Integrated Math II MATHia® Software
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CARNEGIE LEARNING

1 Angles, Segments, and Lines

MATHia Unit	MATHia Workspace	Overview	CCSS	Problem Solving	Animation	Worked Examples	Classification Tools	Explore
Angle Properties	Calculating and Justifying Angle Measures	Calculate the measure of the sought angle by following a prescribed path of angle measures.	G.CO.C.9	●				
	Calculating Angle Measures	Calculate the measure of the sought angle by following an open solution path.	G.CO.C.9	●				
Introduction to Proofs with Segments and Angles	Introduction to Proofs	Students are introduced to proof by answering questions related to two animations demonstrating the Triangle Sum Theorem and the Vertical Angle Theorem.	G.CO.A.1		●			
	Completing Measure Proofs	Students complete the steps in a scaffolded proof, supplying appropriate statements and reasons to prove a variety of fundamental angle and segment theorems.	G.CO.C	●				
	Connecting Steps in Angle Proofs	Students arrange the steps of more complex proofs into logical order.	G.CO.C.9	●				
	Using Angle Theorems	Students use a wide variety of postulates, properties, and theorems to solve mathematical problems related to angles in geometrical figures and diagrams. The Congruent Complements Theorem, Congruent Supplements Theorem, Angle Addition Postulate, angle bisection, Vertical Angle Theorem, and the Transitive Property are all discussed.	G.CO.C.9			●		
Lines Cut by a Transversal	Classifying Angles Formed by Transversals	Students follow worked examples and complete sorting activities as they learn to identify angles and angle pairs formed by lines cut by a transversal.	G.CO.C.9			●	●	
	Calculating Angle Measures Formed by Transversals	Calculate the measure of the sought angle by using angle relationships formed by two lines cut by a single transversal.	G.CO.C.9	●				
	Calculating Angles Formed by Multiple Transversals	Calculate the measure of the sought angle by using angle relationships formed by three parallel lines cut by a single transversal or two parallel lines cut by two transversals.	G.CO.C.9	●				
Parallel Lines Theorems	Proving Parallel Lines Theorems	Students apply basic angle theorems to prove the alternate interior, alternate exterior, same side interior, and side side exterior parallel line theorems.	G.CO.C.9	●				
	Proving the Converse of Parallel Lines Theorems	Students apply basic angle theorems to prove the alternate interior converse, alternate exterior converse, same side interior converse, and side side exterior converse parallel line theorems.	G.CO.C.9	●				
	Modeling Parallel and Perpendicular Lines	Students determine the equations of lines parallel or perpendicular to given lines.	G.CO.C.9	●				

2	Triangles			Problem Solving	Animation	Worked Examples	Classification Tools	Explore
MATHia Unit	**MATHia Workspace**	**Overview**	**CCSS**					
Special Right Triangles	Introduction to Special Right Triangles		G.SRT.B.4			●		
	Calculating the Lengths of Sides of Special Right Triangles	For a 30-60-90 or 45-45-90 degree triangle with an expression for one leg given as x and the measure of one side given, determine expressions and measures for each side	G.SRT.B.4 G.SRT.B.5	●				
Similar Triangles	Understanding Similarity	Students watch an animation which demonstrates that when figures are similar, a series of rigid motions and dilations can transform one figure on top of the other to match exactly. Students recall that similar figures have corresponding side lengths that are proportional and congruent corresponding angles. Students identify similar figures and determine corresponding side lengths and corresponding angle measures, given similar figures.	G.SRT.A.2		●	●		
	Calculating Corresponding Parts of Similar Triangles	Students calculate corresponding parts of similar triangles, both in context and out of context.	G.SRT.B.5	●				
	Proofs using Similar Triangles	Students use the AA similarity postulate, SSS similarity theorem, and SAS similarity theorem in order to prove the parallel segment proportionality theorem and triangle midsegment theorem.	G.SRT.B.4	●				
Triangle Congruence	Introduction to Triangle Congruence	Students practice writing and identifying triangle congruency statements, as well as corresponding sides and angles, given a diagram of congruent triangles or a triangle congruency statement. They then watch a video that introduces the four theorems of triangle congruence -- SAS, SSS, AAS, and ASA. Finally, students use a sorting tool to match images of pairs of triangles with congruency markings to the theorem by which they are proven congruent.	G.CO.B.7 G.CO.B.8		●	●	●	
	Proving Triangles Congruent using SAS and SSS	Students prove triangles congruent using the side-angle-side and side-side-side congruence theorems in a variety of diagrams.	G.CO.C.10	●				
	Proving Triangles Congruent using AAS and ASA	Students prove triangles congruent using the angle-angle-side and angle-side-angle congruence theorems in a variety of diagrams.	G.CO.C.10	●				
	Proving Triangles Congruent using HL and HA	Students prove triangles congruent using the hypotenuse-leg and hypotenuse-angle congruence theorems in a variety of diagrams.	G.CO.C.10	●				
	Using Triangle Congruence	Students use SSS, SAS, AAS, and ASA congruence theorems to determine whether two triangles are congruent. They then prove two triangle are congruent by the same group of theorems when given statements about the geometric figures shown. Finally, students complete a two-column proof to identify the reasons for given congruency statements.	G.CO.C.10				●	
	Proving Theorems using Congruent Triangles	Students using congruent triangle theorems to prove the perpendicular bisector theorem, isosceles triangle base angle theorem and its converse, and the angle bisector theorem.	G.CO.C.10	●				

