

River Dell Regional School District

Mathematics Curriculum

Table of Contents

[Pre-Algebra](#)

[Foundations of Algebra](#)

[Sequential Math](#)

[Algebra I](#)

[Geometry](#)

[Intermediate Algebra](#)

[Algebra II](#)

[Trigonometry](#)

[Pre-Calculus](#)

[Calculus](#)

PRE-ALGEBRA
Year Course/5 Credits
Grade: 8

I Rationale

The eighth grade Pre Algebra course is designed to prepare students for future studies of Algebra and Geometry. Previously studied mathematical topics will be refined and enhanced. Students will focus on process-oriented goals, which include problem solving, communications of mathematical concepts, mathematical reasoning, and connections with different strands of math and real-life problems. One of the main objectives of the Pre Algebra course is for students to master solving multi-step equations and inequalities. Students will be exposed to linear systems. Other topics of study will include real numbers, number theory, data analysis/statistics, geometry, probability, discrete math, and functions in compliance with the standards set forth by New Jersey's Core Curriculum Standards and National Council of Teachers of Mathematics.

II Goals

Goals for this course include development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

1. To evaluate algebraic expressions, including expressions with whole numbers, fractions, decimals, and integers. **4.1.8.A.1-6; 4.3.8.A.1**
2. To use the order of operations to compute and evaluate expressions. **4.3.8.D.3-4**
3. To simplify numerical and algebraic expressions involving the distributive property. **4.3.8.D.3-4**
4. To understand the concept of a power and to apply the rules of exponents in order to simplify an expression. **4.1.8.A.2; 4.1.8.B.2; 4.1.8.C.1**
5. To recognize, describe, extend, and create patterns involving whole numbers, rational numbers, and integers. **4.3.8.A.1; 4.3.8.C.2**

6. To perform arithmetic operations on signed numbers, including addition, subtraction, multiplication, and division. **4.1.8.A.1; 4.1.8.B.1**
7. To use symbolic algebraic expressions and equations to represent real world situations. **4.3.8.C.1-2; 4.5.C.1**
8. To understand and apply the properties of operations, numbers, linear equations, and linear inequalities. **4.1.8.C.1; 4.1.8.A.2; 4.3.8.D.4**
9. To solve simple equations involving one variable. **4.3.8.D.2**
10. To understand and apply the properties of polygons, including triangles, quadrilaterals, and regular polygons. **4.2.8.A.1-2; 4.5.C.3**
11. To select and interpret appropriate representations for sets of data, including but not limited to pictographs, bar graphs, line graphs, frequency tables, histograms, stem-and-leaf plots, box-and-whisker plots, scatter plots, and circle graphs. **4.4.8.A.1-2; 4.5.C.1-4**
12. To find the mean, median, mode, and range of a set of data and interpret their meaning. **4.4.8.A.1-2; 4.5.C.1-4**
13. To identify basic geometric figures, including points, lines, rays, angles, and polygons. **4.2.8.A.1-3**
14. To understand and apply transformations, including translations, reflections, rotations, and dilations. **4.2.8.B.1; 4.2.8.C.1-2**
15. Understand and use the coordinate plane. **4.2.8.C.1-2**
16. Understand and use ratios, proportions, and percents, including percents greater than 100 and less than 1, in a variety of situations. **4.1.8.A.3; 4.1.8.A.4-5**
17. To understand and apply the concept of area, perimeter, and circumference. **4.2.8.E.1; 4.5.C.1-2**
18. To find the probability and the odds of a simple event or of a compound event. **4.4.8.B.1-4**
19. To use the counting principle or apply techniques of systematic listing, counting, and reasoning in a variety of different contexts. **4.4.8.C.1-3; 4.5.C.1-3**
20. To solve simple linear equations and inequalities written with one variable algebraically and graphically. **4.3.8.D.2; 4.5.C.1**
21. To develop strategies to find the surface area and volume of three dimensional figures. **4.2.8.E.2; 4.5.C.1-3**

22. To understand and to apply the process of simplifying polynomials through addition, subtraction, and/or multiplication by a monomial. **4.3.8.D.4**
23. To analyze linear equations with two variables through the coordinate plane. **4.3.8.B.1**

IV Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Real World Applications
- c. Class work and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- a. Textbook: Pre Algebra (Holt)
- b. Calculators
- c. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

1. To evaluate algebraic expressions, including expressions with whole numbers, fractions, decimals, and integers.
 - To evaluate algebraic expressions by substituting integers, fractions, and decimals as values of the variables.
2. To use the order of operations to compute and evaluate expressions.
 - To recognize the appropriate procedure in order to solve a multi-step expression or equation
3. To simplify numerical and algebraic expressions involving the distributive property.

4. To understand the concept of a power and to apply the rules of exponents in order to simplify an expression.
5. To recognize, describe, extend, and create patterns involving whole numbers, rational numbers, and integers.
6. To perform arithmetic operations on signed numbers, including addition, subtraction, multiplication, and division.
7. To use symbolic algebraic expressions and equations to represent real world situations.
 - To translate verbal phrases and real-life situations into algebraic expressions and equations.
8. To understand and apply the properties of operations, numbers, linear equations, and linear inequalities.
9. To solve simple equations involving one variable.
 - To solve multi-step equations involving integers, decimals, and fractions.
 - To solve multi-step equations involving simplifying by combining like terms, distributive property.
 - To solve multi-step equations with non-integer coefficients
 - To solve one step / multi-step equations with non-integer solutions
10. To understand and apply the properties of polygons, including triangles, quadrilaterals, and regular polygons.
 - Identify the classifications of polygons
 - Identify the classifications of triangles by sides and by angles.
 - Identify the classifications of quadrilaterals and their properties and apply that knowledge to compute the missing angles and sides of quadrilaterals.
 - Understand and compute the sum of the angles of any polygon and apply that knowledge to find the missing angle of any given polygon.
 - Identify the diagonals and compute the number of diagonals of any polygon.
11. To select and interpret appropriate representations for sets of data, including but not limited to pictographs, bar graphs, line graphs, frequency tables, histograms, stem-and-leaf plots, scatter plots, and circle graphs.
 - To interpret the information/data on bar graphs, line graphs, frequency tables, histograms, stem-and-leaf plots, box, scatter plots, and circle graphs.
 - To construct any of the graphs listed above given a set of data.
 - To choose the most appropriate graph given a situation.
 - To analyze the data and present a convincing argument whether or not the information is misleading.
12. To find the mean, median, mode, and range of a set of data and interpret their meaning.

- To calculate the mean, median, mode, and range of a set of data involving integers and decimals.
 - To calculate the mean, median, mode, and range of a set of data from stem-and-leaf plots and frequency tables
 - To recognize the most appropriate measure of central tendency given a set of data.
13. To identify basic geometric figures, including points, lines, rays, angles, and polygons.
- To identify the basic geometric figures.
 - To identify the classifications of angles, compute the complement and/or supplement of a given angle, draw, and measure angles.
 - Identify parallel and perpendicular lines and use their properties to compute missing angles and sides of polygons.
14. To understand and apply transformations, including translations, reflections, rotations, and dilations.
- To recognize the different types of transformations.
 - Given a figure, perform the various types of transformations.
15. Understand and use the coordinate plane.
- To plot given ordered pairs on the coordinate plane.
 - To identify the four quadrants of the coordinate plane.
16. Understand and use ratios, proportions, and percents, including percents greater than 100 and less than 1, in a variety of situations.
- To represent rates and ratios given a situation.
 - To simplify rates and ratios.
 - To use proportions to solve word problems.
 - To solve percent problems using both the equation method and the proportion method.
 - To find the percent of increase and percent of decrease.
17. To understand and apply the concept of area, perimeter, and circumference.
- To compute the perimeter of regular and irregular polygons.
 - To compute the area of triangles, quadrilaterals, circles, and irregular polygons and understand the basis of the formulas.
 - To compute the circumference of a circle given the radius or diameter and vice versa.
 - Given a figure, calculate the perimeter/area of its congruent and similar figure.
 - Find the area of the shaded region of a figure containing a polygon and a circle and one of them is shaded.
18. To find the probability and the odds of a simple event or of a compound event.
- To understand the difference between probability and odds.
 - To find the probability of the odds in favor of a simple event.

- To find the probability of a compound event, independent and dependent.
19. To use the counting principle or apply techniques of systematic listing, counting, and reasoning in a variety of different contexts.
- Create and interpret tree diagrams.
 - Recognize the correlation between tree diagrams and the Counting Principle.
 - Use the Counting Principle to compute the sample space and the probability of compound events.
20. To solve simple linear equations and inequalities written with one variable algebraically and graphically.
21. To develop strategies to find the surface area and volume of three dimensional figures.
- To identify types of three dimensional figures.
 - To understand and to apply the appropriate formula for a given figure to calculate surface area and volume of prisms and cylinders.
22. To understand and to apply the process of simplifying polynomials through addition, subtraction, and/or multiplication by a monomial.
- To simplify polynomials by adding and/or subtracting like terms
 - To write polynomials in standard form.
 - To multiply a monomial with a polynomial.
 - To understand and to apply the Product of Powers Rule and Quotient of Powers Rule.
23. To analyze linear equations with two variables through the coordinate plane.
- To understand and identify the slope, y -intercept, and x -intercept of a line.
 - To graph a linear equation.

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- Examples of
- Evaluate $-5\frac{2}{3}t$ for $t = \frac{5}{8}$
 - Mrs. Smith wants to put a fence around 3 sides of a square garden that has an area of 225 sq. feet. How much fencing does she need?
 - A cylinder has a volume of 1205.8 cubic inches and a height of 24 inches. Find the radius.
- b. Real World Applications, Examples of

- Teresa has taken three tests worth 100 points each. Her scores are 85, 93, and 88. She has one test left to take. What score does she need on the fourth test to get an average of 90?
 - The world's tallest Ferris wheel is in Osaka, Japan, and stands 369 feet tall. Its circumference is 1029.9 feet. How high does this Ferris Wheel stand?
 - Contestants in a festival game have a 2% chance of winning \$5, a 8% chance of winning \$1, a 15% chance of winning \$0.50, and 20% chance of winning \$0.25. What is the probability of not winning anything?
- c. Class work and class participation
- Utilize the Guided Practice exercises in the textbook to assess student proficiency after the initial instruction has been provided.
 - Utilize exploration worksheets as a lead into the development of a new skill or understanding of a new concept.
 - Utilize a problem of the day for introduction, reinforcement, or extension.
 - Journal writing to communicate knowledge of concepts, skills, or procedures. This writing is also an opportunity to comment on area of concern.
- d. Homework assignments
- Assign problems from textbook
 - Writing samples as a form of communicating the solution to a problem.
 - Worksheets
 - Online assignments such as lessons from RM Framework
 - Correcting assessments once they have been scored and returned to students.
- e. Attendance in conformance with River Dell Board of Education policy

FOUNDATIONS OF ALGEBRA

Year Course/5 Credits

Grade: 8

I Rationale

This course is designed to provide students with a strong understanding of algebra, as well as other strands of mathematics. The algebraic structure of the real number system will be reviewed and extended. The basic properties of this algebraic structure will be applied to the study of equations, inequalities, and polynomials. Students will master graphing of equations and inequalities. Topics will include a study of factoring, operations with polynomials, linear systems, properties of exponents and radicals.

II Goals

Goals for this course include development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

1. Represent and use numbers in a variety of equivalent forms (integers, fractions, decimals, percent, square root, exponential/scientific notation, calculator display). **4.1.8.A.1-2, 4-6**
2. Understand and apply the properties of the real numbers, including operations with signed numbers. **4.1.8.A.1, 4.1.8.B.1-2**
3. Understand the concept of variable and use of variables. **4.3.8.C.1, 4.5.8.B.4, 4.5.8.E.1-3**
4. Understand and use mathematical language, notation and structure to represent ideas, describe relationships, and model situations. **4.3.8.B.1-2, 4.3.8.C.1-2**
5. Represent situations and number patterns with tables, graphs, verbal rules, and equations and understand the interrelationships of these representations. **4.3.8.B.1-2, 4.3.8.C.2, 4.5.8.A.1-3, 4.5.8.E.1-3**

6. Analyze tables and graphs to identify properties and relationships. **4.3.8.B.2, 4.3.8.C.2, 4.4.8.A.1-4**
7. Formulate, simplify and evaluate algebraic expressions. **4.3.8.D.1**
8. Use algebraic expressions to represent mathematical situations. **4.3.8.C.1, 4.5.8.C.4, 4.5.8.E.2**
9. Understand the process of solving linear equations and inequalities in one or two variables and, where appropriate, represent their solution graphically. **4.3.8.B.1-2, 4.3.8.D.2**
10. Perform operations on and simplify polynomial expressions. **4.1.8.A.3, 4.1.8.B.1-4, 4.3.8.D.1**
11. Apply skill in factoring polynomial expressions. **4.3.8.D.1-2**
12. Apply the process of solving problems using equations and inequalities. **4.3.8.B.1-2, 4.3.8.C.1-2, 4.3.8.D.1-3**
13. Apply algebraic methods to solve a variety of real-world and mathematical problems. **4.5.8.C.1-5**
14. Represent and analyze linear relationships among a table of values, an algebraic formula, a written statement and a graph, including the concepts of slope and intercept. **4.3.8.B.2, 4.3.8.C.1-2, 4.5.8.F.1-3**
15. Understand the process of solving linear equations in two variables by elimination, substitution, or graphing. **4.3.8.B.2, 4.5.8.C.2, 4.5.8.F.4**
16. Construct, interpret and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations. **4.3.8.C.1-2, 4.4.8.A.2-4, 4.5.8.C.3, 4.5.8.E.1**
17. Represent and solve problems using geometric models. **4.2.8.A.1-3**
18. Apply algebraic techniques to geometric problems involving perimeter and area. **4.2.8.E.1-3, 4.3.8.D.3**
19. Do basic probability and odds problems for simple events and compound events. **4.4.8.B.1-4**
20. Make predictions based on experimental or mathematical probabilities. **4.4.8.B.5-6**
21. Perform operations on and simplify rational expressions. **4.1.8.A.3, 4.1.8.B.1-4, 4.3.8.D.1**

IV Methods of Evaluation

- f. Teacher constructed and/or standardized examinations, tests, and quizzes
- g. Real World Applications
- h. Class work and class participation
- i. Homework assignments
- j. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- d. Textbook: *Holt Algebra 1*
- e. Calculators
- f. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

1. Represent and use numbers in a variety of equivalent forms (integers, fractions, decimals, percent, square root, exponential/scientific notation, calculator display).
 - Recognize the equivalent forms of a number
 - Convert from one form to another
2. Understand and apply the properties of the real numbers, including operations with signed numbers.
 - State and apply the properties of arithmetic, properties of equality, and the properties of inequalities
 - State and apply the rules of signed numbers for basic operations
3. Understand the concept of variable and use of variables.
 - Recognize that a variable can represent an unknown value(s)
 - Utilize a variable as a symbol for a set of known values
4. Understand and use mathematical language, notation and structure to represent ideas, describe relationships, and model situations.
 - Translate between words and algebra

- Using graphs, charts, and equations explain how a change in one quantity can result in a change in another
5. Represent situations and number patterns with tables, graphs, verbal rules, and equations and understand the interrelationships of these representations.
 - Use manipulatives, tables, graphs, verbal rules, algebraic sentences to model situations
 - Graph functions and understand their general behavior
 - Learn mathematics through problem solving, inquiry, and discovery
 6. Analyze tables and graphs to identify properties and relationships.
 - Recognize and describe the difference between linear and exponential growth
 - Use patterns, relations, symbolic algebra, and linear functions to model situations
 7. Formulate, simplify and evaluate algebraic expressions.
 - Use graphing techniques on a number line
 8. Use algebraic expressions to represent mathematical situations.
 - Apply mathematics in practical situations and in other disciplines
 - Select, apply, and translate among mathematical representations to solve problems
 9. Understand the process of solving linear equations and inequalities in one and two variables and, where appropriate, represent their solution graphically.
 - Solve simple linear equations or inequalities informally, graphically, and using formal algebraic methods
 - Graph functions, and understand and describe their behavior
 10. Perform operations on and simplify polynomial expressions.
 - Use and explain procedures for performing calculations with all real number types
 - Use manipulatives to demonstrate the simplification of expressions
 11. Apply skill in factoring polynomial expressions.
 - Demonstrate proficiency in factoring by grouping
 - Demonstrate proficiency in factoring perfect square trinomials
 - Demonstrate proficiency in factoring the difference of two squares
 12. Apply the process of solving problems using equations and inequalities.
 - Use the graph of an equation involving two variables to represent solutions
 - Analyze functional relationships from graphs, charts, and equations

