

## COURSE OVERVIEW

Algebra II is a full-year, high school math course intended for the student who has successfully completed the prerequisite course Algebra I. This course focuses on algebraic techniques and methods in order to develop student understanding of advanced number theory, concepts involving linear, quadratic and polynomial functions, and pre-calculus theories. This course also integrates geometric concepts and skills throughout the units, as well as introducing students to basic trigonometric identities and problem solving.

By the end of the course, students will be expected to do the following:

- Understand set notation and the structure of mathematical systems.
- Know how to use functional notation and operations on functions.
- Simplify and solve algebraic fractions.
- Perform operations on polynomials, including factoring, long division, and synthetic division.
- Solve algebraic word problems involving mixtures, money, integers, and work.
- Evaluate and solve radical expressions and equations.
- Solve systems of equations with graphing, substitution, and matrices.
- Graph and solve quadratic equations, including conic sections.
- Graph and solve exponential and logarithmic equations.
- Calculate permutations, combinations, and complex probabilities.

| UNIT 1: SET, STRUCTURE, AND FUNCTION |   |  |   |
|--------------------------------------|---|--|---|
| ALGEBRA II                           | <b>Assignment Titles</b>                |  |   |
|                                      | 1.                                      | Course Overview                            | 13. Algebraic Expressions: Exponents Part 2                   |
|                                      | 2.                                      | Properties of Sets                         | 14. Algebraic Expressions: Multiplication and Division Part 1 |
|                                      | 3.                                      | Operations of Sets                         | 15. Algebraic Expressions: Multiplication and Division Part 2 |
|                                      | 4.                                      | Quiz 1: Set, Structure, and Function       | 16. Exponents of Exponential Expressions                      |
|                                      | 5.                                      | Structure: Axioms                          | 17. Algebraic Expressions: Combining Terms                    |
|                                      | 6.                                      | Structure: Applications                    | 18. Quiz 3: Set, Structure, and Function                      |
|                                      | 7.                                      | Relations and Functions: Definitions       | 19. Special Project*  |
|                                      | 8.                                      | Relations and Functions: Graphs            | 20. Test  |
|                                      | 9.                                      | Relations and Functions: Function Notation | 21. Alternate Test*   |
|                                      | 10.                                     | Relations and Functions: Inverses          | 22. Glossary and Credits                                      |
|                                      | 11.                                     | Quiz 2: Set, Structure, and Function       |   |
| 12.                                  | Algebraic Expressions: Exponents Part 1 |  |   |

| UNIT 2: NUMBERS, SENTENCES, AND PROBLEMS |   |  |  |
|--|---|--|--|
| ALGEBRA II                               | <b>Assignment Titles</b>                |  |  |
|  | 1.                                      | Number Order and Absolute Value          | 11. Compound Sentences                       |
|  | 2.                                      | Sums and Products                        | 12. Quiz 2: Numbers, Sentences, and Problems |
|  | 3.                                      | Quiz 1: Numbers, Sentences, and Problems | 13. Number Problems                          |
|  | 4.                                      | Solving Equations                        | 14. Motion Problems                          |
|  | 5.                                      | Multiplication Property                  | 15. Miscellaneous Problems                   |
|  | 6.                                      | Multi-step Equations                     | 16. Quiz 3: Numbers, Sentences, and Problems |
|  | 7.                                      | Equations with Parentheses               | 17. Special Project*                         |
|  | 8.                                      | Literal Expressions                      | 18. Test                                     |
|  | 9.                                      | Solving Inequalities                     | 19. Alternate Test*                          |
| 10.                                      | Graphing Solution Sets for Inequalities | 20. Glossary and Credits                 |  |

## UNIT 3: LINEAR EQUATIONS AND INEQUALITIES

ALGEBRA II

## Assignment Titles

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|--|---|
| 1. Line Graphs                         | 12. Solutions by Addition                     |
| 2. Line Graphs by Two Points           | 13. Solutions by Substitution                 |
| 3. Slope of Lines Part 1               | 14. Application of Systems of Equations       |
| 4. Slope of Lines Part 2               | 15. Quiz 2: Linear Equations and Inequalities |
| 5. Equations: Point Slope Part 1       | 16. Solving Inequalities                      |
| 6. Equations: Point Slope Part 2       | 17. Solving Two-order Inequalities            |
| 7. Equations: Point Slope Part 3       | 18. Quiz 3: Linear Equations and Inequalities |
| 8. Equations: Slope-Intercept          | 19. Special Project*                          |
| 9. General Equation of a Line          | 20. Test                                      |
| 10. Quiz 1: Linear Equations           | 21. Alternate Test*                           |
| 11. Solutions for Systems of Equations | 22. Glossary and Credits                      |

