Geometry | Mathematics Standards of Learning for Virginia Public Schools 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

Mathematical Process Goals for Students	Aligned Components of *Eureka Math*
Mathematical Problem Solving	Lessons in every module engage students in mathematical processes.
Mathematical Communication	
Mathematical Reasoning	
Mathematical Connections	
Mathematical Representations	

Reasoning, Lines and Transformations

G.RLT.1 The student will translate logic statements, identify conditional statements, and use and interpret Venn diagrams.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.RLT.1.a Translate propositional statements and compound statements into symbolic form, including negations ($\sim p$, read "not p"), conjunctions ($p \wedge q$, read "p and q"), disjunctions ($p \vee q$, read "p or q"), conditionals ($p \rightarrow q$, read "if p then q"), and biconditionals ($p \leftrightarrow q$, read "p if and only if q"), including statements representing geometric relationships.	*Supplemental material is necessary to address this standard.*
G.RLT.1.b Identify and determine the validity of the converse, inverse, and contrapositive of a conditional statement, and recognize the connection between a biconditional statement and a true conditional statement with a true converse, including statements representing geometric relationships.	*Supplemental material is necessary to address this standard.*
G.RLT.1.c Use Venn diagrams to represent set relationships, including union, intersection, subset, and negation.	*Supplemental material is necessary to address this standard.*

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.RLT.1.d Interpret Venn diagrams, including those representing contextual situations.	*Supplemental material is necessary to address this standard.*

Reasoning, Lines and Transformations

G.RLT.2 The student will analyze, prove, and justify the relationships of parallel lines cut by a transversal.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.RLT.2.a Prove and justify angle pair relationships formed by two parallel lines and a transversal, including:	*This standard is addressed by the lessons aligned to its subsections.*
G.RLT.2.a.i corresponding angles;	Geometry M1 Lesson 11: Unknown Angle Proofs—Proofs of Known Facts
G.RLT.2.a.ii alternate interior angles;	Geometry M1 Lesson 18: Looking More Carefully at Parallel Lines
G.RLT.2.a.iii alternate exterior angles;	Geometry M1 Lesson 10: Unknown Angle Proofs—Proofs with Constructions
G.RLT.2.a.iv same-side (consecutive) interior angles; and	Geometry M1 Lesson 11: Unknown Angle Proofs—Proofs of Known Facts

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.RLT.2.a.v same-side (consecutive) exterior angles.	*Supplemental material is necessary to address this standard.*
G.RLT.2.b Prove two or more lines are parallel given angle measurements expressed numerically or algebraically.	Geometry M1 Lesson 9: Unknown Angle Proofs—Writing Proofs Geometry M1 Lesson 11: Unknown Angle Proofs—Proofs of Known Facts Geometry M1 Lesson 18: Looking More Carefully at Parallel Lines
G.RLT.2.c Solve problems by using the relationships between pairs of angles formed by the intersection of two parallel lines and a transversal.	Geometry M1 Topic B: Unknown Angles Geometry M1 Lesson 18: Looking More Carefully at Parallel Lines Geometry M1 Lesson 33: Review of the Assumptions

Reasoning, Lines and Transformations

G.RLT.3 The student will solve problems, including contextual problems, involving symmetry and transformation.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.RLT.3.a Locate, count, and draw lines of symmetry given a figure, including figures in context.	Geometry M1 Lesson 15: Rotations, Reflections, and Symmetry
G.RLT.3.b Determine whether a figure has point symmetry, line symmetry, both, or neither, including figures in context.	Geometry M1 Lesson 15: Rotations, Reflections, and Symmetry

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.RLT.3.c Given an image or preimage, identify the transformation or combination of transformations that has/have occurred. Transformations include:	*This standard is fully addressed by the lessons aligned to its subsections.*
G.RLT.3.c.i translations;	Geometry M1 Lesson 16: Translations 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
G.RLT.3.c.ii reflections over any horizontal or vertical line or the lines $y = x$ or $y = -x$;	Geometry M1 Lesson 14: Reflections 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
G.RLT.3.c.iii clockwise or counterclockwise rotations of $90°$, $180°$, $270°$, or $360°$ on a coordinate grid where the center of rotation is limited to the origin; and	Geometry M1 Lesson 13: Rotations 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
G.RLT.3.c.iv dilations, from a fixed point on a coordinate grid.	Geometry M2 Lesson 6: Dilations as Transformations of the Plane

