# Cape Elizabeth School Department
# K – 12 Math Curriculum Secondary Goals

May, 2010

# K-4 Math Secondary Learning Goals

| | Kindergarten | Grade 1 | Grade 2 | Grade 3 | Grade 4 |
|---|---|---|---|---|---|
| **Priority/Mastery Knowledge and Skills** | | | | | |
| **NUMBER SENSE** | Students will:<br>• Use manipulatives to identify and model odd and even numbers<br>• Demonstrate proficiency with addition and subtraction facts through 10 | Students will:<br>• Add and subtract two digit numbers<br>• Find equivalent names for numbers (tallies, arrays, numerical expressions)<br>• Shade a specific fractional part of a region and name the part | Students will:<br>• Compare and order numbers to one million<br>• Add and subtract multi-digit numbers<br>• Use a variety of strategies to compute multiplication facts through 10 * 10<br>• Solve addition and subtraction number stories | Students will:<br>• Compare large numbers<br>• Solve addition and subtraction facts<br>• Estimate sums, differences, and products<br>• Read, write, and order fractions | Students will:<br>• Use expanded notation to represent whole numbers<br>• Place positive and negative numbers on a number line and determine the distance between them |
| **DATA** | Students will:<br>• Know and compare the value of pennies, nickels, dimes, quarters, and dollar bills<br>• Use a calendar to identify days, weeks, months, and dates<br>• Tell the time to the nearest half and quarter hour using an analog clock | Students will:<br>• Use equivalent coins to show amounts of money in different ways<br>• Measure lengths to the nearest inch and centimeter<br>• Compare quantities using a bar graph | Students will:<br>• Measure lengths to the nearest half-inch and half centimeter<br>• Tell the time to the nearest minute using an analog clock<br>• Interpret graphs to ask and answer simple questions | Students will:<br>• Collect and organize data and use data to create charts, tables and graphs | Students will:<br>• Read, construct, and interpret line graphs |
| **GEOMETRY** | Students will:<br>• Identify shapes having lines of symmetry<br>• Identify two dimensional shapes | Students will:<br>• Identify three dimensional shapes | Students will:<br>• Create two dimensional symmetrical shapes<br>• Locate lines of symmetry | Students will:<br>• Name and draw polygons | Students will:<br>• Identify, describe and classify solid figures<br>• Identify acute, obtuse, and straight angles |
| **ALGEBRA** | Students will:<br>• Describe some simple patterns | Students will:<br>• Use less-than, greater-than, and equal symbols to compare numbers | Students will:<br>• Use addition, subtraction, multiplication, division, less-than, greater-than, and equal symbols to represent and analyze numerical relationships | Students will:<br>• Write number sentences to model number stories | Students will:<br>• Create and evaluate simple expressions |

| | Grade 5 | Grade 6 | Rational Math | Transition Math, Part 1 |
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| **Priority/Mastery Knowledge and Skills** | | | | |
| **NUMBER SENSE** | Students will:<br>• Apply the order of operations to simplify expressions<br>• Identify prime and composite numbers<br>• Multiply a fraction by a whole number<br>• Multiply and divide decimals to the third place<br>• Convert fractions/decimals/percents | Students will:<br>• Investigate the property that every integer greater than one can be expressed as a unique product of prime numbers<br>• Investigate multiplication and division of fractions<br>• Investigate division "by" a decimal number<br>• Investigate the concept of square root and pi | Students will:<br>• Apply the order of operations to simplify expressions<br>• Add, subtract, multiply and divide positive and negative numbers<br>• Use a calculator to perform arithmetic operations and solve problems involving rational numbers<br>• Find percents of quantities in various given situations | Students will:<br>• Use the **Putting-Together** and **Slide** models for addition to form sentence involving addition<br>• Use the **Take-Away** and **Comparison** models for subtraction to form sentences involving subtraction<br>• Know and apply the **Substitution Principle**<br>• Memorize common fractions to sixteenths<br>• Use the equal fractions property to rewrite equivalent fractions<br>• Convert word names to decimals |
| **DATA** | Students will:<br>• Begin to use appropriate tools to measure capacity and mass<br>• Be introduced to problems related to probability and chance | Students will:<br>• Have experiences with probability | Students will:<br>• Name and use customary measures of length in U.S. standard units<br>• Name and use customary measures of mass and volume in the U.S. standard system<br>• Describe given events in various degrees of likelihood, as a fraction, and as a percentage | Students will:<br>• Read and graph numbers (whole, negative, decimals, fractions, and mixed numbers) on a number line<br>• Illustrate the addition of integers on a number line<br>• Illustrate the subtraction of integers on a number line<br>• Use Venn Diagrams to describe and illustrate overlap<br>• Use the putting together with overlap model to solve subtraction sentences related to probability<br>• Plot and name points on a coordinate graph<br>• Solve and plot solutions to linear equations in the form of $y = ax + b$<br>• Continue to measure lengths and draw line segments to an eighth of an inch, a centimeter, and a millimeter<br>• Convert from inches to centimeters<br>• Use appropriate units for measuring common units of weight and capacity (pound, ton, cup, pint, quart, and gallon) and convert within the US Standard system |

