



Statewide Framework Document for: 270301

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 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 1 credit of Algebra II.** 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 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.

Applied Algebra II		
Course Title: Applied Algebra II		Total Framework Hours: 180
CIP Code: 270301	<input checked="" type="checkbox"/> Exploratory <input type="checkbox"/> Preparatory	Date Last Modified: May 4, 2015
Career Cluster: Science, Technology, Engineering and Math		Cluster Pathway: Science and Math
Eligible for Equivalent Credit in: <input checked="" type="checkbox"/> Math <input type="checkbox"/> Science		Total Number of Units: 13
Course Overview		
<p>Summary: Applied Algebra II 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.</p>		

Unit 1: Fundamentals of Algebra	Total Learning Hours for Unit: 8
<p>Unit Summary: In this unit, students will:</p> <ul style="list-style-type: none"> • 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:

Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework. Each unit has assessment resources that may include hands-on practice, group projects, applied problem-solving tasks, unit quizzes, and pre- and post-tests for understanding.

It is expected that students will:

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

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Aligned Washington State Standards

Standards for Mathematical Practice (Common Core State Standards):

- Practice 1: Make sense of problems and persevere in solving them.
 Practice 2: Reason abstractly and quantitatively.
 Practice 3: Construct viable arguments and critique the reasoning of others.
 Practice 4: Model with mathematics.
 Practice 5: Use appropriate tools strategically.
 Practice 6: Attend to precision.
 Practice 7: Look for and make use of structure.
 Practice 8: Look for and express regularity in repeated reasoning.

Washington Mathematical Standards (Common Core State Standards):

- Cluster: Reason quantitatively and use units to solve problems.
 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.
- Cluster: Interpret the structure of expressions.
 A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.
 1a Interpret part of an expression, such as terms, factors, and coefficients.
 1b Interpret complicated expressions by viewing one or more of their parts as a single entity.
 A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.
- Cluster: Create equations that describe numbers or relationships.
 A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems.
 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 nonviable options in a modeling context.

A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Cluster: Understand solving equations as a process of reasoning and explain the reasoning.

A.REI.A.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.

A.REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Cluster: Solve equations and inequalities in one variable.

A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Cluster: Summarize, represent, and interpret data on a single count or measurement variable.

S.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).

S.ID.A.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.

S.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Cluster: Interpret linear models.

S.ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S.ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.

S.ID.C.9 Distinguish between correlation and causation.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 11-12):

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Washington English Language Arts Standards (Common Core State Standards) - Writing Standards (Grades 11-12):

W.11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

W.11-12.2 Write informational/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

W.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Washington English Language Arts Standards (Common Core State Standards) - Speaking and Listening Standards (Grades 11-12):

SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Washington English Language Arts Standards (Common Core State Standards) - Language Standards (Grades 11-12):

L.11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

L.11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

L.11-12.3 Apply knowledge of language to understand how language functions in different context, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Educational Technology:

1.2.1 Communicate and collaborate to learn with others.

1.3.2 Locate and organize information from a variety of sources and media.

2.2.1 Develop skills to use technology effectively.

Unit 2: Systems of Equations and Inequalities

Total Learning Hours for Unit: 10

Unit Summary:

In this unit, students will:

- 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:

Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

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

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

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Standards for Mathematical Practice (Common Core State Standards):

Practice 1: Make sense of problems and persevere in solving them.

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Practice 4: Model with mathematics.

Practice 5: Use appropriate tools strategically.

Practice 6: Attend to precision.

Practice 7: Look for and make use of structure.

Practice 8: Look for and express regularity in repeated reasoning.

Washington Mathematical Standards (Common Core State Standards):

Cluster: Reason quantitatively and use units to solve problems.

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.

Cluster: Perform operations on matrices and use matrices in applications.

N.VM.C.6 Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.

N.VM.C.7 Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.

N.VM.C.8 Add, subtract, and multiply matrices of appropriate dimensions.

N.VM.C.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.

N.VM.C.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.

N.VM.C.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.

N.VM.C.12 Work with 2×2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.

Cluster: Interpret the structure of expressions.

A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

1a Interpret part of an expression, such as terms, factors, and coefficients.

1b Interpret complicated expressions by viewing one or more of their parts as a single entity.

