

**Course Title:** Algebra III  
**Board Approval Date:** 06/16/14  
**Credit / Hours:** .5 credit  
**Reviewed Annually**

**Course Description:**

Algebra III is a third-year study of the concepts of Algebra. The course provides students with knowledge of conic sections, logarithms, sequences, series, matrices and determinants. The Algebra III course is offered to advanced tenth graders and 11<sup>th</sup> graders as a pre-requisite to Calculus and 12th graders as an enrichment before pre-calculus in college.

*\*Students will need a scientific calculator or a TI-89 graphing calculator for this course.*

**Learning Activities / Modes of Assessment:**

Large group instruction	Tests and Quizzes
Laboratory experiments	Checklists / Teacher Observation
Small group work	Projects with Rubrics
Journals/ Write-ups	

**Instructional Resources:**

Algebra II (Prentice Hall Mathematics, 2003)  
Teacher made resources

## Course Pacing Guide

Course: Algebra III

### Course Unit (Topic)

### Length of Instruction (Days/Periods)

1. Review of Algebra II (Systems of Linear Equations)

10 days

2. Rational and Radical Equations and Expressions

20 days

3. Polynomials

10 days

4. Exponentials and Logarithms

20 days

5. Probability

15 days

6. Sequences and Series

10 days

Total Days

85 days

Topic: Systems of Equations/Review of Algebra II  
 Subject(s): High School Math


Days: 10  
 Grade(s): 10-12

Know:	Understand:	Do:
<ul style="list-style-type: none"> <li>• Systems of linear equations</li> <li>• Systems containing higher order equations</li> <li>• Equation and graph of a circle</li> <li>• Graphing quadratics and absolute value</li> </ul>	<p>Systems of equations can be solved graphically and algebraically in order to model real world situations.</p>	<p>Standard - CC.2.2.HS.C.2</p> <p><b>Graph and analyze functions and use their properties to make connections between the different representations.</b></p> <p>Standard - CC.2.2.HS.C.5</p> <p><b>Construct and compare linear, quadratic and exponential models to solve problems.</b></p> <p>Standard - CC.2.2.HS.D.10</p> <p><b>Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.</b></p> <p>A1.1.2.2 Write, solve, and/or graph systems of linear equations using various methods.</p> <p>A1.1.3.2 Write, solve, and/or graph systems of linear inequalities using various methods.</p> <p>A2.2.2.2.1 Identify or describe the effect of changing parameters within a family of functions (e.g., <math>y = x^2</math> and <math>y = x^2 + 3</math>, or <math>y = x^2</math> and <math>y = 3x^2</math>).</p> <p>A2.2.1.1.3 Determine the domain, range, or inverse of a relation.</p> <p>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).</p> <p>A2.2.2.1.1 Create, interpret, and/or use the equation, graph, or table of a polynomial function (including quadratics).</p> <p>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.</p>

# Student Learning Map


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Concept:  
Solving/Graphing Systems  
containing Equations of  
Circles



Lesson Essential  
Questions:

- How do we solve systems of equations with three equations?



Vocabulary:

- Center, radius, equation of a circle

## Student Learning Map

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Concept: Two-way  
Frequency Tables

Lesson Essential

Questions:

- How do we use frequency tables to calculate probability?

Vocabulary:

- Frequency table, marginal frequency, conditional frequency, relative frequency

Course/Subject: Algebra III/Mathematics  
Topic: Unit 1 – Systems of Equations

Days: 10  
Date: 6/2022  
School District: CCSD

Key Learning: Linear and quadratic functions represent families of lines and curves with complex solutions.

Systems of equations containing linear and quadratic equations can be solved using a variety of techniques.

Unit Essential Question: How can the equations of lines and quadratic equations be expressed and used in graphing and solving systems of equations? How do we use the solutions of quadratic equations to solve systems?

Concept:  
Solving/Graphing Systems of Linear Equations

Concept:  
Solving/Graphing Absolute Value Equations

Concept:  
Solving/Graphing Quadratic Equations

Lesson Essential Questions:

- How do we solve systems of linear equations?

Lesson Essential Questions:

- How do we use graphs of absolute value functions to solve systems of equations?

Lesson Essential Questions:

- How do we use characteristics of quadratics to solve systems of equations graphically?
- How do we algebraically solve systems of equations with quadratic functions?

