Algebra 2	Unit 1: Expressions and Equations (Ch. 1-3)		Suggested Length: Semester Course: 4 weeks Year Course: 8 weeks
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and Assessment** ***Student will:***
1. How do you use basic skills and operands to create and solve a variety of equations and inequalities? 2. How do you relate subsets of the real number system? 3. How are linear equations used to model relationships between real-world quantities and make predictions of outcomes? 4. How do you solve linear systems of equations numerically, algebraically, and graphically with and without appropriate technology?	**Program of Studies** **Core Content** ❑ MA-HS-1.1.1 Students will compare real numbers using order relations (less than, greater than, equal to) to represent problems using real numbers. ❑ MA-HS-1.1.2 Students will demonstrate the relationships between different subsets of the real number system. ❑ MA-HS-1.1.3 Students will use scientific notation to express very large or very small quantities. ❑ **MA-HS-1.3.1 Students will solve real-world and mathematical problems to specified accuracy levels by simplifying expressions with real numbers involving addition, subtraction, multiplication, division, absolute value, integer exponents, roots (square, cube), and factorials. DOK 2** ❑ MA-HS-1.5.2 Students will use equivalence relations (reflexive, symmetric, transitive). ❑ **MA-HS-4.1.2 Students will construct data displays for data with no more than two variables. DOK 2** ❑ MA-HS-4.1.3 Students will represent real-world data using matrices and will use matrix addition, subtraction, multiplication (with matrices no larger than 2x2), and scalar multiplication to solve real-world problems. ❑ **MA-HS-5.1.1 Students will identify multiple representations (tables, graphs, equations) of functions (linear, quadratic, absolute value, exponential) to solve real-world or mathematical problems. DOK 1** ❑ MA-HS-5.1.4 Students will recognize and solve problems that can be modeled using an exponential function, such as compound	❑ Matrix ❑ Scalar ❑ Multiplication ❑ Exponents ❑ Irrational numbers ❑ Commutative ❑ Associative ❑ Distribute ❑ Closure ❑ Reflexive ❑ Symmetric ❑ Transitive ❑ Identity ❑ Inverse ❑ Absolute value ❑ Roots ❑ Factorials ❑ Domain & range ❑ Line of best fit	❑ Determine the number of seconds a balloon stays in the air when released based on the number of breaths needed to inflate it. Create a chart and graph from the data. Analyze and interpret results. DOK 4 ❑ KOT (Keep on Track quiz): Sections 1.3-1.5 ❑ Celebration of Knowledge: Ch. 1(mult. choice and open response) [focus on mastery of 1.1.1, 1.2.1, 1.3.1, 1.3.2, 1.3.3, 4.1.2] **(CLA)** DOK 3 ❑ KOT: Functions, Standard Form, Intercepts, and Slope DOK 4 ❑ Celebration of Knowledge: Ch. 2 (mult. choice and open response) [focus on mastery of 3.1.2. 3.2.2. 3.2.3. 3.3.4. 4.1.1 4.2.1. 4.2.2. 4.2.5-linear] **CLA** DOK 4 ❑ Students will solve a variety of systems of linear equations (2 variables) using the method of elimination and/or method of substitution (algebraically). DOK 3 ❑ Students will solve systems of linear equations (2 or 3 variables) using the TI-83 graphing calculator by graphing the lines and finding the point of intersection, if one exists. (graphically). DOK 3 ❑ Students will solve systems of linear equations (2 or 3 variables) using the TI-83 graphing calculator using the matrix feature and reduced row echelon form (rref) function (numerically). DOK 3 ❑ Apply critical thinking strategies to solve real-world problems involving two unknowns such as problems involving ground speed of a plane and wind speed; amounts of 2 kinds of fertilizer (different % mixtures) needed to produce a third (% mixture); investment and loan amounts; break-even points, etc. Students may solve using any method, including use of matrices. DOK 4 ❑ KOT: Functions, Standard Form, Intercepts, and Slope ❑ KOT: Systems of Equations—Application Problems

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Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and Assessment** ***Student will:***