MATHia Unit	MATHia Workspace	Overview	CCSS	Problem Solving	Animation	Worked Examples	Classification Tools	Explore
Triangle Theorems	Proving Triangle Theorems	Students apply previously proved theorems to prove the triangle sum and exterior angle theorems.	G.CO.C.10	●				
	Using Triangle Theorems	Students apply angle, parallel line, and triangle theorems to prove relationships between elements in more complex diagrams.	G.CO.C.10	●				
Parallelogram Proofs	Proofs about Parallelograms	Students will be given a diagram of a parallelogram with the measures of some sides, diagonals and/or angles given, and asked to determine the measures of the remaining sides/diagonals/angles.	G.CO.C.11	●				

3	Triangles and Trigonometry			Problem Solving	Animation	Worked Examples	Classification Tools	Explore
MATHia Unit	**MATHia Workspace**	**Overview**	**CCSS**					
Trigonometric Ratios	Introduction to Trigonometric Ratios	Students use similar triangles to define and understand the trigonometric ratios sine, cosine, and tangent. Students then explore the sine, cosine, and tangent and estimating these ratios using an interactive Explore Tool with a unit circle, including describing the ratios as percents of different lengths. Students solve problems in various contexts using the trigonometric ratios and the Explore Tool.	G.SRT.C.6			●		●
	Relating Sines and Cosines of Complementary Angles	Students use the interactive unit circle trig ratio Explore Tool to explore complementary angles and to see that the sine of an angle is equal to the cosine of its complement, and vice versa.	G.SRT.C.7					●
Right Triangles and Trigonometric Ratios	Using One Trigonometric Ratio to Solve Problems	Students calculate the measures of sides and angles of a right triangle using the trigonometric ratios, the Pythagorean Theorem, and/or the Triangle Sum Theorem in both contextual and abstract problems.	G.SRT.C.8	●				
	Using Multiple Trigonometric Ratios to Solve Problems	Students calculate the measures of sides and angles of two right triangles that share a side using trigonometric ratios, the Pythagorean Theorem, and/or the Triangle Sum Theorem in both contextual and abstract problems.	G.SRT.C.8	●				

