Advanced Algebra/Geometry 42

Description

Advanced Algebra/Geometry 42 is an extension of topics in algebra, geometry, and data analysis. SAT problems and questions will be integrated into the first semester. Full year topics include: functions, analyzing data, linear programming, sequences and series, and trigonometry which will prepare seniors for an introduction to material that may be included in college entrance exams and/or introductory math courses in college. Credit is granted by semester.

Course Overview

Course Goals	Essential Questions	Assessments
Students should:	- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? - How are quantitative relationships represented by numbers? - How do geometric relationships and measurements help us to solve problems and make sense of our world? - How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?	*Common Assessments* *Skill Assessments*

Content Outline
   I.   Unit 1 - Geometry and Trigonometry
  II. Unit 2 - Functions and Equations
 III. Unit 3 - Sequences and Series
 IV. Unit 4 - Modeling and Analyzing Data
	Standards
	
	State of Connecticut Mathematics Curriculum Frameworks
	
	Connecticut State Standards are met in the following areas:
	    Algebraic Reasoning: Patterns And Functions ***Numerical and Proportional Reasoning*** ***Geometry and Measurement*** ***Working with Data: Probability and Statistics***
		Grade Level Skills
		Students will:
		    Skills Matrix

Pacing Guide			
1st Marking Period	2nd Marking Period	3rd Marking Period	4th Marking Period
September　　October　　November	December　　January	February　　March　　April	May　　June
Unit 1 **Geometry and Trigonometry** 8 weeks	Unit 2 **Functions and Equations** 12 weeks	Unit 3 **Sequences and Series** 4 weeks	Unit 4 **Modeling and Analyzing Data** 5 weeks

Unit 1 - Geometry and Trigonometry, 8 weeks top

Standards

Geometry and Measurement – Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies.

3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure.

Core   3.3a Students should solve a variety of problems involving one- two- and three-dimensional measurements using geometric relationships and trigonometric ratios.

Extended   3.3a Students should approximate measurements that cannot be directly determined with some degree of precision using appropriate tools, techniques and strategies.

Unit Objectives

Students will be able to:

- use trigonometry and geometry to determine angles, arcs and sides of polygons.
- define and utilize the properties of inscribed polygons, inscribed circles and regular and semi-regular polyhedra.
- use the Law of Cosines and the Law of Sines to solve triangles.

Essential Question

- How do geometric relationships and measurements help us to solve problems and make sense of our world?

Focus Questions

- How do geometric concepts get tested on SAT and placement tests for colleges?
- What are the properties of inscribed polygons?
- How do the Law of Cosines, Law of Sines, trigonometric ratios and Pythagorean theorem lead to the solutions of triangles in problem situations?
- How are the behavior of functions classified and described?

Assessments

Skill Objectives

Students will:

- investigate formulas for the sums of interior and exterior angle measures in polygons.
- examine the relationships between inscribed and circumscribed polygons and circles.
- use indirect methods including the Pythagorean Theorem, trigonometric ratios and proportions in similar figures to solve a variety of measurement problems.
- use techniques of trigonometry to make indirect measurements of lengths and angles to solve a variety of problems.
- use Pythagorean Theorem to determine the measures of the sides of a triangle.
- apply Triangle Inequality Theorem.
- use law of sines to solve problem situations.
- categorize a graph by type: periodic, damping, saturating, constant.

		- compare the rates of change of graphs. - determine the period and amplitude of a function from its graph. - write an equation of the horizontal axis of graph. - sketch a periodic graph using the amplitude period and equation of axis.

Unit 2 – Functions and Equations, 12 weeks top

Standards

Algebraic Reasoning: Patterns And Functions – Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

1.1 Students should understand and describe patterns and functional relationships.
Core   1.1a Students should describe relationships and make generalizations about patterns and functions.
Extended   1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

1.2 Students should represent and analyze quantitative relationships in a variety of ways.
Core   1.2a Students should represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs.
Extended   1.2a Students should relate the behavior of functions and relations to specific parameters and determine functions to model real world situations.

1.3 Students should use operations, properties, and algebraic symbols to determine equivalence and solve problems.
Core   1.3a Students should manipulate equations, inequalities, and functions to solve problems.
Extended   1.3a Students should use and extend algebraic concepts to include real and complex numbers and matrices.

Numerical and Proportional Reasoning – Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.

2.1 Students should understand that a variety of numerical representations can be used to describe quantitative relationships.
Extended   2.1a Students should extend the understanding of number to include the set of complex numbers.

2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.
Extended   2.2a Students should investigate mathematical properties and operations related to objects that are not numbers.

Unit Objectives
Students will be able to:
- represent, graph and analyze functions and equations.
- model problem situations using systematic lists and systems of equations and inequalities.
- recognize and describe linear, quadratic, polynomial, radical, and rational functions.
- write and use logarithmic and exponential functions to model situations.

Essential Questions
- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented by numbers?