- Solve linear equations using formal algebraic methods
13. Apply algebraic methods to solve a variety of real-world and mathematical problems.
 - Recognize recurring themes across mathematical domains
 - Use connections among mathematical ideas to explain concepts
 - Apply mathematics in practical situations and in other disciplines
 14. Represent and analyze linear relationships among a table of values, an algebraic formula, a written statement and a graph, including the concepts of slope and intercept.
 - Use tables, graphs, and equations to recognize and describe differences between functions
 - Using tables, graphs, and equations explain how a change in one quantity influences the change in another quantity
 - Use technology to gather, analyze, and communicate mathematical information
 15. Understand the process of solving linear equations in two variables by elimination, substitution, or graphing.
 - Use calculators as problem solving tools
 - Use connections among mathematical ideas to explain concepts
 - Use tables, graphs, and equations to recognize and describe differences between functions
 16. Construct, interpret and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations.
 - Use patterns, relations, symbolic algebra, and linear functions to model situations
 - Make inferences and formulate and evaluate arguments based on displays and analysis of data
 - Recognize that mathematics is used in a variety of contexts outside of mathematics
 - Create and use representations to organize, record, and communicate mathematical ideas
 17. Represent and solve problems using geometric models.
 - Understand and apply concepts involving paired angles
 - Understand and apply the Pythagorean Theorem
 18. Apply algebraic techniques to geometric problems involving perimeter and area.
 - Develop and apply strategies for finding perimeter and area
 19. Do basic probability and odds for simple events and compound events.
 - Interpret probabilities as ratios, percents, and decimals

- Explore the probabilities of conditional events
20. Make predictions based on experimental or mathematical probabilities.
- Estimate probabilities and make predictions based on experimental and theoretical probabilities
21. Perform operations on and simplify rational expressions.
- Use and explain procedures for performing calculations with all real number types
 - Solve problems involving proportions and percents
 - Understand use ratios, proportions, and percents in a variety of situations

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes, Examples of
- John read the first 65 pages of a book in 1.75 hours. How many more hours will it take him to read the remaining 260 pages at the same rate?
 - The length of a rectangle is 10 more than three times its width. The perimeter of the rectangle is 108 feet. Find the dimensions of the rectangle.
 - A math test has 25 problems. Some are worth 2 points and some are worth 3 points. The test is worth 60 points total. Write a system of equations that can be used to determine the number of 2 point questions and the number of 3 point questions. Solve the system to find the number of 3 point questions.
- b. Real World Applications, Examples of
- A woman who is 5.5 feet tall casts a shadow of 3.5 feet long. At the same time, a telephone pole casts a shadow 28 feet long. Write and solve a proportion to find the height of the telephone pole?
 - In his studies of the motion of free falling objects, Galileo Galilei found that regardless of its mass, an object will fall a distance d that is related to the square of its travel time t in seconds. The modern formula that describes free fall motion is $d = 0.5gt^2$, where g is the acceleration due to gravity and t is the length of time in seconds the object falls. Find the distance an object falls in 3 seconds. (Hint: Research to find acceleration due to gravity in meters per second squared.)
 - A customer purchases a one piece round table with an 8 foot diameter. Only the legs of this table are removable. The only entrance to the home of this customer is a doorway with dimensions of 3 feet by 7 feet. Can the delivery men bring this table into the customer's home? Explain why or why not. Support your answer with calculations.

- c. Classwork and class participation
 - Utilize the Guided Practice exercises in the textbook to assess student proficiency after the initial instruction has been provided.
 - Utilize exploration worksheets as a lead into the development of a new skill or understanding of a new concept.
 - Utilize a problem of the day for introduction, reinforcement, or extension.
 - Journal writing to communicate knowledge of concepts, skills, or procedures. This writing also is an opportunity to comment on areas of concern.
- d. Homework assignments
 - Assign problems from textbook
 - Writing samples as a form of communicating the solution to a problem.
 - Worksheets
 - On line assignments such as lessons from RM Framework
 - Correcting assessments once they have been scored and returned to students.
- e. Attendance in conformance with River Dell Board of Education policy

ALGEBRA I
Year Course/5 Credits
Grade: 8

I Rationale

The Advanced Algebra program complies with the Standards set forth by the National Council of Teachers of Mathematics and New Jersey's Core Curriculum Standards. The unifying themes of the curriculum are problem solving, mathematics as communication, mathematical reasoning, and mathematical connections. These interrelated themes are not to be treated as isolated entities. The interrelationships are woven throughout the activities of the program. The course is presented as an integrated whole, thus allowing students to observe the relationships among the various topics within the program. Topics will include a study of linear and quadratic functions, properties of exponential and radical functions, factoring, operations with polynomials, systems of linear equations and linear inequalities, rational functions and equations, as well as the discrete topics of data analysis and probability.

II Goals

Goals for this course include development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

22. Represent and use numbers in a variety of equivalent forms (integers, fractions, decimals, percent, square root, exponential/scientific notation, calculator display). **4.1.8.A.1-2, 4-6**
23. Understand and apply the properties of the real numbers, including operations with signed numbers. **4.1.8.A.1, 4.1.8.B.1-2**
24. Understand the concept of variable and use of variables. **4.3.8.C.1, 4.5.8.B.4, 4.5.8.E.1-3**
25. Understand and use mathematical language, notation and structure to represent ideas, describe relationships, and model situations. **4.3.8.B.1-2, 4.3.8.C.1-2**

26. Represent situations and number patterns with tables, graphs, verbal rules, and equations and understand the interrelationships of these representations. **4.3.8.B.1-2, 4.3.8.C.2, 4.5.8.A.1-3, 4.5.8.E.1-3**
27. Analyze tables and graphs to identify properties and relationships. **4.3.8.B.2, 4.3.8.C.2, 4.4.8.A.1-4**
28. Formulate, simplify and evaluate algebraic expressions. **4.3.8.D.1**
29. Use algebraic expressions to represent mathematical situations. **4.3.8.C.1, 4.5.8.C.4, 4.5.8.E.2**
30. Understand the process of solving linear equations and inequalities in one or two variables and, where appropriate, represent their solution graphically. **4.3.8.B.1-2, 4.3.8.D.2**
31. Perform operations on and simplify polynomial expressions. **4.1.8.A.3, 4.1.8.B.1-4, 4.3.8.D.1**
32. Apply skill in factoring polynomial expressions. **4.3.8.D.1-2**
33. Understand the process of solving quadratic equations by the square root method, factoring, quadratic formula, or graphing. **4.3.8.D.2**
34. Apply the process of solving problems using equations and inequalities. **4.3.8.B.1-2, 4.3.8.C.1-2, 4.3.8.D.1-3**
35. Apply algebraic methods to solve a variety of real-world and mathematical problems. **4.5.8.C.1-5**
36. Represent and analyze linear relationships among a table of values, an algebraic formula, a written statement and a graph, including the concepts of slope and intercept. **4.3.8.B.2, 4.3.8.C.1-2, 4.5.8.F.1-3**
37. Understand the process of solving linear equations in two variables by elimination, substitution, or graphing. **4.3.8.B.2, 4.5.8.C.2, 4.5.8.F.4**
38. Construct, interpret and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations. **4.3.8.C.1-2, 4.4.8.A.2-4, 4.5.8.C.3, 4.5.8.E.1**
39. Represent and solve problems using geometric models. **4.2.8.A.1-3**
40. Apply algebraic techniques to geometric problems involving perimeter and area. **4.2.8.E.1-3, 4.3.8.D.3**
41. Apply algebraic techniques to solving triangles using trigonometric ratios. **4.2.8.A.2-3, 4.2.8.E.1, 4.5.8.F.4-5**

42. Do basic probability and odds problems for simple events and compound events.
4.4.8.B.1-4
43. Make predictions based on experimental or mathematical probabilities.
4.4.8.B.5-6
44. Perform operations on and simplify rational expressions. **4.1.8.B.1-4, 4.3.8.D.1**
45. Simplify expressions involving radicals and solve equations involving radicals.
4.1.8.B.1-4
46. Graph quadratic equations on the coordinate plane and perform transformations on the parabolas. **4.3.8.B.1, 4.3.8.D.2, 4.5.8.A.1, 4.5.8.F.3**

IV Methods of Evaluation

- k. Teacher constructed and/or standardized examinations, tests, and quizzes
- l. Real World Applications
- m. Class work and class participation
- n. Homework assignments
- o. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- g. Textbook: *Holt Algebra 1*
- h. Calculators
- i. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

22. Represent and use numbers in a variety of equivalent forms (integers, fractions, decimals, percent, square root, exponential/scientific notation, calculator display).
 - Recognize the equivalent forms of a number
 - Convert from one form to another

23. Understand and apply the properties of the real numbers, including operations with signed numbers.
 - State and apply the properties of arithmetic, properties of equality, and the properties of inequalities
 - State and apply the rules of signed numbers for basic operations
24. Understand the concept of variable and use of variables.
 - Recognize that a variable can represent an unknown value(s)
 - Utilize a variable as a symbol for a set of known values
25. Understand and use mathematical language, notation and structure to represent ideas, describe relationships, and model situations.
 - Translate between words and algebra
 - Using graphs, charts, and equations explain how a change in one quantity can result in a change in another quantity
26. Represent situations and number patterns with tables, graphs, verbal rules, and equations and understand the interrelationships of these representations.
 - Use manipulatives, tables, graphs, verbal rules, algebraic sentences to model situations
 - Graph functions and understand their general behavior
 - Learn mathematics through problem solving, inquiry, and discovery
27. Analyze tables and graphs to identify properties and relationships.
 - Recognize and describe the difference between linear and exponential growth
 - Use patterns, relations, symbolic algebra, and linear functions to model situations
28. Formulate, simplify and evaluate algebraic expressions.
 - Use graphing techniques on a number line
29. Use algebraic expressions to represent mathematical situations.
 - Apply mathematics in practical situations and in other disciplines
 - Select, apply, and translate among mathematical representation to solve problems
30. Understand the process of solving linear equations and inequalities in one and two variables and, where appropriate, represent their solution graphically.
 - Solve simple linear equations or inequalities informally, graphically, and using formal algebraic methods
 - Graph functions, and understand and describe their behavior
31. Perform operations on and simplify polynomial expressions.
 - Use and explain procedures for performing calculations with all real number types

- Use manipulatives to demonstrate the simplification of expressions
32. Apply skill in factoring polynomial expressions.
 - Demonstrate proficiency in factoring by grouping
 - Demonstrate proficiency in factoring perfect square trinomials
 - Demonstrate proficiency in factoring the difference of two squares
 33. Understand the process of solving quadratic equations by square root method, factoring, quadratic formula, or graphing.
 - For $x^2 = \text{constant number}$ solve for x either by the square root method or by factoring
 - Solve quadratic equations involving trinomials either by factoring or by quadratic formula
 34. Apply the process of solving problems using equations and inequalities.
 - Use the graph of an equation involving two variables to represent solutions
 - Analyze functional relationships from graphs, charts, and equations
 - Solve linear equations using formal algebraic methods
 35. Apply algebraic methods to solve a variety of real-world and mathematical problems.
 - Recognize recurring themes across mathematical domains
 - Use connections among mathematical ideas to explain concepts
 - Apply mathematics in practical situations and in other disciplines
 36. Represent and analyze linear relationships among a table of values, an algebraic formula, a written statement and a graph, including the concepts of slope and intercept.
 - Use tables, graphs, and equations to recognize and describe differences, between functions
 - Using tables, graphs, and equations explain how a change in one quantity influences the change in another quantity
 - Use technology to gather, analyze, and communicate mathematical information
 37. Understand the process of solving linear equations in two variables by elimination, substitution, or graphing.
 - Use calculators as problem solving tools
 - Use connections among mathematical ideas to explain concepts
 - Use tables, graphs, and equations to recognize and describe differences between functions
 38. Construct, interpret and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations.
 - Use patterns, relations, symbolic algebra, and linear functions to model situations

- Make inferences and formulate and evaluate arguments based on displays and analysis of data
 - Recognize that mathematics is used in a variety of contexts outside of mathematics
 - Create and use representations to organize, record, and communicate mathematical ideas
39. Represent and solve problems using geometric models.
- Understand and apply concepts involving paired angles
 - Understand and apply the Pythagorean Theorem
40. Apply algebraic techniques to geometric problems involving perimeter and area.
- Develop and apply strategies for finding perimeter and area
41. Do basic probability and odds for simple events and compound events.
- Interpret probabilities as ratios, percents, and decimals
 - Explore the probabilities of conditional events
42. Make predictions based on experimental or mathematical probabilities.
- Estimate probabilities and make predictions based on experimental and theoretical probabilities
43. Perform operations on and simplify rational expressions.
- Use and explain procedures for performing calculations with all real number types
 - Solve problems involving proportions and percents
 - Understand and use ratios, proportions, and percents in a variety of situations
44. Simplify expressions involving radicals and solve equations involving radicals.
- Perform basic operations with irrational numbers expressed in simplest radical form
 - Solve radical equations by means of squaring the equation
45. Graph quadratic equations on the coordinate plane and perform transformation on the parabolas.
- Solve quadratic equations informally, graphically, and using formal algebraic methods

VII Methods of Evaluation

- f. Teacher constructed and/or standardized examinations, tests, and quizzes, Examples of

- The length of a rectangle is 10 more than three times its width. The perimeter of the rectangle is 108 feet. Find the dimensions of the rectangle.
- A triangle has an area of 60 in^2 . Its base is 10 inches and its height is \sqrt{x} inches. What is the value of x ? What is the height of the triangle?
- The base of a triangle is $2x + 4$ meters and the area is $2x^2 + 5x + 2$ meters squared. How much longer is the base than the height?

g. Real World Applications, Examples of

- The top of a lighthouse is 40 meters above sea level. The angle of elevation from a fishing boat to the top of the lighthouse is 20 degrees. How far is the fishing boat from the base of the lighthouse? Round your answer to the nearest tenth of a meter.
- A customer purchases a one piece round table with an 8 foot diameter. Only the legs of this table are removable. The only entrance to the home of this customer is a doorway with dimensions of 3 feet by 7 feet. Can the delivery men bring this table into the customer's home? Explain why or why not. Support your answer with calculations.

h. Class work and class participation

- Utilize the Guided Practice exercises in the textbook to assess student proficiency after the initial instruction has been provided.
- Utilize exploration worksheets as a lead into the development of a new skill or understanding of a new concept.
- Utilize a problem of the day for introduction, reinforcement, or extension.
- Journal writing to communicate knowledge of concepts, skills, or procedures. This writing also is an opportunity to comment on areas of concern.

i. Homework assignments

- Assign problems from textbook
- Writing samples as a form of communicating the solution to a problem
- Worksheets
- On line assignments such as lessons from RM Framework
- Correcting assessments once they have been scored and returned to students

j. Attendance in conformance with River Dell Board of Education policy

ALGEBRA
Year Course/5 Credits
Grade: 9
Level: College Prep

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course include development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

47. Represent and use numbers in a variety of equivalent forms (integers, fractions, decimals, percent, square root, exponential/scientific notation, calculator display).
4.1.12.A.1
48. Understand and apply the properties of the real numbers, including operations with signed numbers. **4.1.12.A.1, 4.1.12.B.1**
49. Understand the concept of variable and use of variables. **4.3.12.C.1, 4.5.12.E.1-3, 4.5.12.B.4**
50. Understand and use mathematical language, notation and structure to represent ideas, describe relationships, and model situations. **4.3.12.B.1-4, 4.3.12.C.1-2**
51. Represent situations and number patterns with tables, graphs, verbal rules, and equations and understand the interrelationships of these representations.
4.3.12.B.1-4, 4.3.12.C.2, 4.5.12.A.1-3, 4.5.12.E.1
52. Analyze tables and graphs to identify properties and relationships. **4.3.12.B.2, 4.3.12.C.2, 4.4.12.A.5**
53. Formulate, simplify and evaluate algebraic expressions. **4.3.12.D.1**
54. Use algebraic expressions to to represent mathematical situations. **4.3.12.C.1, 4.5.12.E.2, 4.5.12.C.4**

