



Pine Grove Area
SCHOOL DISTRICT

Mathematics

Career Technical Algebra II

BOARD APPROVED AUGUST 2007

I. PHILOSOPHY

The Career Technical Algebra II course of the Pine Grove Area School District has been structured to systematically reinforce the language of mathematics and the use of fundamental operations, measurement, probability, statistics, algebra and geometry. These skills will be practiced using many application problems drawn from the mechanical and building trades, and will include many opportunities for “hands-on” learning. The course will allow for the accommodation of many learning styles, motivational levels, and academic abilities.

II. CORE CONCEPTS

1. Language of Mathematics- Define terms and symbols used in mathematical operations.
2. Fundamentals of Operations- Perform basic operations using signed numbers, fractions, decimals, percents, scientific notation, and ratio and proportion.
3. Measurement- Convert from one unit of measure to another, both from within a system and from system to system.
4. Statistics and Data Analysis- Calculate measures of central tendency, and read and interpret charts and graphs.
5. Probability- Calculate probability using the fundamental counting principle, permutations, combinations and independent and mutually exclusive events.
6. Fundamentals of Algebra- Simplify expressions, solve equations, and transform formulas.
7. Advanced Algebra- Solve inequalities, perform operations on polynomials, and use the quadratic formula.
8. Graphing- Graph linear equations using a variety of methods.
9. Basic Geometry- Define terms, identify figures, and calculate perimeter, area, and volume.
10. Advanced Geometry- Use theorems to solve triangles and circles.

III. COURSE OF STUDY

A. Course Name: Career Technical Algebra II

B. Grade Level: 11

C. Length of Course: One semester

1. Frequency: Daily

2. Duration: 84 minutes

D. Academic Level: Career Technical

E. Credits: 1

F. Prerequisites: Algebra I, Geometry

G. Course Description: This course is an extension of Algebra I and Geometry, but it goes well beyond the limits of the previous courses. The types of equations studied expand to include quadratic and fractional. It includes a further study of factoring methods and of simplifying rational expressions. Triangles and circles are explored using proofs involving axioms and theorems. The problem solving skills are continually refined with more involved and more sophisticated applications using one or two variables in various equations and inequalities. An introduction to probability and statistics is also offered in this course. This course is intended for 11th grade vo-tech students and will be taught in a double period format for one semester.

IV. CONTENT: Career Technical Algebra II
CORE CONCEPT 1: Language of Mathematics
MAJOR OBJECTIVE: Define terms and symbols used in mathematical operations.

| CURRICULUM STANDARD: | | | |
|---|---|--|---|
| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
| <p>PA STANDARD 2.5B</p> <p>Use symbols and mathematical terminology to communicate observations, concepts, generalizations, ideas and results.</p> | <p>Teacher will guide students to:</p> <p>Identify and use common mathematical symbols.</p> <p>Compare Roman and Arabic numerals.</p> <p>Define and use set notation.</p> <p>Identify properties of real numbers.</p> | <p>Teacher evaluation of:</p> <p>Student board work</p> <p>Student written work</p> <p>Student use of manipulatives</p> <p>Student notebooks</p> | <p>Textbook resources</p> <p>Workbook resources</p> <p>Student notebooks</p> <p>Manipulatives</p> |

CONTENT: Career Technical Algebra II

CORE CONCEPT 2: Fundamentals of Operations

MAJOR OBJECTIVE: Perform basic operations using signed numbers, fractions, decimals, percents, scientific notation, and ratio and proportion.

CURRICULUM STANDARD:

| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
|---|--|--|--|
| <p>PA STANDARD 2.2.A</p> <p>Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations.</p> | <p>Teacher will guide students to:</p> <p>Use the order of operations to evaluate an expression.</p> <p>Add, subtract, multiply, and divide signed numbers, fractions, mixed numbers and decimals.</p> <p>Evaluate absolute value.</p> <p>Convert between improper fractions and mixed numbers.</p> <p>Rewrite fractions in higher terms.</p> <p>Reduce fractions.</p> <p>Simplify complex fractions.</p> <p>Convert decimals to fractions and percents, fractions to decimals and percents, and percents to decimals and fractions.</p> <p>Evaluate and write expressions with exponents.</p> | <p>Teacher evaluation of:</p> <p>Student board work</p> <p>Student written calculations</p> <p>Student use of graphing calculator and manipulatives</p> <p>Student notebooks</p> | <p>Textbook resources</p> <p>Workbook resources</p> <p>Graphing calculators</p> <p>Manipulatives</p> |

CONTENT: Career Technical Algebra II

CORE CONCEPT 2: Fundamentals of Operations

MAJOR OBJECTIVE: Perform basic operations using signed numbers, fractions, decimals, percents, scientific notation, and ratio and proportion.