A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.

Cluster: Create equations that describe numbers or relationships.

A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems.

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 nonviable options in a modeling context.

A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Cluster: Understand solving equations as a process of reasoning and explain the reasoning.

A.REI.A.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.

Cluster: Solve systems of equations.

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.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.C.8 Represent a system of linear equations as a single matrix equation in a vector variable.

A.REI.C.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).

Cluster: Represent and solve equations and inequalities graphically.

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.

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.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 11-12):

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

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RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

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RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

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SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

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L.11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

L.11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

L.11-12.3 Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Educational Technology:

- 1.2.1 Communicate and collaborate to learn with others.
- 1.3.2 Locate and organize information from a variety of sources and media.
- 2.2.1 Develop skills to use technology effectively.

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

In this unit, students will:

- 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:

Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

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

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Aligned Washington State Standards**Standards for Mathematical Practice (Common Core State Standards):**

- Practice 1: Make sense of problems and persevere in solving them.
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- Practice 5: Use appropriate tools strategically.
- Practice 6: Attend to precision.
- Practice 7: Look for and make use of structure.
- Practice 8: Look for and express regularity in repeated reasoning.

Washington Mathematical Standards (Common Core State Standards):

Cluster: Reason quantitatively and use units to solve problems.

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.

Cluster: Interpret the structure of expressions.

A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

1a Interpret part of an expression, such as terms, factors, and coefficients.

1b Interpret complicated expressions by viewing one or more of their parts as a single entity.

A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.

Cluster: Create equations that describe numbers or relationships.

A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems.

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.

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Cluster: Understand solving equations as a process of reasoning and explain the reasoning.

A.REI.A.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.

Cluster: Solve equations and inequalities in one variable.

A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Cluster: Represent and solve equations and inequalities graphically.

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.

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.

Cluster: Understand the concept of a function and use function notation.

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.A.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

Cluster: Interpret functions that arise in applications in terms of the 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.

F.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F.IF.B.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.

Cluster: Analyze functions using different representations.

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.

- 7a Graph linear and quadratic functions and show intercepts, maxima, and minima.
- 7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- 7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- 7d Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- 7e 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.

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.

8b Use the properties of exponents to interpret expressions for exponential 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).

Cluster: Build a function that models a relationship between two quantities.

F.BF.A.1 Write a function that describes a relationship between two quantities.

1a Determine an explicit expression, a recursive process, or steps for calculation from a context.

1b Combine standard function types using arithmetic operations.

1c Compose functions.

Cluster: Build new functions from existing functions.

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.

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.

4b Verify by composition that one function is the inverse of another.

4c Read values of an inverse function from a graph or a table, given that the function has an inverse.

4d Produce an invertible function from a non-invertible function by restricting the domain.

Cluster: Interpret expressions for functions in terms of the situation they model.

F.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.

Cluster: Interpret linear models.

S.ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S.ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.

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- 2.2.1 Develop skills to use technology effectively.

Unit 4: Exponents

Total Learning Hours for Unit: 5

Unit Summary:

In this unit, students will:

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

Performance Assessments:

Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

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

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

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Practice 4: Model with mathematics.

Practice 5: Use appropriate tools strategically.

Practice 6: Attend to precision.

Practice 7: Look for and make use of structure.

Practice 8: Look for and express regularity in repeated reasoning.

Washington Mathematical Standards (Common Core State Standards):

Cluster: Extend the properties of exponents to rational exponents.

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.

N.RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Cluster: Reason quantitatively and use units to solve problems.

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.

Cluster: Perform arithmetic operations with complex numbers.

N.CN.A.1 Know that 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.

Cluster: Interpret the structure of expressions.

A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

1a Interpret part of an expression, such as terms, factors, and coefficients.

1b Interpret complicated expressions by viewing one or more of their parts as a single entity.

A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.

Cluster: Write expressions in equivalent forms to solve problems.

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.

3a Factor a quadratic expression to reveal the zeros of the function it defines.

