



MOHAWK

Local School District

Preparing today's students for tomorrow's challenges

Mohawk Local Schools Geometry

Quarter 4 Curriculum Guide

Mathematical Practices

1. Make Sense of Problems and Persevere in Solving them
2. Reasoning Abstractly & Quantitatively
3. Construct Viable Arguments 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

Critical Areas of Focus Being Addressed:

- Congruence and Proof
- Modeling and Reasoning
- Probability
- Circles

Content Statements Addressed and Whether they are Knowledge, Reasoning, Performance Skill, or Product:
 (DOK1) (DOK2) (DOK3) (DOK4)

Underpinning Targets Corresponding with Standards and Whether they are Knowledge, Reasoning, Performance Skill, or Product: "I can.....", "Students Will Be Able To....."

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

- Explain the construction of geometric figures using a variety of tools and methods. (K)
- Apply the definitions, properties and theorems about line segments, rays and angles to support geometric

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. **(DOK3)** *Chapters 10-5*

G.C. 4 (+) Construct a tangent line from a point outside a given circle to the circle. **(DOK3)** *Chapters 10-5*

G.C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. **(DOK3)** *Chapters 10-5*

constructions. (R)

- Apply properties and theorems about parallel and perpendicular lines to support constructions. (R)
- Perform geometric constructions including: 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, using a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). (PS)
- Recall vocabulary: Tangent Radius Perpendicular bisector Midpoint (K)
- Identify the center of the circle
- Synthesize theorems that apply to circles and tangents, such as: (R)
- Tangents drawn from a common external point are congruent. (R)
- A radius is perpendicular to a tangent at the point of tangency. (R)
- Construct the perpendicular bisector of the line segment between the center C to the outside point P. (PS)
- Construct arcs on circle C from the midpoint Q, having length of CQ. (PS)
- Construct the tangent line. (PS)
- Define inscribed and circumscribed circles of a triangle. (K)
- Recall midpoint and bisector definitions. (K)

G.CO.13 Construct an equilateral triangle, a square and a regular hexagon inscribed in a circle. **(DOK4)** Chapters 10-5

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. **(DOK2)** Chapters 10-8

G.GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio. **(DOK2)** Chapters 10-8

- Define a point of concurrency. (K)
- Prove properties of angles for a quadrilateral inscribed in a circle. (R)
- Construct inscribed circles of a triangle Construct circumscribed circles of a triangle. (PS)

- Note: Underpinning performance, reasoning, and knowledge targets, if applicable, are addressed in G.CO.12 (K)
- Construct an equilateral triangle, a square and a regular hexagon inscribed in a circle. (PR)

- Define a circle. (K)
- Use Pythagorean Theorem. (K)
- Complete the square of a quadratic equation. (K)
- Derive equation of a circle using the Pythagorean (R)
- Theorem – given coordinates of the center and length of the radius. (R)
- Determine the center and radius by completing the square. (R)

- Recall the definition of ratio. (K)
- Recall previous understandings of coordinate geometry. (K)
- Given a line segment (including those with positive and negative slopes) and a ratio, find the point on the segment that partitions the segment into the given ratio. (R)

G.GPE.2 Derive the equation of a parabola given a focus and directrix. **(DOK2)** Chapters 10-8

G.GPE.7 Use coordinates to compute perimeters of polygons and area of triangles and rectangles, e.g., using the distance formula. (*Modeling Standard) **(DOK2)** Chapters 11,12

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). (*Modeling Standard) **(DOK2)** Chapters 11,12

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). (*Modeling Standard) **(DOK2)** Chapters 11,12

- Define a parabola including the relationship of the focus and the equation of the directrix to the parabolic shape. (K)
- Derive the equation of parabola given the focus and directrix. (R)

- Use the coordinates of the vertices of a polygon to find the necessary dimensions for finding the perimeter (i.e., the distance between vertices). (K)
- Use the coordinates of the vertices of a triangle to find the necessary dimensions (base, height) for finding the area (i.e., the distance between vertices by counting, distance formula, Pythagorean Theorem, etc.). (K)
- Use the coordinates of the vertices of a rectangle to find the necessary dimensions (base, height) for finding the area (i.e., the distance between vertices by counting, distance formula). (K)
- Formulate a model of figures in contextual problems to compute area and/or perimeter. (R)

- Describe a typographical grid system. (K)
- 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). (R)

- Define density. (K)
- Apply concepts of density based on area and volume to model real-life situations (e.g., persons per square mile, BTUs per cubic foot). (R)

G.C. 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.

