

Ledyard Public Schools

Geometry Curriculum



Course Description

This course incorporates CT Core Standards from Geometry, Algebra, and Statistics. The blend of topics from geometry provide ample opportunities for students to practice modeling with algebraic equations and working with figures on the coordinate plane. Units of study including Ratio/Proportion, Trigonometry and Introductory Statistics also provide students with fundamental skills necessary for cross-discipline problem solving.

Geometry topics include: Foundational elements of Euclidean geometry, triangles, transformations, circles, and volume.

Introductory Statistics topics include: measures of center and spread, data displays, normal model, theoretical probability, and contingency tables.

Real-life applications and problem-solving skills are integrated throughout the course.

Topic pacing and instructional depth may be adjusted to accommodate the learning needs of level 1 and level 2 students.

UNIT 1: Foundations		Pacing: 18 Blocks
Description	This unit presents the foundational concepts and skills upon which the course is built. Each unit of study incorporates communication through vocabulary, notation & symbols and diagram markings, in addition to deductive reasoning and algebra application.	
Essential Questions	<ol style="list-style-type: none"> 1. What is deductive reasoning and how is it used to understand relationships in geometry? 2. How do we communicate our geometric ideas to one another? 3. How can we use geometry to illustrate algebraic concepts? 4. How can we use algebra to confirm geometric concepts? 	
Learning Targets	<p><u>Topic 1 - Language of Geometry</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Interpret undefined terms and postulates <input type="checkbox"/> Communicate about geometric terms and relationships using appropriate symbols, notations, and diagram markings <p><u>Topic 2 - Coordinate Geometry</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Investigate collinear and non-collinear points using coordinate geometry <input type="checkbox"/> Verify that intersecting lines intersect in exactly one point. <input type="checkbox"/> Prove lines parallel or perpendicular using slope relationships <input type="checkbox"/> Interpret and apply the distance and midpoint formulas <p><u>Topic 3 - Modeling with Algebra</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Interpret and apply midpoint and segment bisector definitions <input type="checkbox"/> Interpret and apply segment and angle addition postulates <input type="checkbox"/> Interpret and apply segment and angle congruence definitions <input type="checkbox"/> Interpret and apply definitions of angle pairs: linear pair, vertical, complementary, supplementary <input type="checkbox"/> Investigate and apply angle relationships formed by parallel lines and a transversal 	
Vocabulary	Word Bank	
Suggested Learning Activities	<p><u>SAT Released Practice Questions</u></p> <p><u>Algebra Skills Practice</u></p> <p>Students practice solving linear systems by graphing, substitution and elimination methods. Materials may include: Algebra with Pizzazz, Khan Academy, Desmos, Teachers Pay Teachers, etc.</p>	
Technology Enhancements	TI-84 graphing calculator and Desmos for visual representation of geometric relations on the coordinate plane.	
Assessments	Section Quizzes, Summative Unit Test	
Alignments	Textbook	PH Geometry
	CCS	G-CO.1 , G-CO.9 , G-CO.11

