Mathematics: Content Knowledge (5161*)
Match to Common Core State Standards

Knowledge and skills assessed are designated by their outline numbering in the test content specifications that appear on page 2.
For example, **II**K is **II** Algebra / K Understands the concept of rate of change of nonlinear functions.

Common Core Mathematics Domain		Grade Level			
		6	**7**	**8**	**High School**
NUMBER and OPERATIONS	Ratios and Proportional Relationships (RP)	**I**G	**I**G		
	The Number System (NS)	**I**D, **II**J, **IV**J	**I**D	**I**D	
	The Real Number System (N-RN)				**I**A, **I**B
	Quantities (N-Q)				**I**C, **I**H
	The Complex Number System (N-CN)				**I**D, **I**E
	Vector and Matrix Quantities (N-VM)				**I**F
ALGEBRA	Expressions and Equations (EE)	**II**A, **II**F, **II**G, **III**D	**II**A, **II**B, **II**F, **II**G, **III**D	**I**A, **I**I, **I**J, **II**A, **II**B, **II**F, **II**G, **II**H, **II**I	
	Seeing Structure in Expressions (A-SSE)				**II**A
	Arithmetic with Polynomials and Rational Expressions (A-APR)				**II**B, **II**C, **II**D, **II**E, **II**J
	Creating Equations (A-CED)				**II**F
	Reasoning with Equations and Inequalities (A-REI)				**I**F, **II**G, **II**H, **II**I, **II**M
FUNCTIONS and their graphs	Functions (F)			**II**L, **III**A, **III**C, **III**D	
	Interpreting Functions (F-IF)				**II**K, **II**L, **II**M, **III**A, **III**B, **III**C
	Building Functions (F-BF)				**III**D, **III**E, **VI**B
	Linear, Quadratic, and Exponential Models (F-LE)				**III**F, **III**K, **VI**A
	Trigonometric Functions (F-TF)				**III**G, **III**H, **III**I, **III**K
GEOMETRY and MEASUREMENT	Geometry (G)	**IV**J, **IV**K, **IV**L, **IV**M, **IV**N	**I**G, **IV**K, **IV**L, **IV**M, **IV**N	**IV**A, **IV**B, **IV**D, **IV**K, **IV**M	
	Congruence (G-CO)				**IV**A, **IV**B, **IV**C, **IV**D
	Similarity, Right Triangles, and Trigonometry (G-SRT)				**IV**B, **IV**D, **IV**E, **IV**F
	Circles (G-C)				**IV**G, **IV**H
	Expressing Geometric Properties with Equations (G-GPE)				**IV**I, **IV**J
	Geometric Measurement and Dimension (G-GMD)				**IV**K, **IV**L
	Modeling with Geometry (G-MG)				**IV**M
STATISTICS and PROBABILITY	Statistics and Probability (SP)	**V**A	**V**A, **V**D, **V**F, **V**G, **V**J, **VI**F	**V**B, **V**C	
	Interpreting Categorical and Quantitative Data (S-ID)				**V**A, **V**B, **V**C
	Making Inferences and Justifying Conclusions (S-IC)				**V**D, **V**E
	Conditional Probability and the Rules of Probability (S-CP)				**V**F, **V**G, **V**J, **VI**F, **VI**G
	Using Probability to Make Decisions (S-MD)				**V**H, **V**I

* Mathematics: Content Knowledge (5161) is a newly revised and regenerated test and replaces Mathematics: Content Knowledge (0061), Fall 2013.

Key
- A vacant cell indicates that there are no CCSS Standards at that grade level in that Domain.
- A dash (—) indicates that the test does not have content specifications matching the Domain.

Mathematics: Content Knowledge (5161) Match to Common Core State Standards

I. Number and Quantity

A. Understands the properties of exponents.

B. Understands the properties of rational and irrational numbers, and the interactions between those sets of numbers.

C. Understands how to solve problems by reasoning quantitatively (e.g., dimensional analysis, reasonableness of solutions).

D. Understands the structure of the natural, integer, rational, real, and complex number systems and how the basic operations $(+, -, \times, \text{and} \div)$ on numbers in these systems are performed.

E. Understands how to work with complex numbers when solving polynomial equations and rewriting polynomial expressions.

F. Understands how to perform operations on matrices and how to use matrices in applications.

G. Understands how to solve problems involving ratios, proportions, averages, percents, and metric and traditional unit conversions.

H. Knows how to analyze both precision and accuracy in measurement situations.

I. Understands various ways to represent and compare very large and very small numbers (e.g., scientific notation, orders of magnitude).

J. Understands how to both estimate and perform calculations on very large and very small quantities.

II. Algebra

A. Understands how to write algebraic expressions in equivalent forms.

B. Understands how to perform arithmetic operations on polynomials.

C. Understands the relationship between zeros of polynomial functions (including their graphical representation) and factors of the related polynomial expressions.

D. Understands how to use polynomial identities (e.g., difference of squares, sum and difference of cubes) to solve problems.

E. Understands how to rewrite rational expressions and perform arithmetic operations on rational expressions.

F. Understands how to create equations and inequalities that describe relationships.

G. Understands how to justify the reasoning process used to solve equations, including analysis of potential extraneous solutions.

