ALGEBRA I: SEMESTER 1

Unit: Reasoning with Equations and Inequalities

Lesson: Properties of Algebra	● 6.EE.A.2.C - Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). ● 6.EE.A.3 - Apply the properties of operations to generate equivalent expressions.
Lesson: Solving One-Step Equations	● HSA.REI.A.1 - Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. ● HSA.REI.B.3 - Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Lesson: Solving Multi-Step Equations Part 1 and Isolating Variables	• HSA.CED.A.4 • HSA.REI.A.1 • HSA.REI.B.3 • Students will solve multi-step linear equations in one variable. • Students will be able to explain their reasoning when solving multi-step linear equations in one variable. • Students will be able to rearrange equations and formulas to highlight a quantity of interest.
Lesson: Creating and Solving Inequalities	• HSA.CED.A.1 • HSA.REI.B.3 • Students will be able to create inequalities to represent given situations. • Students will be able to solve inequalities in one variable.
Lesson: Add and Subtract Polynomials	• HSA.APR.A.1 • Students will be able to add and subtract polynomials and write their answers in standard form.
Lesson: Multiply Polynomials	• HSA.APR.A.1 • Students will be able to multiply polynomials and write their answers in standard form.
Lesson: Solving Multi-Step Equations Part 2	• HSA.REI.B.3 • Students will further develop their skills solving equations and inequalities with multiple occurences of the same variable.

Unit: Radical Expressions

Lesson: Simplifying Radicals	• HSN.RN.A.1 • HSN.RN.A.2 • Students will gain a basic understanding of what a rational exponent is and how they can be used. • Students will become fluent in converting between radical and exponential form. • Students will review prime factorization and use it to simplify radicals. • Students will be able to simplify radicals with radicands consisting of numbers, variables, and exponents.
Lesson: Multiplying Radicals	• HSN.RN.B.3 • Students will know how to multiply radical expressions.
Lesson: Combining Radicals	• HSN.RN.B.3 • Students will be able to add radical expressions by combining like terms. • Students will use simplification of radicals to further their ability to add radicals.

Lesson: Rational and Irrational Numbers	• HSN.RN.B.3 • Students will understand the difference between rational and irrational numbers. • Students will understand that the sum and product of two rational numbers is a rational number. • Students will understand that the sum of an irrational and rational number is irrational. • Students will understand that the product of an irrational and a non-zero rational number is irrational. • Students will be aware that the product of two irrational numbers can result in both irrational or rational numbers.

Unit: Understanding Functions and Sequences

Lesson: Definition of a Function	• HSF.IF.A.1 • Students will understand what a function is. • Students will know how to determine from tables, ordered pairs, graphs, and situations if a relationship represents a function.
Lesson: Function Notation	• HSF.IF.A.2 • Students will be able to use function notation to evaluate functions for inputs in their domains. • Students will be able to interpret statements that use function notation in terms of a context.

Lesson: Functional Notation: Addition, Subtraction, Multiplication	• HSF.LE.A.1
	  ◦ HSF.LE.A.1.A
	  ◦ HSF.LE.A.1.B
	• HSF.LE.A.2
	• Students will understand the basic characteristics of linear functions.
	• Students will be able to create a linear function to fit data given in the form of a table, graph, or as two coordinate points.

Lesson: Linear Functions	• HSF.LE.A.1
	  ◦ HSF.LE.A.1.A
	  ◦ HSF.LE.A.1.B
	• HSF.LE.A.2
	• Students will understand the basic characteristics of linear functions.
	• Students will be able to create a linear function to fit data given in the form of a table, graph, or as two coordinate points.

Lesson: Exponential Functions	• HSF.LE.A.1
	  ◦ HSF.LE.A.1.A
	  ◦ HSF.LE.A.1.C
	• HSF.LE.A.2
	• Students will understand the basic characteristics of exponential functions.
	• Students will be able to create an exponential function to fit data given in the form of a table or graph.

Lesson: Domain and Range	● HSF.IF.B.5 ● Students will understand the concepts of domain and range. ● Students will become fluent in using interval notation to represent domain and range of functions. ● Students will be able to identify the domain and range of a graph.
Lesson: Sequences	● HSF.IF.A.3 ● HSF.BF.A.2 ● HSF.LE.A.2 ● Students will understand what a sequence is and that sequences are functions. ● Students will know the difference between arithmetic, geometric, and recursive sequences. ● Students will be able to create an explicit formula (arithmetic or geometric) for a given sequence of numbers. ● Students will be able to produce sequence values from a recursive formula.

Unit: Graphing Functions and Inequalities

Lesson: Graphing Linear and Exponential Functions	HSF.LE.A.1 ● HSF.LE.A.1.B ● HSF.LE.A.1.C ● Students will review and practice concepts learned in earlier grades pertaining to graphing linear functions from tables and equations. ● Students will be able to graph exponential functions from a table of values or the equation.

Lesson: Average Rate of Change	• HSF.IF.B.6 • Students will understand what the average rate of change means. • Students will be able to calculate the average rate of change from a table of values. • Students will be able to calculate (when possible) or estimate the average rate of change from a graph.
Lesson: Comparing Functions	• HSF.IF.C.9 • Students will be able to compare properties of linear functions in different forms. • Students will be able to compare properties of exponential functions in different forms.
Lesson: Graphing Linear Inequalities with Two Variables	• HSA.REI.D.12 • Students will be able to graph linear inequalities and identify the solution region.

ALGEBRA I: SEMESTER 2

Unit: Systems of Equations

Lesson: Solutions of Equations	● HSA.REI.C.6 ● Students will understand what a solution to an equation is. ● Students will be able to check to see if a given coordinate point is a solution to an equation.
Lesson: Systems of Equations	● HSA.REI.C.6 ● Students will understand what a solution to a system of linear equation is. ● Students will know the three possible solution types for a system of linear equations. ● Students will be able to verify if a coordinate point is a solution to a system of linear equations.
Lesson: Solve by Graphing	● HSA.REI.C.6 ● Students will be able to solve systems of linear equations by graphing them and finding their intersection point. ● Students will be able to solve systems of linear equations by setting them equal and using algebra.

Lesson: Solving Systems of Inequalities by Graphing	• HSA.REI.D.12 • Students will review the process of graphing linear inequalities. • Students will solve systems of linear inequalities by graphing. • Students will understand that the solution region for a system of linear inequalities is the region where the all the solution sets for each inequality overlap.
Lesson: Solving by Substitution	• HSA.REI.C.6 Students will learn to solve systems of linear equations using algebra in two methods • Setting Equal • Substitution
Lesson: Solving by Elimination	• HSA.REI.C.5 • Students will be able to solve systems of linear equations using elimination.

Unit: Quadratic Equations

Lesson: Introduction to Solving Quadratic Equations	• HSF.IF.A.2 • HSF.IF.C.7.a • Students will be able to evaluate quadratic functions at specified values. • Students will understand the vocabulary associated with solutions to quadratic equations. • Students will be able to find solutions to quadratic equations using graphs.

Lesson: Factoring When a=1	• HSA.APR.A.1 • HSA.SSE.B.3.a • HSF.IF.C.8 • Students will review the FOIL method of distribution when multiplying two binomials. • Students will understand the inverse relationship between distribution and factoring. • Students will be able to factor quadratics when a = 1.
Lesson: Factoring When A Does Not =1	• HSA.SSE.B.3.a • HSF.IF.C.8 • Students will review how to find the greatest common factor (GCF) between a set of numbers. • Students will know how to factor quadratics when a does not equal 1 using the factoring by grouping method..
Lesson: Solve by Factoring	• HSA.REI.B.4.b • Students will be able to find solutions to quadratic equations when a=1 by factoring.
Lesson:Factoring Difference of Squares Expressions	• HSA.SSE.A.2 • Students will recognize perfect square terms (numbers and variables). • Students will recognize difference of squares expressions. • Students will be able to factor difference of squares expressions.

Lesson: Completing the Square	• HSA.SSE.B.3.B • HSF.IF.C.8 • Students will understand what a perfect square trinomial is. • Students will be able to use the process of completing the square to convert a quadratic in standard form to vertex form.
Lesson: Solve by Completing the Square	• HSA.REI.B.4.a • HSA.REI.B.4.b • HSF.IF.C.8.a • Students will understand the idea that solving with square roots produces two solutions. • Students will be able to solve a quadratic equation by first completing the square on a quadratic that is in standard form and then solving for x.
Lesson: Solving by Quadratic Formula	• HSA.REI.B.4.b • Students will learn and memorize the quadratic formula. • Students will know what the standard form of a quadratic equation looks like and be able to identify the a, b, and c values. • Students will be able to solve quadratic equations using the quadratic formula.

Unit: Graphing Quadratics and Transformations

Lesson: Intro to Quadratic Graphs and Key Features	• HSF.IF.B.4 • Students will be able to identify key features of a function from a graph. These key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative
Lesson: Quadratic Transformations	• HSF.BF.B.3 • Students will be able to identify the vertex of a parabola from the vertex form of its equation. • Students will be able to interpret the vertex form of a quadratic to identify a reflection, vertical stretch/ shrink, horizontal translation, or vertical translation.
Lesson: Graphing Quadratics	• HSA.SSE.B.3.a • HSA.SSE.B.3.b • HSF.IF.C.7.a • HSF.IF.C.8.a • Students will be able to identify the y-intercept from a quadratic equation in standard form. • Students will be able to identify the zeros from a quadratic equation in factored form. • Students will be able to identify the vertex from a quadratic equation in vertex form. • Students will be able to graph a quadratic equation with reasonable accuracy using the key features shown by the equation in standard, factored, and vertex form.

Lesson: Creating Quadratic Equations	● HSA.SSE.B.3.a ● HSA.SSE.B.3.b ● Students will be able to write the equation of a quadratic in standard form given the zeros and one additional point. ● Students will be able to write the equation of a quadratic in standard form given the vertex and one additional point. ● Students will be able to write the equation of a quadratic in standard form given the graph of the equation.
Lesson: Comparing Quadratics	● HSF.IF.C.9 ● Students will be able to compare quadratics in various forms and make decisions about key features of those quadratics.
Lesson: Applications of Quadratics and Realistic Domains	● HSA.CED.A.3 ● HSF.IF.B.5 ● Students will be able to interpret keys features of quadratics in context of a given problem. ● Students will be able to set a realistic domain for a quadratic based on the context of the problem.

