GCS Curriculum Map for Honors Math 2 (GEC)

Year at a Glance

Quarter/Module	1	2	3	4
Module Title	Exponents Polynomials	Quadratic Functions Quadratic Systems Functions and Graphs	Transformations Geometry Basics Triangles	Right Triangles Probability Points of Concurrency and Review
Time Frame	21 days 15 days	21 days 7 days 10 days	13 days 9 days 13 days	13 days 13 days 10 days
Standards	Review of NC.M1.N-RN.2 NC.M2.N-RN.2 NC.M2.A-SSE.1 NC.M2.N-RN.3 NC.M2.N-RN.1 NC.M2.A-REI.1 NC.M2.A-REI.2 NC.M2.N-CN.1 Prep for NC.M3.N-CN.9 Prep for NC.M3.A-SSE.1a NC.M2.A-APR.1 NC.M2.F-IF.4 NC.M2.F-IF.7	NC.M2.A-CED.1 NC.M2.A-CED.2 NC.M2.A-SSE.1 NC.M2.A-SSE.3 NC.M2.F-IF.8 NC.M2.F-IF.1 NC.M2.F-IF.7 NC.M2.F-BF.1 NC.M2.A-CED.3 NC.M2.A-REI.11 NC.M2.F-BF.3	NC.M2.F-IF.2 NC.M2.G-CO.2 NC.M2.G-CO.3 NC.M2.G-CO.4 NC.M2.G-CO.5 NC.M2.G-CO.6 NC.M2.G-CO.7 NC.M2.G-CO.8 NC.M2.G-CO.9 NC.M2.G-CO.10 NC.M2.G-SRT.2 NC.M2.G-SRT.3 NC.M2.G-SRT.4 Prep for NC.M3.G-CO.14	NC.M2.A-SSE.1a NC.M2.A-CED.1 NC.M2.G-SRT.4 NC.M2.G-SRT.6 NC.M2.G-SRT.8 NC.M2.G-SRT.12 NC.M2.S-IC.2 NC.M2.S-CP.1 NC.M2.S-CP.3 NC.M2.S-CP.4 NC.M2.S-CP.5 NC.M2.S-CP.6 NC.M2.S-CP.7 NC.M2.S-CP.8 NC.M3.G-CO.10
ELD Standards (Content)	ELD-MA.9-12.Explain.Interpretive ELD-MA.9-12.Explain.Expressive ELD-MA.9-12.Argue.Interpretive ELD-MA.9-12.Argue.Expressive	ELD-MA.9-12.Explain.Interpretive ELD-MA.9-12.Explain.Expressive ELD-MA.9-12.Argue.Interpretive ELD-MA.9-12.Argue.Expressive	ELD-MA.9-12.Explain.Interpretive ELD-MA.9-12.Explain.Expressive ELD-MA.9-12.Argue.Interpretive ELD-MA.9-12.Argue.Expressive	ELD-MA.9-12.Explain.Interpretive ELD-MA.9-12.Explain.Expressive ELD-MA.9-12.Argue.Interpretive ELD-MA.9-12.Argue.Expressive
Essential Questions	See individual modules below	See individual modules below	See individual modules below	See individual modules below

Performance Events	Summative Assessments for each Module	Summative Assessments for each Module	Summative Assessments for each Module Animation Project	Summative Assessments for each Module

GCS Curriculum Map for Honors Math 2 (GEC)

Module A: Exponents **Essential Questions:** Why do we need irrational and complex numbers to fully describe mathematical relationships? How are rational exponents and radicals related? Why are exponent properties still valid when exponents are rational numbers? How can expressions involving radicals be rewritten without changing their value? When is one form of an expression (radical or exponential) more useful than another? What does it mean to simplify a radical expression, and why is simplification important? How can recognizing structure help us perform operations with radicals more efficiently? Why do mathematicians rationalize denominators, and how does this affect the value of an expression? How can imaginary numbers help solve equations that have no real solutions? How are operations with complex numbers similar to and different from operations with real numbers? Why is it important to verify solutions when solving radical and rational equations? How can solving an equation introduce solutions that are not actually valid? What conditions must be considered when solving equations involving radicals or rational expressions?	**Timeline:** 21 days
Performance Event: Summative Assessment	
SWBAT: (Mastery Objectives) SWBAT explain the relationship between rational exponents and radical notation. SWBAT convert expressions between radical form and exponential form. SWBAT apply the properties of exponents to simplify expressions containing rational exponents. SWBAT rewrite equivalent expressions involving radicals and rational exponents. SWBAT simplify radical expressions using properties of radicals. SWBAT identify and combine like radicals. SWBAT perform addition, subtraction, multiplication, and division with radical expressions. SWBAT rationalize denominators containing radicals. SWBAT justify algebraic procedures used when simplifying radical expressions. SWBAT define and identify complex and imaginary numbers. SWBAT represent complex numbers in standard form, a+bi. SWBAT simplify powers of the imaginary unit i. SWBAT perform addition, subtraction, multiplication, and division with complex numbers.	

SWBAT verify whether a proposed solution satisfies an equation.
SWBAT identify and explain the occurrence of extraneous solutions.
SWBAT solve radical equations and verify the validity of solutions.
SWBAT solve rational equations using appropriate algebraic techniques.
SWBAT identify domain restrictions in rational equations.
SWBAT recognize and eliminate extraneous solutions when solving radical and rational equations.
SWBAT select and justify efficient solution methods for radical and rational equations.

Vertical Alignment

Previous Grade Level Standards	Grade Level Standards	Next Grade Level Standards
NC.M1.N-RN.2 NC.M1.A-SSE.1 NC.M1.A-REI.1	NC.M2.N-RN.1 NC.M2.N-RN.2 NC.M2.N-RN.3 NC.M2.N-CN.1 NC.M2.A-SSE.1 NC.M2.A-REI.1 NC.M2.A-REI.2	NC.M3.N-CN.9 NC.M3.A-SSE.1 NC.M3.A-REI.1 NC.M2.A-REI.2

Instructional Resources

Tier III Vocabulary:	Performance Tasks:	Additional Resources
rational exponent, radical, radicand, index, rationalize the denominator, irrational number, complex number, imaginary, standard form, factor, polynomial, radical equation, rational equation, rational expression, extraneous solution	Exponent Quiz	Calculator Desmos

Remediation Skills, Extensions and Considerations:

- Remediation: operations on fractions, simplifying fractions, factors of a number
- Extension: simplifying the discriminant of a quadratic equation
- Considerations: students can use calculators to simplify when there is no variable

ELD Standard 1: Social and Instructional Language Multilingual Learners communicate for Social and Instructional purposes within the school setting.

