

Integrated Math I

SCOPE + SEQUENCE

CONTENT OFFERED IN CARNEGIE LEARNING™ MATH SOLUTIONS

Textbook	Cognitive Tutor® Software	Skills Covered
Print Chapter	Software Unit	The student will:
Organizing Single Variable Data		Organize and visualize data. Match data sets with visual displays. Develop a qualitative understanding of data. Develop understanding of distribution of data, clusters, and outliers. Employ line graphs, bar graphs, number line plots, dot plots, stem-and-leaf plots, and histograms for visual displays. Create frequency and relative frequency graphs. Find mean, median, and mode as measures of central tendency.
Patterns and Linear Functions	<ol style="list-style-type: none"> 1. Linear Patterns 2. Linear Models and First Quadrant Graphs 3. Two-Step Linear Equations 4. Linear Models and Independent Variables 	Attain competency in reasoning inductively and deductively. Identify an algebraic or geometric pattern and represent it symbolically. Write and evaluate algebraic expressions. Find the next term, tenth term, and n th term in a sequence, and verbalize this procedure. Model situations symbolically. Understand the relationship between independent and dependent variables. Define functions. Solve simpler problems. Use student generated data to integrate statistics and algebra. Plot points and create graphs for linear functions. Compare and contrast functional relationships.
Proportional Reasoning	5. Linear Models and Ratios	Solve problems involving proportional change. Relate direct variation to linear functions. Graph linear functions. Understand and use fractions, decimals, and percents in given situations. Understand a ratio as a constant rate of change. Represent verbal quantitative situations algebraically. Solve linear equations.
Modeling Situations Using Multiple Representations	<ol style="list-style-type: none"> 6. Linear Equations with Similar Terms 7. Linear Models and Four Quadrant Graphs 30. Finding Equations of a Line 	Understand the relationship between input and output variables. Express one variable in terms of another (e.g., length in terms of width). Model real-world phenomena with linear equations. Create graphs using four quadrants. Use graphical techniques to find solutions to problem situations. Solve multi-step linear equations. Evaluate and simplify algebraic expressions. Describe a linear relationship as a linear function, interpret that function, and make inferences based upon the function. Describe problem situations by using and relating multiple representations, including numerical, symbolic, graphical, and verbal ones. Compare numbers using inequalities. Represent inequalities on a number line and in the coordinate plane. Connect meaning between graphical, symbolic, and numeric representations of inequalities.
Linear Equations: Solving, Graphing, Intercepts, and Slopes	<ol style="list-style-type: none"> 8. Linear Models and Slope-Intercept Graphs A 9. Linear Equations and the Distributive Property 10. Linear Models and the Distributive Property 11. Linear Equations with Variables on Both Sides 29. Graphing Using Slope and Y-Intercept B 31. Systems of Linear Equations Modeling 	Represent verbal quantitative situations algebraically. Use appropriate procedures to solve linear equations in one variable. Graph linear functions in two variables. Compute x - and y - intercepts. Determine domain and range of functions. Describe problem situations by using and relating numerical, symbolic, graphical, and verbal representations. Graph lines defined by $y=mx+b$. Develop the concept of slope as a rate of change; for a fixed change in x there is a fixed change in y . Interpret the meaning of slope in given situations. Create an equation by finding slope and y -intercept. Determine the intercepts and slope of a line, given its equation. Investigate, describe, and predict the effects of changes in m and b on the graph of $y=mx+b$. Interpret and predict the effects of changing slope and y -intercept in applied situations. Investigate vertical and horizontal transformations. Sketch the graph of $y = k$. Connect the algebra and the geometry of the distributive property. Apply the distributive property. Use the distributive property to simplify algebraic expressions. Factor out common monomials to “reverse” the distributive property.