Unit: Statistics

Lesson: Dot Plots, Histograms, and Box Plots	• HSS.ID.A.1 • Students will understand that displaying numerical data always involves the number line. • Students will be able to create a dot plot from numerical data. • Students will be able to create a box plot from numerical data. • Students will be able to create a histogram from numerical data. • Students will be able to make informed decisions about which representation would best fit a numerical data set.
Lesson: Measures of Center and Spread	• HSS.ID.A.2 • Students will be able to compute measures of center for a data set (mean and median) • Students will be able to determine which measure of center is a better representation for a data set. • Students will be able to compute measures of spread for a data set (interquartile range and standard deviation)

Lesson: Two-Way Frequency Tables	• HSS.ID.B.5 • Students will be able to construct and interpret two-way frequency tables of data when two categories are associated with each object. • Students will know the difference between joint and marginal frequencies. • Students will be able to calculate the relative frequencies from a two-way frequency table.
Lesson: Scatter Plots and Linear Regression	HSS.ID.B.6 • HSS.ID.B.6.c • Students will know what a scatter plot is and how to read the data from it. • Students will be able to create a scatter plot given a set of data points. • Students will be able to fit a linear regression to a scatter plot. • Students will be able to predict future data on a scatter plot using a linear regression.
Lesson: Residuals	• HSS.ID.B.6.b • Students will know that residuals are and how relate to a line of best fit on a scatter plot. • Students will be able to calculate residuals on a scatter plot. • Students will be able to assess the accuracy of a line of best fit based on the residuals.

Lesson: Correlation Coefficient	• HSS.ID.C.8 • Students will know what the correlation coefficient of two data sets represents. • Students will be able to use the TI-84 calculator (or similar model) to calculate the correlation coefficient of two data sets. • Students will be able to use the Microsoft Excel to calculate the correlation coefficient of two data sets.
Lesson: Correlation vs Causation	• HSS.ID.C.9 • Students will be able to distinguish between correlation and causation. • Students will know that correlation does not imply causation.

GEOMETRY: SEMESTER 1

Unit: Introduction to Geometry - Lines, Angles, and Theorems about Polygons

Lesson: Lines and Angles	• HSG.CO.A.1 • Students will be able to define the following terms: line, line segment, ray, angle, right angle, parallel lines, and perpendicular lines. • Students will understand the conventional mathematical notation associated with lines and angles.
Lesson: Theorems about Lines and Angles: Vertical Angles	• HSG.CO.C.9 • Students will understand the general idea of congruence, especially as it relates to angles. • Students will know the definitions for complementary and supplementary angles. • Students will know what vertical angles are and be able to prove the Vertical Angles Theorem.
Lesson: Theorems about LIne and Angles - Parallel Line Theorems	• HSG.CO.C.9 • Students will be able to define and identify corresponding angles. • Students will be able to define and identify alternate interior angles. • Students will be able to define and identify alternate exterior angles. • Students will be able to use their knowledge of angles in connection with parallel lines to find sets of congruent angles in a figure.

Lesson: Perpendicular Bisector Theorem	• HSG.CO.C.9 • Students will know what it means to bisect an angle and a line segment. • Students will be able to define a perpendicular bisector. • Students will prove the Perpendicular Bisector Theorem. • Students will be able to use the Perpendicular Bisector Theorem to set up and solve equations from geometric figures.
Lesson: Polygons, Perimeter, and Area	• This section will briefly review many of the standards relating to 2-D shapes from grades 5-8. • Students will be able to define a polygon. • Students will know the difference between a regular and irregular polygon. • Students will know how to find the perimeter of polygons. • Students will have a general knowledge of how to find the area of basic polygons.

Lesson: Theorems about Triangles	● HSG.CO.C.10 ● Students will review the types of triangles they have learned about in previous courses. ● Students will understand the Triangle Inequality Theorem and be able to apply it to given side lengths to determine if a triangle can be formed from them. ● Students will understand the proof of the Triangle Sum Theorem. ● Students will know what the Triangle Midsegment Theorem states and be able to apply it to solve problems. ● Students will understand the proof of the Base Angles Theorem and be able to apply it to solve problems. ● Students will know that the medians of a triangle meet at as single point called the centroid.

Unit: Coordinate Geometry

Lesson: Review Slope and Line	● Review of concepts from 8.EE.B.6 ● Students will review the concept of slope. ● Students will review how to find the slope of a graph. ● Students will review how to build and use equations of lines. ● Students will review how to graph a line from an equation.

Lesson: Parallel and Perpendicular Lines	• HSG.GPE.B.5 • Students will prove the slope criteria for parallel lines. • Students will prove the slope criteria for perpendicular lines. • Given a line and a point, students will be able to find the equations of the lines that are parallel and perpendicular to the given line through the given point.
Lesson: Distance Formula	• HSG.GPE.B.7 • Students will review the Pythagorean Theorem. • Students will understand how the distance formula is derived from the Pythagorean Theorem. • Students will use the distance formula to compute the distance between two points. • Students will use coordinates in conjunction with the distance formula to compute perimeters of polygons and areas of triangles and rectangles.
Lesson: Coordinate Proofs	• HSG.GPE.B.4 • Students will use what they have learned about coordinate geometry thus far to prove simple geometric conjectures.

Lesson: Partitioning Segments and the Midpoint Formula	● HSG.GPE.B.6 ● Students will review and understand how to read ratios. ● Students will be able to look at a directed line segment that has been partitioned and identify the ratio that has been created. ● Students will understand what it means to partition a line segment into the ratio 1:1 and then be able to use the Midpoint Formula to find the partition point.
Lesson: Ratios of Line Segments	● HSG.GPE.B.6 ● Students will use the coordinate plane to find the point on a directed line segment between two given points that partitions the segment in a given ratio.

Unit: Transformations and Congruence

Lesson: Transformations - Translations	● HSG.CO.A.2 ● Students will understand how to translate figures on a plane. ● Students will understand the notation associated with translations on a plane.

Lesson: Transformations - Reflections	• HSG.CO.A.2 • Students will understand how to reflect figures about the *x*-axis on a plane. • Students will understand how to reflect figures about the *y*-axis on a plane. • Students will understand how to reflect figures about the line $y = x$ on a plane. • Students will understand how to graphically reflect figures across other lines.
Lesson: Transformations - Rotations	• HSG.CO.A.2 • Students will understand how to rotate a figure 90°, 180°, and 270° around the origin. • Students will understand how to rotate a figure around a point not on the origin.
Lesson: Transformations Practice	• HSG.CO.A.4 • Students will develop tools to help them perform and verify rigid transformations on a plane.
Lesson: Triangle Congruence	• HSG.CO.B.7 • Students will learn and understand the definition of congruence for polygons in terms of rigid transformations. • Students will use the definition of congruence in terms of rigid transformations to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

Lesson: Types of Triangle Congruence	• HSG.CO.B.8 • Students will understand the ASA criteria for proving triangle congruence and be able to use it to determine if two triangles are congruent. • Students will understand the SAS criteria for proving triangle congruence and be able to use it to determine if two triangles are congruent. • Students will understand the SSS criteria for proving triangle congruence and be able to use it to determine if two triangles are congruent. • Students will understand why SSA and AAA are not criteria that can be used to prove triangle congruence.

Unit: Dilation and Similarity

Lesson: Dilation	• HSG.SRT.A.1 • Students will understand what a dilation does to an image and that dilations require a center of dilation and a scale factor. • Students will be able to use a given pre-image and scale factor to calculate measurements on an image. • Students will be able to identify the scale factor of a dilation based on an image and its pre-image.

Lesson: Performing a Dilation on the Coordinate Plane	HSG.SRT.A.1 ● HSG.SRT.A.1.A ● HSG.SRT.A.1.B ● Students will know how to dilate a pre-image given a scale factor and the center of dilation at the origin on the coordinate plane. ● Students will know how to dilate a preimage given a scale factor and the center of dilation not at the origin on the coordinate plane. ● Students will know how to dilate a preimage given a scale factor and a center of dilation not on the coordinate plane.
Lesson: Performing a Dilation without the Coordinate Grid	HSG.SRT.A.1 ● HSG.SRT.A.1.A ● HSG.SRT.A.1.B ● Students will be able to dilate a pre-image on a blank surface by using a ruler and pencil.
Lesson: Similarity	● HSG.SRT.A.2 ● Students will understand the formal definition of similarity in terms of transformations. ● Students will be able to determine if two shapes are similar based on their corresponding angles and sides.

Lesson: Triangle Similarity Criteria	• HSG.SRT.A.3 • HSG.SRT.B.5 • Students will understand the Angle-Angle Similarity Postulate and be able to use it to determine if two triangles are similar. • Students will understand the Side-Side-Side Similarity Theorem and be able to use it to determine if two triangles are similar. • Students will understand the Side-Angle-Side Similarity Theorem and be able to use it to determine if two triangles are similar.
Lesson: Side Splitter Theorem	• HSG.SRT.B.4 • Students will understand the Side Splitter Theorem and its proof. • Students will be able to apply the Side Splitter Theorem to solve for missing side lengths of triangles. • Students will be exposed to the proof of the Pythagorean Theorem using similar triangles.
Lesson: Proving the Pythagorean Theorem Using Similarity	• HSG.SRT.B.4 • Students will understand the proof of the Pythagorean Theorem using similar triangles.

GEOMETRY: SEMESTER 2

Unit: Circles and Arcs

Lesson: Circles Review and All Circles Are Similar	• 7.G.B.4 • HSG.C.A.1 • Students will review vocabulary associated with circles. • Students will review how to find the circumference and area of a circle. • Students will understand that all circles are similar and be able to solve problems based on that fact.
Lesson: Angles and Arcs	• HSG.C.A.2 • Students will know the difference between a central angle and an inscribed angle. • Students will be able to calculate an arc measure given a central angle and vise versa. • Students will be able to calculate an arc measure given an inscribed angle and vice versa.
Lesson: Inscribed Figures	• HSG.C.A.2 • HSG.C.A.3 • Students will prove and know that inscribed angles on a diameter are right angles. • Students will prove and know that opposite angles of an inscribed quadrilateral are supplementary.

Lesson: Tangent Lines	• HSG.C.A.2 • Students will know that a line tangent to a circle is always perpendicular to the radius of the circle. They will be able to use this knowledge to solve for missing segment lengths as well as verify tangent lines. • Students will know the relationship between angles created outside a circle with tangent and secant lines. They will be able to use this knowledge to solve for missing angles. • Students will know the relationship between a tangent chord angle and the intercepted arc. They will be able to use this information to solve for missing angles and arcs. • Students will know the relationship between angles formed by intersecting chords and their intercepted arcs. They will be able to use this knowledge to solve for missing angles and arc measures.
Lesson: Constructing Triangles and Tangent Lines with Circles	• HSG.C.A.3 • HSG.C.A.4 • Student will learn what inscribed and circumscribed figures are. • Students will know how to construct a triangle inscribed in a circle. • Students will know how to a circle that is circumscribed by a triangle. • Students will know how to draw tangent lines to a circle from a point.