ELD-MA.9-12.Explain.Interpretive: Interpret mathematical explanations by: Identifying concept or entity; Analyzing data and owning problem-solving approaches; Evaluating rationales, models, and/or interpretations based on evidence and mathematical principles.
ELD-MA.9-12.Explain.Expressive: Construct mathematical explanations that: Introduce mathematical concept or entity; Share solutions with others; Describe data and/or approach used to solve a problem; State reasoning used to generate own or alternate solutions
ELD-MA.9-12.Argue.Interpretive: Interpret concepts in arguments by: Comparing conjectures with previously established results and stated assumptions; Distinguishing correct from flawed logic; Evaluating relationships among evidence and mathematical principles to create generalizations
ELD-MA.9-12.Argue.Expressive: Construct mathematics arguments that: Create precise conjecture, using definitions, previously established results, and stated assumptions; Generalize logical relationships across cases; Justify (and refute) conclusions with evidence and mathematical principles; Evaluate and extend others' arguments

Module B: Polynomials **Essential Questions:** How are polynomial expressions similar to and different from whole numbers? How do the properties of operations apply when adding, subtracting, and multiplying polynomials? How can the degree and structure of a polynomial help predict the result of polynomial operations? How can identifying common factors simplify problem solving? How can recognizing special patterns make factoring more efficient? Why does the Greatest Common Factor often provide the first step in factoring? How can we determine which factoring strategy is most appropriate for a given polynomial? How are multiplication and factoring inverse processes? How can we verify that a polynomial has been factored correctly? How do the features of a polynomial function help describe its behavior? How do the degree and leading coefficient of a polynomial determine its end behavior? Why can the leading term alone often predict the long-term behavior of a polynomial function? How does understanding end behavior help us sketch and interpret graphs?	**Timeline:** 15 days
Performance Event: Summative Assessment	
SWBAT: (Mastery Objectives) SWBAT classify polynomials by degree and number of terms. SWBAT identify the degree, leading coefficient, and standard form of a polynomial. SWBAT add and subtract polynomial expressions by combining like terms. SWBAT multiply polynomials using the distributive property and other appropriate methods. SWBAT factor out the greatest common factor (GCF) from a polynomial. SWBAT recognize and factor differences of squares. SWBAT factor quadratic trinomials when the leading coefficient is 1. SWBAT factor quadratic trinomials when the leading coefficient is greater than 1. SWBAT determine and justify an appropriate factoring strategy for a given polynomial. SWBAT verify that a factored expression is equivalent to the original polynomial. SWBAT analyze the end behavior of polynomial functions. SWBAT predict the end behavior of a polynomial function using its degree and leading coefficient.SWBAT determine whether the degree of a polynomial is even or odd and describe the effect on end behavior. SWBAT determine whether the leading coefficient is positive or negative and describe the effect on end behavior.	

Vertical Alignment		
Previous Grade Level Standards	**Grade Level Standards**	**Next Grade Level Standards**
NC.M1.A-APR.1 NC.M1.A-SSE.1 NC.M1.F-IF.4	NC.M2.A-APR.1 NC.M2.A-SSE.1 NC.M2.F-IF.4	NC.M3.A-SSE.1 NC.M3.F-IF.4 NC.M3.F-IF.7

NC.M1.F-IF.7	NC.M2.F-IF.7	
Instructional Resources		
Tier III Vocabulary: polynomial,monomial, binomial, trinomial, constant, linear, quadratic, cubic, quartic, quintic, term, coefficient, degree of a polynomial, like terms, standard form, factor, greatest common factor, end behavior	**Performance Tasks:** Adding, Subtracting, and Multiplying Polynomials Quiz Factoring Quiz	**Additional Resources** Calculator Desmos
Remediation Skills, Extensions and Considerations: ● Remediation: properties of exponents, factors of a number, greatest common factor ● Extension: ● Considerations: some students learned to factor differently, based on their teacher		
ELD Standard 1: Social and Instructional Language Multilingual Learners communicate for Social and Instructional purposes within the school setting.		
ELD-MA.9-12.Explain.Interpretive: Interpret mathematical explanations by: Identifying concept or entity; Analyzing data and owning problem-solving approaches; Evaluating rationales, models, and/or interpretations based on evidence and mathematical principles. **ELD-MA.9-12.Explain.Expressive:** Construct mathematical explanations that: Introduce mathematical concept or entity; Share solutions with others; Describe data and/or approach used to solve a problem; State reasoning used to generate own or alternate solutions **ELD-MA.9-12.Argue.Interpretive:** Interpret concepts in arguments by: Comparing conjectures with previously established results and stated assumptions; Distinguishing correct from flawed logic; Evaluating relationships among evidence and mathematical principles to create generalizations **ELD-MA.9-12.Argue.Expressive:** Construct mathematics arguments that: Create precise conjecture, using definitions, previously established results, and stated assumptions; Generalize logical relationships across cases; Justify (and refute) conclusions with evidence and mathematical principles; Evaluate and extend others' arguments		

