Assessment Development Guide

Educator Resource

Mathematics: Grade 10

This document is intended to describe how the Kansas assessments align to the Kansas standards. It illustrates how standards, evidence statements, performance level descriptors (PLDs), and depth of knowledge influence the Kansas summative assessment.

The 2017 Kansas mathematics standards serve as the foundation of the assessment. These standards are grouped into clusters, and the assessment mirrors these same groupings. By assessing at the cluster level, it is possible to highlight student mastery of the connected material contained in the standards. Emphasis on particular clusters captures the focus, coherence, and rigor of the standards. These content emphases guide the development of each assessment.

Suggested Uses

Educators can use this document to

- better understand the standards and the assessment.
- understand what is expected of students to achieve performance level 3.
- check the alignment of curriculum and learning activities.
- ensure that long-range instructional plans match the major emphases of the standards.
- apply standards at the level of rigor necessary to allow students to demonstrate success within a balanced assessment system.
- develop learning goals.
- build a greater understanding of student, grade-level, school, and district results and plan for future learning activities accordingly.
- provide professional development opportunities within a school or district for vertical team planning, grade-level planning, and professional learning communities.

Evidence Statements

Evidence statements are derived from the content standards. They describe the knowledge and skills that an assessment item or task elicits from students.

Evidence statements are also designed to provide guidance for teachers in creating classroom-learning opportunities that align with the expectations of the standards. Evidence statements should not be used as a checklist of student understanding, nor should they be used to limit instructional practices.

Performance Level Descriptors

To help educators and parents understand students' performance at each level, performance level descriptors (PLDs) are available for each test. PLDs define the knowledge, skills, and processes that students likely demonstrate at different levels of proficiency within the reporting categories (1, 2, 3, 4). PLDs are not inclusive: they do not describe all possible skills students could demonstrate at each level. PLDs should not be viewed as checklists of what students should know or be able to do.

These PLDs appear on Individual Student Reports and describe student performance on the assessment.

Level 1: A student at Level 1 shows a *limited* ability to understand and use the skills and knowledge needed for post-secondary readiness.

Level 2: A student at Level 2 shows a *basic* ability to understand and use the skills and knowledge needed for post-secondary readiness.

Level 3: A student at Level 3 shows an *effective* ability to understand and use the skills and knowledge needed for post-secondary readiness.

Level 4: A student at Level 4 shows an *excellent* ability to understand and use the skills and knowledge needed for post-secondary readiness.

Detailed descriptions of performance levels for grade 10 mathematics are contained within this document.

Depth of Knowledge

The Kansas Assessment Program (KAP) uses Webb's depth of knowledge (DOK) framework to classify each assessment item according to the level of cognitive demand required by students. The four DOK levels **do not** directly correspond to the four performance levels of the KAP summative assessments.

DOK is a measure of cognitive complexity, not a measure of difficulty. Item difficulty is determined by the percentage of students who correctly respond to an item. It is possible for a DOK 2 item to be very difficult and for a DOK 3 item to be relatively easy.

Items within an assessment include a range of DOK levels and correspond to the levels of cognitive complexity required by the content standards. There are four DOK levels, as outlined below.

Level 1 Recall and Reproduction: Recall a fact, term, definition, principle, or concept; perform a simple procedure.

Level 2 Basic Application of Skills and Concepts: Apply conceptual knowledge; use provided information to select appropriate procedures for a task; perform two or more steps with decision points along the way; solve routine problems; organize or display data; interpret or use simple graphs.

Level 3 Strategic Thinking: Apply reasoning, using evidence, and developing a plan to approach or solve abstract, complex, or nonroutine problems; interpret information and provide justification when more than one approach is possible.

Level 4 Extended Thinking: Perform investigations or apply concepts and skills that require research and problem-solving across content areas or multiple sources.

Test Content Summary

The content emphases of the Kansas summative assessment reflect the instructional emphases outlined in the Kansas State Department of Education Grade Level Focus documents.

Two groups of items make up the summative assessment.

1. Skills and Concepts:
Items that assess Skills and Concepts align to one or more evidence statements within a single cluster and require students to perform operations, apply formulas, compare and classify information, and demonstrate conceptual understanding. These items involve applying knowledge of mathematical concepts and executing procedures to solve problems.

