

Performance Level Descriptors – Geometry

PLD	Domain	Below Basic	Basic	Proficient	Advanced
Reporting		<p>Below Basic do not yet demonstrate proficiency in the knowledge and skills necessary at this grade level/course of learning, as specified in content expectations.</p> <p>The students need substantial academic support to be prepared for the next grade level or course and to be on track for <i>college and career readiness</i>.</p>	<p>Basic demonstrate partial proficiency in the knowledge and skills necessary at this grade level/course of learning, as specified in content expectations. The students need additional academic support to ensure success in the next grade level or course and to be on track for <i>college and career readiness</i>.</p>	<p>Proficient demonstrate proficiency in the knowledge and skills necessary at this grade level/course of learning, as specified in content expectations, and uses clear and precise language when communicating mathematical understanding. The students are prepared for the next grade level or course and are on track for <i>college and career readiness</i>.</p>	<p>Advanced demonstrate advanced proficiency in the knowledge and skills necessary at this grade level/course of learning, as specified in content expectations. The students are well prepared for the next grade level or course and are well prepared for <i>college and career readiness</i>.</p>
		<p>A student who performs at the Below Basic level demonstrates minimal command of the grade-level expectations.</p>	<p>A student who performs at the Basic level demonstrates partial command of the grade-level expectations.</p>	<p>A student who performs at the Proficient level demonstrates proficiency of the grade-level expectations.</p>	<p>A student who performs at the Advanced level demonstrates advanced proficiency of the grade-level expectations.</p>

RANGE	CONGRUENCE	<p>Identifies translations in the coordinate plane; identifies reflections and rotations; identifies lines of symmetry; knows the definition of a rigid motion; identifies a transformed figure given a figure and a transformation; knows properties of geometric figures, lines, and angles; identifies basic geometric constructions; defines angle, circle, perpendicular line, line segment, and ray based on undefined notions of a point, line distance along a line and distance around a circular arc.</p>	<p>Perform and identify all rotations (counterclockwise and clockwise) and reflections in the coordinate plane; describes rotational symmetry and line of symmetry; uses given geometric theorems and properties of rigid motions, lines, angles, triangles and parallelograms to solve routine problems; identifies and draws congruent figures through rigid motions; draws the transformed figure given a figure and a transformation; uses appropriate tools (including technology) to construct basic geometric components of construction, i.e., copying a segment, and copying an angle; uses the rules of transformations to solve problems and describes them as functions</p>	<p>Perform and Identify a sequence of composite transformations of shapes in the coordinate plane; explains a composition of transformations; creates new images by reflecting across lines other than the x- or y-axis and rotating about a center that is not the origin; describes all transformations as functions that map inputs to outputs; understands and shows that congruence is preserved through rigid motion; makes geometric constructions, i.e., bisecting an angle, bisecting a segment, including the perpendicular bisector of a line segment; constructs perpendicular and parallel lines given a line and a point not on the line; develops proofs involving triangles, polygons, lines, and angles; provides justifications for geometric statements and arguments; Formulate a complete line of geometric reasoning to prove a specific geometric statement; connects the definition of congruence using rigid motions to develop criteria for triangle congruence; makes drawings given a figure and a sequence of transformations; uses precise geometric terminology to specify a sequence of transformations that will carry a figure onto itself or another.</p>	<p>Analyzes others' geometric theorems and properties of rigid motions, lines, angles, triangles, and parallelograms when solving problems; determines the validity of geometric arguments and revise invalid geometric arguments; uses a variety of tools and methods to construct equilateral triangles, squares, and regular hexagons inscribed in circles; proves theorems about lines, angles, triangles, and polygons.</p>
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RANGE	SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY	<p>Identifies transformation relationships in simple geometric figures in cases where an image is provided; identifies the parts of a right triangle.</p>	<p>Identifies similar figures and scale changes; identifies composites of similarity transformations; identifies transformation relationships in simple geometric figures; uses properties of similarity as justifications;; identifies trigonometric ratios for a right triangle: uses provided geometric relationships in the coordinate plane to solve problems involving area and perimeter; uses trigonometric ratios and the Pythagorean Theorem to determine the unknown side lengths of a right triangle; applies geometric concepts to describe, model and solve applied problems using the Pythagorean Theorem, geometric shapes, their measures and properties.</p>	<p>Apply congruence or similarity criteria to solve problems Construct and analyze scale changes of geometric figures; solves problems involving similar figures;; uses transformations to determine relationships among geometric figures and to solve problems; develops proofs involving similar triangles, using properties and prior knowledge to formulate the argument; Formulate a complete line of geometric reasoning to prove a specific geometric statement; Articulate reasoning for the AA Similarity theorem using similarity transformations and its properties; Explain and use the relationship between the sine and cosine of complementary angles; uses similarity transformations with right triangles to define trigonometric ratios for acute angles; Uses trig ratios to find missing angles in a right triangle; applies geometric concepts and trigonometric ratios to describe, model and solve applied problems (including design problems) related to the Pythagorean Theorem, density, geometric shapes, their measures and properties; analyzes other's work using geometric relationships in the coordinate plane to solve problems involving area, perimeter and ratios of lengths</p>	<p>uses transformations and congruence and similarity criteria for triangles to prove relationships among geometric figures and to solve problems; uses congruence & similarity criteria to prove relationships among composite figures; derives the formula $A = \frac{1}{2} ab \sin(C)$ for the area of a triangle;</p>
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RANGE	CIRCLES	Identifies an inscribed angle, radius, and chords of a circle; Identifies arcs and sectors of a circle; identifies tangents and secants of a circle; solves problems involving area and circumference of a circle.	Applies properties and theorems of angles, segments, and arcs in circles to solve problems;	Describe and apply the properties of segments and angles formed by chords of circles; describes and applies the relationship between the tangent and the radius; constructs an inscribed and circumscribed circle of a triangle; applies properties and theorems of angles, segments and arcs in circles to solve problems and model relationships; completes the square to find the center and radius of a circle given by an equation; determines the arc length and area of a sector of a circle both mathematically and contextually; Formulate a complete line of geometric reasoning to prove a specific geometric statement.	Articulates reasoning to prove that all circles are similar through similarity transformations and their properties; proves quadrilateral properties that are inscribed; derives the formula for arc length and area of a sector of a circle
RANGE	EXPLORING GEOMETRIC PROPERTIES WITH EQUATIONS	Able to find slope and distance between two points.	Identifies key components from the equation of a circle; Using coordinates computes the perimeter of polygons and area of triangles and rectangles in the coordinate plane; identifies the equations of lines as parallel, perpendicular, or neither; identifies the coordinates of the midpoint of a line segment	Derives the equation of a circle with a given center and radius using the Pythagorean Theorem; identifies a point on a line segment that partitions the line to a given ratio; uses slope, prove that lines are parallel or perpendicular in both mathematical and contextual situations; formulates a complete line of geometric reasoning to prove a specific geometric statement.	Derives the equation of a circle by completing the square; derives the equation for a parabola given a focus and directrix; proves geometric theorems using coordinates and shapes in the plane

