Course Title:	**Geometry**
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Cycle/Division:	High School
Grade Level:	**9 or 10**
Credit Unit:	1
Duration:	one year
Course Prerequisites:	Grade 8 Math

Department's Vision:	• Produce the highest standards of excellence in teaching mathematics to prepare students to flourish and fulfill personal ambitions and career goals in an increasingly technological society.
Department's Mission:	• Develop students' abilities to become mathematical thinkers, lifelong learners, and link learning to life through problem solving and utilizing the high-tech resources.

COURSE DESCRIPTION:

Unit 2: Lines, Angles, and Triangles
Properties of Triangles
Special Segments in Triangles
Unit 3: Quadrilaterals and Coordinate Proof
Properties of Quadrilaterals
Coordinate Proof Using Slope and Distance
Unit 4: Similarity
Similarity and Transformations
Using Similar Triangles
Unit 5: Trigonometry
Trigonometry with Right Triangles
Trigonometry with All Triangles
Unit 6: Properties of Circles
Angles and Segments in Circles
Arc Length and Sector Area

Equations of Circles and Parabolas
Unit 7: Measurement and Modeling in Two and Three Dimensions
Volume Formulas: Visualizing Solids
Modeling and Problem Solving
Unit 8: Probability
Introduction to Probability
Conditional Probability and
Independence of Events
Probability and Decision Making

GENERAL COURSE LEARNING OBJECTIVES:

- Experiment with transformations in the plane
- Understand congruence in terms of rigid motions
- Prove geometric theorems
- 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
- Understand and apply theorems about circles
- Find arc lengths and areas of sectors of circles
- Translate between the geometric description and the equation for iconic section
- Explain volume formulas and use them to solve problems
- Visualize relationships between two-dimensional and three dimensional objects
- Apply geometric concepts in modeling situations
- Understand independence and conditional probability and use them to interpret data
- Use the rules of probability to compute probabilities of compound events in a uniform probability model.

I.

STANDARDS/BENCHMARKS:

❖ Congruence G-CO

Experiment with transformations in the plane

1. Know precise 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.

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).
3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Understand congruence in terms of rigid motions

6. Use geometric descriptions of rigid motions 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 congruent.
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.
8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Prove geometric theorems

9. Prove theorems about lines and angles. Theorems include: 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.
10. Prove theorems about triangles. Theorems include: 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.
11. Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

Make geometric constructions

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.
13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

- ❖ Similarity, Right Triangles, and Trigonometry G-SRT

Understand similarity in terms of similarity transformations
1. Verify experimentally the properties of dilations 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.
2. Given two figures, use the definition of similarity in terms of similarity transformations 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.
3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
Prove theorems involving similarity
4. Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
Define trigonometric ratios and solve problems involving right Triangles
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.
7. Explain and use the relationship between the sine and cosine of complementary angles.
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.★
Apply trigonometry to general triangles
9. (+) Derive the formula A = 1/2 ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.
11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g.,

surveying problems, resultant forces).

- Circles G-C

Understand and apply theorems about circles

1. Prove that all circles are similar.
2. Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
4. (+) Construct a tangent line from a point outside a given circle to the circle.

Common Core State Standards for MAT HEMAT ICS
high school — geometry | 78

Find arc lengths and areas of sectors of circles

5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

- Expressing Geometric Properties with Equations G-GPE

Translate between the geometric description and the equation for a conic section

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.
2. Derive the equation of a parabola given a focus and directrix.
3. (+) Derive 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

4. Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).
5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Geometric Measurement and Dimension G-GMD
Explain volume formulas and use them to solve problems
1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.
2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
Visualize relationships between two-dimensional and three dimensional objects
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.

- Modeling with Geometry G-MG

Apply geometric concepts in modeling situations
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).★
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).★
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).

- Conditional Probability and the Rules of Probability S-CP

Understand independence and conditional probability and use them to interpret data
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").
2. Understand that two events A and B are independent 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.
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.
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.

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.
Use the rules of probability to compute probabilities of compound events in a uniform probability model
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.
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.
8. (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.
9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.

II.

RESOURCES:

- ✓ Pencils, green pens, scissors, glue, geometry tool box, and Math folder with transparent pocket sheets.
- ✓ Holt Geometry and Algebra 2 text book.
- ✓ Online resources
- ✓ HMH attached resources CD'S (lesson tutorial videos, power point presentations, one stop planer,…..)
- ✓ Internet.
- ✓ E-games and links
- ✓ Teacher's Handouts

III.

