



## Integrated Math 2

### Course Description:

This Integrated Math course will give students an understanding of the foundations of Algebra and Geometry. Students will build on an understanding of functions and equations, then apply strategies they have learned for representing a quantity, creating an equation and finding a solution to the context of modeling Geometric relationships.

Part 1: 5 credit hours

Part 2: 5 credit hours

### Course Outline

### Common Core Standards

#### Integrated Math 2, Part 1

##### Unit 1 – Characteristics of Functions

- 1.1 Absolute Value Functions
- 1.2 Direct and Inverse Variation Functions
- 1.3 Inverse Functions
- 1.4 Properties of Exponents
- 1.5 Radical and Rational Exponents
- 1.6 Exponential Functions

##### In this unit:

Students will learn about a variety of functions and methods for identifying them. The absolute value function is a function where all the output values are positive. They will use variation functions to describe either a direct proportional relationship between variables or an inverse relationship, that as one increases, the other decreases by a constant proportion. An inverse function, is a function that "undoes" the original function. Students will explore functions with positive, negative and rational exponents as well as exponential functions.

**N.RN.1, N.RN.2, A.SSE.2, A.SSE.3, A.CED.1, F.IF.1, F.IF.4**

##### Unit 2 – Polynomial Operations

- 2.1 Adding/Subtracting Polynomials
- 2.2 Multiplying Polynomials
- 2.3 Special Polynomials
- 2.4 Factor  $x^2 + bx + c$
- 2.5 Factor  $ax^2 + bx + c$
- 2.6 Factoring Special Products
- 2.7 Factoring Polynomials Completely
- 2.8 Solving Polynomial Equations

##### In this unit:

Students will explore polynomial functions and equations. Polynomial expressions have similar properties to the real numbers and can be added, subtracted, multiplied and divided. When solving polynomial equations, students will learn to factor special polynomials, simple and complex quadratic equations, and apply special formulas.

**A.SSE.2, A.APR.1, A.APR.3, A.SSE.2, A.APR.1**

### Unit 3 – Graphing Quadratic Functions

- 3.1 Graphing Parabolas Standard Form
- 3.2 Graphing Parabolas with Vertical Shifts and in Vertex Form
- 3.3 Graphing Parabolas in factored form:  
 $f(x) = a(x - p)(x - q)$
- 3.4 Comparing Linear, Exponential, and Quadratic Functions

### Unit 4 – Solving Quadratic Equations

- 4.1 Properties of Radicals
- 4.2 Solving Quadratic Equations by Graphing
- 4.3 Solving Quadratic Equations by Using Square Roots
- 4.4 Solving Quadratic Equations by Completing the Square
- 4.5 Solving Quadratic Equations by Using the Quadratic Formula
- 4.6 Solving Quadratic Equations with Complex Solutions

### Unit 5 – Relationship within Triangles

- 5.1 Proving Geometric Relationships
- 5.2 Perpendicular Bisectors and Circumcenter
- 5.3 Angle Bisectors and Incenter
- 5.4 Medians and Altitudes of Triangles
- 5.5 The Triangle Mid Segment Theorem
- 5.6 Indirect Proof and Inequalities in One Triangle
- 5.7 Inequalities in Two Triangles

#### **In this unit:**

Students will learn that a quadratic function has a special shape, and the leading coefficient determines if the quadratic opens upward or downward. The unit will explore graphing the parent function and graphing a quadratic in different forms. Students will transform parent functions using vertical and horizontal shifts in quadratics and use vertex and focus to write functions. Students will revisit functions and compare linear, quadratic and exponential functions with the new information they have acquired.

**A.SSE.3, F.IF.3, F.IF.5, F.IF.7, F.IF.8, F.LE.1**

#### **In this unit:**

Students will focus on solving quadratic equations that can not be factored. They will learn simplification and operations with radicals as a foundation to solving equations by completing the square and the quadratic formula. Students will learn to derive the quadratic formula and use it to solve equations with complex solutions.

**A.REI.4, A.APR.1, A.APR.3, A.CED.1, A.SSE.3**

#### **In this unit:**

Students will learn about the triangle, a foundational polygon in Geometry. They will study geometric relationships of triangles such as perpendicular bisectors, circumcenter, medians, altitudes and more. Students will apply the Triangle Mid-Segment Theorem and other theorems and relationships to create models of real-world problems.

**A.CED.4, G.CO.9, G.CO.10, G.SRT.4, G.SRT.5**

## Course Outline

## Common Core Standards

### Integrated Math 2, Part 2

#### Unit 1 – Quadrilateral and Other Polygons

- 1.1 Angles of Polygons
- 1.2 Properties of Parallelograms
- 1.3 Proving Quadrilaterals as Parallelograms
- 1.4 Properties of Special Parallelograms
- 1.5 Conditions for Special Parallelograms
- 1.6 Trapezoids and Kites

#### **In this unit:**

Students will explore polygons, with a focus on quadrilaterals. They will learn to recognize parallelograms, squares, rectangles, rhombuses, and kites based on properties related to the length of opposite sides, angles, diagonals, etc. Using these properties, theorems, algebra and coordinate geometry, students will prove a quadrilateral is a parallelogram. They will learn to determine if a quadrilateral is a trapezoid or a kite by examining diagonals, opposite sides, and opposite angles.

