College Algebra

Course Description:

The curriculum for this NCAA approved elective course aligns with several of the Common Core State Standards for Mathematics, ACT College Readiness Benchmarks and University of Wisconsin System Placement Testing. The desired learning objectives for COLLEGE ALGEBRA is to increase mathematical proficiency, conceptual understanding, procedural fluency, and logical reasoning in students intending to use mathematics in their future coursework, profession, or day-to-day life. This course aims to increase student success in a rigorous preparation for college-level mathematics, while meeting the needs of students by using a curricular design that combines online and paper resources. The course covers basic algebra, absolute values and inequalities, linear equations, geometry, systems of linear equations, exponents, polynomials, factoring, solving by factoring, radicals and exponents, rational expressions, quadratic equations, and quadratic functions. Currently this course is articulated through Blackhawk Technical College. It is in discussion to later be given college credit. The information in this course overview outlines what students should understand and be able to do by the end of the trimester/year.

Mastery Standards:

Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. (8.EE.C.7b)

Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's Law V = IR to highlight resistance R.* (HSA.CED.4)

Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. (8.EE.C.7b)

Define & graph the Unit Circle and trigonometric ratios/formulas and then use them to solve problems involving right triangles and non-right triangles. (HSF.TF.A.1–7 & HSG.SRT.C.6–11)

Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (A-CED.A.2)

Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$. (8.EE.A.1)

Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b. (HSA-REI.B.4b)

Rewrite expressions involving radicals and rational exponents using the properties of exponents. For example: $\log_a(c)=b <-> a^b=c$. (HSN-RN.A.2)

Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b. (HSA-REI.B.4b)

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.** (HSF.IF.B.4)

Unit	Description of Unit and Learning Targets
Unit 01: Algebra basics Essential Questions: ● How do you solve equations and inequalities with one variable? ● How do you model a mathematical situation using an equation? ● What features can help to identify where equations have one, none, or infinitely many solutions? ● How is order of operations used to isolate a variable in an equation?	Students will……. Learning Targets: ● I can categorize which subsection of the Real Number System a number falls into. ● I can evaluate and simplify arithmetic expressions with and without the use of a calculator. ● I can write an equation given a mathematical situation. ● I can solve linear equations in one variable. ● I can solve linear inequalities in one variable. ● I can apply the order of operations correctly. ● I can graph solution sets on the real line. ● I can solve equations involving absolute value. ● I can solve inequalities involving absolute value. ● I can use properties of inequalities to simplify, to solve inequalities, and to combine inequalities.
Unit 02: Linear Equations/Inequalities Essential Questions: ● How can functions be represented in multiple ways? ● How do various functions compare to each other? ● How do you use interval notation to communicate solutions? ● How do we use given information to write the equation or construct a graph of a linear equation? ● How is the graph of a linear equation different from the graph of a linear inequality?	Students will... Learning Targets: ● I can state the domain and range of a rational expression. ● I can convert between interval notation, inequality notation, and graphical notation for subsets of real numbers. ● I can determine whether a relation represents a function and find the value of a function. ● I can find the equation of a line given its slope and a point. ● I can find the equation of a line given its slope and its y-intercept. ● I can find the equation of a line given two points on the line. ● I can find equations of parallel lines and perpendicular lines. ● I can write the equation of a line in slope-intercept form, standard form, and point-slope form. ● I can graph a line. ● I can identify the slope and y-intercept of a line from its equation or graph. ● I can graph piecewise-defined functions and I can determine the equation given the graph of a piecewise-defined function. ● I can determine the equation of a line parallel or perpendicular to a given line that passes through a given point.
Unit 03: Scatterplots Essential Questions: ● How can linear functions be used in real-life situations? ● How is identifying trends or associations in a data set important? ● How do you write equations to model real-world data?	Students will... Learning Targets: ● I can construct a scatter plot. ● I can interpret a scatter plot that has outliers. ● I can interpret a scatter plot that has a positive correlation. ● I can interpret a scatter plot that has a negative correlation. ● I can interpret a scatter plot that has no correlation. ● I can model situations using linear equations. ● I can draw a line of best fit (trend line) for a scatter plot that suggests a linear relationship. ● I can create a linear equation representing the line of best fit. ● I can use a linear equation representing the line of best fit that I wrote to solve problems about the given situation. ● I can use a linear equation representing the line of best fit that I wrote to interpret the meaning of the slope and the y-intercept about the given situation.