5. How are matrices used to represent and organize data?	interest problems. ❑ MA-HS-5.1.6 Students will find the domain and range for absolute value functions. ❑ MA-HS-5.1.7 Students will apply and use direct and inverse variation to solve real-world and mathematical problems. ❑ **MA-HS-5.2.1 Students will apply order of operations, real number properties (identity, inverse, commutative, associative, distributive, closure), and rules of exponents (integer) to simplify algebraic expressions. DOK 1** ❑ MA-HS-5.2.2 Students will evaluate polynomial and rational expressions and expressions containing radicals and absolute values at specified values of their variables. ❑ **MA-HS-5.3.1Students will model, solve and graph first-degree single variable equations and inequalities including absolute value, in real-world and mathematical problems and graph the solutions on a number line. DOK 2** ❑ MA-HS-5.3.2 Students will solve for a specified variable in a multivariable equation. ❑ **MA-HS-5.3.3 Students will model, solve and graph first degree, two-variable equations and inequalities in real-world and mathematical problems, DOK 2** ❑ **MA-HS-5.3.4 Students will model, solve and graph systems of linear equations (two equations in two variables) in real-world and mathematical problems. DOK 3**		❑ Celebration of Knowledge: Ch. 3-4 (mult. choice and open response) [focus on mastery of 1.1.3, 1.2.3, 4.1.3, 4.2.3, 4.2.2, 4.3.1] ❑ Formal Open Responses: ❑ Electricity (Systems) ❑ Coffee Purchase (systems) ❑ Beach Vacation Rentals (matrices) DOK 4 ❑ Informal Open Responses: ❑ Meal Matrix (matrices) ❑ Home Computers (scatter plots) ❑ Investments (systems) DOK 4 ❑ Celebration of Knowledge: Unit I (mult. choice and open response) ❑ **Additional Resources:** ❑ *Glencoe Mathematics: Algebra 2 text* ❑ *College Algebra and Trigonometry* text (DeVry Institute of Technology) ❑ *Precalculus with Limits* text (Larson)

Algebra 2	Unit 2: Second Degree Equations and Functions		Suggested Length: 3 weeks
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and Assessment** *Student will:*
1. What are graphs of quadratic functions in terms of shape and appropriate terminology? 2. How is the quadratic formula used to determine approximate (or exact) solutions to quadratic equations? 3. How are quadratic functions/equations used to solve real-life problems? 4. How do changes in parameters affect graphs of parabolas?	**Program of Studies** **Core Content** ❑ **MA-HS-5.1.1 Students will identify multiple representations (tables, graphs, equations) of functions (linear, quadratic, absolute value, exponential) in real-world or mathematical problems. DOK 1** ❑ MA-HS-5.1.2 Students will identify, relate, and apply representations (graphs, equations, tables) of a piecewise function (such as long distance telephone rates) from mathematical or real-world information. ❑ MA-HS-5.1.3 Students will demonstrate how equations and graphs are models of the relationship between two real-world quantities (e.g., the relationship between degrees Celsius and degrees Fahrenheit). ❑ **MA-HS-5.1.5 Students will** ❑ **determine if a relation is a function;** ❑ **determine the domain and range of a function (linear and quadratic);** ❑ **determine the slope and intercepts of a linear function;** ❑ **determine the maximum, minimum, and intercepts (roots/zeros) of quadratic function and** ❑ **evaluate a function written in function notation for a specified rational number. DOK 2** ❑ MA-HS-5.1.6 Student will find the domain and range for absolute value functions. ❑ **MA-HS-5.1.8 Students will identify the changes and explain how changes in parameters affect graphs of functions (linear, quadratic, absolute value, exponential) (e.g., compare $y=x^2$, $y=2x^2$,**	❑ Roots ❑ Absolute value ❑ Slope ❑ Perceive functions ❑ Quadratic ❑ Simplifying radicals	❑ **Marzano** Activity: "Reading to Learn Mathematics" (Use Resource Master) In this activity students become acquainted with terminology associated with graphing quadratic functions by reading through the text and examples in their textbook and completing writing tasks on the workbook page. At the close of class, students volunteer to explain sections of the activity to the rest of the class using the overhead projector. The sections include describing graphs of quadratic functions using