Module C: Quadratic Functions **Essential Questions:** How can quadratic functions be used to model and solve real-world problems? How do different representations of a quadratic relationship reveal different information about a situation? How can algebraic and graphical methods be used together to analyze quadratic functions? How do mathematicians choose the most useful form of a quadratic function for a given purpose? What quantities and constraints must be considered when modeling a situation with a quadratic function? How can a quadratic model help us make predictions and decisions? How do we determine whether a quadratic model is reasonable for a given context? What can the factors, coefficients, and terms of a quadratic expression tell us about its graph? How can equivalent forms of a quadratic expression reveal different characteristics of the same function? How does factoring help reveal the zeros of a quadratic function? How does completing the square help reveal the vertex of a quadratic function? How are the vertex, intercepts, and axis of symmetry related to the equation of a quadratic function? How can key features of a graph help us understand a real-world situation? How can we build a quadratic function from a graph, table, equation, or real-world situation? What information is needed to write a quadratic function that models a situation? How can the vertex help answer optimization questions involving maximums and minimums? What do the intercepts of a quadratic function represent in context? How can we determine whether a solution is meaningful in the context of a problem?	**Timeline:** 21 days
Performance Event: Summative Assessment	
SWBAT: (Mastery Objectives) SWBAT create quadratic equations to represent relationships in real-world situations. SWBAT write quadratic functions from verbal descriptions, tables, graphs, and contextual situations. SWBAT interpret the meaning of variables, parameters, and solutions within a quadratic model. SWBAT use quadratic models to make predictions and solve application problems. SWBAT interpret the meaning of factors, coefficients, and terms in a quadratic expression. SWBAT recognize and compare equivalent forms of quadratic expressions. SWBAT explain how different forms of a quadratic expression reveal different characteristics of a function. SWBAT rewrite quadratic expressions by factoring to reveal zeros. SWBAT rewrite quadratic expressions by completing the square to reveal the vertex. SWBAT convert between standard, factored, and vertex forms of quadratic functions. SWBAT select an appropriate form of a quadratic function based on the information needed to solve a problem. SWBAT graph quadratic functions in standard, factored, and vertex forms. SWBAT identify and interpret the vertex, intercepts, and axis of symmetry of a quadratic function. SWBAT determine the domain and range of a quadratic function.	

SWBAT describe intervals where a quadratic function is increasing or decreasing.
SWBAT determine the zeros of a quadratic function algebraically and graphically.
SWBAT determine the maximum or minimum value of a quadratic function.
SWBAT solve quadratic equations by factoring.
SWBAT solve quadratic equations by completing the square.
SWBAT solve quadratic equations using graphing technology.
SWBAT solve quadratic equations using square roots.
SWBAT solve quadratic equations using the quadratic formula.
SWBAT use the vertex of a quadratic function to solve optimization problems involving maximums and minimums.
SWBAT use x-intercepts and y-intercepts to answer questions about a real-world situation.
SWBAT determine whether solutions are reasonable within the context of a problem.
SWBAT use graphs, equations, and tables to analyze and solve quadratic application problems.

Vertical Alignment

Previous Grade Level Standards	Grade Level Standards	Next Grade Level Standards
NC.M1.A-CED.1 NC.M1.A-CED.2 NC.M1.A-SSE.1 NC.M1.A-SSE.3 NC.M1.F-IF.1 NC.M1.F-IF.7 NC.M1.F-IF.8 NC.M1.F-BF.1	NC.M2.A-CED.1 NC.M2.A-CED.2 NC.M2.A-SSE.1 NC.M2.A-SSE.3 NC.M2.F-IF.8 NC.M2.F-IF.1 NC.M2.F-IF.7 NC.M2.F-BF.1	NC.M3.A-CED.1 NC.M3.A-CED.2 NC.M3.A-SSE.1 NC.M3.A-SSE.3 NC.M3.F-IF.1 NC.M3.F-IF.7 NC.M3.F-BF.1

Instructional Resources

Tier III Vocabulary:	Performance Tasks:	Additional Resources
quadratic equation, Standard form, Factored form, Vertex form, coefficient, constant term, leading coefficient, factor, zero, root, solution, x-intercept, y-intercept, complete the square, maximum/minimum value, vertex, axis of symmetry, domain, range, parabola, increasing, decreasing	Solving Quadratics Quiz Part 1 Solving Quadratics Quiz Part 2	Calculator Desmos

Remediation Skills, Extensions and Considerations:

- Remediation: simplifying radicals, imaginary numbers, factoring,
- Extension: completing the square to write equations of circles
- Considerations: completing the square is not necessary due to Desmos, however, they need it for writing equations of circles in Math 3.

ELD Standard 1: Social and Instructional Language Multilingual Learners communicate for Social and Instructional purposes within the school setting.

ELD-MA.9-12.Explain.Interpretive: Interpret mathematical explanations by: Identifying concept or entity; Analyzing data and owning problem-solving approaches; Evaluating rationales, models, and/or interpretations based on evidence and mathematical principles.
ELD-MA.9-12.Explain.Expressive: Construct mathematical explanations that: Introduce mathematical concept or entity; Share solutions with others; Describe data and/or approach used to solve a problem; State reasoning used to generate own or alternate solutions
ELD-MA.9-12.Argue.Interpretive: Interpret concepts in arguments by: Comparing conjectures with previously established results and stated assumptions; Distinguishing correct from flawed logic; Evaluating relationships among evidence and mathematical principles to create generalizations
ELD-MA.9-12.Argue.Expressive: Construct mathematics arguments that: Create precise conjecture, using definitions, previously established results, and stated assumptions; Generalize logical relationships across cases; Justify (and refute) conclusions with evidence and mathematical principles; Evaluate and extend others' arguments