Triangles

G.TR.1 The student will determine the relationships between the measures of angles and lengths of sides in triangles, including problems in context.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.TR.1.a Given the lengths of three segments, determine whether a triangle could be formed.	*Supplemental material is necessary to address this standard.*
G.TR.1.b Given the lengths of two sides of a triangle, determine the range in which the length of the third side must lie.	*Supplemental material is necessary to address this standard.*
G.TR.1.c Order the sides of a triangle by their lengths when given information about the measures of the angles.	*Supplemental material is necessary to address this standard.*
G.TR.1.d Order the angles of a triangle by their measures when given information about the lengths of the sides.	*Supplemental material is necessary to address this standard.*
G.TR.1.e Solve for interior and exterior angles of a triangle, when given two angles.	Geometry M1 Lesson 8: Solve for Unknown Angles—Angles in a Triangle

Triangles

G.TR.2 The student will, given information in the form of a figure or statement, prove and justify two triangles are congruent using direct and indirect proofs, and solve problems involving measured attributes of congruent triangles.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.TR.2.a Use definitions, postulates, and theorems (including Side-Side-Side (SSS); Side-Angle-Side (SAS); Angle-Side-Angle (ASA); Angle-Angle-Side (AAS); and Hypotenuse-Leg (HL)) to prove and justify two triangles are congruent.	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 34: Review of the Assumptions
G.TR.2.b Use algebraic methods to prove that two triangles are congruent.	*Supplemental material is necessary to address this standard.*
G.TR.2.c Use coordinate methods, such as the slope formula and the distance formula, to prove two triangles are congruent.	*Supplemental material is necessary to address this standard.*
G.TR.2.d Given a triangle, use congruent segment, congruent angle, and/or perpendicular line constructions to create a congruent triangle (SSS, SAS, ASA, AAS, and HL).	*Supplemental material is necessary to address this standard.*

Triangles

G.TR.3 The student will, given information in the form of a figure or statement, prove and justify two triangles are similar using direct and indirect proofs, and solve problems, including those in context, involving measured attributes of similar triangles.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.TR.3.a Use definitions, postulates, and theorems (including Side-Angle-Side (SAS); Side-Side-Side (SSS); and Angle-Angle (AA)) to prove and justify that triangles are similar.	Geometry M2 Lesson 17: The Side-Angle-Side (SAS) and Side-Side-Side (SSS) Criteria for Two Triangles to Be Similar
G.TR.3.b Use algebraic methods to prove that triangles are similar.	Geometry M2 Lesson 17: The Side-Angle-Side (SAS) and Side-Side-Side (SSS) Criteria for Two Triangles to Be Similar
G.TR.3.c Use coordinate methods, such as the slope formula and the distance formula, to prove two triangles are similar.	*Supplemental material is necessary to address this standard.*
G.TR.3.d Describe a sequence of transformations that can be used to verify similarity of triangles located in the same plane.	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
G.TR.3.e Solve problems, including those in context involving attributes of similar triangles.	Geometry M2 Lesson 16: Between-Figure and Within-Figure Ratios

Triangles

G.TR.4 The student will model and solve problems, including those in context, involving trigonometry in right triangles and applications of the Pythagorean Theorem.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.TR.4.a Determine whether a triangle formed with three given lengths is a right triangle.	Geometry M2 Lesson 24: Prove the Pythagorean Theorem Using Similarity
G.TR.4.b Find and verify trigonometric ratios using right triangles.	Geometry M2 Lesson 25: Incredibly Useful Ratios Geometry M2 Lesson 26: The Definition of Sine, Cosine, and Tangent
G.TR.4.c Model and solve problems, including those in context, involving right triangle trigonometry (sine, cosine, and tangent ratios).	Geometry M2 Lesson 28: Solving Problems Using Sine and Cosine Geometry M2 Lesson 29: Applying Tangents Geometry M2 Lesson 31: Using Trigonometry to Determine Area Geometry M2 Lesson 32: Using Trigonometry to Find Side Lengths of an Acute Triangle
G.TR.4.d Solve problems using the properties of special right triangles.	Geometry M2 Lesson 24: Prove the Pythagorean Theorem Using Similarity Geometry M2 Lesson 27: Sine and Cosine of Complementary Angles and Special Angles
G.TR.4.e Solve for missing lengths in geometric figures, using properties of $45°$-$45°$-$90°$ triangles, where rationalizing denominators may be necessary.	Geometry M2 Lesson 24: Prove the Pythagorean Theorem Using Similarity Geometry M2 Lesson 27: Sine and Cosine of Complementary Angles and Special Angles

