

Dover-Sherborn High School
Mathematics Curriculum
Algebra II Honors

A. DESCRIPTION

This course represents an accelerated, rigorous approach to the topics of Algebra II, combined with some topics typically studied in an advanced mathematics course. Students are responsible for all proofs and derivations done in class.

B. OBJECTIVES

The student should be able to:

1. extend his/her knowledge of the real number system and solve related problems;
2. demonstrate a knowledge of the complex number system through problem solving;
3. analyze functions and their inverses;
4. examine higher degree polynomials and solve problems involving same;
5. develop an understanding of the basic elements of right triangle trigonometry and demonstrate this understanding through problem solving;
6. solve problems using the principles of counting and basic probability,
7. expand his/her knowledge of finite sequences and series and demonstrate mastery by solving related problems.

C. OUTLINE

1. The real number system [A.SSE.1]; [A.SSE.2]; [A.APR.1]; [A.APR.7]; [N.RN.1]; [N.RN.2]; [N.VM.6]; [N.VM.8]; [N.VM.12]; [F.BF.1]; [A.CED.1]; [A.CED.2]; [A.CED.3]; [A.CED.4]; [A.REI.2]; [A.REI.11]
 - a. structure, properties and operations of real numbers, including proofs
 - b. radicals and rational expressions
 - c. first degree equations and inequalities, including systems
 - d. operations involving matrices
 - e. linear programming
 - f. second degree equations and inequalities
 - g. polynomial and rational inequalities
 - h. absolute value
 - i. radical equations
 - j. implicit equations
2. The complex number system [N.CN.1]; [N.CN.2]; [N.CN.7]; [N.CN.8]
 - a. operations with complex numbers
 - b. higher order polynomials with complex solutions

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3. Functions [F.IF.1]; [F.IF.2]; [F.IF.3]; [F.IF.4]; [F.IF.5]; [F.IF.6]; [F.IF.7]; [A.CED.1]; [F.BF.1b&c]; [F.BF.3]; [F.BF.4]; [F.LE.4]; [F.IF.7a&b&d]
 - a. definition of a function and a relation
 - b. utilizing function notation
 - c. graphing functions such as: $y = x$, $y = [x]$, $y = \frac{1}{x}$, $y = |x|$, $y = \sqrt{x}$, $y = x^2$, $y = x^3$, piecewise functions. Utilize graphing transformations.
 - d. identifying key characteristics of a function including but not limited to intervals when increasing/decreasing/constant, maximas, average rate of change.
 - e. graphing rational functions and identifying key characteristics such as domain, symmetry, asymptotes, and removable discontinuities
 - f. determining and graphing the inverse of a function
 - g. graphing exponential and logarithmic functions
 - h. solving exponential and logarithmic equations
 - i. modeling application problems including but not limited to growth, decay, interest.
4. Higher degree polynomials and equations [A.APR.2]; [A.APR.3]; [A.APR.4]; [A.APR.6]; [N.CN.9]; [F.IF.7c]
 - a. remainder and factor theorems
 - b. synthetic division
 - c. rational root theorem
 - d. fundamental theorem of Algebra
 - e. graphing polynomials
 - f. approximating irrational roots
5. Sequences and series [A.SSE.4]; [F.IF.3]; [A.APR.5]; [F.BF.1.a]
 - a. arithmetic sequences and series
 - b. geometric sequences and series
 - c. binomial theorem
6. Trigonometry [F.TF.1]; [F.TF.2]; [F.TF.8]
 - a. review and extension of right triangle trig
 - b. basic word problems
 - c. radian measure
 - d. simple identities
7. Probability and Statistics [S.ID.4]; [S.IC.1]; [S.IC.2]; [S.IC.3]; [S.IC.4]; [S.IC.5]; [S.IC.6]; [S.MD.6]; [S.MD.7]; [S.CP.6]
 - a. sequential counting
 - b. permutations and combinations
 - c. probability
 - d. data - visual representation and analysis

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D. TEXT

Algebra and Trigonometry, Sullivan; Prentice Hall, 1999
ISBN 0-13-081019-3

E. RESOURCE MATERIALS

1. Worksheets prepared by individual teachers
2. Problem Sets
3. Graphical calculators
4. Mathematics Teacher
5. Web sites

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Mathematics Curriculum Maps
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Course Title: Algebra II Honors

Grade: 10

Unit: The Real Number System

Essential Question (s):

- What can and can not be done when working with real numbers?
- How can the properties of the real number system be used to solve linear equations, inequalities, radical equations, and absolute value equations?