| GEOMETRY | Students will: | Students will: | Students will: | Students will: |
|---|---|---|---|---|
| | • Understand how to find the volume and surface area of rectangular prisms<br>• Reflect, rotate, and slide plane figures | • Investigate the use of "nets" to represent cubes, prisms, and square or triangular based pyramids<br>• Experiment with drawing three-dimensional figures | • Identify and describe several common polygons by their number of sides<br>• Measure and draw angles to a certain degree using a protractor<br>• Know and apply relationships among angles formed by **intersecting lines** | • Distinguish between acute, right, central, and obtuse angles<br>• Identify right, isosceles, and scalene triangles<br>• Calculate magnitudes of turns given angle measures or revolution<br>• Find perimeter of a polygon |
| ALGEBRA | Students will: | Students will: | Students will: | Students will: |
| | • Find the unknown in simple equations<br>• Use graphs and data to analyze the relationship between quantities | • Be exposed to solving equations of the form $ax + b = c$ and $ax - b = c$, when $a$, $b$, and $c$ are whole numbers | • Give instances of a pattern and write a "rule" for a pattern using variables<br>• Evaluate algebraic expressions given the value of the variable<br>• Identify and apply the **Addition Property of Equality** to solve algebraic equations | • Calculate the value of a variable given the values of the other variables in a formula<br>• Learn to collect like terms |

|  | Transition Math, Part 2 | Transition Math, Full year | Algebra | Geometry |
|---|---|---|---|---|
| **Priority/Mastery Knowledge and Skills** | | | | |
| **NUMBER SENSE** | Students will:<br>• Identify the **Commutative Property of Multiplication**<br>• Identify the **Associative Property of Multiplication**<br>• Use the **Commutative Property** and **Associative Property of Multiplication** to simplify expressions<br>• Multiply fractions<br>• Identify properties of reciprocals<br>• Apply the **Rate Factor Model** of multiplication<br>• Multiply positive and negative integers<br>• Identify and apply the **Multiplication Properties of zero and -1**<br>• Recognize and apply the **Repeated Addition Property of Multiplication** to simplify expressions<br>• Use integer division with real numbers<br>• Use the **Rate Model for Division**<br>• Know and apply the general properties for dividing positive and negative integers<br>• Use the **Ratio Comparison Model for Division**<br>• Recognize and solve problems involving proportions | Students will:<br>• Use the **Putting-Together** and **Slide** models for addition to form sentences involving addition<br>• Use the **Take-Away** and **Comparison** models for subtraction to form sentences involving subtraction<br>• Know and apply the **Substitution Principle**<br>• Memorize common fractions to sixteenths<br>• Use the equal fractions property to rewrite equivalent fractions<br>• Convert word names to decimals<br>• Identify the **Commutative Property of Multiplication**<br>• Identify the **Associative Property of Multiplication**<br>• Use the **Commutative Property** and **Associative Property of Multiplication** to simplify expressions<br>• Multiply fractions<br>• Identify properties of reciprocals<br>• Apply the **Rate Factor Model** of multiplication<br>• Multiply positive and negative integers<br>• Identify and apply the **Multiplication Properties of zero and -1**<br>• Recognize and apply the **Repeated Addition Property of Multiplication** to simplify expressions<br>• Use integer division with real numbers<br>• Use the **Rate Model for Division**<br>• Know and apply the general properties for dividing positive and negative integers<br>• Use the **Ratio Comparison Model for Division**<br>• Recognize and solve problems involving proportions | See **Algebra Course** under HS Secondary Learning Goals | See **Geometry Course** under HS Secondary Learning Goals |

