Washington Office of Superintendent of
PUBLIC INSTRUCTION

Learning that works for Washington
CTE

Statewide Framework Document for: 270301

Applied Algebra 2

Standards may be added to this document prior to submission but may not be removed from the framework to meet state credit equivalency requirements. Performance assessments and leadership alignment may be developed at the local level. In order to earn state approval, performance assessments must be submitted within this framework. **This course is eligible for one credit of Algebra 2.** Washington Mathematics Standards (Common Core State Standards) support foundational mathematical knowledge and reasoning. While it is important to develop a conceptual understanding of mathematical topics and fluency in numeracy and procedural skills, teachers should also focus on the application of mathematics to career fields to support the three (3) key shifts of CCSS. The Standards for Mathematical Practice develop mathematical habits of mind and are to be modeled and integrated throughout the course. The details about each mathematical standard can be found at Common Core Mathematics Standards.

School District Name	
Course Title: Applied Algebra 2	**Total Framework Hours:** 180
CIP Code: 270301 ☒ Exploratory ☐ Preparatory	**Date Last Modified:** December 31, 2020
Career Cluster: Science, Technology, Engineering and Math	**Cluster Pathway:** Science and Math
Course Summary: Applied Algebra 2 focuses on the application of mathematics and statistics to the solution of functional problems in fields such as engineering and the applied sciences. The course includes practical application of mathematical concepts such as exponents and systems of equations and inequalities. Students will learn about functions, quadratic equations, conic sections, exponential and logarithmic functions, polynomials, rational functions, sequences and series, probability, and trigonometric functions and identities.	
Eligible for Equivalent Credit in: Math and Science	**Total Number of Units:** 13

Unit 1: Fundamentals of Algebra	**Total Learning Hours for Unit:** 8

Unit Summary:

In this unit, students:

- Identify natural numbers, whole numbers, integers, rational numbers, and irrational numbers.
- Understand identity properties and inverse properties.
- Solving equations and inequalities.
- Understand the properties of inequalities.
- Solve absolute value equations and inequalities.
- Graph linear equations and inequalities using *y*-intercept, slope intercept form, and point slope form.
- Graph scatter plots.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Synthesize information from a variety of instructional and technological sources by using real numbers, equations, and inequalities.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

1B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

2C.5 Reflect critically on learning experiences and processes

2D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions

3B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

Industry Standards and/or Competencies:

Applied Algebra 2 is not industry specific. Algebra 2 is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. Students discuss and explore careers where the understanding and application of the principals of Algebra 2 are applicable.

Aligned Washington State Academic Standards	
Mathematics: Common Core	HS.N.Q.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. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. HS.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.* HS.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients. HS.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. HS.A.SSE.2 Use the structure of an expression to identify ways to rewrite it.

	HS.A.CED.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. HS.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. HS.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. HS.A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. HS.A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. HS.A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. HS.A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. HS.S.ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). HS.S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. HS.S.ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). HS.S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. HS.S.ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit. HS.S.ID.9 Distinguish between correlation and causation.
Mathematical Practices	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.

Unit 2: Systems of Equations and Inequalities	**Total Learning Hours for Unit:** 10
Unit Summary: In this unit, students:	

- Solve systems of equations by graphing.
- Solve systems of equations using substitution.
- Solve systems of equations using elimination.
- Solve systems of equations in three variables.
- Solve systems of linear inequalities.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Engage in a variety of mechanisms to identify the function of the mathematical computation.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

2A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation
2C.3 Synthesize and make connections between information and arguments
2D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions
3A.5 Communicate effectively in diverse environments (including multi-lingual)

Industry Standards and/or Competencies:

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Aligned Washington State Academic Standards	
Mathematics: Common Core	HS.N.Q.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. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. HS.N.VM.6 (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network. HS.N.VM.7 (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled. HS.N.VM.8 (+) Add, subtract, and multiply matrices of appropriate dimensions. HS.N.VM.9 (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties. HS.N.VM.10 (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse. HS.N.VM.11 (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.

	HS.N.VM.12 (+) Work with 2 × 2 matrices as a transformations of the plane, and interpret the absolute value of the determinant in terms of area. HS.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.* HS.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients. HS.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. HS.A.SSE.2 Use the structure of an expression to identify ways to rewrite it. HS.A.CED.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. HS.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. HS.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. HS.A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. HS.A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. HS.A.REI.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. HS.A.REI.6 Solve systems of linear equations exactly and approximately (e.g., with grapHS.), focusing on pairs of linear equations in two variables. HS.A.REI.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. HS.A.REI.8 (+) Represent a system of linear equations as a single matrix equation in a vector variable. HS.A.REI.9 (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater). HS.A.REI.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). HS.A.REI.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.* HS.A.REI.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.

