



Wolcott Public Schools

154 Center Street
Wolcott, Connecticut 06716
www.wolcottps.org – 203-879-8183

High School Curriculum
Mathematics
Functions, Statistics and Trigonometry
Grade 12



Children are our Future...

Acknowledgements

Curriculum Writers:

Linda DeVoe

We acknowledge and celebrate the professionalism, expertise, and diverse perspectives of these teachers. Their contributions to this curriculum enrich the educational experiences of all Wolcott students.

Dr. Gail A. Gilmore
Assistant Superintendent

Date of Presentation to the Board of Education:

Functions, Statistics and Trigonometry

Functions, Statistics and Trigonometry

Mission Statement:

The mission of the Wolcott Public Schools is to develop in each student the knowledge, skills, and attitudes necessary to become a productive member of the community and a contributing member to society.

Departmental Philosophy:

The philosophy of the Mathematics Department at Wolcott High School is that mathematics education should support the development of mathematical literacy in all students, prepare students for successful post-secondary endeavors, and motivate more students to pursue careers in mathematics, technology, and engineering. Mathematical literacy is a comprised understanding of major mathematic concepts; having computational facility, and making the connections which support the application of that understanding in a variety of mathematical situations. Students will be offered appropriately sequenced instruction which promotes the development of deep understanding of key mathematical concepts and skills, including the ability to compute, reason, communicated and solve problems. The department will articulate the mathematical understandings that all students should have by setting higher expectations for all students to ensure earlier and more equitable opportunities to learn mathematics. Students will be actively involved with mathematics and required to use a variety of mathematical tools and strategies to solve problems as well as the appropriate use of technological tools to enhance access to mathematical concepts.

Course Description:

Functions, Statistics and Trigonometry is a course that will review topics taught in an Algebra II course and develop them in further depth using a hands on visual approach. The student will cover topics including functions, (linear, quadratic, polynomial, exponential, logarithmic and trigonometric) linear programming, sequences and series, probability and statistics. These topics will assist students with their ability to successfully continue studying mathematics and science in college. Technology is an integral part of this course and graphing calculators will be used extensively.

Functions, Statistics and Trigonometry

Content Standard: Understand and describe patterns and functional relationships.

<i>Performance Standards</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
<p>Describe relationships and make generalizations about patterns and functions.</p> <p>Model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.</p>	<ul style="list-style-type: none"> • Make and justify predictions based on patterns • Identify the characteristics of functions and relations, including domain and range. • Describe and compare properties and classes of linear, quadratic, exponential, logarithmic and trigonometric functions. • Analyze essential relations in a problem to determine possible functions that could model the situation. • Solve problems involving direct and inverse variation. 	<ol style="list-style-type: none"> 1. Tests 2. Quizzes 3. Projects 4. Homework 5. Class work 6. Take home tests 7. Extra credit assignments 8. Rubrics 	<ol style="list-style-type: none"> 1. Textbook 2. Course organizers 3. State of CT Mathematics Curriculum Framework 4. Graphing calculators 5. Cooperative learning groups 6. www.amc.glencoe.com

Functions, Statistics and Trigonometry

Content Standard: Represent and analyze quantitative relationships in a variety of ways.

<i>Performance Standards</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
<p>Represent and analyze linear and nonlinear functions and relations symbolically and with tables and graphs.</p> <p>Relate the behavior of functions and relations to specific parameters and determine functions to model real-world situations.</p>	<ul style="list-style-type: none"> • Relate the graphical representation of a function to its function family and find equations, intercepts, maximum or minimum values, asymptotes, and line of symmetry for that function. • Evaluate and interpret the graphs of linear, exponential, and polynomial functions. • Recognize the effects of change in parameters on the graphs of functions or relations. 	<ol style="list-style-type: none"> 1. Tests 2. Quizzes 3. Projects 4. Homework 5. Class work 6. Take home tests 7. Extra credit assignments 8. Rubrics 	<ol style="list-style-type: none"> 1. Textbook 2. Course organizers 3. State of CT Mathematics Curriculum Framework 4. Graphing calculators 5. Cooperative learning groups www.amc.glencoe.com

Functions, Statistics and Trigonometry

Content Standard: Use operations, properties and algebraic symbols to determine equivalence and solve problems.

<i>Performance Standards</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
<p>Manipulate equations, inequalities and functions to solve problems.</p> <p>Use and extend algebraic concepts to include real and complex numbers.</p>	<ul style="list-style-type: none"> • Model and solve problems with linear, quadratic and absolute value equations and linear inequalities. • Solve systems of two linear equations using algebraic or graphical methods. • Combine, compose and invert functions. • Use logarithms to solve problems. 	<ol style="list-style-type: none"> 1. Tests 2. Quizzes 3. Projects 4. Homework 5. Class work 6. Take home tests 7. Extra credit assignments 8. Rubrics 	<ol style="list-style-type: none"> 1. Textbook 2. Course organizers 3. State of CT Mathematics Curriculum Framework 4. Graphing calculators 5. Cooperative learning groups www.amc.glencoe.com

Functions, Statistics and Trigonometry

Content Standard: Understand that a variety of numerical representations can be used to describe quantitative relationships.