Lesson: Radians	• HSG.C.B.5 • Students will know what a radians are and how they are used to measure angles. • Students will be able to convert from degrees to radians. • Students will be able to convert from radians to degrees.
Lesson: Arc Length and Area of a Sector	• HSG.C.B.5 • Students will know the difference between the measure of an arc and arc length. • Students will derive the formula for arc length using a proportion and be able to apply it to find the length of arcs. • Students will derive the formula for sector area using a proportion and be able to apply it to find areas of sectors.
Lesson: Equation of a Circle	• HSG.GPE.A.1 • Students will derive the equation of a circle if given the center and radius, using the Pythagorean theorem. • Students will be able to identify the center and radius of a circle from its equation. • Students will be able to convert a circle equation in general form to standard form by using the technique of completing the square.

Unit: Three Dimensional Solids and Geometric Modeling

Lesson: Area and Volume	• HSG.GMD.A.1 • HSG.GMD.A.3 • Students will review common area formulas. • Students will review the volume formulas for rectangular prisms, cubes, and trianglular prisms. • Students will learn and apply the volume formulas for a cylinder, cone, pyramid, and sphere.
Lesson: Geometric Scaling	• HSG.GMD.A.1 • Students will understand the relationship between length, area, and volume when similarity transformations are applied. • Students will be able to use their knowledge of geometric scaling to solve for length, area, and volume measurements.
Lesson: 2D Cross Sections	• HSG.GMD.B.4 • Students will identify the shapes of two-dimensional cross sections of three-dimensional objects. • Students will identify three-dimensional objects generated by rotations of two-dimensional objects.
Lesson: Modeling with Geometry	• HSG.MG.A.1 • Students will apply their knowledge of geometric objects and algebra to solve modeling problems. • Students will learn to recognize restrictions that arise when using geometry to model situations.

Lesson: Density	• HSG.MG.A.2 • Students will understand what the concept of density is and how to calculate it. • Students will solve problems involving area and volume density.

Unit: Trigonometry

Lesson: Trigonometric Ratios	• HSG.SRT.C.6 • Students will know the trigonometric ratios of sin, cos, tan, csc, sec, and cot on a right triangle.
Lesson: Solving Right Triangles	• HSG.SRT.C.8 • Students will be able to solve for missing side lengths and angle measures on right triangles using trigonometric ratios.
Lesson: Relationship Between Sine and Cosine	• HSG.SRT.C.7 • Students will review what complementary angles are. • Students will understand the relationship between the sine and cosine of the two non-right angles in a right triangle. • Students will be able to use the relationship between sine and cosine of complementary angles to solve mathematical problems.

Lesson: The Pythagorean Identity	• HSG.SRT.B.4 • Students will know the Pythagorean Identity. • Students will derive the Pythagorean Identity. • Students will be able to apply the Pythagorean Identity to solve problems.
Lesson: Law of Sines	• HSG.SRT.D.10 • Students will recognize when the Law of Sines is needed to solve trigonometry problems. • Students will be able to apply the Law of Sines to solve for a missing side length of triangle when given an angle/side pair and a second side length. • Students will be able to determine when a triangle could have two solutions (Ambiguous Case). • Students will be able to find both solution sets when dealing with an ambiguous case problem.
Lesson: Law of Cosines	• HSG.SRT.D.10 • Students will recognize when the Law of Cosines is needed to solve trigonometry problems. • Students will be able to apply the Law of Cosines to solve for a missing side length of triangle when given two sides and the included angle. • Students will be able to apply the Law of Cosines to solve for a missing angle of a triangle when given three side lengths.

Lesson: Area of a Triangle and Application of Trig Laws	• HSG.SRT.D.9 • HSG.SRT.D.11 • Students will know the formula for the area of a triangle when the height is unknown. • Students will understand where the area of a triangle formula when the height is unknown comes from. • Students will be able to use the area of a triangle formula when the height is unknown to solve problems. • Students will be able to combine and apply trig formulas to solve application problems.

ALGEBRA II: SEMESTER 1

Unit: Algebra 1 Review

Lesson: Definition of a Function	● HSF.IF.A.1 ● Students will understand what a function is. ● Students will know how to determine from tables, ordered pairs, graphs, and situations if a relationship represents a function.
Lesson: Function Notation	● HSF.IF.A.2 ● Students will be able to use function notation to evaluate functions for inputs in their domains. ● Students will be able to interpret statements that use function notation in terms of a context.
Lesson: Functional Notation - Addition, Subtraction, Multiplications	● HSF.BF.A.1.B ● Students will be able to combine standard function types using arithmetic operations (addition, subtraction, multiplication, and division).
Lesson: Linear Functions	● HSF.LE.A.1 ○ HSF.LE.A.1.A ○ HSF.LE.A.1.B ● HSF.LE.A.2 ● Students will understand the basic characteristics of linear functions. ● Students will be able to create a linear function to fit data given in the form of a table, graph, or as two coordinate points.

Lesson: Exponential Functions	● HSF.LE.A.1 ○ HSF.LE.A.1.A ○ HSF.LE.A.1.C ● HSF.LE.A.2 ● Students will understand the basic characteristics of exponential functions. ● Students will be able to create an exponential function to fit data given in the form of a table or graph.
Lesson: Graphing Linear and Exponential Functions	HSF.LE.A.1 ● HSF.LE.A.1.B ● HSF.LE.A.1.C ● Students will review and practice concepts learned in earlier grades pertaining to graphing linear functions from tables and equations. ● Students will be able to graph exponential functions from a table of values or the equation.
Lesson: Average Rate of Change	● HSF.IF.B.6 ● Students will understand what the average rate of change means. ● Students will be able to calculate the average rate of change from a table of values. ● Students will be able to calculate (when possible) or estimate the average rate of change from a graph.

Lesson: Domain and Range	• HSF.IF.B.5 • Students will understand the concepts of domain and range. • Students will become fluent in using interval notation to represent domain and range of functions. • Students will be able to identify the domain and range of a graph.
Lesson: Graphing Parent Functions	• HSF.IF.B.4 • HSF.IF.C.7 • Students will understand the basic characteristics of linear, exponential, quadratic, and piecewise-defined functions. • Students will be able to graph the basic function types listed above using tables or from their knowledge of parent functions.
Lesson: Key Features of Graphs	• HSF.IF.B.4 • Students will be able to identify key features of a function from a graph. These key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative

Lesson: Transformations with Quadratics	● HSF.BF.B.3 ● Students will understand how transformations change the quadratic parent function. ● Students will be able to identify transformations on quadratics from an equation in vertex form. ● Students will be able to identify transformations from quadratic graphs. ● Students will be able to identify transformations from coordinate points.

Unit: Quadratic Functions and Complex Numbers

Lesson: Structure and Notation of Expressions	● HSA.SSE.A.1 ○ HSA.SSE.A.1.A ● HSF.LE.A.1 ● Students will understand how to interpret expressions that represent a quantity in terms of its context. ● Students will understand how to interpret parts of an expression, such as terms, factors, and coefficients. ● Students will be able to distinguish linear, quadratic, and exponential expressions.
Lesson: Factoring When a = 1	● HSA.APR.A.1 ● HSA.SSE.B.3.A ● HSF.IF.C.8 ● Students will review the FOIL method of distribution when multiplying two binomials. ● Students will understand the inverse relationship between distribution and factoring. ● Students will be able to factor quadratics when a = 1.

Lesson: Factoring When a Does Not Equal 1	● HSA.SSE.B.3.A ● HSF.IF.C.8 ● Students will review how to find the greatest common factor (GCF) between a set of numbers. ● Students will know how to factor quadratics when a does not equal 1 using the factoring by grouping method.
Lesson: Completing the Square	● HSF.IF.C.8 ● HSA.SSE.B.3.B ● Students will understand what a perfect square trinomial is. ● Students will be able to use the process of completing the square to convert a quadratic in standard form to vertex form.
Lesson: Solving Quadratics with Real Solutions	● HSA.REI.B.4 ○ HSA.REI.B.4.A ○ HSA.REI.B.4.B ● HSF.IF.C.7.A ● HSF.IF.C.8 ○ HSF.IF.C.8.A ● Students will understand what it means to solve a quadratic equation and the terminology that is associated with those solutions. ● Students will be able to find real number solutions to quadratic equations using graphs, factoring, and completing the square.

Lesson: Introduction to Complex Numbers	● N.CN.A.1 ● Students will learn that complex numbers consist of a real and an imaginary part. ● Students will learn that complex numbers form the largest grouping of numbers. ● Students will be introduced to the number i. ● Students will be able to compute the value of i raised to a power greater than 0.
Lesson: Operations with Complex Numbers	● HSN.CN.A.2 ● Students will be able to add, subtract, and multiply complex numbers. ● Students will be able to simplify sums, differences, and products of complex numbers into a single complex number answer in the form of *a+bi.*
Lesson: Solving Quadratics with Complex Solutions	● HSN.CN.C.7 ● HSA.REI.B.4 ○ HSA.REI.B.4.A ○ HSA.REI.B.4.B ● Students will understand the basic idea of the Fundamental Theorem of Algebra and how it applies to quadratics. ● Students will recognize that some quadratics have complex solutions. ● Students will understand the derivation of the Quadratic Formula from completing the square on the standard form of a quadratic equation. ● Students will be able to use the quadratic formula to solve quadratics; including those with complex solutions.

Lesson: Problem Solving - Creating a Quadratic	● HSA.SSE.A.1 ○ HSA.SSE.A.1.A ● HSA.CED.A.2 ● Students will see connections between real-life situations and modeling with a quadratic equation. ● Students will create quadratic equations to model a real-life situation. ● Students will graph quadratic equations that model real-life situations and interpret the graph in context of the problem.

Unit: Polynomials and Polynomial Functions

Lesson: Add, Subtract, and Multiply Polynomials	● HSA.APR.A.1 ● Students will be able to add and subtract polynomials and write their answers in standard form. ● Students will be able to multiply polynomials and write their answers in standard form.
Lesson: The Remainder Theorem	● HSA.APR.B.2 Students will know, apply, and practice the Remainder Theorem

Lesson: Fundamental Theorem of Algebra	• HSN.CN.C.9 • HSA.SSE.A.2 • Students will solidify their understanding of the complex number system and how classifications of numbers are related. • Students will know that the Fundamental Theorem of Algebra can be used to find the number of roots a polynomial has. • Students will understand the concept of multiplicity of roots and be able to identify the multiplicity of roots in the factored form of a polynomial. • Students will know that imaginary roots always come in conjugate pairs. • Students will develop skills to factor a degree three polynomial and find its roots.
Lesson: End Behavior	• HSF.IF.B.4 • HSF.IF.C.7.C • Students will review how to identify the degree of a polynomial in both standard and factored form. • Students will learn how to identify the leading coefficient of a polynomial in both standard and factored form. • Students will understand what the end behavior of a polynomial refers to. • Students will learn to identify the end behavior of a polynomial based on its degree and leading coefficient only and without the aid of technology.