	● I can utilize my PEMDAS knowledge with Pearson's Correlation Coefficient.
Unit 04: Multiple Equations/Linear Programming Essential Questions: ● What does the number of solutions (none, one or, infinite) of a system of linear equations represent? ● What are the advantages and disadvantages of solving a system of linear equations graphically versus algebraically? ● How can systems of inequalities be used to find an optimal solution?	Students will... Learning Targets: ● I can solve systems of linear equations in two variables by substitution and I can solve systems of linear equations in two variables by elimination. ● I can identify inconsistent systems of equations in two variables and I can express the solution of a system of dependent equations containing two variables. ● I can solve systems of three equations and three unknowns by substitution and/or elimination. ● I can identify inconsistent systems of three equations and three unknowns. ● I can model situations using linear equations. ● I can model real-world problems using inequalities and form conclusions using the model.
Unit 05: Trigonometry Essential Questions: ● How do you evaluate trigonometric functions for given values? ● How do trigonometric functions relate to the unit circle? ● How do we model "real world" scenarios to trigonometric functions? ● How can inverse trigonometric functions be used to solve "real world" scenarios?	Students will... Learning Targets: ● I know and can apply geometry formulas related to squares, triangles, circles, boxes, spheres, and right circular cylinders. ● I can use the Pythagorean Theorem. ● I can apply the relationship between Sine & Cosine of complementary angles to solve mathematical problems. ● I can solve right triangle problems using Trigonometric ratios and the Pythagorean Theorem. ● I can apply the Laws of Sines and Cosines to problems. ● I can apply the Law of Sines and Cosines to problems involving unknown measures in right and non-right triangles.
Unit 06: Power Rules Essential Questions: ● How can functions be manipulated to make new functions? ● How do students use properties of rational exponents to simplify and create equivalent forms of numerical expressions? ● How do you simplify expressions using exponents?	Students will... Learning Targets: ● I can use the Law of Exponents, including those involving roots. ● I can simplify expressions involving nth roots ● I can simplify expressions involving rational exponents. ● I can perform operations on polynomials, including addition, subtraction, multiplication and division. ● I can perform algebraic operations on rational expressions, including reducing to lowest terms, addition, subtraction, multiplication and division.
Unit 07: Logarithms Essential Questions: ● How do you evaluate exponential functions for given values? ● How do you solve exponential and logarithmic equations? ● How do you use exponential models so solve real world problems? ● How do you change bases in logarithmic expressions?	Students will... Learning Targets: ● I can evaluate exponential functions. ● I can define the number "e". ● I can graph exponential functions. ● I can solve basic exponential equations. ● I can change an exponential equation to a logarithmic equation. ● I can change a logarithmic equation to an exponential equation.

● How do you use properties of logarithms to evaluate or rewrite expressions?	● I can evaluate logarithmic expressions. ● I can determine the domain of a logarithmic function. ● I can graph logarithmic functions. ● I can solve basic logarithmic equations.
Unit 08: Simplifying Rational Expressions Essential Questions: ● What are the key features of the graphs of radical and rational functions? ● How can polynomials be simplified and applied to solve/model real-world problems? ● How do you simplify rational expressions? ● Why is the domain affected by rational functions? ● Why are the domain restrictions in rational equations important?	Students will... Learning Targets: ● I can factor polynomials using a variety of techniques. ● I can find the vertical asymptotes of a rational function. ● I can find the horizontal asymptotes of a rational function. ● I can find any intercepts appearing on the graph of a rational function.
Unit 09: Solving Quadratics Essential Questions: ● How can you find a solution to a polynomial equation algebraically and graphically? ● How can features of polynomial functions such as the equation, solutions, axis of symmetry, vertex, etc. be represented in tables, equations, and in “real world” contexts? ● How do zeros and imaginary numbers represent solutions to polynomial equations? ● How are the real solutions of a quadratic equation related to the graph of the related quadratic function? ● How are the solutions of a quadratic equation related to the x-intercepts of the graph of a quadratic function? ● What does the degree of a polynomial tell you about its related polynomial function? ● What is a complex number and how do you simplify complex numbers?	Students will... Learning Targets: ● I can find all real and complex solutions to quadratic equations using a variety of methods. ● I can use factoring to solve quadratic-like equations. ● I can solve equations in quadratic form. ● I can model situations using quadratic equations and use the model to form conclusions. ● I can describe the discriminant of a quadratic equation and use it to determine its number of solutions over the real numbers. ● Given a quadratic equation, I can identify the vertex and the axis of symmetry on its graph. ● I can graph a quadratic function using its equation. ● I can graph a quadratic function using its vertex and one other point. ● I can find and identify x-intercepts on the graph of a quadratic function. ● I can use an equation or a graph to find the minimum or maximum value of a quadratic function.
Unit 10: Sequences & Series Essential Questions: ● How do you represent a sequence of numbers or the sum of a sequence? ● How do you use mathematical induction to find and prove formulas for sums of sequences and series?	Students will... Learning Targets: ● I can determine whether a sequence has a pattern. ● I can determine whether a sequence can be generalized to find a formula for the general term in the sequence. ● I can determine whether a sequence is arithmetic or geometric. ● I can determine the general terms of an arithmetic and

	geometric sequence. ● I can determine the sum of a finite arithmetic or geometric series