## UNIT 4: POLYNOMIALS

ALGEBRA II

## Assignment Titles

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|---|------------------------------------|
| 1. Products and Factoring                 | 12. Quiz 2: Polynomials            |
| 2. Multiplying Polynomials by Polynomials | 13. Direct Variation               |
| 3. Using Special Products Part 1          | 14. Inverse Variation              |
| 4. Using Special Products Part 2          | 15. Joint and Combined Variation   |
| 5. Factoring Trinomials                   | 16. Quiz 3: Polynomials            |
| 6. Factoring Special Products Part 1      | 17. Project: Creating an Algorithm |
| 7. Factoring Special Products Part 2      | 18. Special Project*               |
| 8. Quiz 1: Polynomials                    | 19. Test                           |
| 9. Addition and Subtraction Operations    | 20. Alternate Test*                |
| 10. Division with Polynomials             | 21. Glossary and Credits           |
| 11. Synthetic Division                    |                                    |

## UNIT 5: ALGEBRAIC FRACTIONS

ALGEBRA II

## Assignment Titles

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|---|---------------------------------|
| 1. Multiplying and Dividing with Fractions    | 12. Proportions                 |
| 2. Reducing Rational Expressions              | 13. Quiz 3: Algebraic Fractions |
| 3. Multiplying Algebraic Fractions            | 14. Applications of Fractions   |
| 4. Dividing Algebraic Fractions               | 15. Mixture Problems            |
| 5. Quiz 1: Algebraic Fractions                | 16. Work Problems               |
| 6. Adding and Subtracting Algebraic Fractions | 17. Quiz 4: Algebraic Fractions |
| 7. Addition and Subtraction                   | 18. Special Project*            |
| 8. Mixed Expressions and Complex Fractions    | 19. Test                        |
| 9. Quiz 2: Algebraic Fractions                | 20. Alternate Test*             |
| 10. Equations with Fractions                  | 21. Glossary and Credits        |
| 11. Fractional Equations                      |                                 |

## UNIT 6: SEMESTER REVIEW AND EXAM

ALGEBRA II

## Assignment Titles

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|-----------|-----------------------------|
| 1. Review | 3. Alternate Exam - Form A* |
| 2. Exam   | 4. Alternate Exam - Form B* |

## UNIT 7: REAL NUMBERS

ALGEBRA II

## Assignment Titles

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|----------------------------------|---|
| 1. Real Numbers                  | 11. Word Problems Involving Quadratic Equations |
| 2. Law of Radicals               | 12. Sum and Product of Roots                    |
| 3. Conjugates                    | 13. The Discriminant                            |
| 4. Radical Equations             | 14. Imaginary Numbers                           |
| 5. Quiz 1: Real Numbers          | 15. Quiz 3: Real Numbers                        |
| 6. Quadratic Equations           | 16. Special Project*                            |
| 7. Factoring Quadratic Equations | 17. Test  |
| 8. Completing the Square         | 18. Alternate Test*                             |
| 9. Quiz 2: Real Numbers          | 19. Glossary and Credits                        |
| 10. Quadratic Formula            |   |

## UNIT 8: QUADRATIC RELATIONS AND SYSTEMS

ALGEBRA II

## Assignment Titles

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|--|--|
| 1. Distance Formula                    | 12. Systems of Equations                   |
| 2. Circle                              | 13. Solutions of Inequalities              |
| 3. Ellipse                             | 14. Applications of Conic Sections: Part 1 |
| 4. Ellipse Continued                   | 15. Applications of Conic Sections: Part 2 |
| 5. Quiz 1: Real Numbers                | 16. Applications of Conic Sections: Part 3 |
| 6. Conic Sections: Parabola            | 17. Constant of Proportionality            |
| 7. Conic Sections: Parabola Continued  | 18. Quiz 3: Real Numbers                   |
| 8. Conic Sections: Hyperbola           | 19. Special Project*                       |
| 9. Conic Sections: Hyperbola Continued | 20. Test                                   |
| 10. Identifying Conic Sections         | 21. Alternate Test*                        |
| 11. Quiz 2: Real Numbers               | 22. Glossary and Credits                   |