3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

3c Use the properties of exponents to transform expressions for exponential functions.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 11-12):

- RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
- RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Washington English Language Arts Standards (Common Core State Standards) - Writing Standards (Grades 11-12):

- W.11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- W.11-12.2 Write informational/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- W.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Washington English Language Arts Standards (Common Core State Standards) - Speaking and Listening Standards (Grades 11-12):

- SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
- SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Washington English Language Arts Standards (Common Core State Standards) - Language Standards (Grades 11-12):

- L.11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- L.11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
- L.11-12.3 Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Educational Technology:

- 1.2.1 Communicate and collaborate to learn with others.
- 1.3.2 Locate and organize information from a variety of sources and media.
- 2.2.1 Develop skills to use technology effectively.

Unit 5: Quadratic Equations	Total Learning Hours for Unit: 22
<p>Unit Summary: In this unit, students will:</p> <ul style="list-style-type: none"> • 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. 	
<p>Performance Assessments: <i>Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.</i></p> <p><i>It is expected that students will:</i></p> <ul style="list-style-type: none"> • Engage in a variety of activities to use various methods of solving quadratic equations, including quadratic equations with complex roots. 	
<p>Leadership Alignment:</p> <ul style="list-style-type: none"> • Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students. • The event, activity, or project and the associated 21st Century Skill should be clearly articulated. Example: Students will demonstrate the ability to communicate clearly through their group project presentation. 	
<p><i>Aligned Washington State Standards</i></p>	
<p>Standards for Mathematical Practice (Common Core State Standards): Practice 1: Make sense of problems and persevere in solving them. Practice 2: Reason abstractly and quantitatively. Practice 3: Construct viable arguments and critique the reasoning of others. Practice 4: Model with mathematics. Practice 5: Use appropriate tools strategically. Practice 6: Attend to precision. Practice 7: Look for and make use of structure. Practice 8: Look for and express regularity in repeated reasoning.</p>	
<p>Washington Mathematical Standards (Common Core State Standards): Cluster: Reason quantitatively and use units to solve problems. 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. Cluster: Use complex numbers in polynomial identities and equations. N.CN.C.7 Solve quadratic equations with real coefficients that have complex solutions. N.CN.C.8 Extend polynomial identities to the complex numbers.</p>	

N.CN.C.9 Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Cluster: Interpret the structure of expressions.

A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

1a Interpret part of an expression, such as terms, factors, and coefficients.

1b Interpret complicated expressions by viewing one or more of their parts as a single entity.

A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.

Cluster: Write expressions in equivalent forms to solve problems.

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.

3a Factor a quadratic expression to reveal the zeros of the function it defines.

3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

3c Use the properties of exponents to transform expressions for exponential functions.

Cluster: Create equations that describe numbers or relationships.

A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems.

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 nonviable options in a modeling context.

A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Cluster: Understand solving equations as a process of reasoning and explain the reasoning.

A.REI.A.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.

Cluster: Solve equations and inequalities in one variable.

A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Cluster: Solve systems of equations.

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 $x^2 + y^2 = 3$.

Cluster: Represent and solve equations and inequalities graphically.

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.

Cluster: Analyze functions using different representations.

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.

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.

8b Use the properties of exponents to interpret expressions for exponential 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).

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 11-12):

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Washington English Language Arts Standards (Common Core State Standards) - Writing Standards (Grades 11-12):

W.11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

W.11-12.2 Write informational/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

W.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Washington English Language Arts Standards (Common Core State Standards) - Speaking and Listening Standards (Grades 11-12):

SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Washington English Language Arts Standards (Common Core State Standards) - Language Standards (Grades 11-12):

L.11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

L.11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

L.11-12.3 Apply knowledge of language to understand how language functions in different context, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Educational Technology:

1.2.1 Communicate and collaborate to learn with others.

1.3.2 Locate and organize information from a variety of sources and media.

2.2.1 Develop skills to use technology effectively.

Unit 6: Conic Sections

Total Learning Hours for Unit: 10

Unit Summary:

In this unit, students will:

- 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:

Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

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

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Aligned Washington State Standards

Standards for Mathematical Practice (Common Core State Standards):

Practice 1: Make sense of problems and persevere in solving them.

Practice 2: Reason abstractly and quantitatively.

Practice 3: Construct viable arguments and critique the reasoning of others.

Practice 4: Model with mathematics.

Practice 5: Use appropriate tools strategically.

Practice 6: Attend to precision.