4	Circles			Problem Solving	Animation	Worked Examples	Classification Tools	Explore
MATHia Unit	**MATHia Workspace**	**Overview**	**CCSS**					
Properties of Circles	Introduction to Circles	Students watch an animation defining some of the terminology of circle parts. They then identify chords, tangents, points of tangency, and secants of circles. Next, students sort inscribed and central angles. Finally, they classify minor and major arcs as well as semicircles.	G.C.A.1 G.C.A.2		●			
Angles in Circles	Determining Central and Inscribed Angles in Circles	Students will calculate the measure of an arc or an angle using the definition of a central angle, the Arc Addition Postulate, or the Inscribed Angle Theorem.	G.C.A.2	●				
	Determining Chords in Circles	Students will calculate the length of an arc using the radius or diameter, the circumference, and the arc-to-circle ratio.	G.C.A.2	●				
	Determining Interior and Exterior Angles in Circles	Students will calculate the measure of an arc or an angle using Interior Angles of a Circle Theorem and Exterior Angles of a Circle Theorem.	G.C.A.2	●				
	Angles of an Inscribed Quadrilateral	Students are shown an inscribed quadrilateral and prove the Inscribed Quadrilateral-Opposite Angles Conjecture. They then use the theorem to determine the measure of an angle in an inscribed quadrilateral given the measure of the opposite angle.	G.C.A.3			●		
Arc Length	Relating Arch Length and Radius	Students explore the difference between the degree measure of an arc and the length of an arc. They then practice calculating the fraction of a circle's circumference that an arc occupies and writing an expression that can be used to calculate an arc's length. Students then calculate the arc length given the radius or diameter of the circle. Next, they relate the arc length to the circle's radius and are introduced to the units radians and the theta symbol. Finally, students practice determining different measurements of a circle using the formula theta = s/r.	G.C.B.5			●		●
	Calculating the Area of a Sector	Students are given the definition of a sector of a circle and practice identifying sectors. They then work through an example that develops the formula for determining the area of a sector of a circle before using the formula to find areas of different sectors of circles.	G.C.B.5			●		

5	Three-Dimensional Objects			Problem Solving	Animation	Worked Examples	Classification Tools	Explore
MATHia Unit	**MATHia Workspace**	**Overview**	**CCSS**					
Three-Dimensional Shapes	Visualizing Cross Sections of Three-Dimensional Shapes	Students watch an animation showing two different intersections of a plane and a solid. They then describe cross-sections of different solids given the intersection of a plane. Finally, students identify the solid from a given cross-section.	G.GMD.B.4		●			
	Creating Three-Dimensional Shapes from Two-Dimensional Figures	Students rotate two-dimensional figures about an axis to create three-dimensional shapes and relate the dimensions of the plane figure to the solid. They then identify vocabulary highlighting the difference between right and oblique solids. Finally students create solids by stacking congruent or similar shapes.	G.GMD.B.4			●		
Volume	Calculating Volume of Cylinders	Students will use mathematical and real-world objects to determine the volume of cylinders.	G.GMD.A.3	●				
	Calculating Volume of Pyramids	Students calculate the volume of pyramids in mathematical and real-world contexts using given measurements.	G.GMD.A.3	●				
	Calculating Volume of Cones	Students will use mathematical and real-world objects to determine the volume of cones.	G.GMD.A.3	●				
	Calculating Volume of Spheres	Students will use mathematical and real-world objects to determine the volume of spheres.	G.GMD.A.3	●				

6	Quadratics			Problem Solving	Animation	Worked Examples	Classification Tools	Explore
MATHia Unit	**MATHia Workspace**	**Overview**	**CCSS**					
Quadratic Models in Factored Form	Modeling Area as Product of Monomial and Binomial	Students complete a table of values and graph from a scenario represented by a quadratic model. Students construct the quadratic function for the scenario as a product of a monomial and a binomial.	A.CED.A.1	●				
	Modeling Area as Product of Two Binomials	Students complete a table of values and graph from a scenario represented by a quadratic model. Students construct the quadratic function for the scenario as the product of two binomials.	A.CED.A.1	●				
	Interpreting Maximums of Quadratic Models	Students analyze the graphs of functions modeling scenarios of area and vertical motion to identify the maximum and interpret what it means in terms of the problem.	A.CED.A.1			●		
Quadratic Models in General Form	Modeling Projectile Motion	Students use quadratic functions to model projectile motion, and use the solver and the graphs to answer questions.	F.IF.B.4	●				
	Recognizing Key Features of Vertical Motion Graphs	Students use an interactive Explore Tool to investigate how a vertical motion graph changes when the different values in the vertex, factored, and general form of the quadratic function change. They then use vertical motion graphs to identify the maximum, x-intercepts, y-intercept, domain, and range of a quadratic function. Finally, students use a vertical motion graph to determine the axis of symmetry and vertex of a quadratic function.	F.IF.B.4					●
Linear and Quadratic Transformations	Shifting Vertically	Students vertically shift graphs of linear and quadratic functions. Students use verbal descriptions, graphs, and algebraic representations.	F.BF.B.3	●				
	Reflecting and Dilating using Graphs	Students reflect and dilate graphs of linear and quadratic functions. Students use verbal descriptions, graphs, and algebraic representations.	F.BF.B.3	●				
	Shifting Horizontally	Students horizontally shift graphs of linear and quadratic functions. Students use verbal descriptions, graphs, and algebraic representations.	F.BF.B.3	●				
	Transforming using Tables of Values	Given a table of values and a table of transformed values, students determine how the basic linear and quadratic functions were transformed to create the new functions.	F.BF.B.3	●				
	Using Multiple Transformations	Given a representation of a transformed function, students determine how the basic linear and quadratic functions were transformed to create the new functions.	F.BF.B.3	●				