| DATA | Students will: | Students will: | See **Algebra Course** under HS Secondary Learning Goals | See **Geometry Course** under HS Secondary Learning Goals |
|---|---|---|---|---|
| | • Determine **mean, median, range,** and **mode** of a given set of numbers and use them to solve problems involving raw data and data displays<br>• Know the reasons for using graphs to display data<br>• Represent data using a **Stem and Leaf Display**<br>• Interpret and display information using bar graphs<br>• Interpret and display information using coordinate graphs<br>• Calculate the probability of Independent Events<br>• Represent data using **Box Plots** and **Quartiles**<br>• Graph equations of the form y=ax<br>• Find the line on which numerators and denominators of equal fractions lie | • Read and graph numbers (whole, negative, decimals, fractions, and mixed numbers) on a number line<br>• Illustrate the addition of integers on a number line<br>• Illustrate the subtraction of integers on anumber line<br>• Use Venn Diagrams to describe and illustrate overlap<br>• Use the putting together with overlap model to solve subtraction sentences related to probability<br>• Plot and name points on a coordinate graph<br>• Solve and plot solutions to linear equations in the form of y = ax + b<br>• Continue to measure lengths and draw line segments to an eighth of an inch, a centimeter, and a millimeter<br>• Convert from inches to centimeters<br>• Use appropriate units for measuring common units of weight and capacity (pound, ton, cup, pint, quart, and gallon) and convert within the US Standard system<br>• Determine **mean, median, range,** and **mode** of a given set of numbers and use them to solve problems involving raw data and data displays<br>• Know the reasons for using graphs to display data<br>• Represent data using a **Stem and Leaf Display**<br>• Interpret and display information using bar graphs<br>• Interpret and display information using coordinate graphs<br>• Calculate the probability of Independent Events<br>• Represent data using **Box Plots** and **Quartiles**<br>• Graph equations of the form y=ax<br>• Find the line on which numerators and denominators of equal fractions lie | | |

| **GEOMETRY** | Students will:<br>• Apply the relationships between figures and their reflection images<br>• Create an original Tessellation<br>• Find the area of a rectangle or right triangle<br>• Determine the number of elements in rectangular arrays<br>• Picture multiplication using arrays or areas of rectangles<br>• Represent the **Distributive Property of Multiplication** using the areas of rectangles<br>• Choose appropriate units in measurement situations<br>• Find the area of any triangle<br>• Graph formulas for perimeter, area, and other quantities that involve two variables | Students will:<br>• Distinguish between acute, right, central, and obtuse angles<br>• Identify right, isosceles, and scalene triangles<br>• Calculate magnitudes of turns given angle measures or revolution<br>• Find perimeter of a polygon<br>• Apply the relationships between figures and their reflection images<br>• Create an original Tessellation<br>• Find the area of a rectangle or right triangle<br>• Determine the number of elements in rectangular arrays<br>• Picture multiplication using arrays or areas of rectangles<br>• Represent the **Distributive Property of Multiplication** using the areas of rectangles<br>• Choose appropriate units in measurement situations<br>• Find the area of any triangle<br>• Graph formulas for perimeter, area, and other quantities that involve two variables | See **Algebra Course** under HS Secondary Learning Goals | See **Geometry Course** under HS Secondary Learning Goals |
|---|---|---|---|---|
| **ALGEBRA** | Students will:<br>• Represent equations of the form Ax = B with a "Balance-Scale" diagram or through the use of manipulatives or technology<br>• Represent equations of the form Ax+B = C with a "Balance-Scale" diagram or through the use of manipulatives or tech.<br>• Translate situations of constant increase or constant decrease that lead to sentences of the form ax+b = cx+d<br>• Explore the concept of parabolas and solving equations of the form $y = Ax^2$<br>• Begin to understand that the graph of an equation in the form y = ax+b is a line with slope "a" and y-intercept "b" | Students will:<br>• Calculate the value of a variable given the values of the other variables in a formula<br>• Learn to collect like terms<br>• Represent equations of the form Ax = B with a "Balance-Scale" diagram or through the use of manipulatives or technology<br>• Represent equations of the form Ax+B = C with a "Balance-Scale" diagram or through the use of manipulatives or technology<br>• Translate situations of constant increase or constant decrease that lead to sentences of the form ax+b = cx+d<br>• Explore the concept of parabolas and solving equations of the form $y = Ax^2$<br>• Begin to understand that the graph of an equation in the form y = ax+b is a line with slope "a" and y-intercept "b" | See **Algebra Course** under HS Secondary Learning Goals | See **Geometry Course** under HS Secondary Learning Goals |