UNIT 2: Triangles

Pacing:
14 Blocks

Description	This unit begins with side length criteria for triangle formation and facts about the angles of a triangle, then advances to the side and angle relationships of polygons. Students use the triangle's angle/side relationships to solve problems using Pythagorean Theorem and Right Triangle Trigonometry.
Essential Questions	<ol style="list-style-type: none"> 1. How do we <i>really</i> know that the sum of any triangle's angles is 180 degrees? 2. How does our knowledge of the triangle angle sum help us understand angle relationships in other polygons? 3. How can we use the Pythagorean Theorem to solve problems in our everyday lives? 4. What is trigonometry and how can it be used in problem-solving?
Learning Targets	<p><u>Topic 1 - Angles of Triangles & Polygons</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Prove and apply the Triangle Angle Sum Theorem <input type="checkbox"/> Prove and apply the Exterior Angle Theorem <input type="checkbox"/> Discover and apply Polygon interior angle sum formula, $S = (n - 2) \cdot 180$ <p><u>Topic 2 - Triangle Formation & Inequality</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Discover basic triangle formation <input type="checkbox"/> Discover and apply Inequalities in Triangles <input type="checkbox"/> Discover and apply the Isosceles Triangle Theorem and its converse <p><u>Topic 3 - Pythagorean Theorem & Right Triangle Trigonometry</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Apply the Pythagorean Theorem and the Pythagorean Theorem Converse <input type="checkbox"/> Apply Special Right Triangle side relationships <input type="checkbox"/> Apply Trigonometric ratios (sin, cos, tan)
Vocabulary	Word Bank
Suggested Learning Activities	<p><u>SAT Released Practice Questions</u></p> <p><u>Deductive Proof:</u></p> <ul style="list-style-type: none"> • Using two parallel lines cut by a transversal, students discover that the interior angle sum of a triangle equals 180 degrees. • An exterior angle of a triangle equals the sum of its two remote interior angles. <p><u>Investigation:</u></p> <p>Students engage in a polygon cut-out activity to discover the sum of the exterior angles of any convex polygon = 360 degrees. (pentagon, hexagon, octagon)</p> <p><u>Outdoor Activities:</u></p> <ul style="list-style-type: none"> • Students use their knowledge of right triangle side and angle relationships to determine the angle of elevation of ramps to the school building. Check for compliance with ADA guidelines. • Students use an angle measuring device (clinometer) and other measurement tools to determine the height of the flagpole using trigonometry. (height of the bleachers, top of the goal posts, etc.) <p><u>CSDE:</u> triangle investigation, special rights discovery investigation</p>
Technology Enhancements	Use a scientific or graphing calculator to evaluate trig solutions

	Use Desmos and Khan Academy activities for enrichment	
Assessments	Section Quizzes, Summative Unit Test	
Alignments	Textbook	PH Geometry
	CCS	G-SRT.8 , F-TF.7

UNIT 3: Transformations

Pacing:
14 Blocks

Description	This unit focuses on isometric transformations including translations, reflections, and rotations. A student of non-isometric transformations, dilations, follows and includes a review of ratios and problem-solving with the cross product property of proportions.
Essential Questions	<ol style="list-style-type: none"> 1. What keeps a figure from losing its shape when it is enlarged or reduced in size? 2. How can multiplying a figure by a scale factor result in the figure becoming smaller in size?
Learning Targets	<p><u>Topic 1 - Congruence</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Definition of congruence <input type="checkbox"/> Notation for congruent figures <input type="checkbox"/> Diagram markings and statements of congruence <p><u>Topic 2 - Transformations (isometries)</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Translations - arrow notation and vectors <input type="checkbox"/> Reflections and glide-reflections <input type="checkbox"/> Reflection Rules on the xy-coordinate plane (axes reflections, $y = x$, $y = -x$) <input type="checkbox"/> Rotations <input type="checkbox"/> Write rules for isometries graphed on the coordinate plane <p><u>Topic 3 - Transformations of function families</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Given the equation of a function written in graphing form, graph a function as a transformation of its parent on the coordinate plane (families include: linear in point-slope, absolute value, and quadratic) <input type="checkbox"/> Given the graph of a function, write its equation in graphing form. <p><u>Topic 4 - Dilations (non-isometries)</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Enlargements and Reductions given a center and scale factor <input type="checkbox"/> Similar Figures <input type="checkbox"/> Solve for missing side lengths and angle measures (proportions) <input type="checkbox"/> Percent increase/decrease of dilated figures
Vocabulary	Word Bank
Suggested Learning Activities	<p><u>SAT Released Practice Questions</u></p> <p><u>Investigation</u>: Use patty paper activities to investigate congruence of transformations - translation, reflection, rotation</p> <p><u>Creative</u>: Students create an enlargement of a photo using angle congruence and proportionality.</p> <p><u>CSDE</u>: transformation investigations and dilation & similarity investigations</p>
Technology Enhancements	Use Desmos and Khan Academy activities for enrichment
Assessments	Section Quizzes, Summative Unit Test

