

Algebra 2 Curriculum

Chambersburg Area School District

Course Map Timeline 2016

Units *Note: unit numbers are for reference only and do not indicate the order in which concepts need to be taught	Suggested Days Traditional Schedule	Suggested Days Block Schedule
Unit 1: Applications of Linear Functions The concepts within this unit are a review of algebra 1. Teachers should give a pre-test to determine how much time to take on each concept.	36 Days	18 Days
Unit 2: Data Analysis and Probability The concepts within this unit are a review of algebra 1. Teachers should give a pre-test to determine how much time to take on each concept.	10 days	5 days
Unit 3: Quadratic Functions	36 Days	18 Days
Unit 4: Polynomial Functions	30 Days	15 Days
Unit 5: Exponential and Logarithmic Function	20 Days	10 Days
Unit 6: Rational and Radical Functions	30 Days	15 Days

Topic: Unit 1 Applications of Linear Functions
Subject(s): Math

Days: T36-B18
Grade(s): 9th, 10th, 11th, 12th

Key Learning:

- **Review and extend the concepts of linear functions, inequalities and systems from Algebra 1.**

Unit Essential Question(s):

- **How can linear functions be used to interpret data and find solutions?**
- **How do we create and solve systems of linear equations and inequalities?**

Concept:	Concept:	Concept:
Linear Functions and Inequalities	Rewriting Formulas	Systems of Equations and Inequalities
CC.2.4.HS.B.2, CC.2.4.HS.B.3, CC.2.2.HS.D.8, CC.2.2.HS.D.10	CC.2.2.HS.D.8	CC.2.4.HS.D.8, CC.2.4.HS.D.10
Lesson Essential Question(s): How do we solve linear equations and inequalities? (ET) How do we distinguish a function from a relation? (ET) How do we graph equations and inequalities? (ET) How do we derive the equation of a line? (ET) How can we fit scatter plot data using linear functions with and without technology? (ET) How do we use linear models to make predictions? (ET)	Lesson Essential Question(s): How can we use the algebraic process to solve a formula for a given variable? (ET) How do we write the equation of a line in slope-intercept, point-slope and standard form? (A) How can we rewrite the equation of a line in standard form? (A)	Lesson Essential Question(s): How are the techniques of substitution, linear combination and graphing used to solve a system of linear equations? (ET) How do we determine the best method to use when solving a linear system? How do we solve a system of linear inequalities? (A)
Vocabulary: Relation, function, domain, range, mapping diagram, vertical line test, independent variable, dependent variable, function notation, x-intercept, y-intercept, standard form, point-slope form, slope-intercept form, Regression, no correlation, linear model, scatterplot, line of best fit, correlation	Vocabulary: Variable, formula	Vocabulary: Equivalent systems, linear combination, substitution, elimination, parallel lines, coinciding lines, linear programming, feasible region, vertices, constraints, objective function, optimization, boundary line

Topic: Unit 2 Data Analysis and Probability
Subject(s): Math

Days: T10-B5
Grade(s): 9th, 10th, 11th, 12th

Key Learning:

- **Review and extend the data analysis and probability concepts learned in Algebra 1**

Unit Essential Question(s):

- **How can we create and analyze different kinds of graphs of data?**
- **How do we calculate the probability of independent and dependent events?**