# HS Math Secondary Learning Goals

| Algebra | Geometry | Adv. Algebra | Functions, Stats. Trig. |
|---|---|---|---|
| **Priority/Mastery Knowledge and Skills** | **Priority/Mastery Knowledge and Skills** | **Priority/Mastery Knowledge and Skills** | **Priority/Mastery Knowledge and Skills** |

## Algebra

### Using Algebra to Describe

Students will:
- Determine if two expressions seem equivalent by substituting values or making a table.
- Apply the Algebraic Definitions of Subtraction and Division.
- Graph ordered pairs from expressions.

### Using Algebra to Explain

Students will:
- Use related facts to solve sentences.

### Linear Equations and Inequalities

Students will:
- Graph horizontal and vertical lines.
- Use graphs to solve absolute value inequalities of the form $|ax + b| < c$ or $|ax + b| > c$.

### Division and Proportions in Algebra

Students will:
- Multiply and simplify algebraic fractions.
- Divide algebraic fractions.

### Powers and Roots

Students will:
- Test a special case to determine whether a pattern is true.
- Use powers to count the number of sequences possible for repeated choices.

## Geometry

### Points and Lines

Students will:
- Draw discrete lines.
  Analyze networks.
- Make and analyze perspective drawings.
- Recognize and use notation for lines, segments, and rays.
- Give the dimensions of figures and objects.
- Given the property of points and lines, tell whether it is true in each of the four geometries: discrete geometry, synthetic geometry, plane coordinate geometry, graph theory.
- Recognize the use of undefined terms and postulates.
- Apply the definition of distance to real situations.
- Use discrete geometry and graph theory to model real-world situations.
- Determine distance on a number line.
  Graph points and lines in the coordinate plane.

### The Language of Logic and Geometry

Students will:
- Distinguish between convex and non-convex figures.
- Draw and identify polygons.
- Use and interpret the symbols
- Use the definition of midpoint to find lengths of segments.
- Write the converse of a conditional.
- Apply the properties of a good definition.
- Write conditionals and biconditionals.
- Evaluate conditionals and conjectures.
- Determine the union and intersection of sets.
- Determine whether a triangle can be formed with sides of three given lengths.
- Apply properties of conditionals in real situations.

## Adv. Algebra

### Functions

Students will:
- Evaluate expressions and formulas, including correct units in answers.
- Use function notation.
- Rewrite formulas.
- Evaluate sequences.
- Determine whether a relation defined by a table, a list of ordered pairs, or a simple equation is a function.
- Use addition, subtraction, multiplication, and division to write expressions which model real-world problems.
- Use functions to solve real-world situations.
- Use linear equations to solve real-world problems.
- Apply the Vertical-Line Test for a function.

