**Content Area / Grade Level:** Mathematics / 9th, 10th, & 11th Grade

**Course Title:** Secondary Mathematics II

**Course Description:**
The focus of Secondary Mathematics II is on quadratic equations, and functions; and comparing their characteristics and behavior to those of linear and exponential relationships from Secondary Mathematics I. Real and complex numbers are introduced so that all quadratic equations can be solved. The link between probability and data is explored. The study of right triangles utilizes the Pythagorean Theorem and introduces trigonometry concepts to find area and volume.

**Westbrook K-12 Learning Standards**

- Algebra
- Functions
- Geometry
- Number & Quantity
- Statistics

**Guiding Principles / Vision of the Graduate**

- Clear and Effective Communicator
- Self-Directed and Lifelong Learner
- Creative and Practical Problem Solver
- Integrative and Informed Thinker

**Expected Outcomes -** *Expectations for students upon completion of the course.*
Students will be able to

- Add, subtract, multiply numbers involving polynomials and exponents
- Add, subtract, multiply numbers involving radicals and complex numbers
- Use Pythagorean Theorem, sine, cosine, and tangent ratios to find missing sides and angles, including in application problems
- Calculate area of 2-D figures and volume of 3-D figures
- Calculate probabilities and use probabilities to solve application problems
- Create graphs using key features for quadratic functions
- Solve quadratic equations using various methods
- Create functions using operations with functions and the inverse of a function

**Core Units of Study -** *Each course has 4 - 6 Core Units of Study which are required and in which all targeted learning standards are embedded.*

- Unit 1: Extending the Number System - Polynomials & Exponents
- Unit 2: Extending the Number System - Radicals & Complex Numbers
- Unit 3: Right Triangle Trigonometry
- Unit 4: Area and Volume
- Unit 5: Probability
- Unit 6: Key Features of Quadratics Functions
- Unit 7: Solving Quadratic Functions
- Unit 8: Building Functions

**CORE UNIT # 1**
**Title:** Extending the Number System - Polynomials & Exponents

| **Westbrook Learning Standards** | **Content** |
|---|---|
| ● Number & Quantity | ● Operations with polynomials<br>● Operations with numbers/variables with exponents |
| **Performance Indicators (Skills)**<br>**Students will be able to:**<br>● Add, subtract, multiply numbers involving polynomials<br>● Multiply and divide numbers involving integer exponents | **Essential Questions**<br>● How do operations work with polynomials?<br>● What does it mean for a number to be raised to an exponent?<br>● Are there numbers beyond the real numbers? |

**Common Assessments**
- Formative for operations with polynomials
- Formative for operations with numbers involving exponents
- Unit summative

| **Instructional Suggestions / Resources** | **Assessment (formative) Suggestions/Resources** |
|---|---|
| ● Big Ideas Textbook<br>(2.1)reading pages 64-65<br>HMWK pages 66-67 # 23-42, 55, 61<br>(2.2)reading pages 70-72<br>HMWK page 73 # 3-42 even<br>(2.3) reading pages 76-77<br>HMWK page 79 # 3-24<br>(1.4) reading pages 28-31<br>HMWK pages 32-33 # 5-44, 47-50 | ● |

**CORE UNIT # 2**
**Title:** Extending the Number System - Radicals & Complex Numbers

| **Westbrook Learning Standards** | **Content** |
|---|---|
| ● Number & Quantity | ● Operations with numbers with rational exponents<br>● Operations with numbers involving radicals<br>● Operations with complex numbers |
| **Performance Indicators (Skills)**<br>**Students will be able to:**<br>● Multiply and divide numbers involving rational exponents<br>● Rewrite rational exponents to/from radical form<br>● Add, subtract, multiply numbers involving radicals<br>● Add, subtract, multiply numbers involving complex numbers | **Essential Questions**<br>● What is the relationship between a power and a root?<br>● Why are there imaginary and complex numbers? |
| **Common Assessment**s<br>● Formative for rational exponents<br>● Formative for operations with radicals<br>● Formative for operations with complex numbers<br>● Unit summative | |
| **Instructional Suggestions / Resources**<br>● | **Assessment (formative) Suggestions/Resources**<br>● |

**CORE UNIT # 3**
**Title:** Right Triangle Trigonometry

| **Westbrook Learning Standards** | **Content** |
|---|---|
| ● Geometry | ● Use Pythagorean Theorem, sine, |

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|---|---|
| | cosine, and tangent ratios to find missing sides and angles, including in application problems |
| **Performance Indicators (Skills)**<br>**Students will be able to:**<br>● use the Pythagorean Theorem to find side lengths of right triangles<br>● use a calculator to evaluate sine, cosine, and tangent<br>● use a calculator to evaluate the inverses of sine, cosine, and tangent.<br>● find the ratio of sides for sine, cosine, and tangent<br>● use the sine, cosine and tangent ratios to find missing sides<br>● use the inverses of sine, cosine and tangent ratios to find missing angles<br>● use angle of elevation or depression and trig ratios to solve a problem when given a picture of the scenario | **Essential Questions**<br>● How are the patterns in right triangles used to help us solve real world problems? |
| **Common Assessments**<br>● Formative for Pythagorean Theorem & Trig Ratios<br>● Formative for Solving Right Triangles<br>● Unit summative | |
| **Instructional Suggestions / Resources**<br>● Big Ideas Textbook 9.1, 9.4, 9.5, 9.6 | **Assessment (formative) Suggestions/Resources**<br>● |

| **CORE UNIT # 4**<br>**Title:** Area and Volume | |
|---|---|
| **Westbrook Learning Standards** | **Content** |