Concept:	Concept:	Concept:
Data Displays	Probability	Independent and Dependent Events
CC.2.4.HS.B.1, CC.2.4.HS.B.2, CC.2.4.HS.B.3, CC.2.4.HS.B.4, CC.2.4.HS.B.5, CC.2.1.HS.F.3	CC.2.4.HS.B.4, CC.2.4.HS.B.5	CC.2.4.HS.B.6, CC.2.4.HS.B.7
Lesson Essential Question(s): How can we organize data into a table, bar graph, line graph or circle graph? (ET) How can we organize data into a stem-and-leaf plot or histogram? (ET) How do we calculate measures of central tendency? (ET) How can we organize data into a box-and-whisker plot? (ET) How do we read and interpret data from various displays? (ET) How can we recognize misleading graphs and statistics? (ET)	Lesson Essential Question(s): How do we calculate the experimental probability of an event? (ET) How can we use this experimental probability to make predictions? (ET) How do we calculate the theoretical probability of an event? (ET)	Lesson Essential Question(s): What is the difference between an independent and dependent event? (ET) How do we calculate the probability of an independent event? (ET) How do we calculate the probability of a dependent event? (ET)
Vocabulary: Bar graph, line graph, circle graph, stem-and-leaf plot, frequency table, histogram, mean, median, mode, range, outlier, first quartile, third quartile, interquartile range, box-and-whisker plot, random sample	Vocabulary: Experiment, trial, outcome, sample space, even, probability, experimental probability, prediction, equally likely, theoretical probability	Vocabulary: Independent event, dependent event

Topic: Unit 3 Quadratic Functions
Subject(s): Math

Days: T36-B18
Grade(s): 9th, 10th, 11th, 12th

Key Learning:

- **Extend the factoring concepts learned in Algebra 1 to analyze, graph and solve quadratic functions.**

Unit Essential Question(s):

- **How can we use quadratic functions to represent, analyze and solve real-life problems?**
- **How are complex numbers reflected in quadratic functions?**

Concept:	Concept:	Concept:
Graphing Quadratic Functions	Methods of Factoring	Solving Quadratic Equations
CC.2.2.HS.C.1, CC.2.2.HS.C.2, CC.2.2.HS.C.4, CC.2.2.HS.D.7	CC.2.2.HS.D.2, CC.2.2.HS.D.3, CC.2.2.HS.D.5	CC.2.2.HS.C.2, CC.2.2.HS.D.2, CC.2.2.HS.D.5, CC.2.2.HS.D.7, CC.2.2.HS.D.8, CC.2.2.HS.D.9, CC.2.2.HS.D.10, CC.2.1.HS.F.6
Lesson Essential Question(s): How do we transform a quadratic function? (A) How do we describe the effects of changes in the coefficients of a quadratic function in vertex form? (A) How do we define, identify and graph quadratic functions? (A) How can we use maximums and minimums to solve problems? (A) How can we find the domain and range of quadratic functions? (A)	Lesson Essential Question(s): How do we factor a quadratic when it has a greatest common factor? (ET) How do we factor special forms of a quadratic (difference of squares, difference of cubes, sum of cubes)? (A) How do we factor a trinomial when $a = 1$? When $a > 1$? (A) What strategies can we use to factor a polynomial that has more than three terms? (A)	Lesson Essential Question(s): What methods can be used to solve a quadratic equation? (A) How do the solutions of quadratic equations relate to the graph of a quadratic functions? (A) How can we determine a quadratic function from its roots? (A) How can we solve quadratic equations by completing the square? (A) How do we write quadratic equation in vertex form? (ET) How do we use the Quadratic Formula to solve quadratic equations? (ET) How do we classify roots using the discriminant? (A)
Vocabulary: Quadratic function, parabola, vertex of a parabola, vertex form, axis of symmetry, standard form, minimum value, maximum value	Vocabulary: Term, standard form, coefficient, GCF, binomial, trinomial, polynomial, perfect square, perfect cube, grouping, degree	Vocabulary: Zero of a function, root of an equation, binomial, trinomial, completing the square, discriminant

Concept:
Operations with Complex Numbers and Roots
CC.2.2.HS.D.8, CC.2.1.HS.F.6
Lesson Essential Question(s): How are complex and imaginary numbers defined and used? (A) How do we solve quadratic equations with complex roots? (ET) What do complex solutions tell us about the graph of a quadratic function? (A) How do we perform operations with complex numbers? (A)
Vocabulary: Imaginary unit, imaginary number, complex number, real part, imaginary part, complex conjugate, complex plane, absolute value of a complex number