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Polynomial Operations	Introduction to Polynomial Arithmetic	Students are introduced to polynomials and identify the difference between different types of polynomials as well as non-polynomials. They then use an Explore Tool to investigate combining like terms when adding polynomial expressions. Finally, students examine the steps to simplifying polynomial expressions that are either added or subtracted before simplifying on their own.	A.APR.A.1					●
	Adding Polynomials	Students add quadratic expressions.	A.APR.A.1	●				
	Subtracting Polynomials	Students subtract polynomials.	A.APR.A.1	●				
	Using a Factor Table to Multiply Polynomials	Students use factor tables to multiply polynomials. Students combine like terms.	A.APR.A.1	●				
	Multiplying Polynomials	Students determine which factor table is appropriate for a given problem, set up the table, and then use the table to multiply polynomials.	A.APR.A.1	●				
Quadratic Expression Factoring	Using a Factor Table to Multiply Binomials	Students use factor tables to multiply linear expressions. Students combine like terms.	A.APR.A.1	●				
	Multiplying Binomials	Students determine which factor table is appropriate for a given problem, set up the table, and then use the table to multiply linear expressions.	A.APR.A.1	●				
	Factoring Trinomials with Coefficients of One	Students factor quadratic trinomials with a coefficient of one.	A.APR.D.6	●				
	Factoring Trinomials with Coefficients Other than One	Students factor quadratic trinomials with a coefficient other than one.	A.APR.D.6	●				
	Factoring using Difference of Squares	Students factor quadratic expressions using difference to two squares.	A.APR.D.6	●				
	Factoring Quadratic Expressions	Students factor quadratic expressions using all known factoring methods.	A.APR.D.6	●				
	Completing the Square	Students analyze a worked example of a quadratic function in general form being written in vertex form through the process of completing the square. They then practice completing the square using polynomials and area models before filling in unknown values in trinomials that create perfect square trinomials. Finally, students are shown the algebraic method of changing a quadratic function in general form to vertex form by completing the square. They use the algebra shown to determine the axis of symmetry and vertex of quadratic functions in general form.	A.REI.B.4a F.IF.C.8a			●		

MATHia Unit	MATHia Workspace	Overview	CCSS	Problem Solving	Animation	Worked Examples	Classification Tools	Explore
Forms of Quadratics	Identifying Properties of Quadratic Functions	Students differentiate among general form, factored form, and vertex form of a quadratic function. They learn the characteristics of the graph that are visible from each form: y-intercept from general form, x-intercepts from factored form, and vertex from vertex form, and practice identifying these characteristics from the algebraic representations. The axis of symmetry is introduced as an aid in graphing, and students determine the vertex and axis of symmetry from the vertex form and factored form of a quadratic function. They use the concept of symmetry to determine an additional point that lies on a parabola. Lastly, students identify whether a parabola is concave up or down based upon the sign of the x-squared term when the function is written in any form.	F.IF.C.8a			●		
	Converting Quadratics to General Form	Students use the solver to convert quadratics in factored form and vertex form to general form.	A.SSE.B.3a A.SSE.B.3b F.IF.C.8a	●				
	Converting Quadratics to Factored Form	Students use the solver to convert quadratics in general form and vertex form to factored form.	A.SSE.B.3a A.SSE.B.3b F.IF.C.8a	●				
	Converting Quadratics to Vertex Form	Students use the solver to convert quadratics in factored form and general form to vertex form.	A.SSE.B.3a A.SSE.B.3b F.IF.C.8a	●				
	Sketching Quadratic Functions	Students sketch a quadratic function given factored, standard or vertex form	F.IF.C.7a	●				
	Comparing Quadratic Functions in Different Forms	Given two quadratic functions in different representations — equation, graph, table, or description — with a contextual or noncontextual scenario, students compare the functions' y-intercepts, zeros, absolute maximums/minimums, or rates of change over a specific interval.	F.IF.C.9	●				
Quadratic Equation Solving	Making Sense of Roots and Zeros	Students experiment with patterns relating two lines and the parabola that is generated by the product of their two linear functions. The first pattern solidifies the fact that the two expressions are factors of the quadratic function. The second pattern guides students to the Zero Product Property, an underpinning for determining the zeros of a quadratic function written in factored form. The quadratic formula is provided as a method for calculating roots when a quadratic function is written is general form. Clarification is made as to when to use the terms zeros and roots.	A.REI.D.11			●	●	
	Solving Quadratic Equations by Factoring	Students solve quadratic equations by factoring and applying the zero-product property.	A.REI.B.4b	●				
	Solving Quadratic Equations	Students solve quadratic equations by using factoring or the quadratic formula.	A.REI.B.4b	●				
	Using Regression Models	Students use equations of quadratic regression models, the solver, and graphs to answer questions.	S.ID.B.6a	●				