Practice 7: Look for and make use of structure.

Practice 8: Look for and express regularity in repeated reasoning.

Washington Mathematical Standards (Common Core State Standards):

Cluster: Reason quantitatively and use units to solve problems.

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.

Cluster: Interpret the structure of expressions.

A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

1a Interpret part of an expression, such as terms, factors, and coefficients.

1b Interpret complicated expressions by viewing one or more of their parts as a single entity.

A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.

Cluster: Write expressions in equivalent forms to solve problems.

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.

3a Factor a quadratic expression to reveal the zeros of the function it defines.

3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

3c Use the properties of exponents to transform expressions for exponential functions.

Cluster: Create equations that describe numbers or relationships.

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.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Cluster: Make geometric constructions.

G.CO.D.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).

Cluster: Translate between the geometric description and the equation for a conic section.

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.

G.GPE.A.2 Derive the equation of a parabola given a focus and directrix.

G.GPE.A.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.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 11-12):

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Washington English Language Arts Standards (Common Core State Standards) - Writing Standards (Grades 11-12):

W.11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

W.11-12.2 Write informational/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

W.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Washington English Language Arts Standards (Common Core State Standards) - Speaking and Listening Standards (Grades 11-12):

SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Washington English Language Arts Standards (Common Core State Standards) - Language Standards (Grades 11-12):

L.11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

L.11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

L.11-12.3 Apply knowledge of language to understand how language functions in different context, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Educational Technology:

1.2.1 Communicate and collaborate to learn with others.

1.3.2 Locate and organize information from a variety of sources and media.

2.2.1 Develop skills to use technology effectively.

Unit 7: Exponential and Logarithmic Functions**Total Learning Hours for Unit: 15****Unit Summary:**

In this unit, students will:

- 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:

Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Engage in a variety of activities to evaluate and apply exponential and logarithmic functions.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Aligned Washington State Standards**Standards for Mathematical Practice (Common Core State Standards):**

Practice 1: Make sense of problems and persevere in solving them.

Practice 2: Reason abstractly and quantitatively.

Practice 3: Construct viable arguments and critique the reasoning of others.

Practice 4: Model with mathematics.

- Practice 5: Use appropriate tools strategically.
- Practice 6: Attend to precision.
- Practice 7: Look for and make use of structure.
- Practice 8: Look for and express regularity in repeated reasoning.

Washington Mathematical Standards (Common Core State Standards):

Cluster: Extend the properties of exponents to rational exponents.

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.

N.RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Cluster: Use properties of rational and irrational numbers.

N.RN.B.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.

Cluster: Reason quantitatively and use units to solve problems.

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.

Cluster: Interpret the structure of expressions.

A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

1a Interpret part of an expression, such as terms, factors, and coefficients.

1b Interpret complicated expressions by viewing one or more of their parts as a single entity.

A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.

Cluster: Write expressions in equivalent forms to solve problems.

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.

3a Factor a quadratic expression to reveal the zeros of the function it defines.

3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

3c Use the properties of exponents to transform expressions for exponential functions.

A.SSE.B.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.

Cluster: Create equations that describe numbers or relationships.

A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems.

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 nonviable options in a modeling context.

A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Cluster: Understand solving equations as a process of reasoning and explain the reasoning.

A.REI.A.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.

Cluster: Interpret functions that arise in applications in terms of the 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.

F.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F.IF.B.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.

Cluster: Build new functions from existing functions.

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.

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.

4b Verify by composition that one function is the inverse of another.

4c Read values of an inverse function from a graph or a table, given that the function has an inverse.

4d Produce an invertible function from a non-invertible function by restricting the domain.

F.BF.B.5 Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Cluster: Construct and compare linear, quadratic, and exponential models and solve problems.

F.LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.

1a Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

1b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

1c 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.

Cluster: Interpret expressions for functions in terms of the situation they model.

F.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 11-12):

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Washington English Language Arts Standards (Common Core State Standards) - Writing Standards (Grades 11-12):

W.11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

W.11-12.2 Write informational/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

W.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Washington English Language Arts Standards (Common Core State Standards) - Speaking and Listening Standards (Grades 11-12):

- SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
- SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Washington English Language Arts Standards (Common Core State Standards) - Language Standards (Grades 11-12):

- L.11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- L.11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
- L.11-12.3 Apply knowledge of language to understand how language functions in different context, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Educational Technology:

- 1.2.1 Communicate and collaborate to learn with others.
- 1.3.2 Locate and organize information from a variety of sources and media.
- 2.2.1 Develop skills to use technology effectively.