Lesson: Sketching Polynomials	● HSF.IF.B.4 ● HSF.IF.C.7 ○ HSF.IF.C.7.C ● HSA.APR.B.3 ● Students will review how to find zeros, multiplicity, and end behavior from a polynomial in factored form. ● Students will be able to identify the behavior of a polynomial graph at its zeros when the polynomial is given in factored form. ● Students will be able to sketch a polynomial graph by hand without the help of technology.
Lesson: Sum and Difference of Squares Identities	● HSA.APR.C.4 ● HSN.CN.C.8 ● Students will recognize difference of squares expressions and know how to factor them using an identity. ● Students will recognize sum of squares expressions and know how to factor them using an identity. ● Students will apply their understanding of the sum and difference of squares identities to more complex binomials.
Lesson: Perfect Square Trinomial Identities	● HSA.APR.C.4 ● HSF.IF.C.8.A ● Students will review concepts relating to standard and factored forms of quadratics. ● Students will be able to create perfect square trinomials. ● Students will be able to factor perfect square trinomials using an identity.

Lesson: Cubic Identities	● HSA.APR.C.4 ● Students will know and show proof of the sum and difference of cubes identities. ● Students will learn how to expand binomials being cubed using an identity.
Lesson: Binomial Expansion with Pascal's Triangle	● HSA.APR.C.5 ● Students will understand how Pascal's Triangle is formed. ● Students will be able to reproduce Pascal's Triangle in order to generate the coefficients needed for expanding a binomial raised to a power. ● Students will be able to apply the Binomial Theorem to expand binomials in the form of (x+y)^n.

Unit: Rational Expressions and Functions

Lesson: Key Features of Rationals and Sketching	● HSF.IF.C.7.d ● Students will learn what defines a rational function. ● Students will be able to identify the key features of a rational function (intercepts, points of discontinuity, vertical asymptotes, and horizontal asymptotes) from an equation. ● Students will be able to sketch the graph of a rational function.

Lesson: Rational Expressions and Simplification	• HSA.APR.D.6 • Students will know that rational expression implies division. • Students will be able to divide a polynomial by a monomial. • Students will be able to divide two polynomials using factoring to cancel out common factors. • Students will be able to divide two polynomials using polynomial long division. • Students will be able to divide a polynomial by a degree one binomial using synthetic division.
Lesson: Polynomial Long Division	• HSA.APR.D.6 • Students will review the process of long division. • Students will be able to divide two polynomials using polynomial long division. • Students will be able to divide a polynomial by a degree one binomial using synthetic division.
Lesson: Multiply and Divide Rational Expressions	• HSA.APR.D.7 • Students will review multiplication and division of rational numbers. • Students will be able to multiply and divide rational expressions. • Students will understand the concept of closure in mathematics and know that rational expressions form a closed system under the operations of multiplication and division.

Lesson: Add and Subtract Rational Expressions	● HSA.APR.D.7 ● Students will review addition and subtraction of rational numbers. ● Students will be able to add and subtract rational expressions. ● Students will understand the concept of closure in mathematics and know that rational expressions form a closed system under the operations of addition and subtraction.
Lesson: Solving Rational Equations	● HSA.REI.A.2 ● Students will be able to solve rational equations with 2 or more terms in them. ● Students will review the technique of cross multiplication. ● Students will know what an extraneous solution is and how to identify it.
Lesson: Applying Rational Equations (Combined Work Formula)	● HSA.CED.A.1 ● HSA.REI.A.2 ● Students will know the Combined Work Formula and be able to used it to solve work problems.

Unit: Inverses and Logarithms

Lesson: Review of Exponents Rules	● 8.EE.A.1 ● Students will review and apply exponent rules learned in previous grades in order to be better prepared to understand logarithms.

Lesson: Exponent Rules	• HSF.BF.B.4.a • HSF.BF.B.4.d • Students will understand what an inverse function is. • Students will be able to find the inverse of a given function. • Students will be able to use the horizontal line test to determine if a function has an inverse. • Students will recognize why some functions need a restricted domain in order to have an inverse function.
Lesson: Inverse Functions	• HSF.BF.B.5 • Students will understand the inverse relationship between exponentials and logarithms.
Lesson: Introduction to Logarithms	• HSF.BF.B.5 • Students will understand the inverse relationship between exponentials and logarithms.
Lesson: Logarithm Rules	• HSF.BF.B.5 • Students will know and be able to apply the product rule of logarithms. • Students will know and be able to apply the quotient rule of logarithms. • Students will know and be able to apply the power rule of logarithms. • Students will be able to apply the change of base formula to logarithms in order of evaluate them using technology.

Lesson: Graphing Logarithms	• HSF.IF.C.7.e • Students will understand how to algebraically find the domain of a logarithmic function. • Students will be able to sketch a graph of a logarithmic function with the aid of technology.
Lesson: Logarithmic and Exponential Inverses	• HSF.BF.B.4.a • Students will be able to find the inverse of a logarithmic function. • Students will be able to find the inverse of an exponential function.
Lesson: Solving Logarithmic and Exponential Equations	• HSF.BF.B.5 • Students will be able to solve logarithmic equations. • Students will be able to solve exponential equations.

ALGEBRA II: SEMESTER 2

Unit: Solving and Graphing Equations

Lesson: Solving Radical Equations	• HSA.REI.A.2 • Students will review how to convert radical expressions to expressions with rational exponents. • Students will be able to solve radical equations. • Students will be able to solve equations with rational exponents in them. • Students will understand what an extraneous solution is and be able to identify them when solving equations
Lesson: Solve for a Specified Variable	• HSA.CED.A.4 • Students will be able to use their algebra skills to solve for a specified variable in a given equation. Emphasis will be placed on quadratic, rational, and radical equations.
Lesson: Creating and Solving Equations in One Variable	• HSA.CED.A.1 • Students will be able to create and solve equations from problems with context (story problems).
Lesson: Solving One-Variable Inequalities	• HSA.CED.A.1 • Students will be able to solve non-linear inequalities by hand using a sign array.

Lesson: Parent Functions Review	• HSF.IF.B.4 • HSF.BF.B.3 • Students will be able to determine if a function is odd, even, or neither based on the graph of the function. • Students will review the graph and key features of the parent functions they have learned thus far in math.
Lesson: Function Notation and Transformations	• HSF.BF.B.3 • Students will be able to identify the effect on the graph of a parent function by replacing $f(x)$ with $-f(x)$, $k\,f(x)$, $f(x) + k$, and $f(x + k)$ for specific values of k (both positive and negative) • Students will be able to write a function from a written description of transformations applied to a given parent function. • Students will be able to find write a function from the transformed graph of a given parent function.

Lesson: Average Rate of Change	• HSF.IF.B.6 • Students will understand what the average rate of change means. • Students will be able to calculate the average rate of change from a table of values. • Students will be able to calculate (when possible) or estimate the average rate of change from a graph. • Students will be able to calculate the average rate of change from an equation.
Lesson: Graphing Piecewise-Defined Functions	• HSF.IF.C.7.b • Students will be able to graph piecewise-defined functions.

Unit: Systems of Equations

Lesson: Solutions of Systems	• HSA.REI.C.6 • HSA.REI.D.11 • Students will understand what a system of equations is and the notation associated with them. • Students will learn how to check if coordinate points are solutions to a system of equations or not.

Lesson: Solve Systems of Equations by Graphing	• HSA.REI.C.6 • HSA.REI.D.10 • HSA.REI.D.11 • Students will understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). • Students will review how to solve linear systems of equations graphically. • Students will learn to solve non-linear systems of equations graphically. • Students will learn to solve non-linear systems of equations using a graphing calculator.
Lesson: Solving Systems of Equations with Algebra	• HSA.REI.C.6 • Students will be able to solve non-linear systems of equations using their Algebra skills. • Students will recognize when systems of non-linear equations have no solutions or infinitely many solutions.
Lesson: Solving Systems of Inequalities by Graphing	• HSA.REI.D.12 • Students will review the concepts and skills needed to solve systems of linear inequalities graphically. • Students will apply their knowledge of solving systems of linear inequalities to solving systems of non-linear inequalities.

Lesson: Applications of Systems of Inequalities	• HSA.CED.A.3 • HSA.REI.D.12 • Students will be able to graph systems inequalities in two variables and interpret their solutions in context of the problem given.

Unit: Functions Patterns, Sequences, and Series

Lesson: Introduction and Vocabulary	Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
Lesson: Identifying Linear and Exponential Functions from Tables	• Students will identify linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
Lesson: Identifying Quadratic Functions from Tables	• For a function that models a relationship between two quantities, students will interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. • Students will distinguish linear, exponential, and quadratic relationships based on equations, tables, and verbal descriptions.

Lesson: Arithmetic Explicit Rule	• Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
Lesson: Geometric Explicit Rule	• Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
Lesson: Arithmetic Recursive Rule	Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
Lesson: Geometric Recursive Rule	• Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
Lesson: Sum of a Geometric Series	• Students will understand the formula for the sum of a geometric series, and use the formula to solve problems. a. Derive the formula for the sum of an arithmetic series. b. Derive the formula for the sum of a geometric series, and use the formula to solve problems. Extend to infinite geometric series. For example, calculate mortgage payments.
Lesson: Writing Equations from Tables	• Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

Unit: Trigonometric Functions

Lesson: Trigonometric Ratios	● Students will find the point on a directed line segment between two given points that partitions the segment in a given ratio.
Lesson: Solving Right Triangles	● Students will use trigonometric ratios and the Pythagorean theorem to solve right triangles in applied problems.
Lesson: Introduction to Trigonometric Graphs	Students will be able to define the following: ○ Period – How long it takes for the function to make one full cycle ○ Midline – The center line in which a periodic function oscillates. ○ Amplitude – The distance from the midline to the local maximu local minimum ○ Frequency –The number of cycles within a given interval. ○ Transformation – The manipulation of a shape, point, graph, etc. 10.3.2 – Students will be able to define and plot the trigonometric functions (sine, cosine and tangent, and their inverses).
Lesson: Transformations with Trigonometric Graphs	● Students will learn and explore transformations and trigonometric graphs.
Lesson: Modeling with Trigonometric Functions	● Students will learn to model with trigonometric functions.