2. Strategic Thinking and Reasoning:
Items that assess Strategic Thinking and Reasoning align to one or more clusters and require students to use problem-solving and modeling strategies and to communicate their reasoning. These items involve analyzing complex mathematical and real-world problems, using problem-solving strategies and mathematical models to interpret and solve problems, constructing arguments to support the reasoning used, and critiquing the reasoning of others.

The remaining pages of this document are organized by cluster. The cluster descriptions include the cluster heading and a list of the standards within each cluster, as structured in the 2017 Kansas mathematics standards. Evidence statements and PLDs are shown below each cluster.

Cluster: N.RN.A Use properties of rational numbers and irrational numbers.

Standard: N.RN.1

Grade Level Focus: ● Additional

Evidence Statement			
1. The student generates equivalent numerical expressions by applying the properties of integer exponents.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to work with and apply one property of whole-number exponents with one base or variable.	Students should be able to work with and apply one property of whole-number exponents with one or two bases or variables.	Students should be able to work with and combine two properties of integer exponents with one or two bases or variables.	Students should be able to work with and combine more than two properties of integer exponents with any number of bases or variables.

Cluster: A.SSE.B Write expressions in equivalent forms to solve problems.

Standards: A.SSE.3

Grade Level Focus: ▶ Major

Evidence Statement			
1. The student writes equivalent forms of quadratic expressions to reveal and explain different properties of the quantity represented by the expression.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to write quadratic expressions with integer coefficients and a leading coefficient of 1 in an equivalent form by factoring.	Students should be able to write quadratic expressions with integer coefficients in equivalent forms.	Students should be able to write quadratic expressions with rational coefficients in equivalent forms; and identify and use the zeros to solve or explain problems.	Students should be able to identify appropriate equivalent forms of expressions to reveal and explain different properties of a quantity represented by the expression.

Cluster: A.APR.A Perform arithmetic operations on polynomials.

Standard: A.APR.1

Grade Level Focus: ◆ Supporting

Evidence Statements			
1. The student adds or subtracts polynomials. 2. The student multiplies polynomials.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to multiply a single-variable monomial and a single-variable binomial of degree 1; and add and subtract monomials and binomials with a single variable and to a degree of 1.	Students should be able to multiply two single-variable binomials of degree 2 or less; and add and subtract up to two single-variable trinomials of degree 2 or less.	Students should be able to multiply multivariable polynomials of degree 2 or less; add and subtract multivariable polynomials of degree 2 or less; and perform more than one operation on polynomials.	Students should be able to multiply multivariable polynomials of any degree; and add and subtract multivariable polynomials of any degree.

Cluster: A.APR.B Use polynomial identities to solve problems.

Standard: A.APR.4

Grade Level Focus: ● Additional

Evidence Statement			
1. The student uses patterns to generate and identify polynomial identities.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to recognize patterns in relationships expressed numerically.	Students should be able to recognize patterns in relationships expressed algebraically.	Students should be able to use patterns to generate and identify polynomial identities.	Students should be able to explain and justify polynomial identities generated from patterns.

Cluster: A.REI.B Solve equations and inequalities in one variable.

Standards: A.REI.2, A.REI.3, A.REI.5

Grade Level Focus: ▶ Major

Evidence Statements
1. The student solves linear equations and inequalities in one variable. 2. The student solves compound inequalities in one variable. 3. The student solves literal equations and inequalities. 4. The student solves simple rational equations in one variable, including identifying the number and type of real solutions that might exist for the equation and recognizing where extraneous solution(s) might arise. 5. The student solves absolute value equations in one variable, including identifying the number and type of real solutions that might exist for the equation and recognizing where extraneous solution(s) might arise. 6. The student solves square root equations in one variable, including identifying the number and type of real solutions that might exist for the equation and recognizing where extraneous solution(s) might arise. 7. The student solves quadratic equations in one variable by inspection, taking square roots, using the quadratic formula, or factoring. 8. The student recognizes when the quadratic formula gives complex solutions (no real solutions).

Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to solve linear equations in one variable; and solve quadratic equations by inspection.	Students should be able to solve linear inequalities in one variable; and solve quadratic equations by taking square roots.	Students should be able to solve compound inequalities in one variable; solve simple rational equations in one variable; solve absolute value equations in one variable, including identifying the number and type of real solutions that might exist for the equation and recognizing where extraneous solution(s) might arise; solve square root equations in one variable; and solve quadratic equations in one variable with real roots using the quadratic formula or by factoring.	Students should be able to solve literal equations and inequalities; identify the number and type of real solutions that might exist for simple rational and square root equations and recognizing where extraneous solution(s) might arise; and recognize when the quadratic formula gives complex solutions.

Cluster: A.REI.C Solve systems of equations.

Standard: A.REI.6

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student estimates solutions by graphing systems of two linear equations in two variables. 2. The student recognizes when a system of two linear equations in two variables has one solution, no solution, or infinitely many solutions. 3. The student solves a system of two linear equations in two variables in real-world and mathematical problems.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to estimate solutions by graphing systems of two linear equations in two variables.	Students should be able to recognize when systems of two linear equations in two variables have one solution, no solution, or infinitely many solutions.	Students should be able to solve systems of two linear equations in two variables in real-world and mathematical problems.	No descriptor

Cluster: A.REI.D Represent and solve equations and inequalities graphically.

Standards: A.REI.8, A.REI.9, A.REI.10

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student recognizes points on a graph as solutions to an equation in two variables. 2. The student represents and solves the equation $f(x) = g(x)$ by graphing $y = f(x)$ and $y = g(x)$ and finding the x-value of the intersection point. 3. The student graphs the solutions to a linear inequality in two variables as a half plane. 4. The student graphs the solutions to a system of linear inequality in two variables as the intersection of the corresponding half planes.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to recognize points on a graph of a linear equation as solutions to an equation in two variables.	Students should be able to recognize points on a graph of a quadratic equation as solutions to an equation in two variables; and graph a linear inequality in two variables by graphing the solutions as a half plane.	Students should be able to recognize points on a graph of an absolute value equation as solutions to an equation in two variables; represent and solve the equation $f(x) = g(x)$ by graphing $y = f(x)$ and $y = g(x)$ and finding the x-value of the intersection point; and graph a system of linear equations in two variables by graphing the solutions as the intersection of the corresponding half planes.	Students should be able to explain why the x-coordinates of the points where $f(x)$ and $g(x)$ intersect create the solution to $f(x) = g(x)$.

Cluster: F.IF.A Understand the concept of a function and use function notation.

Standards: F.IF.1, F.IF.2, F.IF.3

Grade Level Focus: ● Additional

Evidence Statements			
1. The student distinguishes between functions and nonfunctions represented in a variety of ways (algebraically, graphically, numerically in tables, or by verbal descriptions). 2. The student identifies the domain and range of linear, quadratic, and absolute value functions represented in a variety of ways (algebraically, graphically, numerically in tables, or by verbal descriptions). 3. The student recognizes that the graph of f is the graph of the equation $y = f(x)$. 4. The student evaluates linear, quadratic, and absolute value functions for inputs in their domains or outputs in their ranges. 5. The student interprets statements that use function notation in terms of a context. 6. The student recognizes patterns and uses function notation to write a linear or quadratic function whose domain is a subset of the integers.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to distinguish between functions and nonfunctions represented graphically; and identify the domain and range of a function represented graphically.	Students should be able to distinguish between functions and nonfunctions represented algebraically, numerically in tables, or by verbal descriptions; identify the domain and range of a function represented algebraically, numerically in tables, or by verbal descriptions; and evaluate linear functions for inputs in their domains or outputs in their ranges.	Students should be able to recognize that the graph of f is the graph of the equation $y = f(x)$; evaluate quadratic and absolute value functions for inputs in their domains or outputs in their ranges; interpret statements that use function notation in terms of a context; and recognize patterns and use function notation to write a linear function whose domain is a subset of the integers.	Students should be able to recognize restrictions that need to be placed on the domain in order for an equation to represent a function; and recognize patterns and use function notation to write a quadratic function whose domain is a subset of the integers.

Cluster: F.IF.B Interpret functions that arise in applications in terms of the context.

