

ADVANCED ALGEBRA
1 UNIT

I. SPECIFIC COURSE OBJECTIVES

A. At the completion of this course, the student will:

1. be able to use various techniques to model and solve - mathematical problems that are found in the world.
2. be prepared to continue his or her studies in mathematics and science

II. SPECIFIC OUTLINE OF COURSE CONTENT

A. The language of Algebra standards(10.A.1.1)

1. Describing situations with Algebra
2. Formula
3. Explicit formulas for sequences
4. Recursive formulas for sequences
5. Algebra as a mathematical system
6. Reasoning in Algebra
7. Solving equations
8. Rewriting formulas
9. Solving inequalities

B. Variations and graphs standards(10.N.4.2)

1. Direct variation **I**
2. Inverse Variation **I**
3. The Fundamental Theorem of Variation
4. The graph of $y = kx$
5. The graph of $y = kx^2$
6. Using an automatic grapher
7. The graphs of $y = k/x$ and $y = k/x^2$
8. Fitting a model to data
9. Combined and joint variation

C. Linear relations standards(10.A.1.3)

1. Constant increase or decrease
2. The graph of $y = mx + b$
3. Linear combinations
4. The graph of $Ax + By = C$
5. Finding an equation of a line
6. Arithmetic sequences: explicit formulas
7. Arithmetic sequences: recursive formulas
8. Piecewise linear graphs

9. Linear inequalities

D. Matrices standards(10.G.2.2)

1. Storing data in matrices
2. Matrix multiplication
3. Size changes
4. Reflections
5. Transformations and matrices
6. Rotations
7. Perpendicular lines
8. Matrix addition
9. Translations

E. Systems standards(10.A.1.2)

1. Compound sentences
2. Representing systems
3. The linear-combination method
4. The substitution method
5. Inverses of matrices
6. Using matrices to solve systems
7. Systems of linear inequalities

F. Parabolas and quadratic equations standards(10.A.1.1)

1. Squares and square roots
2. Graphing $y = ax^2 + bx + c$
3. The parabola
4. The graph-translation theorem
5. Completing the square
6. The quadratic formula
7. Analyzing solutions to a quadratic
8. The imaginary number i
9. Complex numbers
10. Solving all quadratics

G. Functions standards(10.P.5.1)

1. Function notation
2. Graphs of functions
3. Composition of functions
4. Step functions
5. Other special functions
6. Reflections and inverses
7. Inverse functions

H. Powers and roots standards(10.N.4.1)

1. Properties of powers
2. Compound interest
3. Geometric sequences

4. Negative integer exponents
5. Nth roots
6. Positive rational exponents
7. Negative rational exponents
8. Radical notation for nth roots
9. Powers and roots of negative numbers
10. Solving $ax^n = b$
11. Solving $a(x - h)^n = b$

I. Exponents and logarithms standards(10.P.5.2)

1. Exponential growth
2. Exponential decay
3. Logarithmic scales
4. Common Logarithms
5. Logarithms to bases other than 10
6. Properties of logarithms
7. The number e
8. Natural logarithms
9. Solving $bx = a$

J. Trigonometry standards(10.M.3.1)

1. The trigonometric ratios
2. More right triangle trigonometry
3. Properties of sines and cosines
4. The unit circle
5. Cosines and sines in quadrants II-IV
6. The law of cosines
7. The law of sines
8. Solving $\sin e = k$
9. The cosine and sine functions _n
10. Radian measure

K. Polynomials standards(10.M.3.2)

1. Polynomial models
2. Polynomials and geometry
3. Factoring polynomials
4. The factor theorem
5. Estimating zeros of polynomial functions
6. Solving all polynomial equations
7. Finite differences
8. Modeling data with polynomials

L. Quadratic relations standards(10.G.2.1)

1. Circles
2. Semicircles, interiors, and exteriors of circles
3. Drawing ellipses and hyperbolas

4. Equations *of* some ellipses
5. Relations between ellipses and circles
6. Equations for some hyperbolas
7. More hyperbolas
8. Classifying quadratic relations
9. Quadratic-linear systems
10. Quadratic-quadratic systems

III. PLAN FOR STUDENT EVALUATION

- A. Grade student daily work which will include homework and small quizzes.
- B. Give at least one quiz per chapter over material covered in the first sections *of* the chapter.
- C. Give a test over the material in each chapter.

IV. SPECIFIC STANDARDS FOR PASSING

- A. The student will accomplish passing work (60% accuracy) in the following areas:
 1. Using sequence in real world situations.
 2. Identifying properties *of* variation graphs.
 3. Graphing linear equations and inequalities.
 4. Using matrix addition, matrix multiplication, and scalar r^n multiplication to solve real world problems.
 5. Recognizing properties *of* systems *of* equations and systems *of* inequalities.
 6. Graphing parabolas and interpreting them.
 7. Determining whether a given relation is a function.
 8. Solving real world problems which can be modeled by powers and roots
 9. Solving logarithmic functions
 10. Using the properties *of* a unit circle to find trigonometric values.
 11. Factoring polynomials.
 12. Describing relations