Course description

In *Algebra II*, students learn to represent various families of functions—linear, quadratic, exponential, logarithmic, radical, and rational—in various ways: as verbal descriptions, equations, tables, and graphs. *Algebra II* lessons also include concepts and applications of trigonometry, and geometry, data analysis and probability. Assessments are done in a variety of formats: multiple choice, short response, extended response, and major situation-based applications.

Primary text(s) and other major resources:
*Algebra II*  Larson, Boswell, Kanold, Stiff
(MacDougal Littell, 2007)
<table>
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<tr>
<th>Unit length and MLRs</th>
<th>Objectives</th>
<th>Essential Questions</th>
<th>Assessment</th>
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<td><strong>Unit 1</strong></td>
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| Linear Equations, Inequalities, Functions and Systems | Objective set 1: 3 classes  
Student will:  
✓ review—properties of real numbers  
✓ review—simplifying algebraic expressions  
✓ review—solve linear equations  
✓ review—rewrite and evaluate formulas and equations  
✓ review—use problem solving strategies and models  
✓ review—solve linear inequalities  
✓ review—solve absolute value equations and inequalities | For set 1: How are linear and absolute value equations/inequalities used in budgets, businesses, and carpentry? | For set 1: Olympics Performances Project  
Students research men's and women's performances in the Olympics to apply linear models to assist them in making future predictions about Olympic performances. (This assessment comes from the textbook supplements and is available from the publisher.) |
| Goal set 1: |            |                     |            |
| ✓ D11a Use properties to evaluate and simplify expressions.  
✓ D11a Use problem solving strategies and verbal models.  
✓ C13d Solve linear and absolute value equations and inequalities. | Objective set 2: 5 classes  
Student will:  
✓ represent relations and graph linear functions  
✓ find slopes of lines and rates of change  
✓ graph linear equations in slope-intercept or standard form  
✓ write equations of lines  
✓ write and graph direct variation equations  
✓ draw scatter plots and best-fitting lines  
✓ graph and write absolute value functions and transformations  
✓ graph linear equalities in two variables. | For set 2: How are linear equations and models helpful in making everyday decisions? | For set 2: Researching, Collecting, Graphing, Scatter Plots Project: Students research and develop a survey where they can form a scatter plot and find a best fitting line for a relationship. |
| Goal set 2: |            |                     |            |
| ✓ D12a Represent relations and functions.  
✓ D13a Graph linear equations and inequalities in two variables.  
✓ D13a Write linear equations and inequalities | Objective set 3: 7 classes  
Student will:  
✓ solve linear systems by graphing | For set 3: How are systems of linear equations used to solve real-world problems (e.g. payment options) | For set 3: Buying a Jet Ski Project: Students use linear models to help them purchase the most |
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<th>Goal set 5:</th>
<th>Objective set 5:</th>
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<tr>
<td>✓ D11 Graph polynomial functions.</td>
<td>8 classes Student will: ✓ review-- simplify expressions involving powers ✓ evaluate and graph polynomial functions ✓ review-- add, subtract and multiply other polynomial functions ✓ review-- factor and solve other polynomial equations ✓ apply the remainder and factor theorems</td>
</tr>
<tr>
<td>✓ D11b Perform operations with polynomials.</td>
<td></td>
</tr>
<tr>
<td>✓ D11b Solve polynomial equations and</td>
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| Unit 2 Qua**rdatic, Polynomial and Radical Functions** | | Unit 2 Qua**rdatic, Polynomial and Radical Functions** |
|---|---|
| Goal set 4: | | Goal set 4: |
| ✓ D12a Graph systems of equations and inequalities. | ✓ solve linear systems algebraically ✓ graph systems of linear inequalities ✓ solve systems of linear equations in three variables ✓ perform basic operations with matrices ✓ multiply matrices ✓ evaluate determinants of matrices ✓ solve linear systems using inverse matrices. | ✓ Graph and write quadratic functions in several forms. ✓ Solve quadratic equations using a variety of methods. ✓ Perform operations with square roots and complex numbers. |
| ✓ Use matrices. | | ✓ Solve quadratic equations ✓ use factoring to solve equations of the form $ax^2 + bx + c = 0$ ✓ solve quadratic equations by finding square roots ✓ perform operations with complex numbers ✓ solve quadratic equations by completing the square ✓ solve quadratic equations using the quadratic formula ✓ graph and solve quadratic inequalities ✓ write quadratic functions and models |

