# Applied Math II

**Course Description**

This course will include operations on real numbers, solve equations and inequalities, analyze various forms of functions (linear, quadratic, absolute value, exponential and sequences) and use introductory statistics to organize and make predictions. This course is the foundation for further mathematical understanding.

**Scope And Sequence**

| Timeframe | Unit | Instructional Topics |
|---|---|---|
| 5 Week(s) | Linear Equations and Functions | 1. Graphing linear equations<br>2. Writing linear equations<br>3. Solving and Graphing linear inequalities<br>4. Systems of linear equations and inequalities |
| 2 Week(s) | Exponents and Exponential Functions | 1. Properties of Exponents<br>2. Graphing Exponential Functions |
| 5 Week(s) | Polynomial Expressions, Functions and Equations | 1. Operations with Polynomials and Factoring<br>2. Quadratic Equations and Functions |
| 3 Week(s) | Radicals & Rationals | 1. Operations on Rational Expressions and Solving Rational Equations |
| 3 Week(s) | Statistics | 1. Probability<br>2. Data Analysis and Data Displays |

**Course Rationale**

In alignment with State of Missouri Learning Standards, the Pettis County RV School District's Mathematics courses provide students with a solid foundation in number sense while building to the application of more demanding math concepts and procedures. The courses focus on procedural skills and conceptual understandings to ensure coherence and depth in mathematical practices and application to real world issues and challenges.

**Enduring Understandings**

Functions model real world situations.
The graph of a function is a tool that can be used to solve equations and inequalities.
Algebraic expressions have similar properties and operations as numbers.
Statistics and probability are tools used to make predictions in the real world.

**Key Resources**

Holt McDougal - Larson 2011 Algebra I
Classzone.com

**Board Approval Date**

## Course Details

**Unit:** Linear Equations and Functions **Duration:** 5 Week(s)

**Unit Overview**

Graphing linear functions will be covered using various techniques. Equations to representing lines will be written. Linear equalities in one variable will be solved. Systems of linear equations and inequalities will be solved.

**Enduring Understandings**

A linear equation can be represented graphically in the coordinate plane as a continuous or discrete relationship.

Any two points determine a unique linear function.

The solution to linear inequalities is a set of numbers or a set of ordered pairs.

The solution to a system of linear equations or linear inequalities is the shared points.

**Essential Questions**

How is an equation translated into a graph?

How is an equation written to represent a line?

How are the solution sets of linear inequalities found?

How are the shared point(s) of a linear system of equations or inequalities found, if they exist?

**Example Assessment Items**

Given a linear equation, the student can produce a graphical representation using the slope, intercepts, or tables.

Given two points, point and slope, arithmetic sequence, graph of a line, or a verbal description, the student can write a symbolic representation of the linear relationship.

Given linear inequalities in one or two variables, the student can find and represent graphically the solution sets.

Given a linear system of equations or inequalities, the student can find the solutions.

**Academic Vocabulary**

Function
Inequalities
Slope/rate of change
Point slope
Proportions
Range
Real numbers
Slope-intercept
System of equations(solutions)
Vertex

**Topic:** Graphing linear equations **Duration:** 0 Day(s)

**Learning Targets**

# Applied Math II

Grade(s) 10th, 1 Credit
Required Course

- CEDAlg1.A2 Create and graph linear, quadratic and exponential equations in two variables.
- CEDAlga.A3 Represent constraints by equations or inequalities and by systems of equations or inequalities, and interpret the data points as a solution or non-solution in a modeling context.
- DSAlg1.A1 Analyze and interpret graphical displays of data.
- BFAlg1.A1 Analyze the effect of translations and scale changes on functions.
- CEDAlg1.A4 Solve literal equations and formulas for a specified variable that highlights a quantity of interest.

**Topic:** Writing linear equations **Duration:** 0 Day(s)

**Learning Targets**

- DSAlg1.A6 Interpret the slope (rate of change) and the y-intercept (constant term) of a linear model in the context of the data.
- DSAlg1.A7 The student will write equations of parallel and perpendicular lines.
- 05c. The student will apply the distance and midpoint formulas.
- 05d. The student will perform linear regression on various data and use the linear models to make predictions.

**Topic:** Solving and Graphing linear inequalities **Duration:** 0 Day(s)

**Learning Targets**

- 06a. The student will solve linear inequalities and graph solutions on a number line.
- 06b. The student will write and solve compound inequalities and graph solutions on a number line.
- 06c. The student will solve absolute value equations and inequalities, and graph absolute value functions.
- 6d. The student will graph linear inequalities in two variables.