Mathematical Practices	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.

Unit 3: Functions	**Total Learning Hours for Unit:** 15

Unit Summary:

In this unit, students:

- Identify functions using the vertical line test.
- Identify a relation.
- Identify the domain and range of a function.
- Identify the domain and range of a data set.
- Use and evaluate function notation.
- Perform operations of addition and subtraction in functions.
- Identify constant and inverse functions.
- Perform transformations of functions.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Engage in a variety of mechanisms to identify and use functions and function notation to solve problems.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

4A.2 Evaluate information critically and competently
4B.1 Use information accurately and creatively for the issue or problem at hand
6A.1 Use technology as a tool to research, organize, evaluate and communicate information
8B.1 Monitor, define, prioritize and complete tasks without direct oversight

Industry Standards and/or Competencies:

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Aligned Washington State Academic Standards	
Mathematics: Common Core	HS.N.Q.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. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. HS.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.*

	HS.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients. HS.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. HS.A.SSE.2 Use the structure of an expression to identify ways to rewrite it. HS.A.CED.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. HS.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. HS.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. HS.A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. HS.A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. HS.A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. HS.A.REI.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). HS.A.REI.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.* HS.A.REI.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. HS.F.IF.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). HS.F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. HS.F.IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. HS.F.IF.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.* HS.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. HS.F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.* HS.F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* HS.F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima. HS.F.IF.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. HS.F.IF.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. HS.F.IF.7d (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. HS.F.IF.7e Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. HS.F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. HS.F.IF.8a 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. HS.F.IF.8b Use the properties of exponents to interpret expressions for exponential functions. HS.F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). HS.F.BF.1 Write a function that describes a relationship between two quantities.* HS.F.BF.1a Determine an explicit expression, a recursive process, or steps for calculation from a context. HS.F.BF.1b Combine standard function types using arithmetic operations. HS.F.BF.1c (+) Compose functions. HS.F.BF.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. HS.F.BF.4 Find inverse functions. HS.F.BF.4a 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. HS.F.BF.4b (+) Verify by composition that one function is the inverse of another.

	HS.F.BF.4c (+) Read values of an inverse function from a graph or a table, given that the function has an inverse. HS.F.BF.4d (+) Produce an invertible function from a non-invertible function by restricting the domain. HS.F.BF.5 (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. HS.S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. HS.S.ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.
Mathematical Practices	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. MP7 Look for and make use of structure. MP8 Look for and express regularity in repeated reasoning.

Unit 4: Exponents	**Total Learning Hours for Unit:** 5

Unit Summary:

In this unit, students:

- Understand the properties of exponents.
- Simplify radical expressions.
- Understand rational exponents and *n*th roots.
- Solve radical equations.
- Understand complex numbers.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Investigate multiple countries' population growth rates and agricultural output growth rates.
- Using data, students determine whether there will be sufficient food to feed the nations' inhabitants given different rates of growth in population and agricultural outputs.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

2A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation
2C.3 Synthesize and make connections between information and arguments
3A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
9A.1 Know when it is appropriate to listen and when to speak

9B.2 Respond open-mindedly to different ideas and values	
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Aligned Washington State Academic Standards	
Mathematics: Common Core	HS.N.RN.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. HS.N.RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents. HS.N.Q.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. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. HS.N.CN.1 Know there is a complex number i such that i2 = -1, and every complex number has the form a + bi with a and b real. HS.N.CN.2 Use the relation i2 = -1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. HS.N.CN.3 (+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers. HS.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.* HS.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients. HS.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. HS.A.SSE.2 Use the structure of an expression to identify ways to rewrite it. HS.A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* HS.A.SSE.3a Factor a quadratic expression to reveal the zeros of the function it defines. HS.A.SSE.3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. HS.A.SSE.3c Use the properties of exponents to transform expressions for exponential functions.
Mathematical Practices	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.