H. Understands how varied techniques (e.g., graphical, algebraic) are used to solve equations and inequalities in one variable.

I. Understands how varied techniques (e.g., graphical, algebraic, matrix) are used to solve systems of equations and inequalities.

J. Understands the properties of number systems under various operations.

K. Understands the concept of rate of change of nonlinear functions.

L. Understands the concepts of intercept(s) of a line and slope as a rate of change.

M. Understands how to find the zero(s) of functions.

III. Functions

A. Understands the function concept and the use of function notation.

B. Understands how to find the domain and range of a function and a relation.

C. Understands how function behavior is analyzed using different representations. (e.g., graphs, mappings, tables).

D. Understands how functions and relations are used to model relationships between quantities.

E. Understands how new functions are obtained from existing functions (e.g., compositions, transformations, inverses).

F. Understands differences between linear, quadratic, and exponential models, including how their equations are created and used to solve problems.

G. Understands how to construct the unit circle and how to use it to find values of trigonometric functions for all angle measures in their domains.

H. Understands how periodic phenomena are modeled using trigonometric functions.

I. Understands the application of trigonometric identities (e.g., Pythagorean, double angle, half angle, sum of angles, difference of angles).

J. Knows how to interpret representations of functions of two variables (e.g., three-dimensional graphs, tables).*

K. Understands how to solve equations (e.g., trigonometric, logarithmic, exponential).

IV. Geometry

A. Understands transformations in a plane.

B. Understands how to prove geometric theorems such as those about lines and angles, triangles, and parallelograms.

C. Understands how geometric constructions are made with a variety of tools and methods.

D. Understands congruence and similarity in terms of transformations.

E. Understands how trigonometric ratios are defined in right triangles.

F. Understands how trigonometry is applied to general triangles.

G. Understands and applies theorems about circles.

H. Understands arc length and area measurements of sectors of circles.

I. Knows how to translate between a geometric description (e.g., focus, asymptotes, directrix) and an equation for a conic section.

J. Understands how to use coordinate geometry to algebraically prove simple geometric theorems.

K. Understands how perimeter, area, surface area, and volume formulas are used to solve problems.

L. Knows how to visualize relationships (e.g., cross section, nets, rotations) between two-dimensional and three-dimensional objects.

M. Knows how to apply geometric concepts in real-world situations.

N. Understands the properties of parallel and perpendicular lines, triangles, quadrilaterals, polygons, and circles and how they can be used in problem solving.

V. Probability and Statistics

A. Understands how to summarize, represent, and interpret data collected from measurements on a single variable (e.g., box plots, dot plots, normal distributions).

B. Understands how to summarize, represent, and interpret data collected from measurements on two variables, either categorical or quantitative (e.g., scatterplots, time series).

C. Understands how to create and interpret linear regression models (e.g., rate of change, intercepts, correlation coefficient).

D. Understands statistical processes and how to evaluate them.

E. Understands how to make inferences and justify conclusions from samples, experiments, and observational studies.

F. Understands the concepts of independence and conditional probability and how to apply these concepts to data.

G. Understands how to compute probabilities of simple events, probabilities of compound events, and conditional probabilities.

H. Knows how to make informed decisions using probabilities and expected values.

I. Understands how to use simulations to construct experimental probability distributions and to make informal inferences about theoretical probability distributions.

J. Understands how to find probabilities involving finite sample spaces and independent trials.

VI. Discrete Mathematics

A. Understands sequences (e.g., arithmetic, recursively defined, geometric).

B. Is familiar with how recursion can be used to model various phenomena.

C. Has knowledge of equivalence relations.*

D. Understands the differences between discrete and continuous representations (e.g., data, functions) and how each can be used to model various phenomena.*

E. Understands basic terminology and symbols of logic.*

F. Understands how to use counting techniques such as the multiplication principle, permutations, and combinations.

G. Understands basic set theory (e.g., unions, differences, Venn diagrams).

VII. Calculus*

A. Understands the meaning of a limit of a function and how to calculate limits of functions, determine when the limit does not exist, and solve problems using the properties of limits.

B. Understands the derivative of a function as a limit, as the slope of a line tangent to a curve, and as a rate of change.

C. Understands how to show that a particular function is continuous.

D. Knows the relationship between continuity and differentiability.

E. Understands how to approximate derivatives and integrals numerically.

F. Understands how and when to use standard differentiation and integration techniques.

G. Understands how to analyze the behavior of a function (e.g., extrema, concavity, symmetry).

H. Understands how to apply derivatives to solve problems (e.g., related rates, optimization).

I. Understands the foundational theorems of calculus (e.g., fundamental theorems of calculus, mean value theorem, intermediate value theorem).

J. Understands integration as a limit of Riemann sums.

K. Understands how to use integration to compute area, volume, distance, or other accumulation processes.

L. Knows how to determine the limits of sequences, if they exist.

M. Is familiar with simple infinite series.

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* This topic does not directly link to a standard at these grade levels in the CCSS. It is included in the test because it has been identified by experts in the field as necessary to assess for beginning teachers seeking licensure.

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