Vocabulary:

- Slope intercept form, standard form, slope, y-intercept, substitution, elimination

Vocabulary:

- Conjunction, disjunction, vertex

Vocabulary:

- Parabola, vertex of a parabola, axis of symmetry, standard form, vertex form. Maximum/minimum

Additional Information/Resources:

Topic: Radical and Rational Equations and Expressions  
 Subject(s): High School Math

Days: 20  
 Grade(s): 10-12

Know:	Understand:	Do:
<ul style="list-style-type: none"> <li>• Radical Expressions</li> <li>• Radical Equations</li> <li>• Rational Expressions</li> <li>• Rational Equations</li> </ul>	<p>Radical functions represent a family of curves. Radical equations can be solved using a variety of techniques.</p> <p>Rational Expressions can be used to model real-world situations. Rational Equations can be solved using various techniques.</p>	<p><b>Standard - CC.2.2.HS.D.2: Write expressions in equivalent forms to solve problems.</b></p> <p><b>Standard - CC.2.2.HS.D.3: Extend the knowledge of arithmetic operations and apply to polynomials.</b></p> <p><b>Standard - CC.2.2.HS.D.5: Use polynomial identities to solve problems.</b></p> <p><b>Standard - CC.2.2.HS.D.6: Extend the knowledge of rational functions to rewrite in equivalent forms.</b></p> <p><b>Standard - CC.2.2.HS.D.8: Apply inverse operations to solve equations or formulas for a given variable.</b></p> <p><b>Standard - CC.2.2.HS.D.9: Use reasoning to solve equations and justify the solution method.</b></p> <p>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).</p> <p>A2.1.2.1.1 Use exponential expressions to represent rational numbers.</p> <p>A2.1.2.1.3 Simplify/evaluate expressions involving multiplying with exponents (e.g., <math>x^6 \cdot x^7 = x^{13}</math>), powers of powers (e.g., <math>(x^6)^7 = x^{42}</math>), and powers of products (e.g., <math>(2x^2)^3 = 8x^6</math>). Note: Limit to rational exponents.</p> <p>A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g., <math>10/(x + 3) + 12/(x - 2) = 1</math> or <math>\sqrt{x^2 + 21x} = 14</math>).</p> <p>A2.2.1.1.3 Determine the domain, range, or inverse of a relation.</p> <p>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).</p>

# Student Learning Map

Course/Subject: Algebra III  
Topic: Radical and Rational Equations

Days: 20  
Date: 6/2022  
Grades: 10-12

Key Learning: Radical and Rational equations and expressions can be solved and simplified in a variety of ways.

Unit Essential Question: How can radical and rational equations and expressions be solved and simplified?

<p><u>Concept:</u> Radical Expressions and Equations</p>	<p><u>Concept:</u> Rational Equations and Expressions</p>	<p><u>Concept:</u></p>
<p><u>Lesson Essential Questions:</u></p> <ul style="list-style-type: none"><li>• How are radical expressions with a higher index simplified?</li><li>• How do we add/subtract radical expressions?</li><li>• How do we multiply and divide radical expressions?</li><li>• How do we solve radical equations with and without extraneous solutions?</li></ul>	<p><u>Lesson Essential Questions:</u></p> <ul style="list-style-type: none"><li>• How are rational expressions simplified?</li><li>• What steps do we take to add/subtract rational expressions?</li><li>• What steps do we take to multiply/divide rational expressions?</li><li>• How do we solve rational equations?</li></ul>	<p><u>Lesson Essential Questions:</u></p> <ul style="list-style-type: none"><li>•</li></ul>
<p><u>Vocabulary:</u></p> <ul style="list-style-type: none"><li>• Index, conjugates, extraneous solutions</li></ul>	<p><u>Vocabulary:</u></p> <ul style="list-style-type: none"><li>• Polynomial, rational coefficients</li></ul>	<p><u>Vocabulary:</u></p> <ul style="list-style-type: none"><li>•</li></ul>

Additional Information/Resources:



Topic: Polynomials  
Subject(s): High School Math

Days: 10  
Grade(s): 10-12

Know:

Understand:

Do:

<ul style="list-style-type: none"><li>• Long division</li><li>• Synthetic division</li><li>• Rational roots</li></ul>	The roots of a polynomial function can be found using various methods.	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).
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# Student Learning Map

Course/Subject: Algebra III/Mathematics  
Topic: Unit 3 - Polynomials

Days: 10  
Date: 6/2022  
School District: CCSD

Key Learning: Polynomial functions represent a family of curves. The roots of a polynomial equation can be found using a variety of techniques.

Unit Essential Question: How are polynomial expressions simplified, and how are polynomial equations solved?

Concept:  
Simplifying Polynomial Expressions

Concept:  
Solving Polynomial Equations

Lesson Essential Questions:

- How do you divide two polynomials?

Lesson Essential Questions:

- How do you solve a polynomial equation?