Unit 5: Quadratic Equations	**Total Learning Hours for Unit:** 22
Unit Summary: In this unit, students: • Solve quadratic equations by graphing. • Solve quadratic equations by using square roots. • Solve quadratic equations by completing the square. • Solve quadratic equations by factoring. • Solve quadratic equations using the quadratic formula. • Solving quadratic equations with complex roots.	
Performance Assessments: (Districts to complete for each unit) *Example assessments for this unit include:* • Engage in a variety of activities to use various methods of solving quadratic equations, including quadratic equations with complex roots.	
Leadership Alignment: (Districts to complete for each unit) *Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.* *Example:* 2A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation 2C.3 Synthesize and make connections between information and arguments 3A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts	
Industry Standards and/or Competencies: Applied Algebra 2 is not industry specific. Algebra 2 is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. Students discuss and explore careers where the understanding and application of the principals of Algebra 2 are applicable.	
Aligned Washington State Academic Standards	
Mathematics: Common Core	HS.N.Q.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. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. HS.N.CN.7 Solve quadratic equations with real coefficients that have complex solutions. HS.N.CN.8 (+) Extend polynomial identities to the complex numbers. HS.N.CN.9 (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials. HS.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.* HS.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients. HS.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity.

	HS.A.SSE.2 Use the structure of an expression to identify ways to rewrite it. HS.A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* HS.A.SSE.3a Factor a quadratic expression to reveal the zeros of the function it defines. HS.A.SSE.3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. HS.A.SSE.3c Use the properties of exponents to transform expressions for exponential functions. HS.A.CED.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. HS.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. HS.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. HS.A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. HS.A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. HS.A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. HS.A.REI.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. HS.A.REI.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). HS.A.REI.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.* HS.F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. HS.F.IF.8a 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. HS.F.IF.8b Use the properties of exponents to interpret expressions for exponential functions. HS.F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
Mathematical Practices	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.

Unit 6: Conic Sections	**Total Learning Hours for Unit:** 10

Unit Summary:

In this unit, students:

- Find the distance between two points on a coordinate grid.
- Find the midpoint of a line segment on a coordinate grid.
- Classify a conic section.
- Write equations explaining parabolas.
- Identify, write an equation, and sketch graphs of ellipses.
- Identify, write an equation, and sketch graphs of circles.
- Identify, write an equation, and sketch graphs of hyperbolas.
- Solve systems of conic sections.
- Identify and use transformations of parent functions and graphs.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Engage in a variety of mechanisms to analyze the characteristics and key elements of conic sections

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

8A.3 Utilize time and manage workload efficiently
9A.2 Conduct themselves in a respectable, professional manner
10A.2 Prioritize, plan and manage work to achieve the intended result
11B.1 Act responsibly with the interests of the larger community in mind

Industry Standards and/or Competencies:

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Aligned Washington State Academic Standards

Mathematics: Common Core	HS.N.Q.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. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. HS.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.* HS.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients. HS.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. HS.A.SSE.2 Use the structure of an expression to identify ways to rewrite it. HS.A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* HS.A.SSE.3a Factor a quadratic expression to reveal the zeros of the function it defines. HS.A.SSE.3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. HS.A.SSE.3c Use the properties of exponents to transform expressions for exponential functions. HS.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. HS.A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. HS.G.CO.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. HS.G.GPE.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. HS.G.GPE.2 Derive the equation of a parabola given a focus and directrix. HS.G.GPE.3 (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.
Mathematical Practices	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.

Unit 7: Exponential and Logarithmic Functions	**Total Learning Hours for Unit:** 15
Unit Summary: In this unit, students: • Identify and graph exponential functions. • Write, evaluate, and sketch graphs of logarithmic functions. • Identify logarithmic properties. • Simplify and expand logarithms. • Simplify, expand, and graph natural logarithms. • Solve exponential and logarithmic equations. • Solve problems using compound interest.	
Performance Assessments: (Districts to complete for each unit) *Example assessments for this unit include:* • Engage in a variety of activities to evaluate and apply exponential and logarithmic functions.	
Leadership Alignment: (Districts to complete for each unit) *Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.* *Example:* 2A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation 2D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions 3B.1 Demonstrate ability to work effectively and respectfully with diverse teams 4A.2 Evaluate information critically and competently	
Industry Standards and/or Competencies: Applied Algebra 2 is not industry specific. Algebra 2 is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. Students discuss and explore careers where the understanding and application of the principals of Algebra 2 are applicable.	
Aligned Washington State Academic Standards	
Mathematics: Common Core	HS.N.RN.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. HS.N.RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents. Use properties of rational and irrational numbers. HS.N.RN.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