Standards: F.IF.4, F.IF.5, F.IF.6

Grade Level Focus: ◆ Supporting

Evidence Statements			
1. The student interprets key features of a function that models a relationship between two quantities represented in a variety of ways. 2. The student sketches graphs of functions showing key features, given a description of a relationship between two quantities. 3. The student relates the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. 4. The student calculates and interprets the average rate of change of a linear function (presented symbolically or as a table) over a specified interval and estimates the rate of change of a linear function from a graph.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to interpret key features of linear functions that model relationships between two quantities; and relate the domain of a linear function to its graph.	Students should be able to interpret key features of quadratic functions that model relationships between two quantities; relate the domain of a quadratic or absolute value function to its graph; and estimate the average rate of change of a linear function from a graph.	Students should be able to interpret key features of absolute value functions that model relationships between two quantities; relate the domain of a function to the quantitative relationship it describes; and calculate and interpret the average rate of change of a linear function over a specified interval.	Students should be able to interpret key features of advanced functions that model nonlinear situations; and relate the domain of an advanced function that model a nonlinear situation to its graph and the quantitative relationship it describes.

Cluster: F.IF.C Analyze functions using different representations.

Standards: F.IF.7, F.IF.8, F.IF.9

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student graphs linear, quadratic, and absolute value functions expressed symbolically and shows key features of the graph. 2. The student writes linear functions in different forms, such as slope-intercept, standard, and point-slope, to reveal and explain different properties of the function. 3. The student compares properties of two functions represented in a variety of ways (algebraically, graphically, numerically in tables, or by verbal descriptions).			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to graph key features of linear functions and show key features of the graph; identify equivalent forms of linear functions; and compare properties of two linear functions represented in different ways.	Students should be able to graph key features or quadratic functions and show key features of the graph; write linear functions in slope-intercept form and identify intercepts and rate of change; and compare properties of two quadratic functions or two absolute value functions represented graphically.	Students should be able to graph key features of absolute value functions and show key features of the graph; write linear functions in standard and point-slope forms and identify intercepts and rate of change; and compare properties of two different types of functions represented in the same way.	Students should be able to compare properties of two different types of functions represented in different ways; and determine which equivalent form reveals the properties of a function.

Cluster: F.BF.A Build a function that models a relationship between two quantities.

Standard: F.BF.1

Grade Level Focus: ◆ Supporting

Evidence Statements			
1. The student uses functions to model real-world linear, quadratic, and absolute value relationships. 2. The student combines multiple functions to model complex relationships.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to model real-world linear functions; and combine two linear functions, without context.	Students should be able to model real-world quadratic functions; and combine two quadratic functions or one linear and one quadratic function to model a real-world problem.	Students should be able to model real-world absolute value functions; and combine an absolute value function with another function to model a real-world problem.	Students should be able to analyze and interpret a real-world problem by combining any number of functions.

Cluster: F.BF.B Build new functions from existing functions.

Standard: F.BF.3

Grade Level Focus: ● Additional

Evidence Statements			
1. The student identifies transformations of parent functions from equations and graphs. 2. The student writes functions formed by transformations of parent functions. 3. The student graphs and explains the changes made to a parent function.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify, write, and graph transformations of a linear parent function.	Students should be able to identify, write, and graph transformations of a quadratic parent function.	Students should be able to identify, write, and graph transformations of an absolute value parent function.	Students should be able to explain the changes made to the graph of a parent function.

Cluster: G.CO.A Experiment with transformations in the plane.

Standards: G.CO.1, G.CO.2

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student describes the effects of sequences of rotations, reflections, and translations on lines and angles in the plane and verifies that lines and angles are congruent. 2. The student identifies any line and/or rotational symmetry within a figure. 3. The student recognizes transformations (rotations, reflections, and translations) as functions and uses points in the plane as inputs to give other points as outputs.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify a rotation, reflection, or translation of a line or angle in the plane; and identify line symmetry within a figure.	Students should be able to identify a sequence of rotations, reflections, and translations of a line or angle in the plane; and identify rotational symmetry within a figure.	Students should be able to describe the effects of rotations, reflections, and translations on lines and angles in the plane and verify that lines and angles are congruent.	Students should be able to recognize transformations (rotations, reflections, and translations) as functions and use points in the plane as inputs to give other points as outputs.