**Topic:** Systems of linear equations and inequalities **Duration:** 0 Day(s)

**Learning Targets**

- 07a. The student will write systems of equations to model real world situations and solve these systems by graphing, substitution and elimination.
  - This includes systems with no solution and infinite solutions.
- 07b. The student will graph and analyze piecewise functions.
- 07c. The student will solve systems of linear inequalities.

## Unit: Exponents and Exponential Functions **Duration:** 2 Week(s)

**Unit Overview**

The properties of exponents will be extended to include zero and negative integers. Simple rational numbers as exponents will be defined. Geometric sequences will be used as a foundation for understanding exponential functions.

**Enduring Understandings**

The properties of exponents are logical extensions of the definition of exponents.

A geometric sequence is a discrete form of an exponential function.

Exponential functions can be used to model real world situations, including both growth and decay.

**Essential Questions**

How are the properties of exponents used to simplify and evaluate expressions, including expressions with rational exponents?

Why is a geometric sequence a discrete function?

How does the formula of an exponential function determine if the function is modeling growth or decay?

**Example Assessment Items**

Given expressions with rational exponents, the student can rewrite in simplified form using only positive exponents, and when appropriate can evaluate exponential expressions.

Given a geometric sequence in table, graphical, recursive, explicit, or verbal form, the student can generate any of other forms with an

emphasis on the graph being discrete.

Given a exponential growth or decay situation, the student can write, graph, and explain the attributes of the function.

**Academic Vocabulary**

Factoring
Laws of exponents
Radical
Range
Real numbers

**Topic:** Properties of Exponents **Duration:** 0 Day(s)

**Learning Targets**

- LQEAlg1.A2 Describe, using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.
- BFAlg1.A1 Analyze the effect of translations and scale changes on functions.

**Topic:** Graphing Exponential Functions **Duration:** 0 Day(s)

**Learning Targets**

- LQEAlg1.B1 Write arithmetic and geometric sequences in recursive and explicit forms, and use them to model situations and translate between the two forms.
- LQEAlg1.B2. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the set of integers.

## Unit: Polynomial Expressions, Functions and Equations **Duration:** 5 Week(s)

**Unit Overview**

Polynomials will be simplified using the basic operations and they will be factored. Factoring will be used to solve polynomial equations. In addition, on quadratic equations square roots, completing the square, and quadratic formula will be used to find the real solutions. Quadratic functions will be graphed and analyzed.

**Enduring Understandings**

The operations on polynomials parallel the operations on real numbers and factoring polynomials parallel the factoring of real numbers.

The real solutions of a quadratic equation are the x-intercepts of the related function.

Functions can be classified from tables, graphs, and equations.

**Essential Questions**

How are the operations applied to polynomials?

How is a polynomial expression factored completely?

How are the solutions to a quadratic equation found?

How are quadratic functions graphed?

**Example Assessment Items**

Given polynomial expressions, the student can use the indicated operations to simplify.

Given a polynomial expression, the student can factor completely including the special patterns.

Given a quadratic equation, the student can find real solution(s) using factoring, square roots, completing the square, or the quadratic formula.

Given a quadratic function in vertex or standard form, the student can graph by finding vertex, using the line of symmetry, and transformations.

**Academic Vocabulary**

Domain
Function
Like terms
Polynomial distribution
Polynomials
Quadratic equation
Real numbers
Vertex

**Topic:** Operations with Polynomials and Factoring **Duration:** 0 Day(s)

Learning Targets

- APR.Alg1.A1 Add, subtract and multiply polynomials, and understand that polynomials follow the same general rules of arithmetic and are closed under these operations.
- APR.Alg1.A2 Divide polynomials by monomials.
- SSE.Alg1.A2 Analyze the structure of polynomials to create equivalent expressions or equations.

**Topic:** Quadratic Equations and Functions **Duration:** 0 Day(s)

**Learning Targets**

- IF.Alg1.B2 Relate the domain and range of a function to its graph and, where applicable, to the quantitative relationship it describes.
- IF.Alg1.B3 Determine the average rate of change of a function over a specified interval and interpret the meaning.
- IF.Alg1.B4. Interpret the parameters of a linear or exponential function in terms of the context.
- IF.Alg1.C2 Translate between different but equivalent forms of a function to reveal and explain properties of the function and interpret these in terms of a context.
- IF.Alg1.C3 Compare the properties of two functions given different representations.