Topic: Unit 4 Polynomial Functions
Subject(s): Math

Days: T30-B15
Grade(s): 9th, 10th, 11th, 12th

Key Learning:

- **Write, solve, and graph polynomial functions and equations and use them to model relationships between quantities.**

Unit Essential Question(s):

- **How do we analyze, evaluate, and graph polynomial functions?**

Concept:	Concept:	Concept:
Polynomials and Polynomial Operations	Factoring Polynomials	Roots of Polynomial Functions
CC.2.2.HS.C.2, CC.2.2.HS.D.2, CC.2.2.HS.D.3, CC.2.2.HS.D.5	CC.2.2.HS.D.2, CC.2.2.HS.D.3, CC.2.2.HS.D.5	CC.2.2.HS.D.4, CC.2.2.HS.D.5, CC.2.2.HS.D.8, CC.2.2.HS.D.9, CC.2.2.HS.D.10
Lesson Essential Question(s): How do we identify, evaluate, add and subtract polynomials? (A) How do we classify and graph polynomials? (A) How do we multiply polynomials? (A) How do we use binomial expansion? (A) How do we use long division and synthetic division to divide polynomials? (A)	Lesson Essential Question(s): What methods can be used to factor a polynomial? (A) How can we use special patterns of polynomials to factor? (A) How can we solve a polynomial by factoring? (A)	Lesson Essential Question(s): How do we identify the multiplicity of roots? (A) How can we use to Rational Root Thm. And the Irrational Root Thm. to solve polynomial equations? (A) What is the Fundamental Thm. of Algebra and how use it to write polynomial equations? (A) How do we identify all the roots of a polynomial equation? (A)
Vocabulary: Synthetic division	Vocabulary:	Vocabulary: multiplicity

Concept:

Investigating Graphs of Polynomial Functions

CC.2.2.HS.C.1, CC.2.2.HS.C.2, CC.2.2.HS.C.3, CC.2.2.HS.C.4, CC.2.2.HS.C.6, CC.2.2.HS.D. 4, CC.2.2.HS.D.7, CC.2.1.HS.F.3, CC.2.1.HS.F.7

Lesson Essential Question(s):

How can we use properties of end behavior to analyze, describe and graph polynomial functions? (A)

How can we use maxima and minima of polynomial functions to solve problems? (A)

How can we transform polynomial functions? (A)

Vocabulary:

End behavior, turning point, local maximum, local minimum

Topic: Unit 5 Exponential and Logarithmic Functions
 Subject(s): Math

Days: T20-B10
 Grade(s): 9th, 10th, 11th, 12th

Key Learning:

- **Graph exponential functions and their applications to growth and decay. Logarithmic functions are the inverses of exponential functions.**

Unit Essential Question(s):

- **What are the relationships between exponents, logarithms, exponential functions and logarithmic functions?**
- **How are these relationships useful?**

Concept:	Concept:	Concept:
Exponential Functions: Growth & Decay	Inverses of Relations & Functions	Logarithmic Functions
CC.2.2.HS.C.2, CC.2.2.HS.C.3, CC.2.2.HS.C.6, CC.2.1.HS.D.2, CC.2.2.HS.D.7, CC.2.1.HS.F.1, CC.2.2.HS.F.3	CC.2.2.HS.C.1, CC.2.2.HS.C.4, CC.2.2.HS.D.8, CC.2.2.HS.D.9, CC.2.2.HS.D.10	CC.2.2.HS.C.2, CC.2.2.HS.C.6, CC.2.1.HS.D.2, CC.2.2.HS.D.7, CC.2.2.HS.D.8 CC.2.1.HS.F.1, CC.2.1.HS.F.3
Lesson Essential Question(s): How can we write, evaluate, and graph exponential expressions to model growth and decay situations? (A) What are the similarities and differences between exponential growth and decay functions? (A) How do we model real-world data using growth and decay functions? (A)	Lesson Essential Question(s): How can we recognize inverses of relations and functions? (A) How do we find the inverse of a functions? (A) How do the graphs of functions and their inverses compare? (A) How do we determine whether the inverse of a function is a function? (A) What are the rules for inverses of functions? (A) How do we prove two functions are inverses of each other? (A)	Lesson Essential Question(s): How do we write equivalent forms of exponential and logarithmic functions? (A) How can we evaluate logarithmic functions? (A) What are the characteristics of the graph of a logarithmic function? (A) How can we simplify logarithmic expressions? (A) How do we translate between logarithms in any base? (A)
Vocabulary: Exponential function, base, asymptote, exponential growth, exponential decay	Vocabulary: Inverse relation, inverse function, one-to-one function	Vocabulary: Logarithm, common logarithm, logarithmic function