Cluster: G.CO.B Understand congruence in terms of rigid motions.

Standards: G.CO.3, G.CO.4

Grade Level Focus: ◆ Supporting

Evidence Statements			
1. The student describes a sequence of rotations, reflections, and translations between two congruent figures using the coordinate and non-coordinate planes. 2. The student constructs a new figure after the original figure is rotated, reflected, or translated. 3. The student uses rotations, reflections, and translations to show that two triangles are congruent if corresponding sides and angles are congruent.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to describe a rotation, reflection, or translation of two congruent figures in the coordinate and non-coordinate planes.	Students should be able to describe a sequence of two transformations (rotations, reflections, and translations) between two congruent figures in the coordinate and non-coordinate planes; and construct a new figure after a figure is rotated, reflected, or translated.	Students should be able to describe a sequence of any number of transformations (rotations, reflections, and translations) between two congruent figures in the coordinate and non-coordinate planes; show that two triangles are congruent if corresponding sides and angles are congruent; and use a sequence of rotations, reflections, and translations to construct a new figure in the plane and determine the two figures are congruent.	Students should be able to explain why two figures are congruent in relation to a sequence of rotations, reflections, and translations.

Cluster: G.CO.C Construct arguments about geometric theorems using rigid transformations and/or logic.

Standards: G.CO.7, G.CO.8, G.CO.9, G.CO.10

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student constructs arguments related to theorems about the congruency of lines and angles. 2. The student constructs arguments related to theorems about the relationship within one triangle. 3. The student constructs arguments related to theorems about the congruency of two triangles or relationships between two triangles. 4. The student constructs arguments related to theorems about the congruency of parallelograms.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify lines, angles, and necessary components of triangles and parallelograms to construct arguments related to theorems.	Students should be able to identify the property being used and construct arguments related to theorems involving lines, angles, triangles, and parallelograms.	Students should be able to construct arguments and complete proofs involving congruency of lines, angles, triangles, and parallelograms.	Students should be able to identify errors in arguments and proofs involving lines, angles, triangles, and parallelograms and explain the reasoning; and use congruence criteria to solve contextual problems.

Cluster: G.CO.D Make geometric constructions.

Standard: G.CO.11

Grade Level Focus: ● Additional

Evidence Statement			
1. The student makes geometric constructions of figures with a variety of tools and methods.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify congruent angles or segments using a variety of tools and methods.	Students should be able to replicate congruent angles or segments using a variety of tools and methods.	Students should be able to construct geometric figures based on the relationships between the objects, using a variety of tools and methods.	Students should be able to devise methods for constructing geometric figures and verify that the constructions are accurate.

Cluster: G.SRT.A Understand similarity in terms of similarity transformations.

Standards: G.SRT.1, G.SRT.2, G.SRT.3, G.SRT.4

Grade Level Focus: ● Additional

Evidence Statements			
1. The student recognizes transformations (dilations, rotations, reflections, and translations) as functions and uses points in the plane as inputs to give other points as outputs. 2. The student describes the effects of dilations on two-dimensional figures. 3. The student constructs a new figure after a sequence of transformations to the original figure. 4. The student describes a sequence of transformations between two similar figures using the coordinate and non-coordinate planes. 5. The student determines whether two-dimensional figures are similar and explains why they are similar using the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify a dilation as a transformation of two similar figures in the non-coordinate plane.	Students should be able to identify dilations of two-dimensional figures as functions that take points in the plane as inputs and give other points as outputs; and determine whether two-dimensional figures are similar.	Students should be able to construct a new figure after a sequence of transformations and describe a sequence of transformations with dilations of two similar figures using the coordinate and non-coordinate planes.	Students should be able to recognize transformations (dilations, rotations, reflections, and translations) as functions and use points in the plane as inputs to give other points as outputs; and explain why two figures are similar in relation to a sequence of transformations.

Cluster: G.SRT.B Construct arguments about theorems involving similarity.