## Unit: Radicals & Rationals

**Duration:** 3 Week(s)

Radicals will be simplified and radical equations will be solved. The basic operations will be applied to rational expressions and rational equations will be solved.

**Enduring Understandings**

Irrational numbers are measurements in real world applications.

The definition of the square root function result in some radical equations having no solution.

Operations on rational expressions parallel operations on numerical fractions.

Solving a rational equation requires rewriting the equation to form a linear or quadratic equation.

**Essential Questions**

How are the Pythagorean Theorem and the distance formula related?

Why does solving radical equations at times result in extraneous solutions?

Why is it necessary to find a common denominator when adding and subtracting but not when multiplying and dividing?

How is a rational equation rewritten to form a simple linear or quadratic equation?

**Example Assessment Items**

Given a problem involving a right triangle, the student can apply the Pythagorean Theorem to solve for the unknown values, giving exact or approximate answers.

Given a radical equation, the student can solve and check all possible solutions.

Given rational expressions, the student can perform indicated operations and simplify the resulting expression.

Given rational equations, the student can solve for the indicated variable and state the restrictions on the domain.

**Academic Vocabulary**

Domain
Factoring
Like terms
Proportions
Pythagorean Theorem
Quadratic equation
Radical
Radical
Real numbers

**Topic:** Operations on Rational Expressions and Solving Rational Equations **Duration:** 0 Day(s)

**Learning Targets**

- NQAlg1.A1 T Explain how the meaning of rational exponents extends from the properties of integer exponents.
- NQ.Alg1.A2 Rewrite expressions involving radicals and rational exponents using the properties of exponents. Limit to rational exponents with a numerator of 1.

- LQE.Alg1.A1. Distinguish between situations that can be modeled with linear or exponential functions.
  - Determine that linear functions change by equal differences over equal intervals.
  - Recognize exponential situations in which a quantity grows or decays by a constant percent rate per unit interval.
- LQE.Alg1.A2 Describe, using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.
- LQE.Alg1.B1 Write arithmetic and geometric sequences in recursive and explicit forms, and use them to model situations and translate between the two forms.
- LQE.Alg1.B2 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the set of integers.
- LQE.Alg1.B3 Find the terms of sequences given an explicit or recursive formula.

## Unit: Statistics

**Duration:** 3 Week(s)

**Unit Overview**

Statistics and probability are tools used to solve many mathematical situations and make predictions in the real world.

**Enduring Understandings**

Counting methods can be used to determine possible outcomes as well as the likelihood of an event occurring.

Measures of central tendency can be used to quantify sets of data.

Data displays are organizational tools to assist in analysis of real world information.

**Essential Questions**

How can probability be used to make predictions or draw conclusions?

How are measures of central tendency used to quantify data?

How can it be determined which data display is the best tool to analyze a set of data?

**Example Assessment Items**

Given a probability situation, the student can use a permutation or combination to predict the probability of an outcome.

Given a set of data, the student can apply statistical measures of center to solve problems.

Given a set of data, the student can select and construct an appropriate display to represent the data.

**Academic Vocabulary**

Range
Real numbers

### Topic: Probability

**Duration:** 0 Day(s)

**Learning Targets**

13a. The student will find probabilities involving permutations, combinations or compound events, and convert the probabilities to odds.

### Topic: Data Analysis and Data Displays

**Duration:** 0 Day(s)

**Learning Targets**

- DS.Alg1.A1 Analyze and interpret graphical displays of data.
- DS.Alg1.A2 Use statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets.
- DS.Alg1.A3 Interpret differences in shape, center and spreads in the context of the data sets, accounting for possible effects of outliers.
- DS.Alg1.A4 Summarize data in two-way frequency tables.
  - Interpret relative frequencies in the context of the data.
  - Recognize possible associations and trends in the data.
- DS.Alg1.A5 Construct a scatter plot of bivariate quantitative data describing how the variables are related; determine and use a function that models the relationship.
  - Construct a linear function to model bivariate data represented on a scatter plot that minimizes residuals.
  - Construct an exponential function to model bivariate data represented on a scatter plot that minimizes residuals.
- DS.Alg1.A6 Interpret the slope (rate of change) and the y-intercept (constant term) of a linear model in the context of the data.
- DS.Alg1.A7 Determine and interpret the correlation coefficient for a linear association.
- DS.Alg1.A8 Distinguish between correlation and causation.