

Geometric Reasoning (GR)

Kindergarten		Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		Grade 6		Grade 7		Grade 8		Grades 9-12						
MA.K.GR.1 Identify, compare and compose two- and three-dimensional figures.	MA.K.GR.1.1 Identify two- and three-dimensional figures regardless of their size or orientation. Figures are limited to circles, triangles, rectangles, squares, spheres, cubes, cones and cylinders.	MA.1.GR.1 Identify and analyze two- and three-dimensional figures based on their defining attributes.	MA.1.GR.1.1 Identify, compare and sort two- and three-dimensional figures based on their defining attributes. Figures are limited to circles, semi-circles, triangles, rectangles, squares, trapezoids, hexagons, spheres, cubes, rectangular prisms, cones and cylinders.	MA.2.GR.1 Identify and analyze two-dimensional figures and identify lines of symmetry.	MA.2.GR.1.1 Identify and draw two-dimensional figures based on their defining attributes. Figures are limited to triangles, rectangles, squares, pentagons, hexagons and octagons.	MA.3.GR.1 Describe and identify relationships between lines and classify quadrilaterals.	MA.3.GR.1.1 Describe and draw points, lines, line segments, rays, intersecting lines, perpendicular lines and parallel lines. Identify these in two-dimensional figures.	MA.4.GR.1 Draw, classify and measure angles.	MA.4.GR.1.1 Informally explore angles as an attribute of two-dimensional figures. Identify and classify angles as acute, right, obtuse, straight or reflex.	MA.5.GR.1 Classify two-dimensional figures and three-dimensional figures based on defining attributes.	MA.5.GR.1.1 Classify triangles or quadrilaterals into different categories based on shared defining attributes. Explain why a triangle or quadrilateral would or would not belong to a category.	MA.6.GR.1 Apply previous understanding of the coordinate plane to solve problems.	MA.6.GR.1.1 Extend previous understanding of the coordinate plane to plot rational number ordered pairs in all four quadrants and on both axes. Identify the x- or y-axis as the line of reflection when two ordered pairs have an opposite x- or y-coordinate.	MA.7.GR.1 Solve problems involving two-dimensional figures, including circles.	MA.7.GR.1.1 Apply formulas to find the areas of trapezoids, parallelograms and rhombi.	MA.8.GR.1 Develop an understanding of the Pythagorean Theorem and angle relationships involving triangles.	MA.8.GR.1.1 Apply the Pythagorean Theorem to solve mathematical and real-world problems involving unknown side lengths in right triangles.	MA.912.GR.1 Prove and apply geometric theorems to solve problems.	MA.912.GR.1.1 Prove relationships and theorems about lines and angles. Solve mathematical and real-world problems involving postulates, relationships and theorems of lines and angles.	MA.912.GR.1.2 Prove triangle congruence or similarity using Side-Side-Side, Side-Angle-Side, Angle-Side-Angle, Angle-Angle-Side, Angle-Angle and Hypotenuse-Leg.	MA.912.GR.1.3 Prove relationships and theorems about triangles. Solve mathematical and real-world problems involving postulates, relationships and theorems of triangles.	MA.912.GR.1.4 Prove relationships and theorems about parallelograms. Solve mathematical and real-world problems involving postulates, relationships and theorems of parallelograms.	MA.912.GR.1.5 Prove relationships and theorems about trapezoids. Solve mathematical and real-world problems involving postulates, relationships and theorems of trapezoids.	MA.912.GR.1.6 Solve mathematical and real-world problems involving congruence or similarity in two-dimensional figures.
