PSAT/NMSQT Skill Category and Description of Skills	Colorado Math: Academic Standards 2009 Course/ Level	Standard	Standard ID
Algebra and Functions Solve problems using algebraic expressions and symbols to represent relationships, patterns and functions of different types.	High School	a. Determine when a relation is a function using a table, a graph, or an equation	P.1.a
	High School	b. Demonstrate the relationship between all representations of linear functions using point-slope, slope-intercept, and standard form of a line	P.1.b
	High School	c. Represent linear, quadratic, absolute value, power, exponential, logarithmic, rational, trigonometric (sine and cosine), and step functions in a table, graph, and equation and convert from one representation to another	P.1.c
	High School	d. Determine the inverse (expressed graphically or in tabular form) of a function from a graph or table	P.1.d
	High School	e. Categorize sequences as arithmetic, geometric, or neither and develop formulas for the general terms related to arithmetic and geometric sequences	P.1.e
	High School	a. Evaluate a function at a given point in its domain given an equation (including function notation), a table, and a graph	P.2.a
	High School	b. Identify the domain and range of a function given an equation (including function notation), a table, and a graph	P.2.b
	High School	c. Identify intercepts, zeros (or roots), maxima, minima, and intervals of increase and decrease, and asymptotes of a function given an equation (including function notation), a table, and a graph	P.2.c
	High School	d. Make qualitative statements about the rate of change of a function, based on its graph or table	P.2.d
	High School	a. Apply transformations (translation, reflection, dilation) to a parent function, f(x)	P.3.a
	High School	b. Interpret the results of these transformations verbally, graphically, and symbolically	P.3.b
	High School	a. Perform and justify steps in generating equivalent expressions by identifying properties used including the commutative, associative, inverse, identity, and distributive properties	P.4.a
	High School	b. Apply the properties of positive and negative rational exponents to generate equivalent algebraic expressions including those involving nth roots	P.4.b
	High School	c. Solve equations for one variable in terms of the others	P.4.c

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PSAT/NMSQT Skill Category and Description of Skills	Colorado Math: Academic Standards 2009 Course/ Level	Standard	Standard ID
Algebra and Functions Solve problems using algebraic expressions and symbols to represent relationships, patterns and functions of different types.	High School	a. Find solutions to quadratic and cubic equations and inequalities by using appropriate algebraic methods such as factoring, completing the square, graphing or using the quadratic formula	P.5.a
	High School	b. Find solutions to equations involving power, exponential, rational and radical functions	P.5.b
	High School	c. Solve systems of linear equations and inequalities with two variables	P.5.c
	High School	a. Represent, solve, and interpret problems in various contexts using linear, quadratic, and exponential function	P.6.a
	High School	b. Represent, solve, and interpret problems involving direct and inverse variations and a combination of direct and inverse variation	P.6.b
	High School	c. Analyze the impact of interest rates on a personal financial plan	P.6.c
	High School	d. Evaluate the costs and benefits of credit	P.6.d
	High School	e. Analyze various lending sources, services, and financial institutions	P.6.e
Communication Express mathematical ideas precisely and communicate them coherently and clearly in the language and notation of mathematics.	High School	c. Explain how data might be analyzed to provide answers to a research question	D.1.c
	High School	a. Identify the characteristics of a well-designed and well-conducted survey	D.2.a
	High School	b. Identify the characteristics of a well-designed and well-conducted experiment	D.2.b
	High School	a. Identify and choose appropriate ways to summarize numerical or categorical data using tables, graphical displays, and numerical summary statistics (describing shape, center and spread) and accounting for outliers when appropriate	D.3.a
	High School	b. Define and explain how sampling distributions (developed through simulation) are used to describe the sample-to-sample variability of sample statistics	D.3.b
	High School	c. Describe the relationship between two categorical variables using percents	D.3.c
	High School	a. Define and explain the meaning of significance (both practical and statistical)	D.4.a
	High School	c. Describe factors affecting take-home pay and calculate the impact	N.2.c

