-response Bias	Probability
Systematic Sample	Observational Study	Conditional Probability
Stratified Sample	Experiment	Relative Frequency

Assessment Evidence	
Performance Tasks: **Summative Unit Assessment: TCC2(9-12); TI3(9-12)** topics to	**Other Evidence:** **Common Formative Assessments:**

include: ● Sampling Methods ● Bias ● Observational Studies and Experiments ● Two Way Tables and Conditional Probability	● Sampling Methods, Bias, and Observational Studies and Experiments Quiz (created from SAT released questions) ● Two Way Tables and Conditional Probability (created from SAT released questions)
Learning Plan	
In this unit, students will begin to explore the basics of data collection as part of an observational study or experiment. They will study appropriate ways to collect data, and critique the negative effects that can result when this is not done properly. Students will advance their knowledge of basic probability by considering situations involving conditional probability. These will be visualized primarily through the use of two-way tables where a probability is calculated from one row, or column, of the table. The types of bias can be easily confused by students due to similarities and perceived overlap. Students will learn sampling methods, types of bias, as well as discuss observational strides and experimental design. More important than classifying bias by the correct term is the ability to explain why bias occurred and to speculate on its implications. **TCC2(9-12), TI3(9-12)** For Two Way Tables and Conditional Probability, students will first be introduced to the use of a two-way table, how to fill one in, and the importance of having a row and column for totals. Next, questions of conditional probability will be explored. Students will be encouraged to “block out” information in the table by literally covering up rows or columns based on provided information. **TCC2(9-12)**	
Teacher Resources: Algebra 2 Textbooks; Desmos; TI Smartview Software; Teacher created in-class notes, activities, and problem sets	