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

In this unit, students will:

- 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:

Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will 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:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Aligned Washington State Standards**Standards for Mathematical Practice (Common Core State Standards):**

Practice 1: Make sense of problems and persevere in solving them.

Practice 2: Reason abstractly and quantitatively.

Practice 3: Construct viable arguments and critique the reasoning of others.

Practice 4: Model with mathematics.

Practice 5: Use appropriate tools strategically.

Practice 6: Attend to precision.

Practice 7: Look for and make use of structure.

Practice 8: Look for and express regularity in repeated reasoning.

Washington Mathematical Standards (Common Core State Standards):

Cluster: Reason quantitatively and use units to solve problems.

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.

Cluster: Interpret the structure of expressions.

A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

1a Interpret part of an expression, such as terms, factors, and coefficients.

1b Interpret complicated expressions by viewing one or more of their parts as a single entity.

A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.

Cluster: Write expressions in equivalent forms to solve problems.

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.

3a Factor a quadratic expression to reveal the zeros of the function it defines.

3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

3c Use the properties of exponents to transform expressions for exponential functions.

Cluster: Perform arithmetic operations on polynomials.

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.

Cluster: Understand the relationship between zeros and factors of 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 a suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Cluster: Use polynomial identities to solve problems.

A.APR.C.4 Prove polynomial identities and use them to describe numerical relationships.

A.APR.C.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.

Cluster: Create equations that describe numbers or relationships.

A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems.

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 nonviable options in a modeling context.

A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Cluster: Understand solving equations as a process of reasoning and explain the reasoning.

A.REI.A.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.

Cluster: Interpret functions that arise in applications in terms of the 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.

F.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F.IF.B.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.

Cluster: Analyze functions using different representations.

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.

7a Graph linear and quadratic functions and show intercepts, maxima, and minima.

7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

7d Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

7e 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.

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.

8b Use the properties of exponents to interpret expressions for exponential 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).

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 11-12):

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Washington English Language Arts Standards (Common Core State Standards) - Writing Standards (Grades 11-12):

- W.11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- W.11-12.2 Write informational/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- W.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Washington English Language Arts Standards (Common Core State Standards) - Speaking and Listening Standards (Grades 11-12):

- SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
- SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Washington English Language Arts Standards (Common Core State Standards) - Language Standards (Grades 11-12):

- L.11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- L.11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
- L.11-12.3 Apply knowledge of language to understand how language functions in different context, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Educational Technology:

- 1.2.1 Communicate and collaborate to learn with others.
- 1.3.2 Locate and organize information from a variety of sources and media.
- 2.2.1 Develop skills to use technology effectively.

Unit 9: Rational Functions

Total Learning Hours for Unit: 15

Unit Summary:

In this unit, students will:

- 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:

Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

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

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Aligned Washington State Standards**Standards for Mathematical Practice (Common Core State Standards):**

Practice 1: Make sense of problems and persevere in solving them.

Practice 2: Reason abstractly and quantitatively.

Practice 3: Construct viable arguments and critique the reasoning of others.

Practice 4: Model with mathematics.

Practice 5: Use appropriate tools strategically.

Practice 6: Attend to precision.

Practice 7: Look for and make use of structure.

Practice 8: Look for and express regularity in repeated reasoning.

Washington Mathematical Standards (Common Core State Standards):

Cluster: Use properties of rational and irrational numbers.

N.RN.B.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.

Cluster: Reason quantitatively and use units to solve problems.

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.

Cluster: Interpret the structure of expressions.

A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

1a Interpret part of an expression, such as terms, factors, and coefficients.

1b Interpret complicated expressions by viewing one or more of their parts as a single entity.

A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.

Cluster: Understand the relationship between zeros and factors of polynomials.

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.

Cluster: Rewrite rational expressions.

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.

Cluster: Create equations that describe numbers or relationships.

A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems.

