Geometry | North Dakota Mathematics K–12 Standards Correlation to *Eureka Math*®

About *Eureka Math*

Created by Great Minds®, a mission-driven Public Benefit Corporation, *Eureka Math*® helps teachers deliver unparalleled math instruction that provides students with a deep understanding and fluency in math. Crafted by teachers and math scholars, the curriculum carefully sequences the mathematical progressions to maximize coherence from Prekindergarten through Precalculus—a principle tested and proven to be essential in students' mastery of math.

Teachers and students using *Eureka Math* find the trademark "Aha!" moments in *Eureka Math* to be a source of joy and inspiration, lesson after lesson, year after year.

Aligned

Great Minds offers detailed analyses that demonstrate how each grade of *Eureka Math* aligns with specific state standards. Access these free alignment studies at greatminds.org/state-studies.

Data

Schools and districts nationwide are experiencing student growth and impressive test scores after using *Eureka Math*. See their stories and data at greatminds.org/data.

Full Suite of Resources

Great Minds offers the *Eureka Math* curriculum as PDF downloads for free, noncommercial use. Access the free PDFs at greatminds.org/math/curriculum.

The teacher–writers who created the curriculum have also developed essential resources, available only from Great Minds, including the following:

- Printed material in English and Spanish
- Digital resources
- Professional development
- Classroom tools and manipulatives
- Teacher support materials
- Parent resources

Math Attributes	Aligned Components of *Eureka Math*
9–12.MA.P Learners can analyze, execute, critique, and adapt approaches and solutions when problem-solving in novel situations.	Lessons in every module engage students in math attributes. These are indicated in margin notes included with every lesson.
9–12.MA.C Learners can create connections within and across concepts, using supporting evidence to interpret how they originate, extend, and relate to other learning, ideas, and life experiences.	Lessons in every module engage students in math attributes. These are indicated in margin notes included with every lesson.
9–12.MA.R Learners can reason logically, citing evidence to critique and explain what they see, think, and conclude through exploration, generalization, and validation.	Lessons in every module engage students in math attributes. These are indicated in margin notes included with every lesson.

Number and Operations: Learners will develop a foundational understanding of the number system, operations, and computational fluency to create connections and solve problems within and across concepts.

North Dakota Mathematics K–12 Standards	Aligned Components of *Eureka Math*
9-10.NO.2 Perform basic operations on simple radical expressions to write a simplified equivalent expression.	Geometry M2 Lesson 22: Multiplying and Dividing Expressions with Radicals Geometry M2 Lesson 23: Adding and Subtracting Expressions with Radicals

Geometry and Measurement: Learners will use visualization, spatial reasoning, geometric modeling, and measurement to investigate the characteristics of figures, perform transformations, and construct logical arguments.

North Dakota Mathematics K–12 Standards	Aligned Components of *Eureka Math*
9-10.GM.1 Know precise definitions and notations of angle, circle, perpendicular line, parallel line, and line segment based on the undefined notions of point, line, and plane.	Geometry M1 Lesson 1: Construct an Equilateral Triangle Geometry M1 Lesson 3: Copy and Bisect an Angle Geometry M1 Lesson 4: Construct a Perpendicular Bisector Geometry M1 Lesson 33: Review of the Assumptions
9-10.GM.2 Represent transformations in the plane. Describe transformations as functions taking points in the plane as inputs and giving other points as outputs. Compare transformations that preserve distance and angle to those that do not (i.e., rigid versus non-rigid motion).	Geometry M1 Lesson 12: Transformations—The Next Level Geometry M1 Lesson 13: Rotations Geometry M1 Lesson 14: Reflections Geometry M1 Lesson 15: Rotations, Reflections, and Symmetry Geometry M1 Lesson 16: Translations Geometry M1 Lesson 18: Looking More Carefully at Parallel Lines