CURRICULUM STANDARD:

| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
|--|---|---|---|
| PA STANDARD 2.2.A Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations. | Teacher will guide students to: Evaluate and write expressions with scientific notation. Evaluate percents. Calculate simple interest. Represent quantities using ratios. Solve proportions. | Teacher evaluation of: Student board work Student written calculations Student use of graphing calculator and manipulatives Student notebooks | Textbook resources Workbook resources Graphing calculators Manipulatives |
| PA STANDARD 2.2.B Use estimation to solve problems for which an exact answer is not needed. | Teacher will guide students to: Round and estimate using fractions, decimals, and percents. | Teacher evaluation of: Student board work Student written calculations Student use of manipulatives Student notebooks | Textbook resources Workbook resources |

CONTENT: Career Technical Algebra II

CORE CONCEPT 3: Measurement

MAJOR OBJECTIVE: Convert from one unit of measure to another, both from within a system and from system to system.

CURRICULUM STANDARD:

| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
|---|--|--|--|
| <p>PA STANDARD 2.3.A</p> <p>Select and use appropriate units to measure to the degree of accuracy required in particular measurement situations.</p> | <p>Teacher will guide students to:</p> <p>Differentiate between precision and accuracy.</p> <p>Evaluate decimal tolerances.</p> <p>Identify units of measure in the English System and International System.</p> <p>Convert measures to other units within the same system.</p> <p>Convert measures to units in a different system.</p> <p>Calculate length, area, and volume in both systems.</p> <p>Measure angles in decimal degrees, degrees-minutes-seconds, and radians.</p> <p>Convert from degrees to radians and vice-versa.</p> <p>Use units of measure for weight, mass, temperature, heat, and pressure.</p> | <p>Teacher evaluation of:</p> <p>Student board work</p> <p>Student written calculations</p> <p>Student use of graphing calculator and measuring tools</p> <p>Student notebooks</p> <p>Student group work</p> | <p>Textbook resources</p> <p>Workbook resources</p> <p>Measuring tools</p> <p>Graphing calculators</p> |

CONTENT: Career Technical Algebra II

CORE CONCEPT 4: Statistics and Data Analysis

MAJOR OBJECTIVE: Calculate measures of central tendency, and read and interpret charts and graphs.

CURRICULUM STANDARD:

| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
|---|---|--|--|
| <p>PA STANDARD 2.6.A</p> <p>Describe data as an example of a distribution using statistical measures of center and spread.</p> | <p>Teacher will guide students to:</p> <p>Calculate the mean, median, and mode of a data set.</p> <p>Read and interpret frequency tables, bar graphs, circle graphs, and line graphs.</p> | <p>Teacher evaluation of:</p> <p>Student board work</p> <p>Student written calculations</p> <p>Student use of graphing calculator and manipulatives</p> <p>Student notebooks</p> | <p>Textbook resources</p> <p>Workbook resources</p> <p>Manipulatives</p> <p>Graphing calculators</p> |

CONTENT: Career Technical Algebra II

CORE CONCEPT 5: Probability

MAJOR OBJECTIVE: Calculate probability using the fundamental counting principle, permutations, combinations and independent and mutually exclusive events.