55. Understand the process of solving linear equations and inequalities in one variable and, where appropriate, represent their solution graphically. **4.3.12.B.1-2, 4.3.12.D.2**
56. Perform operations on and simplify polynomial, rational and square root expressions. **4.1.12.A.3, 4.3.12.D.1, 4.1.12.B.1-4**
57. Apply skill in factoring polynomial expressions. **4.3.12.D.1-2**
58. Understand the process of solving quadratic equations by factoring. **4.3.12.D.2**
59. Apply the process of solving problems using equations and inequalities. **4.3.12.B.1-4, 4.3.12.C.1-2, 4.3.12.D.1-3**
60. Apply algebraic methods to solve a variety of real-world and mathematical problems. **4.5.C.1-5**
61. Represent and analyze linear relationships among a table of values, an algebraic formula, a written statement and a graph, including the concepts of slope and intercept. **4.3.12.B.2, 4.5.12.F.1-3, 4.3.12.C.1-2**
62. Understand the process of solving linear equations in two variables by elimination, substitution, or graphing. **4.3.12.B.2, 4.5.12.C.2, 4.5.12.F.4**
63. Construct, interpret and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations. **4.3.12.C.1-2, 4.5.12.C.3, 4.4.12.A.2-4, 4.5.12.E.1**
64. Represent and solve problems using geometric models. **4.2.12.A.1-3**
65. Apply algebraic techniques to geometric problems involving perimeter and area. **4.2.12.E.2, 4.3.12.D.3**
66. Apply algebraic techniques to solving triangles using trigonometric ratios. **4.2.12.A.3, 4.2.12.E.1, 4.5.12.F.5**
67. Do basic probability problems. **4.4.12.B.1-3**
68. Make predictions based on experimental or mathematical probabilities. **4.4.12.B.5-6**

IV Methods of Evaluation

- p. Teacher constructed and/or standardized examinations, tests, and quizzes
- q. Unit Test
- r. Classwork and class participation

- s. Homework assignments
- t. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- j. Textbook: *Algebra: Structure and Method, Book 1, Algebra I: Explorations & Applications*
- k. Calculators
- l. Computer Software

VI Proficiencies

- a. At the end of this course, students should be able to:
- b. Represent and use numbers in a variety of equivalent forms (integers, fractions, decimals, percent, square root, exponential/scientific notation, calculator display).
- c. Understand and apply the properties of the real numbers, including operations with signed numbers.
- d. Understand the concept of variable and use of variables.
- e. Understand and use mathematical language, notation and structure to represent ideas, describe relationships, and model situations.
- f. Represent situations and number patterns with tables, graphs, verbal rules, and equations and understand the interrelationships of these representations.
- g. Analyze tables and graphs to identify properties and relationships.
- h. Formulate, simplify and evaluate algebraic expressions.
- i. Use algebraic expressions to to represent mathematical situations.
- j. Understand the process of solving linear equations and inequalities in one variable and, where appropriate, represent their solution graphically.
- k. Perform operations on and simplify polynomial, rational and square root expressions.
- l. Apply skill in factoring polynomial expressions.
- m. Understand the process of solving quadratic equations by factoring.

- n. Apply the process of solving problems using equations and inequalities.
- o. Apply algebraic methods to solve a variety of real-world and mathematical problems.
- p. Represent and analyze linear relationships among a table of values, an algebraic formula, a written statement and a graph, including the concepts of slope and intercept.
- q. Understand the process of solving linear equations in two variables by elimination, substitution, or graphing.
- r. Construct, interpret and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations.
- s. Represent and solve problems using geometric models.
- t. Apply algebraic techniques to geometric problems involving perimeter and area.
- u. Apply algebraic techniques to solving triangles using trigonometric ratios.
- v. Do basic probability problems.
- w. Make predictions based on experimental or mathematical probabilities.

VII Evaluations

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Unit Test
- c. Classwork and class participation
- m. Homework assignments
- n. Attendance in conformance with River Dell Board of Education policy

Sequential Math I

Year Course/5 Credits

Grade: 9

Level: College Prep

Prerequisite: None

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course includes development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

69. Represent and use numbers in a variety of equivalent forms (integers, fractions, decimals, percent, square root, exponential/scientific notation). **4.1.12.A.1**
70. Understand and apply the properties of the real numbers, including operations with signed numbers. **4.1.12.B.1-4**
71. Understand the concept of variable and use of variables. **4.3.12.C.1, 4.5.12.E.1-3, 4.5.12.B.4**
72. Formulate, simplify, and evaluate algebraic expressions. **4.3.12.D.1**
73. Use algebraic expressions to represent mathematical situations. **4.3.12.C.1, 4.5.12.E.2, 4.5.12.C.4**
74. Understand the process of solving multiple step equations, verbal equations, and percent equations. **4.3.12.D.2**
75. Solve and graph inequalities. **4.3.12.B.1-2, 4.3.12.D.2**
76. Solving for / isolating a variable in a formula or literal equation. **4.3.12.D.2**

77. Perform operations with monomials, including addition, subtraction, multiplication, division, and powers of monomials. **4.3.12.D.1**
78. Graph linear functions, equations, and inequalities. **4.3.12.D.2, 4.5.12.F.3**
79. Understand the process of solving linear equations and inequalities in one variable and, where appropriate, represent their solution graphically. **4.3.12.B.1-2, 4.3.12.D.2**
80. Perform operations on and simplify polynomial, rational and square root expressions. **4.1.12.A.3, 4.3.12.D.1, 4.1.12.B.1-4**
81. Apply skill in factoring polynomial expressions. **4.3.12.D.1-2**
82. Understand the process of solving quadratic equations by factoring. **4.3.12.D.2**
83. Apply the process of solving problems using equations and inequalities. **4.3.12.B.1-4, 4.3.12.C.1-2, 4.3.12.D.1-3**
84. Apply algebraic methods to solve a variety of real-world and mathematical problems. **4.5.C.1-5**
85. Represent and analyze linear relationships among a table of values, an algebraic formula, a written statement and a graph, including the concepts of slope and intercept. **4.3.12.B.2, 4.5.12.F.1-3, 4.3.12.C.1-2**
86. Understand the process of solving linear equations in two variables by elimination, substitution, or graphing. **4.3.12.B.2, 4.5.12.C.2, 4.5.12.F.4**

IV Methods of Evaluation

- u. Teacher constructed and/or standardized examinations, tests, and quizzes
- v. Midterm and Final Exams
- w. Classwork and class participation
- x. Homework assignments
- y. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- o. Textbook: *Amsco Integrated Math Course I* and *Houghton Mifflin Basic Algebra*
- p. Calculators

q. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

1. Represent and use numbers in a variety of equivalent forms (integers, fractions, decimals, percent, square root, exponential/scientific notation).
2. Understand and apply the properties of the real numbers, including operations with signed numbers.
3. Understand the concept of variable and use of variables.
4. Formulate, simplify, and evaluate algebraic expressions.
5. Use algebraic expressions to represent mathematical situations.
6. Understand the process of solving multiple step equations, verbal equations, and percent equations.
7. Solve and graph inequalities.
8. Solving for / isolating a variable in a formula or literal equation.
9. Perform operations with monomials, including addition, subtraction, multiplication, division, and powers of monomials.
10. Graph linear functions, equations, and inequalities.
11. Understand the process of solving linear equations and inequalities in one variable and, where appropriate, represent their solution graphically.
12. Perform operations on and simplify polynomial, rational and square root expressions.
13. Apply skill in factoring polynomial expressions.
14. Understand the process of solving quadratic equations by factoring.
15. Apply the process of solving problems using equations and inequalities.
16. Apply algebraic methods to solve a variety of real-world and mathematical problems.

17. Represent and analyze linear relationships among a table of values, an algebraic formula, a written statement and a graph, including the concepts of slope and intercept.
18. Understand the process of solving linear equations in two variables by elimination, substitution, or graphing.

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Midterm and Final Exams
- c. Classwork and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

River Dell Regional School District

Sequential Math II
Year Course/5 Credits
Grade: 10
Level: College Prep
Prerequisite: Sequential Math I

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course include development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

87. Understand and apply the basic concepts related to points, lines, planes, and space including parallelism and perpendicularity. **4.2.12.A.1-3, 4.2.12.C.1**
88. Use and interpret appropriate symbols and notation to communicate geometric ideas. **4.5.12.B.1-4**
89. Understand and apply concepts of angle measure, including angle pair relationships. **4.2.12.A.3, 4.5.12.F.5, 4.2.12.E.1-2**
90. Demonstrate an understanding of figures based upon information regarding angles and/or side measure. **4.2.12.A.1-3, 4.2.12.E.1, 4.5.12.C.1**
91. Be able to recognize and apply inductive and deductive reasoning. **4.3.12.A.3, 4.5.12.D.1-6**
92. Demonstrate an understanding of parallel lines, their properties and applications. **4.2.12.A.3, 4.2.12.C.1, 4.5.12.A.1-2, 4.5.12.F.5**
93. Demonstrate the ability to identify congruent figures and understand and use their properties in practical applications. **4.2.12.A.3, 4.5.12.A.1-2, 4.5.12.F.5**

94. Understand and apply properties of lines and segments related to triangles. **4.2.12.A.1, 4.2.12.A.3, 4.5.12.C.4, 4.5.12.C.6, 4.5.12.F.5**
95. Understand and apply concepts and principles relating to quadrilaterals and other polygons. **4.2.12.A.1, 4.2.12.A.3, 4.5.12.C.4, 4.5.12.C.6, 4.5.12.F.5**
96. Understand and apply properties of lines segments, angles, and arcs related to circles. **4.2.12.A.1, 4.2.12.A.3, 4.5.12.C.4, 4.5.12.C.6, 4.5.12.F.5**
97. Understand and apply simple reflections, rotations, and translations, recognizing their effects on geometric figures. **4.2.12.B.1, 4.3.12.B.3**
98. Identify similar figures and understand their properties. **4.2.12.A.3, 4.2.12.E.1**
99. Apply the Pythagorean theorem. **4.2.12.A.1, 4.2.12.E.1**
100. Use trigonometric ratios in solution of triangle and area problems. **4.2.12.E.1-2, 4.5.12.C.6**
101. Understand and apply the concepts of perimeter, circumference, areas, surface area, and volume. **4.2.12.B.2, 4.2.12.E.2, 4.5.12.C.3-6**
102. Apply the principles of coordinate geometry to determine properties of geometric figures. **4.2.12.A.3, 4.2.12.B.2, 4.2.12.C.1**
103. Interpret and draw two and three-dimensional objects. **4.2.12.E.1-2, 4.5.12.A.1-3, 4.5.12.E.3**
104. Recognize and describe algebraic and geometric sequences and series. **4.3.12.A.1**

IV Methods of Evaluation

- z. Teacher constructed and/or standardized examinations, tests, and quizzes
- aa. Midterm and Final Exams
- bb. Classwork and class participation
- cc. Homework assignments
- dd. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- r. Textbook: *Amsco Integrated Math Course II* and *Houghton Mifflin Basic Geometry*
- s. Calculators
- t. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

1. Understand and apply the basic concepts related to points, lines, planes, and space including parallelism and perpendicularity.
2. Use and interpret appropriate symbols and notation to communicate geometric ideas.
3. Understand and apply concepts of angle measure, including angle pair relationships.
4. Demonstrate an understanding of figures based upon information regarding angles and/or side measure.
5. Be able to recognize and apply inductive and deductive reasoning.
6. Demonstrate an understanding of parallel lines, their properties and applications.
7. Demonstrate the ability to identify congruent figures and understand and use their properties in practical applications.
8. Understand and apply properties of lines and segments related to triangles.
9. Understand and apply concepts and principles relating to quadrilaterals and other polygons.
10. Understand and apply properties of lines segments, angles, and arcs related to circles.
11. Understand and apply simple reflections, rotations, and translations, recognizing their effects on geometric figures.
12. Identify similar figures and understand their properties.
13. Apply the Pythagorean theorem.
14. Use trigonometric ratios in solution of triangle and area problems.

15. Understand and apply the concepts of perimeter, circumference, areas, surface area, and volume.
16. Apply the principles of coordinate geometry to determine properties of geometric figures.
17. Interpret and draw two and three-dimensional objects.
18. Recognize and describe algebraic and geometric sequences and series.

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Midterm and Final Exams
- c. Classwork and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

River Dell Regional School District
Sequential Math III
Year Course/5 Credits
Grade: 11
Level: College Prep
Prerequisite: Sequential Math II

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course include development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

105. Perform operations and simplify polynomials, rational, and radical expressions with rational exponents. **4.3.12.A.1, 4.3.12.B.4**
106. Recognize and solve quadratic equations using square root method, factoring method, quadratic formula, and/or completing the square method. **4.3.12.D.2, 4.5.12.E.1-2**
107. Understand operations on, and the general properties and behavior of linear and quadratic functions. **4.3.12.D.2**
108. Construct, interpret and/or draw inferences from graphs, tables, and charts that reflect linear or quadratic data from real world situations. **4.3.12.D.2**
109. Graph and state the equation of lines. **4.3.12.D.2, 4.5.12.E.2, 4.5.12.F.3**
110. Understand the process of solving quadratic/linear systems, by algebraic and graphing methods. **4.3.12.D.2, 4.5.12.C.2**
111. Understand the process of solving absolute value equations and inequalities. **4.5.12.D.2**
112. Understand the process of solving equations involving radicals. **4.5.12.D.2**
113. Recognize and perform operations on matrices. **4.1.12.B.3**

- 114. Understand relations and functions, with the ability to select and use various representations for them, including equations or inequalities, tables, and graphs. **4.3.12.B.1**
- 115. Recognize, graph, and apply the properties of classes of functions, including exponential, polynomial, rational, and step functions. **4.3.12.B.4, 4.3.12.C.1**
- 116. Recognize and understand properties of number systems and sets of numbers. **4.1.12.A.3**
- 117. Evaluate probabilities using the counting principle. **4.4.12.C.1-3**
- 118. Count using combinations and permutations, with and without replacement. **4.4.12.C.1-3**
- 119. Understand and apply basic single valued and two valued statistics. **4.4.12.A.1-3**
- 120. Evaluate the use of data in real-world situations. **4.4.12.A.2**
- 121. Estimate and determine lines of best fit with technology, and use them to predict and interpret information. **4.4.12.A.4-5**

IV Methods of Evaluation

- ee. Teacher constructed and/or standardized examinations, tests, and quizzes
- ff. Midterm and Final Exams
- gg. Classwork and class participation
- hh. Homework assignments
- ii. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- u. Textbook: *Amsco Integrated Math Course I, Amsco Integrated Math Course II, and Prentice Hall Intermediate Algebra*
- v. Calculators
- w. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

1. Perform operations and simplify polynomials, rational, and radical expressions with rational exponents.
2. Recognize and solve quadratic equations using square root method, factoring method, quadratic formula, and/or completing the square method.
3. Understand operations on, and the general properties and behavior of linear and quadratic functions.
4. Construct, interpret and/or draw inferences from graphs, tables, and charts that reflect linear or quadratic data from real world situations.
5. Graph and state the equation of lines.
6. Understand the process of solving quadratic/linear systems, by algebraic and graphing methods.
7. Understand the process of solving absolute value equations and inequalities.
8. Understand the process of solving equations involving radicals.
9. Recognize and perform operations on matrices.
10. Understand relations and functions, with the ability to select and use various representations for them, including equations or inequalities, tables, and graphs.
11. Recognize, graph, and apply the properties of classes of functions, including exponential, polynomial, rational, and step functions.
12. Recognize and understand properties of number systems and sets of numbers.
13. Evaluate probabilities using the counting principle.
14. Count using combinations and permutations, with and without replacement.
15. Understand and apply basic single valued and two valued statistics.
16. Evaluate the use of data in real-world situations.
17. Estimate and determine lines of best fit with technology, and use them to predict and interpret information.