**A.SSE.1, G.CO.11, G.SRT.5**

#### Unit 2 – Triangle Similarity

- 2.1 Dilations
- 2.2 Similarity and Transformations
- 2.3 Similar Polygons
- 2.4 Proving Similar Triangles by AA
- 2.5 Proving Triangles by SSS and SAS
- 2.6 Proportionality Theorems

#### **In this unit:**

Students will learn how a dilation is a transformation that creates similar figures in the coordinate plane. They will extend their understanding of similarity to composite transformations which include dilations, translations, rotations and reflections. They will explore the definition of similar polygons not on the coordinate plane. Using the AA, SSS, and SAS similarity theorems, they will learn to prove triangles are similar, as well as apply these principles to determine angle and side measurements. They will learn to use proportions to find the lengths of similar triangles.

**A.SSE.1, G.CO.2, G.CO.3, G.CO.4, G.CO.5, G.CO.6, G.CO.10, G.SRT.1, G.SRT.2, G.SRT.3, G.SRT.4**

#### Unit 3 – Right Triangles and Trigonometry

- 3.1 Pythagorean Theorem
- 3.2 Special Right Triangles
- 3.3 Similar Right Triangles (Geometric Mean)
- 3.4 The Sine and Cosine Ratios
- 3.5 The Tangent Ratio
- 3.6 Solving Right Triangles

#### **In this unit:**

Students will explore the Pythagorean Theorem which defines the relationship between the legs and hypotenuse of a right triangle. By applying the Pythagorean Theorem to special, 30-60-90° and 45-45-90°, triangles they will determine a relationship between the legs and the hypotenuse of these special triangles. Using more proportionality

theorems that relate right triangles within right triangles, the geometric mean and the trigonometric ratios of sine, cosine, and tangent, they will solve triangles for side lengths and angle measures.

**A.SSE.1, A.CED.4, F.BF.4, , F.TF.7, G.SRT.4, G.SRT.5, G.SRT.6, G.SRT.7, G.SRT.8**

## Unit 4 – Circles

- 4.1 Introduction to Circles and Tangents
- 4.2 Arcs and Chords
- 4.3 Sector Area and Arc Length
- 4.4 Inscribed Angles
- 4.5 Angle Relationships in Circles
- 4.6 Segment Relationships in Circles
- 4.7 Coordinate Circles

### **In this unit:**

Students will learn circle vocabulary such as secant, tangent, and chord. They will apply the relationships between secants and radii, as well as between central angles, arc measures, congruent chords and arcs to find arc and chord measurements. They will learn to compute the area of a sector and the length of an arc in a circle. Using the definition and the properties of an inscribed angle as well as the relationship between the angles of intersecting chords and secants, they will determine chord and angles measurements. They will write the equation of a circle in a coordinate plane and graph a circle given an equation.

**A.SSE.1, A.CED.2, A.CED.4, G.CO.1, G.SRT.11, G.C.2, G.C.3, G.C.4, G.C.5, G.GPE.1**

## Unit 5 – Volume

- 5.1 Area of a Circle
- 5.2 Areas of Regular Polygons
- 5.3 Surface Area and Volume of Prisms and Cylinders
- 5.4 Volume and Surface Area of Pyramids
- 5.5 Surface Areas and Volumes of Cones
- 5.6 Surface Areas and Volumes of Spheres

### **In this unit:**

Students will build on their knowledge of area and circumference of a circle, to solve practical problems. They will learn to find the area of any polygon using traditional methods as well as trigonometry. They will find the volume and surface area of a prism and cylinder and apply their formulas in real world scenarios. They will apply the relationship between a pyramid and a cube, to find the formula for volume and surface area of pyramids with square, triangular and other bases. They will find the volume and surface area of a cone and a sphere and use this information to determine height and base of a three-dimensional object.

**N.Q.1, A.SSE.1, A.CED.4, G.GPE.7, G.GMD.3, G.GM.1, G.GM.2**

## Unit 6 – Understanding Probability

- 6.1 Sample Spaces and Probability
- 6.2 Permutations and Combinations
- 6.3 Independent and Dependent Events
- 6.4 Two Way Tables and Probability
- 6.5 Probability of Disjoint and Overlapping Events
- 6.6 Geometric Probability

### **In this unit:**

Students will learn multiple strategies to help identify a sample space and populations. They will learn to count outcomes of a sample space using permutations and combinations. They will apply their knowledge of probability to compare and contrast independent and dependent events. They will find probability for two dependent overlapping events, distinguish between overlapping and disjoint events. They will apply properties of probability to determine geometric outcomes.

**N.Q.1, S.CP.1, S.CP.2, S.CP.3, S.CP.4, S.CP.5, S.CP.6, S.CP.7, S.CP.9**