CURRICULUM STANDARD:

| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
|---|--|--|--|
| <p>PA STANDARD 2.7.D</p> <p>Use experimental and theoretical probability distributions to make judgments about the likelihood of various outcomes in uncertain situations.</p> | <p>Teacher will guide students to:</p> <p>Apply the fundamental counting principle to determine the number of outcomes.</p> <p>Use permutations or combinations to determine the number of outcomes.</p> <p>Calculate probability using ratio, relative frequency, and theoretical formulas.</p> | <p>Teacher evaluation of:</p> <p>Student board work</p> <p>Student written calculations</p> <p>Student use of graphing calculator and manipulatives</p> <p>Student notebooks</p> | <p>Textbook resources</p> <p>Workbook resources</p> <p>Graphing calculators</p> <p>Manipulatives</p> |
| <p>PA STANDARD 2.7.E</p> <p>Solve problems involving independent simple and compound events.</p> | <p>Teacher will guide students to:</p> <p>Calculate the probability of two or more independent events.</p> <p>Calculate the probability of mutually exclusive events.</p> | <p>Teacher evaluation of:</p> <p>Student board work</p> <p>Student written calculations</p> <p>Student use of graphing calculator and manipulatives</p> <p>Student notebooks</p> | <p>Textbook resources</p> <p>Workbook resources</p> <p>Graphing calculators</p> <p>Manipulatives</p> |

CONTENT: Career Technical Algebra II

CORE CONCEPT 6: Fundamentals of Algebra

MAJOR OBJECTIVE: Simplify expressions, solve equations, and transform formulas.

CURRICULUM STANDARD:

| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
|--|--|---|---|
| PA STANDARD 2.8.D Formulate expressions and equations to model routine and non-routine problem situations. | Teacher will guide students to: Simplify algebraic expressions, including expressions with exponents or radicals. | Teacher evaluation of: Student board work Student written calculations Student use of graphing calculator Student notebooks | Textbook resources Workbook resources Graphing calculators |
| PA STANDARD 2.8.N Solve linear equations both symbolically and graphically. | Teacher will guide students to: Solve one- and two-step linear equations. Solve literal equations. | Teacher evaluation of: Student board work Student written calculations Student use of graphing calculator and manipulatives Student notebooks | Textbook resources Workbook resources Graphing calculators Manipulatives |

CONTENT: Career Technical Algebra II

CORE CONCEPT 6: Fundamentals of Algebra

MAJOR OBJECTIVE: Simplify expressions, solve equations, and transform formulas.

CURRICULUM STANDARD:

| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
|--|---|---|---|
| PA STANDARD 2.8.J Demonstrate the connection between algebraic equations | Teacher will guide students to: Transform formulas to solve for a specific variable. | Teacher evaluation of: Student board work Student written calculations Student use of graphing calculator and manipulatives Student notebooks | Textbook resources Workbook resources Graphing calculators Manipulatives |

CONTENT: Career Technical Algebra II

CORE CONCEPT 7: Advanced Algebra

MAJOR OBJECTIVE: Solve inequalities, perform operations on polynomials, and use the quadratic formula.

CURRICULUM STANDARD:

| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
|---|--|---|--|
| PA STANDARD 2.8.N Solve linear equations both symbolically and graphically. | Teacher will guide students to: Solve linear inequalities. | Teacher evaluation of: Student board work Student written calculations Student use of graphing calculator Student notebooks | Textbook resources Workbook resources Graphing calculators |
| PA STANDARD 2.8.S Analyze properties and relationships of functions. | Teacher will guide students to: Identify direct and inverse variation. Solve problems involving direct or inverse variation. Simplify polynomials. Add and subtract polynomials. Multiply a polynomial by a monomial. Multiply a polynomial by a polynomial. | Teacher evaluation of: Student board work Student written calculations Student use of graphing calculator Student notebooks | Textbook resources Workbook resources Graphing calculators |

CONTENT: Career Technical Algebra II

CORE CONCEPT 7: Advanced Algebra

MAJOR OBJECTIVE: Solve inequalities, perform operations on polynomials, and use the quadratic formula.

CURRICULUM STANDARD:

| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
|--|--|---|--|
| PA STANDARD 2.8.S Analyze properties and relationships of functions. | Factor a polynomial. Simplify, add, subtract, multiply, and divide algebraic fractions. | Teacher evaluation of: Student board work Student written calculations Student use of graphing calculator Student notebooks | Textbook resources Workbook resources Graphing calculators |
| PA STANDARD 2.8.N Solve quadratic equations both symbolically and graphically. | Teacher will guide students to: Use the quadratic formula to solve a quadratic equation. Solve a quadratic equation using a graphing calculator. | Teacher evaluation of: Student board work Student written calculations Student use of graphing calculator Student notebooks | Textbook resources Workbook resources Graphing calculators |

CONTENT: Career Technical Algebra II

CORE CONCEPT 8: Graphing

MAJOR OBJECTIVE: Graph linear equations using a variety of methods.