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Midterm and Final Exams
- c. Classwork and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

CP GEOMETRY
Year Course/5 Credits
Grade: 10
Level: College Prep
Prerequisite: Algebra

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course include development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

122. Understand and apply the basic concepts related to points, lines, planes, and space including parallelism and perpendicularity. **4.2.12.A.1-3, 4.2.12.C.1**
123. Use and interpret appropriate symbols and notation to communicate geometric ideas. **4.5.12.B.1-4**
124. Understand and apply concepts of angle measure, including angle pair relationships. **4.2.12.A.3, 4.5.12.F.5, 4.2.12.E.1-2**
125. Demonstrate an understanding of figures based upon information regarding angles and/or side measure. **4.2.12.A.1-3, 4.2.12.E.1, 4.5.12.C.1**
126. Make and test a conjecture. **4.2.12.A.4, 4.5.12.D.1-6**
127. Be able to recognize and apply inductive and deductive reasoning. **4.3.12.A.3, 4.5.12.D.1-6**
128. Judge the validity of and construct an argument. **4.2.12.A.4, 4.5.12.B.3-4**
129. Prove statements with two column proof and paragraph. **4.5.12.B.1-4, 4.5.12.D.1-6**
130. Demonstrate an understanding of parallel lines, their properties and applications. **4.2.12.A.3, 4.2.12.C.1, 4.5.12.A.1-2, 4.5.12.F.5**

131. Demonstrate the ability to identify congruent figures and understand and use their properties in practical applications. **4.2.12.A.3, 4.5.12.A.1-2, 4.5.12.F.5**
132. Understand and apply properties of lines and segments related to triangles. **4.2.12.A.1, 4.2.12.A.3, 4.5.12.C.4, 4.5.12.C.6, 4.5.12.F.5**
133. Understand and apply concepts and principles relating to quadrilaterals and other polygons. **4.2.12.A.1, 4.2.12.A.3, 4.5.12.C.4, 4.5.12.C.6, 4.5.12.F.5**
134. Understand and apply properties of lines segments, angles, and arcs related to circles. **4.2.12.A.1, 4.2.12.A.3, 4.5.12.C.4, 4.5.12.C.6, 4.5.12.F.5**
135. Understand and apply simple reflections, rotations, and translations, recognizing their effects on geometric figures. **4.2.12.B.1, 4.3.12.B.3**
136. Identify similar figures and understand their properties. **4.2.12.A.3, 4.2.12.E.1**
137. Apply the Pythagorean theorem. **4.2.12.A.1, 4.2.12.E.1**
138. Use trigonometric ratios in solution of triangle and area problems. **4.2.12.E.1-2, 4.5.12.C.6**
139. Use algebraic methods to solve geometric problems. **4.2.12.A.1, 4.2.12.E.1, 4.5.12.C.6**
140. Understand and apply the concepts of perimeter, circumference, areas, surface area, and volume. **4.2.12.B.2, 4.2.12.E.2, 4.5.12.C.3-6**
141. Apply the principles of coordinate geometry to determine properties of geometric figures. **4.2.12.A.3, 4.2.12.B.2, 4.2.12.C.1**
142. Interpret and draw two and three-dimensional objects. **4.2.12.E.1-2, 4.5.12.A.1-3, 4.5.12.E.3**

IV Methods of Evaluation

- jj. Teacher constructed and/or standardized examinations, tests, and quizzes
- kk. Unit Test
- ll. Classwork and class participation
- mm. Homework assignments
- nn. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- x. Textbook: *Geometry*
- y. Calculators
- z. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

- a. Understand and apply the basic concepts related to points, lines, planes, and space including parallelism and perpendicularity.
- b. Use and interpret appropriate symbols and notation to communicate geometric ideas.
- c. Understand and apply concepts of angle measure, including angle pair relationships.
- d. Demonstrate an understanding of figures based upon information regarding angles and/or side measure
- e. Make and test a conjecture
- f. Be able to recognize and apply inductive and deductive reasoning
- g. Judge the validity of and construct an argument
- h. Prove statements with two column proof and paragraph
- i. Demonstrate an understanding of parallel lines, their properties and applications
- j. Demonstrate the ability to identify congruent figures and understand and use their properties in practical applications
- k. Understand and apply properties of lines and segments related to triangles
- l. Understand and apply concepts and principles relating to quadrilaterals and other polygons

- m. Understand and apply properties of lines segments, angles, and arcs related to circles
- n. Understand and apply simple reflections, rotations, and translations, recognizing their effects on geometric figures.
- o. Identify similar figures and understand their properties
- p. Apply the Pythagorean theorem
- q. Use trigonometric ratios in solution of triangle and area problems
- r. Use algebraic methods to solve geometric problems
- s. Understand and apply the concepts of perimeter, circumference, areas, surface area, and volume.
- t. Apply the principles of coordinate geometry to determine properties of geometric figures.
- u. Interpret and draw two and three dimensional objects.

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Unit Test
- c. Classwork and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

HONORS GEOMETRY
Year Course/5 Credits
Grade: 9
Level: Honors
Prerequisite: Advanced Algebra

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course include development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

143. Relate geometry to art and to understand and apply simple reflections, rotations, and translations, recognizing their effects on geometric figures. This includes interpreting and drawing two- and three-dimensional objects. **4.2.12.A.2, 4.2.12.B.1, 4.3.12.B.3**
144. Understand and apply the basic concepts related to points, lines, planes, and space including parallelism and perpendicularity. **4.2.12.A.1-3, 4.2.12.C.1**
145. Use and interpret appropriate symbols and notation to communicate geometric ideas. **4.5.12.B.1-4**
146. Make and test a conjecture. **4.2.12.A.4, 4.5.12.D.1-6**
147. Be able to recognize and apply inductive and deductive reasoning. **4.3.12.A.3, 4.5.12.D.1-6**
148. Judge the validity of and construct an argument. **4.2.12.A.4, 4.5.12.B.3-4**
149. Formulate a counter example. **4.5.12.B.1-4**
150. Understand and apply concepts of angle measure, including angle pair relationships. **4.2.12.A.3, 4.5.12.F.5, 4.2.12.E.1-2**
151. Demonstrate an understanding of parallel lines, their properties and applications. **4.2.12.A.3, 4.2.12.C.1, 4.5.12.A.1-2, 4.5.12.F.5**
152. Identify similar figures and understand their properties. **4.2.12.A.3, 4.2.12.E.1**

153. Demonstrate an understanding of figures based upon information regarding angles and/or side measure. **4.2.12.A.1-3, 4.2.12.E.1, 4.5.12.C.1**
154. Demonstrate the ability to identify congruent figures and understand and use their properties in practical applications. **4.2.12.A.3, 4.5.12.A.1-2, 4.5.12.F.5**
155. Understand and apply properties of lines and segments related to triangles. **4.2.12.A.1, 4.2.12.A.3, 4.5.12.C.4, 4.5.12.C.6, 4.5.12.F.5**
156. Understand and apply concepts and principles relating to quadrilaterals and other polygons. **4.2.12.A.1, 4.2.12.A.3, 4.5.12.C.4, 4.5.12.C.6, 4.5.12.F.5**
157. Apply the Pythagorean theorem. **4.2.12.A.1, 4.2.12.E.1**
158. Use trigonometric ratios in solution of triangle and area problems. **4.2.12.E.1-2, 4.5.12.C.6**
159. Use the law of sines and cosines to solve triangles. **4.2.12.E.1**
160. Extend the concept of trigonometric ratios to that of a function. **4.3.12.B.4**
161. Use algebraic methods to solve geometric problems. **4.2.12.A.1, 4.2.12.E.1, 4.5.12.C.6**
162. Understand and apply properties of lines, segments, angles, and arcs related to circles. **4.2.12.A.1, 4.2.12.A.3, 4.5.12.C.4, 4.5.12.C.6, 4.5.12.F.5**
163. Apply the principles of coordinate geometry to determine properties of geometric figures. **4.2.12.A.3, 4.2.12.B.2, 4.2.12.C.1**
164. Identify the equation and graph of the conic sections. **4.3.12.B.4**
165. Understand and apply the concepts of perimeter, circumference, area, surface area, and volume. **4.2.12.B.2, 4.2.12.E.2, 4.5.12.C.3-6**
166. Use trigonometric ratios in solution of triangle and area problems. **4.2.12.E.1-2, 4.5.12.C.6**
167. Apply the principles of coordinate geometry to determine properties of geometric figures. **4.2.12.A.3, 4.2.12.B.2, 4.2.12.C.1**
168. Interpret and draw two and three-dimensional objects. **4.2.12.E.1-2, 4.5.12.A.1-3, 4.5.12.E.3**

IV Methods of Evaluation

- oo. Teacher constructed and/or standardized examinations, tests, and quizzes

- pp. Unit Test
- qq. Classwork and class participation
- rr. Homework assignments
- ss. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- aa. Textbook: *Geometry: Integration, Applications, Connections*
- bb. Calculators
- cc. Computer Software

VI Objectives/Proficiencies

At the end of this course, students should be able to:

1. Relate geometry to art and to understand and apply simple reflections, rotations, and translations, recognizing their effects on geometric figures. This includes interpreting and drawing two and three dimensional objects.
2. Understand and apply the basic concepts related to points, lines, planes, and space including parallelism and perpendicularity.
3. Use and interpret appropriate symbols and notation to communicate geometric ideas.
4. Make and test a conjecture.
5. Be able to recognize and apply inductive and deductive reasoning.
6. Judge the validity of and construct an argument.
7. Formulate a counter example.
8. Understand and apply concepts of angle measure, including angle pair relationships.
9. Demonstrate an understanding of parallel lines, their properties and applications.
10. Identify similar figures and understand their properties.
11. Demonstrate an understanding of figures based upon information regarding angles and/or side measure.

12. Demonstrate the ability to identify congruent figures and understand and use their properties in practical applications.
13. Understand and apply properties of lines and segments related to triangles.
14. Understand and apply concepts and principles relating to quadrilaterals and other polygons.
15. Apply the Pythagorean theorem.
16. Use trigonometric ratios in solution of triangle and area problems.
17. Use the law of sines and cosines to solve triangles.
18. Extend the concept of trigonometric ratios to that of a function.
19. Use algebraic methods to solve geometric problems.
20. Understand and apply properties of lines, segments, angles, and arcs related to circles.
21. Apply the principles of coordinate geometry to determine properties of geometric figures.
22. Identify the equation and graph of the conic sections.
23. Understand and apply the concepts of perimeter, circumference, area, surface area, and volume.
24. Use trigonometric ratios in solution of triangle and area problems
25. Apply the principles of coordinate geometry to determine properties of geometric figures.
26. Interpret and draw two and three dimensional objects.

IV Methods of Evaluation

- a) Teacher constructed and/or standardized examinations, tests, and quizzes
- b) Unit Test
- c) Classwork and class participation
- d) Homework assignments
- e) Attendance in conformance with River Dell Board of Education policy

*Department of Mathematics
River Dell High School*

Eleventh Grade HSPA Math

COURSE SUMMARY: HSPA 11 is a course designed to provide a specialized program for those students who have been identified by the New Jersey Grade Eight Proficiency Assessment, or by their teacher as needing additional reinforcement and instruction in the basic skills of mathematics, as well as to prepare students for High School Proficiency Assessment. The course covers all four clusters that students are being tested on HSPA. The course consists of a study of number sense, concepts, and discrete mathematics, patterns, functions, and algebra. Problem solving skills are stressed.

STATE STANDARDS: State standards met by this course are as follows:
NJ Mathematics Core Curriculum Content Standards

4.1. Number and Numerical Operations

- A. Number Sense
- B. Numerical Operations
- C. Estimation

4.2. Geometry and Measurement

- A. Geometric Properties
- B. Transforming Shapes
- C. Coordinate Geometry
- D. Units of Measurement
- E. Measuring Geometric Objects

4.3. Patterns and Algebra

- A. Patterns
- B. Functions and Relationships
- C. Modeling
- D. Procedures

4.4. Data Analysis, Probability, and Discrete Mathematics

- A. Data Analysis (Statistics)
- B. Probability
- C. Discrete Mathematics--Systematic Listing and Counting
- D. Discrete Mathematics--Vertex-Edge Graphs and Algorithms

4.5. Mathematical Processes

- A. Problem Solving
- B. Communication
- C. Connections
- D. Reasoning
- E. Representations
- F. Technology

ENDURING UNDERSTANDINGS:

4.1. Number and Numerical Operations

- One representation may sometimes be more helpful than another; and, used together, multiple representations give a fuller understanding of a problem. *4.1.A*
- A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways. *4.1.A*
- Numeric fluency includes both understanding of and the ability to appropriate use numbers. *4.1.A*
- Computation fluency includes understanding the meaning and the appropriate use of numerical operations. *4.1.B*
- The magnitude of numbers affects the outcome of operations on them. *4.1.B*
- In many cases, there are multiple algorithms for findings a mathematical solution, and those algorithms are frequently associated with different cultures. *4.1.B*
- Context is critical when using estimation. *4.1.C*

4.2. Geometry and Measurement

- Geometric properties can be used to construct geometric figures. *4.2.A*
- Geometric relationships provide a means to make sense of a variety of phenomena. *4.2.A*
- Shape and area can be conserved during mathematical transformations. *4.2.B*
- Reasoning and/or proof can be used to verify or refute conjectures or theorems in geometry. *4.2.C*
- Coordinate geometry can be used to represent and verify geometric/algebraic relationships. *4.2.C*
- Everyday objects have a variety of attributes, each of which can be measured in many ways. *4.2.D.E*
- What we measure affects how we measure it. *4.2.D.E*
- Measurement can be used to describe, compare, and make sense of phenomena. *4.2.D.E*

4.3. Patterns and Algebra

- The symbolic language of algebra is used to communicate and generalize the patterns in mathematics. *4.3.A*
- Algebraic representations can be use to generalize patterns and relationships. *4.3.A*
- Patterns and relationships can be represented graphically, numerically, symbolically, or verbally. *4.3.B*
- Mathematical models can be used to describe and quantify physical relationships. *4.3.C*
- Physical models can be used to clarify mathematical relationships. *4.3.C*
- Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole. *4.3.D*
- Reasoning and/or proof can be used to verify or refute conjectures or theorems in algebra. *4.3.D*

4.4. Data Analysis, Probability, and Discrete Mathematics

- The message conveyed by the data depends on how the data is collected, represented, and summarized. *4.4.A*
- The results of a statistical investigation can be used to support or refute an argument. *4.4.A*
- Experimental results tend to approach theoretical probability after a large number of trials. *4.4.B*
- Grouping by attributes (classifications) can be used to answer mathematical questions. *4.4.C*
- Algorithms can effectively and efficiently be used to quantify and interpret discrete information. *4.4.C*
- Optimization is finding the best solution within given constraints. *4.4.D*
- Algorithms can effectively and efficiently be used to quantify and interpret discrete information. *4.4.D*

BIG IDEAS/COMMON THREADS:

To enable ALL of New Jersey's children to acquire the mathematical skills, understandings, and attitudes that they will need to be successful in their careers and daily lives. More specifically,

4.1 Numeric reasoning involves fluency and facility with numbers.

4.2 Geometry: Spatial sense and geometric relationships are means to solve problems and make sense of a variety of phenomena.

Measurement: Measurement is a tool to quantify a variety of phenomena.

4.3 Algebra provides language through which we communicate the patterns in mathematics.

4.4 Data Analysis: Reading, understanding, interpreting, and communicating data are critical in modeling a variety of real-world situation, drawing appropriate inferences, making informed decisions, and justifying those decisions.

Probability: Probability quantifies the likelihood that something will happen and enables us to make predictions and informed decisions.

Discrete Mathematics: Discrete mathematics consists of tools and strategies for representing, organizing, and interpreting non-continuous data.

4.5 While no additional big ideas, essential questions, or enduring understandings are listed for this standard, the mathematical process are imbedded in the content-specific ideas, questions, and understandings delineated for the first four standards.

ESSENTIAL QUESTIONS:

Primary:

1. What is number sense?
2. What are numerical operations?
3. What is estimation?
4. What are the geometric properties?
5. How do you transform shapes?
6. What is coordinate geometry?

7. How do you measure geometric objects?
8. What are patterns?
9. What is a function?
10. What is data analysis (statistics)?
11. What is probability?
12. What is discrete mathematics?
13. What are mathematic processes?

Secondary?

