

Course Description: Integrated Math 2 builds on the foundations of Algebra and Geometry by deepening students' understanding of functions, equations, and mathematical reasoning. Throughout the course, learners develop fluency with algebraic expressions, radicals, exponential relationships, polynomials, quadratic functions, and rational expressions while applying mathematical practices to solve complex problems. Students use multiple representations, including graphs, tables, equations, and verbal descriptions, to analyze and model real-world situations.

As the course progresses, learners investigate polynomial and rational functions, solve systems of equations, explore function operations, and examine inverse relationships. Students strengthen their ability to make connections among mathematical concepts, interpret data, and use technology to analyze patterns and construct models. Emphasis is placed on problem solving, critical thinking, precision, and communicating mathematical reasoning.

The second half of the course integrates probability, logic, proof, geometry, triangles, trigonometry, and circles. Learners develop formal reasoning skills through conjectures, proofs, and geometric investigations while applying geometric and trigonometric concepts to real-world contexts. By the end of the course, students will be prepared to analyze complex mathematical relationships, justify solutions, and apply algebraic and geometric reasoning across a variety of disciplines.

Module	Lesson Title	Objectives
Module 7 Probability	7.1 Probability Concepts	- Define <i>outcome, simple event, random event, complementary event, and sample space</i>. - Define outcome, simple event, random event, complementary event, and sample space. - Define outcome, simple event, random event, complementary event, and sample space.
	7.2 Area Models	- Define <i>biased events, area model, mutually exclusive events, "and" probability, and "or" probability</i>. - Calculate the probability of biased events. - Construct an area model. - Calculate outcomes using an area model.

Module	Lesson Title	Objectives
	7.3 Independent Events	- Differentiate between dependent and independent events. - Calculate the probability of independent events. - Show that events are independent using the multiplication rule for independent events.
	7.4 Add and Subtract Rules	- Name the outcomes in an intersection, union, and complement. - Create a Venn diagram to represent a scenario. - Explain the addition and subtraction rules. - Calculate probability using addition and subtraction rules, along with a Venn diagram.
	7.5 Conditional Probability	- Define and identify conditional probability scenarios. - Apply the conditional probability formula. - Calculate the conditional probability of independent and dependent events and interpret the outcome.
	7.6 Two-Way Tables	- Construct a two-way relative frequency table. - Interpret a two-way table, including classifying events as independent or dependent. - Calculate probability using a two-way table.
	7.7 Fundamental Counting Rule	- Define the fundamental counting rule. - Calculate the total number of outcomes using the fundamental counting rule. - Explain how sample size affects probability.
	7.8 Permutations	- Identify permutations in which repetition is allowed and in which repetition is not allowed. - Develop formulas for calculating the number of permutations. - Calculate the number of permutations for a given scenario, using the appropriate formula.
	7.9 Combinations	- Differentiate between permutations and combinations. - Derive the formulas for combinations with and without repetition. - Identify combinations where repetition is allowed and those where it is not allowed. - Calculate the number of combinations for a given scenario.

Module	Lesson Title	Objectives
	7.10 Decision Making & Analysis	• Make fair decisions using probability. • Apply the rules of probability to make the best decision in a scenario. • Analyze decision-making using probability.
Module 8 Logic and Proofs	8.1 Recognizing Patterns	• Recognize patterns. • Write conjectures. • Determine if a conjecture is false.
	8.2 Conjectures	• Create a Venn diagram. • Evaluate a conjecture using a Venn diagram. • Distinguish between a conjecture and a proof.
	8.3 Conditional Statements	• Define <i>conditional</i>, <i>biconditional</i>, and <i>converse statements</i>. • Write conditional, biconditional, and converse statements. • Identify conditional, biconditional, and converse statements.
	8.4 Conditional Forms	• Explain what inverse and contrapositive statements are. • Write inverse and contrapositive statements. • Write a simple algebraic proof using a contrapositive statement.
	8.5 Syllogism	• Identify a syllogism. • Validate a conclusion using a syllogism. • Write a syllogism.
	8.6 Types of Reasoning	• Distinguish between inductive and deductive reasoning. • Identify the best type of reasoning for a scenario. • Write conjectures using reasoning.
	8.7 Counterexamples	• Define <i>counterexample</i>. • Select the most appropriate counterexample for a scenario. • Write a counterexample for a false conditional statement.
	8.8 Informal Proof	• Distinguish between informal and formal proof. • Describe the process of creating informal proof. • Write informal proofs.

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	8.9 Formal Proof	- Define the types of proof formats. - Translate a proof from one form to another. - Order statements logically.
	8.10 Writing Proofs	- Explain the types of justifications that can be used in a geometric proof. - Verify that a proof is correct. - Write a formal proof using logic statements.
Module 9 Triangle Properties and Proofs	9.1 Triangles Defined	- Relate angles to triangles. - Identify different types of triangles using their properties. - Read diagrams to determine if two triangles are congruent.
	9.2 Triangle Congruence	- Name congruent parts of triangle pairs. - Explain the criteria for triangle congruence. - Write congruence statements about pairs of triangles.
	9.3 Hypotenuse-Leg Theorem	- Explain the hypotenuse-leg theorem. - Determine if two triangles are congruent by the hypotenuse-leg theorem. - Write an informal proof for triangle congruence.
	9.4 Ratio & Proportion	- Define <i>similarity</i>. - Calculate the common ratio between similar figures. - Write proportions. - Solve proportions using cross-multiplication.
	9.5 Similarity	- Define <i>similarity</i> in terms of dilation in the coordinate plane. - Explain that all congruent shapes are also similar. - Determine if shapes are congruent or similar based on transformations.
	9.6 Similar Triangles	- Distinguish between congruence and similarity. - Explain the criteria for triangle similarity. - Write similarity statements about pairs of triangles.

