Course Title: Algebra II
Board Approval Date: 6/2018
Credit / Hours: 1
Reviewed Annually

Course Description:

Algebra II is a second-year study of the concepts and structure of Algebra. The course provides students with a more in-depth investigation of several Algebra I topics including the expansion of the real number system, rational expressions, polynomials, factoring, and linear equations/functions. An Algebra II student will also participate in a comprehensive study of several new Algebra topics including irrational and complex numbers, quadratic equations and functions, variation, rational and exponential functions. Students are expected to communicate mathematical concepts and processes using written communication.
*Students will need a scientific calculator for this course. Recommended model: TI34II

Learning Activities / Modes of Assessment:

Large group instruction
Tests and Quizzes
Experiments
Teacher Observation
Small group/teamwork
Projects with Rubrics
Journals/Learning Logs

Instructional Resources:

Algebra 2: Prentice Hall Mathematics (2004)
Teacher made materials including Microsoft One Note Digital Notebooks
Ipad Apps including Go Formative, Desmos Graphing Calculator/Activities, Ebackpack, Doceri

Course Pacing Guide

Course: Algebra II

Course Unit (Topic) (Days/Periods)	**Length of Instruction**
1. Unit 1 Algebra 1 Review	20 days
2. Unit 2A Quadratic Expressions and Equations	65 days
3. Unit 2B Quadratic Functions	35 days
4. Unit 3 Radical Expressions, Functions, and Equations	40 days
5. Unit 4 Exponential Expressions, Functions, and Equations	10 days

Total Days: 170 days **(Note: 10 days for Final Exams & Review)

Topic: 1 Algebra 1 Review Days: 20
Subject(s): Grade(s): 9th, 10th, 11th

Know:	Understand:	Do:
Graphing Lines Writing the Equation of a Line Solving Systems of Linear Equations/Inequalities Graphing Absolute Value Equations/Inequalities	Review Algebraic concepts of single-variable expressions and equations using the order of operations, sets of real numbers, and the properties of real numbers	**A1.1.2.1.1** Write, solve, and/or graph linear equations using various methods. **A1.1.2.2.1** Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination (Limit systems to 2 linear equations). **A1.1.3.2.1** Write, solve, and/or graph systems of linear inequalities using various methods. **A1.1.3.1.1** Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities). **CC.2.2. HS.C.2** Graph and analyze functions and use their properties to make connections between different representations. **A2.1.3.2.2** Use algebraic processes to solve a formula for a given variable (e.g. solve d = rt for r).

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Topic: 1 Algebra I Review

Days: 20

Subject(s):

Grade(s): 9th, 10th

Key Learning:

Review Algebraic concepts of single-variable expressions and equations using the order of operations, sets of real numbers and the properties of real numbers.

Unit Essential Question(s):

How can the equations of lines be expressed and used in graphing and solving systems of equations and inequalities?

Concept: Graphing Lines	Concept: Writing the Equation of a Line	Concept: Solving Systems of Linear Equations/Inequalities
Lesson Essential Question(s): What is the process for graphing lines given the three basic equations of a line? (A) What is the process for graphing horizontal and vertical lines? (A)	Lesson Essential Question(s): What is the process for writing the equation of a line, given two points or a point and a slope? (A) What is the process for writing the equation of a line that is parallel/perpendicular to a given line? (A)	Lesson Essential Question(s): What techniques can be used to solve a system of linear equations? (A) How do you represent the solution set for a system of linear inequalities? (A)
Vocabulary: slope, y-intercept, x-intercept, undefined slope	Vocabulary: slope-intercept form, standard form, point-slope form, parallel lines, perpendicular lines	Vocabulary: substitution, elimination, boundary line

Concept:
Solving/Graphing Absolute Value Equations/Inequalities

Lesson Essential Question(s):
How do you solve an absolute value equation/ inequality? (A)

How do you graph absolute value functions? (A)

Vocabulary:
conjunction, disjunction, vertex

Concept:
Literal Equations

Lesson Essential Question(s):
How do you solve literal equations?

Vocabulary:
literal equation

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Topic: 2A Quadratic Expressions and Equations Days: 65
Subject(s): Grade(s): 9th, 10th, 11th

Know:	Understand:	Do:
Factoring Quadratic Expressions GCF Quadratic Trinomials Factoring by Grouping Sum/Difference of Cubes Quadratic form Complex Numbers Completing the Square Quadratic Formula	Quadratic equations can be solved using a variety of techniques.	**A2.1.3.1.1** Write and/or solve quadratic equations (including factoring and using the Quadratic Formula) **A2.1.2.2.1** Factor algebraic expressions, including difference of squares and trinomials. **A2.1.1.1.1** Simplify/write square roots in terms of i(e.g. $\sqrt{-24} = 2i\sqrt{6}$). Note: Trinomials limited to the form ax^2 + bx + c, where a is not equal to 0.