14. How do mathematical ideas interconnect and build on one another to produce a coherent whole? *4.1.A*
15. How can we compare and contrast numbers? *4.1.A*
16. What makes computational strategy both effective and efficient? *4.1.B*
17. How do operations affect numbers? *4.1.B*
18. How do mathematical representations reflect the needs of society across cultures? *4.1.B*
19. How do we decide when to use an estimate? *4.1.C*
20. How can spatial relationships be described by careful use of geometric language? *4.2.A*
21. How do geometric relationships help to solve problems and/or make sense of phenomena? *4.2.A*
22. What situations can be analyzed using transformations and symmetries? *4.2.B*
23. How can we best represent and vary geometric/algebraic relationships? *4.2.C*
24. How can measurements be used to solve problems? *4.2.D.E*
25. How can change be best represented mathematically? *4.3.A*
26. How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations? *4.3.A*
27. How are patterns of change related to behaviors of functions? *4.3.B*
28. How can we use mathematical models to describe physical relationships? *4.3.C*
29. How can we use physical models to clarify mathematical relationships? *4.3.C*
30. What makes an algebraic algorithm both effective and efficient? *4.3.D*
31. How can the collection, organization, interpretation, and display of data be used to answer questions? *4.4.A*
32. How can experimental and theoretical probabilities be used to make predictions and draw conclusions? *4.4.B*
33. How can attributes be used to classify data/objects? *4.4.C*
34. What is the best way to solve this? What counting strategy works best here? *4.4.C*
35. How can visual tools such as networks (vertex-edge graphs) be used to answer questions? *4.4.D*
36. How can algorithmic thinking be used to solve problems *4.4.D*

MODULE OBJECTIVES:

Students will:

- Develop number sense and will perform standard numerical operations and estimations on all types of numbers in a variety of ways. *4.1*
- Develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe, and analyze phenomena. *4.2*
- Represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concepts and processes. *4.3*

- Develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data. 4.4
- Use mathematical processes of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas. 4.5

MODULE SKILLS:

Upon successful completion of the requirements for this course, the student will be able to:

4.1. Number and Numerical Operations

4.1.12 A. Number Sense

1. Extend understanding of the number system to all real numbers.
2. Compare and order rational and irrational numbers.
3. Develop conjectures and informal proofs of properties of number systems and sets of numbers.

4.1.12 B. Numerical Operations

1. Extend understanding and use of operations to real numbers and algebraic procedures.
2. Develop, apply, and explain methods for solving problems involving rational and negative exponents.
3. Perform operations on matrices.
 - Addition and subtraction
 - Scalar multiplication
4. Understand and apply the laws of exponents to simplify expressions involving numbers raised to powers.

4.1.12 C. Estimation

1. Recognize the limitations of estimation, assess the amount of error resulting from estimation, and determine whether the error is within acceptable tolerance limits.

4.2. Geometry and Measurement

4.2.12 A. Geometric Properties

1. Use geometric models to represent real-world situations and objects and to solve problems using those models (e.g., use Pythagorean Theorem to decide whether an object can fit through a doorway).
2. Draw perspective views of 3D objects on isometric dot paper, given 2D representations (e.g., nets or projective views).
3. Apply the properties of geometric shapes.
 - Parallel lines – transversal, alternate interior angles, corresponding angles
 - Triangles
 - a. Conditions for congruence
 - b. Segment joining midpoints of two sides is parallel to and half the

- length of the third side
- c. Triangle Inequality
- d. Special right triangles
 - Minimal conditions for a shape to be a special quadrilateral
 - Circles – arcs, central and inscribed angles, chords, tangents
 - Self-similarity
- 4. Use reasoning and some form of proof to verify or refute conjectures and theorems.
 - Verification or refutation of proposed proofs
 - Simple proofs involving congruent triangles
 - Counterexamples to incorrect conjectures
- 5. Perform basic geometric constructions using a variety of methods (e.g., straightedge and compass, patty/tracing paper, or technology).
 - Perpendicular bisector of a line segment
 - Bisector of an angle
 - Perpendicular or parallel lines

4.2.12 B. Transforming Shapes

1. Determine, describe, and draw the effect of a transformation, or a sequence of transformations, on a geometric or algebraic representation, and, conversely, determine whether and how one representation can be transformed to another by a transformation or a sequence of transformations.
2. Recognize three-dimensional figures obtained through transformations of two-dimensional figures (e.g., cone as rotating an isosceles triangle about an altitude), using software as an aid to visualization.
3. Determine whether two or more given shapes can be used to generate a tessellation.
4. Generate and analyze iterative geometric patterns.
 - Fractal (e.g., Sierpinski's Triangle)
 - Patterns in areas and perimeters of self-similar figures
 - Outcomes of extending iterative process indefinitely

4.2.12 C. Coordinate Geometry

1. Use coordinate geometry to represent and verify properties of lines and line segments.
 - Distance between two points
 - Midpoint and slope of a line segment
 - Finding the intersection of two lines
 - Lines with the same slope are parallel
 - Lines that are perpendicular have slopes whose product is -1
2. Show position and represent motion in the coordinate plane using vectors.
 - Addition and subtraction of vectors
3. Find an equation of a circle given its center and radius and, given an equation of a circle in standard form, find its center and radius.

4.2.12 D. Units of Measurement

1. Understand and use the concept of significant digits.
2. Choose appropriate tools and techniques to achieve the specified degree of precision and error needed in a situation.
 - Degree of accuracy of a given measurement tool

- Finding the interval in which a computed measure (e.g., area or volume) lies, given the degree of precision of linear measurements

4.2.12 E. Measuring Geometric Objects

1. Use techniques of indirect measurement to represent and solve problems.
 - Similar triangles
 - Pythagorean theorem
 - Right triangle trigonometry (sine, cosine, tangent)
2. Use a variety of strategies to determine perimeter and area of plane figures and surface area and volume of 3D figures.
 - Approximation of area using grids of different sizes
 - Finding which shape has minimal (or maximal) area, perimeter, volume, or surface area under given conditions using graphing calculators, dynamic geometric software, and/or spreadsheets
 - Estimation of area, perimeter, volume, and surface area

4.3. Patterns and Algebra

4.3.12 A. Patterns

1. Use models and algebraic formulas to represent and analyze sequences and series.
 - Explicit formulas for n th terms
 - Sums of finite arithmetic series
 - Sums of finite and infinite geometric series
2. Develop an informal notion of limit.
3. Use inductive reasoning to form generalizations.

4.3.12 B. Functions and Relationships

1. Understand relations and functions and select, convert flexibly among, and use various representations for them, including equations or inequalities, tables, and graphs.
2. Analyze and explain the general properties and behavior of functions or relations, using algebraic and graphing techniques.
 - Slope of a line
 - Domain and range
 - Intercepts
 - Continuity
 - Maximum/minimum
 - Estimating roots of equations
 - Solutions of systems of equations
 - Solutions of systems of linear inequalities using graphing techniques
 - Rates of change
3. Understand and perform transformations on commonly-used functions.
 - Translations, reflections, dilations
 - Effects on linear and quadratic graphs of parameter changes in equations
 - Using graphing calculators or computers for more complex functions
4. Understand and compare the properties of classes of functions, including exponential, polynomial, rational, and trigonometric functions.
 - Linear vs. non-linear
 - Symmetry

- Increasing/decreasing on an interval

4.3.12 C. Modeling

1. Use functions to model real-world phenomena and solve problems that involve varying quantities.
 - Linear, quadratic, exponential, periodic (sine and cosine), and step functions (e.g., price of mailing a first-class letter over the past 200 years)
 - Direct and inverse variation
 - Absolute value
 - Expressions, equations and inequalities
 - Same function can model variety of phenomena
 - Growth/decay and change in the natural world
 - Applications in mathematics, biology, and economics (including compound interest)
2. Analyze and describe how a change in an independent variable leads to change in a dependent one.
3. Convert recursive formulas to linear or exponential functions (e.g., Tower of Hanoi and doubling).

4.3.12 D. Procedures

1. Evaluate and simplify expressions.
 - Add and subtract polynomials
 - Multiply a polynomial by a monomial or binomial
 - Divide a polynomial by a monomial
 - Perform simple operations with rational expressions
 - Evaluate polynomial and rational expressions
2. Select and use appropriate methods to solve equations and inequalities.
 - Linear equations and inequalities – algebraically
 - Quadratic equations – factoring (including trinomials when the coefficient of x^2 is 1) and using the quadratic formula
 - Literal equations
 - All types of equations and inequalities using graphing, computer, and graphing calculator techniques
3. Judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology.

4.4. Data Analysis, Probability, and Discrete Mathematics

4.4.12 A. Data Analysis

1. Use surveys and sampling techniques to generate data and draw conclusions about large groups.
 - Advantages/disadvantages of sample selection methods (e.g., convenience sampling, responses to survey, random sampling)
2. Evaluate the use of data in real-world contexts.
 - Accuracy and reasonableness of conclusions drawn
 - Correlation vs. causation
 - Bias in conclusions drawn (e.g., influence of how data is displayed)

- Statistical claims based on sampling
3. Design a statistical experiment, conduct the experiment, and interpret and communicate the outcome.
 4. Estimate or determine lines of best fit (or curves of best fit if appropriate) with technology, and use them to interpolate within the range of the data.
 5. Analyze data using technology, and use statistical terminology to describe conclusions.
 - Measures of dispersion: variance, standard deviation, outliers
 - Correlation coefficient
 - Normal distribution (e.g., approximately 95% of the sample lies between two standard deviations on either side of the mean)
 6. Distinguish between randomized experiments and observational studies.

4.4.12 B. Probability

1. Calculate the expected value of a probability-based game, given the probabilities and payoffs of the various outcomes, and determine whether the game is fair.
2. Use concepts and formulas of area to calculate geometric probabilities.
3. Model situations involving probability with simulations (using spinners, dice, calculators and computers) and theoretical models, and solve problems using these models.
4. Determine probabilities in complex situations.
 - Conditional events
 - Complementary events
 - Dependent and independent events
5. Estimate probabilities and make predictions based on experimental and theoretical probabilities.
6. Understand and use the “law of large numbers” (that experimental results tend to approach theoretical probabilities after a large number of trials).

4.4.12 C. Discrete Mathematics—Systematic Listing and Counting

1. Calculate combinations with replacement (e.g., the number of possible ways of tossing a coin 5 times and getting 3 heads) and without replacement (e.g., number of possible delegations of 3 out of 23 students).
2. Apply the multiplication rule of counting in complex situations, recognize the difference between situations with replacement and without replacement, and recognize the difference between ordered and unordered counting situations.
3. Justify solutions to counting problems.
4. Recognize and explain relationships involving combinations and Pascal’s Triangle, and apply those methods to situations involving probability.

4.4.12 D. Discrete Mathematics—Vertex-Edge Graphs and Algorithms

1. Use vertex-edge graphs and algorithmic thinking to represent and solve practical problems.
 - Circuits that include every edge in a graph
 - Circuits that include every vertex in a graph
 - Scheduling problems (e.g., when project meetings should be scheduled to avoid conflicts) using graph coloring
 - Applications to science (e.g., who-eats-whom graphs, genetic trees, molecular structures)
2. Explore strategies for making fair decisions.

- Combining individual preferences into a group decision (e.g., determining winner of an election or selection process)
- Determining how many Student Council representatives each class (9th, 10th, 11th, and 12th grade) gets when the classes have unequal sizes (apportionment)

4.5. *Mathematical Processes*

4.5 A. Problem Solving

1. Learn mathematics through problem solving, inquiry, and discovery.
2. Solve problems that arise in mathematics and in other contexts.
 - Open-ended problems
 - Non-routine problems
 - Problems with multiple solutions
 - Problems that can be solved in several ways
3. Select and apply a variety of appropriate problem-solving strategies (e.g., “try a simpler problem” or “make a diagram”) to solve problems.
4. Pose problems of various types and levels of difficulty.
5. Monitor their progress and reflect on the process of their problem solving activity.
6. Distinguish relevant from irrelevant information, and identify missing information.

4.5 B. Communication

1. Use communication to organize and clarify their mathematical thinking.
 - Reading and writing
 - Discussion, listening, and questioning
2. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing.
3. Analyze and evaluate the mathematical thinking and strategies of others.
4. Use the language of mathematics to express mathematical ideas precisely.

4.5 C. Connections

1. Recognize recurring themes across mathematical domains (e.g., patterns in number, algebra, and geometry).
2. Use connections among mathematical ideas to explain concepts (e.g., two linear equations have a unique solution because the lines they represent intersect at a single point).
3. Recognize that mathematics is used in a variety of contexts outside of mathematics.
4. Apply mathematics in practical situations and in other disciplines.
5. Trace the development of mathematical concepts over time and across cultures (cf. world languages and social studies standards).
6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

4.5 D. Reasoning

1. Recognize that mathematical facts, procedures, and claims must be justified.
2. Use reasoning to support their mathematical conclusions and problem solutions.
3. Select and use various types of reasoning and methods of proof.
4. Rely on reasoning, rather than answer keys, teachers, or peers, to check the correctness of their problem solutions.

5. Make and investigate mathematical conjectures.
 - Counterexamples as a means of disproving conjectures
 - Verifying conjectures using informal reasoning or proofs.
6. Evaluate examples of mathematical reasoning and determine whether they are valid.

4.5 E. Representations

1. Create and use representations to organize, record, and communicate mathematical ideas.
 - Concrete representations (e.g., base-ten blocks or algebra tiles)
 - Pictorial representations (e.g., diagrams, charts, or tables)
 - Symbolic representations (e.g., a formula)
 - Graphical representations (e.g., a line graph)
2. Select, apply, and translate among mathematical representations to solve problems.
3. Use representations to model and interpret physical, social, and mathematical phenomena.

4.5 F. Technology

1. Use technology to gather, analyze, and communicate mathematical information.
2. Use computer spreadsheets, software, and graphing utilities to organize and display quantitative information.
3. Use graphing calculators and computer software to investigate properties of functions and their graphs.
4. Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions).
5. Use computer software to make and verify conjectures about geometric objects.
6. Use computer-based laboratory technology for mathematical applications in the sciences (cf. science standards).

MODULE ASSESSMENT:

- a. Students will participate daily in the HSPA preparation program offered on www.studyisland.com .
 - a. Students will take a pretest to determine the Standard(s) they are least proficient.
 - b. Students will work on lessons for each Standard they are not proficient.
- b. Teacher-made and standardized tests to gauge student progress.
- c. One day out of each rotation, students will take and grade each other's practice open-ended exam questions.
- d. Students will assess other students' open-ended answers and delegate appropriate scores based on the given rubric.
- e. Notebooks/journals
- f. Homework
- g. Class work
- h. Student participation
- i. Observation of student performance:
 - a. Effort
 - b. Attitude
 - c. Work habits
 - d. Effective methods of thinking

- e. Study skills
- f. Discipline

RESOURCES:

- Texts: Preparing for the New Jersey HSPA Grade 11; Glatzer & Glatzer
Roadmap to the New Jersey HSPA Mathematics; The Princeton Review
New Jersey HSPA Mathematics Comprehensive Review; Prentice Hall
AIM Higher HSPA Math, Level K; Castro et al
- Websites: www.studyisland.com
http://www.state.nj.us/education/njpep/assessment/hspa/hspa_math/index.htm
www.pcti.tec.nj.us/hspapcti/index.html
<http://www.domath.org>
<http://www.goenc.com/>
<http://forum.swarthmore.edu/algpow>
<http://www.mathcounts.org>
<http://www.mathguide.com>
<http://mathforum.org/>
- Videos: www.unitedstreaming.com ; www.teachertube.com
- Technology: laptops (Internet), calculators

INTERMEDIATE ALGEBRA

Year Course/5 Credits

Grade: 11 & 12

Level: College Prep

Prerequisite: Integrated Math 2B

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course includes development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

169. Represent order and use numbers in a variety of equivalent forms (fractions, decimals, percent, exponential/scientific notation, radical, calculator display).
4.1.12.A.1
170. Perform operations and simplify polynomials, rational, and radical expressions with rational exponents. **4.3.12.A.1, 4.3.12.B.4**
171. Factor polynomials expressions. **4.3.12.D.2**
172. Understand the process of solving equations and inequalities with one variable and, where appropriate, representing solutions graphically.
4.3.12.D.2, 4.5.12.F.3
173. Understand the process of solving quadratic equations. **4.3.12.D.2**
174. Understand the process of solving systems of equations in two variables.
4.3.12.D.2
175. Understand the process of solving systems of linear inequalities in two variables by graphing. **4.3.12.D.2, 4.5.12.F.3**

176. Understand the process of solving absolute value equations and inequalities. **4.5.12.D.2**
177. Apply the process of solving problems using equations and inequalities. **4.3.12.C.1, 4.5.12.A.3**
178. Understand and apply the field properties of the complex numbers, including operations with complex numbers. **4.1.12.A.3**
179. Understand and apply the concept of finite and infinite relations and functions (including domain and range). **4.3.12.B.1**
180. Represent and analyze the relationship among a table of values, an algebraic formula, a written statement, and a graph, including the line, the parabola, and the circle. **4.3.12.B.1-2**
181. Understand operations on, and the general properties and behavior of functions, including the basic concepts of trigonometry. **4.3.12.B.4.3.12.B.1-2**
182. Apply the concepts and skills of coordinate geometry, such as midpoint, distance, and slope. **4.2.12.C.1**
183. Construct, interpret, and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations. **4.5.12.E.1-3**

IV Methods of Evaluation

- tt. Teacher constructed and/or standardized examinations, tests, and quizzes
- uu. Unit Test
- vv. Classwork and class participation
- ww. Homework assignments
- xx. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- dd. Textbook: *Intermediate Algebra*
- ee. Calculators
- ff. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

- a. Represent order and use numbers in a variety of equivalent forms (fractions, decimals, percent, exponential/scientific notation, radical, calculator display).
- b. Perform operations and simplify polynomials, rational, and radical expressions with rational exponents.
- c. Factor polynomials expressions.
- d. Understand the process of solving equations and inequalities with one variable and, where appropriate, representing solutions graphically.
- e. Understand the process of solving quadratic equations.
- f. Understand the process of solving systems of equations in two variables.
- g. Understand the process of solving systems of linear inequalities in two variables by graphing.
- h. Understand the process of solving absolute value equations and inequalities.
- i. Apply the process of solving problems using equations and inequalities.
- j. Understand and apply the field properties of the complex numbers, including operations with complex numbers.
- k. Understand and apply the concept of finite and infinite relations and functions (including domain and range).
- l. Represent and analyze the relationship among a table of values, an algebraic formula, a written statement, and a graph, including the line, the parabola, and the circle.
- m. Understand operations on, and the general properties and behavior of functions, including the basic concepts of trigonometry.
- n. Apply the concepts and skills of coordinate geometry, such as midpoint, distance, and slope.
- o. Construct, interpret, and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations.