Unit: Statistical Analysis

Lesson: Methods of Collecting Data	• Students will recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
Lesson: Random Sampling	• Students will understand that statistics allows inferences to be made about population parameters based on a random sample from that population.
Lesson: Using Normal Distributions	• Students will use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. • Students will recognize that there are data sets for which such a procedure is not appropriate. • Students will use calculators, spreadsheets, and tables to estimate areas under the normal curve.
Lesson: Population Means and Margin of Error	• Students will explore Population Means and Margin of Error.
Lesson: Population Proportions and Margin of Error	• Students will learn about population proportions and margin of error.
Lesson: Evaluating Reports Based on Data	• Students will evaluate reports based on data.

SECONDARY MATH I: SEMESTER 1

Unit: Reviewing Algebra

Lesson: Structure and Notation of Expressions	● Students will understand how to interpret expressions that represent a quantity in terms of its context. ● Students will understand how to interpret parts of an expression, such as terms, factors, and coefficients. ● Students will understand how to interpret complicated expressions by viewing one or more of their parts as a single entity.
Lesson: Reasoning, units, and Problem Solving	● Students will use units as a way to understand problems and to guide the solution of multi-step problems, choose and interpret units consistently in formulas, and choose and interpret the scale and origin in graphs and data displays. ● Students will define appropriate quantities for the purpose of descriptive modeling. ● ● Students will choose a level of accuracy to limitations on measurements when reporting quantities.
Lesson: Review Properties of Algebra	Students will review algebraic properties.
Lesson: Solving One-Step Equations	● Students will practice and learn how to solve one-step algebraic problems.

Lesson: Solving Multi-Step Equations	• Students will rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
Lesson: Introduction to Inequalities	• Students will create equations and inequalities in one variable and use them to solve problems including equations arising from linear and exponential functions. • Students will create equations in two or more variables to represent relationships between quantities. • Students will graph equations on coordinate axes with labels and scales.

Unit: Sequences

Lesson: Introduction and Vocabulary	Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
Lesson: Arithmetic Recursive Rule	Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
Lesson: Geometric Recursive Rule	• Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
Lesson: Arithmetic Explicit Rule	• Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

Lesson: Geometric Explicit Rule	• Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
Lesson: Writing Equations from Tables	• Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
Lesson: Writing Equations from Patterns	• Students will write a function that describes a relationship between two quantities. • Students will determine an explicit expression, a recursive process, or steps for calculation from a context. • Students will combine standard function types using arithmetic operations. • Students will write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

Unit: Introduction of Functions

Lesson: Definition of a Function	• Students will understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y=f(x).
Lesson: Functions and Function Notation	• Students will use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
Lesson: Domain and Range	• Students will relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
Lesson: Key Features of Graphs	• Students will, for a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities. • Students will sketch graphs showing key features, given a verbal description of the relationship. • Students will understand key features including intercepts and intervals where the function is increasing, decreasing, positive, or negative.

Lesson: Identifying Functions from Tables	• Students will identify linear and exponential functions, including arithmetic and geometric sequences, when given a graph, a description of a relationship, or two input-output pairs, including those requiring students to read them from a table.

Unit: Creating Functions

Lesson: Which Increases Faster?	• Students will learn how to distinguish between situations that can be modeled with linear functions and with exponential functions. • Students will prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. • Students will learn to recognize situations in which one quantity changes at a constant rate per unit interval relative to another. • Students will learn to recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. • Students will use graphs and tables to observe that a quantity increasing exponentially eventually exceeds a quantity increasing linearly.

Lesson: Constructing Functions from Tables	• Students will identify linear and exponential functions, including arithmetic and geometric sequences, when given a graph, a description of a relationship, or two input-output pairs, including those requiring students to read them from a table.
Lesson: Constructing Functions from Graphs	• Students will identify linear and exponential functions, including arithmetic and geometric sequences, when given a graph, a description of a relationship, or two input-output pairs, including those requiring students to read them from a table.

Lesson: Graphing Linear and Exponential Equations	● Students will create equations in two or more variables to represent relationships between quantities, and graph equations on coordinate axes with labels and scales. ● Students will represent constraints by equations or inequalities, and by systems of equations and/or inequalities. ● Students will interpret solutions as viable or non-viable options in a modeling context. ● Students will understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve, which could be a line. ● Students will graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ● Students will learn how to distinguish between situations that can be modeled with linear functions and with exponential functions. ● Students will prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. ● Students will learn how to recognize situations in which one quantity changes at a constant rate per unit interval relative to another. ● Students will learn how to recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

Lesson: Adding and Subtracting Functions	• Students will write a function that describes a relationship between two quantities. • Students will determine an explicit expression, a recursive process, or steps for calculation from a context. • Students will combine standard function types using arithmetic operations.
Lesson: Multiplying Functions	• Students will write a function that describes a relationship between two quantities. • Students will determine an explicit expression, a recursive process, or steps for calculation from a context. • Students will combine standard function types using arithmetic operations.
Lesson: Vertical Transformations	• Students will identify the effect on the graph of replacing f(x) with F(x)+k for specific values of k (both positive and negative). Students will then find the value of k given the graphs. • Students will use technology to experiment with cases and illustrate an explanation of the effects on the graph.
Lesson: Comparing Linear Equations	• Students will compare properties of two functions each represented in a different way, whether algebraically, graphically, numerically, in tables, or by verbal descriptions.

SECONDARY MATH I: SEMESTER 2

Unit: Problem Solving - Linear and Exponential

Lesson: Validating Steps	• Students will explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. • Students will learn how to construct a viable argument to justify a solution method.
Lesson: Linear Inequalities with Two Variables	• Students will create equations in two or more variables to represent relationships between quantities and graph equations on coordinate axes with labels and scales. • Students will represent constraints by equations or inequalities, and by systems of equations and/or inequalities. • Students will interpret solutions as viable or non-viable options in a modeling context. • Students will solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Lesson: Graphing Linear Inequalities	• Students will solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Lesson: Solving Compound Inequalities	• Students will understand what compound inequalities are and learn how to solve them. • Students will understand what an absolute value inequality is and means.

Lesson: Average Rate of Change	• Students will calculate and interpret the average rate of change of a function, presented symbolically or as a table, over a specified interval. • Students will estimate the rate of change from a graph.

Unit: Introduction to Geometry

Lesson: Review Lines, Triangles, and Area	• Students will review past critical topics such as lines, triangles, and area.
Lesson: Geometry Definitions	Students will learn precise definitions of angle, circle, perpendicular line, parallel line, and line segment, basing these definitions on the undefined notions of point, line, distance along a line, and distance around a circular arc.
Lesson: Distance Formula	Students will use coordinates to compute perimeters of polygons and areas of triangles and rectangles, using the distance formula.
Lesson: Parallel and Perpendicular Lines	Students will prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.
Lesson: Geometric Theorems and Introduction to Proofs	Students will use coordinates to prove simple geometric theorems algebraically. For example, students will prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle.

Lesson: Polygon Symmetry	• Given a rectangle, parallelogram, trapezoid, or regular polygon, students will describe the rotations and reflections that carry it onto itself. • • Students will construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Unit: Geometric Transformations and Congruence

Lesson: Transformations - Translations	• Students will learn to represent transformations in the plane using transparencies and geometry software. • Students will describe transformations as functions that take points in the plane as inputs and give other points as outputs. • Students will compare transformations that preserve distance and angle to those transformations that do not.
Lesson: Transformations - Reflections	• Students will learn to represent transformations in the plane using transparencies and geometry software. • Students will describe transformations as functions that take points in the plane as inputs and give other points as outputs. • Students will compare transformations that preserve distance and angle to those transformations that do not.

Lesson: Transformations - Rotations	• Students will learn to represent transformations in the plane using transparencies and geometry software. • Students will describe transformations as functions that take points in the plane as inputs and give other points as outputs. • Students will compare transformations that preserve distance and angle to those transformations that do not.
Lesson: Transformations Practice	Students will develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
Lesson: Practice Transformations	• Students will draw the transformed figure using graph paper, tracing paper, or geometry software, when given a geometric figure and a rotation, reflection, or translation. • • Students will specify a sequence of transformations to carry a given figure onto another.
Lesson: Transforming Coordinate Points and Finding Transformations	• Students will use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure. • Students will, if given two figures, use the definition of congruence in terms of rigid motions to decide whether the two figures are congruent.

Lesson: Triangle Congruence	Students will use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
Lesson: Constructions	● Students will make formal geometric constructions with a variety of tools and methods, including compass and straightedge, string, reflective devices, paper folding, and dynamic geometric software. ● Students will copy and bisect segments and angles. ● Students will construct perpendicular lines, including the perpendicular bisector of a line segment. ● Students will construct a line parallel to a given line through a point not on the line.
Lesson: Constructions Inscribed in a Circle	● Students will learn how to construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Unit: Systems of Equations

Lesson: Solutions of Equations	• Students will create equations in two or more variables to represent relationships between quantities • Students will graph equations on coordinate axes with labels and scales. • Students will represent constraints by equations or inequalities, and by systems of equations and/or inequalities. • Students will interpret solutions as viable or non-viable options in a modeling context. • Students will understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve, which could be a line. • Students will learn to graph functions expressed symbolically. • Students will show key features of the graph, working by hand in simple cases and using technology for more complicated cases.

Lesson: Review Graphing a Line	• Students will distinguish between situations that can be modeled with linear functions and with exponential functions. • Students will prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. • Students will recognize situations in which one quantity changes at a constant rate per unit interval relative to another. • Students will recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

Lesson: Solutions of Systems	• Students will prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. • Students will understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve, which could be a line. • Students will be able to explain why the x-coordinates of the points where the graphs of the equations y=f(x) and y=g(x)intersect are the solutions of the equation f(x)=g(x); students will then find the solutions approximately. • Students will learn to solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Lesson: Solve by Graphing	• Students will understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve, which could be a line. • Students will explain why the x-coordinates of the points where the graphs of the equations y=f(x) and y=g(x)intersect are the solutions of the equation f(x)=g(x). Students will find the solutions approximately. • Students will graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary in the case of a strict inequality, and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. • Students will learn to solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. • Students will prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. • Students will solve systems of linear equations exactly and approximately (using graphs, for example), and focusing on pairs of linear equations in two variables.

Lesson: Solving Systems of Inequalities by Graphing	• Students will understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve, which could be a line. • Students will explain why the x-coordinates of the points where the graphs of the equations y=g(x)intersect are the solutions of the equation f(x)=g(x). Students will find the solutions approximately. • Students will graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary in the case of a strict inequality, and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. • Students will learn to solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. • Students will prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. • Students will solve systems of linear equations exactly and approximately (using graphs, for example), and focusing on pairs of linear equations in two variables.