appropriate terminology to describe shape (e.g. parabola opening upward, minimum value, vertex, axis of symmetry) and showing commonalities among the terms (e.g. vertex lies on axis of symmetry and includes the maximum or minimum value of the function.) Students also describe how to find the y-intercept, vertex, and axis of symmetry and use a table of values to draw the graph of the parabola given the quadratic equation in standard form. DOK 4 ❑ **Integrating Technology**: "Using the Quadratic Formula" Students identify the "a" (quadratic coefficient), "b" (linear coefficient), and "c", the constant coefficient, to find real solutions. After mastery of use of the quadratic formula, the teacher uses the overhead graphing calculator to graph several of the quadratic functions given in the exercise. The students realize that the "solutions" or "roots" are also the "x-intercepts" and see why some equations have no real solution (no x-intercept). If time permits, the maximum or minimum values are also found using the technology. DOK 3 ❑ Activity: "Solving Physics Problems using the Quadratic Formula" Students learn to complete word problems involving finding the time it takes for an object to hit the ground (neglecting wind resistance) given its initial height and initial velocity. Students also

Algebra 2	Unit 2: Second Degree Equations and Functions		Suggested Length: 3 weeks
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and Assessment** ***Student will:***
	$y=(x-4)^2$, and $y=x^2+3$). DOK 2 ❑ MA-HS-5.2.2 Students will evaluate polynomial and rational expressions and expressions containing radicals and absolute values at specified values of their variables. ❑ **MA-HS-5.2.3 Student will:** ❑ **add, subtract and multiply polynomial expressions;** ❑ **factor polynomial expressions using the greatest common monomial factor and** ❑ **factor quadratic polynomials of the form ax^2+bx+c, when a=1 and b and c are integers. DOK 1** ❑ MA-HS-5.2.4 Students will factor quadratic polynomials, such as perfect square trinomials and quadratic polynomials of the form ax^2+bx+c when a≠1 and b and c are integers. ❑ **MA-HS-5.2.5 Students will add, subtract, multiply and divide simple rational expressions with monomial first-degree denominators and integer numerators (e.g., $\frac{3}{5x}+\frac{4}{3y}$; $\frac{9}{2a}-\frac{-7}{4b}$; $\frac{3}{-5x}\times\frac{-4}{7y}$; $\frac{5}{2c}\div\frac{9}{-11d}$) and will express the results in simplified form. DOK 1** ❑ MA-HS-5.3.5 Students will write, graph and solve systems of linear inequalities (two inequalities in two variables) based on real-world or mathematical problems and interpret the solution. ❑ **MA-HS-5.3.6 Students will model, solve and graph quadratic equations in real-world and mathematical problems. DOK 2**		determine if the object could ever reach a given height, with the given conditions. DOK 4 ❑ Activity: "Shifting Graphs" Students use the vertex form equation of a parabola to determine how changes in parameters affect the graphs of the parabolas. Graphing calculators are needed for the opening investigation (determining which parameters cause each transformation), but are not necessary to complete the rest of the activity (Students eyes become trained to see what *will* happen without actually seeing it on the calculator.) DOK 3 ❑ KOT: Beginning to Analyze Quadratic Functions ❑ KOT: Using the Quadratic Formula (OR) Physics Applications "3...2...1…Liftoff!" ❑ "Factoring Fanatics" Students will work together in groups of 3-4 to develop 10-15 (depending on the number of groups) factoring problems by multiplying either a monomial by a polynomial or 2 binomials of their design. Their "answers" will be written as problems for the other groups to factor. The goal will be to challenge the other groups factoring abilities. (Ways to make this competitive are in developmental stages.) DOK 4 ❑ Celebration: Unit II: Second Degree Equations and Functions (CLA)

Algebra 2	Unit 3: Discrete Mathematics: Sequence, Series, Probability, and Statics		Suggested Length: 8 weeks
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