North Dakota Mathematics K–12 Standards	Aligned Components of *Eureka Math*
9-10.GM.2 ***continued***	Geometry M1 Lesson 19: Construct and Apply a Sequence of Rigid Motions Geometry M1 Lesson 20: Applications of Congruence in Terms of Rigid Motions Geometry M1 Lesson 21: Correspondence and Transformations Geometry M2 Lesson 6: Dilations as Transformations of the Plane
9-10.GM.3 Describe the rotations and reflections of a triangle, rectangle, parallelogram, trapezoid, or regular polygon that map each figure onto itself or another figure.	Geometry M1 Lesson 15: Rotations, Reflections, and Symmetry Geometry M1 Lesson 21: Correspondence and Transformations
9-10.GM.4 Develop or verify the characteristics of rotations, reflections, and translations in angles, circles, perpendicular lines, parallel lines, and line segments.	Geometry M1 Lesson 12: Transformations—The Next Level Geometry M1 Lesson 13: Rotations Geometry M1 Lesson 14: Reflections Geometry M1 Lesson 16: Translations Geometry M4 Lesson 5: Criterion for Perpendicularity Geometry M4 Lesson 8: Parallel and Perpendicular Lines
9-10.GM.5 Draw the image of a figure that has undergone a series of transformations [rotation(s), reflection(s), or translation(s)] of a geometric figure using a variety of methods (e.g., graph paper, tracing paper, or geometry software).	Geometry M1 Lesson 13: Rotations Geometry M1 Lesson 14: Reflections Geometry M1 Lesson 16: Translations Geometry M1 Lesson 18: Looking More Carefully at Parallel Lines Geometry M1 Lesson 19: Construct and Apply a Sequence of Rigid Motions Geometry M1 Lesson 20: Applications of Congruence in Terms of Rigid Motions Geometry M1 Lesson 21: Correspondence and Transformations

North Dakota Mathematics K–12 Standards	Aligned Components of *Eureka Math*
9-10.GM.6 Predict the effect of a specified rigid motion on a given figure using geometric descriptions of rigid motions. Determine whether two figures are congruent using the definition of congruence in terms of rigid motions.	Geometry M1 Lesson 15: Rotations, Reflections, and Symmetry Geometry M1 Lesson 19: Construct and Apply a Sequence of Rigid Motions Geometry M1 Lesson 21: Correspondence and Transformations
9-10.GM.7 Use the definition of congruence, based on rigid motions, to show two triangles are congruent if and only if their corresponding sides and corresponding angles are congruent.	Geometry M1 Lesson 19: Construct and Apply a Sequence of Rigid Motions Geometry M1 Lesson 20: Applications of Congruence in Terms of Rigid Motions Geometry M1 Lesson 21: Correspondence and Transformations Geometry M1 Topic D: Congruence Geometry M1 Lesson 34: Review of the Assumptions
9-10.GM.8 Prove two triangles are congruent using the congruence theorems.	Geometry M1 Lesson 22: Congruence Criteria for Triangles—SAS Geometry M1 Lesson 24: Congruence Criteria for Triangles—ASA and SSS Geometry M1 Lesson 25: Congruence Criteria for Triangles—AAS and HL Geometry M1 Lesson 26: Triangle Congruency Proofs Geometry M1 Lesson 27: Triangle Congruency Proofs Geometry M1 Lesson 28: Properties of Parallelograms Geometry M1 Lesson 34: Review of the Assumptions
9-10.GM.9 Prove and apply theorems about lines and angles.	Geometry M1 Topic B: Unknown Angles Geometry M1 Lesson 18: Looking More Carefully at Parallel Lines Geometry M1 Lesson 33: Review of the Assumptions Geometry M4 Lesson 5: Criterion for Perpendicularity

North Dakota Mathematics K–12 Standards	Aligned Components of *Eureka Math*
9-10.GM.10 Prove and apply theorems about triangles.	Geometry M1 Lesson 23: Base Angles of Isosceles Triangles Geometry M1 Lesson 29: Special Lines in Triangles Geometry M1 Lesson 30: Special Lines in Triangles Geometry M1 Topic G: Axiomatic Systems
9-10.GM.11 Prove and apply theorems about parallelograms.	Geometry M1 Lesson 28: Properties of Parallelograms Geometry M1 Lesson 34: Review of the Assumptions
9-10.GM.12 Make basic geometric constructions (e.g., segment, angle, bisectors, parallel and perpendicular lines) with a variety of tools and methods.	Geometry M1 Topic A: Basic Constructions Geometry M1 Lesson 13: Rotations Geometry M1 Lesson 14: Reflections Geometry M1 Lesson 16: Translations Geometry M1 Lesson 17: Characterize Points on a Perpendicular Bisector Geometry M1 Lesson 18: Looking More Carefully at Parallel Lines
9-10.GM.13 Apply basic constructions to create polygons such as equilateral triangles, squares, and regular hexagons inscribed in circles.	Geometry M1 Topic F: Advanced Constructions
9-10.GM.14 Verify experimentally and justify the properties of dilations given by a center and a scale factor.	Geometry M2 Lesson 1: Scale Drawings Geometry M2 Lesson 2: Making Scale Drawings Using the Ratio Method Geometry M2 Lesson 3: Making Scale Drawings Using the Parallel Method Geometry M2 Lesson 5: Scale Factors Geometry M2 Topic B: Dilations

