

Subject Area MathB Grade Level 10-12

Mission Statement: It is the mission of the Elba Central School District to actualize the phrase “Elba Equals Educational Excellence for Everyone.” We are committed to providing both quality and equity. Every student will have the opportunity to develop to the best of his/her ability.

Elba Standards: In addition to the knowledge and basic skills they need in order to participate in society, graduates of Elba Central School will develop:

1. Empowering skills: decision making, goal setting, creative thinking and problem solving abilities;
2. Communication and social interaction skills;
3. Technological literacy;
4. Total wellness (social, physical, emotional health and self-esteem);
5. The values necessary to participate in society.

As a result of achieving these outcomes, our students will embrace lifelong learning.

New York State Standards and Performance Indicators (Description of the levels of student achievement pertaining to standard):

Standard 3 - *Students will understand mathematics and become mathematically confident by communicating and reasoning mathematically, by applying mathematics in real-world settings, and by solving problems through the integrated study of number systems, geometry, algebra, data analysis, probability, and trigonometry;* but also the seven key ideas.

1. Mathematical Reasoning

- a) construct simple logical arguments
- b) follow and judge the validity of logical arguments
- c) use symbolic logic in the construction of valid arguments
- d) construct proofs based on deductive reasoning

2. Numbers and Numeration

- a) understand and use rational and irrational numbers
- b) recognize the order of real numbers
- c) apply the properties of the real numbers to various subsets of numbers

3. Operations

- a) use addition, subtraction, multiplication, division, and exponentiation with real numbers and algebraic expressions
- b) develop an understanding of and use the composition of functions and transformations
- c) explore and use negative exponents on integers and algebraic expressions
- d) use field properties to justify mathematical procedures
- e) use transformations on figures and functions in the coordinate plane

4. Modeling/Multiple Representation

- a) represent problem situations symbolically by using algebraic expressions, sequences, tree diagrams, geometric figures, and graphs
- b) manipulate symbolic representations to explore concepts at an abstract level
- c) choose appropriate representations to facilitate the solving of a problem
- d) use learning technologies to make and verify geometric conjectures
- e) justify the procedures for basic geometric constructions
- f) investigate transformations in the coordinate plane
- g) develop meaning for basic conic sections
- h) develop and apply the concept of basic loci to compound loci
- i) use graphing utilities to create and explore geometric and algebraic models
- j) model real-world problems with systems of equations and inequalities

5. Measurement

- a) derive and apply formulas to find measures such as length, area, volume, weight, time, and angle in real-world contexts
- b) choose the appropriate tools for measurement

- c) use dimensional analysis techniques
- d) use statistical methods including measures of central tendency to describe and compare data
- e) use trigonometry as a method to measure indirectly
- f) apply proportions to scale drawings, computer-assisted design blueprints, and direct variation in order to compute indirect measurements
- g) relate absolute value, distance between two points, and the slope of a line to the coordinate plane
- h) understand error in measurement and its consequence on subsequent calculations
- i) use geometric relationships in relevant measurement problems involving geometric concepts

6. Uncertainty

- a) judge the reasonableness of results obtained from applications in algebra, geometry, trigonometry, probability, and statistics
- b) judge the reasonableness of a graph produced by a calculator or computer
- c) use experimental or theoretical probability to represent and solve problems involving uncertainty
- d) use the concept of random variable in computing probabilities
- e) determine probabilities using permutations and combinations

7. Patterns/Functions

- a) use function vocabulary and notation
- b) represent and analyze functions using verbal descriptions, tables, equations, and graphs
- c) translate among the verbal descriptions, tables, equations and graphic forms of functions
- d) analyze the effect of parametric changes on the graphs of functions

- e) apply linear, exponential, and quadratic functions in the solution of problems
- f) apply and interpret transformations to functions
- g) model real-world situations with the appropriate function
- h) apply axiomatic structure to algebra and geometry
- j) use computers and graphing calculators to analyze mathematical phenomena

Standard 6—*Interconnectedness: Common Themes. Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.*

The Key Ideas for Standard Six are

1. Systems Thinking—Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.
2. Models—Models are simplified representations of objects, structure, or systems used in analysis, explanation, interpretation, or design.
3. Magnitude and Scale—The grouping of magnitudes of size, time, frequency, and pressures or other units of measurement into a series of relative order provides a useful way to deal with the immense range and the changes in scale that affect the behavior and design of systems.
4. Equilibrium and Stability—Equilibrium is a state of stability due either to a lack of changes (static equilibrium) or a balance between opposing forces (dynamic equilibrium).
5. Patterns of Change—Identifying patterns of change is necessary for making predictions about future behavior and conditions.
6. Optimization—In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

National Standards: National Standards (published by the National Council of Teachers of Mathematics) are directly in line with our state standards and can be found at NCTM.ORG.