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Textbook	Cognitive Tutor®Software	Skills Covered
Print Chapter	Software Unit	The student will:
Area and Perimeter	12. Perimeter and Area of Squares and Rectangles 13. Perimeter and Area of Parallelograms 14. Perimeter and Area of Triangles 15. Perimeter and Area of Trapezoids 16. Circumference and Area of Circles 17. Area Composition 18. Perimeter and Area of Regular Polygons	Develop a conceptual understanding of area and perimeter. Understand the proper units of measurement for area and perimeter. Relate the concepts of altitude and height. Discover the area formulas for rectangles, squares, parallelograms, triangles, trapezoids, and other polygons. Understand connections between the areas of various polygonal figures. Find the area, perimeter, base, or height of various polygonal figures. Use coordinate geometry to develop an understanding of properties of various polygonal figures. Explore the relationship between the circumference of a circle and its diameter, and identify this relationship as pi. Discover the area of a circle by relating it to the area of parallelograms. Find area, circumference, radius, or diameter of circles. Use problem-solving strategies to solve area composition problems.
The Geometry and Algebra of Right Triangles	19. Pythagorean Theorem 20. Special Right Triangles 21. Right Triangles and Trigonometric Functions	Use a variety of methods to find the hypotenuse of a right triangle. Understand the properties of a right triangle. Apply the Pythagorean Theorem and its converse. Solve numerical and practical problems using the Pythagorean Theorem and its converse. View the distance formula as the Pythagorean Theorem. Calculate distances in the coordinate plane. Identify right triangles and special right triangles. Identify and use properties of a 45-45-90 (isosceles) right triangle and 30-60-90 right triangle. Identify and use the sine, cosine, and tangent ratios. Utilize these ratios to solve problems. Understand square roots and squaring. Compute squares and square roots.
Quadratics	22. Quadratic Models and Area 23. Quadratic Expression Factoring 24. Quadratic Equation Solving 25. Quadratic Models and Vertical Motion	Compare and contrast linear and quadratic functions. Define and identify a quadratic equation. Find roots or x-intercepts of a quadratic function. Employ factoring techniques. Use the quadratic formula. Model and solve problems involving quadratic functions. Find minimum or maximum values for quadratic functions. Define the vertex and line of symmetry. Explore non-constant rates of change.
Statistical Analysis	26. Measures of Central Tendency	Organize and visualize data using stem-and-leaf plots, histograms, and box plots. Understand measures of central tendency and dispersion, and calculate and apply descriptive and inferential statistics. Design, conduct, and interpret the results of a simple study. Model data using scatterplots and regression equations to find the best fit. Understand that a model is a best approximation and may be used for the purpose of prediction and estimation. Find a regression line for an experiment and interpret its slope and y-intercept. Identify distribution shapes and decide if distributions are symmetrical or skewed. Interpret variations in data. Make and interpret box-and-whisker plots. Identify and use percentiles and quartiles.
Probability	27. Single Event Probability 28. Independent and Dependent Probabilities	Define probability. Predict probability of everyday events. Compute simple probabilities without replacement. Compare and contrast probabilities computed with and without replacement. Compute geometric probability. Conduct probability experiments and predict results.