1. How do you derive and apply an explicit formula, or general rule, to a given real world situation to find the nth term of an arithmetic or geometric sequence? 2. How can predictions and conclusions be drawn from a probability simulation and how do the results compare to the theoretical probabilities? 3. How do you know when to use combinations or permutations?	**<u>Program of Studies</u>** **<u>Core Content</u>** ❑ **MA-HS-1.3.2 Students will:** ❑ **describe and extend arithmetic and geometric sequences;** ❑ **determine a specific term of a sequence given an explicit formula;** ❑ **determine an explicit rule for the nth term of an arithmetic sequence;\ and** ❑ **apply sequences to solve real-world problems. DOK 3** ❑ MA-HS-1.3.3 Students will write an explicit rule for the nth term of a geometric sequence. ❑ MA-HS-1.3.4 Students will recognize and solve problems that can be modeled using a finite geometric series, such as home mortgage problems and other compound interest problems. ❑ **MA-HS-4.1.1 Students will analyze and make inferences from a set of data with no more than two variables, and will analyze problems for the use and misuse of data representations. DOK 3** ❑ **MA-HS-4.1.2 Students will construct data displays for data with no more than two variables. DOK 2** ❑ **MA-HS-4.2.1 Students will describe and compare data distributions and make inferences from the data based on the shapes of graphs, measures of center (mean, median, mode) and measures of spread (range, standard deviation). DOK 2** ❑ MA-HS-4.2.2 Students will know the characteristics of the Gaussian normal	❑ Combinations ❑ Permutations ❑ Explicit formula ❑ Probability ❑ Factorials ❑ Arithmetic & geometric sequences & series ❑ Identity ❑ Inverse ❑ Combination ❑ Permutations ❑ Statistics	❑ Determine the seating capacity in an amphitheater given that 18 seats are in the 1st row, each row can seat 4 or more people than the previous row, and that there are a total of 26 rows. Create a table of values for the first 5 rows, find the pattern, and use knowledge of arithmetic sequences to write and explicit formula and determine the sum. DOK 3 ❑ Determine a salary amount if a beginning salary is given, and a 3% increase is applied for consecutive years (geometric sequence/series). DOK 4

Algebra 2	Unit 3: Discrete Mathematics: Sequence, Series, Probability, and Statics		Suggested Length: 8 weeks
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	distribution (bell-shaped curve). ❑ **MA-HS-4.2.3 Students will:** ❑ **identify an appropriate curve of best fit (linear, quadratic, exponential) for a set of two-variable data;** ❑ **determine a line of best fit equation for a set of linear two-variable data and** ❑ **apply a line of best fit equations to make predictions within and beyond a given set of data. DOK 3** ❑ MA-HS-4.2.4 Students will recognize when arguments based on data confuse correlation and causation**.** ❑ **MA-HS-4.3.1 Students will recognize potential for bias resulting from the misuse of sampling methods (e.g., non-random sampling, polling only a specific group of people, using limited or extremely small sample sizes) and explain why these samples can lead to inaccurate inferences. DOK 2** ❑ MA-HS-4.3.2 Students will design simple experiments or investigations to collect data to answer questions of interest. ❑ MA-HS-4.3.3 Students will explain the differences between randomized experiments and observational studies. ❑ **MA-HS-4.4.1 Students will:** ❑ **determine theoretical and experimental (from given data) probabilities;** ❑ **make predictions and draw inferences from probabilities;** ❑ **compare theoretical and experimental probabilities and** ❑ **determine probabilities involving replacement and non-replacement. DOK 3**		

Algebra 2	Unit 3: Discrete Mathematics: Sequence, Series, Probability, and Statics		Suggested Length: 8 weeks
Essential Questions	***Program of Studies* and Core Content**	**Key Terms and Vocabulary**	**Classroom Instruction and <u>Assessment</u>** ***Student will:***
	❑ MA-HS-4.4.2 Students will recognize and identify the differences combinations and permutations and use them to count discrete quantities. ❑ MA-HS-4.4.3 Students will represent probabilities in multiple ways, such as fractions, decimals, percentages and geometric area models.		