(DOK2) Chapters 11,12

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).>(*Modeling Standard) **(DOK2)**

Chapters 11,12

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).>(*Modeling Standard) **(DOK2)**

Chapters 11,12

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

- Recall how to find the area and circumference of a circle. Explain that $1^\circ = \pi/180$ radians (K)
- Recall from G.C.1, that all circles are similar. (K)
- Determine the constant of proportionality (scale factor). Justify the radii of any two circles (r_1 and r_2) and the arc lengths (s_1 and s_2) determined by congruent central angles are proportional, such that $r_1/s_1 = r_2/s_2$ (R)
- Verify that the constant of a proportion is the same as the radian measure, θ , of the given central angle. Conclude $s = r \theta$ (R)

- Describe a typographical grid system. (K)
- 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). (R)

- Use measures and properties of geometric shapes to describe real world objects. (K)
- Given a real world object, classify the object as a known geometric shape – use this to solve problems in context. (R)

- Use strategies to help visualize relationships between

dimensional objects generated by rotations of two-dimensional objects. **(DOK2)** Chapters 11,12

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). **(DOK2)** Chapter 13

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”). Statistics and Probability is a Modeling Conceptual Category. **(DOK2)** Chapter 13

S.CP 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. Statistics and Probability is a Modeling Conceptual Category. **(DOK1)** Chapter 13

S.CP 3 Understand the conditional probability of A given B as $P(A \text{ and } B)/P(B)$, 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. Statistics and Probability is a Modeling Conceptual Category. **(DOK1)**

two-dimensional and three dimensional objects (K)

- Relate the shapes of two-dimensional cross-sections to their three-dimensional objects (K)
- Discover three-dimensional objects generated by rotations of two-dimensional objects. (R)

- Describe a typographical grid system. (K)
- 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). (R)

- Define unions, intersections and complements of events. (K)
- 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”). (R)

- Categorize events as independent or not using the characterization that two events A and B are independent when the probability of A and B occurring together is the product of their probabilities. (K)

- Know the conditional probability of A given B as $P(A \text{ and } B)/P(B)$ (K)
- 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

Chapter 13

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 10th grade. Do the same for other subjects and compare the results. Statistics and Probability is a Modeling Conceptual Category. **(DOK1)**

Chapter 13

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. Statistics and Probability is a Modeling Conceptual Category. **(DOK2)**

Chapter 13

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. Statistics and Probability is a Modeling Conceptual Category. **(DOK2)** Chapter 13

given A is the same as the probability of B. (K)

- Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. (K)
- Interpret two-way frequency tables of data when two categories are associated with each object being classified. (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 10th grade. Do the same for other subjects and compare the results.) (K)
- Recognize the concepts of conditional probability and independence in everyday language and everyday situations. (K)
- 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.) (R)
- Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A. (K)
- Interpret the answer in terms of the model. (R)

S.CP.7 Apply the Additional Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ and interpret the answer in terms of the model. Statistics and Probability is a Modeling Conceptual Category. **(DOK2)** Chapter 13

S.CP.8 (+) Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B|A) = P(B)P(A|B)$, and interpret the answer in terms of the model. Statistics and Probability is a Modeling Conceptual Category. **(DOK2)** Chapter 13

S.CP.9 (+) Use permutations and combinations to compute probabilities of compound events and solve problems. Statistics and Probability is a Modeling Conceptual Category. **(DOK2)** Chapter 13

S.MD.6 (+) Use probabilities to make fair decisions (e.g. drawing by lots, using a random number generator.) This unit sets the stage for work in Algebra II, where the ideas of statistical inference are introduced. Evaluating the risks associated with conclusions drawn from sample data (i.e. incomplete information) requires an understanding of probability concepts. Statistics and Probability is a Modeling Conceptual Category. **(DOK2)** Chapter 13

S.MD.7 (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game.) Statistics and Probability is a Modeling Conceptual Category. **(DOK2)** Chapter 13

- Use the Additional Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ (K)
- Interpret the answer in terms of the model. (R)

- Use the multiplication rule with correct notation. (K)
- Apply the general Multiplication Rule in a uniform probability model $P(A \text{ and } B) = P(A)P(B|A) = P(B)P(A|B)$. (R)
- Interpret the answer in terms of the model. (R)

- Identify situations that are permutations and those that are combinations. (K)
- Use permutations and combinations to compute probabilities of compound events and solve problems. (R)

- Compute Theoretical and Experimental Probabilities. (K)
- Use probabilities to make fair decisions (e.g. drawing by lots, using a random number generator.) (R)

- Recall prior understandings of probability. (K)
- Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game.) (R)