### Variation and Graphs

Students will:
- Translate variation language into formulas and formulas into variation language.
- Use the Fundamental Theorem of Variation.
- Identify the properties of variation functions.
- Solve real-world variation problems.
- Identify variation equations from graphs.
- Recognize the effects of a change in scale or viewing window on a graph of a variation equation.

### Linear Functions

Students will:
- Determine the slope and intercepts of a line given its equation.
- Find an equation for a line given two points on it or given a point on it and its slope.

## Functions, Stats. Trig.

### Exploring Data

Students will:
- Calculate measures of center and spread for data sets
- Use $\Sigma$-notation to represent a sum, mean, variance or standard deviation.
- Determine relationships and interpret data presented in a table.
- Use statistics to describe data sets and to compare or contrast data sets.
- Read and interpret bar graphs, circle graphs, and coordinate graphs.
- Read and interpret box plots.
- Read and interpret dotplots and histograms.
- Draw graphs to display.

### Functions and Models

Students will:
- Evaluate functions described with Euler's notation.
- Describe properties of quadratic and exponential functions.
- Find and interpret linear models.
- Find and interpret exponential models.
- Find and interpret quadratic models.
- Use step functions to model situations.
- Graph linear, exponential, quadratic and step functions.
- Interpret properties of relations from graphs.

## Quadratic Equations and Functions

Students will:
- Identify and use the properties of solutions to quadratic equations.
- Solve geometric problems involving quadratic equations.

## Linear Systems

Students will:
- Multiply 2 X 2 matrices by 2 X 2 or 2 X 1 matrices.
- Solve systems using matrices.
- Solve nonlinear systems.
- Determine whether a system has 0, 1 or infinitely many solutions.
- Write a system of inequalities given a graph.

## Polynomials

Students will:
- Expand squares of binomials.
- Classify polynomials by their degree or number of terms.
- Translate investment situations into polynomials.
- Determine number of permutations.
- Represent polynomials by areas.

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- Identify polygons used in the real world.
- Apply the Triangle Inequality Postulate in real situations.
- Draw hierarchies of triangles and polygons.

## Angles and Lines

Students will:
- Draw and analyze drawings of angles.
- Use algebra to represent and find measures of angles.
- Determine measures of angles formed by parallel lines, perpendicular lines, and transversals.
- Draw parallel lines, bisectors, and perpendicular lines.
- Draw rotation images and find magnitudes of rotations.
- Recognize and use the postulates of equality and inequality.
- Apply parallel and perpendicular lines in real situations.
- Determine the slope of a line from its equation or given two points on it.
- Determine the slope of a line parallel or perpendicular to a given line.

## From Reflections to Congruence

Students will:
- Draw figures by applying the definition of reflection image.
- Draw reflection images of segments, angles, and polygons over a given line.
- Draw translation and glide-reflection images of figures
- Draw or identify images of figures under composites of two reflections.
- Apply properties of reflections to make conclusions, using one or more of the following justifications: definition of reflection; reflections preserve distance; reflections preserve angle measure; reflections switch orientation; Figure Reflection Theorem.

- Apply the Two-Reflection Theorems for Translations and for Rotations.

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- Evaluate expressions based on step functions.
- Recognize properties of linear functions.
- Recognize properties of arithmetic sequences.
- Model constant-increase or constant-decrease situations or situations involving arithmetic sequences.
- Model situations leading to linear combinations.
- In a real-world context, find an equation for a line containing two points.
- Model situations leading to piecewise-linear functions or step functions.
- Graph or interpret graphs of piecewise-linear functions or step functions.

## Matrices

Students will:
- Add, subtract, and find scalar multiples of matrices.
- Multiply matrices.
- Determine equations of lines of perpendiculars to given lines.
- Recognize properties of matrix operations.
- Recognize relationships between figures and their transformation images.
- Relate transformations to matrices, and vice versa.
- Use matrices to store data.
- Use matrix addition, matrix multiplication, and scalar multiplication to solve real-world problems.
- Graph figures and their transformation images.

## Systems

Students will:
- Find the determinant and the inverse of a square matrix.
- Graph linear inequalities in two variables.