<table>
<tr><td colspan="2">Module D: Quadratic Systems
Essential Questions:
How can systems of equations be used to model and solve real-world problems?
What information does the intersection of two graphs provide about a situation?
How do we determine whether a solution is meaningful in the context of a problem?
What does the point of intersection of two graphs represent?
How can graphs be used to determine the solutions to a system of equations?
Why can a system involving a line and a parabola have zero, one, or two solutions?
When might a mathematical solution not be meaningful in a real-world context?</td><td>Timeline: 7 days</td></tr>
<tr><td colspan="3">Performance Event:
Summative Assessment</td></tr>
<tr><td colspan="3">SWBAT: (Mastery Objectives)
SWBAT create systems of equations to model relationships between quantities in real-world situations.
SWBAT interpret solutions of systems within the context of a real-world problem.
SWBAT determine whether a solution is feasible or non-feasible based on the constraints of a situation.
SWBAT explain the meaning of solutions in terms of the quantities being modeled.
SWBAT graph linear and quadratic functions on the same coordinate plane.
SWBAT identify the point(s) of intersection of a linear and quadratic function.
SWBAT interpret the coordinates of intersection points in context.
SWBAT determine the solution(s) to a system by analyzing graphs.
SWBAT use technology to graph and analyze systems of equations.</td></tr>
<tr><td colspan="3">Vertical Alignment</td></tr>
<tr><td>Previous Grade Level Standards</td><td>Grade Level Standards</td><td>Next Grade Level Standards</td></tr>
<tr><td>NC.M1.A-CED.3
NC.M1.A-REI.11</td><td>NC.M2.A-CED.3
NC.M2.A-REI.11</td><td>NC.M3.A-CED.3
NC.M3.A-REI.11</td></tr>
<tr><td colspan="3">Instructional Resources</td></tr>
<tr><td>Tier III Vocabulary:
system of equations, solution of a system, intersection, infinitely many solutions</td><td>Performance Tasks:
Systems Quiz</td><td>Additional Resources
Desmos
Graphing Calculator</td></tr>
<tr><td colspan="3">Remediation Skills, Extensions and Considerations:
● Remediation: substitution, linear systems
● Extension: conic sections, including circles, ellipses, and hyperbolas
● Considerations: all problems can be solved by graphing</td></tr>
</table>

ELD Standard 1: Social and Instructional Language Multilingual Learners communicate for Social and Instructional purposes within the school setting.
ELD-MA.9-12.Explain.Interpretive: Interpret mathematical explanations by: Identifying concept or entity; Analyzing data and owning problem-solving approaches; Evaluating rationales, models, and/or interpretations based on evidence and mathematical principles. **ELD-MA.9-12.Explain.Expressive:** Construct mathematical explanations that: Introduce mathematical concept or entity; Share solutions with others; Describe data and/or approach used to solve a problem; State reasoning used to generate own or alternate solutions **ELD-MA.9-12.Argue.Interpretive:** Interpret concepts in arguments by: Comparing conjectures with previously established results and stated assumptions; Distinguishing correct from flawed logic; Evaluating relationships among evidence and mathematical principles to create generalizations **ELD-MA.9-12.Argue.Expressive:** Construct mathematics arguments that: Create precise conjecture, using definitions, previously established results, and stated assumptions; Generalize logical relationships across cases; Justify (and refute) conclusions with evidence and mathematical principles; Evaluate and extend others' arguments

Module E: Functions and Graphs **Essential Questions:** How do changes to an equation affect the behavior and graph of a function? What makes a relation a function? How do inputs and outputs describe a functional relationship? How can function notation help us communicate mathematical ideas? How can graphs, tables, equations, and verbal descriptions represent the same function? How can key features of a graph help us understand a function's behavior? How can direct variation be used to describe proportional relationships? How can inverse variation be used to describe relationships where one quantity increases as another decreases? How can we determine whether a situation is best modeled by direct variation, inverse variation, or another type of function? How can parent functions help us understand more complex functions? How do translations, reflections, and stretches affect the graph of a function? How can we predict a graph's transformation from its equation? How can we determine the equation of a transformed function from its graph? How can domain and range help describe the behavior of a function? How can intervals of increase and decrease help us understand a graph? What do maximum and minimum values tell us about a function? What information do zeros provide about a function and its graph?	**Timeline:** 10 days
Performance Event: Summative Assessment	
SWBAT: (Mastery Objectives) SWBAT determine whether a relation is a function. SWBAT identify the inputs and outputs of a function. SWBAT evaluate functions using function notation. SWBAT identify the domain and range of a function from graphs, tables, and equations.SWBAT describe key features of a graph, including zeros, maximums, minimums, and intervals of increase and decrease. SWBAT compare functions represented by graphs, tables, equations, and verbal descriptions. SWBAT identify and model direct variation relationships. SWBAT identify and model inverse variation relationships. SWBAT determine the constant of variation in direct and inverse variation equations. SWBAT distinguish between direct variation, inverse variation, and other functional relationships. SWBAT identify parent functions from graphs and equations. SWBAT describe transformations applied to parent functions. SWBAT identify vertical and horizontal translations of functions. SWBAT identify reflections across the x-axis and y-axis. SWBAT identify vertical stretches and compressions of functions.	

SWBAT graph transformed functions from equations.
SWBAT write equations of transformed functions from graphs.
SWBAT predict the effect of transformations on the graph of a function.
SWBAT compare a transformed function to its parent function.
SWBAT identify intervals where a function is increasing, decreasing, or constant.
SWBAT identify and interpret maximum and minimum values of a function.
SWBAT identify and interpret zeros of a function.

Vertical Alignment

Previous Grade Level Standards	Grade Level Standards	Next Grade Level Standards
NC.M1.F-IF.1 NC.M1.F-BF.1	NC.M2.F-IF.1 NC.M2.F-BF.1 NC.M2.F-BF.3	NC.M3.F-IF.1 NC.M3.F-BF.1 NC.M3.F-BF.3

Instructional Resources

Tier III Vocabulary:	Performance Tasks:	Additional Resources
function, relation, input, output, function notation, domain, range, transformation, parent function, translation, reflection across the x-axis, vertical stretch, vertical compression, symmetry, inverse variation, direct variation, asymptote	Evaluating Functions Quiz Variation Quiz	Desmos Graphing Calculator

Remediation Skills, Extensions and Considerations:

- Remediation: solving a proportion, substitution, mathematical expressions (more than, less than, double, etc)
- Extension: continuous vs. discontinuous functions, equations of asymptotes
- Considerations: students always struggle with inverse variation graph when describing it

ELD Standard 1: Social and Instructional Language Multilingual Learners communicate for Social and Instructional purposes within the school setting.