	HS.N.Q.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. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. HS.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.* HS.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients. HS.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. HS.A.SSE.2 Use the structure of an expression to identify ways to rewrite it. HS.A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* HS.A.SSE.3a Factor a quadratic expression to reveal the zeros of the function it defines. HS.A.SSE.3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. HS.A.SSE.3c Use the properties of exponents to transform expressions for exponential functions. HS.A.SSE.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. HS.A.CED.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. HS.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. HS.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. HS.A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. HS.A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. HS.F.IF.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.* HS.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. HS.F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*

	HS.F.BF.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. HS.F.BF.4 Find inverse functions. HS.F.BF.4a 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. HS.F.BF.4b (+) Verify by composition that one function is the inverse of another. HS.F.BF.4c (+) Read values of an inverse function from a graph or a table, given that the function has an inverse. HS.F.BF.4d (+) Produce an invertible function from a non-invertible function by restricting the domain. HS.F.BF.5 (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. HS.F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. HS.F.LE.1a Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. HS.F.LE.1b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. HS.F.LE.1c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. HS.F.LE.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). HS.F.LE.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. HS.F.LE.4 For exponential models, express as a logarithm the solution to abct = d where a, c, and dare numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. HS.F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context.
Mathematical Practices	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.

Unit 8: Polynomials	**Total Learning Hours for Unit:** 20

Unit Summary:

In this unit, students:

- Add, subtract, and multiply polynomials.
- Factor polynomials.
- Divide polynomials using long division and synthetic division.
- Use the factor theorem and the remainder theorem.
- Solve polynomial equations.
- Identify end behaviors of polynomial graphs.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

Complete the following project:

- Students start with a rectangular piece of paper. By cutting out squares of equal size from each corner of the piece of paper and folding the flaps upward, students can create boxes of varying heights. How much would they need to cut out of the corners to maximize the volume of each box?
- Once students understand the question, they should create a hypothesis and a strategy for testing their hypothesis. Can they come up with a formula for the volume of the resulting box? Can they graph points to find a maximum value for the volume? What happens to the volume if the original piece of paper is very narrow, or a square? Is there an answer that can generalize to any size of paper?
- As an option, if this project coincides with a holiday such as Christmas, Valentine's Day, or a special school event, students can fill the boxes with something that they could sell as a class fundraiser. By creating a mixture problem (systems of equations), they could fill boxes with different items and figure out the cost that it will take to make that item. Finally, they can decide on the price point that would maximize their profits as they sell each item.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

1A.1 Use a wide range of idea creation techniques (such as brainstorming)
1B.3 Demonstrate originality and inventiveness in work and understand the real-world limits to adopting new ideas
2B.1 Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems
3A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts

Industry Standards and/or Competencies:

Applied Algebra 2 is not industry specific. Algebra 2 is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. Students discuss and explore careers where the understanding and application of the principals of Algebra 2 are applicable.

Aligned Washington State Academic Standards

Mathematics: Common Core	HS.N.Q.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. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. HS.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.* HS.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients. HS.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. HS.A.SSE.2 Use the structure of an expression to identify ways to rewrite it. HS.A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* HS.A.SSE.3a Factor a quadratic expression to reveal the zeros of the function it defines. HS.A.SSE.3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. HS.A.SSE.3c Use the properties of exponents to transform expressions for exponential functions. HS.A.APR.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. HS.A.APR.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). HS.A.APR.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. HS.A.APR.4 Prove polynomial identities and use them to describe numerical relationships. HS.A.APR.5 (+) Know and apply the Binomial Theorem for the expansion of (x + y)n in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle. HS.A.CED.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. HS.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. HS.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. HS.A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. HS.A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

	HS.F.IF.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.* HS.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. HS.F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.* HS.F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* HS.F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima. HS.F.IF.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. HS.F.IF.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. HS.F.IF.7d (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. HS.F.IF.7e Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. HS.F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. HS.F.IF.8a 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. HS.F.IF.8b Use the properties of exponents to interpret expressions for exponential functions. HS.F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
Mathematical Practices	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.

Unit 9: Rational Functions	**Total Learning Hours for Unit:** 15

Unit Summary:
In this unit, students:

- Determine discontinuity and asymptotes of functions.
- Graph rational functions.
- Write rational expressions in simplest form.
- Multiply and divide rational expressions.
- Add and subtract rational expressions.
- Solve rational equations.
- Simplify and solve complex fractions.
- Solve problems using direct, inverse, and joint variation.

Performance Assessments: (Districts to complete for each unit)
Example assessments for this unit include:

- Engage in a variety of activities to evaluate, model problems, and apply rational functions.