North Dakota Mathematics K–12 Standards	Aligned Components of *Eureka Math*
9-10.GM.15 Use transformations to decide if two given figures are similar. Apply the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.	Geometry M2 Lesson 12: What Are Similarity Transformations, and Why Do We Need Them? Geometry M2 Lesson 13: Properties of Similarity Transformations Geometry M2 Lesson 14: Similarity
9-10.GM.16 Prove similarity theorems about triangles.	Geometry M2 Lesson 15: The Angle-Angle (AA) Criterion for Two Triangles to Be Similar Geometry M2 Lesson 17: The Side-Angle-Side (SAS) and Side-Side-Side (SSS) Criteria for Two Triangles to be Similar Geometry M2 Lesson 19: Families of Parallel Lines and the Circumference of the Earth Geometry M2 Lesson 24: Prove the Pythagorean Theorem Using Similarity
9-10.GM.17 Apply knowledge of congruence and similarity criteria for triangles to solve problems and to prove relationships in various geometric figures.	Geometry M2 Lesson 16: Between-Figure and Within-Figure Ratios Geometry M2 Lesson 17: The Side-Angle-Side (SAS) and Side-Side-Side (SSS) Criteria for Two Triangles to be Similar Geometry M2 Lesson 18: Similarity and the Angle Bisector Theorem Geometry M2 Topic D: Applying Similarity to Right Triangles
9-10.GM.18 Recognize how the properties of similar right triangles allow the trigonometric ratios to be defined and determine the sine, cosine, and tangent of an acute angle in a right triangle.	Geometry M2 Lesson 21: Special Relationships Within Right Triangles—Dividing into Two Similar Sub-Triangles Geometry M2 Lesson 25: Incredibly Useful Ratios Geometry M2 Lesson 26: The Definition of Sine, Cosine, and Tangent Geometry M2 Lesson 29: Applying Tangents

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9-10.GM.19 Explain and use the relationship between the sine and cosine of complementary angles.	Geometry M2 Lesson 27: Sine and Cosine of Complementary Angles and Special Angles Geometry M2 Lesson 28: Solving Problems Using Sine and Cosine
9-10.GM.20 Solve applied problems involving right triangles using trigonometric ratios, the Pythagorean Theorem, and special right triangles ($30°$-$60°$-$90°$ and $45°$-$45°$-$90°$).	Geometry M2 Lesson 25: Incredibly Useful Ratios Geometry M2 Lesson 26: The Definition of Sine, Cosine, and Tangent Geometry M2 Lesson 28: Solving Problems Using Sine and Cosine Geometry M2 Lesson 29: Applying Tangents Geometry M2 Lesson 30: Trigonometry and the Pythagorean Theorem Geometry M2 Lesson 34: Unknown Angles *Supplemental material is necessary to address solving problems using special right triangles.*
9-10.GM.21 Solve unknown sides and angles of non-right triangles using the Laws of Sines and Cosines.	Geometry M2 Lesson 32: Using Trigonometry to Find Side Lengths of an Acute Triangle Geometry M2 Lesson 33: Applying the Laws of Sines and Cosines Precalculus and Advanced Topics M4 Lesson 8: Law of Sines Precalculus and Advanced Topics M4 Lesson 9: Law of Cosines
9-10.GM.22 Apply theorems about relationships between line segments and circles or angles and circles formed by radii, diameter, secants, tangents, and chords to find unknown lengths or angles.	Geometry M5 Topic A: Central and Inscribed Angles Geometry M5 Lesson 7: The Angle Measure of an Arc Geometry M5 Lesson 8: Arcs and Chords Geometry M5 Topic C: Secants and Tangents