Alignments	Textbook	PH Geometry
	CCS	G-SRT.8 , F-TF.7

UNIT 4: Volume

**Pacing:
14 Blocks**

Description	This unit focuses on the dimensions of 3-D figures, base area, and volume. Students use appropriate units of measure to communicate their full understanding of solutions to applied problems.
Essential Questions	<ol style="list-style-type: none"> How does the shape of a 3-D object impact its volume? Why is it important to include units of measure on diagrams and solutions to linear, area, and volume applications?
Suggested Learning Activities	<p><u>Topic 1 - Units of Measure and Area</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Review units of measure of linear, area and volume (cm, cm², cm³) <input type="checkbox"/> Use dimensional analysis for unit conversion. <input type="checkbox"/> Review area formulas for common 2D figures (square, rectangle, triangle, trapezoid, circle) <p><u>Topic 2 - Volume of Prisms & Cylinders</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Volume is a 3D measurement that builds from the 2nd dimension, base area x height. ($V = Bh$) <input type="checkbox"/> Find Volume - express with appropriate units of measure <input type="checkbox"/> Find a missing dimension, given volume. <input type="checkbox"/> Find volume of composite figures (add/subtract volumes) <p><u>Topic 3 - Volume of Pyramids & Cones</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Volume is one-third the volume of a prism/cylinder with the same base area and height. ($V = \frac{1}{3}Bh$) <input type="checkbox"/> Find Volume given dimensions for the base area and height or slant height. <input type="checkbox"/> Find a missing dimension, given volume. <input type="checkbox"/> Find volume of composite figures (add/subtract volumes) <p><u>Topic 4 - Volume of Sphere & Hemisphere</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Find Volume given radius or diameter ($V = \frac{4}{3}\pi r^3$) <input type="checkbox"/> Find radius/diameter given volume <input type="checkbox"/> Find volume of composite figures (add/subtract volumes) <p><u>SAT Released Practice Questions</u></p> <p><u>Algebra:</u> Review/apply skills of gcf, difference of squares and trinomial factoring.</p> <ul style="list-style-type: none"> • Given an algebraic expression for the dimensions of a 3D solid, write an expression for its volume. • Given an algebraic expression for the volume of a prism, factor to write expressions for its dimensions. <p><u>Application:</u> Calculate the volumes of a variety of containers by measuring and recording dimensions, then applying appropriate volume formulas. Create games/competitions involving estimation of volume, then use calculating skills to check accuracy.</p>
Vocabulary	Word Bank

	<p><u>Application:</u> Compare the unit pricing of items with volumes expressed with different units of measure. Use dimensional analysis to change units of measure, so unit pricing is comparable. Compare both liquid volume measures (bottles, cans, cylinders - liters vs quarts) and rigid measurements (rectangular boxes, cubes, prisms - cubic cm vs cubic inches)</p> <p><u>CDSE:</u> Cavalieri's Principle & Volume investigations</p>	
Technology Enhancements	Use Desmos and Khan Academy activities for enrichment	
Assessments	Section Quizzes, Summative Unit Test	
Alignments	Textbook	PH Geometry
	CCS	G-GMD