**For set 4:** How are quadratic functions used to model the heights of projectiles such as a batted baseball, and numerous uses of engineering and business applications?  
**For set 4:** Water Flow Students analyze and construct their own water tower in which they apply quadratic function solving techniques. *(This assessment comes from the textbook supplements and is available from the publisher.)*

**For set 5:** How are polynomial functions used to model real-world situations such as volumes of objects, speed and physics applications, and decorative aesthetics?  
**For set 5:** Quadratics: Physics & Gravity Project Students toss balls in the air to help find speed and maximum heights associated with polynomial equations.
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<th>Goal set 6:</th>
<th>Objective set 6:</th>
<th>For set 6:</th>
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<tbody>
<tr>
<td>✓ D11a Use rational exponents.</td>
<td>✓ find rational zeros ✓ apply the Fundamental Theorem of Algebra to classify the zeros of polynomial functions ✓ use intercepts to graph polynomial functions</td>
<td>How are radical functions used to predict populations and growth/decay.</td>
</tr>
<tr>
<td>✓ D12 Perform function operations and find inverse functions.</td>
<td>✓ use intercepts to graph polynomial functions</td>
<td></td>
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<tr>
<td>✓ D13e Graph radical functions and solve radical equations.</td>
<td>✓ 12 classes Student will: ✓ evaluate nth roots and use rational exponents ✓ simplify expressions involving rational expressions ✓ perform function operations and composition ✓ use inverse functions ✓ review—graph square root and cube root functions ✓ solve radical equations</td>
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### Unit 3
Other Nonlinear Functions and Relations

**[IMPORTANT NOTE: Goal set 7, study of Exponential and Logarithmic Functions is now in Pre-calculus—not to be learned here, even though it appears in this text]**

**Goal set 8:**
| ✓ D13e Graph rational functions | ✓ add, subtract, multiply and divide rational expressions ✓ solve rational equations | ✓ How are rational functions used in engineering and construction applications? ✓ How are operations of rational functions helpful in problem solving? |
| ✓ A1 Perform operations with rational |  | For set 8: Depreciation of Cars Project Students apply radical functions to help them realize the depreciation of car values. |
### Goal set 9:

- Write equations of conic sections.
- Graph equations of conic sections.
- Solve quadratic systems.

#### Objective set 9:

- Solve rational equations

#### For set 9:

- Where are conics used in real life and why is it useful for an engineer to understand conic properties?

### Unit 4

#### Probability, Data Analysis and Discrete Math

**Goal set 10a**

(content derived from Chapter 13, MacDougall Littell Algebra I text)

- Probability and Data Analysis:
  - B6 Find probabilities of simple and compound events
  - B4 Analyze sets of data
  - B3b, B4 Make and interpret data displays

**Objective set 10a**

- Find probabilities of simple and compound events
- Find probabilities using permutations
- Use combinations to count possibilities
- Find probabilities of compound events
- Analyze surveys and samples
- Use measures of central tendency and dispersion
- Make and interpret stem-and-leaf plots and histograms
- Make and interpret box-and-whisker plots

**For set 10a**

- How is the fundamental counting principle used to calculate the number of choices for a given situation?

**Goal set 10b**

(content derived from Chapter 10, MacDougall Littell)

**Objective set 10b**

- Find sample spaces and probabilities
- Find probabilities using permutations
- Use combinations to count possibilities
- Find probabilities of compound events
- Analyze surveys and samples
- Use measures of central tendency and dispersion
- Make and interpret stem-and-leaf plots and histograms
- Make and interpret box-and-whisker plots

**For set 10b**

- How are permutations and combinations used to answer probability and find the number of choices one has in a given situation?
<table>
<thead>
<tr>
<th>Algebra II)</th>
<th>✓ Use permutations and combinations.</th>
<th>✓ apply the fundamental counting principle and permutations</th>
<th>✓ use probability to find the likelihood that an event will occur</th>
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<tbody>
<tr>
<td>✓ B6 Find probabilities.</td>
<td>✓ use combinations and the Binomial Theorem</td>
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<tr>
<td>✓ Construct binomial distributions.</td>
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<thead>
<tr>
<th>Goal set 11:</th>
<th>✓ B4, B7a, B7b</th>
<th>Objective set 11:</th>
<th>For set 11:</th>
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</thead>
<tbody>
<tr>
<td>Use measures of central tendency and dispersion.</td>
<td>2 classes</td>
<td>2 classes</td>
<td>How is central tendency and dispersion used substantially in statistics?</td>
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<td>Student will:</td>
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<tr>
<td></td>
<td>✓ describe and use data using mean, median, mode and standard deviation</td>
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