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PSAT/NMSQT Skill Category and Description of Skills	Colorado Math: Academic Standards 2009 Course/ Level	Standard	Standard ID
Communication Express mathematical ideas precisely and communicate them coherently and clearly in the language and notation of mathematics.	High School	d. Design and use a budget, including income (net take-home pay) and expenses (mortgage, car loans, and living expenses) to demonstrate how living within your means is essential for a secure financial future	N.2.d
	High School	b. Demonstrate the relationship between all representations of linear functions using point-slope, slope-intercept, and standard form of a line	P.1.b
	High School	d. Make qualitative statements about the rate of change of a function, based on its graph or table	P.2.d
	High School	a. Classify polygons according to their similarities and differences	S.2.a
Connections Connect ideas from different areas of mathematics (particularly geometry and algebra) to state or solve abstract or applied problems.	High School	a. Develop simulations that demonstrate probability as a long-run relative frequency	D.5.a
Data, Statistics, and Probability Analyze data, understand descriptive statistics, make inferences and determine the likelihood that certain events will occur.	High School	a. Formulate appropriate research questions that can be answered with statistical analysis	D.1.a
	High School	b. Determine appropriate data collection methods to answer a research question	D.1.b
	High School	c. Explain how data might be analyzed to provide answers to a research question	D.1.c
	High School	a. Identify the characteristics of a well-designed and well-conducted survey	D.2.a
	High School	b. Identify the characteristics of a well-designed and well-conducted experiment	D.2.b
	High School	c. Differentiate between the inferences that can be drawn in experiments versus observational studies	D.2.c
	High School	a. Identify and choose appropriate ways to summarize numerical or categorical data using tables, graphical displays, and numerical summary statistics (describing shape, center and spread) and accounting for outliers when appropriate	D.3.a
	High School	b. Define and explain how sampling distributions (developed through simulation) are used to describe the sample-to-sample variability of sample statistics	D.3.b
	High School	c. Describe the relationship between two categorical variables using percents	D.3.c

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PSAT/NMSQT Skill Category and Description of Skills	Colorado Math: Academic Standards 2009 Course/ Level	Standard	Standard ID
Data, Statistics, and Probability Analyze data, understand descriptive statistics, make inferences and determine the likelihood that certain events will occur.	High School	d. When the relationship between two numerical variables is reasonably linear, apply the least-squares criterion for line fitting, use Pearson's correlation coefficient as a measure of strength, and interpret the slope and y-intercept in the context of the problem	D.3.d
	High School	a. Define and explain the meaning of significance (both practical and statistical)	D.4.a
	High School	a. Develop simulations that demonstrate probability as a long-run relative frequency	D.5.a
	High School	b. Apply and solve problems using the concepts of independence and conditional probability	D.5.b
	High School	c. Apply and solve problems using the concept of mutually exclusive properties when combining probabilities	D.5.c
	High School	f. Analyze the cost of insurance as a method to offset the risk of a situation	D.5.f
Geometry and Measurement Solve problems based on understanding the properties of shapes, such as triangles and circles, and the spatial relationships between angles and lines.	High School	a. Calculate (or estimate when appropriate) the perimeter and area of a two-dimensional irregular shape	S.1.a
	High School	b. Justify, interpret, and apply the use of formulas for the surface area, and volume of cones, pyramids, and spheres including real-world situations	S.1.b
	High School	c. Solve for unknown quantities in relationships involving perimeter, area, surface area, and volume	S.1.c
	High School	d. Apply the effect of dimensional change, utilizing appropriate units and scales in problem-solving situations involving perimeter, area, and volume	S.1.d
	High School	a. Classify polygons according to their similarities and differences	S.2.a
	High School	b. Solve for unknown attributes of geometric shapes based on their congruence, similarity, or symmetry	S.2.b
	High School	c. Know and apply properties of angles including corresponding, exterior, interior, vertical, complementary, and supplementary angles to solve problems. Justify the results using two-column proofs, paragraph proofs, flow charts, or illustrations	S.2.c
	High School	d. Develop conjectures and solve problems about geometric figures including definitions and properties (congruence, similarity, and symmetry). Justify these conjectures using two-column proofs, paragraph proofs, flow charts, or illustrations	S.2.d