	MA.K.GR.1.2 Compare two-dimensional figures based on their similarities, differences and positions. Sort two-dimensional figures based on their similarities and differences. Figures are limited to circles, triangles, rectangles and squares.		MA.1.GR.1.2 Sketch two-dimensional figures when given defining attributes. Figures are limited to triangles, rectangles, squares and hexagons.		MA.2.GR.1.2 Categorize two-dimensional figures based on the number and length of sides, number of vertices, whether they are closed or not and whether the edges are curved or straight.		MA.3.GR.1.2 Identify and draw quadrilaterals based on their defining attributes. Quadrilaterals include parallelograms, rhombi, rectangles, squares and trapezoids.		MA.4.GR.1.2 Estimate angle measures. Using a protractor, measure angles in whole-number degrees and draw angles of specified measure in whole-number degrees. Demonstrate that angle measure is additive.		MA.5.GR.1.2 Identify and classify three-dimensional figures into categories based on their defining attributes. Figures are limited to right pyramids, right prisms, right circular cylinders, right circular cones and spheres.		MA.6.GR.1.2 Find distances between ordered pairs, limited to the same x-coordinate or the same y-coordinate, represented on the coordinate plane.		MA.7.GR.1.2 Solve mathematical or real-world problems involving the area of polygons or composite figures by decomposing them into triangles or quadrilaterals.		MA.8.GR.1.2 Apply the Pythagorean Theorem to solve mathematical and real-world problems involving the distance between two points in a coordinate plane.		MA.912.GR.1.6 Solve mathematical and real-world problems involving congruence or similarity in two-dimensional figures.					
	MA.K.GR.1.3 Compare three-dimensional figures based on their similarities, differences and positions. Sort three-dimensional figures based on their similarities and differences. Figures are limited to spheres, cubes, cones and cylinders.		MA.1.GR.1.3 Compose and decompose two- and three-dimensional figures. Figures are limited to semi-circles, triangles, rectangles, squares, trapezoids, hexagons, cubes, rectangular prisms, cones and cylinders.		MA.2.GR.1.3 Identify line(s) of symmetry for a two-dimensional figure.		MA.3.GR.1.3 Draw line(s) of symmetry in a two-dimensional figure and identify line-symmetric two-dimensional figures.		MA.4.GR.1.3 Solve real-world and mathematical problems involving unknown whole-number angle measures. Write an equation to represent the unknown.		MA.6.GR.1.3 Solve mathematical and real-world problems by plotting points on a coordinate plane, including finding the perimeter or area of a rectangle.		MA.7.GR.1.3 Explore the proportional relationship between circumferences and diameters of circles. Apply a formula for the circumference of a circle to solve mathematical and real-world problems.		MA.8.GR.1.3 Use the Triangle Inequality Theorem to determine if a triangle can be formed from a given set of sides. Use the Pythagorean Theorem to determine if a right triangle can be formed from a given set of sides.		MA.912.GR.1.3 Prove relationships and theorems about triangles. Solve mathematical and real-world problems involving postulates, relationships and theorems of triangles.							
	MA.K.GR.1.4 Find real-world objects that can be modeled by a given two- or three-dimensional figure. Figures are limited to circles, triangles, rectangles, squares, spheres, cubes, cones and cylinders.		MA.1.GR.1.4 Given a real-world object, identify parts that are modeled by two- and three-dimensional figures. Figures are limited to semi-circles, triangles, rectangles, squares and hexagons, spheres, cubes, rectangular prisms, cones and cylinders.		MA.8.GR.1.4 Solve mathematical problems involving the relationships between supplementary, complementary, vertical or adjacent angles.		MA.912.GR.1.4 Prove relationships and theorems about parallelograms. Solve mathematical and real-world problems involving postulates, relationships and theorems of parallelograms.																	
	MA.K.GR.1.5 Combine two-dimensional figures to form a given composite figure. Figures used to form a composite shape are limited to triangles, rectangles and squares.		MA.7.GR.1.4 Explore and apply a formula to find the area of a circle to solve mathematical and real-world problems.		MA.8.GR.1.4 Solve mathematical and real-world problems involving dimensions and areas of geometric figures, including scale drawings and scale factors.		MA.912.GR.1.4 Prove relationships and theorems about trapezoids. Solve mathematical and real-world problems involving postulates, relationships and theorems of trapezoids.																	