ELD-MA.9-12.Explain.Interpretive: Interpret mathematical explanations by: Identifying concept or entity; Analyzing data and owning problem-solving approaches; Evaluating rationales, models, and/or interpretations based on evidence and mathematical principles.
ELD-MA.9-12.Explain.Expressive: Construct mathematical explanations that: Introduce mathematical concept or entity; Share solutions with others; Describe data and/or approach used to solve a problem; State reasoning used to generate own or alternate solutions

ELD-MA.9-12.Argue.Interpretive: Interpret concepts in arguments by: Comparing conjectures with previously established results and stated assumptions; Distinguishing correct from flawed logic; Evaluating relationships among evidence and mathematical principles to create generalizations
ELD-MA.9-12.Argue.Expressive: Construct mathematics arguments that: Create precise conjecture, using definitions, previously established results, and stated assumptions; Generalize logical relationships across cases; Justify (and refute) conclusions with evidence and mathematical principles; Evaluate and extend others' arguments

Module F: Geometric Transformations **Essential Questions:** How do transformations preserve or change the properties of a figure? How can coordinates be used to represent and verify geometric transformations? How do transformations help us understand symmetry and congruence? What characteristics define a translation, reflection, and rotation? What properties remain unchanged under rigid transformations? What makes a figure have rotational symmetry? How can rotational symmetry be identified and described? How does the angle of rotation affect the image of a figure? Why do some figures have multiple rotational symmetries while others have none? How can transformations be represented algebraically and graphically? What patterns occur in coordinates after translations, reflections, and rotations? How do translations, reflections, and rotations affect the location of a figure? How can we determine which transformation has occurred by examining a preimage and image? How can transformation rules be used to predict the coordinates of image points? How can rigid transformations be used to determine whether two figures are congruent? What does it mean for two figures to be congruent? How can a sequence of transformations map one figure onto another? Why do rigid transformations preserve congruence? How does a dilation differ from a rigid transformation? How can transformations be used to determine whether figures are similar? What properties are preserved under similarity transformations? How does scale factor affect the size and shape of a figure?	**Timeline:** 13 days
Performance Event: Summative Assessment Animation	
SWBAT: (Mastery Objectives) SWBAT interpret transformation rules as functions that map preimage points to image points. SWBAT use coordinate rules to predict the image of a figure after a transformation. SWBAT define and identify translations, reflections, and rotations. SWBAT describe the characteristics of rigid transformations. SWBAT explain how rigid transformations preserve distance and angle measure. SWBAT determine whether a figure has rotational symmetry. SWBAT identify the angle(s) of rotational symmetry for a figure. SWBAT determine the order of rotational symmetry of a figure. SWBAT represent translations, reflections, and rotations in the coordinate plane. SWBAT verify transformations using coordinates. SWBAT write coordinate rules for transformations. SWBAT perform translations in the coordinate plane.	

SWBAT perform reflections across the x-axis, y-axis, and other lines.
SWBAT perform rotations about the origin.
SWBAT determine the image of a figure after a given transformation.
SWBAT identify a transformation from a preimage and image.
SWBAT determine whether two figures are congruent using rigid transformations.
SWBAT use a sequence of transformations to map one figure onto another.
SWBAT justify congruence using transformations.
SWBAT identify corresponding parts of congruent figures.
SWBAT distinguish between congruence transformations and similarity transformations.
SWBAT perform dilations using a given scale factor.
SWBAT determine whether two figures are similar using transformations.
SWBAT identify and interpret scale factors in dilations.
SWBAT explain how dilations affect side lengths and angle measures.
SWBAT identify examples of transformations and symmetry in real-world contexts such as art, architecture, engineering, and technology.

Vertical Alignment

Previous Grade Level Standards	Grade Level Standards	Next Grade Level Standards
NC.M1.F-IF.2	NC.M2.F-IF.2 NC.M2.G-CO.2 NC.M2.G-CO.3 NC.M2.G-CO.4 NC.M2.G-CO.5 NC.M2.G-CO.6 NC.M2.G-CO.7 NC.M2.G-SRT.2	NC.M3.F-IF.2

Instructional Resources

Tier III Vocabulary:	Performance Tasks:	Additional Resources
transformation, reflection, translation, rotation, dilation, symmetry, order, magnitude, scale factor, prime notation, image	Animation Project Proposal Transformations Quiz	Desmos Graphing Calculator

Remediation Skills, Extensions and Considerations:

- Remediation: graphing the lines y=x and y=-x, writing equations of horizontal and vertical lines, solving proportions
- Extension: rotation for points other than origin, dilations centered not at origin
- Considerations: students must label points correctly for image

ELD Standard 1: Social and Instructional Language Multilingual Learners communicate for Social and Instructional purposes within the school setting.
ELD-MA.9-12.Explain.Interpretive: Interpret mathematical explanations by: Identifying concept or entity; Analyzing data and owning problem-solving approaches; Evaluating rationales, models, and/or interpretations based on evidence and mathematical principles. **ELD-MA.9-12.Explain.Expressive:** Construct mathematical explanations that: Introduce mathematical concept or entity; Share solutions with others; Describe data and/or approach used to solve a problem; State reasoning used to generate own or alternate solutions **ELD-MA.9-12.Argue.Interpretive:** Interpret concepts in arguments by: Comparing conjectures with previously established results and stated assumptions; Distinguishing correct from flawed logic; Evaluating relationships among evidence and mathematical principles to create generalizations **ELD-MA.9-12.Argue.Expressive:** Construct mathematics arguments that: Create precise conjecture, using definitions, previously established results, and stated assumptions; Generalize logical relationships across cases; Justify (and refute) conclusions with evidence and mathematical principles; Evaluate and extend others' arguments