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PSAT/NMSQT Skill Category and Description of Skills	Colorado Math: Academic Standards 2009 Course/ Level	Standard	Standard ID
Geometry and Measurement Solve problems based on understanding the properties of shapes, such as triangles and circles, and the spatial relationships between angles and lines.	High School	a. Make conjectures involving two-dimensional objects represented with Cartesian coordinates. Justify these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations	S.3.a
	High School	b. Represent transformations (reflection, translation, rotation, and dilation) using Cartesian coordinates	S.3.b
	High School	c. Develop arguments to establish what remains invariant and what changes after a transformation (reflection, translation, rotation, and dilations). Justify these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations	S.3.c
	High School	d. Using construction tools, including technology, make conjectures about relationships among properties of shapes in the plane including those formed through transformation. Justify these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations	S.3.d
	High School	b. Apply the Pythagorean theorem and its converse to solve real-world problems	S.4.b
	High School	c. Determine the midpoint of a line segment and the distance between two points in the Cartesian coordinate plane	S.4.c
Number and Operations Understand types of numbers (integers, fractions, decimals), their properties and the correct order of operations (addition, multiplication, division). Perform computations correctly.	High School	a. Show that between any two rational numbers there are an infinite number of rational numbers, and that between any two irrational numbers there are also an infinite number of irrational numbers	N.1.a
	High School	a. Use appropriate computation methods that encompass estimation and calculation	N.2.a
	High School	b. Use technology to perform operations (addition, subtraction, multiplication, and division) on numbers written in scientific notation	N.2.b
	High School	c. Describe factors affecting take-home pay and calculate the impact	N.2.c
	High School	d. Design and use a budget, including income (net take-home pay) and expenses (mortgage, car loans, and living expenses) to demonstrate how living within your means is essential for a secure financial future	N.2.d
	High School	a. Use combinatorics (Fundamental Counting Principle, permutations and combinations) to solve problems in real-world contexts	N.3.a

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PSAT/NMSQT Skill Category and Description of Skills	Colorado Math: Academic Standards 2009		
	Course/ Level	Standard	Standard ID
Problem Solving Solve abstract and practical problems by, applying and adapting a variety of strategies. Monitor progress and evaluate answers in terms of questions asked.	High School	b. Apply and solve problems using the concepts of independence and conditional probability	D.5.b
	High School	c. Apply and solve problems using the concept of mutually exclusive properties when combining probabilities	D.5.c
	High School	a. Use appropriate computation methods that encompass estimation and calculation	N.2.a
	High School	b. Use technology to perform operations (addition, subtraction, multiplication, and division) on numbers written in scientific notation	N.2.b
	High School	a. Use combinatorics (Fundamental Counting Principle, permutations and combinations) to solve problems in real-world contexts	N.3.a
	High School	d. Determine the inverse (expressed graphically or in tabular form) of a function from a graph or table	P.1.d
	High School	a. Evaluate a function at a given point in its domain given an equation (including function notation), a table, and a graph	P.2.a
	High School	b. Identify the domain and range of a function given an equation (including function notation), a table, and a graph	P.2.b
	High School	c. Identify intercepts, zeros (or roots), maxima, minima, and intervals of increase and decrease, and asymptotes of a function given an equation (including function notation), a table, and a graph	P.2.c
	High School	a. Apply transformations (translation, reflection, dilation) to a parent function, f(x)	P.3.a
	High School	b. Interpret the results of these transformations verbally, graphically, and symbolically	P.3.b
	High School	c. Solve equations for one variable in terms of the others	P.4.c
	High School	a. Find solutions to quadratic and cubic equations and inequalities by using appropriate algebraic methods such as factoring, completing the square, graphing or using the quadratic formula	P.5.a
	High School	b. Find solutions to equations involving power, exponential, rational and radical functions	P.5.b
	High School	c. Solve systems of linear equations and inequalities with two variables	P.5.c