Concept:	Concept:
Exponential & Logarithmic Equations	The Natural Base, e
CC.2.2.HS.D.2, CC.2.2.HS.D.8, CC.2.2.HS.D.9, CC.2.2.HS.D.10, CC.2.1.HS.F.1	CC.2.2.HS.C.2, CC.2.2.HS.C.6, CC.2.1.HS.D.2, CC.2.1.HS.D.7, CC.2.1.HS.F.1, CC.2.1.HS.F.3
Lesson Essential Question(s): How do we solve exponential equations? (A) How do we solve logarithmic equations? (A) What relationship do exponential and logarithmic equations have? (A)	Lesson Essential Question(s): What is the number e ? (A) How do we use the number e to write and graph exponential functions in real-world scenarios? (A) How can we solve problems involving e or natural logarithms? (A)
Vocabulary: Exponential equation, logarithmic equation	Vocabulary: Natural logarithm, natural logarithmic function

Topic: Unit 6 Rational and Radical Functions
Subject(s): Math

Days: T30-B15
Grade(s): 9th, 10th, 11th, 12th

Key Learning:

- Operations with rational expressions follow the same rules as operations with fractions. Graphs of rational functions and solutions of rational equations have some unique features that relate to the denominator.**

Unit Essential Question(s):

- What are the characteristics of rational functions and how do they apply to real-life problems?**

Concept:	Concept:	Concept:
Variation Functions	Operations with Rational Expressions	Radical Expressions & Rational Exponents
CC.2.2.HS.D.8, CC.2.2.HS.D.10	CC.2.2.HS.D.2, CC.2.2.HS.D.3, CC.2.1.HS.F.1	CC.2.1.HS.D.2, CC.2.2.HS.D.6, CC.2.1.HS.F.1
Lesson Essential Question(s): What is direct, inverse, joint and combined variation? (A) How do we solve problems involving them? (A)	Lesson Essential Question(s): How can we simplify rational expressions? (A) How do we multiply and divide rational expressions? (A) How do we add and subtract rational expressions? (A) How do we simplify complex fractions? (A)	Lesson Essential Question(s): How can we rewrite radical expressions using rational exponents? (A) How do we simplify radical expressions and expressions containing rational exponents? (A) How do we evaluate radical expressions and expressions containing rational exponents? (A)
Vocabulary: Direct variation, constant of variation, joint variation, inverse variation, combined variation	Vocabulary: Rational expression, complex fraction	Vocabulary: Index, rational exponent

Concept:
Radical & Rational Equations
CC.2.2.HS.C.4, CC.2.2.HS.C.6, CC.2.2.HS.D.7, CC.2.2.HS.D.8, CC.2.2.HS.C.9, CC.2.2.HS.C.10
Lesson Essential Question(s): How do we solve radical equations? (A) How do we solve rational equations? (A)
Vocabulary: Radical function, square-root function, radical equation, rational function, discontinuous function, continuous function, hole (in a graph), rational equation, extraneous solution