10TH GRADE - Geometry

MATH STANDARDS GUIDANCE

WI Math Standards

Domain: Congruence (G - CO)

CLUSTER	STANDARD	EXAMPLES
A. Experiment with transformations in the plane	M.G.CO.A.1 (F2Y) 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.	
	M.G.CO.A.2 (F2Y) 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).	
	M.G.CO.A.3 (F2Y) Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	
	M.G.CO.A.4 (F2Y) Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	
	M.G.CO.A.5 (F2Y) 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.	
B. Understand congruence in terms of rigid motion.	M.G.CO.B.6 (F2Y) 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.	
	M.G.CO.B.7 (F2Y) 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.	
	M.G.CO.B.8 (F2Y) Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.	
C. Prove geometric theorems.	M.G.CO.C.9 (F2Y) Prove theorems about lines and angles. Theorems should 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.	
	M.G.CO.C.10 (F2Y) Prove theorems about triangles. Theorems should 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 atriangle meet at a point.	
	M.G.CO.C.11 (F2Y) Prove theorems about parallelograms. Theorems should 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.	
D. Make geometric constructions.	M.G.CO.D.12 (F2Y) 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.	
	M.G.CO.D.13 (F2Y) Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	

Domain: Similarity, Right Triangles, and Trigonometry (G-SRT)

CLUSTER	STANDARD	EXAMPLES
A. Understand similarity in terms of similarity transformations	M.G.SRT.A.1 (F2Y) 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	
	M.G.SRT.A.2 (F2Y) 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.	
	M.G.SRT.A.3 (F2Y) Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	
	M.G.SRT.B.4 (F2Y) 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.	

B. Prove theorems involving similarity.	M.G.SRT.B.5 (F2Y) Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	
C. Define trigonometric ratios and solve problems involving right triangles. (M)	M.G.SRT.C.6 (F2Y) 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.	
	M.G.SRT.C.7 (F2Y) Explain and use the relationship between the sine and cosine of complementary angles.	
	M.G.SRT.C.8 (F2Y) Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems	
D. Apply trigonometry to general triangles.	M.G.SRT.D.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.	
	(+) Prove the Laws of Sines and Cosines and use them to solve problems.	
	(+) 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).	
Domain: Circles (G-C)		
CLUSTER	STANDARD	EXAMPLES
A. Understand and apply theorems about circles.	M.G.C.A.1 (F2Y) [WI.2010. G.C.A.2 and G.C.A.3] Identify and describe relationships among inscribed angles, radii, and chords. Prove properties of angles for a quadrilateral inscribed in a circle. 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.	
B. Find arc lengths and areas of sectors of circles.	M.G.C.B.2 (F2Y) [WI.2010. G.C.B.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.	
Domain: Expressing Geometric Properties (G-GPE)		
CLUSTER	STANDARD	EXAMPLES
A. Translate between the geometric description and the equation for a conic section.	M.G.GPE.A.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.	
	M.G.GPE.A.2 (+) Derive the equation of a parabola given a focus and directrix.	
	M.G.GPE.A.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.	
B. Use coordinates to prove simple geometric theorems algebraically.	M.G.GPE.B.4 (F2Y) 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).
	M.G.GPE.B.5 (F2Y) 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).	
	M.G.GPE.B.6 (F2Y) Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	

	M.G.GPE.B.7 (F2Y) Use coordinates to compute perimeters of polygons and areas of triangles and rectangles (e.g., using the distance formula).	
Domain: Geometric Measurement and Dimension (G-GMD)		
CLUSTER	STANDARD	EXAMPLES
A. Explain volume formulas and use them to solve problems. (M)	M.G.GMD.A. 1 (F2Y) Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.	
	M.G.GMD.A. 2 (F2Y) [WI.2010. G.GMC.A.3] Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	
B. Visualize relationships between twodimensional and three-dimensional objects.	M.G.GMD.B. 3 (F2Y) [WI.2010. G.GMD.4] Identify three-dimensional objects generated by rotations of two-dimensional objects.	
C. Apply geometric concepts in modeling situations. (M)	M.G.GMD.C. 4 (F2Y) [WI.2010. M.G.MG.A.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).	
	M.G.GMD.C. 5 (F2Y) [WI.2010. M.G.MG.A.2] Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	
	M.G.GMD.C. 6 (F2Y) [WI.2010. M.G.MG.A.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).	
Domain: Statistics and Probability (SP) Interpreting Categorical and Quantitative Data (S-ID)		
CLUSTER	STANDARD	EXAMPLES
B. Summarize, represent, and interpret data on two categorical and quantitative variables. (M)	M.SP.ID.B.5 (F2Y) Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies as examples of proportionality and disproportionality). Recognize possible associations and trends in the data.	
Domain: Statistics and Probability Conditional Probability and the Rules of Probability (S-CP)		
CLUSTER	STANDARD	EXAMPLES
A. Understand independence and conditional probability and use them to interpret data. (M)	M.SP.CP.A.1 (F2Y) 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").	
	M.SP.CP.A.2 (F2Y) 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.	
	M.SP.CP.A.3 (F2Y) 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.	
	M.SP.CP.A.4 (F2Y) Represent data from two categorical variables using two-way frequency tables or Venn diagrams. Interpret the representation when two categories are associated with each object being classified. Use the representation 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.

	M.SP.CP.A.5 (F2Y) 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.
B. Use the rules of probability to compute probabilities of compound events in a uniform probability model.	M.SP.CP.B.6 (F2Y) Use a representation such as a two-way table or Venn diagram to 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.	
	M.SP.CP.B.7 (F2Y) Use a representation such as a two-way table or Venn diagram to 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.	
	M.SP.CP.B.8 (+) Use a representation such as a tree diagram to 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.	
	M.SP.CP.B.9 (+) Use permutations and combinations to compute probabilities of compound events and solve problems.	
Domain: Quantities (N-Q)		
CLUSTER	STANDARD	EXAMPLES
A. Reason quantitatively and use units to solve problems. (M)	M.N.Q.A.1 (F2Y) Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	
	M.N.Q.A.2 (F2Y) Define appropriate quantities for the purpose of descriptive modeling.	
	M.N.Q.A.3 (F2Y) Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	
Domain: Seeing Structure in Expressions (A-SSE)		
CLUSTER	STANDARD	EXAMPLES
A. Interpret the structure of expressions. (M)	M.A.SSE.A.1 (F2Y) Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. For example, in the expression representing height of a projective, -16t^2+vt+c recognizing there are three terms in the expression, factors within some of the terms, and coefficients. Interpret within the context the meaning of the coefficient -16 as related to gravity, the factor of v as the initial velocity, and the c-term as initial height. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret the expression representing population growth P(1+r)n as the product of P and a factor not depending on P. Interpret the meaning of the P-factor as initial population and the other factor as being related to growth rate and a period of time.	
	M.A.SSE.A.2 (F2Y) Use the structure of an expression to identify ways to rewrite it.	For example, see x4-y4 as (x^2)^2-(y^2)^2, thus recognizing it as a difference of squares that can be factored as (x^2-y^2)(x^2+y^2)
CLUSTER	STANDARD	EXAMPLES
1	Make sense of problems and persevere in solving them.	
2	Reason abstractly and quantitatively.	
3	Construct viable arguments, and appreciate and critique the reasoning of others.	
4	Model with mathematics.	
5	Use appropriate tools strategically.	
6	Attend to precision.	
7	Look for and make use of structure.	
8	Look for and express regularity in repeated reasoning.	