Learning Objectives:

- Manipulate expressions using order of operations
- Simplify radical and rational expressions
- Solve linear equations, inequalities, including systems
- Perform matrix operations
- Solving linear programming problems
- Solve second degree equations and inequalities
- Solve absolute value equations and inequalities
- Solve radical equations and eliminate extraneous solutions
- Solve application word problems

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)

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Unit: The Complex Number System

Essential Question (s):

- What is a complex number?
- What operations can be performed on complex numbers?
- How do I find non-real solutions to higher order polynomial equations?

Learning Objectives:

- Perform four basic operations (addition, subtraction, multiplication, division) on complex numbers.
- Find complex solutions (zeros) to polynomial functions.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Textbook
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Assessment Strategies:

- Discussion/Daily class performance
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Unit: Functions

Essential Question (s):

- How do I distinguish a function from a relation?
- How do I graph the parent functions: linear, quadratic, cubic, absolute value, square root, exponential, logarithmic, and reciprocal?
- How do I use transformation techniques to graph?
- How do I construct the inverse equation/graph of a function?
- How can I describe a function when given its graph and vice versa?
- How do I solve equations involving functions such as exponential?
- How do I solve application problems such as growth and decay?
- How do I find a model of best fit?

Learning Objectives:

- Distinguish between a function and a relation using the definition of functions and the vertical line test.
- Graph functions and identify key aspects such as vertex, asymptotes, symmetry...etc.
- Construct and analyze functions.
- Use graphs or equations of functions to derive the inverse function.
- Perform four basic operations (addition, subtraction, multiplication, division) on functions.
- Find composite of functions and use composition to verify inverses.
- Model real-world data using algebra techniques to derive the equation of best fit and also the regression capability of the graphing calculators.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games
- Data Projects

Materials Utilized:

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Assessment Strategies:

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Unit: Higher Degree Polynomials and Equations

Essential Question (s):

- What is a zero?
- How can I find all (real and complex) zeros of a function?

Learning Objectives:

- Use synthetic division
- Use the remainder and factor Theorem
- Use Descartes' rule of signs
- Use the rational zero theorem
- Use the intermediate value theorem. and graphing calculators to approximate irrational zeros
- Utilize conjugate pairs theorem
- Construct a polynomial function when given some zeros, degree, and leading coefficient

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
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Unit: Sequences and Series

Essential Question (s):

- How can I classify a sequence?
- How do I expand a sequence when given an explicit rule or a recursive rule?
- How do I write the rule for a sequence?
- How can I expand something given in sigma notation or vice versa?
- How can I evaluate the sum of a series?
- How can I expand a binomial?

Learning Objectives:

- Determine if a sequence is arithmetic, geometric, or neither.
- Construct an explicit and recursive rule for arithmetic and geometric sequences.
- Use a given rule to identify any term of a sequence.
- Find the sum of an arithmetic and geometric series.
- Evaluate an infinite geometric series.
- Prove a statement is true using mathematical induction. *(If time permits)*
- Use binomial theorem to expand a binomial or identify a particular coefficient/term.
- Solve applied word problems.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
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- Daily homework/Error analysis
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Unit: Trigonometry

Essential Question (s):

- How can I measure an angle?
- How can I measure the speed of something traveling in circular motion?
- How can I find the values of trigonometric functions of right angles?
- How can I use the trigonometric identities?
- How can I solve right triangles and oblique triangles?

Learning Objectives:

- Give angle measurements in degrees, radians, and DMS (degrees, minutes, and seconds).
- Find linear and angular speed.
- Use SOHCAHTOA to find trigonometric values and solve right triangles.
- Derive and use identities to convert trig expressions.
- Use Law of Sines and Law of Cosines to solve oblique triangles. *(If time permits)*
- Solve applied word problems.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games
- Clinometer Project

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
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Unit: Probability and Statistics

Essential Question(s):

- How can I figure out how many ways a particular event can happen?
- What is the probability of an event occurring?
- How can I statistically analyze a set of data?
- How can I visually represent a set of data?

Learning Objectives:

- Use counting principle, permutations and combinations to solve counting problems.
- Compute probabilities using counting principle, permutations, combinations, addition rule.
- Determine mean, median, mode, mean variation, variance, and standard deviation.
- Construct stem-and-leaf plot, histograms, circle graphs, box and whisker.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities
- Problem sections from other textbooks since statistical topics not covered

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)