<table>
<tr><td colspan="2">Module G: Basic Geometry
Essential Questions:
How can points, segments, rays, and angles be named and described precisely?
Why is accurate notation important in geometry?
What relationships exist between angles formed by intersecting lines?
Why are vertical angles always congruent?
How can linear pairs be used to determine unknown angle measures?
How can angle relationships help us write and solve algebraic equations?
How do angle relationships provide clues about missing measures?
How can we determine whether two angles are complementary, supplementary, or neither?
What angle relationships are created when parallel lines are cut by a transversal?
How are corresponding, alternate interior, alternate exterior, and same-side interior angles related?
How can angle relationships be used to determine whether lines are parallel?
How can we verify that a solution is reasonable?</td><td>Timeline: 9 days</td></tr>
<tr><td colspan="2">Performance Event:
Summative Assessment</td></tr>
<tr><td colspan="2">SWBAT: (Mastery Objectives)
SWBAT identify and name points, segments, rays, and angles using correct geometric notation.
SWBAT distinguish between points, lines, line segments, and rays.
SWBAT identify and classify angles based on their measures.
SWBAT identify vertical angles and linear pairs in geometric diagrams.
SWBAT apply the Vertical Angles Theorem to determine unknown angle measures.
SWBAT apply the Linear Pair Postulate to determine unknown angle measures.
SWBAT write and solve algebraic equations involving vertical angles and linear pairs.
SWBAT identify complementary and supplementary angle pairs.
SWBAT determine unknown angle measures using complementary angle relationships.
SWBAT determine unknown angle measures using supplementary angle relationships.
SWBAT write and solve equations involving complementary and supplementary angles.
SWBAT identify corresponding angles formed by parallel lines and a transversal.
SWBAT identify alternate interior angles formed by parallel lines and a transversal.
SWBAT identify alternate exterior angles formed by parallel lines and a transversal.
SWBAT identify same-side interior angles formed by parallel lines and a transversal.
SWBAT use angle relationships created by parallel lines and a transversal to determine unknown angle measures.
SWBAT write and solve equations involving angles formed by parallel lines and a transversal.
SWBAT use angle relationships to justify whether two lines are parallel.</td></tr>
<tr><td colspan="2">Vertical Alignment</td></tr>
<tr><td>Previous Grade Level Standards</td><td>Grade Level Standards</td><td>Next Grade Level Standards</td></tr>
</table>

	NC.M2.G-CO.9	
Instructional Resources		
Tier III Vocabulary: vertical angles, linear pairs, transversal, parallel lines, alternate interior, alternate exterior, consecutive interior, consecutive exterior, adjacent, corresponding, congruent, supplementary	**Performance Tasks:** Angle Pairs Quiz	**Additional Resources** Desmos Graphing Calculator
Remediation Skills, Extensions and Considerations: ● Remediation: solving equations ● Extension: complementary and supplementary word problems ● Considerations: stressing the difference between shapes being congruent and their measures being equal		
ELD Standard 1: Social and Instructional Language Multilingual Learners communicate for Social and Instructional purposes within the school setting.		
ELD-MA.9-12.Explain.Interpretive: Interpret mathematical explanations by: Identifying concept or entity; Analyzing data and owning problem-solving approaches; Evaluating rationales, models, and/or interpretations based on evidence and mathematical principles. **ELD-MA.9-12.Explain.Expressive:** Construct mathematical explanations that: Introduce mathematical concept or entity; Share solutions with others; Describe data and/or approach used to solve a problem; State reasoning used to generate own or alternate solutions **ELD-MA.9-12.Argue.Interpretive:** Interpret concepts in arguments by: Comparing conjectures with previously established results and stated assumptions; Distinguishing correct from flawed logic; Evaluating relationships among evidence and mathematical principles to create generalizations **ELD-MA.9-12.Argue.Expressive:** Construct mathematics arguments that: Create precise conjecture, using definitions, previously established results, and stated assumptions; Generalize logical relationships across cases; Justify (and refute) conclusions with evidence and mathematical principles; Evaluate and extend others' arguments		

Module H: Triangles **Essential Questions:** What does it mean for two figures to be congruent? How can rigid transformations be used to determine whether two triangles are congruent? What properties remain unchanged when a figure undergoes a rigid transformation? How can corresponding parts of congruent figures be identified and compared? How can we determine whether two triangles are congruent without measuring every side and angle? Why are SSS, SAS, ASA, AAS, and HL sufficient to prove triangle congruence? How can congruent triangles be used to determine unknown side lengths and angle measures? How can the relationships among the angles of a triangle be used to determine missing measures? Why is the sum of the interior angles of a triangle always the same? How is an exterior angle related to the remote interior angles of a triangle? How do the properties of isosceles triangles help us determine unknown measures? How does the size of an angle affect the length of the side opposite it? How can the Hinge Theorem be used to compare triangles? Why can some combinations of side lengths form a triangle while others cannot? How does the Triangle Inequality Theorem help determine whether a triangle is possible? How can a proof demonstrate that a geometric relationship is always true? Why is justification as important as finding an answer? What does it mean for two figures to be similar? How can angle relationships be used to establish triangle similarity? Why is AA Similarity sufficient to prove two triangles are similar? How can similar triangles be used to determine unknown lengths? How do proportional relationships arise in similar figures?	**Timeline:** 13 days
Performance Event: Summative Assessment	
SWBAT: (Mastery Objectives) SWBAT determine unknown angle measures using the Triangle Sum Theorem. SWBAT determine unknown angle measures using the Exterior Angle Theorem. SWBAT identify and apply angle relationships within triangles. SWBAT write and solve algebraic equations involving triangle angle measures. SWBAT justify solutions using triangle angle theorems. SWBAT identify the properties of isosceles triangles. SWBAT use the Isosceles Triangle Theorem to determine unknown angle measures. SWBAT use the Converse of the Isosceles Triangle Theorem to determine unknown side lengths and angle measures. SWBAT justify conclusions using properties of isosceles triangles. SWBAT determine whether two figures are congruent using rigid transformations. SWBAT identify corresponding parts of congruent figures. SWBAT prove triangles congruent using SSS. SWBAT prove triangles congruent using SAS.	