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PSAT/NMSQT Skill Category and Description of Skills	Colorado Math: Academic Standards 2009 Course/ Level	Standard	Standard ID
Problem Solving Solve abstract and practical problems, applying and adapting a variety of strategies. Monitor progress and evaluate answers in terms of questions asked.	High School	a. Calculate (or estimate when appropriate) the perimeter and area of a two-dimensional irregular shape	S.1.a
	High School	c. Solve for unknown quantities in relationships involving perimeter, area, surface area, and volume	S.1.c
	High School	d. Apply the effect of dimensional change, utilizing appropriate units and scales in problem-solving situations involving perimeter, area, and volume	S.1.d
	High School	b. Solve for unknown attributes of geometric shapes based on their congruence, similarity, or symmetry	S.2.b
	High School	b. Apply the Pythagorean theorem and its converse to solve real-world problems	S.4.b
	High School	c. Determine the midpoint of a line segment and the distance between two points in the Cartesian coordinate plane	S.4.c
Reasoning Develop and use mathematical arguments and proofs to explore the truth of conjectures and justify conclusions.	High School	a. Formulate appropriate research questions that can be answered with statistical analysis	D.1.a
	High School	b. Determine appropriate data collection methods to answer a research question	D.1.b
	High School	c. Differentiate between the inferences that can be drawn in experiments versus observational studies	D.2.c
	High School	d. When the relationship between two numerical variables is reasonably linear, apply the least-squares criterion for line fitting, use Pearson's correlation coefficient as a measure of strength, and interpret the slope and y-intercept in the context of the problem	D.3.d
	High School	f. Analyze the cost of insurance as a method to offset the risk of a situation	D.5.f
	High School	a. Show that between any two rational numbers there are an infinite number of rational numbers, and that between any two irrational numbers there are also an infinite number of irrational numbers	N.1.a
	High School	e. Categorize sequences as arithmetic, geometric, or neither and develop formulas for the general terms related to arithmetic and geometric sequences	P.1.e
	High School	a. Perform and justify steps in generating equivalent expressions by identifying properties used including the commutative, associative, inverse, identity, and distributive properties	P.4.a

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PSAT/NMSQT Skill Category and Description of Skills	Colorado Math: Academic Standards 2009 Course/ Level	Standard	Standard ID
Reasoning Develop and use mathematical arguments and proofs to explore the truth of conjectures and justify conclusions.	High School	c. Analyze the impact of interest rates on a personal financial plan	P.6.c
	High School	d. Evaluate the costs and benefits of credit	P.6.d
	High School	e. Analyze various lending sources, services, and financial institutions	P.6.e
	High School	b. Justify, interpret, and apply the use of formulas for the surface area, and volume of cones, pyramids, and spheres including real-world situations	S.1.b
	High School	c. Know and apply properties of angles including corresponding, exterior, interior, vertical, complementary, and supplementary angles to solve problems. Justify the results using two-column proofs, paragraph proofs, flow charts, or illustrations	S.2.c
	High School	d. Develop conjectures and solve problems about geometric figures including definitions and properties (congruence, similarity, and symmetry). Justify these conjectures using two-column proofs, paragraph proofs, flow charts, or illustrations	S.2.d
	High School	a. Make conjectures involving two-dimensional objects represented with Cartesian coordinates. Justify these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations	S.3.a
	High School	c. Develop arguments to establish what remains invariant and what changes after a transformation (reflection, translation, rotation, and dilations). Justify these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations	S.3.c
	High School	d. Using construction tools, including technology, make conjectures about relationships among properties of shapes in the plane including those formed through transformation. Justify these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations	S.3.d
Representation Use and translate among representations including verbal, numerical, symbolic and graphical to communicate mathematical ideas and solve problems.	High School	a. Determine when a relation is a function using a table, a graph, or an equation	P.1.a
	High School	c. Represent linear, quadratic, absolute value, power, exponential, logarithmic, rational, trigonometric (sine and cosine), and step functions in a table, graph, and equation and convert from one representation to another	P.1.c
	High School	b. Apply the properties of positive and negative rational exponents to generate equivalent algebraic expressions including those involving nth roots	P.4.b

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PSAT/NMSQT Skill Category and Description of Skills	Colorado Math: Academic Standards 2009		
	Course/ Level	Standard	Standard ID
Representation Use and translate among representations including verbal, numerical, symbolic and graphical to communicate mathematical ideas and solve problems.	High School	a. Represent, solve, and interpret problems in various contexts using linear, quadratic, and exponential function	P.6.a
	High School	b. Represent, solve, and interpret problems involving direct and inverse variations and a combination of direct and inverse variation	P.6.b
	High School	b. Represent transformations (reflection, translation, rotation, and dilation) using Cartesian coordinates	S.3.b