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Unit Test
- c. Classwork and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

ALGEBRA 2
Year Course/5 Credits
Grade: 11
Level: College Prep
Prerequisite: Geometry

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course includes development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

184. Represent order and use numbers in a variety of equivalent forms (fractions, decimals, percent, exponential/scientific notation, radical, calculator display).
4.1.12.A.1
185. Perform operations and simplify polynomials, rational, and radical expressions with rational exponents. **4.3.12.A.1, 4.3.12.B.4**
186. Factor polynomials expressions. **4.3.12.D.2**
187. Understand the process of solving equations and inequalities with one variable and, where appropriate, representing solutions graphically.
4.3.12.D.2, 4.5.12.F.3
188. Understand the process of solving quadratic equations. **4.3.12.D.2**
189. Understand the process of solving systems of equations in two variables.
4.3.12.D.2
190. Understand the process of solving systems of linear inequalities in two variables by graphing. **4.3.12.D.2, 4.5.12.F.3**
191. Understand the process of solving absolute value equations and inequalities.
4.5.12.D.2

- 192. Apply the process of solving problems using equations and inequalities. **4.3.12.C.1, 4.5.12.A.3**
- 193. Understand and apply the field properties of the complex numbers, including operations with complex numbers. **4.1.12.A.3**
- 194. Understand and apply the concept of finite and infinite relations and functions (including domain and range). **4.3.12.B.1**
- 195. Represent and analyze the relationship among a table of values, an algebraic formula, a written statement, and a graph, including the line, the parabola, and the circle. **4.3.12.B.1-2**
- 196. Understand operations on, and the general properties and behavior of functions, including the basic concepts of trigonometry. **4.3.12.B.1-2**
- 197. Apply the concepts and skills of coordinate geometry, such as midpoint, distance, and slope. **4.2.12.C.1**
- 198. Construct, interpret, and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations. **4.5.12.E.1-3**
- 199. Understand the connection between trigonometric and circular functions. **4.3.12.B.4**
- 200. Use circular functions to model real-world phenomena. **4.3.12.C.1**
- 201. Graph the trigonometric functions. **4.3.12.B.4, 4.5.12.F.3**
- 202. Solve trigonometric equations. **4.3.12.D.2**

IV Methods of Evaluation

- yy. Teacher constructed and/or standardized examinations, tests, and quizzes
- zz. Unit Test
- aaa. Classwork and class participation
- bbb. Homework assignments
- ccc. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

gg. Textbook: *Algebra 2*

hh. Calculators

ii. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

1. Represent order and use numbers in a variety of equivalent forms (fractions, decimals, percent, exponential/scientific notation, radical, calculator display).
2. Perform operations and simplify polynomials, rational, and radical expressions with rational exponents.
3. Factor polynomials expressions.
4. Understand the process of solving equations and inequalities with one variable and, where appropriate, representing solutions graphically.
5. Understand the process of solving quadratic equations.
6. Understand the process of solving systems of equations in two variables.
7. Understand the process of solving systems of linear inequalities in two variables by graphing.
8. Understand the process of solving absolute value equations and inequalities.
9. Apply the process of solving problems using equations and inequalities.
10. Understand and apply the field properties of the complex numbers, including operations with complex numbers.
11. Understand and apply the concept of finite and infinite relations and functions (including domain and range).
12. Represent and analyze the relationship among a table of values, an algebraic formula, a written statement, and a graph, including the line, the parabola, and the circle.
13. Understand operations on, and the general properties and behavior of functions, including the basic concepts of trigonometry.

14. Apply the concepts and skills of coordinate geometry, such as midpoint, distance, and slope.
15. Construct, interpret, and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations.
16. Understand the connection between trigonometric and circular functions.
17. Use circular functions to model real-world phenomena.
18. Graph the trigonometric functions.
19. Solve trigonometric equations.

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Unit Test
- c. Classwork and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

HONORS ALGEBRA 2

Year Course/5 Credits

Grade: 10

Level: Honors

Prerequisite: Honors Geometry

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course includes development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

20. Represent order and use numbers in a variety of equivalent forms (fractions, decimals, percent, exponential/scientific notation, radical, calculator display).
4.1.12.A.1
21. Perform operations and simplify polynomials, rational, and radical expressions with rational exponents. **4.3.12.A.1, 4.3.12.B.4**
22. Factor polynomials expressions. **4.3.12.D.2**
23. Understand the process of solving equations and inequalities with one variable and, where appropriate, representing solutions graphically.
4.3.12.D.2, 4.5.12.F.3
24. Understand the process of solving quadratic equations. **4.3.12.D.2**
25. Understand the process of solving systems of equations in two variables.
4.3.12.D.2
26. Understand the process of solving systems of linear inequalities in two variables by graphing. **4.3.12.D.2, 4.5.12.F.3**
27. Understand the process of solving absolute value equations and inequalities.
4.5.12.D.2

28. Apply the process of solving problems using equations and inequalities. **4.3.12.C.1, 4.5.12.A.3**
29. Understand and apply the field properties of the complex numbers, including operations with complex numbers. **4.1.12.A.3**
30. Understand and apply the concept of finite and infinite relations and functions (including domain and range). **4.3.12.B.1**
31. Represent and analyze the relationship among a table of values, an algebraic formula, a written statement, and a graph, including the line, the parabola, and the circle. **4.3.12.B.1-2**
32. Graph and state the equation of lines and the conic sections. **4.3.12.B.4, 4.3.12.D.2, 4.5.12.F.4**
33. Understand operations on, and the general properties and behavior of functions, including the basic concepts of trigonometry, exponential, and logarithmic functions. **4.3.12.B.4**
34. Apply the concepts and skills of coordinate geometry, such as midpoint, distance, and slope. **4.2.12.C.1**
35. Construct, interpret, and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations. **4.5.12.E.1-3**
36. Understand the connection between trigonometric and circular functions. **4.3.12.B.4**
37. Use circular functions to model real-world phenomena. **4.3.12.C.1**
38. Graph the trigonometric functions. **4.3.12.B.4, 4.5.12.F.3**
39. Graph the trigonometric function with changes in amplitude and frequency as well as the reciprocal functions. **4.3.12.B.4, 4.5.12.F.3**
40. Solve trigonometric equations by using algebraic methods and trigonometric substitutions. **4.3.12.D.2**
41. Prove trigonometric identities. **4.3.12.B.4**
42. Evaluate expressions involving inverse trigonometric expressions. **4.3.12.B.4**
43. Solve triangles using trigonometric ratios, the law of sines, and the law of cosines, as well as apply these to real-life problems. **4.2.12.E.1**
44. Use binomial expansion and apply it to probability problems. **4.4.12.C.4**

45. Perform and apply operations on matrices. **4.5.12.E.1**
46. Use permutations and combinations in problem-solving as well as solving probability problems. **4.4.12.B.1-5**
47. Use the normal distribution to solve probability problems. **4.4.12.B.1-5**
48. Use the properties of arithmetic and geometric sequences in problem solving. **4.3.12.A.1**

IV Methods of Evaluation

- f. Teacher constructed and/or standardized examinations, tests, and quizzes
- g. Unit Test
- h. Classwork and class participation
- i. Homework assignments
- j. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- jj. Textbook: *Merrill Algebra 2 w/ Trig*
- kk. Calculators
- ll. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

1. Represent order and use numbers in a variety of equivalent forms (fractions, decimals, percent, exponential/scientific notation, radical, calculator display).
2. Perform operations and simplify polynomials, rational, and radical expressions with rational exponents.
3. Factor polynomials expressions.

4. Understand the process of solving equations and inequalities with one variable and, where appropriate, representing solutions graphically.
5. Understand the process of solving quadratic equations.
6. Understand the process of solving systems of equations in two and three variables using elimination and determinants.
7. Understand the process of solving systems of linear inequalities in two variables by graphing.
8. Understand the process of solving absolute value equations and inequalities.
9. Apply the process of solving problems using equations, inequalities and matrices.
10. Understand and apply the field properties of the complex numbers, including operations with complex numbers.
11. Understand and apply the concept of finite and infinite relations and functions (including domain and range).
12. Represent and analyze the relationship among a table of values, an algebraic formula, a written statement, and a graph, including the line, the parabola, and the circle.
13. Graph and state the equation of lines and the conic sections.
14. Understand operations on, and the general properties and behavior of functions, including the basic concepts of trigonometry, exponential, and logarithmic functions.
15. Apply the concepts and skills of coordinate geometry, such as midpoint, distance, and slope.
16. Construct, interpret, and/or draw inferences from graphs, tables, and charts that reflect data from real-world situations.
17. Understand the connection between trigonometric and circular functions.
18. Use circular functions to model real-world phenomena.
19. Graph the trigonometric functions.
20. Graph the trigonometric function with changes in amplitude and frequency as well as the reciprocal functions.
21. Solve trigonometric equations by using algebraic methods and trigonometric substitutions.

22. Prove trigonometric identities.
23. Evaluate expressions involving inverse trigonometric expressions.
24. Solve triangles using trigonometric ratios, the law of sines, and the law of cosines, as well as apply these to real-life problems.
25. Use binomial expansion and apply it to probability problems.
26. Perform and apply operations on matrices.
27. Use permutations and combinations in problem-solving as well as solving probability problems.
28. Use the normal distribution to solve probability problems.
29. Use the properties of arithmetic and geometric sequences in problem solving.

VII Methods of Evaluation

- i. Teacher constructed and/or standardized examinations, tests, and quizzes
- ii. Unit Test
- iii. Classwork and class participation
- iv. Homework assignments
- v. Attendance in conformance with River Dell Board of Education policy

TRIGONOMETRY
Semester Course/2.5 Credits
Grade: 12
Level: College Prep
Prerequisite: Intermediate Algebra

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course includes development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

49. Use the Pythagorean Theorem, distance/midpoint formulas, and interval notation. **4.2.12.A.1, 4.2.12.C.1, 4.2.12.E.1**
50. Identify types of angles and convert angles to standard position. **4.2.12.A.3**
51. Use angle relationships and similar triangles. **4.2.12.A.3, 4.2.12.E.1**
52. Define trigonometric functions and use quadrantal angles. **4.3.12.B.4**
53. Apply trigonometric identities for find indicated function values. **4.2.12.B.4**
54. Review right triangle-based definitions of trigonometric functions. **4.2.12.B.4, 4.2.12.E.1**
55. Learn reference angles and evaluate function values. **4.2.12.B.4**
56. Use a calculator to find angles measure and solve grade resistance problems. **4.5.12.F.3**
57. Solve right triangles using angle of elevation/depression and bearing. **4.2.12.A.3, 4.2.12.E.1**
- 58.** Define radian measure and convert between degrees and radians. **4.2.12.D.2**

59. Learn to find arc length of a circle and area of a sector. **4.2.12.A.3**
60. Develop the unit circle and apply it to circular functions. **4.3.12.B.3-4**
61. Learn concept of linear and angular velocity.
- 62.** Graph all general circular functions. **4.3.12.B.3, 4.5.12.F.3**
63. Identify graphs of circular functions. **4.5.12.F.3**
64. Review the fundamental identities. **4.2.12.A.4, 4.2.12.E.1**
65. Prove trigonometric identities. **4.2.12.A.4**
66. Verify an equation using the sum and difference identities of sine, cosine, and tangent. **4.2.12.A.4, 4.2.12.E.1**
67. Simplify expression using double-angle and half-angle identities. **4.3.12.D.1**
68. Solve non-right triangles using the law of sines and cosines. **4.2.12.E.1**
69. Find the area of a triangles using Heron's formula. **4.2.12.E.2**

IV Methods of Evaluation

- k. Teacher constructed and/or standardized examinations, tests, and quizzes
- l. Unit Test
- m. Classwork and class participation
- n. Homework assignments
- o. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- mm. Textbook: *Trigonometry*
- nn. Calculators
- oo. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

1. Use the Pythagorean Theorem, distance/midpoint formulas, and interval notation.
2. Identify types of angles and convert angles to standard position.
3. Use angle relationships and similar triangles.
4. Define trigonometric functions and use quadrantal angles.
5. Apply trigonometric identities for find indicated function values.
6. Review right triangle-based definitions of trigonometric functions.
7. Learn reference angles and evaluate function values.
8. Use a calculator to find angles measure and solve grade resistance problems.
9. Solve right triangles using angle of elevation/depression and bearing.
10. Define radian measure and convert between degrees and radians.
11. Learn to find arc length of a circle and area of a sector.
12. Develop the unit circle and apply it to circular functions.
13. Learn concept of linear and angular velocity.
14. Graph all general circular functions.
15. Identify graphs of circular functions.
16. Review the fundamental identities.
17. Prove trigonometric identities.
18. Verify an equation using the sum and difference identities of sine, cosine, and tangent.
19. Simplify expression using double-angle and half-angle identities.
20. Solve non-right triangles using the law of sines and cosines.
21. Find the area of a triangles using Heron's formula.

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Unit Test
- c. Classwork and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

STATISTICS
Semester Course/2.5 Credits
Grade: 12
Level: College Prep
Prerequisite: Intermediate Algebra

I Rationale

Statistics is a one-semester course designed to introduce the student to statistical concepts, their use and applications. It is intended that the integration of technology will allow for the collection, display, and analysis of data.

II Goals

Goals for this course include development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

70. Graph statistics using histogram, bar chart, and frequency charts. **4.4.12.A.1, 4.4.12.A.3**
71. Establish a frequency distribution. **4.4.12.A.1, 4.4.12.A.3**
72. Find the weighted mean, median, and mode of a set of data. **4.4.12.A.1, 4.4.12.A.3**
73. Graphically represent data and use regression and correlation. **4.4.12.A.12**
74. Deal directly with sets, associated definitions and operations. **4.4.12.A.1**
75. Count using combinations and permutations. **4.4.12.C.1-3**
76. Find the probability of an event using the addition and multiplication properties. **4.4.12.B.3-5**
77. Find the probability of an event using the binomial or normal distribution. **4.4.12.C.4**

IV Methods of Evaluation

- p. Teacher constructed and/or standardized examinations, tests, and quizzes
- q. Unit Test
- r. Classwork and class participation
- s. Homework assignments
- t. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- pp. Textbook: *Elementary Statistics: A Step by Step Approach*
- qq. Calculators
- rr. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

- 78. Graph statistics using histogram, bar chart, and frequency charts.
- 79. Establish a frequency distribution.
- 80. Find the weighted mean, median, and mode of a set of data.
- 81. Graphically represent data and use regression and correlation.
- 82. Deal directly with sets, associated definitions and operations.
- 83. Count using combinations and permutations.
- 84. Find the probability of an event using the addition and multiplication properties.
- 85. Find the probability of an event using the binomial or normal distribution.