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.TR.4.f Solve for missing lengths in geometric figures, using properties of $30°$-$60°$-$90°$ triangles, where rationalizing denominators may be necessary.	Geometry M2 Lesson 24: Prove the Pythagorean Theorem Using Similarity Geometry M2 Lesson 27: Sine and Cosine of Complementary Angles and Special Angles
G.TR.4.g Solve problems, including those in context, involving right triangles using the Pythagorean Theorem and its converse, including recognizing Pythagorean Triples.	Geometry M2 Lesson 24: Prove the Pythagorean Theorem Using Similarity *Supplemental material is necessary to address recognizing Pythagorean Triples.*

Polygons and Circles

G.PC.1 The student will prove and justify theorems and properties of quadrilaterals, and verify and use properties of quadrilaterals to solve problems, including the relationships between the sides, angles, and diagonals.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.PC.1.a Solve problems, using the properties specific to parallelograms, rectangles, rhombi, squares, isosceles trapezoids, and trapezoids.	Geometry M1 Lesson 28: Properties of Parallelograms Geometry M1 Lesson 34: Review of the Assumptions Geometry M4 Lesson 5: Criterion for Perpendicularity Geometry M4 Lesson 13: Analytic Proofs of Theorems Previously Proved by Synthetic Means

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.PC.1.b Prove and justify that quadrilaterals have specific properties, using coordinate and algebraic methods, such as the slope formula, the distance formula, and the midpoint formula.	Geometry M4 Lesson 5: Criterion for Perpendicularity Geometry M4 Lesson 13: Analytic Proofs of Theorems Previously Proved by Synthetic Means *Supplemental material is necessary to address justifying properties of quadrilaterals by using the distance formula.*
G.PC.1.c Prove and justify theorems and properties of quadrilaterals using deductive reasoning.	Geometry M1 Lesson 28: Properties of Parallelograms
G.PC.1.d Use congruent segment, congruent angle, angle bisector, perpendicular line, and/or parallel line constructions to verify properties of quadrilaterals.	Geometry M1 Lesson 28: Properties of Parallelograms

Polygons and Circles

G.PC.2 The student will verify relationships and solve problems involving the number of sides and measures of angles of convex polygons.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.PC.2.a Solve problems involving the number of sides of a regular polygon given the measures of the interior and exterior angles of the polygon.	*Supplemental material is necessary to address this standard.*

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.PC.2.b Justify the relationship between the sum of the measures of the interior and exterior angles of a convex polygon and solve problems involving the sum of the measures of the angles.	*Supplemental material is necessary to address this standard.*
G.PC.2.c Justify the relationship between the measure of each interior and exterior angle of a regular polygon and solve problems involving the measures of the angles.	*Supplemental material is necessary to address this standard.*

Polygons and Circles

G.PC.3 The student will solve problems, including those in context, by applying properties of circles.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.PC.3.a Determine the proportional relationship between the arc length or area of a sector and other parts of a circle.	Geometry M5 Lesson 9: Arc Length and Areas of Sectors
G.PC.3.b Solve for arc measures and angles in a circle formed by central angles.	Geometry M5 Lesson 7: The Angle Measure of an Arc Geometry M5 Lesson 8: Arcs and Chords

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.PC.3.c Solve for arc measures and angles in a circle involving inscribed angles.	Geometry M5 Lesson 7: The Angle Measure of an Arc Geometry M5 Lesson 8: Arcs and Chords
G.PC.3.d Calculate the length of an arc of a circle.	Geometry M5 Lesson 9: Arc Length and Areas of Sectors Geometry M5 Lesson 10: Unknown Length and Area Problems
G.PC.3.e Calculate the area of a sector of a circle.	Geometry M5 Lesson 9: Arc Length and Areas of Sectors Geometry M5 Lesson 10: Unknown Length and Area Problems
G.PC.3.f Apply arc length or sector area to solve for an unknown measurement of the circle including the radius, diameter, arc measure, central angle, arc length, or sector area.	Geometry M5 Lesson 9: Arc Length and Areas of Sectors Geometry M5 Lesson 10: Unknown Length and Area Problems