Focus Questions
- How do the concepts of functions and equations get tested on SAT and placement tests for colleges?
- What are the differences between linear, quadratic, polynomial, radical, rational, exponential, logarithmic and

Assessments

Skill Objectives
Students will:
- solve systems of two or three linear equations using algebraic methods, graphical methods or matrices.
- use systems of inequalities to model situations and find maximum and minimum values.
- identify the characteristics of functions and relations including domain and range.
- write and interpret functional notation.
- determine from a graph whether an equation

	composite functions? • How can linear and exponential functions be used to model situations? • How can the process of linear programming be used to determine an optimal solution?	represents a function and is either one to one or many to one. • model and solve problems with linear and linear inequalities. • determine the intercepts and maximum or minimum values from an equation. • determine equivalent representations of an algebraic equation or inequality to simplify and solve problems. • evaluate and interpret the graphs of linear, and polynomial functions. • determine if a function is quadratic from a graph and an equation. • solve problem situations using the formula for height or distance. • describe and compare properties and classes of linear, direct, quadratic, radical, exponential and polynomial. • write and solve problems involving direct variation. • identify an appropriate symbolic representation for a function or relation displayed graphically or verbally. • analyze essential relations in a problem to determine possible functions that could model the situation. • understand and use optimization strategies including linear programming. • determine the degree and zeros of a polynomial function. • simplify and solve radical equations. • use the discriminant to find the number of real solutions of a quadratic equation. • perform operations of Complex Numbers. • use exponential growth and decay functions to model situations. • rewrite exponential functions in the form $y=ab^x$ where x is either positive or negative. • model situations using exponential functions with

		base e.
		• write expressions with fractional exponents in radical form.
		• write radical expressions using a fractional exponent.
		• simplify radicals using fractional exponents.
		• write an equation in base 10 logarithmic form.
		• write an equation in exponential form.
		• evaluate base 10 logarithmic expressions.
		• solve problems involving financial applications including compound interest.

Unit 3 - Sequences and Series,   4 weeks [top](#)

Standards

Algebraic Reasoning: Patterns And Functions – Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

1.1 Students should understand and describe patterns and functional relationships.

Core   1.1a Students should describe relationships and make generalizations about patterns and functions.

Extended   1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

1.2 Students should represent and analyze quantitative relationships in a variety of ways.

Core   1.2a Students should represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs.

1.3 Students should use operations, properties, and algebraic symbols to determine equivalence and solve problems.

Core   1.3a Students should manipulate equations, inequalities, and functions to solve problems.

Unit Objectives	Essential Question	Assessments
Students will be able to: - develop, symbolize and classify sequences and series. - use sigma notation to represent series and evaluate sums. - determine, define and evaluate geometric and arithmetic sequences and series.	- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? **Focus Questions** - How does the concept of numeric patterns get tested on SAT and placement tests for colleges? - How can geometric and arithmetic sequences and series be used to model situations? - How can you use sigma to represent a series? - How can you determine the sum of a series? - How can you use explicit and recursive formulas to represent terms in sequences or series?	**Skill Objectives** Students will: - identify, describe, create, and generalize numeric patterns with graphs, words and symbolic rules. - write the next terms of a sequence. - graph the sequence and apply the concepts of limits to sequences. - determine the terms of a sequence or series using an explicit formula and recursive formula. - write the explicit formula and recursive formula for a sequence or a series. - identify a common difference in an arithmetic sequence. - identify a common ratio in a geometric sequence. - classify a sequence or series as arithmetic, geometric or neither. - use a formula to determine the sum of a

<table>
<tr>
<td></td>
<td></td>
<td>finite arithmetic series, a finite geometric series and infinite series.
• write a series in sigma notation.
• evaluate the sum of a sigma notation.
• determine the partial sums of an infinite series.</td>
</tr>
</table>

**Unit 4 - Modeling and Analyzing Data, 5 weeks **

Standards

Working with Data: Probability and Statistics – Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies.
4.1 Students should collect, organize and display data using appropriate statistical and graphical methods.
Core   4.1a Students should create the appropriate visual or graphical representation of real data.
Extended   4.1a Students should model real data graphically using appropriate tools, technology and strategies.
4.2 Students should analyze data sets to form hypotheses and make predictions.
Core   4.2a Students should analyze real world problems using statistical techniques.
4.3 Students should understand and apply basic concepts of probability.
Extended   4.3b Students should make statistical inferences through the use of probability.

Unit Objectives	Essential Question	Assessments
Students will be able to: • gather, organize, model, represent and interpret sets of data. • use technology to explore and analyze data. • model data in a variety of ways.	• How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions? **Focus Questions** • How does analyzing data get tested on SAT and placement tests for colleges? • How can a frequency distribution be determined from a model data set? • How can data be modeled appropriately to form a linear or quadratic equation in order to analyze and make predictions?	**Skill Objectives** Students will: • collect real data and create meaningful graphical representations of the data. • develop, use, and explain applications and limitations of linear and non-linear models and regression in a variety of contexts. • create, use and interpret frequency distribution, least squares, quadratic regressions, box and whisker plots, scatter plots, histograms and relative frequency histograms. • estimate an unknown value between data points on a graph (interpolation) and make predictions by extending the graph (extrapolation). • explore and analyze types of frequency distributions. • identify, describe, create and generalize statistical patterns with graphs and symbolic rules. • determine and use measures of spread

		and central tendency to describe and compare sets of data.
		• use statistics to compare two sets of data.
		• explore the characteristics and applications of the normal distribution and standardized scores.
		• apply regression models for bivariate data and use them to formulate predictions.
		• interpret the correlation coefficient.