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 nonviable options in a modeling context.

A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Cluster: Understand solving equations as a process of reasoning and explain the reasoning.

A.REI.A.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.

A.REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Cluster: Understand the concept of a function and use function notation.

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.

Cluster: Interpret functions that arise in applications in terms of the 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.

F.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F.IF.B.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.

Cluster: Analyze functions using different representations.

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.

7d Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 11-12):

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Washington English Language Arts Standards (Common Core State Standards) - Writing Standards (Grades 11-12):

- W.11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- W.11-12.2 Write informational/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- W.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Washington English Language Arts Standards (Common Core State Standards) - Speaking and Listening Standards (Grades 11-12):

- SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
- SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Washington English Language Arts Standards (Common Core State Standards) - Language Standards (Grades 11-12):

- L.11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- L.11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
- L.11-12.3 Apply knowledge of language to understand how language functions in different context, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Educational Technology:

- 1.2.1 Communicate and collaborate to learn with others.
- 1.3.2 Locate and organize information from a variety of sources and media.
- 2.2.1 Develop skills to use technology effectively.

Unit 10: Sequences and Series

Total Learning Hours for Unit: 10

Unit Summary:

In this unit, students will:

- 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:

Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

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

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Aligned Washington State Standards**Standards for Mathematical Practice (Common Core State Standards):**

Practice 1: Make sense of problems and persevere in solving them.

Practice 2: Reason abstractly and quantitatively.

Practice 3: Construct viable arguments and critique the reasoning of others.

Practice 4: Model with mathematics.

Practice 5: Use appropriate tools strategically.

Practice 6: Attend to precision.

Practice 7: Look for and make use of structure.

Practice 8: Look for and express regularity in repeated reasoning.

Washington Mathematical Standards (Common Core State Standards):

Cluster: Reason quantitatively and use units to solve problems.

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.

Cluster: Write expressions in equivalent forms to solve problems.

A.SSE.B.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.

Cluster: Understand solving equations as a process of reasoning and explain the reasoning.

A.REI.A.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.

Cluster: Understand the concept of a function and use function notation.

F.IF.A.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

Cluster: Build a function that models a relationship between two quantities.

F.BF.A.1 Write a function that describes a relationship between two quantities.

1a Determine an explicit expression, a recursive process, or steps for calculation from a context.

1b Combine standard function types using arithmetic operations.

1c Compose functions.

F.BF.A.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 11-12):

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Washington English Language Arts Standards (Common Core State Standards) - Writing Standards (Grades 11-12):

W.11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

W.11-12.2 Write informational/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

W.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Washington English Language Arts Standards (Common Core State Standards) - Speaking and Listening Standards (Grades 11-12):

SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Washington English Language Arts Standards (Common Core State Standards) - Language Standards (Grades 11-12):

L.11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

L.11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

L.11-12.3 Apply knowledge of language to understand how language functions in different context, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Educational Technology:

1.2.1 Communicate and collaborate to learn with others.

1.3.2 Locate and organize information from a variety of sources and media.

2.2.1 Develop skills to use technology effectively.

Unit 11: Trigonometric Functions

Total Learning Hours for Unit: 30

Unit Summary:

In this unit, students will:

- 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:

Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

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

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Aligned Washington State Standards

Standards for Mathematical Practice (Common Core State Standards):

Practice 1: Make sense of problems and persevere in solving them.

Practice 2: Reason abstractly and quantitatively.

Practice 3: Construct viable arguments and critique the reasoning of others.

Practice 4: Model with mathematics.

Practice 5: Use appropriate tools strategically.

Practice 6: Attend to precision.

Practice 7: Look for and make use of structure.

Practice 8: Look for and express regularity in repeated reasoning.

Washington Mathematical Standards (Common Core State Standards):

Cluster: Reason quantitatively and use units to solve problems.

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.

Cluster: Create equations that describe numbers or relationships.

A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems.

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 nonviable options in a modeling context.

A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Cluster: Build new functions from existing functions.

F.BF.B.4 Find inverse functions.

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.

4b Verify by composition that one function is the inverse of another.

4c Read values of an inverse function from a graph or a table, given that the function has an inverse.

4d Produce an invertible function from a non-invertible function by restricting the domain.