Integrated Math II

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Textbook	Cognitive Tutor®Software	Skills Covered
Print Chapter	Software Unit	The student will:
Probability	<ol style="list-style-type: none"> 1. Single Event Probability 2. Independent and Dependent Probabilities 	<p>Count the number of possible outcomes for a random experiment using tables, tree diagrams, and applying the fundamental counting principle. Determine the number of permutations of n objects taken n at a time, n objects taken r at a time, and determine the number of permutation as when objects are repeated. Use factorial notation in computations. Determine the number of combinations of n objects taken r at a time. Determine probability of simple events and their complement, independent events, and mutually exclusive events. Compute probability distributions for given data and when performing probability experiments. Use set operations and read and construct Venn diagrams.</p>
Linear Functions	<ol style="list-style-type: none"> 3. Systems of Linear Equations Modeling 4. Linear Models in General Form 5. Graphs of Linear Equations in Two Variables 6. Systems of Linear Equations 7. Graphs of Linear Inequalities in Two Variables 8. Systems of Linear Inequalities 	<p>Prepare a mathematical analysis of a problem modeled by a linear function in any form. Solve any linear equation. Understand the concept of inequalities and be able to solve, graph, and interpret linear inequalities. Model and solve systems of two equations or inequalities. Understand what is meant by a solution to a system of equations or inequalities. Use systems of equations or inequalities to solve real-world problems. Connect graphical, tabular, and algebraic representations. Maximize and minimize functions. Understand and use arithmetic sequences and series and inverse functions. Use linear programming to solve real-world problems. Understand functional notation, $f(x)$, and evaluate $f(x)$ for given values of x. Determine the domain and range of a given function. Describe different kinds of sequences, list next terms of nth terms, and generate a recursive and explicit formula that defines the sequence. Create and use the formula for finding the sum of the first n terms of an arithmetic series. Use matrices to organize data. Perform matrix addition and subtraction. Perform matrix multiplication and perform scalar multiplication. Use matrices to solve linear systems.</p>
Parallel and Perpendicular Lines	<ol style="list-style-type: none"> 9. Angles and Angle Pairs 10. Angle Relationships in a Triangle 11. Angles Formed by Parallel Lines 	<p>Use many of the common notations and symbols from the field of geometry. Name and classify a variety of geometric objects and shapes using geometric naming and classification conventions. Measure angles accurately, and classify them correctly. Bridge algebraic and geometric concepts of parallel and perpendicularity by moving from algebraic definitions with slope to geometric ones. Define transversal, alternate interior angles, alternate exterior angles, corresponding angles, exterior angles on the same side of the transversal, and interior angles on the same side of the transversal. Recognize and identify special pairs of angles. Identify parallel lines. Calculate the measures of angles formed by the intersection of a transversal and two parallel lines. Construct the three altitudes of a given triangle using straightedge and compass. Identify perpendicular lines. Construct a perpendicular to a line through a point either on or not on the line. Determine if lines are parallel or perpendicular based upon measures of angles or based upon slopes of the lines in question. Solve problems involving linear pairs, vertical, complementary, and supplementary angles. Find the measures of adjacent angles. Construct and judge the validity of a logical argument consisting of a set of premises and conclusions.</p>
Triangles and Quadrilaterals	<ol style="list-style-type: none"> 13. Properties of Quadrilaterals and Parallelograms 14. Properties of Trapezoids and Rectangles 15. Properties of Rhombi 	<p>Use the Triangle Sum Theorem to find missing angles in triangles. Classify triangles according to the measures of their angles and the lengths of their sides. Determine whether a triangle can be created to fit a set of given conditions and justify any conclusions reached. Use the relationship between the measure of an exterior angle of a triangle and its two remote interior angles. Solve practical problems involving the exterior and interior angles of a triangle. Define and sketch angle and segment bisectors. Determine and use the properties of special quadrilaterals, including parallelograms, rhombi, rectangles, and square in order to determine missing measurements of parts. Compare and contrast properties of quadrilaterals. Calculate the sum of the interior, each interior, each exterior, and the sum of the exterior angles in any given polygon. Justify conclusions based on the properties of special quadrilaterals. Use algebra and the properties of certain quadrilaterals to solve practical problems in geometry. Use variables, algebraic expressions, and equations to solve problems with quadrilaterals.</p>