Vocabulary:

- Polynomial long division, synthetic division

Vocabulary:

- Possible rational roots

Additional Information/Resources:

Topic: Exponential and Logarithmic Expressions, Functions, and Equations  
 Subject(s): High School Math

Days: 20  
 Grade(s): 10-12

Know:	Understand:	Do:
<ul style="list-style-type: none"> <li>• Regression Modeling</li> <li>• Growth Factor</li> <li>• Decay Factor</li> <li>• Asymptote</li> <li>• Exponential Function/ Equation</li> <li>• Logarithmic Function/ Equation</li> <li>• Properties of Logarithms</li> <li>• Natural Logarithm</li> <li>• The number e</li> </ul>	<p>Logarithmic and exponential functions can be used to model real-life applications.</p> <p>Logarithmic and Exponential Equations can be solved using various techniques.</p>	<p>Standard - CC.2.2.HS.C.2</p> <p><b>Graph and analyze functions, and use their properties to make connections between the different representations.</b></p> <p>Standard - CC.2.2.HS.C.5</p> <p><b>Construct and compare linear, quadratic, and exponential models to solve problems</b></p> <p>A2.1.3.1.3 Write and/or solve a simple exponential or logarithmic equation (including common and natural logarithms).</p> <p>A2.1.3.1.4 Write, solve, and/or apply linear or exponential growth or decay (including problem situations).</p> <p>A2.1.2.1.4 Simplify or evaluate expressions involving logarithms and exponents (e.g., <math>\log 28 = 3</math> or <math>\log 42 = \frac{1}{2}</math>).</p> <p>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).</p> <p>A2.2.1.1.3 Determine the domain, range, or inverse of a relation.</p> <p>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).</p> <p>A2.2.2.1.1 Create, interpret, and/or use the equation, graph, or table of a polynomial function (including quadratics).</p> <p>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.</p>

		<p>A2.2.2.1.4 Translate a polynomial, exponential, or logarithmic function from one representation of a function to another (graph, table, and equation).</p>
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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  $y = 3x^2$ ).










# Student Learning Map

Curriculum: CCSD CURRICULUM  
 Course/Subject: Algebra III  
 Topic: Exponentials and Logarithms

Days: 20  
 Date: 6/2022  
 Grades: 10-12

Key Learning: There are many real-life occurrences to which exponential and logarithmic equations can be applied.

Unit Essential Question: What are of characteristics of exponential and logarithmic equations and how can they be applied to real life?

		
<p><u>Concept:</u> Exponential graphs and equations</p>	<p><u>Concept:</u> Applications of Exponentials</p>	<p><u>Concept:</u> Logarithms</p>
		
<p><u>Lesson Essential Questions:</u></p> <ul style="list-style-type: none"> <li>• What is the difference between exponential growth and decay graphs?</li> <li>• What are the steps to graphing an exponential equation?</li> <li>• What are the steps to solving an exponential equation?</li> </ul>	<p><u>Lesson Essential Questions:</u></p> <ul style="list-style-type: none"> <li>• What are the different types of exponential formulas used in application problems?</li> <li>• How do we find different missing variables in the different exponential application equations?</li> <li>• What are the real-life applications of exponentials?</li> </ul>	<p><u>Lesson Essential Questions:</u></p> <ul style="list-style-type: none"> <li>• What are the properties of logarithms?</li> <li>• How are logarithms added and subtracted?</li> <li>• What are the steps to solving logarithmic equations?</li> <li>• How are logarithms used to solve exponential equations?</li> </ul>
		
<p><u>Vocabulary:</u></p> <ul style="list-style-type: none"> <li>• Growth, decay, same base</li> </ul>	<p><u>Vocabulary:</u></p> <ul style="list-style-type: none"> <li>• Compounded, compounded continuously</li> </ul>	<p><u>Vocabulary:</u></p> <ul style="list-style-type: none"> <li>• Product property, quotient property, power property, logarithm, common logarithm, natural logarithm</li> </ul>

Additional Information/Resources:

Topic: Probability  
 Subject(s): High School Math

Days: 15  
 Grade(s): 10-12

Know:	Understand:	Do:
<ul style="list-style-type: none"> <li>• Probability</li> <li>• Odds</li> <li>• Combination</li> <li>• Permutation</li> <li>• Independent events</li> <li>• Dependent events</li> <li>• Mutually Exclusive Events</li> <li>• Conditional Probability</li> <li>• Two-way frequency table</li> <li>• Marginal Probability</li> <li>• Intersection Formula</li> <li>• Union Formula</li> </ul>	<p>There are many ways to determine the number of possible outcomes of an event.</p> <p>Probability and Odds can be used to determine the likelihood of an outcome of an event.</p>	<p>Standard - CC.2.4.HS.B.4</p> <p><b>Recognize and evaluate random processes underlying statistical experiments.</b></p> <p>Standard - CC.2.4.HS.B.5</p> <p><b>Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.</b></p> <p>Standard - CC.2.4.HS.B.6</p> <p><b>Use the concepts of independence and conditional probability to interpret data.</b></p> <p>Standard - CC.2.4.HS.B.7</p> <p><b>Apply the rules of probability to compute probabilities of compound events in a uniform probability model.</b></p> <p>A2.2.3.2 Apply probability to practical situations.</p> <p>A2.2.3.2.3 Use probability for independent, dependent, or compound events to predict outcomes.</p> <p>A2.2.3.2.2 Use odds to find probability and/or use probability to find odds.</p> <p>A2.2.3.2.1 Use combinations, permutations, and the fundamental counting principle to solve problems involving probability.</p>

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.