Cluster: Extend the domain of trigonometric functions using the unit circle.

F.TF.A.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

F.TF.A.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.

F.TF.A.3 Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for x , $\pi + x$, and $2\pi - x$ in terms of their values for x , where x is any real number.

F.TF.A.4 Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

Cluster: Model periodic phenomena with trigonometric functions.

F.TF.B.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

F.TF.B.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.

F.TF.B.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.

Cluster: Define trigonometric ratios and solve problems involving right triangles.

G.SRT.C.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.

G.SRT.C.7 Explain and use the relationship between the sine and cosine of complementary angles.

G.SRT.C.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Cluster: Apply trigonometry to general triangles.

G.SRT.D.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.

G.SRT.D.10 Prove the Laws of Sines and Cosines and use them to solve problems.

G.SRT.D.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).

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 11-12):

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Washington English Language Arts Standards (Common Core State Standards) - Writing Standards (Grades 11-12):

W.11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

W.11-12.2 Write informational/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

W.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Washington English Language Arts Standards (Common Core State Standards) - Speaking and Listening Standards (Grades 11-12):

- SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
- SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Washington English Language Arts Standards (Common Core State Standards) - Language Standards (Grades 11-12):

- L.11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- L.11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
- L.11-12.3 Apply knowledge of language to understand how language functions in different context, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Educational Technology:

- 1.2.1 Communicate and collaborate to learn with others.
- 1.3.2 Locate and organize information from a variety of sources and media.
- 2.2.1 Develop skills to use technology effectively.

Unit 12: Trigonometric Graphs and Identities

Total Learning Hours for Unit: 10

Unit Summary:

In this unit, students will:

- 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:

Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Engage in a variety of activities to analyze and apply trigonometric graphs and identities.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Aligned Washington State Standards

Standards for Mathematical Practice (Common Core State Standards):

- Practice 1: Make sense of problems and persevere in solving them.
Practice 2: Reason abstractly and quantitatively.
Practice 3: Construct viable arguments and critique the reasoning of others.
Practice 4: Model with mathematics.
Practice 5: Use appropriate tools strategically.
Practice 6: Attend to precision.
Practice 7: Look for and make use of structure.
Practice 8: Look for and express regularity in repeated reasoning.

Washington Mathematical Standards (Common Core State Standards):

Cluster: Reason quantitatively and use units to solve problems.

- 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.

Cluster: Interpret the structure of expressions.

- A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.
1a Interpret part of an expression, such as terms, factors, and coefficients.
1b Interpret complicated expressions by viewing one or more of their parts as a single entity.
A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.

Cluster: Write expressions in equivalent forms to solve problems.

- 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.
3a Factor a quadratic expression to reveal the zeros of the function it defines.
3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
3c Use the properties of exponents to transform expressions for exponential functions.

Cluster: Rewrite rational expressions.

- 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.

Cluster: Represent and solve equations and inequalities graphically.

- 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).

Cluster: Understand the concept of a function and use function notation.

- 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 $y = f(x)$.

Cluster: Interpret functions that arise in applications in terms of the 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.
F.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

Cluster: Analyze functions using different representations.

- 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.

- 7a Graph linear and quadratic functions and show intercepts, maxima, and minima.
- 7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- 7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- 7d Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- 7e 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.

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.

8b Use the properties of exponents to interpret expressions for exponential 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).

Cluster: Build a function that models a relationship between two quantities.

F.BF.A.1 Write a function that describes a relationship between two quantities.

1a Determine an explicit expression, a recursive process, or steps for calculation from a context.

1b Combine standard function types using arithmetic operations.

1c Compose functions.

Cluster: Build new functions from existing functions.

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.

Cluster: Model periodic phenomena with trigonometric functions.

F.TF.B.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

F.TF.B.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.

F.TF.B.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.

Cluster: Prove and apply trigonometric identities.

F.TF.C.8 Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.

F.TF.C.9 Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 11-12):

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Washington English Language Arts Standards (Common Core State Standards) - Writing Standards (Grades 11-12):

- W.11-12.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- W.11-12.2 Write informational/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- W.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Washington English Language Arts Standards (Common Core State Standards) - Speaking and Listening Standards (Grades 11-12):

- SL.11-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
- SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

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- L.11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
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- L.11-12.3 Apply knowledge of language to understand how language functions in different context, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Educational Technology:

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- 1.3.2 Locate and organize information from a variety of sources and media.
- 2.2.1 Develop skills to use technology effectively.