<i>Performance Standards</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
Extend the understanding of numbers to include the set of complex numbers.	<ul style="list-style-type: none">• Compare and contrast the properties of numbers and number systems, including rational, real and complex numbers.	<ol style="list-style-type: none">1. Tests2. Quizzes3. Projects4. Homework5. Class work6. Take home tests7. Extra credit assignments8. Rubrics	<ol style="list-style-type: none">1. Textbook2. Course organizers3. State of CT Mathematics Curriculum Framework4. Graphing calculators5. Cooperative learning groups www.amc.glencoe.com

Functions, Statistics and Trigonometry

Content Standard: Use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.

<i>Performance Standards</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
<p>Develop strategies for computation and estimation using properties of number systems to solve problems.</p> <p>Investigate mathematical properties and operations related to objects that are not numbers.</p> <p>Solve proportional reasoning problems.</p>	<ul style="list-style-type: none"> • Develop and use a variety of strategies to estimate values of formulas, functions and roots; to recognize the limitations of estimation; and to judge the implications of the results. • Perform operations with complex numbers and logarithms. • Use dimensional analysis to determine equivalent rates. • Solve problems using direct and inverse variation. 	<ol style="list-style-type: none"> 1. Tests 2. Quizzes 3. Projects 4. Homework 5. Class work 6. Take home tests 7. Extra credit assignments 8. Rubrics 	<ol style="list-style-type: none"> 1. Textbook 2. Course organizers 3. State of CT Mathematics Curriculum Framework 4. Graphing calculators 5. Cooperative learning groups www.amc.glencoe.com

Functions, Statistics and Trigonometry

Content Standard: Develop and apply units, systems, formulas and appropriate tools to estimate and measure.

<i>Performance Standards</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
<p>Solve a variety of problems involving one, two and three dimensional measurements using geometric relationships and trigonometric ratios.</p> <p>Approximate measurements that cannot be directly determined with some degree of precision using appropriate tools, techniques and strategies.</p>	<ul style="list-style-type: none"> • Use indirect methods including the Pythagorean Theorem, trigonometric ratios and proportions in similar figures to solve a variety of measurement problems. • Use properties of similarity and techniques of trigonometry to make indirect measurements of lengths and angles to solve a variety of problems. 	<ol style="list-style-type: none"> 1. Tests 2. Quizzes 3. Projects 4. Homework 5. Class work 6. Take home tests 7. Extra credit assignments 8. Rubrics 	<ol style="list-style-type: none"> 1. Textbook 2. Course organizers 3. State of CT Mathematics Curriculum Framework 4. Graphing calculators 5. Cooperative learning groups www.amc.glencoe.com

Functions, Statistics and Trigonometry

Content Standard: Collect, organize and display data using appropriate statistical and graphical methods.

<i>Performance Standards</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
<p>Model real data graphically using appropriate tools, technology and strategies.</p>	<ul style="list-style-type: none"> • Investigate and solve relevant problems by designing statistical experiments and collecting, organizing, displaying and analyzing data in tabular, graphical and symbolic forms. • Apply and defend regression models for bivariate data and use them to formulate predictions. • Recognize the limitations of mathematical models based on sample data as representations of real world situations. 	<ol style="list-style-type: none"> 1. Tests 2. Quizzes 3. Projects 4. Homework 5. Class work 6. Take home tests 7. Extra credit assignments 8. Rubrics 	<ol style="list-style-type: none"> 1. Textbook 2. Course organizers 3. State of CT Mathematics Curriculum Framework 4. Graphing calculators 5. Cooperative learning groups www.amc.glencoe.com

Functions, Statistics and Trigonometry

Content Standard: Analyze data sets to form hypotheses and make predictions.

<i>Performance Standards</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
<p>Analyze real world problems using statistical techniques.</p> <p>Describe and analyze sets of data using statistical methods.</p>	<ul style="list-style-type: none"> • Estimate an unknown value between data points on a graph (interpolation) and make predictions by extending the graph. • Use data from samples to make inferences about a population and determine whether claims are reasonable or false. • Determine and use measures of spread and central tendency to describe and compare sets of data. • Determine statistical measures to describe univariate data. • Describe characteristics of sampling methods and analyze the effects of random versus biased sampling. 	<ol style="list-style-type: none"> 1. Tests 2. Quizzes 3. Projects 4. Homework 5. Class work 6. Take home tests 7. Extra credit assignments 8. Rubrics 	<ol style="list-style-type: none"> 1. Textbook 2. Course organizers 3. State of CT Mathematics Curriculum Framework 4. Graphing calculators 5. Cooperative learning groups www.amc.glencoe.com

Functions, Statistics and Trigonometry

Content Standard: Understand and apply basic concepts of probability.