Leadership Alignment: (Districts to complete for each unit)
Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.
Example:

3B.1 Demonstrate ability to work effectively and respectfully with diverse teams
9A.1 Know when it is appropriate to listen and when to speak 1
10B.1 Demonstrate additional attributes associated with producing high quality products

Industry Standards and/or Competencies:
Applied Algebra 2 is not industry specific. Algebra 2 is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. Students discuss and explore careers where the understanding and application of the principals of Algebra 2 are applicable.

Aligned Washington State Academic Standards	
Mathematics: Common Core	HS.N.RN.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. HS.N.Q.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. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. HS.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.* HS.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients. HS.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. HS.A.SSE.2 Use the structure of an expression to identify ways to rewrite it.

	HS.A.APR.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. HS.A.APR.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. HS.A.APR.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. HS.A.CED.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. HS.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. HS.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. HS.A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. HS.A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. HS.A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. HS.F.IF.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). HS.F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. HS.F.IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. HS.F.IF.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.* HS.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

	HS.F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.* HS.F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* HS.F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima. HS.F.IF.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. HS.F.IF.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. HS.F.IF.7d (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
Mathematical Practices	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.

Unit 10: Sequences and Series	**Total Learning Hours for Unit:** 10

Unit Summary:

In this unit, students:

- Identify and write a formula for a pattern.
- Use a formula to find the terms in a sequence.
- Identify and evaluate sequences and series.
- Identify and evaluate geometric sequences and series.
- Find the sum of an infinite geometric series.
- Determine the difference between divergence and convergence.
- Use Pascal's Triangle and the binomial theorem to expand powers of a binomial.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Engage in a variety of activities to identify and write formulas for patterns, including arithmetic and geometric sequences and series.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

1A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts 1B.3 Demonstrate originality and inventiveness in work and understand the real-world limits to adopting new ideas 2C.3 Synthesize and make connections between information and arguments 3B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal	
Industry Standards and/or Competencies: Applied Algebra 2 is not industry specific. Algebra 2 is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. Students discuss and explore careers where the understanding and application of the principals of Algebra 2 are applicable.	
Aligned Washington State Academic Standards	
Mathematics: Common Core	HS.N.Q.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. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. HS.A.SSE.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. HS.A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. HS.F.IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. HS.F.BF.1 Write a function that describes a relationship between two quantities.* HS.F.BF.1a Determine an explicit expression, a recursive process, or steps for calculation from a context. HS.F.BF.1b Combine standard function types using arithmetic operations. HS.F.BF.1c (+) Compose functions. HS.F.BF.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*
Mathematical Practices	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.

Unit 11: Trigonometric Functions	**Total Learning Hours for Unit:** 30

Unit Summary:

In this unit, students:

- Identify trigonometric ratios.
- Find side length of a right triangle using trigonometric functions.
- Convert between degrees and radians.
- Measure angles using degrees and radians.
- Find arc length.
- Evaluate trigonometric functions.
- Find angles in a right triangle using trigonometric functions.
- Use the Law of Sines to solve for missing sides, angles, and area of a triangle.
- Use the Law of Cosines to solve for missing sides, angles, and area of a triangle.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Engage in a variety of activities to evaluate and apply trigonometric expressions and functions.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

2A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation
2C.3 Synthesize and make connections between information and arguments
3A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
9A.1 Know when it is appropriate to listen and when to speak
9B.2 Respond open-mindedly to different ideas and values

Industry Standards and/or Competencies:

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Aligned Washington State Academic Standards	
Mathematics: Common Core	HS.N.Q.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. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. HS.A.CED.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. HS.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

	HS.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. HS.A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. HS.F.BF.4 Find inverse functions. HS.F.BF.4a 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. HS.F.BF.4b (+) Verify by composition that one function is the inverse of another. HS.F.BF.4c (+) Read values of an inverse function from a graph or a table, given that the function has an inverse. HS.F.BF.4d (+) Produce an invertible function from a non-invertible function by restricting the domain. HS.F.TF.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. HS.F.TF.2 Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. HS.F.TF.3 (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for x, π + x, and 2π - x in terms of their values for x, where x is any real number. HS.F.TF.4 (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. Model periodic phenomena with trigonometric functions. HS.F.TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.* HS.F.TF.6 (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. HS.F.TF.7 (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.* HS.G.SRT.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. HS.G.SRT.7 Explain and use the relationship between the sine and cosine of complementary angles. HS.G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.* HS.G.SRT.9 (+) Derive the formula A = 1/2 ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. HS.G.SRT.10 (+) Prove the Laws of Sines and Cosines and use them to solve problems.