Standards: G.SRT.5, G.SRT.6

Grade Level Focus: ◆ Supporting

Evidence Statements			
1. The student construct arguments related to theorems about the similarity of triangles. 2. The student uses congruence and similarity criteria for triangles to solve problems and prove relationships in geometric figures.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify lines, angles, and necessary components of triangles to construct arguments related to theorems.	Students should be able to identify the property being used and construct arguments about the similarity of triangles.	Students should be able to construct arguments and complete proofs about the similarity of triangles; and construct arguments and complete proofs about the similarity and congruence of triangles in geometric figures.	Students should be able to identify errors in arguments or proofs about the similarity and congruence of triangles and explain the reasoning; identify errors in arguments or proofs about the similarity and congruence of triangles in geometric figures and explain the reasoning; and use congruence and similarity criteria for triangles to solve contextual problems.

Cluster: G.SRT.C Define trigonometric ratios and solve problems involving right triangles.

Standards: G.SRT.7, G.SRT.8, G.SRT.9

Grade Level Focus: ◆ Supporting

Evidence Statements			
1. The student uses the definitions of trigonometric ratios for acute angles in a right triangle. 2. The student uses similar triangles to define and determine trigonometric ratios in right triangles. 3. The student explains and uses the relationship between the sine and cosine of complementary angles. 4. The student uses trigonometric ratios and the Pythagorean theorem to solve problems involving right triangles in mathematical or real-world context.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify trigonometric ratios and use the Pythagorean theorem to solve for the missing side in a right triangle in familiar real-world or mathematical contexts, with scaffolding.	Students should be able to define trigonometric ratios and know the relationship between the sine and cosine of complementary angles; and use the Pythagorean theorem in unfamiliar problems and trigonometric ratios in familiar problems to solve for the missing side in a right triangle, with some scaffolding.	Students should be able to use the Pythagorean theorem, trigonometric ratios, and the sine and cosine of complementary angles to solve unfamiliar problems involving right triangles, finding the missing side or missing angle of a right triangle, with minimal scaffolding.	Students should be able to solve complex or multistep problems involving right triangles, without scaffolding.

Cluster: G.C.A Understand and apply theorems about circles.

Standards: G.C.1, G.C.2, G.C.3

Grade Level Focus: ● Additional

Evidence Statements			
1. The student constructs arguments that all circles are similar. 2. The student identifies and describes relationships among inscribed angles, radii, and chords. (Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; and the radius of a circle is perpendicular to the tangent where the radius intersects the circle.) 3. The student constructs arguments using properties of polygons inscribed and circumscribed about circles.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify angles, radii, diameters, and chords of a circle, given a graph of the circle.	Students should be able to identify the center of a circle and determine the scale factor of a dilation of circle; and describe relationships among parts of a circle.	Students should be able to construct arguments and complete proofs about the similarity of circles; and construct arguments and complete proofs using properties of polygons inscribed and circumscribed about circles.	Students should be able to identify errors in arguments and proofs about the similarity of circles and explain the reasoning; and identify errors in arguments and proofs using properties of polygons inscribed and circumscribed about circles.

Cluster: G.GPE.A Translate between the geometric description and the equation for a conic section.

Standard: G.GPE.1

Grade Level Focus: ● Additional

Evidence Statements			
1. The student writes the equation of a circle, given the center and radius or a graph of the circle. 2. The student uses the center and the radius to graph the circle in the coordinate plane.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify center, radius, and diameter of a circle, given a graph of the circle.	Students should be able to write an equation for a circle, given the radius and center; and write an equation for a circle with a center at the origin, given a graph of the circle.	Students should be able to write an equation for a circle, given a graph of the circle; and graph a circle, given the center and radius.	Students should be able to compare features of circles by analyzing their graphs and equations.

Cluster: G.GPE.B Use coordinates to prove simple geometric theorems algebraically.