UNIT 5: Circles

Pacing:
14 Blocks

Description	In this unit students build on basic knowledge of area and circumference to learn about sector area, arc length, radian measure, theorems involving tangents & chords of circles, and circles on the coordinate plane.
Essential Questions	<ol style="list-style-type: none"> What is radian measure and when is it used instead of the more common degree measure? How are translation rules for functions applied to circles?
Learning Targets	<p><u>Topic 1 - Tangents to a circle</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Tangent relationship to a radius whose endpoint is the point of tangency <input type="checkbox"/> Tangents drawn from a common point outside of the circle to the same circle <p><u>Topic 2 - Sector Area and Arc Length (degree measure)</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Area of a sector is part of its whole area: $A = \frac{n^\circ}{360^\circ} \pi r^2$ <input type="checkbox"/> Arc length is part of its whole circumference: $C = \frac{n^\circ}{360^\circ} 2\pi r$ <p><u>Topic 3 - Radian measure</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Radian definition <input type="checkbox"/> Convert radians to degrees and degrees to radians (dimensional analysis, $\pi = 180^\circ$) <input type="checkbox"/> Sector Area - derive formula: $A = \frac{1}{2} \theta r^2$ <input type="checkbox"/> Arc Length - derive formula: $s = r\theta$ <p><u>Topic 4 - Chords</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Chord and Arc relationships <input type="checkbox"/> Congruent chords <input type="checkbox"/> Chords equidistant from the circle's center <p><u>Topic 5 - Central Angles & Inscribed Angles</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Angle and Arc relationships <input type="checkbox"/> Inscribed triangles <input type="checkbox"/> Inscribed quadrilaterals <p><u>Topic 6 - Circles on the Coordinate Plane</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Derive the equation using the Pythagorean Theorem or the Distance Formula $(x - h)^2 + (y - k)^2 = r^2$ <input type="checkbox"/> Write an equation using a centerpoint and radius/diameter measure <input type="checkbox"/> Graph a circle given its equation written in translation form
Vocabulary	Word Bank
Suggested Learning Activities	<p><u>SAT Released Practice Questions</u></p> <p><u>Investigation:</u> Students use string and various size circles to determine that 3+ radii equals a half circle and 6+ radii equals a full circle. Use discovery to define radian measure, $\pi = 180^\circ$.</p>

	<p>TPT free activity: inscribed angles</p> <p>Desmos activity: chords</p> <p>CSDE: circle investigations</p>	
Technology Enhancements	Use Desmos and Khan Academy activities for enrichment	
Assessments	Section Quizzes, Summative Unit Test	
Alignments	Textbook	PH Geometry
	CCS	HSG-C

UNIT 6: Statistics

Pacing:
14 Blocks

Description	In this unit students are introduced to the basics of probability and statistics ~ shape, center & spread of data, the fundamental counting principle, and conditional probability.	
Essential Questions	<ol style="list-style-type: none"> 1. How is probability used to predict actions or outcomes of larger populations? 2. How can our understanding measures of center and data displays make us better consumers? 3. How is it possible to compare apples to oranges? 	
Learning Targets	<p><u>Topic 1 - Data organization and display</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Frequency tables & Histograms <input type="checkbox"/> Stem and leaf & Dot plot <p><u>Topic 2 - Measures of Center & Spread</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Mean, Median, Mode <input type="checkbox"/> Range <input type="checkbox"/> Skewed data & Effect on Mean <p><u>Topic 3 - Median</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Five-Number Summary <input type="checkbox"/> Box Plots <input type="checkbox"/> Parallel boxplots <input type="checkbox"/> Boxplot - Histogram Analysis <p><u>Topic 4 - Normal Distribution</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Mean and Standard Deviation <input type="checkbox"/> 68-95-99.7 Rule <input type="checkbox"/> Z-scores (measure standings) <p><u>Topic 5 - Probability</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Probability (simple and multiple event) <input type="checkbox"/> Two-Way Tables (probability based on sample set) <input type="checkbox"/> Fundamental Counting Principle <input type="checkbox"/> Permutations & Combinations 	
Vocabulary	Word Bank	
Suggested Learning Activities	<p><u>SAT Released Practice Questions</u></p> <p>CSDE: Probability investigations</p>	
Technology Enhancements	<p>TI-84+ Graphing Calculator - Graph histograms & boxplots; Use Statistics feature to compute permutations and combinations</p> <p>Use Desmos and Khan Academy activities for enrichment</p>	
Assessments	Section Quizzes, Summative Unit Test	
Alignments	Textbook	Stats in Your World by Brock, Mariano
	CCS	HSS-ID , HSS-CP