	HS.G.SRT.11(+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).
Mathematical Practices	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.

Unit 12: Trigonometric Graphs and Identities	**Total Learning Hours for Unit:** 10
Unit Summary: In this unit, students: • Graph trigonometric functions. • Simplify trigonometric expressions. • Identify a trigonometric identity. • Use the sum and difference identities to find exact values of trigonometric expressions. • Solve trigonometric equations	
Performance Assessments: (Districts to complete for each unit) *Example assessments for this unit include:* • Engage in a variety of activities to analyze and apply trigonometric graphs and identities.	
Leadership Alignment: (Districts to complete for each unit) *Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.* *Example:* 2A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation 2C.3 Synthesize and make connections between information and arguments 3A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts	
Industry Standards and/or Competencies: Applied Algebra 2 is not industry specific. Algebra 2 is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. Students discuss and explore careers where the understanding and application of the principals of Algebra 2 are applicable.	
Aligned Washington State Academic Standards	
Mathematics: Common Core	HS.N.Q.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. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling.

	HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. HS.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.* HS.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients. HS.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. HS.A.SSE.2 Use the structure of an expression to identify ways to rewrite it. HS.A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* HS.A.SSE.3a Factor a quadratic expression to reveal the zeros of the function it defines. HS.A.SSE.3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. HS.A.SSE.3c Use the properties of exponents to transform expressions for exponential functions. HS.A.APR.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. HS.A.APR.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. HS.A.REI.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). HS.F.IF.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). HS.F.IF.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.* HS.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. HS.F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* HS.F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima. HS.F.IF.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. HS.F.IF.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

	HS.F.IF.7d (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. HS.F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. HS.F.IF.8a 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. HS.F.IF.8b Use the properties of exponents to interpret expressions for exponential functions. HS.F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). HS.F.BF.1 Write a function that describes a relationship between two quantities.* HS.F.BF.1a Determine an explicit expression, a recursive process, or steps for calculation from a context. HS.F.BF.1b Combine standard function types using arithmetic operations. HS.F.BF.1c (+) Compose functions. HS.F.BF.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. HS.F.TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.* HS.F.TF.6 (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. HS.F.TF.7 (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.* HS.F.TF.8 Prove the Pythagorean identity sin2(θ) + cos2(θ) = 1 and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle. HS.F.TF.9 (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.
Mathematical Practices	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.

Unit 13: Probability	**Total Learning Hours for Unit: 10**
Unit Summary: In this unit, students: • Use the fundamental theorem of counting to find probability. • Identify independent and dependent events. • Find the probability of compound events. • Find probability using permutations. • Use combinations to find probability	
Performance Assessments: (Districts to complete for each unit) *Example assessments for this unit include:* • Use the concepts of this unit to create a game or problem that involves probability. Students share their games or problems with other students.	
Leadership Alignment: (Districts to complete for each unit) *Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.* *Example:* 2A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation 2C.3 Synthesize and make connections between information and arguments 3A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts	
Industry Standards and/or Competencies: Applied Algebra 2 is not industry specific. Algebra 2 is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. Students discuss and explore careers where the understanding and application of the principals of Algebra 2 are applicable.	
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	HS.S.ID.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. HS.S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. HS.S.ID.6a 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. HS.S.ID.6b Informally assess the fit of a function by plotting and analyzing residuals. HS.S.ID.6c Fit a linear function for a scatter plot that suggests a linear association. HS.S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. HS.S.ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit. HS.S.ID.9 Distinguish between correlation and causation. HS.S.IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. HS.S.IC.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. HS.S.IC.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. HS.S.IC.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. HS.S.IC.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. HS.S.IC.6 Evaluate reports based on data. HS.S.CP.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). HS.S.CP.2 Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. HS.S.CP.3 Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. HS.S.CP.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities

	HS.S.CP.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. HS.S.CP.6 Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model. HS.S.CP.7 Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model. HS.S.CP.8 (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. HS.S.CP.9 (+) Use permutations and combinations to compute probabilities of compound events and solve problems. HS.S.MD.1 (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. HS.S.MD.2 (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution. HS.S.MD.3 (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. HS.S.MD.4 (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. HS.S.MD.5 (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. HS.S.MD.5a Find the expected payoff for a game of chance. HS.S.MD.5b Evaluate and compare strategies on the basis of expected values. HS.S.MD.6 (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator). HS.S.MD.7 (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).
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