VII Methods of Evaluation

- u. Teacher constructed and/or standardized examinations, tests, and quizzes
- v. Unit Test
- w. Classwork and class participation
- x. Homework assignments

Attendance in conformance with River Dell Board of Education policy

AP STATISTICS

Year Course/5 Credits

Grade: 11, 12

Level: Honors

Prerequisite: Intermediate Algebra / Trig

I Rationale

The AP statistics course is an in-depth study of statistics designed for the highly motivated student. This course introduces students to the major concepts and tools used to collect, analyze, and draw conclusions from data. According to the College Board, "The number of college students who take a statistics course is almost as large as the number of students who take a calculus course. At least one statistics course is typically required for majors such as engineers, psychology, sociology, health science, and business."

II Goals

Goals for this course include to introduce a variety of materials, techniques, and processes used in statistics; to motivate students to incorporate and understand graphical and numerical data encountered in everyday life; to obtain a valid conjecture based on data collected according to a well-developed plan; to effectively use probability as a tool for describing data distributions; to enable student to understand and apply various methods to solve statistics problems; to introduce statistics related career ;and to earn college credit and/or advanced placement through the AP Statistics exam.

III Objectives/Proficiencies

At the end of this course, students should be able to:

86. Explore and analyze data by observing patterns and departures from patterns.
4.3.12.A.3
87. Interpret information form graphical and numerical displays and summaries.
4.4.12.A.1-5
88. Dvelop plans to collect, organize, and analyze data. **4.4.12.A.1-5**
- 89.** Gain an understanding of probability theory and its use in statistical analysis.
4.4.12.B.1-6
90. Apply appropriate statistical models and tests to analyze and infer information from data. **4.4.12.B.1-6**

91. Apply appropriate technology to solve statistical problems. **4.5.12.F.1, 4.5.12.F.4**

IV Methods of Evaluation

- y. Teacher constructed and/or standardized examinations, tests, and quizzes
- z. Unit Test
- aa. Classwork and class participation
- bb. Homework assignments
- cc. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- ss. Textbook: *Practices of Statistics*
- tt. Calculators
- uu. Computer Software

III Proficiencies

At the end of this course, students should be able to:

- a. Explore and analyze data by observing patterns and departures from patterns.
- b. Interpret information from graphical and numerical displays and summaries.
- c. Develop plans to collect, organize, and analyze data.
- d. Gain an understanding of probability theory and its use in statistical analysis.
- e. Apply appropriate statistical models and tests to analyze and infer information from data.
- f. Apply appropriate technology to solve statistical problems.

IV Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Unit Test
- c. Classwork and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

PRECALCULUS
Year Course/5 Credits
Grade: 11, 12
Level: College Prep
Prerequisite: Intermediate Algebra / Trig

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course includes development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

92. Understand and describe the Real Number system, the Complex Number system and demonstrate facility with the properties and operations of both. **4.1.12.A.3**
93. Understand and use linear functions. Apply knowledge in solving "real world" people problems with the aid of the graphing calculator. **4.3.12.B.1, 4.5.12.F.3**
94. Use the techniques of coordinate geometry to solve problems involving the triangle. **4.2.12.A.3**
95. Apply Algebra to model word problems and solve both algebraically and graphically. **4.3.12.C.1, 4.5.12.A.1-3, 4.5.12.F.4**
96. Solve inequalities both algebraically and graphically. **4.3.12.C.1, 4.5.12.F.4**
97. Understand operations on, and the general properties and behavior of, classes of functions. **4.3.12.B.1, 4.3.12.B.4**
98. Analyze the graphs of polynomial, rational, and radical functions. **4.3.12.B.4**
99. Determine the zeros of functions using the graphing calculator. **4.5.12.F.3**
100. Recognize and use exponential and logarithmic expressions, solve equations and graph both. Investigate the applications of these expressions. **4.3.12.C.1**

101. Understand the connection between trigonometric and circular functions.
4.3.12.B.4
102. Apply general graphing techniques to trigonometric functions and recognize applications to real world phenomena. **4.5.12.E.1, 4.5.12.F.3**
103. Solve trigonometric techniques equations and verify trigonometric identities.
4.3.12.D.2
104. Construct matrices and use to solve systems of equations and real world problems. Use the graphing calculator to solve systems beyond 2 variables.
4.5.12.E.1-3, 4.5.12.F.3

IV Methods of Evaluation

- dd. Teacher constructed and/or standardized examinations, tests, and quizzes
- ee. Unit Test
- ff. Classwork and class participation
- gg. Homework assignments
- hh. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- vv. Textbook: *Precalculus: Mathematics for Calculus*
- ww. Calculators
- xx. Computer Software

VI Proficiencies

1. At the end of this course, students should be able to:
2. Understand and describe the Real Number system, the Complex Number system and demonstrate facility with the properties and operations of both.
3. Understand and use linear functions. Apply knowledge in solving “real world” people problems with the aid of the graphing calculator.

4. Use the techniques of coordinate geometry to solve problems involving the triangle.
5. Apply Algebra to model word problems and solve both algebraically and graphically.
6. Solve inequalities both algebraically and graphically.
7. Understand operations on and the general properties and behavior of classes of functions.
8. Analyze the graphs of polynomial, rational, and radical functions.
9. Determine the zeros of functions using the graphing calculator.
10. Recognize and use exponential and logarithmic expressions, solve equations and graph both. Investigate the applications of these expressions.
11. Understand the connection between trigonometric and circular functions.
12. Apply general graphing techniques to trigonometric functions and recognize applications to real world phenomena.
13. Solve trigonometric techniques equations and verify trigonometric identities.
14. Construct matrices and use to solve systems of equations and real world problems. Use the graphing calculator to solve systems beyond 2 variables.

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Unit Test
- c. Classwork and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

CALCULUS
Year Course/5 Credits
Grade: 12
Level: Honors
Prerequisite: Precalculus

I Rationale

This course is designed for those students who are planning on attending a post secondary institution and do not wish to take and AP exam. Students will develop skills in solving real world examples through the application of calculus. This course will also prepare students for the rigors of college level calculus and introduce students to careers in math and math-related professions.

II Goals

The goals of the course are to enable students to understand the properties and elements of calculus, to introduce a variety of materials, techniques and processes used in calculus, to enable students to apply various methods to solve calculus based problems, to introduce related careers in mathematics, and to motivate student to incorporate math in their lives as an essential tool in a life long process.

III Objectives/Proficiencies

At the end of this course, students should be able to:

105. Recognize and apply both linear and non-linear functions to college-based areas including, but not limited to, business, economics, and the social sciences. **4.5.12.C.3-4**
106. Demonstrate knowledge of the limit and continuity of a function. **4.3.12.B.2**
107. Apply and use the derivative and integral to solve real world problems. **4.5.12.C.3-4**
108. Use various techniques of differentiation and integration. **4.5.12.B.3**
109. Demonstrate the ability to relate relative extrema, concavity, absolute maxima and minima to applications used in various college courses. **4.5.12.C.3-4**
110. Demonstrate knowledge and apply concept of integral and differentiation to exponential functions, exponential models, the natural logarithm, and trigonometric functions. **4.5.12.C.1**
111. Apply the concept of compound interest to one's every day life. **4.5.12.C.3-4**

112. Apply infinite series and the Taylor Approximation model to college type scenarios. **4.3.12.1-3, 4.5.12.C.3-4**

IV Methods of Evaluation

- ii. Teacher constructed and/or standardized examinations, tests, and quizzes
- jj. Unit Test
- kk. Classwork and class participation
- ll. Homework assignments
- mm. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- yy. Textbook: *Calculus for Business, Economics, & Social/Life Sciences*
- zz. Calculators
- aaa. Computer Software

VI Objectives/Proficiencies

At the end of this course, students should be able to:

- 1) Recognize and apply both linear and non-linear functions to college based areas including, but not limited to, business, economics, and the social sciences.
- 2) Demonstrate knowledge of the limit and continuity of a function.
- 3) Apply and use the derivative and integral to solve real world problems.
- 4) Use various techniques of differentiation and integration.
- 5) Demonstrate the ability to relate relative extrema, concavity, absolute maxima and minima to applications used in various college courses.

- 6) Demonstrate knowledge and apply concept of integral and differentiatiaion to exponential functions, exponential models, the natural logarithm, and trigonometric functions.
- 7) Apply the concept of compound interest to their everyday lives.
- 8) Apply infinite series and the Taylor Approximation model to college type scenarios.

VII Methods of Evaluation

- a) Teacher constructed and/or standardized examinations, tests, and quizzes
- b) Unit Test
- c) Classwork and class participation
- d) Homework assignments
- e) Attendance in conformance with River Dell Board of Education policy

HONORS PRECALCULUS AB

Year Course/5 Credits

Grade: 11

Level: Honors

Prerequisite: Honors Intermediate Algebra / Trig

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course include development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

113. Demonstrate technical facility with algebraic problem solving, including techniques based on the theory of equations. **4.5.12.A.1-3**
114. Develop the complex number system and demonstrate facility with its operations. **4.1.12.A.3**
115. Understand operations on, and the general properties and behavior of, classes of functions. **4.3.12.B.1, 4.3.12.B.4**
116. Understand and use linear functions, including those that are written in the normal form. **4.3.12.B.1**
117. Use the techniques of coordinate geometry to solve problems that particularly focus on the triangle. **4.2.12.A.3**
118. Analyze the graphs of polynomial, rational, radical, and transcendental functions. **4.3.12.B.4**
119. Understand the connection between trigonometric and circular functions. **4.3.12.B.4**
120. Use circular functions to model real-world phenomena. **4.3.12.C.1**
121. Apply general graphing techniques to trigonometric functions. **4.5.12.E.1, 4.5.12.F.3**

- 122. Solve trigonometric equations and verify trigonometric identities. **4.3.12.D.2**
- 123. Identify, graph, translate, and understand the development of the parabola, circle, ellipse, and hyperbola. **4.5.12.E.1-3**
- 124. Recognize and use exponential and logarithmic expressions, solve equations and graph both. **4.3.12.C.1**
- 125. Construct proofs for mathematical assertions including direct proofs and proofs by mathematical induction. **4.2.12.A.4, 4.5.12.D.3**
- 126. Understand the concepts of arithmetic and geometric sequences and series as well as find the sum of an infinite series. **4.3.12.A.1**
- 127. Use binomial expansion in problem solving. **4.4.12.B.4-5, 4.4.12.C.1-4**

IV Methods of Evaluation

- nn. Teacher constructed and/or standardized examinations, tests, and quizzes
- oo. Unit Test
- pp. Classwork and class participation
- qq. Homework assignments
- rr. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- bbb. Textbook: *Precalculus: Mathematics for Calculus*
- ccc. Calculators
- ddd. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

- 1) Demonstrate technical facility with algebraic problem-solving, including techniques based on the theory of equations.
- 2) Develop the complex number system and demonstrate facility with its operations.

- 3) Understand operations on, and the general properties and behavior of, classes of functions.
- 4) Understand and use linear functions, including those that are written in the normal form
- 5) Use the techniques of coordinate geometry to solve problems which particularly focus on the triangle.
- 6) Analyze the graphs of polynomial, rational, radical, and transcendental functions.
- 7) Understand the connection between trigonometric and circular functions.
- 8) Use circular functions to model real-world phenomena.
- 9) Apply general graphing techniques to trigonometric functions.
- 10) Solve trigonometric equations and verify trigonometric identities.
- 11) Identify, graph, translate, and understand the development of the parabola, circle, ellipse, and hyperbola.
- 12) Recognize and use exponential and logarithmic expressions, solve equations and graph both.
- 13) Construct proofs for mathematical assertions including direct proofs and proofs by mathematical induction.
- 14) Understand the concepts of arithmetic and geometric sequences and series as well as find the sum of an infinite series.
- 15) Use binomial expansion in problem-solving.

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Unit Test
- c. Classwork and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

HONORS PRECALCULUS BC

Year Course/5 Credits

Grade: 11

Level: Honors

Prerequisite: Honors Intermediate Algebra / Trig

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course include development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

128. Demonstrate technical facility with algebraic problem solving, including techniques based on the theory of equations. **4.5.12.A.1-3**
129. Develop the complex number system and demonstrate facility with its operations. **4.1.12.A.3**
130. Understand operations on, and the general properties and behavior of, classes of functions. **4.3.12.B.1, 4.3.12.B.4**
131. Understand and use linear functions, including those that are written in the normal form. **4.3.12.B.1**
132. Use the techniques of coordinate geometry to solve problems that particularly focus on the triangle. **4.2.12.A.3**
133. Analyze the graphs of polynomial, rational, radical, and transcendental functions. **4.3.12.B.4**
134. Understand the connection between trigonometric and circular functions. **4.3.12.B.4**
135. Use circular functions to model real-world phenomena. **4.3.12.C.1**
136. Apply general graphing techniques to trigonometric functions. **4.5.12.E.1, 4.5.12.F.3**

- 137. Solve trigonometric equations and verify trigonometric identities. **4.3.12.D.2**
- 138. Identify, graph, translate, and understand the development of the parabola, circle, ellipse, and hyperbola. **4.5.12.E.1-3**
- 139. Recognize and use exponential and logarithmic expressions, solve equations and graph both. **4.3.12.C.1**
- 140. Construct proofs for mathematical assertions including direct proofs and proofs by mathematical induction. **4.2.12.A.4, 4.5.12.D.3**
- 141. Understand the concepts of arithmetic and geometric sequences and series as well as find the sum of an infinite series. **4.3.12.A.1**
- 142. Use probability, permutations, combinations, and binomial expansion in problem solving. **4.4.12.B.4-5, 4.4.12.C.1-4**
- 143. Understand the concept of limit of a function, including the formal definition. **4.3.12.B.1**
- 144. Understand the concept of derivative, its formal definition and its application to problem solving and graphing. **4.5.12.E.1-3, 4.5.12.F.4**

IV Methods of Evaluation

- ss. Teacher constructed and/or standardized examinations, tests, and quizzes
- tt. Unit Test
- uu. Classwork and class participation
- vv. Homework assignments
- ww. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- eee. Textbook: *Precalculus: Mathematics for Calculus*
- fff. Calculators
- ggg. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

- 16) Demonstrate technical facility with algebraic problem-solving, including techniques based on the theory of equations.
- 17) Develop the complex number system and demonstrate facility with its operations.
- 18) Understand operations on, and the general properties and behavior of, classes of functions.
- 19) Understand and use linear functions, including those that are written in the normal form
- 20) Use the techniques of coordinate geometry to solve problems which particularly focus on the triangle.
- 21) Analyze the graphs of polynomial, rational, radical, and transcendental functions.
- 22) Understand the connection between trigonometric and circular functions.
- 23) Use circular functions to model real-world phenomena.
- 24) Apply general graphing techniques to trigonometric functions.
- 25) Solve trigonometric equations and verify trigonometric identities.
- 26) Identify, graph, translate, and understand the development of the parabola, circle, ellipse, and hyperbola.
- 27) Recognize and use exponential and logarithmic expressions, solve equations and graph both.
- 28) Construct proofs for mathematical assertions including direct proffs and proofs by mathematical induction.
- 29) Understand the concepts of arithmetic and geometric sequences and series as well as find the sum of an infinite series.
- 30) Use probability, permutations, combinations, and binomial expansion in problem-solving.
- 31) Understand the concept of limit of a function, including the formal definition.
- 32) Understand the concept of derivative, its formal definition and its application to problem solving and graphing.

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Unit Test
- c. Classwork and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

AP CALCULUS AB
Year Course/5 Credits
Grade: 12
Level: Honors
Prerequisite: Honors Precalculus

I Rationale

To develop student's mathematical thinking.

II Goals

Goals for this course include development of mathematical thinking, development of modeling skills, communication of mathematical concepts, use of appropriate technology in analyzing and interpreting mathematical data and integrating mathematical skills while problem solving.