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Course: Algebra II

Date: 6/2022

Topic: 2A Quadratic Expressions and Equations

Days: 65

Grade(s): 9th, 10th

Subject(s):

Key Learning:

Quadratic Equations can be solved by using a variety of techniques.

Unit Essential Question(s): **How do you solve a quadratic equation?**

Concept: Solving quadratic equations by Factoring	**Concept:** Solving quadratic equations by using the Quadratic Formula	**Concept:** Solving quadratic equations by Completing the Square
Lesson Essential Question(s): How can factoring be used to solve a quadratic equation?	**Lesson Essential Question(s):** How can the quadratic formula be used to solve quadratic equations?	**Lesson Essential Question(s):** How can completing the square be used to solve quadratic equations? How do you decide which technique to use when solving a quadratic equation?
Vocabulary: Zero product property, standard form, perfect square trinomial, quadratic trinomials, cubes, factoring by grouping	**Vocabulary:** Imaginary numbers, discriminant, simplest radical form, square roots	**Vocabulary:**

Topic: 2B Quadratic Functions
Subject(s):

Days: 35
Grade(s): 9th, 10th, 11th

Know:	Understand:	Do:
Vertex of a Parabola Axis of Symmetry Translations Standard Form of a Quadratic Function Vertex Form of a Quadratic Function	Quadratic functions represent a family of curves with complex solutions.	**A2.2.1.1.3** Determine the domain, range, or inverse of a relation. **A2.2.1.1.4** Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g. intervals of increase/decrease, intercepts, zeros, and asymptotes). **A2.2.2.1.1** Create, interpret, and/or use the equation, graph, or table of a polynomial function (including quadratics). **A2.2.2.1.3** Determine, use, and /or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential, or logarithmic function. **A2.2.2.1.4** Translate a polynomial, exponential, or logarithmic function from one representation of a function to another (graph, table, and equation). **A2.2.2.2.1** Identify or describe the effect of changing parameters within a family of functions (e.g. y=x^2 and y=x^2+3, or y=x^2 and y=3x^2).

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Date: 6/2022

Topic: 2B Quadratic Functions

Days: 35

Subject(s):

Grade(s): 9th,/ . rf

Key Learning:

Quadratic functions represent a family of

curves with complex solutions .

Unit Essential Question:

How do you create and interpret the graph of a quadratic function?

Concept:	Concept:	Concept:
Identifying a Quadratic Function	**Graphing Quadratic Functions**	**Applications of Quadratics**
Lesson Essential Question(s): What are the shape and basic characteristics of a quadratic function? (A)	**Lesson Essential Question(s):** How do you graph a quadratic function in standard form? (A) How do you graph a quadratic function in vertex form? (A)	**Lesson Essential Question(s):** How is the concept of maximum/minimum values used in real-world problems? (A) How can you determine when a linear/ quadratic regression model would be appropriate? (A)
Vocabulary: "U" shaped, parabola	**Vocabulary:** vertex of a parabola, axis of symmetry, relative extrema, standard form,vertex form, translations, dilations	**Vocabulary:** maximum/minimum, linear regression, quadratic regression, line of best fit

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Topic: 3 Radical Expressions, Functions, and Equations Days: 40
Subject(s): Grade(s): 9th, 10th, 11th

Know:	Understand:	Do:
Rational Exponents Radical Expressions Conjugate Radical Equations Extraneous Solutions Inverse Relations Graphing Radical Functions	Radical functions represent a family of curves. Radical equations can be solved using a variety of techniques.	**A2.1.2.1.2** Simplify/evaluate expressions involving positive and negative exponents and/or roots (may contain all types of real numbers – exponents should not exceed power of 10). **A2.1.2.1.1** Use exponential expressions to represent rational numbers. **A2.1.2.1.3** Simplify/evaluate expressions involving multiplying with exponents (e.g. $x^6 \cdot x^7 = x\text{^}13$), powers of powers (e.g. $(x^6)^7 = x^{42}$), and products of products (e.g. $(2x^2)^3 = 8x^6$). Note: Limit to rational exponents. **A2.1.3.1.2** Solve equations involving rational and/or radical expressions (e.g. $\frac{10}{(x+3)} + \frac{12}{(x-2)} = 1$ or $\sqrt{x\text{^}2} + 21x = 14$). **A2.2.1.1.3** Determine the domain, range, or inverse of a relation. **A2.2.1.1.4** Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g. intervals of increase/decrease, intercepts, zeros, and asymptotes). **A2.2.2.1.1** Create, interpret, and/or use the equation, graph, or table of a polynomial function (including quadratics). **A2.2.2.1.3** Determine, use, and /or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential, or logarithmic function. **A2.2.2.1.4** Translate a polynomial, exponential, or logarithmic function from one representation of a function to another (graph, table, and equation). **A2.2.2.2.1** Identify or describe the effect of changing parameters within a family of functions (e.g. y=x^2 and y=x^2+3, or y=x^2 and y=3x^2). **A2.1.1.1.1** Simplify/write square roots in terms of i(e.g. $\sqrt{-24} = 2i\sqrt{6}$). Note: Trinomials limited to the form ax^2+bx+c where a is not equal to 0. **A2.1.1.2.1** Add and subtract complex numbers (e.g. $(7 - 3i) - (2 + i) = 5 - 4i$).