Standards: G.GPE.6, G.GPE.7, G.GPE.8

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student uses coordinates to prove simple geometric theorems algebraically, including the use of slope, distance, and midpoint formulas to solve real-world and mathematical problems. 2. The student determines whether lines or sides of a figure are parallel, intersecting, or perpendicular. 3. The student writes equations of parallel and perpendicular lines. 4. The student uses and proves the slope criteria for parallel and perpendicular lines. 5. The student uses coordinates to compute perimeters of polygons and areas of triangles and rectangles, including the use of the distance and midpoint formulas.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify slope of parallel and perpendicular lines; determine whether lines are parallel, intersecting, or perpendicular; and write equations of parallel line, given a graph.	Students should be able to use coordinates to prove simple geometric theorems involving slope; determine whether sides of a figure are parallel, intersecting, or perpendicular; write equations of parallel and perpendicular lines; and compute the area and perimeter of a regular polygon with four or fewer sides, given a graph and using coordinates.	Students should be able to prove or disprove a claim about a figure using geometric theorems involving distance and midpoint formulas; use and prove the slope criteria for parallel and perpendicular lines; and graph a regular polygon, given coordinates and calculate the area and perimeter.	Students should be able to prove or disprove a claim, given a real-world problem and explain reasoning using logic; find the area and perimeter of a real-world shape using scale and estimation; and compute the perimeter and area of a variety of polygons, including convex, concave, and irregularly shaped polygons.

Cluster: G.MG.A Apply geometric concepts in modeling situations.

Standards: G.MG.1, G.MG.2, G.MG.3

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student uses geometric shapes, measurements, and properties to describe objects. 2. The student applies concepts of density and displacement based on area and volume in modeling situations. 3. The student applies geometric methods to solve design problems.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify geometric shapes that can describe two-dimensional, real-world objects; and create a visual representation of a design problem.	Students should be able to identify geometric shapes that can describe three-dimensional, real-world objects; and solve a design problem using a geometric model.	Students should be able to describe two- and three-dimensional, real-world objects using geometric shapes, measurements, and properties; interpret the results of geometric models used to solve design problems; and apply concepts of density and displacement based on area and volume in modeling situations.	Students should be able to explain and describe real-world objects composed of multiple geometric shapes and use the measurements and properties to solve a problem; and justify geometric methods used to solve design problems.

Cluster: S.ID.A Summarize, represent, and interpret data on a single count or measurement variable.

Standards: S.ID.1, S.ID.2

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student uses statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. 2. The student interprets the differences in shape, center, and spread in the context of data sets represented by dot plots, histograms, and box plots. 3. The student interprets the effects of outliers on the shape, center, and spread of a data set.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to describe one data set in terms of center and spread, represented by dot plots, histograms, and box plots.	Students should be able to describe two or more different data sets in terms of shape, center, and spread, represented by dot plots, histograms, and box plots; identify the center of the data for data sets; and identify outliers in data sets.	Students should be able to use appropriate statistics to interpret, explain, and summarize differences in shape, center, and spread of two or more different data sets, including the effect of outliers; and identify the appropriate measure for representing the center of the data for data sets.	Students should be able to interpret data to explain why a data value is an outlier; and identify the appropriate choice of spread as interquartile range or standard deviation based on the selection of center.

Cluster: S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables.

Standards: S.ID.4, S.ID.5

Grade Level Focus: ◆ Supporting

Evidence Statements			
1. The student summarizes categorical data for two categories in a two-way frequency table. 2. The student uses two-way frequency tables to interpret relative frequencies in the context of the data and identify possible associations and trends in the data. 3. The student represents data on a scatter plot and describes how the two quantitative variables are related. 4. The student solves problems in the context of data represented on a scatter plot, given a linear function or by writing a linear function to fit the data.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to construct a two-way frequency table from given categorical data; represent data on a scatter plot; and interpret scatter plots to describe the form, strength, and direction of the relationship.	Students should be able to calculate frequencies from categorical data in a two-way frequency table; and solve problems in the context of data represented on a scatter plot, given a linear function to fit the data.	Students should be able to identify possible associations between variables in two-way frequency tables; and solve problems in the context of data represented on a scatter plot by writing a linear function to fit the data.	Students should be able to interpret and use relative frequencies from a two-way table to describe possible associations and trends in the data to make predictions in real-world situations.

Cluster: S.ID.C Interpret linear models.

Standard: S.ID.6

Grade Level Focus: ▶ Major

Evidence Statement			
1. The student interprets the slope and the intercept of a linear model in the context of the data.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify the slope and intercept of a linear model.	Students should be able to write a function of a linear model.	Students should be able to interpret the slope and intercept of a linear model in the context of the data.	Students should be able to interpret and explain unreliable extrapolations and limitations of predictions made from linear models.