Secondary Mathematics II YEAR-AT-A-GLANCE (2018-2019)

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<tr><td></td><td>Core Standard and Objective</td><td>Correlated Assignments</td></tr>
<tr><td>Quarter 1 Secondary Math 2</td><td>
N.RN.1 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. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.
N.RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents
N.RN.3 Explain why sums and products of rational numbers are rational, that the sum of a rational number and an irrational number is irrational, and that the product of a nonzero rational number and an irrational number is irrational.
A.APR.1 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
A.SSE.1 Interpret expressions that represent a quantity in terms of its context
a. Interpret parts of an expression, such as terms, factors, and coefficients.
b. Interpret increasingly more complex expressions by viewing one or more of their parts as a single entity. Exponents are extended from the integer exponents to rational exponents focusing on those that represent square or cube roots.
A.SSE.2 Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 – y^4$ as $(x^2)^2 – (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 – y^2)(x^2 + y^2)$.
A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. For example, development of skill in factoring and completing the square goes hand in hand with understanding what different forms of a quadratic expression reveal.
a. Factor a quadratic expression to reveal the zeros of the function it defines.
b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
c. Use the properties of exponents to transform expressions for exponential functions.
A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations; extend to formulas involving squared variables. For example, rearrange the formula for the volume of a cylinder $V = \pi r^2 h$.
F.IF.4 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.
F.IF.5 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.
F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
a. 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.
b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)t$, $y = (0.97)t$, $y = (1.01)12t$, $y = (1.2)t/10$, and classify them as representing exponential growth or decay.
N.CN.1 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.
N.CN.2 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
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This is the suggested order to present Quarter 1 content

Chapter 1 Functions and Exponents
1.1 Absolute Value Functions
1.2 Piecewise Functions
1.4 Properties of Exponents
1.5 Radicals and Rational Exponents
1.6 Exponential Functions

Chapter 2 Polynomial Equations and Factoring
2.1 Adding and Subtracting Polynomials
2.2 Multiplying Polynomials
2.3 Special Products of Polynomials
2.4 Solving Polynomials Equations in Factored Form
2.5 Factoring $x^2 + bx + c$
2.6 Factoring $x^2 + bx + c$
2.7 Factoring Special Products
2.8 Factoring Polynomials Completely (Grouping)

Chapter 3 Graphing Quadratic Functions
3.1 Graphing $f(x) = ax^2$
3.2 Graphing $f(x) = ax^2 + c$
3.3 Graphing $f(x) = ax^2 + bx + c$
3.4 Graphing $f(x) = a(x – h)^2 + c$
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Key Concepts for Differentiation

In an effort to assist teachers in the process of differentiation in Tier 1 teaching, key concepts have been identified in the curriculum maps as those specific objectives a teacher would focus on during small group instruction with struggling students. Key concepts cover minimum, basic skills and knowledge every student must master. Key concepts are not an alternative to teaching the entire Utah State Core Standards, rather they emphasize which concepts to prioritize for differentiation.

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	Core Standard and Objective	**Correlated Assignments**
Quarter 2 Secondary Math 2	**A.REI.4** Solve quadratic equations in one variable. a. 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. b. 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. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b. **F.BF.1** Write a quadratic or exponential function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. 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.* **F.BF.3** 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. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.* **N.CN.7** Solve quadratic equations with real coefficients that have complex solutions. **N.CN.8** Extend polynomial identities to the complex numbers. *For example write* $x^2 + 4$ *as* $(x + 2i)(x - 2i)$. **N.CN.9** Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials. **A.SSE.1** Interpret expressions that represent a quantity in terms of its context. b. 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* **G.GPE.1** Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. **G.GPE.4** Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point* $(1, \sqrt{3})$ *lies on the circle centered at the origin and containing the point (0, 2).* **F.IF.4** 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.* **F.IF.5** 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. **F.IF.6** 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. **F.IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. b. Graph piecewise-defined functions and absolute value functions. Compare and contrast absolute value and piecewise-defined functions with linear, quadratic, and exponential functions. Highlight issues of domain, range, and usefulness when examining piecewise-defined functions. **F.IF.9** Compare properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Extend work with quadratics to include the relationship between coefficients and roots, and that once roots are known, a quadratic equation can be factored. *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* **F.LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. **A.REI.4** Solve quadratic equations in one variable. a. 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. b. 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 **A.REI.7** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line* $y = -3x$ *and the circle* $x^2 + y^2 = 3$.	**This is the suggested order to present Quarter 2 content** **Chapter 3 Graphing Quadratic Functions** 3.5 Graphing $f(x) = a(x - p)(x - q)$ 3.6 Focus of a Parabola (Honors) 3.7 Comparing Linear, Exponential, and Quadratic Functions **Chapter 4 Solving Quadratic Equations** 4.1 Properties of Radicals 4.2 Solving Quadratic Equations by Graphing 4.3 Solving Quadratic Equations Using Square Roots 2.4 Solving Polynomial Equations in Factored Form 4.4 Solving Quadratics by Completing the Square 4.5 Solving Quadratics Using the Quadratic Formula 4.6 Complex Numbers 4.7 Solving Quadratic Equations with Complex Solutions 4.8 Solving Nonlinear Systems of Equations 4.9 Quadratic Inequalities **Chapter 10 Circles** 10.1 Lines and Segments that Intersect Circles 10.2 Finding Arc Measures 10.3 Using Chords 10.7 Circles in the Coordinate Plane