<p>MA.2.GR.2 Describe perimeter and find the perimeter of polygons.</p>	<p>MA.2.GR.2.1 Explore perimeter as an attribute of a figure by placing unit segments along the boundary without gaps or overlaps. Find perimeters of rectangles by counting unit segments.</p> <p>MA.2.GR.2.2 Find the perimeter of a polygon with whole-number side lengths. Polygons are limited to triangles, rectangles, squares and pentagons.</p>	<p>MA.3.GR.2 Solve problems involving the perimeter and area of rectangles.</p>	<p>MA.3.GR.2.1 Explore area as an attribute of a two-dimensional figure by covering the figure with unit squares without gaps or overlaps. Find areas of rectangles by counting unit squares.</p> <p>MA.3.GR.2.2 Find the area of a rectangle with whole-number side lengths using a visual model and a multiplication formula.</p> <p>MA.3.GR.2.3 Solve mathematical and real-world problems involving the perimeter and area of rectangles with whole-number side lengths using a visual model and a formula.</p> <p>MA.3.GR.2.4 Solve mathematical and real-world problems involving the perimeter and area of composite figures composed of non-overlapping rectangles with whole-number side lengths.</p>	<p>MA.4.GR.2 Solve problems involving the perimeter and area of rectangles.</p>	<p>MA.4.GR.2.1 Solve perimeter and area mathematical and real-world problems, including problems with unknown sides, for rectangles with whole-number side lengths.</p> <p>MA.4.GR.2.2 Solve problems involving rectangles with the same perimeter and different areas or with the same area and different perimeters.</p>	<p>MA.5.GR.2 Find the perimeter and area of rectangles with fractional or decimal side lengths.</p>	<p>MA.5.GR.2.1 Find the perimeter and area of a rectangle with fractional or decimal side lengths using visual models and formulas.</p>	<p>MA.6.GR.2 Model and solve problems involving two-dimensional figures and three-dimensional figures.</p>	<p>MA.6.GR.2.1 Derive a formula for the area of a right triangle using a rectangle. Apply a formula to find the area of a triangle.</p> <p>MA.6.GR.2.2 Solve mathematical and real-world problems involving the area of quadrilaterals and composite figures by decomposing them into triangles or rectangles.</p> <p>MA.6.GR.2.3 Solve mathematical and real-world problems involving the volume of right rectangular prisms with positive rational number edge lengths using a visual model and a formula.</p> <p>MA.6.GR.2.4 Given a mathematical or real-world context, find the surface area of right rectangular prisms and right rectangular pyramids using the figure's net.</p>	<p>MA.7.GR.2 Solve problems involving three-dimensional figures, including right circular cylinders.</p>	<p>MA.7.GR.2.1 Given a mathematical or real-world context, find the surface area of a right circular cylinder using the figure's net.</p> <p>MA.7.GR.2.2 Solve real-world problems involving surface area of right circular cylinders.</p> <p>MA.7.GR.2.3 Solve mathematical and real-world problems involving volume of right circular cylinders.</p>	<p>MA.8.GR.2 Understand similarity and congruence using models and transformations.</p>	<p>MA.8.GR.2.1 Given a preimage and image generated by a single transformation, identify the transformation that describes the relationship.</p> <p>MA.8.GR.2.2 Given a preimage and image generated by a single dilation, identify the scale factor that describes the relationship.</p> <p>MA.8.GR.2.3 Describe and apply the effect of a single transformation on two-dimensional figures using coordinates and the coordinate plane.</p> <p>MA.8.GR.2.4 Determine mathematical and real-world problems involving proportional relationships between similar triangles.</p>	<p>MA.912.GR.2 Apply properties of transformations to describe congruence or similarity.</p>	<p>MA.912.GR.2.1 Given a preimage and image, describe the transformation and represent the transformation algebraically using coordinates.</p> <p>MA.912.GR.2.2 Identify transformations that do or do not preserve distance.</p> <p>MA.912.GR.2.3 Specify a sequence of transformations that will map a given figure onto itself or onto another congruent or similar figure.</p> <p>MA.912.GR.2.4 Determine symmetries of reflection, symmetries of rotation and symmetries of translation of a geometric figure.</p> <p>MA.912.GR.2.5 Given a geometric figure and a sequence of transformations, draw the transformed figure on a coordinate plane.</p> <p>MA.912.GR.2.6 Apply rigid transformations to map one figure onto another to justify that the two figures are congruent.</p> <p>MA.912.GR.2.7 Justify the criteria for triangle congruence using the definition of congruence in terms of rigid transformations.</p> <p>MA.912.GR.2.8 Apply an appropriate transformation to map one figure onto another to justify that the two figures are similar.</p> <p>MA.912.GR.2.9 Justify the criteria for triangle similarity using the definition of similarity in terms of non-rigid transformations.</p>
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MA.5.GR.3
Solve problems involving the volume of right rectangular prisms.