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## Transformations of Graphs and Data

Students will:
- Find formulas and values of composites of functions.
- Find inverses of functions.
- Use the Graph-Translation Theorem or the Graph Scale-Change Theorem to find transformation images.
- Describe the effects of translations or scale changes on functions and their graphs.
- Describe the effects of translations or scale changes on measures of center or spread.
- Describe the symmetries of graphs.
- Identify properties of composites and inverses.
- Identify properties of z-scores.
- Use translations, scale changes, or z-scores to analyze data.
- Apply the Graph-Translation Theorem or the Graph Scale-Change Theorem to make or identify graphs.
- From a graph of a function, determine its symmetries or whether its inverse is a function.
- Graph inverses of functions

## Circular Functions

Students will:
- Convert between degrees, radians, and revolutions.
- Apply the definitions of the sine, cosine, and tangent functions.
- Apply theorems about sines, cosines, and tangents.
- Identify the amplitude, period, frequency, phase shift, and other properties of circular functions.
- Use equations of circular functions to solve problems about real phenomena.
- Find equations of circular functions to model periodic phenomena.
- Use the unit circle to find values of sines, cosines, and tangents.
- Draw or interpret graphs of the parent sine, cosine, and tangent functions.
- Graph transformation images of circular functions.

- Determine the isometry which maps one figure onto another.
- Use reflections to find a path from an object to a particular point.
- Use congruence in real situations.
- Find coordinates of reflection and translation images of points over the coordinate axes.

## Proofs using Congruence

Students will:
- Construct equilateral triangles and construct the circle through three noncollinear points.
- Find lengths and angle measures using properties of perpendicular bisectors and alternate interior angles.
- Use the Triangle-, Quadrilateral-, and Polygon-Sum Theorems to determine angle measures.
- Write proofs using the Transitive Properties of Equalities or Congruence.
- Write proof arguments using properties of reflections.
- Tell whether auxiliary figures are uniquely determined.
- Use the Perpendicular Bisector Theorem and theorems on alternate interior angles in real situations.
- Know the history and impact of postulates relating to parallel lines on the development of geometry.

## Polygons and Symmetry

Students will:
- Locate symmetry lines and centers of symmetry of geometric figures. (6-1, 6-2, 6-4, 6-5, 6-6, 6-7)
- Draw polygons satisfying various conditions. (6-2, 6-3, 6-7)
- Apply theorems about isosceles triangles to find angle measures and segment lengths. (6-2, 6-7)
- Apply theorems about quadrilaterals and regular polygons to find angle measures and segment lengths. (6-3, 6-4, 6-5, 6-7)
- Apply properties of symmetry to assert and justify conclusions about symmetric figures. (6-1, 6-6)

## Quadratic Functions

Students will:
- Transform quadratic equations from vertex form to standard form, and visa versa.
- Perform operations with complex numbers.
- Use quadratic equations to solve area problems or problems dealing with velocity and acceleration.
- Fit a quadratic model to data.
- Use the Graph-Translation Theorem to interpret equations and graphs.

## Powers

Students will:
- Solve equations of the form $x^n = b$ where $n$ is a rational number.
- Solve real-world problems which can be modeled by expressions with $n$th powers or $n$th roots.
- Apply the compound interest formula.
- Solve real-world problems involving geometric sequences.

## Inverses and Radicals

Students will:
- Find the values and rules for composites of functions.
- Find the inverse of a relation.
- Rewrite or simplify expressions with radicals.
- Solve equations with radicals.
- Apply properties of the inverse relations and inverse functions.
- Make and interpret graphs of inverses of relations.

- State equations for graphs of circular functions.

## Trigonometric Functions

Students will:
- Solve Trignometric equations.
- Interpret the Law of Sines, Law of Cosines, and related theorems.
- State properties of inverse trigonometric functions.
- Solve problems involving the Law of Sines and Law of Cosines.
- Write and solve equations for phenomena described by trigonometric and circular functions.

## Root, Power, and Logarithm Functions

Students will:
- Solve exponential equations.
- Use properties of logarithms.
- Use rational exponents to model situations.
- Use rational power functions or logarithm functions to model data.
- Interpret graphs of $n$th root, rational power, and logarithm functions.