Integrated Math II

CONTENT OFFERED IN CARNEGIE LEARNING™ MATH SOLUTIONS		
Textbook	Cognitive Tutor® Software	Skills Covered
Print Chapter	Software Unit	The student will:
Transformations and Symmetry	16. Geometric Transformations	Classify transformation types, including reflections, translations, rotations, dilations, and glide reflections. Know the difference between isometries and other transformations. Perform reflections, translations, rotations, and dilations in the coordinate plane and out of the coordinate plane using simple geometric tools. Experience the fact that translations, rotations, and glide reflections are compositions of reflections over lines with certain relationships. Perform composite transformations. Identify types of symmetry in figures.
Similarity	12. Similar Triangles	Students will deduce whether two triangles are congruent, similar or neither. Identify corresponding parts of similar or congruent figures. Find missing angles or sides in any similar or congruent figures. Construct similar triangles and congruent triangles. Apply this working knowledge to problems from outside the classroom, and expand this knowledge to two-dimensional and three-dimensional measurements. Use self-similar objects as a vehicle to create a fractal curve. Justify any conclusions based on conjectures concerning similar and congruent triangles. Recognize that congruency is a special case of similarity.
Exponential and Logarithmic Functions	17. Exponential Modeling 18. Linear and Exponential Transformations 19. Properties of Exponents 20. Logarithmic and Exponential Equations	In addition to the skills attained in previous units, students will define and identify exponential functions. Model exponential functions algebraically and graphically, and evaluate and solve exponential equations. Define and identify logarithmic function. Understand the relationship between exponential and logarithmic functions. Define and apply the properties of logarithms in order to solve exponential functions. Compare basic properties of linear and exponential functions. Find the common ratio of a geometric sequence. Find the formula for the n th term of a geometric sequence and use it to write several terms of that sequence. Define a geometric series. Understand and derive the formula for finding the sum of the first n terms of a geometric series. Determine whether an infinite geometric series will converge or diverge. Find the sum of an infinite geometric series.
Quadratics	21. Quadratic Models in Factored Form 22. Linear and Quadratic Transformations 23. Quadratic Models and Area 24. Quadratic Expression Factoring 25. Quadratic Equation Solving 26. Quadratic Models in General Form	Transform quadratic functions graphically and algebraically using dilations, reflections, vertical shifts, and horizontal shifts. Given the transformation, create the algebraic model of a quadratic function. Understand the equivalence between algebraic representations. Define, model algebraically and graphically, and solve quadratic equations and inequalities. Model real-world phenomena with quadratic functions, and transformations of quadratic functions. Define relationships, functions, one-to-one functions, and inverse functions. Compare functional forms and families of functions, especially linear, quadratic, and exponential functions. Represent quadratic functions in vertex form, factored form, and standard form. Factor algebraic expressions of the second-degree. Use quadratic formula and factoring techniques to find roots of quadratic functions. Find vertex, intercepts, and line of symmetry for a quadratic function. Model vertical motion of a projectile. Use multiple representations, including numeric, algebraic, and graphic, to represent quadratic functions. Express the square root of a negative number in terms of the imaginary unit. Perform arithmetic operations with imaginary numbers. Evaluate powers of the imaginary unit. Identify real and imaginary parts of a complex number and plot on the complex plane. Use the quadratic formula to find complex roots and zeros. Perform operations with complex numbers.
Higher Order Polynomial and Rational Functions	27. Cubic Models 28. Linear, Quadratic, Exponential, Cubic, and Square Root Transformations 29. Polynomial Operations 30. Rational Expressions	Define and identify a polynomial function and the family of polynomial functions. Model and graph situations and solve problems involving polynomial functions. Understand the relationship between the degree of the polynomial function and the number of zeros. Find the zeros of polynomial function. Define local maxima and minima, intervals of increase and decrease, and end behavior. Define a rational function, the domain and range, continuity, and discontinuity. Identify asymptotes. Operate on rational expressions. Define the inverse of a rational function and apply procedures for computing it. Define base, exponent, and power. Use the definition of an exponent to expand and simplify monomial expressions. Analyze properties of exponents. Define a zero power. Define a negative exponent. Simplify algebraic expressions using various laws of exponents and powers.

Integrated Math III

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Textbook	Cognitive Tutor® Software	Skills Covered
Print Chapter	Software Unit	The student will:
1. Behaviors of Functions	1. Linear, Quadratic, and Exponential Transformations	Identify and describe polynomial functions based on key behaviors and characteristics. Analyze the appropriateness of a polynomial model with respect to the real-world situation it represents. Students will examine the domain and range, intercepts, rate of change, relative extremes, intervals of increase and decrease, and end behavior of polynomial functions. Categorize polynomial functions by even and odd degree as well as understand the relationship between the degree of a function and the maximum number of zeros and relative extrema.
2. Continuous and Discontinuous Functions	2. Linear Models using Two points B 3. Quadratic Equation Solving 4. Quadratics in Context 5. Systems of Linear and Quadratic Equations 6. Cubic Models 7. Linear, Quadratic, Exponential, Cubic, and Square Root Transformations 8. Logarithmic and Exponential Equations 9. Function Transformations 27. Reviewing Solving Equations 29. Quadratic Models in General Form 33. Systems of Linear and Exponential Equations 30. Exponential Modeling 31. Systems of Linear and Exponential Equations	Identify, describe, graph, and write equations for absolute value functions, piecewise linear functions, step functions, rational functions, and logistic functions. Identify and classify discontinuity in functions and identify the function's asymptotes. Model functions algebraically, graphically, numerically (with tables of values), and verbally. Continue to use the descriptions of domain, range, intercepts, maxima and minima, rate of change, intervals of increase and decrease, and end behavior. Continue to work with transformations of functions that are represented both algebraically and graphically.
3. Functions, Relations, and Inverses		Differentiate between relations and functions, define inverse and identity functions, determine if a function is one-to-one, use proper notation for inverse functions, and determine the inverses of linear, power, exponential, and rational functions. Verify that functions are inverses, and represent inverse functions algebraically, graphically, verbally, and in terms of domain and range. Develop the concept of inverse and its relation to the identity. Determine the inverses of given functions in contextual situations and in strictly algebraic problems. Continue modeling functions using different representations (algebraic, graphic, numeric, and verbal). Understand inverses in all of their representations: algebraically, as a reflection over $y=x$, as switching domain and range, and as reversing verbal instructions. Students are also introduced to composition of functions as a way to verify that two functions are inverses.
4. Polynomial and Rational Functions	10. Polynomial Operations 11. Rational Expressions	Classify a polynomial based on the number of terms and the degree. Attain competency in simplifying polynomial expressions involving addition, subtraction, multiplication, and long division. Define and identify rational functions, model rational functions algebraically, numerically and graphically, simplify rational expressions, perform operations on rational expressions including addition, subtraction, multiplication and division, and evaluate and solve rational equations. Apply these operations in the solving of rational equations.
5. Statistics and Probability		Use median and mean as measures of central tendency, use the five-number summary and standard deviation as measures of spread, calculate binomial probabilities, describe a binomial probability distribution, describe the normal curve, calculate and interpret standard scores, calculate and interpret confidence intervals, and calculate and interpret the results of a hypothesis test. Problems in this unit extend students' knowledge of probability and statistics so that they can design and conduct their own statistical experiments.