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|---|---|
| • Geometry | • Calculate area of 2-D figures and volume of 3-D figures |
| **Performance Indicators (Skills)**<br>**Students will be able to:**<br>• calculate the area of a circle, square, rectangle, triangle, trapezoid, parallelogram and regular polygon with proper units of measure<br>• calculate the volume of a sphere, cylinder, cone, pyramid and prism with proper units of measure<br>• Solve word problems involving area and volume | **Essential Questions**<br>• How are 2-D and 3-D figures similar and different<br>• How are measurements in 1 dimension, 2-D to 3-D used in real world situations, understanding when to use each measurement? |
| **Common Assessment**s<br>• Formative for Area of 2-Dimensional Figures<br>• Formative for Volume of 3-Dimensional Figures<br>• Unit summative | |
| **Instructional Suggestions / Resources**<br>• Big Ideas Textbook 11.1 - 11.7 | **Assessment (formative) Suggestions/Resources**<br>• |

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| **CORE UNIT # 5**<br>**Title:** Probability |

<table>
<tr><td>Westbrook Learning Standards<ul><li>Statistics & Probability</li></ul></td><td>Content<ul><li>Calculate probabilities and use probabilities to solve application problems</li></ul></td></tr>
<tr><td>Performance Indicators (Skills)<br>Students will be able to:<ul><li>find subsets of a sample space.</li><li>list the sample space</li><li>find unions, intersections, and complements of events.</li><li>find probability of an event.</li><li>find the odds in favor of the event.</li><li>determine whether events are independent or dependent given a situation.</li><li>determine whether events are independent of dependent using probabilities.</li><li>calculate the probabilities of independent and dependent events.</li><li>find conditional probabilities when events are dependent.</li><li>make two-way tables to display data from two different categories.</li><li>find conditional frequencies and conditional probabilities from a two-way table.</li><li>find probabilities of compound events, disjoint, and overlapping.</li><li>use probabilities to solve real-world problems.</li></ul></td><td>Essential Questions<ul><li>In what ways does one event impact the probability of another event occurring?</li></ul></td></tr>
<tr><td colspan="2">Common Assessments<ul><li>Formative Introduction to Probability</li><li>Formative on two-way tables</li><li>Unit summative</li></ul></td></tr>
<tr><td>Instructional Suggestions / Resources<ul><li>Big Ideas Textbook 5.1 - 5.4</li></ul></td><td>Assessment (formative) Suggestions/Resources<ul><li></li></ul></td></tr>
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**CORE UNIT # 6**
**Title:** Key Features of Quadratics Functions

| **Westbrook Learning Standards** | **Content** |
|---|---|
| ● Functions | ● Create graphs using key features for quadratic functions |
| **Performance Indicators (Skills)**<br>**Students will be able to:**<br>● identify the x-intercepts, y-intercepts, intervals of increasing and decreasing, the maximum and minimum, concavity, and axis of symmetry of a quadratic.<br>● create graphs using the key features of a quadratic and absolute value functions<br>● state and explain the domain and range of a function<br>● calculate the average rate of change of a function<br>● compare key features of two functions in different forms. | **Essential Questions**<br>● What information can be gathered by analyzing the key features of a quadratic function?<br>● How is a quadratic equation similar to a linear (exponential) equation? How is it different?<br>● In what situations is it appropriate to use a quadratic model?<br>● What are the applications of the domain of a quadratic function? |
| **Common Assessment**s<br>● Formative graphing quadratics<br>● Formative on key features<br>● Unit summative | |
| **Instructional Suggestions / Resources**<br>● | **Assessment (formative) Suggestions/Resources**<br>● |

**CORE UNIT # 7**
**Title:** Solving Quadratic Functions

| **Westbrook Learning Standards** | **Content** |
|---|---|
| ● Algebra | ● Solve quadratic equations using various methods |
| **Performance Indicators (Skills)**<br>**Students will be able to:**<br>● solve a quadratic equation using square root method, the Quadratic Formula, by factoring, completing the square, and by reading from a graph<br>● determine the number of solutions using the discriminant<br>● interpret the solution of a quadratic equation in a real world problem | **Essential Questions**<br>● Why does the degree of an equation reveal the number of solutions to the equation?<br>● To what extent are solutions to quadratic equations real?<br>● How are the real solutions of a quadratic equation related to the graph of the related quadratic function? |
| **Common Assessments**<br>● Formative on solving a quadratic using graphing and factoring<br>● Formative on solving a quadratic using square root method and quadratic formula<br>● Unit summative | |
| **Instructional Suggestions / Resources**<br>● | **Assessment (formative) Suggestions/Resources**<br>● |

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| **CORE UNIT # 8**<br>**Title:** Building Functions | |
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| **Westbrook Learning Standards**<br>● Algebra<br>● Functions | **Content**<br>● Create functions using operations with functions and the inverse of a function |
| **Performance Indicators (Skills)**<br>**Students will be able to:**<br>● | **Essential Questions**<br>● |
| **Common Assessment**s<br>● Formative for<br>● Formative for<br>● Unit summative | |
| **Instructional Suggestions / Resources**<br>● | **Assessment (formative) Suggestions/Resources**<br>● |

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