Lesson: Solving by Substitution	• Students will learn to solve systems of linear equations exactly and approximately, including using graphs, and focusing on pairs of linear equations in two variables. • Students will prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. • Students will understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve, which could be a line. • Students will learn to explain why the x-coordinates of the points where the graphs of the equations y=g(x)intersect are the solutions of the equation f(x)=g(x). Students will find the solutions approximately. • Students will learn to solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Lesson: Solving by Elimination	• Students will learn to solve systems of linear equations exactly and approximately, including with graphs, and will focus on pairs of linear equations in two variables.

Unit: Statistics

Lesson: Dot Plots, Histograms, and Box Plots	Students will learn to represent data with plots, including dot plots, histograms, and box plots, on the real number line.
Lesson: Measures of Center and Spread	• Students will use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. • Students will learn to interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of outliers, meaning extreme data points.
Lesson: Weighted Average	• Students will be able to calculate the weighted average of a distribution and interpret it as a measure of center.

Lesson: Scatter Plots	• Students will represent data on two quantitative variables on a scatter plot, and describe how the variables are related. • Students will learn how to fit a function to the data. • Students will use functions fitted to data to solve problems in the context of the data, and will use given functions or choose a function suggested by the context. • Students will emphasize linear and exponential models. • Students will informally assess the fit of a function by plotting and analyzing residuals. • Students will learn how to fit a linear function for scatter plots that suggests a linear association. • Students will learn how to interpret the slope, meaning the rate of change, and the intercept (the constant term) of a linear model in the context of the data.
Lesson: Correlation Coefficient	• Students will compute, using technology, the correlation coefficient of a linear fit, and then interpret it.
Lesson: Correlation versus Causation	Students will learn how to distinguish between correlation and causation.

SECONDARY MATH II: SEMESTER 1

Unit: Introduction to Quadratics

Lesson: Review Linear and Exponential	• Students will create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. • Students will represent constraints by equations or inequalities, and by systems of equations and/or inequalities. Students will interpret solutions as viable or non-viable options in a modeling context. • Students will understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). • Students will graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. • Students will learn how to distinguish between situations that can be modeled with linear functions and with exponential functions. Students will prove that linear functions grow by equal differences over equal intervals; exponential functions grow by equal factors over equal intervals. Students will learn how to recognize situations in which one quantity changes at a constant rate per unit interval relative to another. Students will learn how to recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. • Students will interpret the parameters in a linear or

Lesson: Introduction to Quadratics and Key Features	• For a function that models a relationship between two quantities, students will interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. (Key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.)
Lesson: Identifying Functions from Tables	• For a function that models a relationship between two quantities, students will interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. • Students will distinguish linear, exponential, and quadratic relationships based on equations, tables, and verbal descriptions.
Lesson: Domain and Range	• Students will relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. (For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.)

Lesson: Average Rate of Change	• Students will calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Students will estimate the rate of change from a graph.
Lesson: Graphing Quadratics, Absolute Values, and Piecewise-Defined Functions	• Students will create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. • Students will understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). • Students will graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Specifically, students will graph linear and quadratic functions and show intercepts, maxima, and minima. Students will also graph piecewise-defined functions, including step functions and absolute value functions.

Unit: Quadratics Function and Modeling

Lesson: Factoring When a = 1	• Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. Students will use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. Students will use the properties of exponents to interpret expressions for exponential functions.
Lesson: Factoring When a does not equal 1	• Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. Students will use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. Students will use the properties of exponents to interpret expressions for exponential functions.

Lesson: Perfect Squares and Perfect Square Trinomials	Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. Students will use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph and interpret these in terms of a context. Students will use the properties of exponents to interpret expressions for exponential functions.
Lesson: Completing the Square	Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. Students will use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph and interpret these in terms of a context. Students will use the properties of exponents to interpret expressions for exponential functions.
Lesson: Comparing Quadratic Equations	• Students will compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). (For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.)

Lesson: Writing Equations from Patterns	• Students will write a function that describes a relationship between two quantities. Students will determine an explicit expression, a recursive process, or steps for calculation from a context. Students will combine standard function types using arithmetic operations. (For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential and relate these functions to the model.) • Students will distinguish linear, exponential, and quadratic relationships based on equations, tables, and verbal descriptions.
Lesson: Transformations	• Students will be able to identify the effect on the graph of replacing *f*(x) by f(x)+k, k f(x), f(kx), and f(x+k) for specific values of k (both positive and negative); find the value of k given the graphs.

Lesson: Symmetry: Even and Odd Functions	• Students will be able to recognize even and odd functions from their graphs and algebraic expressions. • Students will identify the effect on the graph of replacing f(x) by *f*(x) by f(x)+k, k f(x), f(kx), and f(x+k)for specific values of k (both positive and negative); find the value of k given the graphs. Students will experiment with cases and illustrate an explanation of the effects on the graph using technology.
Lesson: Find Inverse Functions	• Students will be able to find inverse functions. Students will learn to solve an equation of the form f(x)=c for a simple function that has an inverse and write an expression for the inverse. For example, f(x)=2x^3 or f(x)=(x+1)/(x-1) for x not equal to 1.
Lesson: Which Increases Faster?	• Students will use graphs and tables to observe that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

Unit: Quadratic Equations

Lesson: Structure and Notation of Expressions	• Students will understand how to interpret expressions that represent a quantity in terms of its context. • Students will understand how to interpret parts of an expression, such as terms, factors, and coefficients. • Students will understand how to interpret complicated expressions by viewing one or more of their parts as a single entity.
Lesson: Identify Ways to Rewrite Expressions (Difference of Squares)	• Students will use the structure of an expression to identify ways to rewrite it (recognizing difference of squares). • Students will understand how to interpret parts of an expression, such as terms, factors, and coefficients.
Lesson: Introduction to Inequalities	• Students will create equations and inequalities in one variable and use them to solve problems, including equations arising from linear, quadratic, and exponential functions. • Students will create equations in two or more variables to represent relationships between quantities and graph equations on coordinate axes with labels and scales.
Lesson: Compound Inequalities	• Students will learn how to create equations and inequalities in one variable and use them to solve problems. • Students will learn how to solve compound inequalities.

Lesson: Problem Solving - Creating a Quadratic	• Students will learn how to create equations in two or more variables to represent relationships between quantities. • Students will graph equations on coordinate axes with labels and scales.
Lesson: Solving Multi-Step Equations and Isolating Variables	• Students will rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
Lesson: Introduction to Solving Quadratic Equations	• Students will learn how to solve quadratic equations in one variable. Students will learn how to use the method of completing the square to transform any quadratic equation in x into an equation of the form (x-p)^2 that has the same solutions. Students will learn how to derive the quadratic formula from this form. Students will learn how to solve quadratic equations by inspection (e.g., for x^2=49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Students will recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.

Lesson: Solve by Factoring	• Students will choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Students will factor a quadratic expression to reveal the zeros of the function it defines. Students will complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. Students will use properties of exponents to transform expressions for exponential functions. • Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. Students will use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. Students will use the properties of exponents to interpret expressions for exponential functions. • Students will learn how to solve quadratic equations in one variable. Students will learn how to use the method of completing the square to transform any quadratic equation in x into an equation of the form (x-p)^2 that has the same solutions. Students will learn how to derive the quadratic formula from this form. Students will learn how to solve quadratic equations by inspection (e.g., for x^2=49),

Lesson: Solve by Completing the Square	• Students will choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Students will factor a quadratic expression to reveal the zeros of the function it defines. Students will complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. Students will use properties of exponents to transform expressions for exponential functions. • Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. Students will use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. Students will use the properties of exponents to interpret expressions for exponential functions. • Students will learn how to solve quadratic equations in one variable. Students will learn how to use the method of completing the square to transform any quadratic equation in x into an equation of the form (x-p)^2 that has the same solutions. Students will learn how to derive the quadratic formula from this form. Students will learn how to solve quadratic equations by inspection (e.g., for x^2=49),

Lesson: Solving by the Quadratic Formula	• Students will learn how to solve quadratic equations in one variable. Students will learn how to use the method of completing the square to transform any quadratic equation in x into an equation of the form (x-p)^2 that has the same solutions. Students will learn how to derive the quadratic formula from this form. Students will learn how to solve quadratic equations by inspection (e.g., for x^2=49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Students will recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.
Lesson: Simplifying and Combining Radicals	• Students will focus on simplifying and combining radicals.

Unit: Extending Quadratics

Lesson: Introduction to Complex Numbers	• Students will know there is a complex number i such that i^2=-1, and every complex number has the form a+bi with a and b real.
Lesson; Operations with Complex Numbers	• Students will learn how to use the relation i^2=-1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
Lesson: Solving Quadratics with Complex Solutions	• Students will learn how to solve quadratic equations in one variable. Students will learn how to use the method of completing the square to transform any quadratic equation in x into an equation of the form (x-p)^2=q that has the same solutions. Derive the quadratic formula from this form. Students will learn how to solve quadratic equations by inspection (e.g., for x^2=49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Students will recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b. • Students will learn how to solve quadratic equations with real coefficients that have complex solutions.

Lesson: Extending Polynomial Identities to the Complex Numbers	• Students will use the structure of an expression to identify ways to rewrite it (recognizing difference of squares). • Students will understand how to interpret parts of an expression, such as terms, factors, and coefficients. • Students will extend polynomial identities to the complex numbers.
Lesson: Fundamental Theorem of Algebra	• Students will know the Fundamental Theorem of Algebra and show that it is true for quadratic polynomials.
Lesson: Solutions to Systems of Equations	• Students will know the Fundamental Theorem of Algebra and show that it is true for quadratic polynomials.
Lesson: Solving Systems of Equations	• Students will be able to explain why the x-coordinates of the points where the graphs of the equations y=f(x) and y=g(x)intersect are the solutions of the equation f(x)=g(x); find the solutions approximately. • Students will be able to solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

SECONDARY MATH II: SEMESTER 2

Unit: Extending the Number System

Lesson: Review of Exponents Rules	• Students will review the rules of exponents and practice utilizing them.
Lesson: Radicals and Exponents	• Students will explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
Lesson: Operations with Radicals	• Students will learn how to rewrite expressions involving radicals and rational exponents using the properties of exponents.
Lesson: Introduction to Radicals	• Students will learn how to rewrite expressions involving radicals and rational exponents using the properties of exponents.
Lesson: Multiplying Radicals	• Students will learn how to explain why sums and products of rational numbers are rational, why the sum of a rational number and an irrational number is irrational, and why the product of a nonzero rational number and an irrational number is irrational.