CURRICULUM STANDARD:

| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
|--|---|--|--|
| <p>PA STANDARD 2.8.K</p> <p>Select, justify and apply an appropriate technique to graph a linear function in two variables, including slope-intercept, x- and y-intercepts, graphing by transformations and the use of a graphing calculator.</p> | <p>Teacher will guide students to:</p> <p>Plot and identify points in the xy plane.</p> <p>Calculate the slope of a line.</p> <p>Graph a linear equation using a table of x-y values, slope-intercept, x- and y-intercepts, and the use of a graphing calculator.</p> | <p>Teacher evaluation of:</p> <p>Student board work</p> <p>Student written calculations</p> <p>Student use of graphing calculator and manipulatives</p> <p>Student notebooks</p> | <p>Textbook resources</p> <p>Workbook resources</p> <p>Graphing Calculators</p> <p>Manipulatives</p> |

CONTENT: Career Technical Algebra II

CORE CONCEPT 9: Basic Geometry

MAJOR OBJECTIVE: Define terms, identify figures, and calculate perimeter, area, and volume.

CURRICULUM STANDARD:

| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
|--|---|---|---|
| <p>PA STANDARD 2.9.I</p> <p>Model situations geometrically to formulate and solve problems.</p> | <p>Teacher will guide students to:</p> <p>Identify and name points, lines, angles, and planes.</p> <p>Identify polygons and solid figures.</p> <p>Calculate perimeter, area and volume.</p> | <p>Teacher evaluation of:</p> <p>Student board work</p> <p>Student written calculations</p> <p>Student use of graphing calculator and models</p> <p>Student notebooks</p> | <p>Textbook resources</p> <p>Workbook resources</p> <p>Geometric models</p> <p>Graphing calculators</p> |

CONTENT: Career Technical Algebra II

CORE CONCEPT 10: Advanced Geometry

MAJOR OBJECTIVE: Use theorems to solve triangles and circles.

CURRICULUM STANDARD:

| State Standard/Student Expectation | Specific Content | Assessments | Resources/Materials |
|--|---|---|---|
| <p>PA STANDARD 2.9.B</p> <p>Prove that two triangles or two polygons are congruent or similar using algebraic and deductive proofs.</p> | <p>Teacher will guide students to:</p> <p>Identify axioms, postulates, and theorems.</p> <p>Use axioms, postulates, and theorems to solve problems about points, lines, planes, triangles, and polygons.</p> <p>Use the Pythagorean Theorem to solve triangles.</p> | <p>Teacher evaluation of:</p> <p>Student board work</p> <p>Student written calculations</p> <p>Student use of graphing calculator and models</p> <p>Student notebooks</p> | <p>Textbook resources</p> <p>Workbook resources</p> <p>Graphing calculators</p> <p>Geometric models</p> |
| <p>PA STANDARD 2.9.F</p> <p>Use the properties of angles, arcs, chords, tangents and secants to solve problems involving circles.</p> | <p>Teacher will guide students to:</p> <p>Use axioms, postulates, and theorems to solve problems about circles.</p> | <p>Teacher evaluation of:</p> <p>Student board work</p> <p>Student written calculations</p> <p>Student use of graphing calculator and models</p> <p>Student notebooks</p> | <p>Textbook resources</p> <p>Workbook resources</p> <p>Graphing calculators</p> <p>Geometric models</p> |

V. EXPECTED LEVELS OF ACHIEVEMENT

A. Students are expected to reach the proficient level (D or above) of achievement, including all of the skills noted in the specific content area of this curriculum.

B. Grading system for Career Technology Algebra II class is as follows:

| Grading Scale | |
|----------------------|----------|
| A | 90%-100% |
| B | 80%-89% |
| C | 70%-79% |
| D | 60%-69% |
| F | 0%-59% |

C. Each student's grade will be determined at the conclusion of each marking period by dividing the total number of points earned by the total number of points possible. Progress notes will be issued half way through each marking period for those students who are performing below 70%.