Assessment:	Acceptable Performance Level
MathB Regents Exam	65%

Scope: Topics covered are aligned under the 7 key ideas published by the state. The topics are covered in 1.5 years for Math 2 and 3B students.

Sequence:

Course Outline for Math 2 (2nd half)
Beginning of Math B Curriculum

Proving Statements in Geometry (Chapter 3 Amsco)

- A. Inductive Reasoning
- B. Definitions as Biconditionals
- C. Deductive Reasoning
- D. Direct and Indirect Proofs
- E. Understanding the Postulational System
- F. The First Postulates used in Proving Statements
- G. Equivalence Relations
- H. The Substitution Postulate
- I. Postulates Concerning Addition and Subtraction
- J. Postulates Concerning Multiplication and Division
- K. Postulates Involving Lines, Line segments, and Angles
- L. Using Postulates and Definitions in Proofs
- M. Proving Simple Theorems about Angles

Triangle Congruence (Chapter 4)

- A. Congruent Polygons and Corresponding Parts
- B. Proving Triangles Congruent using SAS
- C. Proving Triangles Congruent using ASA
- D. Proving Triangles Congruent using SSS
- E. Line Segments Associated with Triangles
- F. Practice in Proving Triangles Congruent
- G. Using Congruent Triangles to Prove Line Segments and Angles Congruent
- H. Isosceles and Equilateral Triangles
- I. Using Two Pairs of Congruent Triangles
- J. Proving Overlapping Triangles Congruent

Geometric Inequalities (Chapter 5)

- A. Basic Inequality Postulates

- B. Inequality Postulates Involving Addition and Subtraction
- C. Inequality Postulates involving Multiplication and Division
- D. Inequality Involving the Lengths of the Sides of a Triangle
- E. Inequality Involving an Exterior Angle of a Triangle
- F. Inequalities Involving Sides and Angles in a Triangle

Perpendicular and Parallel Lines (Chapter 6)

- A. Proving Lines Perpendicular
- B. Proving Lines Parallel
- C. Properties of Parallel Lines
- D. The Sum of the Measure of the Angles of a Triangle
- E. Proving Triangles Congruent by AAS

- F. The Converse of the Isosceles Triangle Theorem
- G. Proving Right Triangles Congruent by HL
- H. Exterior Angles of a Triangle
- I. Interior and Exterior Angles of a Polygon

Quadrilaterals (Chapter 7)

- A. The General Quadrilateral
- B. The Parallelogram
- C. Proving That a Quadrilateral is a Parallelogram
- D. The Rectangle
- E. The Rhombus
- F. The Square
- G. The Trapezoid
- H. Areas

Rational Expressions (Chapter 9)

- A. Reducing Rational Expressions
- B. Multiplying Rational Expressions
- C. Dividing Rational Expressions
- D. Adding or Subtracting Rational Expressions with the Same Denominator
- E. Adding or Subtracting Rational Expressions with Different Denominators
- F. Simplifying Complex Fractions and Complex Rational Expressions
- G. Solving Fractional Equations

The Real Numbers (2nd half of Chapter 10)

- A. Roots and Radicals
- B. Simplifying a Radical
- C. Adding and Subtracting Radicals
- D. Multiplying Radicals with the Same Index
- E. Dividing Radicals with the Same Index
- F. Rationalizing a Denominator Containing a Radical
- G. The Quadratic Formula and Quadratic Equations with Real Roots
- H. Solving Radical Equations

Geometry of the Circle (Chapter 11)

- A. Arcs and Angles
- B. Arcs and Chords
- C. Inscribed Angles and their Measures
- D. Tangents and Secants
- E. Angles formed by Tangents, Chords, and Secants
- F. Measures of Chords, Tangent Segments, and Secant Segments

Course Outline for Math 3B

The Rational Numbers (Chapter 8 Amsco)

- A. The number line and Sets of Numbers
- B. Quantifiers
- C. Negations of Quantified Statements
- D. Properties of the Rational Numbers
- E. First Degree Equations and Inequalities
- F. Ratio and Proportion
- G. Operations with Polynomials
- H. Factoring Polynomials

The Real Numbers (Chapter 10)

- A. Completing the Real Number line
- B. Graphing Solution Sets Involving One Variable on a Number Line
- C. Absolute Value Equations
- D. Absolute Value Inequalities

Review Of:

- E. Roots and Radicals
- F. Simplifying a Radical
- G. Adding and Subtracting Radicals
- H. Multiplying Radicals with the Same Index
- I. Dividing Radicals with the Same Index
- J. Rationalizing a Denominator Containing a Radical
- K. The Quadratic Formula and Quadratic Equations with Real Roots
- L. Solving Radical Equations

Relations and Functions (Chapter 12)