		A2.1.1.2.2 Multiply and divide complex numbers (e.g.$(7-3i)(2+i)=17+i$).

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Topic: 3 Radical Expressions, Functions, and Equations | Days: 40

Subject(s): | Grade(s): 9th, 10th

Key Learning:

Radical functions represent a family of curves.

Radical equations can be solved using a variety of techniques.

Unit Essential Question(s):

How can the properties of rational exponents be used to simplify radical expressions and solve radical equations?

Concept: **Operations with Radical Expressions**	Concept: **Rational Exponents**	Concept: **Solving Radical Equations**
Lesson Essential Question(s): How do you simplify an expression containing an nth root? (A) How do you multiply and divide radical expressions? (A) How do you add and subtract radical expressions? (A)	**Lesson Essential Question(s):** What is the relationship between radical form and exponential form? (A) How do you use the properties of exponents to simplify expressions containing rational exponents? (A)	**Lesson Essential Question(s):** How are inverse operations used to solve radical equations? (A)
Vocabulary: nth root, rationalize the denominator, conjugate, like radicals	**Vocabulary:** rational exponent	**Vocabulary:** radical equation, extraneous solution

Concept:

Graphing Radical Functions

Lesson Essential Question(s):
How do you find the inverse of a function from its graph/equation? (A)

How do you graph a radical function? (A).

Vocabulary:
inverse of a function, reflection, radical function

Concept:

Complex Numbers

Lesson Essential Question(s):

How do we add/subtract complex numbers??

How do we multiply/divide complex numbers?

Topic: 4 Exponential Expressions, Functions, and Equations Days: 10
Subject(s): Grade(s): 9th, 10th

Know:	Understand:	Do:
Growth Factor Decay Factor Asymptote Exponential Function/Equation Exponential number “e”	Exponential functions can be used to model real-life applications. Exponential equations can be solved using various techniques.	**A2.1.3.1.3** Write and/or solve a simple exponential or logarithmic equation (including common and natural logarithms) **A2.1.3.1.4** Write, solve, and /or apply linear or exponential growth or decay (including problem situations). **A2.1.2.1.4** Simplify or evaluate expressions involving logarithms or exponents **CC.2.2.HS.C.2** Graph and analyze functions, and use their properties to make connections between different representations. **A2.2.2.1.2** Create, interpret, and/or use the equation, graph, or table of an exponential or logarithmic function (including common and natural logarithms). **A2.2.1.1.3** Determine the domain, range, or inverse of a relation. **A2.2.1.1.4** Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g. intervals of increase/decrease, intercepts, zeros, and asymptotes). **A2.2.2.1.1** Create, interpret, and/or use the equation, graph, or table of a polynomial function (including quadratics). **A2.2.2.1.3** Determine, use, and /or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential, or logarithmic function. **A2.2.2.1.4** Translate a polynomial, exponential, or logarithmic function from one representation of a function to another (graph, table, and equation). **A2.2.2.2.1** Identify or describe the effect of changing parameters within a family of functions (e.g. y=x^2 and y=x^2+3, or y=x^2 and y=3x^2).

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Course: Algebra II

Date: 6/2022

Topic: 4 Exponential Expressions, Functions, and Equations

Days: 10

Subject(s):

Grade(s): 9th,10th

Key Learning:

Exponential functions can be used to model real-life applications.

Exponential equations can be solved using various techniques.

Unit Essential Question(s):

How can exponential functions be used to represent real-life applications?

Concept:	**Concept:**	**Concept:**
Radical form to Rational Exponent form	**Graphing Exponential Functions**	**Solving Exponential Equations**
Lesson Essential Question(s): How do we write radical expressions to exponential expressions? How do we evaluate rational exponents?	**Lesson Essential Question(s):** What are the basic characteristics of an exponential function?	**Lesson Essential Question(s):** **What are the methods for solving exponential equations?**
Vocabulary: Index, radicand, exponent	**Vocabulary:** exponential function, growth factor, decay factor, asymptote	**Vocabulary:** change of bases formula