MA.5.GR.3.1
Explore volume as an attribute of three-dimensional figures by packing them with unit cubes without gaps. Find the volume of a right rectangular prism with whole-number side lengths by counting unit cubes.

MA.5.GR.3.2
Find the volume of a right rectangular prism with whole-number side lengths using a visual model and a formula.

MA.5.GR.3.3
Solve real-world problems involving the volume of right rectangular prisms, including problems with an unknown edge length, with whole-number edge lengths using a visual model or a formula. Write an equation with a variable for the unknown to represent the problem.

MA.912.GR.3
Use coordinate geometry to solve problems or prove relationships.

MA.912.GR.3.1
Determine the weighted average of two or more points on a line.

MA.912.GR.3.2
Given a mathematical context, use coordinate geometry to classify or justify definitions, properties and theorems involving circles, triangles or quadrilaterals.

MA.912.GR.3.3
Use coordinate geometry to solve mathematical and real-world geometric problems involving lines, circles, triangles and quadrilaterals.

MA.912.GR.3.4
Use coordinate geometry to solve mathematical and real-world problems on the coordinate plane involving perimeter or area of polygons.

MA.5.GR.4
Plot points and represent problems on the coordinate plane.

MA.5.GR.4.1
Identify the origin and axes in the coordinate system. Plot and label ordered pairs in the first quadrant of the coordinate plane.

MA.5.GR.4.2
Represent mathematical and real-world problems by plotting points in the first quadrant of the coordinate plane and interpret coordinate values of points in the context of the situation.

MA.912.GR.4
Use geometric measurement and dimensions to solve problems.

MA.912.GR.4.1
Identify the shapes of two-dimensional cross-sections of three-dimensional figures.

MA.912.GR.4.2
Identify three-dimensional objects generated by rotations of two-dimensional figures.

MA.912.GR.4.3
Extend previous understanding of scale drawings and scale factors to determine how dilations affect the area of two-dimensional figures and the surface area or volume of three-dimensional figures.

MA.912.GR.4.4
Solve mathematical and real-world problems involving the area of two-dimensional figures.

MA.912.GR.4.5
Solve mathematical and real-world problems involving the volume of three-dimensional figures limited to cylinders, pyramids, prisms, cones and spheres.

MA.912.GR.4.6
Solve mathematical and real-world problems involving the surface area of three-dimensional figures limited to cylinders, pyramids, prisms, cones and spheres.

MA.912.GR.5

Make formal geometric constructions with a variety of tools and methods.

MA.912.GR.5.1

Construct a copy of a segment or an angle.

MA.912.GR.5.2

Construct the bisector of a segment or an angle, including the perpendicular bisector of a line segment.

MA.912.GR.5.3

Construct the inscribed and circumscribed circles of a triangle.

MA.912.GR.5.4

Construct a regular polygon inscribed in a circle. Regular polygons are limited to triangles, quadrilaterals and hexagons.

MA.912.GR.5.5

Given a point outside a circle, construct a line tangent to the circle that passes through the given point.

MA.912.GR.6

Use properties and theorems related to circles.

MA.912.GR.6.1

Solve mathematical and real-world problems involving the length of a secant, tangent, segment or chord in a given circle.

MA.912.GR.6.2

Solve mathematical and real-world problems involving the measures of arcs and related angles.

MA.912.GR.6.3

Solve mathematical problems involving triangles and quadrilaterals inscribed in a circle.

MA.912.GR.6.4

Solve mathematical and real-world problems involving the arc length and area of a sector in a given circle.

MA.912.GR.6.5

Apply transformations to prove that all circles are similar.

MA.912.GR.7
Apply geometric
and algebraic
representations of
conic sections.

MA.912.GR.7.1
Given a conic section, describe how it can result from the slicing of two cones.

MA.912.GR.7.2
Given a mathematical or real-world context, derive and create the equation of a circle using key features.

MA.912.GR.7.3
Graph and solve mathematical and real-world problems that are modeled with an equation of a circle. Determine and interpret key features in terms of the context.

MA.912.GR.7.4
Given a mathematical or real-world context, derive and create the equation of a parabola using key features.

MA.912.GR.7.5
Graph and solve mathematical and real-world problems that are modeled with an equation of a parabola. Determine and interpret key features in terms of the context.

MA.912.GR.7.6
Given a mathematical or real-world context, derive and create the equation of an ellipse using key features.

MA.912.GR.7.7
Graph and solve mathematical and real-world problems that are modeled with an equation of an ellipse. Determine and interpret key features in terms of the context.

MA.912.GR.7.8
Given a mathematical or real-world context, derive and create the equation of a hyperbola using key features.

MA.912.GR.7.9
Graph and solve mathematical and real-world problems that are modeled with an equation of a hyperbola. Determine and interpret key features in terms of the context.