COURSE OUTLINE:

Semester 1:

Chapter's #	Chapter	Lesson(s)
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Module 21	Introduction to probability. Probability	• 21.1 Probability and Set Theory • 21.2 Permutations and Probablility • 21.3 Combinations and Probability • 21.4 Mutually Exclusive and Overlapping Events
22	Conditional probability and independent events	• **22.1: Conditional Probability** • **22.2: Independent Events** • **22.3: Dependent Events** •
Module 7	Properties of triangles	• 7.1 Interior and exterior angles • 7.2 Isosceles and equilateral triangles • 7.3 Triangle inequality Using triagle inequality theorem
Module 8	Special Segments in Triangles	• 8.1 : Perpendicular Bisectors of Triangles • 8.2 : Angle Bisectors of Triangles • 8.3 : Medians and Altitudes of Triangles • 8.4 : Mid segments of Triangles
Module 9	Properties of Quadrilaterals	• 9.1 : Properties of Parallelograms • 9.2 : Conditions for Parallelograms • 9.3 : Properties of Rectangles, Rhombuses, and Squares • 9.4 : Conditions for Rectangles, Rhombuses, and Squares • 9.5 : Properties and Conditions for Kites and Trapezoids
Module 11	Similarity and Transformations	• 11.4 : AA Similarity of Triangles
Module 12	Using Similar Triangles	• 12.1 Triangle Proportionality Theorem • 12.2 Subdividing a Segment in a Given

		Ratio • 12.3 Using Proportional Relationships • 12.4 Similarity in Right Triangles

Semester 2:

Chapter's #	Chapter	Lesson(s)
Module 13	Trigonometry with right Triangles	• 13.1 Tangent Ratio • 13.2 Sine and Cosine Ratios • 13.3 Special Right Triangles • 13.4 Problem Solving with Trigonometry
Module 14	Trigonometry with all Triangles	• 14.1 Law of Sines • 14.2 Law of Cosines
Module 15	Angles and Segments in Circle	• 15.1 Central Angles and Inscribed Angles • 15.2 Angles in Inscribed Quadrilaterals • 15.3 Tangents and Circumscribed Angles • 15.4 Segments Relationships in Circles • 15.5 Angles Relationships in Circles
Module 16	Arc length and Sector Area	• 16.1 Justifying Circumference and Area of a Circle • 16.2 Arc Length and Radian Measure • 16.3 Sector Area
Module 17	Equations of circles and parabolas	• 17.1 Equation of a Circle • 17.2 Equation of a Parabola
Module 18	Volume Formulas	• 18.1 Volume of Prisms and Cylinder • 18.2 Volume of Pyramids • 18.3 Volume of Cones • 18.4 Volume of Spheres

Module 19	visualizing Solids	• 19.2 Surface Area of Prisms and Cylinders • 19.3 Surface Area of Pyramids and Cones • 19.4 Surface Area of Spheres
Module 20	Modeling and Problem Solving	• 20.1 Scale Factor • 20.2 Modeling and Density • 20.3 Problem Solving with Constraints

IV.

GRADING:

Grading Policy/ Assessment Tools:

- 1st The students will be provided with study guides or mock tests on the school website in the students portal, based on our curriculum manual, bench marks and objectives before every quiz, test, or exam.
- 2nd The students will be tested based on what they have practiced at home from the study guides or mock tests mentioned before.
- 3rd The evaluation will be based on what objectives did the students achieve, and in what objectives do they need help, through the detailed report that will be sent to the parents once during the semester and once again with the report card.
- Tests and quizzes will comprise the majority of the student's grade. There will be one major test given at the end of each chapter.
- Warm-up problems for review, textbook assignments, worksheets, etc. will comprise the majority of the daily work.
- Home Works and Assignments will provide students with the opportunity to practice the concepts explained in class and in the text.
- Students will apply the learned Math concepts in their daily lives through Sample Performance Indicators which will be prepared at home and done in class.
- Students will solve a higher-order thinking word problem on weekly basis (Problem of the Week).
- Students will keep a math notebook. In this notebook students will record responses to daily warm-up problems, lesson activities, post-lesson wrap-ups, review work, and daily textbook assignments.
- Class work is evaluated through participation, worksheets, class activities and group work done in the class.
- Passing mark 60 %

Grade Distribution:

Semester -1-		**Semester -2-**		**Final Exam**
Assessment	***Points/Weight***	***Assessment***	***Points/Weight***	
Class Work	15%	Class Work	15%	**Mid-Year / Final Exam 30%** **Total 100**
Homework	5%	Homework	5%	
Quizzes	30 %	Quizzes .	30 %	
Project Based Learning	10%	Project Based Learning	10%	
POP Quizzes	5 %	POP Quizzes	5 %	
MAP (Based on students results)	5%	MAP (Based on students results)	5%	

Cross-Curricular Project(s):

- ICT integration week
- Term projects-integrate Science with math (other subjects if applicable)