## Probability and Simulation

Students will:
- List sample spaces and events for probabilistic experiments.
- Compute probabilities.
- Find the number of ways of selecting or arranging objects.
- Evaluate expressions using factorials.
- Solve equations using factorials.
- Use counting principles and theorems to find the number of ways of arranging objects.
- Design and conduct simulation with and without technology.
- Construct, graph, and interpret probability distributions.

* Know the properties of the various types of triangles and regular polygons. (6-2, 6-7)
* Know the properties of the seven special types of quadrilaterals. (6-3, 6-4, 6-5)
* Write proofs using properties of triangles and quadrilaterals. (6-2, 6-3, 6-4, 6-5, 6-7)
* Locate and draw symmetry lines in real-world designs. (6-1, 6-6)
* Make a schedule for a round-robin tournament. (6-8)
* Draw and apply hierarchies of polygons. (6-3)

## Triangle Congruence

Students will:
* Draw triangles satisfying certain conditions and determine whether all such triangles are congruent.
* Determine measures of angles of polygons and exterior angles.
* Determine whether triangles are congruent from given information.
* Apply properties of parallelograms.
* Determine whether conditions are sufficient for parallelograms.
* From given information, deduce which sides or angles of triangles are smallest or largest.
* Use theorems about triangles to explain real situations
* Draw tessellations of real objects.
* Use theorems about parallelograms to explain real situations.

## Perimeters and Areas

Students will:
* Calculate perimeters of parallelograms, kites, and equilateral polygons given appropriate lengths, and vice versa. (8-1)
* Apply the Pythagorean Converse Theorem.
* Relate various formulas for area.
* Apply formulas for areas of squares, rectangles, parallelograms, trapezoids, and triangles to real-world situations. (8-2, 8-4, 8-5)
* Identify cultures in which the Pythagorean Theorem is known to have been studied.

## Exponential and Logarithmic Functions

Students will:
* Determine values of logarithms.
* Recognize properties of exponential functions.
* Identify or apply properties of logarithms.
* Apply exponential growth and decay models.
* Fit an exponential model to data.
* Graph logarithmic curves.

## Trigonometry

Students will:
* Approximate values of trigonometric functions using a calculator.
* Convert angle measures from radians to degrees or from degrees to radians.
* Identify and use definitions and theorems relating sines, cosines, and tangents.
* Solve real-world problems using the Law of Sines or Law of Cosines.
* Find missing parts of a triangle using the Law of Sines or the Law of Cosines.
* Use the properties of a unit circle to find trigonometric values.
* Identify properties of the sine, cosine, and tangent functions using their graphs.

## Polynomials

Students will:
* Use polynomials to describe geometric situations.

## Polynomial Functions

Students will:
* Use finite differences and systems of equations to determine an equation for a polynomial function from the data points.
* Perform operations with complex numbers.
* Apply the vocabulary of polynomials.
* Apply the Fundamental Theorem of Algebra and Conjugate Zeros Theorem.
* Construct and interpret polynomials that model real situations.
* Represent two-or three-dimensional figures with polynomials.
* Relate properties of polynomials functions and their graphs.

## Binomial and Normal Distributions

Students will:
* Use the Standard Normal Distribution to find probabilities.
* Compare and contrast characteristics of different binomial probability distribution graphs.
* Use properties of normal distributions and their parent functions.
* Solve probability problems using binomial or normal distributions.
* Use binomial and normal distributions to test hypotheses.
* Apply the Central Limit Theorem.
* Graph and interpret a binomial probability distribution.
* Graph and interpret normal distributions.