III Objectives/Proficiencies

At the end of this course, students should be able to:

145. Use the properties of limits involving a constant, sum, product, and quotient. **4.3.12.A.3**
146. Apply the definition of a derivative to sum, product, and quotients, including elementary functions, composite, rational, inverse, logarithmic, exponential, trigonometric, and inverse trigonometric functions. **4.3.12.B.2**
147. Obtain the derivative of an implicitly defined function. **4.5.12.C.2**
148. Obtain the derivative of a rational power of a function. **4.5.12.C.2**
149. Use both Rolle's Theorem and the Mean Value Theorem. **4.5.12.C.2**
150. Apply the derivative to slope of a curve, tangent and normal lines. **4.3.12.B.2, 4.5.12.C.3-4**
151. Apply the derivative to curve sketching, maximum and minimum points, concavity, and points of inflection. **4.5.12.C.3-4**
152. Apply the derivative to both acceleration and velocity. **4.3.12.B.2, 4.5.12.C.3-4**
153. Solve problems pertaining to related rates and maximization of functions using the definition of the derivative. **4.5.12.C.3-4**
154. Recognize the relation between differentiation and continuity. **4.3.12.B.2**

- 155. Use L'Hospital's rule. **4.5.12.C.3-4**
- 156. Using the concept of the definite integral as an area using rectangles, trapezoids, and parabolas. **4.5.12.C.1, 4.5.12.C.6**
- 157. Use the fundamental theorem of integral calculus. **4.5.12.C.3-4**
- 158. Apply the integral to applications involving the mean value, volume, surface area, length of a plane curve, area between two curves, and distance. **4.5.12.A.3**
- 159. Use the basic techniques of integration including substitution, integration by parts, partial functions, and improper integrals. **4.5.12.A.3**
- 160. Be able to determine approximations using upper and lower sums as definite integrals. **4.5.12.A.1**
- 161. Solve simple linear first order differential equations including variable separable. **4.5.12.A.1**
- 162. Solve applications with initial conditions, including harmonic motion. **4.5.12.C.3-4**
- 163. Apply the epsilon-delta definition to the limit of a function. **4.3.12.A.2**
- 164. Solve problems of the form $y'=kz$ and applications to growth and decay. **4.3.12.B.4**

IV Methods of Evaluation

- xx. Teacher constructed and/or standardized examinations, tests, and quizzes
- yy. Unit Test
- zz. Classwork and class participation
- aaa. Homework assignments
- bbb. Attendance in conformance with River Dell Board of Education policy

V Suggested Resources / Materials

- hhh. Textbook: *Calculus: A New Horizon*
- iii. Calculators
- jjj. Computer Software

VI Proficiencies

At the end of this course, students should be able to:

- a. Use the properties of limits involving a constant, sum, product, and quotient.
- b. Apply the definition of a derivative to sum, product, and quotients, including elementary functions, composite, rational, inverse, logarithmic, exponential, trigonometric, and inverse trigonometric functions.
- c. Derive the derivative of an implicitly defined function.
- d. Obtain the derivative of a rational power of a function.
- e. Use both Rolle's Theorem and the Mean Value Theorem.
- f. Apply the derivative to slope of a curve, tangent and normal lines.
- g. Apply the derivative to curve sketching, maximum and minimum points, concavity, and points of inflection.
- h. Apply the derivative to both acceleration and velocity.
- i. Solve problems pertaining to related rates and maximization of functions using the definition of the derivative.
- j. Recognize the relation between differentiation and continuity.
- k. Use L'Hospital's rule.
- l. Using the concept of the definite integral as an area using rectangles, trapezoids, and parabolas.
- m. Use the fundamental theorem of integral calculus.
- n. Apply the integral to applications involving the mean value, volume, surface area, length of a plane curve, area between two curves, and distance.
- o. Use the basic techniques of integration including substitution, integration by parts, partial fractions, and improper integrals.
- p. Be able to determine approximations using upper and lower sums as definite integrals.
- q. Solve simple linear first order differential equations including variable separable.

- r. Solve applications with initial conditions, including harmonic motion.
- s. Apply the epsilon-delta definition to the limit of a function.
- t. Solve problems of the form $y'=kz$ and applications to growth and decay.

VII Methods of Evaluation

- a. Teacher constructed and/or standardized examinations, tests, and quizzes
- b. Unit Test
- c. Classwork and class participation
- d. Homework assignments
- e. Attendance in conformance with River Dell Board of Education policy

AP Calculus BC Course Syllabus

Unit 1 – Limits

- 1) Establish correct notation, one and two sided limits
- 2) Develop the idea of a limit graphically and support this with algebraic computation
- 3) Establish multiple representations for limits including verbal and tabular models
- 4) Application of limits involving infinity; both horizontal and vertical asymptotes as limits
- 5) Prove and use the Sandwich Theorem to establish limits
- 6) Algebraic manipulation of indeterminate forms of a limit

Unit 2 – Continuity

- 1) Informal and formal definition of continuity with its links to limits
- 2) Identify removable vs. removable points of discontinuity and the creation of extension functions
- 3) Functions that are not continuous and where the function has continuity even if the function is not considered continuous
- 4) Intermediate Value Theorem and Extreme Value Theorem of continuous functions and their meaning

Unit 3 – Derivatives

- 1) Create a clear connection between the slope of a curve and the formal definition of a derivative using limits by deriving the formal definition of a curve graphically
- 2) Differentiate the differences between average rate of change vs. instantaneous rate of change
- 3) Discuss and interpret the Mean Value Theorem and its applications
- 4) Determine the relationship between differentiability and continuity and how the converse relationship does not exist.
- 5) All rules of differentiation; Power Rule, Product Rule, Quotient Rule, Chain Rule as well as differentiation of parametric equations and polar curves
- 6) The use of alternative types of differentiation such as implicit and logarithmic for transcendental functions and inverse functions
- 7) Applications of Derivatives; Behavior of a Function, Curve Sketching, Extreme Values on both closed and infinite intervals, Optimization, Related Rates, Tangent Lines and Tangent Line Approximation including Euler's Method, Velocity and Acceleration
- 8) Utilize and develop verbal models for derivatives, especially for setting up and solving problems including related rates and optimization in conjunction with problem solving
- 9) Graphical connection between a function and its derivative both individually and as families of functions
- 10) Second and higher order derivatives.
- 11) Applications of the second derivative to concavity, as an alternate to justify minimum or maximum values and to illustrate min/max values of the first derivative and as a curve sketching tool
- 12) Graphical connection between a function and its first and second derivatives as well as the connection between any two adjacent derivatives as a relationship between a function and its derivative.
- 13) Emphasize the non-direct connections between the multiple derivatives and their parent function, including use of the verbal, tabular and graphical representations of the first and second derivatives to justify intervals of increasing and decreasing behavior as well as the location of local minimum and maximum values

- 14) Application of L'Hospital's Rule in conjunction with limits to evaluate indeterminate forms of a limit
- 15) Overview of slope fields

Unit 4 – Integration

- 1) Integration as the anti-derivative
- 2) Fundamental Theorem of Calculus to represent a particular anti-derivative and its connection to graphical representation of the relationship between a function and its derivative
- 3) Techniques of Integration; Inverse Power Rule, Integration using substitution, Integration by Parts, Trigonometric Integration, Inverse Trigonometric Functions, Partial Fraction and Improper Integrals with one sided limits and limits involving infinity
- 4) Development of Reimann sums and the formal definition of the definite integral
- 5) Fundamental Theorem of Calculus as justification of the definite integral and relative rate of change of a function with regards to its derivative and the area under the curve
- 6) Approximating the value of the area under a curve using all three Reimann sums and the Trapezoidal Rule – through the use of verbal models, tables, graphs or algebraic functions. Discussion of over and underestimation with regards to the behavior or shape of the curve using the connections between first and second derivatives and the nature of the approximating technique
- 7) Solving differential equations, logarithmic and logistic growth models using separation of variables; particular emphasis to be placed on verbal and algebraic models for carrying capacity of a system in logistic growth models and its implication with regards to limits involving infinity of these systems
- 8) Use of the integral to find specific functions given initial conditions
- 9) Applications of Integration – Area under a curve or between curves, net change of a function, volume when an area is rotated about the x, y – axis or any other horizontal or vertical line, volume given geometric cross-sections and their ties to the given function, total distance traveled both given rectangular and parametric equations, average value of a function, accumulation of a function, length of a curve, area contained by a polar curve and between polar curves
- 10) Apply the Intermediate Value Theorem to definite integrals.
- 11) Connect slope fields to separation of variables and use to approximate the curve of the parent function given its derivative and corresponding slope field
- 12) Two specific connections will be made between the improper integral involving infinity. Verbal, graphical and algebraic discussion will connect the convergence or divergence of a function to its improper integral, as well as the establishment of a horizontal asymptote in a parametric system of equations through the use of an improper integral

Unit 5 – Polynomial Approximations and Series

- 1) Review and define finite and infinite series along with sigma notation where $n = 0$
- 2) Connect rational expressions to the infinite power series through division to establish how an infinite series can emulate a function
- 3) Define convergence of a series vs. convergence of sequence and its implications; specifically convergence of a series is the convergence of the partial sums of the series
- 4) Interval of convergence starting with geometric series and the ratio test for convergence and divergence with emphasis on testing endpoints
- 5) Various test for convergence, starting with the nth term test; including special cases, such as the harmonic series and the alternating series with its Error bound.
- 6) Application of the integral test, and development of the rules for the convergence of the p-series

- 7) Global applications of the various tests for the convergence; specifically the use of comparison testing with known series that are convergent or divergent and revisiting the ratio test as validation for an interval of convergence
- 8) Creation of Taylor Polynomials demonstrating their connections to approximation; linked to the Lagrange Error Bound as the maximum value of error on a certain approximation
- 9) Specific Taylor Polynomials centered at $x=0$, or the Maclaurin series; with emphasis placed on: e^x , $\sin x$, $\cos x$, and $\frac{1}{1-x}$ as building blocks to other series using substitution, integration and differentiation
- 10) Conservation of the radius of convergence over integration and differentiation

Primary Textbook

Larson, Ron, Robert P. Hostetler, Bruce H. Edwards. *Calculus of a Single Variable* – 8th Edition. Houghton Mifflin, 2006.

Secondary Textbook

Finney, Ross L., Franklin D. Demana, Bert K. Waits, Daniel Kennedy. *Calculus – Graphical, Numerical, Algebraic*. Prentice Hall, 2003.

Secondary Textbook

Smith, Robert T., Roland B. Minton. *Calculus* – 2nd Edition. McGraw-Hill, 2002.

Assessments:

Periodic tests are given throughout the year, accompanied by many smaller quizzes. The small quizzes are usually used to check for specific skill sets, while the tests require application of our skills to solve more complex problems. For all assessments, written justification of answers needs to be provided for full credit to be earned. Additionally, a wrong answer used correctly to complete a complex question will receive partial credit. Quizzes are usually given about once every 10 days and tests are given at the end of a major idea or theme.

Students are given separate assessments where the use of a graphing calculator is required. While the graphing calculator is a valuable teaching tool, only about 30% of their formal assessments require a calculator. Any assessment that has a calculator requirement will also be accompanied by questions that the calculator will not assist them in solving and usually will require a written explanation. The overall theme of all assessments given in this class is that the process is more important than the actual answer.

Formative assessments are given everyday. Students are given class work and homework daily. Some of this work will require them to come outside of class to successfully complete and others assignments must be completed independently. Again, there is a mix of calculator and non-calculator assignments with no specific directions given to students before the assignment is completed. Upon review in class we discuss whether a calculator would have been appropriate or not and why.

Emphasis is placed on written as well as mathematical justification of answers. Countless hours are spent correcting student's word choice. Students are told to be specific. They must justify the location of a maximum by stating, "The derivative switches from positive to negative at $x = 2$,

therefore there exists a local maximum in the function". The use of the word 'it' in any context is not accepted.

Technology

While calculators are not typically used on formal assessments, they are a powerful tool to be used in instruction. The use of the table function when teaching limits, the location of a hole in a graph vs. an asymptote as a contrast for the types of discontinuity start the class using the calculator to investigate. This is the main use of the calculator in this class.

Additionally, the calculator allows us to explore functions whose zeros or points of intersection cannot be found by hand. Emphasis is placed on using the calculator to find zeros or points of intersection and the memory function in the TI-83plus to ensure accuracy when finite integrals are evaluated or when evaluating a function at a certain point.

Lastly, the calculator is used to validate ideas that we have already proven in class. Using the nDer function, students can easily check to see if their derivatives are correct by comparing them to the graphs of the actual derivative. This is very useful when teaching the chain rule with trigonometric functions as students can see the scale factor they may have missed. The graphical integration tool is powerful to demonstrate the integral as net change when used in conjunction with the function $\sin x$.

There are countless other examples, but our emphasis is using the calculator to validate an answer, explore an idea or find values, derivatives, integrals and graphs of functions that we cannot do algebraically.

DISCRETE MATHEMATICS

Full Year Course – 5 Credits

COURSE DESCRIPTION

Discrete Mathematics is an umbrella of mathematical topics. It is a course designed for students who will undertake higher-level mathematics in college which may not include calculus. Topics include: (1) counting techniques, (2) matrices, (3) recursion, (4) graph theory, (5) social choice, (6) linear programming, and (7) game theory. Technology, such as computers and graphing calculators, should be used frequently.

Included in the study of discrete mathematics are the topics of: exponents and logarithms, sequences and series, combinatorics, probability, statistics, curve fitting and modeling, and an introduction to calculus which includes limits, power series, iterated functions, derivatives, and extreme value problems.

RATIONALE

In this technological age, mathematics is more important than ever. When students leave school, they are more and more likely to use mathematics in their work and everyday lives — operating computer equipment, planning timelines and schedules, reading and interpreting data, comparing prices, managing personal finances, and completing other problem-solving tasks. What they learn in mathematics and how they learn it will provide an excellent preparation for a challenging and ever-changing future.

OBJECTIVES / PROFICIENCIES

I. COUNTING TECHNIQUES

Students develop an understanding of combinatorial reasoning, using various types of diagrams and the fundamental counting principle to find numbers of outcomes and related probabilities. They also use simulations to solve counting and probability problems.

II. MATRICES

Students understand how matrices can be used to store and organize data and to solve systems of equations. They also use matrices to solve Markov chain problems that link present events to future events using probabilities.

III. RECURSION

Students understand and apply recursive methods to solve problems, including the use of finite differences.

IV. GRAPH THEORY

Students understand how graphs of points joined by lines can model a variety of problem situations. These include critical path analysis, graph coloring problems, minimal spanning trees, and bin-packing techniques.

V. SOCIAL CHOICE

Students analyze election data to evaluate different election methods and use weighted voting techniques to decide voting power within a group. They understand and use fair division techniques to solve apportionment problems.

VI. LINEAR PROGRAMMING

Students understand how to use diagrams to solve simple optimization problems and extend this to the Simplex method for solving more general optimization problems.

VII. GAME THEORY

Students understand and use game theory methods to solve strictly determined games and non-strictly determined games.

VIII. MATHEMATICAL REASONING and PROBLEM SOLVING

In a general sense, mathematics is problem solving. In all of their mathematics, students use problem-solving skills: they choose how to approach a problem, they explain their reasoning, and they check their results. At this level, students apply these skills to combinatorial reasoning, recursive thinking, critical path analysis, and other counting situations.

A. COMMUNICATION

The ability to read, write, listen, ask questions, think, and communicate about math will develop and deepen students' understanding of mathematical concepts. Students should read text, data, tables, and graphs with comprehension and understanding. Their writing should be detailed and coherent, and they should use correct mathematical vocabulary. Students should write to explain answers, justify mathematical reasoning, and describe problem-solving strategies.

B. REPRESENTATION

The language of mathematics is expressed in words, symbols, formulas, equations, graphs, and data displays. The concept of one-fourth may be described as a quarter, $\frac{1}{4}$, one divided by four, 0.25, 25 percent, or an appropriately shaded portion of a pie graph. Higher-level mathematics involves the use of more powerful representations: exponents, logarithms, p , unknowns, statistical representation, algebraic and geometric expressions. Mathematical operations are expressed as representations: +, =, divide, square. Representations are dynamic tools for solving problems and communicating and expressing mathematical ideas and concepts.

C. CONNECTIONS

Connecting mathematical concepts includes linking new ideas to related ideas learned previously, helping students to see mathematics as a unified body of knowledge whose concepts build upon each other. Major emphasis should be given to ideas and concepts across mathematical content areas that help students see that mathematics is a web of closely connected ideas (algebra, geometry, the entire number system). Mathematics is also the common language of many other disciplines (science, technology, finance, social science, geography) and students should learn mathematical concepts used in those disciplines. Finally, students should connect their mathematical learning to appropriate real-world contexts.