Unit 13: Probability

Total Learning Hours for Unit: 10

Unit Summary:

In this unit, students will:

- 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:

Performance assessments may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Use the concepts of this unit to create a game or problem that involves probability. Students will share their games or problems with other students.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Aligned Washington State Standards**Standards for Mathematical Practice (Common Core State Standards):**

Practice 1: Make sense of problems and persevere in solving them.

Practice 2: Reason abstractly and quantitatively.

Practice 3: Construct viable arguments and critique the reasoning of others.

Practice 4: Model with mathematics.

Practice 5: Use appropriate tools strategically.

Practice 6: Attend to precision.

Practice 7: Look for and make use of structure.

Practice 8: Look for and express regularity in repeated reasoning.

Washington Mathematical Standards (Common Core State Standards):

Cluster: Reason quantitatively and use units to solve problems.

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.

Cluster: Summarize, represent, and interpret data on a single count or measurement variable.

S.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).

S.ID.A.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.

S.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

S.ID.A.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Cluster: Summarize, represent, and interpret data on two categorical and quantitative variables

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.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

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.

6b Informally assess the fit of a function by plotting and analyzing residuals.

6c Fit a linear function for a scatter plot that suggests a linear association.

Cluster: Interpret linear models.

S.ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S.ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.

S.ID.C.9 Distinguish between correlation and causation.

Cluster: Understand and evaluate random processes underlying statistical experiments.

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.A.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

- Cluster: Make inferences and justify conclusions from sample surveys, experiments, and observational studies.
- 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.
- Cluster: Understand independence and conditional probability and use them to interpret data.
- S.CP.A.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”).
 - S.CP.A.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.
 - S.CP.A.3 Understand the conditional probability of A given B as $P(A \text{ and } B)/P(B)$, 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 .
 - S.CP.A.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.
 - S.CP.A.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.
- Cluster: Use the rules of probability to compute probabilities of compound events in a uniform probability model.
- S.CP.B.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.
 - S.CP.B.7 Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and interpret the answer in terms of the model.
 - S.CP.B.8 Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B|A) = P(B)P(A|B)$, and interpret the answer in terms of the model.
 - S.CP.B.9 Use permutations and combinations to compute probabilities of compound events and solve problems.
- Cluster: Calculate expected values and use them to solve problems.
- S.MD.A.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.
 - S.MD.A.2 Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
 - S.MD.A.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.
 - S.MD.A.4 Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.
- Cluster: Use probability to evaluate outcomes of decisions.
- S.MD.B.5 Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.
 - 5a Find the expected payoff for a game of chance.
 - 5b Evaluate and compare strategies on the basis of expected values.
 - S.MD.B.6 Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).
 - S.MD.B.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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L.11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

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Educational Technology:

1.2.1 Communicate and collaborate to learn with others.

1.3.2 Locate and organize information from a variety of sources and media.

2.2.1 Develop skills to use technology effectively.

21st Century Skills

Students will demonstrate in this course:

LEARNING & INNOVATION

Creativity and Innovation

- Think Creatively
- Work Creatively with Others
- Implement Innovations

Critical Thinking and Problem Solving

- Reason Effectively
- Use Systems Thinking
- Make Judgments and Decisions
- Solve Problems

Communication and Collaboration

- Communicate Clearly
- Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS

Information Literacy

- Access and Evaluate Information
- Use and Manage Information

Media Literacy

- Analyze Media
- Create Media Products

Information, Communications and Technology (ICT Literacy)

- Apply Technology Effectively

LIFE & CAREER SKILLS

Flexibility and Adaptability

- Adapt to Change
- Be Flexible

Initiative and Self-Direction

- Manage Goals and Time
- Work Independently
- Be Self-Directed Learners

Social and Cross-Cultural

- Interact Effectively with Others
- Work Effectively in Diverse Teams

Productivity and Accountability

- Manage Projects
- Produce Results

Leadership and Responsibility

- Guide and Lead Others
- Be Responsible to Others