## UNIT 9: EXPONENTIAL FUNCTIONS

ALGEBRA II

## Assignment Titles

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|--|---|
| 1. Exponential Functions   | 13. Graphs of Logarithmic Functions         |
| 2. Fractional Exponents  | 14. Solving Logarithmic Equations           |
| 3. Exponential Equations   | 15. Logarithmic Applications                |
| 4. Graphing Exponential Functions  | 16. Quiz 2: Exponential Functions           |
| 5. Exponential Applications  | 17. Matrices                                |
| 6. Quiz 1: Exponential Functions   | 18. System Solutions with Matrices          |
| 7. Logarithmic Functions   | 19. Addition and Multiplication of Matrices |
| 8. Evaluation of Logarithms  | 20. Quiz 3: Exponential Functions           |
| 9. Evaluating Exponential Functions, Common Logarithms, and Natural Logarithms | 21. Special Project*                        |
| 10. General Properties of Logarithms   | 22. Test                                    |
| 11. Scientific Notation  | 23. Alternate Test*                         |
| 12. Calculation of Common Logarithms   | 24. Glossary and Credits                    |

## UNIT 10: COUNTING PRINCIPLES

ALGEBRA II

## Assignment Titles

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|---|---|
| 1. Progressions: Sequences              | 11. Quiz 3: Counting Principles           |
| 2. Progressions: Series                 | 12. Probability: Concepts                 |
| 3. Quiz 1: Counting Principles          | 13. Probability: Equally Likely Outcomes  |
| 4. Permutations: Factorials             | 14. Probability: Multiplication Principle |
| 5. Permutation Formula                  | 15. Conditional Probability               |
| 6. Permutations: Applications           | 16. Quiz 4: Counting Principles           |
| 7. Quiz 2: Counting Principles          | 17. Special Project*                      |
| 8. Combination Formula                  | 18. Test                                  |
| 9. Combinations: Applications           | 19. Alternate Test*                       |
| 10. Combinations: Binomial Coefficients | 20. Glossary and Credits                  |

| UNIT 11: REVIEW          |                                     |
|--------------------------|-------------------------------------|
| ALGEBRA II               | <b>Assignment Titles</b>            |
|                          | 1. Integers                         |
|                          | 2. Integers Continued               |
|                          | 3. Open Sentences                   |
|                          | 4. Open Sentences Continued         |
|                          | 5. Graphs                           |
|                          | 6. Graphs Continued                 |
|                          | 7. Quiz 1: Review                   |
|                          | 8. Polynomials                      |
|                          | 9. Polynomials Continued            |
|                          | 10. Algebraic Fractions Part 1      |
|                          | 11. Algebraic Fractions Part 2      |
|                          | 12. Algebraic Fractions Part 3      |
|                          | 13. Real Numbers                    |
|                          | 14. Real Numbers Continued          |
|                          | 15. Quiz 2: Review                  |
|                          | 16. Quadratic Relations and Systems |
|                          | 17. Quadratics Continued            |
|                          | 18. Exponential Functions           |
|                          | 19. Exponential Functions Continued |
|                          | 20. Counting Principles             |
|                          | 21. Counting Principles Continued   |
|                          | 22. Quiz 3: Review                  |
|                          | 23. Special Project*                |
|                          | 24. Test                            |
|                          | 25. Alternate Test*                 |
| 26. Glossary and Credits |                                     |

| UNIT 12: SEMESTER REVIEW AND EXAM |                             |
|-----------------------------------|-----------------------------|
| ALGEBRA II                        | <b>Assignment Titles</b>    |
|                                   | 1. Review                   |
|                                   | 2. Exam                     |
|                                   | 3. Alternate Exam - Form A* |
| 4. Alternate Exam - Form B*       |                             |

| UNIT 13: FINAL EXAM         |                             |
|-----------------------------|-----------------------------|
| ALGEBRA II                  | <b>Assignment Titles</b>    |
|                             | 1. Exam                     |
|                             | 2. Alternate Exam - Form A* |
| 3. Alternate Exam - Form B* |                             |

(\*) Indicates alternate assignment