<i>Performance Standards</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
<p>Understand and apply the principles of probability in a variety of situations.</p> <p>Make statistical inferences through the use of probability.</p>	<ul style="list-style-type: none">• Determine outcomes and solve problems involving the probabilities of events.• Explore the concepts of conditional probability in real world contexts.• Explore the characteristics and applications of the normal distribution and standardized scores.	<ol style="list-style-type: none">1. Tests2. Quizzes3. Projects4. Homework5. Class work6. Take home tests7. Extra credit assignments8. Rubrics	<ol style="list-style-type: none">1. Textbook2. Course organizers3. State of CT Mathematics Curriculum Framework4. Graphing calculators5. Cooperative learning groups www.amc.glencoe.com

Functions, Statistics and Trigonometry

Pacing Guide

September:

Unit 1: Relations, Functions, and Graphs

- 1-1 Relations and Functions
- 1-2 Composition of Functions
- 1-4 Writing Linear Equations
- 1-5 Writing Equations of Parallel and Perpendicular Lines
- 1-6 Modeling Real-World Data with Linear Functions
- 1-8 Graphing Linear Inequalities

October:

Unit 2: Systems of Linear Equations and Inequalities

- 2-1 Solving Systems of Equations in 2 Variables
- 2-2 Solving systems of equations in 3 variables
- 2-3 Modeling Real-World Data with Matrices
- 2-6 Solving Systems of Linear Inequalities
- 2-7 Linear Programming

November:

Unit 3: The Nature of Graphs

- 3-4 Inverse functions and relations

Unit 4: Polynomial and Rational Functions

- 4-1 Polynomial Functions
- 4-2 Quadratic Equations
- 4-5 Locating Zeros of a Polynomial Function
- 4-7 Radical Equations and Inequalities

December:

- 4-8 Modeling Real-World Data with Polynomial Functions

Unit 11: Exponential and Logarithmic Functions

- 11-1 Real Exponents
- 11-2 Exponential Functions
- 11-3 The Number e

January:

- 11-4 Logarithmic Functions
- 11-5 Common Logarithms
- 11-6 Natural Logarithms
- 11-7 Modeling Real-World Data with Logarithmic Functions

Unit 12: Sequences and Series

- 12-1 Arithmetic Sequences and Series
- 12-2 Geometric Sequences and Series

Functions, Statistics and Trigonometry

February:

- 12-3 Infinite Sequences and Series
- 12-5 Sigma Notation and the n^{th} term
- 12-6 The Binomial Theorem
- 12-7 Special Sequences and Series

Unit 5: The Trigonometric Functions

- 5-1 Angles and Degree Measure

March:

- 5-2 Trigonometric Ratios in Right Triangles
- 5-3 Trigonometric Functions on the Unit Circle
- 5-4 Applying Trigonometric Functions
- 5-5 Solving Right Triangles
- 5-6 The Law of Sines
- 5-7 The Ambiguous Case for the Law of Sines

April:

- 5-8 The Law of Cosines

Unit 6: Graphs of Trigonometric Functions

- 6-3 Graphing Sine and Cosine Functions
- 6-4 Amplitude and Period of Sine and Cosine Functions
- 6-7 Graphing Other Trigonometric Functions

May:

- 6-8 Trigonometric Inverses and their Graphs

Unit 14: Statistics and Data Analysis

- 14-1 The Frequency Distribution
- 14-2 Measures of Central Tendency
- 14-3 Measures of Variability
- 14-4 The Normal Distribution

June:

- 14-5 Sample Sets of Data

Unit 13: Combinatorics and Probability

- 13-1 Permutations and Combinations
- 13-4 Probabilities of Compound Events

Functions, Statistics and Trigonometry

Essential Questions

- 1.) How can we connect our previous mathematical knowledge, both in algebra and geometry, to more advanced mathematical topics?
- 2.) How do we classify a function both graphically and algebraically, and what are its basic characteristics?
- 3.) How do we solve a problem algebraically, graphically, and numerically, and how do we communicate our results verbally?
- 4.) How do we determine the most efficient approach to solving a problem, and how can we confirm our results with an alternative method?
- 5.) How do trigonometric functions model the real world?
- 6.) How can we use technology to graphically illustrate or numerically approximate functions and real world data in a concrete way?
- 7.) How do we use statistics to analyze real world data?
- 8.) What is the difference between a sequence and a series?
- 9.) What is the difference between a permutation and a combination?
- 10.) How is the probability of compound events calculated?

Functions, Statistics and Trigonometry

Skills Objectives

[8-12 Students based measurable student objectives that will be accomplished by the end of the class]

- 1.) Students will be able to model real world data using technology and use models to make predictions.
- 2.) Students will be able to solve a variety of equations and communicate the results verbally.
- 3.) Students will be able to graph linear, quadratic, exponential, rational, polynomial, logarithmic and trigonometric functions and describe the effect of certain constants and coefficients.
- 4.) Students will be able to find the n th terms and sum of an arithmetic, geometric, and infinite series.
- 5.) Students will use statistics to make inferences by finding measures of central tendency and variability.
- 6.) Students will be able to solve triangles and find the area of triangles using trigonometry.
- 7.) Students will be able to distinguish between a permutation and a combination and solve these types of problems.
- 8.) Students will be able to calculate the probability of compound events.
- 9.) Students will be able to classify functions graphically and algebraically.

Functions, Statistics and Trigonometry

Assessments