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Textbook	Cognitive Tutor® Software	Skills Covered
Print Chapter	Software Unit	The student will:
6. Circles	13. Central and Inscribed Angles in Circles 14. Circle Chords 15. Interior and Exterior Angles in Circles	Students will define a circle, and name and define parts of a circle. Calculate measures of angles in circles, including central angles, inscribed angles, interior angles, and exterior angles based upon the measures of the intercepted arcs. Calculate measures of intercepted arcs based upon measures of the angles in circles. Distinguish between major arcs, minor arcs, and semicircles. Calculate arc measure and arc length, and tell the difference between these two calculations. Calculate sector and circle segment areas. Use relationships among chord, radii, and tangents to determine angle and segment measures based upon those relationships. Solve problems involving tangent and secant lines with circles. Construct valid arguments consisting of a premise, reasons, and a conclusion dealing with properties of a circle.
7. Periodic Functions	16. Right Triangles and Trigonometric Functions 17. Trigonometric Transformations 18. Trigonometric Laws 19. One-Step Trigonometric Equations 20. Trigonometric Models using Radians 28. Multiple-Step Trigonometric Equations 32. Trigonometric Equations and Identities	Measure angles using radian measure. Convert between amount of turn, degree measure, and radian measure. Create graphs of the trigonometric functions and use reflections to create the inverse trigonometric functions. Create graphs of periodic functions which are not trigonometric functions. Understand and use amplitude, period, phase shift, and horizontal shifts in graphing periodic functions. Use real-world problems to understand the relationship between the unit circle and the trigonometric functions. Compute the intercepts, local maxima, and local minima for periodic functions. Use real-world problems to understand the sinusoidal graphs. Compute the sine, cosine, or tangent of an angle of any measure. Use the relationship between the values of the sine, cosine, and tangent. Understand basic trigonometric identities, and solve trigonometric equations.
8. Conic Sections		Define each conic section algebraically as a locus of points. Use transformations to generalize each equation. Define and identify, depending on the conic sections, key components such as the center, foci, vertices, co-vertices, major and minor axes, directrix, axis of symmetry, asymptotes, transverse and conjugate axes. Write the equation, identify key components, and generate graphs for each conic. Discover the defining characteristic of each conic as a locus of points.
9. Three-Dimensional Geometry	21. Volume and Surface Area of Right Prisms 22. Volume and Surface Area of Cylinders 23. Volume of Pyramids 24. Volume of Cones 25. Volume and Surface Area of Spheres 26. Backwards Volume and Surface Area	Explore the ideas behind the volume and surface area of many three-dimensional figures. Calculate the volume and surface area of any prism, cylinder, pyramid, cone, or sphere. Apply these calculations to applications outside the mathematics classroom. Use nets, cross-sections, vertex-edge graphs, and front, top, and side views to analyze three-dimensional objects. When surface area is explored, students find areas of component faces through the use of nets.
10. Compositions of Transformations	12. Geometric Transformations	Experience the fact that translations, rotations, and glide reflections are compositions of reflections over lines with certain relationships. Perform composite transformations. Use matrices to describe and perform and transformation or composition of transformations. Combine three reflections or a translation and a reflection in order to perform a glide reflection. Create tessellations and designate which regular polygons can and cannot tessellate a plane.