Lesson: More Operations with Radicals	Students will choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Students will learn how to factor a quadratic expression to reveal the zeros of the function it defines. Students will learn how to complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. Students will use the properties of exponents to transform expressions for exponential functions.
Lesson: Radicals and Exponents Review	Students will choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Students will learn how to factor a quadratic expression to reveal the zeros of the function it defines. Students will learn how to complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. Students will use the properties of exponents to transform expressions for exponential functions.
Lesson: Add, Subtract, and Multiply Polynomials	• Students will learn how to explain why sums and products of rational numbers are rational, why the sum of a rational number and an irrational number is irrational, and why the product of a nonzero rational number and an irrational number is irrational.

Unit: Similarity

Lesson: Ratios of Line Segments	• Students will find the point on a directed line segment between two given points that partitions the segment in a given ratio.
Lesson: Dilations	• Students will verify experimentally the properties of dilations given by a center and a scale factor: a) A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged; b) The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
Lesson: Prove Theorems	• Students will prove theorems about lines and angles. (Theorems include vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly equidistant from the segment's endpoints.)

Lesson: Justifying Similar Figures	• Given two figures, students will use the definition of similarity in terms of similarity transformations to decide if they are similar; students will explain, using similarity transformations, the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. • Students will use properties of similarity transformations to establish the AA criterion for two triangles to be similar.
Lesson: PART 1 - Prove Theorems about Triangles	• Students will prove theorems about triangles. (Theorems include measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.)
Lesson: Prove Theorems about Parallelograms	• Students will prove theorems about parallelograms. (Theorems include opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.)

Lesson: PART 2 - Prove Theorems about Triangles	• Students will prove theorems about triangles. (Theorems include a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean theorem proved using triangle similarity.)
Lesson: Types of Triangles	• Students will use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
Lesson: Review Triangle Congruence	Students will use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

Unit: Trigonometry

Lesson: Trigonometric Ratios	• Students will find the point on a directed line segment between two given points that partitions the segment in a given ratio.
Lesson: Relationship Between Sine and Cosine	• Students will explain and use the relationship between the sine and cosine of complementary angles.
Lesson: Solving Right Triangles	• Students will use trigonometric ratios and the Pythagorean theorem to solve right triangles in applied problems.

Lesson: Proving Trigonometric Identities - Pythagorean Identity	• Students will prove the Pythagorean identity sin^2(0) + cos^2(0)=1 and use it to find sin (0), cos(0), or tan(0), given sin(0), cos(0), or tan(0), and the quadrant of the angle.

Unit: Circles and Conics

Lesson: Circles Review and Proving Circles Are Similar	• Students will prove that all circles are similar.
Lesson: Circle Relationships and Finding Angles and Degrees	• Students will identify and describe relationships among inscribed angles, radii, and chords (including the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.) • Students will construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
Lesson: Constructing Triangles and Tangent Lines with Circles	• Students will construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. • Students will construct a tangent line from a point outside a given circle to the circle.

Lesson: Geometric Theorems and Introduction to Proofs	• Students will use coordinates to prove simple geometric theorems algebraically.
Lesson: Arc Lengths and Area of Sectors	• Students will derive, using similarity, the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; students will derive the formula for the area of a sector.
Lesson: Area, Volume, and Circumference	• Students will give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone (using dissection arguments, Cavalieri's principle, and informal limit arguments). • Students will use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
Lesson: Equation of a Circle	• Students will derive the equation of a circle if given the center and radius, using the Pythagorean theorem; students will complete the square to find the center and radius of a circle given by an equation.

Unit: Probability

Lesson: Probabilities, Subsets, and Complements	• Students will describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). • Students will learn how to create equations and inequalities in one variable and use them to solve problems.
Lesson: Two-Way Frequency Tables and Conditional Probabilities	• Students will construct and interpret two-way frequency tables of data when two categories are associated with each object being classified; students will use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. • Students will summarize categorical data for two categories in two-way frequency tables. Students will learn how to interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Students will learn how to recognize possible associations and trends in the data.
Lesson: Compound Events and Probabilities	• Students will find the conditional probability of A given B as the fraction of Bs outcomes that also belong to A, and interpret the answer in terms of the model.

SECONDARY MATH III: SEMESTER 1

Unit: Data Statistics

Lesson: Using Normal Distributions	● Students will use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. ● Students will recognize that there are data sets for which such a procedure is not appropriate. ● Students will use calculators, spreadsheets, and tables to estimate areas under the normal curve.
Lesson: Random Sampling	● Students will understand that statistics allows inferences to be made about population parameters based on a random sample from that population.
Lesson: Methods of Collecting Data	● Students will recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
Lesson: Population Means and Margin of Error	● Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

Lesson: Population Proportions and Margin of Error	• Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
Lesson; Evaluating Reports Based on Data	• Students will evaluate reports based on data.

Unit: Introduction to Polynomials

Lesson: Identify Ways to Rewrite Expressions (Difference of Squares)	• Students will interpret expressions that represent a quantity in terms of its context. • Students will interpret parts of an expression, such as terms, factors, and coefficients. • Students will interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)^n as the product of P and a factor not depending on P. • Students will use the structure of an expression to identify ways to rewrite it (recognizing difference of squares). • Students will understand how to interpret parts of an expression, such as terms, factors, and coefficients.
Lesson: Extending Polynomial Identities to the Complex Numbers	• Students will extend polynomial identities to the complex numbers. For example, rewrite x^2 + 4 as (x+2i)(x-2i).

Lesson: Fundamental Theorem of Algebra	• Students will know the Fundamental Theorem of Algebra and show that it is true for quadratic polynomials.
Lesson: Structure and Notation of Expressions	• Interpret expressions that represent a quantity in terms of its context. • Students will interpret parts of an expression, such as terms, factors, and coefficients. • Students will interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)^n as the product of P and a factor not depending on P.
Lesson: Sum of a Geometric Series	• Students will understand the formula for the sum of a geometric series, and use the formula to solve problems. • Students will derive the formula for the sum of an arithmetic series. • Students will derive the formula for the sum of a geometric series, and use the formula to solve problems. • Students will extend to infinite geometric series. For example, calculate mortgage payments
Lesson: Add, Subtract, and Multiply Polynomials	• Students will understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

Unit: Polynomial Relationships

Lesson: The Remainder Theorem	• Students will know and apply the Remainder Theorem: For a polynomial (x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).
Lesson: End Behavior	• Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. • Students will graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. • Students will, for a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
Lesson: Sketching Polynomials	• Students will identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Lesson: Proving Polynomial Identities	• Students will prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity (x^2 + y^2)^2 = (x^2 – y^2)^2 + (2xy)^2 can be used to generate Pythagorean triples.
Lesson: Binomial Expansion with Pascal's Triangle	Students will know and apply the Binomial Theorem for the expansion of (x+y)^n in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.

Unit: Rational and Radical Relationships

Lesson: Rational Expressions and Polynomial Division	• Students will rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.
Lesson: Operations with Rational Expressions	• Students will understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions

Lesson: Solving Rational Equations	• Students will solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
Lesson; Solving Radical Equations	• Students will solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
Lesson: Simultaneous Equations	• Students will explain why the x-coordinates of the points where the graphs of the equations y=f(x) and y=g(x) intersect are the solutions of the equation f(x)=g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Including cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

Unit: Trigonometry

Lesson: Area of a Triangle	• Students will derive the formula A = ½ ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
Lesson: Law of Sines	• Students will prove the Laws of Sines and Cosines and use them to solve problems.

Lesson: Law of Cosines	• Students will prove the Laws of Sines and Cosines and use them to solve problems.
Lesson: Application of Area, Sine Law, and Cosine Law	• Students will understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).
Lesson: Degrees, Radians, and the Unit Circle	• Students will understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. • Students will explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
Lesson: Special Right Triangles in the Unit Circle	• Students will use special triangles to determine geometrically the values of sine, cosine, tangent for pi/3, pi/4 and pi/6, and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number.
Lesson: Modeling with Trigonometric Functions	• Students will choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

SECONDARY MATH III: SEMESTER 2

Unit: Mathematical Modeling 1

Lesson: Construction Equations	Students will create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
Lesson: Problem Solving - Creating a Quadratic	Students will create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
Lesson: Realistic Domains and Ranges Based on Models	● Students will represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
Lesson: Domain Restrictions	● Students will represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

Unit: Mathematical Modeling 2

Lesson: Solving Multi-Step Equations and Isolating Variables	• Students will rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.
Lesson: Key Features of Rationals and Sketching	• Students will, for a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. • Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
Lesson: Domain and Range	• Students will relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

Lesson: Average Rate of Change	• Students will calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Unit: Mathematical Modeling 3

Lesson: Review and New-Graphing Functions	• Students will graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. • Students will graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. • Students will graph rational functions, identifying zeros, asymptotes, and point discontinuities when suitable factorizations are available, and showing end behavior. • Students will graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

Lesson: Introduction to Trigonometric Graphs	• Students will graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. • Students will graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. • Students will graph rational functions, identifying zeros, asymptotes, and point discontinuities when suitable factorizations are available, and showing end behavior. • Students will graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

Lesson: Transformations with Trigonometric Graphs	• Students will graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. • Students will graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. • Students will graph rational functions, identifying zeros, asymptotes, and point discontinuities when suitable factorizations are available, and showing end behavior. • Students will graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. • Students will identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x+k) for specific values of k (both positive and negative); find the value of k given the graphs. • Students will experiment with cases and illustrate an explanation of the effects on the graph using technology. Including recognizing even and odd functions from their graphs and algebraic expressions for them.

Lesson: Comparing Equations	• Students will compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

Unit: Modeling with Functions

Lesson: Compound Interest	• Students will write a function that describes a relationship between two quantities. • Students will combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.
Lesson: Review Transformations	• Students will identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x+k) for specific values of k (both positive and negative); find the value of k given the graphs. • Students will experiment with cases and illustrate an explanation of the effects on the graph using technology. Including recognizing even and odd functions from their graphs and algebraic expressions for them.