## Three-Dimensional Figures

Students will:

- Draw common 3-dimensional shapes. (9-2, 9-3, 9-4, 9-5)
- Draw plane sections of common 3-dimensional shapes. (9-5)
- Give views of a figure from the top, sides, or front. (9-7)
- Given appropriate lengths, calculate areas and lengths in 3-dimensional figures. (9-3, 9-4, 9-5)
- From 2-dimensional views of a figure, determine the 3-dimensional figure. (9-7)
- Apply the properties of planes. (9-1, 9-2)
- Determine symmetry planes in 3-dimensional figures. (9-6)
- Recognize 3-dimensional figures in the real world. (9-3, 9-4, 9-5)
- Apply the Four-Color Theorem to maps. (9-9)
- Make a surface from a net and vice versa. (9-8)
- I• nterpret maps of the world. (9-9)

## Surface Areas and Volumes

Students will:

- Calculate cube roots. (10-3)
- Develop formulas for specific figures from more general formulas. (10-6)
- Know the conditions under which Cavalieri's Principle can be applied. (10-5)
- Represent products of two (or three) numbers or expressions as areas of rectangles (or volumes of boxes), and vice versa. (10-4) • Calculate cube roots. (10-3)

## Indirect and Coordinate Proofs

Students will:

- Apply the Midpoint Connector Theorem. (11-8)
- Follow the basic laws of reasoning to make

## Quadratic Relations

Students will:
- Rewrite an equation for a conic section in the general form of a quadratic equation in two variables.
- Write equations or inequalities for quadratic relations given sufficient conditions.
- Find the area of an ellipse.
- Solve systems of one linear and one quadratic equation or two quadratic equations by substitution or linear combination.
- Find points on a conic section using the definition of a conic.
- Identify characteristics of parabolas, circles, ellipses, and hyperbolas.
- Classify curves as circles, ellipses, parabolas, or hyperbolas using algebraic or geometric properties.
- Use circles, ellipses, and hyperbolas to solve real-world problems.
- Use systems of quadratic equations to solve real-world problems.
- Graph quadratic relations given sentences from them, and vice versa.
- Solve systems of quadratic equations graphically.

conclusions. (11-1, 11-2, 11-3, 11-4)

• Write the converse, inverse, or contrapositive of a conditional. (11-2)

• Write indirect proofs. (11-4, 11-5, 11-6)

• Use coordinate geometry to deduce properties of figures and prove theorems. (11-5, 11-6, 11-8

• Apply laws of reasoning in real situations. (11-1, 11-2, 11-3, 11-4)

• Graph and write an equation for a circle or a sphere given its center and radius, and vice versa. (11-7, 11-9)

• Give convenient locations for triangles and quadrilaterals in the coordinate plane. (11-5)

## Similarity

Students will:

• Draw size transformation images of figures. (12-2, 12-3)

• Identify and determine proportional lengths and distances in real situations. (12-4, 12-5)

• Apply the Fundamental Theorem of Similarity in real situations. (12-6, 12-7)

• Perform and analyze size transformations on figures in the coordinate plane. (12-1)

## Similar Triangles and Trigonometry

Students will:

• Find lengths in figures by applying the Side-Splitting Theorem and the Side-Splitting Converse Theorem. (13-3)

• Calculate lengths of sides in isosceles right triangles and in 30-60-90 triangles. (13-5)

• Determine whether of not triangles are similar using the AA, SAS, or SSS Similarity Theorems.

• Use the Triangle Similarity and Side-Splitting Theorems to find lengths and distances in real situations. (13-2, 13-3)

## Further Work with Circles

Students will:

• Calculate lengths of chords and arcs.
• Calculate measures of angles between chords, secants, or tangents from measures of intercepted arcs, and vice versa.
• Locate the center of a circle given sufficient information.
• Apply the Secant Length Theorem and the Tangent Square Theorem.
• Make deductions from properties of radii, chords, and tangents, and know sufficient conditions for radii to be perpendicular to them.
• Make deductions from properties of angles formed by chords, tangents, or secants.
• Apply the Isoperimetric Theorems and the Isoperimetric Inequality to determine which figures have the greatest or least area, perimeter, or volume.
• Given the angle width of a lens and the width of an object, determine the set of points from which the object just fits in the picture.
• Determine the maximum distance that can be seen from a particular elevation.
• Apply the Isoperimetric Theorems and the Isoperimetric Inequality in real situations.