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9-10.GM.23 Construct the incenter and circumcenter of a triangle. Relate the incenter and circumcenter to the inscribed and circumscribed circles.	Geometry M5 Lesson 3: Rectangles Inscribed in Circles Geometry M5 Lesson 12: Tangent Segments
9-10.GM.24 Construct a tangent line from a point outside a given circle to the circle.	Precalculus and Advanced Topics M4 Lesson 5: Tangent Lines and the Tangent Function
9-10.GM.25 Explain and use the formulas for arc length and area of sectors of circles.	Geometry M5 Lesson 9: Arc Length and Areas of Sectors Geometry M5 Lesson 10: Unknown Length and Area Problems
9-10.GM.26 Recognize that the radian measure of an angle is the ratio of the length of the arc to the length of the radius of a circle.	Geometry M5 Lesson 9: Arc Length and Areas of Sectors Algebra II M2 Lesson 9: Awkward! Who Chose the Number 360, Anyway?
9-10.GM.27 Develop and verify the slope criteria for parallel and perpendicular lines. Apply the slope criteria for parallel and perpendicular lines to solve problems.	Geometry M4 Lesson 4: Designing a Search Robot to Find a Beacon Geometry M4 Topic B: Perpendicular and Parallel Lines in the Cartesian Plane Geometry M5 Lesson 19: Equations for Tangent Lines to Circles

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9-10.GM.28 Verify simple geometric theorems algebraically using coordinates. Verify algebraically, using coordinates, that a given set of points produces a particular type of triangle or quadrilateral.	Geometry M4 Lesson 9: Perimeter and Area of Triangles in the Cartesian Plane Geometry M4 Lesson 10: Perimeter and Area of Polygonal Regions in the Cartesian Plane
9-10.GM.29 Determine the midpoint or endpoint of a line segment using coordinates. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	Geometry M4 Lesson 12: Dividing Segments Proportionately Geometry M4 Lesson 13: Analytic Proofs of Theorems Previously Proved by Synthetic Means
9-10.GM.30 Compute perimeters of polygons and areas of triangles, parallelograms, trapezoids, and kites using coordinates.	Geometry M4 Lesson 1: Searching a Region in the Plane Geometry M4 Lesson 2: Finding Systems of Inequalities That Describe Triangular and Rectangular Regions Geometry M4 Lesson 3: Lines That Pass Through Regions Geometry M4 Topic C: Perimeters and Areas of Polygonal Regions in the Cartesian Plane *Supplemental material is necessary to address computing areas of kites.*
9-10.GM.31 Explain derivations of the formulas for the circumference of a circle, area of a circle, and volume of a cylinder, pyramid, and cone.	Geometry M3 Topic A: Area Geometry M3 Lesson 8: Definition and Properties of Volume Geometry M3 Lesson 10: The Volume of Prisms and Cylinders and Cavalieri's Principle Geometry M3 Lesson 11: The Volume Formula of a Pyramid and Cone

North Dakota Mathematics K–12 Standards	Aligned Components of *Eureka Math*
9-10.GM.32 Calculate the surface area for prisms, cylinders, pyramids, cones, and spheres to solve problems.	*Supplemental material is necessary to address this standard.*
9-10.GM.33 Know and apply volume formulas for prisms, cylinders, pyramids, cones, and spheres to solve problems.	Geometry M3 Lesson 8: Definition and Properties of Volume Geometry M3 Lesson 9: Scaling Principle for Volumes Geometry M3 Lesson 10: The Volume of Prisms and Cylinders and Cavalieri's Principle Geometry M3 Lesson 11: The Volume Formula of a Pyramid and Cone Geometry M3 Lesson 12: The Volume Formula of a Sphere Geometry M3 Lesson 13: How Do 3D Printers Work? Precalculus and Advanced Topics M3 Lesson 9: Volume and Cavalieri's Principle
9-10.GM.34 Identify the shapes of two-dimensional cross-sections of three-dimensional objects and identify three-dimensional objects generated by rotations of two-dimensional objects.	Geometry M3 Lesson 6: General Prisms and Cylinders and Their Cross-Sections Geometry M3 Lesson 7: General Pyramids and Cones and Their Cross-Sections Geometry M3 Lesson 10: The Volume of Prisms and Cylinders and Cavalieri's Principle Geometry M3 Lesson 12: The Volume Formula of a Sphere Geometry M3 Lesson 13: How Do 3D Printers Work?
9-10.GM.35 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	Geometry M3 Lesson 8: Definition and Properties of Volume Geometry M3 Lesson 11: The Volume Formula of a Pyramid and Cone

North Dakota Mathematics K–12 Standards	Aligned Components of *Eureka Math*
9-10.GM.36 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; scaling a model).	Geometry M2 Lesson 2: Making Scale Drawings Using the Ratio Method Geometry M3 Lesson 11: The Volume Formula of a Pyramid and Cone Geometry M3 Lesson 12: The Volume Formula of a Sphere Geometry M3 Lesson 13: How Do 3D Printers Work?