Lesson: Even and odd Functions (Symmetry)	• Students will identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x+k) for specific values of k (both positive and negative); find the value of k given the graphs. • Students will experiment with cases and illustrate an explanation of the effects on the graph using technology. Including recognizing even and odd functions from their graphs and algebraic expressions for them
Lesson: Composite Functions	• Students will be able to understand and learn how to compose one function with another.
Lesson: Which Increases Faster	• Students will observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

Unit: Modeling with Logs and Geometry

Lesson: Laws of Logarithms	• Students will, for exponential models, express as a logarithm the solution to a b^ct=d where a, c, and d are numbers and the base b is 2, 10 or e; evaluate the logarithm using technology. • Students will interpret the parameters in a linear, quadratic, or exponential function in terms of a context.
Lesson: Solving Logs	• Students will, for exponential models, express as a logarithm the solution to a b^ct=d where a, c, and d are numbers and the base b is 2, 10 or e; evaluate the logarithm using technology. • Students will interpret the parameters in a linear, quadratic, or exponential function in terms of a context.
Lesson: Find Inverse Functions	• Students will learn to find inverse functions. • Students will solve an equation of the form f(x)=c for a simple function f that has an inverse and write an expression for the inverse.
Lesson: 2D and 3D Shapes	• Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Lesson: Modeling with Geometry	• Students will use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). • Students will apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). • Students will apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

PRE-CALCULUS: SEMESTER 1

Unit: Vectors

Lesson: Introduction to Vectors	• Students will recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v). • Students will find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.

Lesson: Adding and Subtracting Vectors	● Students will add and subtract vectors. ○ a. Add vectors end to end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes. ○ b. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum. ○ c. Understand vector subtraction v – w as v + (–w), where –w is the additive inverse of w, with the same magnitude as w and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise. ● Students will solve problems involving velocity and other quantities that can be represented by vectors.

Lesson: Multiplying Vectors	● Students will multiply a vector by a scalar. ○ a. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as c(vx , vy) = (cvx, cvy). ○ b. Compute the magnitude of a scalar multiple cv using ||cv|| = |c|v. Compute the direction. ● Students will understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties. ● Students will multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector; work with matrices as transformations of vectors.
Lesson: Parametric Curves	● Students will solve problems involving velocity and other quantities that can be represented by vectors.

Unit: Matrices

Lesson: Introduction to Matrices	● Students will use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.

Lesson: Multiplying Matrices	• Students will multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.
Lesson: Vectors and Matrices: Determinants and Area	• Students will work with 2 × 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.
Lesson: Special Matrices	• Students will understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
Lesson: Systems of Equations with Matrices	• Students will solve systems of linear equations up to three variables using matrix row reduction. • Students will represent a system of linear equations as a single matrix equation in a vector variable. • Students will find the inverse of a matrix, if it exists, and use it to solve systems of linear equations • (using technology for matrices of dimension 3 x 3 or greater).

Unit: Complex Number System

Lesson: Conjugates of Complex Numbers: Quotients and Moduli	• Students will find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.
Lesson: Geometric Representations of Complex Numbers: The Complex Plane	• Students will represent complex numbers on the complex plane in rectangular form and polar form (including real and imaginary numbers), and explain why the rectangular form of a given complex number represents the same number.
Lesson: Algebraic Operations of Complex Numbers: On the Complex Plane	Students will represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation.
Lesson: Distance Between Complex Numbers and Segment Midpoint: On the Complex Plane	• Students will calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.
Lesson: Powers and Roots of Complex Numbers: De Moivre's Theorem	• Students will multiply complex numbers in polar form and use DeMoivre's Theorem to find roots of complex numbers.

PRE-CALCULUS: SEMESTER 2

Unit: Review and Series

Lesson: Review and New - Graphing Functions	• Students will graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. • Students will graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. • Students will graph rational functions, identifying zeros, asymptotes, and point discontinuities when suitable factorizations are available, and showing end behavior. • Students will graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
Lesson: Introduction to Series	• Students will represent series algebraically, graphically, and numerically. • Students will use sigma notation to represent the sum of a finite arithmetic or geometric series.
Lesson: Sum of a Finite Arithmetic Series	• Students will use sigma notation to represent the sum of a finite arithmetic or geometric series.

Lesson: Sum of a Geometric Series	• Students will understand the formula for the sum of a geometric series, and use the formula to solve problems. • Students will derive the formula for the sum of an arithmetic series. • Students will derive the formula for the sum of a geometric series, and use the formula to solve problems. • Students will extend to infinite geometric series. For example, calculate mortgage payments

Unit: Interpreting and Building Functions

Lesson; Periodicity of Trigonometric Functions	• Students will use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
Lesson: Inverses of Trigonometric Functions	• Students will understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. • Students will use the inverse functions to solve trigonometric equations that arise in the modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.
Lessons: Sum and Difference Identities: Sine, Cosine, Tangent	• Students will prove the addition and subtraction formulas for sine, cosine, and tangent, and use them to solve problems.

Lesson: Composite Functions	• Students will write a function that describes a relationship between two quantities. • Students will compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.
Lesson; Inverse Functions	• Students will find inverse functions. • Students will verify by composition that one function is the inverse of another. • Students will read values of an inverse function from a graph or a table, given that the function has an inverse. • Students will produce an invertible function from a non-invertible function by restricting the domain.
Lesson: Logarithmic and Exponential Functions	• Students will understand the inverse relationship between exponents and logarithms, and use this relationship to solve problems involving logarithms and exponents.

Unit: Geometry

Lesson: Parabolas	• Students will derive the equation of a parabola given a focus and a directrix.

Lesson: Ellipses and Hyperbolas	• Students will derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.
Lesson: Volume of a Sphere	• Students will give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.

Unit: Statistics

Lesson: Probabilities, Subsets, and Complements	• Students will describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). • Students will learn how to create equations and inequalities in one variable and use them to solve problems.

Lesson: Two-Way Frequency Tables and Conditional Probabilities	• Students will construct and interpret two-way frequency tables of data when two categories are associated with each object being classified; students will use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. • Students will summarize categorical data for two categories in two-way frequency tables. Students will learn how to interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Students will learn how to recognize possible associations and trends in the data.
Lesson: Compound Events and Probabilities	• Students will apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model.
Lesson: Permutations and Combinations	• Students will use permutations and combinations to compute probabilities of compound events and solve problems.

CALCULUS I: SEMESTER 1

Unit: Limits and Continuity

Lesson: What Is a Limit?	• Students will find the limit of a function numerically and graphically. • Students will find the limits of polynomial, rational, radical, composite, and trigonometric functions. • Students will identify cases when limits do not exist.
Lesson: Solving Simple Limits	• Students will find the limit of a function numerically and graphically. • Students will find the limits of polynomial, rational, radical, composite, and trigonometric functions. • Students will identify cases when limits do not exist.
Lesson: Solving Complex Limits	• Students will find the limit of a function numerically and graphically. • Students will find the limits of polynomial, rational, radical, composite, and trigonometric functions. • Students will identify cases when limits do not exist.
Lesson: Asymptotes and End Behavior	• Students will find infinite limits of functions. • Students will identify asymptotes of functions. • Students will determine horizontal asymptotes.
Lesson: Continuity	• Students will solve problems that involve extrema.

Unit: Introduction to Derivatives

Lesson: What Is a Derivative?	• Students will demonstrate an understanding of the slope of the tangent line to the graph. • Students will demonstrate an understanding of the instantaneous rate of change. • Students will demonstrate an understanding of the derivative of a function as a slope of the tangent line. • Students will demonstrate an understanding of the derivative as an instantaneous rate of change. • Students will understand the relationship between continuity and differential.
Lesson: Limit Definition of a Derivative	• Students will demonstrate an understanding of the derivative of a function as a slope of the tangent line. • Students will demonstrate an understanding of the derivative as an instantaneous rate of change.
Lesson: Power and Chain Rule	• Students will use various techniques of differentiations to find the derivatives of various functions. • Students will compute the derivatives of higher orders. • Students will apply the chain rule to the calculation of the derivative of a variety of composite functions. • Students will find the derivative of a variety of functions by using the technique of implicit differentiation.

Lesson: Product and Quotient Rule	• Students will use various techniques of differentiations to find the derivatives of various functions. • Students will compute derivatives of higher orders.
Lesson: Trigonometric Derivatives	• Students will compute the derivatives of various trigonometric functions.
Lesson: Exponential and Log Derivatives	• Students will understand the use of the basic definitions of exponential and logarithmic functions and how they are related algebraically. • Students will apply the laws of exponential and logarithmic functions to a variety of applications. • Students will use the basic properties of inverse trigonometric functions to find the derivative and integrals.
Lesson: Differentiability	• Students will understand the relationship between continuity and differential.
Lesson: Second Derivatives	• Students will find intervals where a function is concave upward or downward.

CALCULUS I: SEMESTER 2

Unit: Applications of Derivatives

Lesson: What Are Relative Extrema	● Students will solve problems that involve extrema.
Lesson: Solving Relative Extrema	● Students will use the First and Second Derivative Tests to find absolute maximum and minimum values of a function. ● Students will use the First and Second Derivative Tests to solve optimization applications.
Lesson: Optimization Problems	● Students will use the First and Second Derivative Tests to find absolute maximum and minimum values of a function. ● Students will use the First and Second Derivative Tests to solve optimization applications.
Lesson: Implicit Differentiation	● Students will find the derivative of a variety of functions by using the technique of implicit differentiation.
Lesson: Related Rates	● Students will understand the difference between related rate problems and optimization problems. ● Students will be able to take the derivative with respect to time in equations where time is not a given variable in order to find the desired rate of change.
Lesson: L'Hopital's Rule	● Students will find the limit of an indeterminate form by L'Hopital's Rule.

Unit: Integrals

Lesson: Area Under the Curve	• Students will use Riemann Sums to approximate areas under curves. • Students will use antiderivatives to evaluate definite integrals of Riemann Sums. • Students will use the Mean Value Theorem for integrals to solve problems. • Students will use the Trapezoidal Rule and Simpson's Rule to solve problems. • Students will estimate errors for the Trapezoidal Rule and Simpson's Rule.
Lesson: The Antiderivative	• Students will find the antiderivatives of functions. • Students will use antidifferentiation and integration to solve differential equations.
Lesson: The Integral	• Students will use antiderivatives to evaluate definite integrals of Riemann Sums. • Students will use the Fundamental Theorem of Calculus to evaluate definite integrals.
Lesson: Complex Integrals	• Students will use substitution to evaluate and compute definite integrals.

Lesson: Integrals and Rates	• Students will learn how to use integrals to find the accumulated total from a rate function. • Students will learn how to use the Average Value Formula to find the average value of a function over a given interval using integrals.
Lesson: Particle Motion	• Students will be able to use derivatives and integrals to convert between position, velocity, and acceleration functions for a particle given some initial condition information.
Lesson: Differential Equations	• Students will find general solutions of differential equations. • Students will use initial conditions to find particular solutions of differential equations.
Lesson: Volumes	• Students will compute the area between two curves with respect to the x and y-axes. • Students will find the area of a surface that is generated by revolving a curve about an axis or a line.