- A. Relations
- B. Functions
- C. Relating Graphs to Real Life Situations
- D. Function Notation
- E. Types of Functions
- F. The Parabola
- G. The Ellipse and the Circle
- H. The Hyperbola
- I. The Conic Sections
- J. The Inverse Variation Hyperbola
- K. Composition of Functions
- L. Inverse Functions Under Composition

Transformation Geometry and Functions (Chapter 13)

- A. Transformations and Functions
- B. Transformations and Coordinate Geometry
- C. Compositions and Dilations

- D. Compositions and Symmetries
- E. Composition Rules
- F. Isometries, Orientation, and Other Properties
- G. Compositions with Line Reflections
- H. Groups of Transformations

Trigonometric Functions (Chapter 14)

- A. The Right Triangle
- B. Angles as Rotations
- C. Sine and Cosine as Coordinates
- D. The Sine and Cosine Functions
- E. The Tangent Function
- F. Function Values of Special Angles
- G. The Graphing Calc.: Finding Trig Function Values
- H. Finding an Angle when given a Trig Function Value
- I. Finding Reference Angles
- J. Radian Measure
- K. Trig Functions Involving Radian Measures
- L. The Reciprocal Trig Functions
- M. The Pythagorean Identities
- N. Finding the remaining Trig Function Values of an Angle when one is known
- O. Cofunctions

Trigonometric Graphs (Chapter 15)

- A. The Wrapping Function
- B. Graph of $y = \sin x$
- C. Graph of $y = \cos x$
- D. Amplitude
- E. Period
- F. Sketching Sine and Cosine Curves
- G. Graph of $y = \tan x$
- H. Graphs of Reciprocal Functions
- I. Reflections over the line $y = x$
- J. Inverse Trig Functions

Exponential Functions (Chapter 16)

- A. Laws of Exponents
- B. Extending the Laws of Exponents
- C. Scientific Notation
- D. Fractional Exponents
- E. Exponential Functions
- F. Equations with Negative or Fractional Exponents
- G. Exponential Equations
- H. Compound Interest
- I. Depreciation

Logarithmic Functions (Chapter 17)

- A. Exponential Functions and their Inverses
- B. Logarithmic Form of an Equation
- C. Logarithmic Relationships
- D. Common Logs
- E. Exponential Equations
- F. Log Equations

Trigonometric Applications (Chapter 18)

- A. Review of the Basic Concepts
- B. The Law of Cosines
- C. Using the Law of Cosines to Find Angle Measure
- D. Area of a Triangle
- E. The Law of Sines
- F. The Ambiguous Case
- G. Forces
- H. Solving Triangles

Trigonometric Equations and Identities (Chapter 19)

- A. Types of Equations
- B. Basic Trig Identities
- C. Proving Trig Identities
- D. Cosine of the Difference of Two Angle Measures
- E. Cosine of the Sum of Two Angle Measures
- F. Sine of the Sum or Difference of Angle Measures
- G. Tangent of the Sum or Difference of Angle Measures
- H. Function Values of Double Angles
- I. Function Values of Half Angles
- J. Summary of Identities
- K. First Degree Trig Equations
- L. Second Degree Trig Equations
- M. Equations Involving More Than One Function

The Complex Numbers (Chapter 20)

- A. Imaginary Numbers
- B. Complex Numbers
- C. Addition and Subtraction of Complex Numbers
- D. Multiplication of Complex Numbers
- E. Multiplicative Inverse and Division of Complex Numbers
- F. The Field of Complex Numbers
- G. Solving Quadratic Equations with Imaginary Roots
- H. The Nature of the Roots of any Quadratic Equation
- I. Using Given Conditions to Write a Quadratic Equation
- J. Solution of Systems of Equations
- K. Quadratic Inequalities

Statistics (Chapter 21)

- A. The Summation Symbol
- B. Measures of Central Tendency
- C. Measures of Dispersion: Range and Mean Absolute Deviation
- D. Measures of Dispersion: Variance and the Standard Deviation
- E. Normal Distribution
- F. Grouped Data
- G. Two-Valued Statistics

Probability, Sequences, and the Binomial Theorem (Chapter 22)

- A. Permutations and Combinations
- B. Probability
- C. Probability with Two Outcomes
- D. At Least and At Most
- E. Arithmetic Sequences and Series
- F. Geometric Sequences and Series
- G. The Binomial Theorem

Review of Chapters Taught in Math 2 2nd Half (as time allows)**Review for Math B Exam****Methodology:**

- Incorporation of Six-Traits as a method of assessing short and extended open response question, focusing on the traits of Ideas and Organization.
- Employment of Graphing and Scientific Calculators.
- Use of previous Regents questions and those similar to questions on Math B exams in the form of worksheets and booklets.
- Provide students opportunities for learning in a variety of situations by employing Cooperative Learning Strategies and Short/Long Term Projects.