Polygons and Circles

G.PC.4 The student will solve problems in the coordinate plane involving equations of circles.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.PC.4.a Derive the equation of a circle given the center and radius using the Pythagorean Theorem.	Geometry M5 Lesson 17: Writing the Equation for a Circle Geometry M5 Lesson 18: Recognizing Equations of Circles

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.PC.4.b Solve problems in the coordinate plane involving equations of circles:	*This standard is addressed by the lessons aligned to its subsections.*
G.PC.4.b.i given a graph or the equation of a circle in standard form, identify the coordinates of the center of the circle;	Geometry M5 Lesson 17: Writing the Equation for a Circle Geometry M5 Lesson 18: Recognizing Equations of Circles
G.PC.4.b.ii given the coordinates of the endpoints of a diameter of a circle, determine the coordinates of the center of the circle.	*Supplemental material is necessary to address this standard.*
G.PC.4.b.iii given a graph or the equation of a circle in standard form, identify the length of the radius or diameter of the circle.	Geometry M5 Lesson 17: Writing the Equation for a Circle Geometry M5 Lesson 18: Recognizing Equations of Circles
G.PC.4.b.iv given the coordinates of the endpoints of the diameter of a circle, determine the length of the radius or diameter of the circle.	*Supplemental material is necessary to address this standard.*

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.PC.4.b.v given the coordinates of the center and the coordinates of a point on the circle, determine the length of the radius or diameter of the circle; and	*Supplemental material is necessary to address this standard.*
G.PC.4.b.vi given the coordinates of the center and length of the radius of a circle, identify the coordinates of a point(s) on the circle.	*Supplemental material is necessary to address this standard.*
G.PC.4.c Determine the equation of a circle given:	*Supplemental material is necessary to address this standard.*
G.PC.4.c.i a graph of a circle with a center with coordinates that are integers;	Geometry M5 Lesson 17: Writing the Equation for a Circle
G.PC.4.c.ii coordinates of the center and a point on the circle;	*Supplemental material is necessary to address this standard.*
G.PC.4.c.iii coordinates of the center and the length of the radius or diameter; and	*Supplemental material is necessary to address this standard.*
G.PC.4.c.iv coordinates of the endpoints of a diameter.	*Supplemental material is necessary to address this standard.*

Two- and Three-Dimensional Figures

G.DF.1 The student will create models and solve problems, including those in context, involving surface area and volume of rectangular and triangular prisms, cylinders, cones, pyramids, and spheres.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.DF.1.a Identify the shape of a two-dimensional cross section of a three-dimensional figure.	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?
G.DF.1.b Create models and solve problems, including those in context, involving surface area of three-dimensional figures, as well as composite three-dimensional figures.	*Supplemental material is necessary to address this standard.*
G.DF.1.c Solve multistep problems, including those in context, involving volume of three-dimensional figures, as well as composite three-dimensional figures.	Geometry M3 Lesson 8: Definition and Properties of Volume Geometry M3 Lesson 9: Scaling Principle for Volumes 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?
G.DF.1.d Determine unknown measurements of three-dimensional figures using information such as length of a side, area of a face, or 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?

Two- and Three-Dimensional Figures

G.DF.2 The student will determine the effect of changing one or more dimensions of a three-dimensional geometric figure and describe the relationship between the original and changed figure.

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.DF.2.a Describe how changes in one or more dimensions of a figure affect other derived measures (perimeter, area, total surface area, and volume) of the figure.	Geometry M3 Lesson 3: The Scaling Principle for Area Geometry M3 Lesson 6: General Prisms and Cylinders and Their Cross-Sections Geometry M3 Lesson 9: Scaling Principle for Volumes
G.DF.2.b Describe how changes in surface area and/or volume of a figure affect the measures of one or more dimensions of the figure.	*Supplemental material is necessary to address this standard.*
G.DF.2.c Solve problems, including those in context, involving changing the dimensions or derived measures of a three-dimensional figure.	*Supplemental material is necessary to address this standard.*
G.DF.2.d Compare ratios between side lengths, perimeters, areas, and volumes of similar figures.	Geometry M3 Lesson 3: The Scaling Principle for Area Geometry M3 Lesson 9: Scaling Principle for Volumes

Mathematics Standards of Learning for Virginia Public Schools	Aligned Components of *Eureka Math*
G.DF.2.e Recognize when two- and three-dimensional figures are similar and solve problems, including those in context, involving attributes of similar geometric figures.	Geometry M2 Topic C: Similarity and Dilations *Supplemental material is necessary to address three-dimensional figures.*