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	9.7 Triangle Sum Theorem	- Explain the triangle sum theorem and use it to calculate the missing angle measures. - Connect the triangle sum theorem to the AA postulate. - Explain and apply the remote interior angles theorem. - Describe the triangle sum theorem in spherical geometry.
Module 10 Triangles	10.1 Triangle Constructions	- Construct an equilateral triangle, an obtuse isosceles triangle, and a right scalene triangle. - Define an auxiliary line and apply it to proof creation. - Prove the triangle sum theorem.
	10.2 Pythagorean Theorem	- Verify the Pythagorean theorem. - Calculate the unknown length of a hypotenuse or leg of a right triangle using the Pythagorean theorem. - Identify Pythagorean triples.
	10.3 Pythagoras & Other Proof	- Prove the Pythagorean theorem using triangle similarity. - Prove the triangle proportionality theorem. - Calculate missing triangle side lengths using triangle theorems.
	10.4 Isosceles Triangles	- Define the properties of an isosceles triangle. - Prove that the base angles of an isosceles triangle are congruent. - Calculate missing measures in an isosceles triangle.
	10.5 Median & Altitude	- Sketch the medians and altitudes of a triangle. - Calculate the length of a median using the centroid theorem. - Identify the location of the orthocenter for acute, right, and obtuse triangles. - Prove the altitude to the hypotenuse theorem.
	10.6 Midsegment Theorem	- Calculate the endpoints of a triangle's midsegment. - Calculate the length of a midsegment. - Informally prove the midsegment theorem. - Solve problems using the midsegment theorem.

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	10.7 Triangle Inequality	- Determine if three given side lengths can form a triangle. - Calculate the range that the third side of a triangle can have when given the lengths of two sides of a triangle. - Apply the triangle inequality theorem for angles.
Module 11 Right Triangles	11.1 Special Right Triangles	- State the properties and side ratios for special right triangles. - Prove the side ratios for special right triangles. - Solve problems using special right triangles.
	11.2 The Tangent Ratio	- Write statements about right triangles using the tangent ratio. - Calculate the point where a radius meets the circle using the tangent ratio. - Connect the slope formula to the tangent ratio.
	11.3 Sine and Cosine Ratios	- Write statements about right triangles using the sine and cosine ratios. - Derive the sine formula for the area of a triangle and use it to calculate area. - Explain the complementary relationship between sine and cosine.
	11.4 Applications of Ratios	- Select the best trigonometric ratio to solve a problem. - Solve for an unknown side length using sine, cosine, or tangent. - Write trigonometric ratios using the relationship between similar triangles.
	11.5 Law of Sines	- Prove the law of sines. - Solve for missing side lengths and angle measures using the law of sines. - Identify the ambiguous case for the law of sines.
	11.6 Law of Cosines	- Prove the law of cosines. - Solve for missing side lengths and angle measures using the law of cosines. - Choose the correct version of the law of cosines for each problem.
	11.7 Solving Triangles	- Solve right triangles. - Solve triangles that are not right triangles.
	11.8 Deriving Distance	- Calculate distances in two dimensions using the Pythagorean theorem. - Calculate distances in three dimensions using the Pythagorean theorem. - Derive the two-dimensional distance formula.

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	11.9 Triangles and Rectangles	- Identify rectangles using properties. - Explain how to use triangles to create a rectangle. - Calculate lengths within a rectangle using triangle properties and theorems. - Calculate the area of a rectangle using triangle relationships.
Module 12 Circles	12.1 The Parts of a Circle	- Define terms unique to circles. - Explain and apply the intersecting chords theorem. - Explain and apply the intersecting secants theorem.
	12.2 Circumference and Area	- Explore the relationship between the circumference and diameter of a circle. - Derive the formula for the area of a circle. - Extrapolate the formula for the circumference of a circle. - Solve problems involving the circumference and area of a circle.
	12.3 Arcs and Sectors	- Define and identify arcs, major arcs, minor arcs, central angles, semicircles, and sectors. - Explain the relationship between an arc and a chord. - Differentiate between minor sectors and major sectors. - Name the degree of a sector. - Solve problems using the arc addition postulate.
	12.4 Arc Length	- Derive, using similarity, that the length of the arc intercepted by an angle is proportional to the radius. - Calculate the circumference of a circle and the length of a circular arc. - Convert angle measurements between degree and radian measure. - Explain how the radius of a circle is related to its radian measure.
	12.5 Tangent Lines	- Identify the tangent of a circle and the point of tangency. - Construct a tangent line. - Explain the properties and theorems of tangent lines. - Solve problems using the properties and theorems of tangent lines.
	12.6 Sectors and Segments	- Write an equation to determine the area of a sector. - Calculate the area of a sector. - Define a segment of a circle.

Module	Lesson Title	Objectives
		Calculate the area of a segment.
	12.7 The Equation of a Circle	- Derive the equation of a circle using the Pythagorean theorem. - Calculate the length of a radius in the coordinate plane using the distance formula. - Identify the center and radius of a circle from its equation. - Write the equation of a circle in general form.