SWBAT prove triangles congruent using ASA.
SWBAT prove triangles congruent using AAS.
SWBAT prove right triangles congruent using HL.
SWBAT identify the appropriate congruence theorem for a given situation.
SWBAT use congruent triangles to determine unknown side lengths and angle measures.
SWBAT apply CPCTC to justify geometric relationships.
SWBAT apply the Hinge Theorem to compare side lengths and angle measures in triangles.
SWBAT use the Converse of the Hinge Theorem to compare triangles.
SWBAT determine whether three given side lengths can form a triangle using the Triangle Inequality Theorem.
SWBAT identify possible ranges for unknown side lengths using the Triangle Inequality Theorem.
SWBAT write two-column proofs involving triangles and angle relationships.
SWBAT justify statements using definitions, postulates, and theorems.
SWBAT identify valid reasons for each step in a geometric proof.
SWBAT use deductive reasoning to prove geometric relationships.
SWBAT communicate mathematical arguments clearly and logically.
SWBAT determine whether two triangles are similar using AA Similarity.
SWBAT identify corresponding sides and corresponding angles in similar triangles.
SWBAT use proportions to determine unknown side lengths in similar triangles.
SWBAT write and solve proportions involving corresponding sides of similar triangles.

Vertical Alignment

Previous Grade Level Standards	Grade Level Standards	Next Grade Level Standards
	NC.M2.G-CO.7 NC.M2.G-CO.8 NC.M2.G-CO.10 NC.M2.G-SRT.3 NC.M2.G-SRT.4	NC.M3.G-CO.10

Instructional Resources

Tier III Vocabulary:	Performance Tasks:	Additional Resources
congruence, congruent figures, rigid transformation, corresponding sides, corresponding angles, SSS, SAS, ASA, AAS, HL, included angle, included side, corresponding parts, CPCTC, two-column proof, statement, reason, postulate, theorem, Vertical Angles Theorem,	Triangles Quiz Congruent Triangles Quiz	Desmos Graphing Calculator

Linear Pair Postulate, Triangle Sum Theorem, Exterior Angle Theorem, similarity, similar figures, AA Similarity, scale factor, midsegment, Midsegment Theorem, Isosceles Triangle Theorem, isosceles, base angles, legs, remote interior angles, adjacent angles		

Remediation Skills, Extensions and Considerations:

- Remediation: solving proportions, solving equations, congruent vs. supplementary, algebraic expressions (more than, less than, half, etc.)
- Extension: points of concurrency
- Considerations: students need to identify relationships and set up equations before giving angle measures

ELD Standard 1: Social and Instructional Language Multilingual Learners communicate for Social and Instructional purposes within the school setting.

ELD-MA.9-12.Explain.Interpretive: Interpret mathematical explanations by: Identifying concept or entity; Analyzing data and owning problem-solving approaches; Evaluating rationales, models, and/or interpretations based on evidence and mathematical principles.
ELD-MA.9-12.Explain.Expressive: Construct mathematical explanations that: Introduce mathematical concept or entity; Share solutions with others; Describe data and/or approach used to solve a problem; State reasoning used to generate own or alternate solutions
ELD-MA.9-12.Argue.Interpretive: Interpret concepts in arguments by: Comparing conjectures with previously established results and stated assumptions; Distinguishing correct from flawed logic; Evaluating relationships among evidence and mathematical principles to create generalizations
ELD-MA.9-12.Argue.Expressive: Construct mathematics arguments that: Create precise conjecture, using definitions, previously established results, and stated assumptions; Generalize logical relationships across cases; Justify (and refute) conclusions with evidence and mathematical principles; Evaluate and extend others' arguments

Module I: Right Triangles **Essential Questions:** How do the quantities in a right triangle relate to one another? How can expressions be used to represent unknown side lengths and angle measures? How can equations be created to represent relationships in right triangles? How do special right triangles demonstrate proportional reasoning? How do trigonometric ratios describe relationships among the sides of a right triangle? Why do trigonometric ratios remain constant for similar right triangles? How can sine, cosine, and tangent be used to compare side lengths and angle measures? What information is needed to determine an unknown side or angle using trigonometry? How can trigonometric ratios be used to solve real-world problems involving distance and height? How do we determine which trigonometric ratio is most appropriate for a given problem? How can right triangle trigonometry be used to find missing side lengths and angles? How can angles of elevation and depression be modeled using right triangles? What patterns exist in 45-45-90 triangles, and how can they be used to solve problems? What patterns exist in 30-60-90 triangles, and how can they be used to solve problems? When is it more efficient to use special right triangle relationships instead of the Pythagorean Theorem or trigonometric ratios? How do angle measures determine side-length relationships in special right triangles?	**Timeline:** 13 days
Performance Event: Summative Assessment	
SWBAT: (Mastery Objectives) SWBAT describe the relationships among side lengths and angle measures in right triangles. SWBAT create equations to represent relationships among side lengths and angle measures in right triangles. SWBAT write and solve equations to determine unknown measurements in geometric situations. SWBAT use equations and trigonometric relationships to solve application problems. SWBAT define sine, cosine, and tangent as ratios of side lengths in a right triangle. SWBAT identify the opposite, adjacent, and hypotenuse sides relative to a given angle. SWBAT use trigonometric ratios to describe relationships among sides and angles of right triangles. SWBAT use the Pythagorean Theorem to determine missing side lengths in right triangles. SWBAT apply the relationships of 45-45-90 triangles to determine unknown side lengths. SWBAT apply the relationships of 30-60-90 triangles to determine unknown side lengths. SWBAT use sine, cosine, and tangent to determine unknown side lengths in right triangles. SWBAT use inverse trigonometric functions to determine unknown angle measures. SWBAT select the most appropriate strategy (Pythagorean Theorem, special right triangles, or trigonometry) to solve a problem. SWBAT solve real-world problems involving right triangles and trigonometric ratios. SWBAT identify angles of elevation and angles of depression in real-world situations. SWBAT create right triangle diagrams to model angles of elevation and depression. SWBAT use trigonometric ratios to solve problems involving angles of elevation. SWBAT use trigonometric ratios to solve problems involving angles of depression.	

SWBAT recognize 45-45-90 triangles and apply their side-length relationships.
SWBAT recognize 30-60-90 triangles and apply their side-length relationships.
SWBAT compare the efficiency of using special right triangle relationships versus trigonometric ratios.