A2.1.1.1.2 Simplify/evaluate expressions involving powers of  $i$  (e.g.,  $i^6 + i^3 = -1 - i$ ).

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.,  $(7 - 3i)(2 + i) = 17 + i$ ).

A2.1.3.2.1 Determine how a change in one variable relates to a change in a second variable (e.g.,  $y = 4/x$ ; if  $x$  doubles, what happens to  $y$ ?).

A2.1.2.2.2 Simplify rational algebraic expressions.

A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g.,  $10/(x + 3) + 12/(x - 2) = 1$  or  $\sqrt{x^2 + 21x} = 14$ ).

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  $y = 3x^2$ ).



# Student Learning Map

Course/Subject: Algebra III/Math  
Topic: Unit 5 - Probability

Days: 15  
Date: 6/2022  
School District: CCSD

Key Learning: There are many ways to determine the number of possible outcomes for an event.  
Probability and Odds can be used to determine the likelihood of an outcome for an event.

Unit Essential Question: How can the possible outcomes for an event be determined? What are the techniques which can be used to determine the likelihood an event will occur?

Concept:  
Probability and Odds

Concept:  
Permutations and Combinations

Concept:  
Probability of Compound Events

Lesson Essential Questions:

- How do you calculate the experimental/theoretical probabilities and odds for simple events?

Lesson Essential Questions:

- How can permutations and combinations be used to count the number of possible outcomes for an event?

Lesson Essential Questions:

- How can I compute the probability that compound events will occur?

Vocabulary:

- Experimental probability, theoretical probability, odds

Vocabulary:

- Permutation, combination

Vocabulary:

- Compound events, independent events, dependent events

Additional Information/Resources:

Topic: Sequences and Series  
Subject(s): Math

Days: 10  
Grade(s): 10-12

Know:

- Arithmetic Sequences
- Geometric Sequences
- Arithmetic Series
- Geometric Series

Understand:

There are different types of sequences and series that can be used in a variety of situations. Formulas can be applied to more quickly find particular terms of a sequence and sums of various series.

Do:

**Standard - CC.2.2.HS.C.3: Write functions or sequences that model relationships between two quantities.**

A2.2.1.1.1 Analyze a set of data for the existence of a pattern, and represent the pattern with a rule algebraically and/or graphically.

**Standard - CC.2.4.HS.B.2**

**Summarize, represent, and interpret data on two categorical and quantitative variables.**

A2.2.1.1.2 Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term).

# Student Learning Map

Name: Michelle Kepner  
Course/Subject: Algebra III  
Topic: Sequences and Series

Days: 10  
Date: 6/2022  
Grades: 10-12

Key Learning: There are different types of sequences and series that can be used in a variety of situations.  
Formulas can be applied to quickly find particular terms of sequence and sums of various series.

Unit Essential Question: How can mathematical patterns be identified and generalized?

<u>Concept:</u> Sequences	<u>Concept:</u> Series	<u>Concept:</u> Area Under a Curve
<u>Lesson Essential Questions:</u> <ul style="list-style-type: none"><li>• How do you identify patterns to derive an expression for the <math>n</math>th term of a sequence?</li><li>• How can I apply formulas to extend arithmetic and geometric sequences?</li></ul>	<u>Lesson Essential Questions:</u> <ul style="list-style-type: none"><li>• How can you apply formulas to find the sum of arithmetic and geometric series?</li></ul>	<u>Lesson Essential Questions:</u> <ul style="list-style-type: none"><li>• What technique can be used to approximate the area under a curve?</li></ul>
<u>Vocabulary:</u> <ul style="list-style-type: none"><li>• Sequence, arithmetic sequence, geometric sequence, <math>n</math>th term</li></ul>	<u>Vocabulary:</u> <ul style="list-style-type: none"><li>• Series, arithmetic series, geometric series, sigma notation</li></ul>	<u>Vocabulary:</u> <ul style="list-style-type: none"><li>• Inscribed rectangle, circumscribed rectangles</li></ul>

Additional Information/Resources: