High School Geometry

The Mathematics Curriculum Framework represents the commitment of the Hinsdale School District to the Common Core State Standards and the ideas of Grant Wiggins and Jay McTighe in their principles of *Understanding by Design.* The Mathematics Curriculum Revision Committee (2015-16) believes that this document provides the necessary framework for teachers to develop mathematical units and lessons based on best practices in curriculum, instruction and assessment.

The Common Core State Standards for Mathematics requires that students develop a conceptual understanding of key concepts, procedural skills and fluency and the ability to use their knowledge to solve real world problems. Teachers are expected to develop lessons that meet these requirements by using a variety of instructional techniques and resources to meet individual student needs.

More information about the Common Core State Standards can be found at:

www.corestandards.org

High School - Geometry

Standard G-CO: Congruence

Experiment with transformations in the plane.
Understand congruence in terms of rigid motions.
Prove geometric theorems.
Make geometric constructions.

21st Century Learning Expectations

Hinsdale students will take responsibility for their own learning.
Hinsdale students will demonstrate responsibility for their actions and choices.
Hinsdale students will be able to solve problems.

Enduring Understandings:

Everything is built from points, lines and planes and follows strict and organized rules.
By applying transformations and using symmetry mathematical situations can be analyzed.
Geometry allows measurement of things that can't be measured easily using traditional methods.

Learning Competencies	Essential Questions
Students will be able to • state and apply definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. • apply and develop definitions of geometric transformations. • transform figures using rigid motions to determine congruence. • understand the definition of congruence. • prove theorems about lines, angles, parallelograms and triangles. • make formal geometric constructions with a variety of tools and methods.	• What information is needed in order to prove that triangles are congruent? • How would knowing the properties of special segments of triangles help you apply them to more complex figures? • How do non-rigid structures occur in real life problems?

High School - Geometry

Standard G-SRT: Similarity, Right Triangles, & Trigonometry

Understand similarity in terms of similarity transformations.
Prove theorems involving similarity.
Define trigonometric ratios and solve problems involving right triangles.
Apply trigonometry to general triangles.

21st Century Learning Expectations

Hinsdale students will take responsibility for their own learning.
Hinsdale students will demonstrate responsibility for their actions and choices.
Hinsdale students will be able to solve problems.

Enduring Understandings:

There are many applications of algebra in geometry.
Studying triangles helps us to better understand the world around us.
Any objects can be broken down and analyzed in terms of its two dimensional parts.

Learning Competencies	Essential Questions
Students will be able to • verify experimentally the properties of dilations given by a center and a scale factor and develop a definition of similarity. • use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. • prove theorems about triangles. • use similarity theorems to prove congruency and similarity of figures. • show the relationships of side ratios are the same using corresponding angles of similar right triangles. • apply both trigonometric ratios and the Pythagorean Theorem to solve application problems involving right triangles. • derive the formula $A = 1/2\ ab \sin(C)$ • prove and use the Laws of Sines and Cosines to solve problems. • understand and apply the Law of Sines Cosines to find unknown measurements in triangles.	• How does knowing the properties of similarity transformations assist in understanding triangles? • How can you use dilations to create perspective drawings? • How can geometric properties of triangles be used in real world applications?

High School - Geometry

Standard G-C: Circles

Understand and apply theorems about circles

21st Century Learning Expectations

Hinsdale students will take responsibility for their own learning.
Hinsdale students will demonstrate responsibility for their actions and choices.
Hinsdale students will be able to solve problems.

Enduring Understandings:

Geometric properties can be used to construct geometric figures.
All circles are similar.
Geometric ideas can be communicated using a variety of representations.

Learning Competencies	Essential Questions
Students will be able to • prove that all circles are similar. • identify and describe relationships among inscribed angles, radii, and chords. • construct the inscribed and circumscribed circles of a triangle. • prove properties of angles for a quadrilateral inscribed in a circle. • construct a tangent line from a point outside a given circle to the circle. • use similarity to understand that the length of the arc intercepted by an angle is proportional to the radius. • determine the arc length, derive the formula for area of a sector and find the area of a sector in a circle.	• How do you identify characteristics of circles from equations? • How are angles and intercepted arcs of circles related and applied? • How can you use the arcs and intersecting lines on and within a circle to determine the measurements of arcs, segments, and areas of sectors of the circle?

High School - Geometry

Standard G-GPE: Expressing Geometric Properties with Equations

Translate between the geometric description and the equation for a conic section.
Use coordinates to prove simple geometric theorems algebraically.

21st Century Learning Expectations

Hinsdale students will take responsibility for their own learning.
Hinsdale students will demonstrate responsibility for their actions and choices.
Hinsdale students will be able to solve problems.

Enduring Understandings:

Studying geometry involves learning the basic parts of geometry.
Geometric ideas can be communicated using a variety of representations.

Learning Competencies	Essential Questions
Students will be able to • derive the equation of a circle given the center and radius using the Pythagorean Theorem, and conversely, given an equation of a circle, complete the square to find the center and radius of a circle. • determine the equation of a parabola given a focus and directrix. • find the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. • use coordinates to prove simple geometric theorems algebraically • prove the slope criteria for parallel or perpendicular lines and use them to solve geometric problems. • find the point on the line segment between two given points that divides the segment into a given ratio. • use coordinate geometry and the distance formula to find the perimeters of polygons and the areas of triangles and rectangles.	• How are geometric properties used to help solve real world issues? • How do properties of parallel and perpendicular lines help you understand the world around you? • How do geometric properties relate to algebra?

High School - Geometry

Standard G-GMD: Geometric Measurement & Dimension

Explain volume formulas and use them to solve problems.

Visualize relationships between two-dimensional and three-dimensional objects.

21st Century Learning Expectations

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Hinsdale students will demonstrate responsibility for their actions and choices.

Hinsdale students will be able to solve problems.

Enduring Understandings:

Geometry helps us to understand the structure of space and the spatial relations around us.

Mathematical arguments concerning geometric relationships can be developed through geometry.

Learning Competencies	Essential Questions
Students will be able to • explain the formulas for the circumference and area of a circle and the volume of a cylinder, cone or pyramid by determining the meaning of each term or factor. • use Cavalieri's Principle to provide informal arguments to develop the formulas for the volume of spheres and other solid figures. • solve problems using volume formulas for cylinders, pyramids, cones, and spheres. • identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	• Why are geometry and geometric figures relevant and important? • How can geometry be used to solve problems about real world situations, spatial relationships, and logical reasoning?

High School - Geometry

Standard G-MG: Modeling with Geometry

Apply geometric concepts in modeling situations

21st Century Learning Expectations

Hinsdale students will take responsibility for their own learning.
Hinsdale students will demonstrate responsibility for their actions and choices.
Hinsdale students will be able to solve problems.

Enduring Understandings:

Real world objects can be described using a variety of characteristics.

Learning Competencies	Essential Questions
Students will be able to • use geometric shapes, their measures, and their properties to describe objects. • apply concepts of density based on area and volume in modeling situations. • solve design problems by designing an object or structure that satisfies certain constraints, such as minimizing cost or working with a grid system based on ratios.	• Why are geometry and geometric figures relevant and important? • Describe real world objects in geometric terms. • How can using geometry enhance design of real life structures?