The mission of the Chardon Local Schools is high achievement for all students where learning is our most important work.

Course of Study — MATH

Revised November 2021

GEOMETRY

CHARDON
LOCAL SCHOOLS
#WeAreChardon

Course of Study — MATH — *Revised November 2021*

Geometry

CONGRUENCE

Strand: Experiment with transformations in the plane.

Learning Standard:

G.CO.1 Know precise definitions of ray, angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and arc length.
G.CO.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not, e.g., translation versus horizontal stretch.
G.CO.3 Identify the symmetries of a figure, which are the rotations and reflections that carry it onto itself. a. Identify figures that have line symmetry; draw and use lines of symmetry to analyze properties of shapes. b. Identify figures that have rotational symmetry; determine the angle of rotation, and use rotational symmetry to analyze properties of shapes. **G.CO.4** Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
G.CO.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using items such as graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

How Taught?
Teaching activities may include, but are not limited to:

- Direct Instruction
- Cooperative Groups
- Stations
- Data Driven Instruction
- Scaffolding

Materials:

- Calculator (Desmos, TI-30X IIS)
- Guided Notes
- Board Adopted Materials

How Assessed?
Assessments may include, but are not limited to:

- Pre-Assessments (pre-tests, observation, anticipation guide, questioning, diagnostics)
- Formative Assessments (entry/exit slips, group work, reflections, discussions, homework/classwork, self and peer evaluations, observations, conferences, rubrics)
- Summative Assessments (tests/exams, projects, creative assignments, presentations)

How Re-Taught?
Re-teaching activities may include, but are not limited to:

- breaking down concept into smaller components
- presenting the information again in a different way
- Universal Design for Learning principles offering students opportunities to experience and engage material in new and different way

	• practice activities such as computer tutorials, games, hands-on activities • review sessions

Course of Study — MATH — *Revised November 2021*

Geometry

CONGRUENCE

Strand: Understand congruence in terms of rigid motions.

Learning Standard:

G.CO.6 Use geometric descriptions of rigid motionsG to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruentG.
G.CO.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
G.CO.8 Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

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Geometry

CONGRUENCE

Strand: Prove geometric theorems both formally and informally using a variety of methods.

Learning Standard:

G.CO.9 Prove and apply theorems about lines and angles. Theorems include but are not restricted to the following: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
G.CO.10 Prove and apply theorems about triangles. Theorems include but are not restricted to the following: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. **G.CO.11** Prove and apply theorems about parallelograms. Theorems include but are not restricted to the following: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

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Geometry

CONGRUENCE

Strand: Make geometric constructions.

Learning Standard:

G.CO.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
G.CO.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

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Geometry

CONGRUENCE

Strand: Classify and analyze geometric figures.

Learning Standard:

G.CO.14 Classify two-dimensional figures in a hierarchy based on properties.

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Geometry

SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY

Strand: Understand similarity in terms of similarity transformations.

Learning Standard:

G.SRT.1 Verify experimentally the properties of dilationsG given by a center and a scale factor: a. A dilation takes a line not passing through the center of the dilation to a parallel line and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
G.SRT.2 Given two figures, use the definition of similarity in terms of similarity transformationsG to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

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Geometry

SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY

Strand: Prove and apply theorems both formally and informally involving similarity using a variety of methods.

Learning Standard:

G.SRT.4 Prove and apply theorems about triangles. Theorems include but are not restricted to the following: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and to justify relationships in geometric figures that can be decomposed into triangles.

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Geometry

SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY

Strand: Define trigonometric ratios, and solve problems involving right triangles.

Learning Standard:

G.SRT.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
G.SRT.7 Explain and use the relationship between the sine and cosine of complementary angles.
G.SRT.8 Solve problems involving right triangles.★ a. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems if one of the two acute angles and a side length is given. (G, M2)

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Geometry

CIRCLES

Strand: Understand and apply theorems about circles.

Learning Standard:

G.C.1 Prove that all circles are similar using transformational arguments.
G.C.2 Identify and describe relationships among angles, radii, chords, tangents, and arcs and use them to solve problems. Include the relationship between central, inscribed, and circumscribed angles and their intercepted arcs; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
G.C.3 Construct the inscribed and circumscribed circles of a triangle; prove and apply the property that opposite angles are supplementary for a quadrilateral inscribed in a circle. (+)
G.C.4 Construct a tangent line from a point outside a given circle to the circle.

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Geometry

CIRCLES

Strand: Find arc lengths and areas of sectors of circles.

Learning Standard:

G.C.5 Find arc lengths and areas of sectors of circles. a. Apply similarity to relate the length of an arc intercepted by a central angle to the radius. Use the relationship to solve problems. (G, M2) b. Derive the formula for the area of a sector, and use it to solve problems. (G, M2)

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Geometry

EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS

Strand: Translate between the geometric description and the equation for a conic section.

Learning Standard:

G.GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

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Geometry

GEOMETRIC MEASUREMENT AND DIMENSION

Strand: Explain volume formulas, and use them to solve problems.

Learning Standard:

G.GMD.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, and volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.
G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.★

How Taught?
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Geometry

GEOMETRIC MEASUREMENT AND DIMENSION

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

Learning Standard:

G.GMD.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

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Geometry

GEOMETRIC MEASUREMENT AND DIMENSION

Strand: Understand the relationships between lengths, areas, and volumes.

Learning Standard:

G.GMD.5 Understand how and when changes to the measures of a figure (lengths or angles) result in similar and non-similar figures.
G.GMD.6 When figures are similar, understand and apply the fact that when a figure is scaled by a factor of k, the effect on lengths, areas, and volumes is that they are multiplied by k, k2, and k3, respectively.

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Geometry

MODELING WITH GEOMETRY

Strand: Apply geometric concepts in modeling situations.

Learning Standard:

G.MG.1 Use geometric shapes, their measures, and their properties to describe objects, e.g., modeling a tree trunk or a human torso as a cylinder.★
G.MG.2 Apply concepts of density based on area and volume in modeling situations, e.g., persons per square mile, BTUs per cubic foot.★
G.MG.3 Apply geometric methods to solve design problems, e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios.★

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Geometry

CONDITIONAL PROBABILITY AND THE RULES OF PROBABILITY

Strand: Understand independence and conditional probability, and use them to interpret data.

Learning Standard:

S.CP.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").★
S.CP.2 Understand that two events A and B are independent if and only if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.★
S.CP.3 Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.★
S.CP.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.★
S.CP.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.★

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Geometry

CONDITIONAL PROBABILITY AND THE RULES OF PROBABILITY

Strand: Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Learning Standard:

S.CP.6 Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.★
S.CP.7 Apply the Addition Rule, P(A or B) = P(A) + P(B) − P(A and B), and interpret the answer in terms of the model.★ (+) **S.CP.8** Apply the general Multiplication Rule in a uniform probability modelG, P(A and B) = P(A)·P(B|A) = P(B)·P(A|B), and interpret the answer in terms of the model.★ (G, M2) (+) **S.CP.9** Use permutations and combinations to compute probabilities of compound events and solve problems.★ (G, M2)

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