Vertical Alignment

Previous Grade Level Standards	Grade Level Standards	Next Grade Level Standards
NC.M1.A-SSE.1a NC.M1.A-CED.1	NC.M2.A-SSE.1a NC.M2.A-CED.1 NC.M2.G-SRT.4 NC.M2.G-SRT.6 NC.M2.G-SRT.8 NC.M2.G-SRT.12	NC.M3.A-SSE.1a NC.M3.A-CED.1

Instructional Resources

Tier III Vocabulary:	Performance Tasks:	Additional Resources
right triangle, hypotenuse, legs, Pythagorean Theorem, pattern triangles, sine, cosine, tangent, angle of elevation/depression, opposite, adjacent, theta, isosceles, arcsin, arccos, arctan	Special Right Triangles Quiz Solving Right Triangles Quiz Angle of Elevation of the Sun Activity	Desmos Graphing Calculator

Remediation Skills, Extensions and Considerations:

- Remediation: solving equations, Pythagorean Theorem, simplifying radicals, rationalizing denominators
- Extension:
- Considerations: students always struggle with the difference between sides and angles; always mix up opp. and adj.

ELD Standard 1: Social and Instructional Language Multilingual Learners communicate for Social and Instructional purposes within the school setting.

ELD-MA.9-12.Explain.Interpretive: Interpret mathematical explanations by: Identifying concept or entity; Analyzing data and owning problem-solving approaches; Evaluating rationales, models, and/or interpretations based on evidence and mathematical principles.
ELD-MA.9-12.Explain.Expressive: Construct mathematical explanations that: Introduce mathematical concept or entity; Share solutions with others; Describe data and/or approach used to solve a problem; State reasoning used to generate own or alternate solutions
ELD-MA.9-12.Argue.Interpretive: Interpret concepts in arguments by: Comparing conjectures with previously established results and stated assumptions; Distinguishing correct from flawed logic; Evaluating relationships among evidence and mathematical principles to create generalizations

ELD-MA.9-12.Argue.Expressive: Construct mathematics arguments that: Create precise conjecture, using definitions, previously established results, and stated assumptions; Generalize logical relationships across cases; Justify (and refute) conclusions with evidence and mathematical principles; Evaluate and extend others' arguments

Module J: Probability **Essential Questions:** How can outcomes be organized into sample spaces and events? How do sets and Venn diagrams help represent probability situations? How can visual models help us understand relationships among events? What is the difference between simple and compound events? How does the Fundamental Counting Principle help calculate probabilities? What does it mean for two events to be independent? How can we determine whether one event influences another? How does independence affect probability calculations? How can Venn diagrams be used to calculate probabilities involving multiple events? What does it mean for events to be mutually exclusive? How does overlap affect probability calculations? When should the Addition Rule be used to determine probabilities? How does conditional probability differ from simple probability? How does knowing one outcome affect the probability of another outcome? When should the Multiplication Rule be used to determine probabilities? How can tree diagrams help organize and calculate probabilities?	**Timeline:** 13 days
Performance Event: Summative Assessment	
SWBAT: (Mastery Objectives) SWBAT identify outcomes, events, and sample spaces in probability situations. SWBAT represent events using set notation and Venn diagrams. SWBAT determine probabilities from sample spaces and event descriptions. SWBAT use the Fundamental Counting Principle to determine the number of possible outcomes. SWBAT organize outcomes using lists, tables, and tree diagrams. SWBAT determine whether two events are independent or dependent. SWBAT explain how the occurrence of one event affects the probability of another event. SWBAT calculate probabilities involving independent events using the Multiplication Rule. SWBAT identify mutually exclusive and non-mutually exclusive events. SWBAT use Venn diagrams to represent unions and intersections of events. SWBAT apply the Addition Rule to determine probabilities involving multiple events. SWBAT account for overlap when calculating probabilities of non-mutually exclusive events. SWBAT calculate conditional probabilities from probability models, tables, and tree diagrams. SWBAT apply the Multiplication Rule to determine probabilities involving dependent events. SWBAT create and interpret tree diagrams to represent probability situations.	

Vertical Alignment		
Previous Grade Level Standards	**Grade Level Standards**	**Next Grade Level Standards**

	NC.M2.S-IC.2 NC.M2.S-CP.1 NC.M2.S-CP.3 NC.M2.S-CP.4 NC.M2.S-CP.5 NC.M2.S-CP.6 NC.M2.S-CP.7 NC.M2.S-CP.8	
Instructional Resources		
Tier III Vocabulary: probability, outcome, sample space, event, conditional probability, independent events, dependent events, Multiplication Rule, Addition Rule, union, intersection, complement, mutually exclusive events, Tree diagram, Venn diagram	**Performance Tasks:** Probability Quiz Conditional Probability Quiz	**Additional Resources** Desmos Graphing Calculator
Remediation Skills, Extensions and Considerations: ● Remediation: simplifying fractions, adding/subtracting fractions, multiplying/dividing fractions ● Extension: simulations ● Considerations: venn diagrams are a good way to represent union, intersection, and complements; students are unfamiliar with a deck of cards		
ELD Standard 1: Social and Instructional Language Multilingual Learners communicate for Social and Instructional purposes within the school setting.		
ELD-MA.9-12.Explain.Interpretive: Interpret mathematical explanations by: Identifying concept or entity; Analyzing data and owning problem-solving approaches; Evaluating rationales, models, and/or interpretations based on evidence and mathematical principles. **ELD-MA.9-12.Explain.Expressive:** Construct mathematical explanations that: Introduce mathematical concept or entity; Share solutions with others; Describe data and/or approach used to solve a problem; State reasoning used to generate own or alternate solutions **ELD-MA.9-12.Argue.Interpretive:** Interpret concepts in arguments by: Comparing conjectures with previously established results and stated assumptions; Distinguishing correct from flawed logic; Evaluating relationships among evidence and mathematical principles to create generalizations **ELD-MA.9-12.Argue.Expressive:** Construct mathematics arguments that: Create precise conjecture, using definitions, previously established results, and stated assumptions; Generalize logical relationships across cases; Justify (and refute) conclusions with evidence and mathematical principles; Evaluate and extend others' arguments		