RANGE	GEOMETRIC MEASUREMENT AND DIMENSIONS	Using formulas determines the volume of cylinders, pyramids, cones, and spheres; identifies the shapes of two-dimensional cross-sections of three-dimensional objects, when cross sections are parallel or perpendicular to a base/face.	Solve mathematical and contextual problems that involve the volume of cylinders, pyramids, cones, and spheres; identifies the shapes of two-dimensional cross-sections of three-dimensional objects when not parallel or perpendicular to a base/face.	Solve mathematical and contextual problems that involve the volume of composite figures; provides an informal argument for the formula for the circumference of a circle and area of a circle; analyzes the shapes of two-dimensional cross-sections of three-dimensional objects and three-dimensional objects generated from the transformations of two-dimensional figures.	Provide an informal argument for a formula related to the volume of a cylinder, pyramid, or cone; critiques volume formulas to solve mathematical and contextual problems that involve cylinders, pyramids, cones, and spheres: uses dissection arguments, Cavalieri's principle and informal limit arguments to support the formula for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone; solves problems using modeling with three-dimensional and two-dimensional figures, both abstractly and contextually.
RANGE	MODELING WITH GEOMETRY	Knows the properties of geometric shapes; computes the area of triangle, rectangles, and circles.	Describes objects in terms of geometric shapes and their measures and properties; computes the area of quadrilaterals	Finds areas of regular polygons; Uses modeling with and real-world ideas such as density to solve problems involving area, volume, and design problems.	Applies geometric method to create and solve design mathematical modeling problems given constraints.
RANGE	CONDITIONAL PROBABILITY & RULES OF PROBABILITY	Determines when a two-way frequency table is an appropriate display for a set of data; identify subsets of a sample space: identify $P(A)$, $P(A \text{ and } B)$ $p(B)$; knows the difference between permutations and combinations	Uses permutations and combinations to solve problems; constructs a two-way frequency table with given data using appropriate categories; Calculates relative frequencies from a two-way table	Interpret 2-way frequency tables of data and use the two-way table to decide if events are independent; calculate probabilities for events, including independent, conditional and joint probabilities such as addition and multiplication rules; describe events as subsets of a sample space using characteristics of the outcomes	Determines flaws in reasoning used to solve probability problems in context