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	Core Standard and Objective	**Correlated Assignments**
Quarter 3 Secondary Math 2	**G.SRT.1** 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. 🔑 **G.SRT.2** Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; 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. **G.SRT.3** Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. 🔑 **G.SRT.4** 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.* 🔑 **G.SRT.5** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. 🔑 **G.CO.9** 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 those equidistant from the segment's endpoints. 🔑 **G.CO.10** 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.* 🔑 **G.CO.11** 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.* **G.GPE.4** Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2). **G.GPE.6** Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	**This is the suggested order to present Quarter 3 content** **Chapter 10 Circles** 10.4 Inscribed Angles and Polygons 10.5 Angle Relationships in the Circle 10.6 Segments Relationships in Circles **Chapter 6 Relationships Within Triangles** 6.1 Proving Geometric Relationships 6.2 Perpendicular and Angle Bisectors 6.3 Bisector of Triangles 6.4 Medians and Altitudes of Triangles 6.5 The Triangle Midsegment Theorem 6.6 Indirect Proof and Inequalities in one Triangle 6.7 Inequalities in Two Triangles **Chapter 7 Quadrilaterals and Other Polygons** 7.1 Angles of Polygons 7.2 Properties of Parallelograms 7.3 Proving that a Quadrilateral is a Parallelogram 7.4 Properties of Special Parallelograms ~~7.5 Properties of Trapezoids and Kites~~ **Chapter 8 Similarity** 8.1 Dilations 8.2 Similarity and Transformations 8.3 Similar Polygons 8.4 Proving Tringle Similarity by AA 8.5 Proving Triangle Similarity by SSS or SAS 8.6 Proportionality Theorems

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	Core Standard and Objective	Correlated Assignments
Quarter 4 Secondary Math 2	**G.SRT.6** Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. **G.SRT.7** Explain and use the relationship between the sine and cosine of complementary angles. **G.SRT.8** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. **F.TF.8** Prove the Pythagorean identity $\sin^2(\vartheta) + \cos^2(\vartheta) = 1$ and use it to find $\sin(\vartheta)$, $\cos(\vartheta)$, or $\tan(\vartheta)$, given $\sin(\vartheta)$, $\cos(\vartheta)$, or $\tan(\vartheta)$, and the quadrant of the angle. **G.C.1** Prove that all circles are similar. **G.C.2** Identify and describe relationships among inscribed angles, radii, and chords. *Include 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.* **G.C.3** Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. **G.C.4** Construct a tangent line from a point outside a given circle to the circle. **G.C.5** 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; derive the formula for the area of a sector. **G.GMD.1** Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Informal arguments for area formulas can make use of the way in which area scale under similarity transformations: when one figure in the plane results from another by applying a similarity transformation with scale factor k, its area is k^2 times the area of the first. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.* **G.GMD.3** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems **S.CP.1** 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"). **S.CP.4** Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.* **S.CP.5** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* **S.CP.6** Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model. **S.ID.5** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	**This is the suggested order to present Quarter 4 content** **Chapter 9 Right Triangle Trigonometry** 9.1 The Pythagorean Theorem 9.2 Special Right Triangles 9.3 Similar Right Triangles 9.4 The Tangent Ratio 9.5 The Sine and Cosine Ratios 9.6 Solving Right Triangles **Chapter 11 Circumference, Area and Volume** 11.1 Circumference and Arc length 11.2 Area of Circles and Sectors 11.3 Area of Polygons 11.4 Volumes of Prisms and Cylinders 11.5 Volume of Pyramids 11.6 ~~Surface Areas and~~ Volumes of Cones 11.7 ~~Surface Areas and~~ Volumes of Spheres **Chapter 5 Probability** 5.1 Sample Spaces and Probability 5.2 Independent and Dependent Events 5.3 Two-Way Tables and Probability 5.4 Probability of Overlapping Events