7	Inverse Functions			Problem Solving	Animation	Worked Examples	Classification Tools	Explore
MATHia Unit	**MATHia Workspace**	**Overview**	**CCSS**					
Function Operations	Operating with Functions on the Coordinate Plane	Students watch an animation about operating with functions on the coordinate plane before examining adding and subtracting constant functions, linear functions, and a linear and a quadratic function.	F.BF.B.3		●			
	Adding and Subtracting Linear Functions	Given two functions in function notation, students determine the sum or difference of the functions and verify the sum or difference by evaluating the new function at a given value.	F.BF.A.1b	●				
Inverses of Functions	Recognizing Graphs of Inverses	Given the graphs of two relations, students decide if the relations are inverses.	F.BF.B.4	●				
	Calculating Inverses of Linear Functions	Given a function, students determine the equation of the inverse function and use composition of function to verify that the functions are inverses.	F.BF.B.4	●				
Composition of Functions	Modeling with Linear Function Composition	Given a scenario that can be modeled by a composition of functions, students determine and use a function.	F.BF.A.1c	●				
	Composing Linear Functions	Given two functions in function notation, students determine and use the two related compositions of functions.	F.BF.A.1c	●				

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8	Conics			Problem Solving	Animation	Worked Examples	Classification Tools	Explore
MATHia Unit	**MATHia Workspace**	**Overview**	**CCSS**					
Equation of a Circle	Deriving the Equation of a Circle	Students are given a circle on the coordinate plane with a defined center. They use the Pythagorean Theorem to derive the standard form for the equation of a circle.	G.GPE.A.1			●		
	Determining the Radius and Center of a Circle	Students are given an equation for a circle. They then rewrite the equation if necessary in standard form to identify the radius and center of the circle.	G.GPE.A.1			●		

9	**Probability**			Problem Solving	Animation	Worked Examples	Classification Tools	Explore
MATHia Unit	**MATHia Workspace**	**Overview**	**CCSS**					
Independence and Conditional Probability	Independent Events	Students define "independent events." They investigate different scenarios to determine whether the events given are independent or not independent. Students then investigate compound probability with "and" and use the equation P(A and B) = P(A) x P(B) to verify whether two events are independent or not.	S.CP.A.2			●		
	Conditional Probability	Students use an interactive Explore Tool to explore probability using area and random points. Students then explore the idea of conditional probability, using the interactive tool to visualize the conditional probability formula P(A | B) = P(A and B) / P(B). Students apply what they know about conditional probability to make predictions and check for independence of events using the Explore Tool.	S.CP.A.3 S.CP.B.6					●
	Understanding Frequency Tables	Students review how to read a two-way frequency table and construct a relative frequency table. Students then use two-way frequency tables to determine probabilities, including conditional and other compound probabilities, and they use information from frequency tables to check for the independence of events.	S.CP.A.4			●		
	Recognizing Concepts of Conditional Probability	Students investigate conditional probabilities using two-way frequency tables. They apply the concept of conditional probability in a variety of different situations involving a change in the sample space as a result of an event occurring.	S.CP.A.5			●		
	Calculating Compound Probabilities	Students determine probabilities of compound events from two-way frequency tables via the Addition Rule.	S.CP.B.7	●				