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PSAT/NMSQT Skills Insight™ Alignment to State Standards
Executive Summary, July 2010

Purpose

PSAT/NMSQT *Skills Insight*™ is a free online tool designed to help students and educators gain a better understanding of how PSAT/NMSQT® scores relate to specific academic skills. It provides a description of the academic skills that are typical of students scoring at each score band, suggestions for improvement, and practice test questions. Learn more by visiting www.collegeboard.com/psatskills.

The information provided by PSAT/NMSQT *Skills Insight* is organized by skill category. There are five skill categories for the critical reading section, nine for the mathematics section (4 content skill categories; 5 process skill categories), and 5 for the writing skills section. This report shows the alignment between state standards in English Language Arts and Mathematics and the content and skills measured by the PSAT/NMSQT.

Using Alignment Results with PSAT/NMSQT Reports

Schools and districts that administer the PSAT/NMSQT have access to the *Summary of Answers and Skills* (SOAS) report[1]. SOAS reports summarize performance on test sections, skill categories, and individual test questions, and compare local results to the state or nation. Using SOAS and the alignment information provided in this report, schools and districts can develop remediation strategies to help students improve their college readiness skills, future SAT scores, and performance on state assessments.

Mathematics: Alignment Approach and Findings

- There are nine Skills Categories in Mathematics, representing both content and process skills: *Number and Operations*; *Algebra and Functions*; *Geometry and Measurement*; *Data, Statistics and Probability; Problem Solving*; *Representation*; *Reasoning*; *Connections* and *Communication*.
- Only standards for grades 9-12 were considered for these alignments. Within grades 9-12, the areas with the greatest concentration of alignments are the Number and Operations, Algebra and Geometry strands of the state standards. In most cases, Precalculus and Trigonometry were excluded from the alignment study.
- The organization and hierarchy of standards varies on a state-by-state basis. During the alignment process, the College Board aligned the PSAT/NMSQT skills to the most specific level of the state's standards.
- States often integrate process and content standards. In such cases, the state standard received an alignment to both a process skill category and a content skill category.
- Generally, there is strong correspondence between the PSAT/NMSQT Skills Categories in Mathematics and state standards. Coverage of the Skills Categories across a state standards document is dependent upon the specific state standards and on the degree of specificity of language employed within the standards.
- The PSAT/NMSQT is administered to students in grades 10 and 11; consequently, the strongest areas of alignment are in the content categories of *Number and Operations*, *Algebra and Functions* and *Geometry and Measurement* and in the process categories of *Problem Solving*, *Reasoning* and *Representations*. Considering the design and purpose of the PSAT/NMSQT, extensive alignments in upper levels of high school mathematics standards, including Trigonometry, are not intended or expected.

[1] Using the access code printed on the PSAT/NMSQT *Roster of Student Scores and Plans*, SOAS reports can be downloaded from www.collegeboard.com/reports beginning in the first week of January.

- The College Board content specialists who conducted the alignments have a deep understanding of the PSAT/NMSQT test specifications. Therefore, although multiple Skills Categories might link to a particular standard, these alignments display only the strongest and most appropriate matches.

English Language Arts: Alignment Approach and Findings

- Reading and Writing each have five PSAT/NMSQT Skills Categories. In Reading, the categories are *Determining the Meaning of Words*, *Author's Craft*, *Reasoning and Inferencing*, *Organization and Ideas* and *Understanding Literary Elements*. In Writing, the categories are *Manage Word Choice and Grammatical Relationships Between Words*, *Manage Grammatical Structures Used to Modify or Compare*, *Manage Phrases and Clauses in a Sentence*; *Recognize Correctly Formed Sentences* and *Manage Order and Relationships of Sentences and Paragraphs*.

- The PSAT/NMSQT is administered to students in grades 10 and 11, and the College Board targeted the English Language Arts alignments at these specific grade levels. In states where the standards are organized by grade band (grades 9-10, 11-12) or by one high school band (grades 9-12), the College Board aligned to all high school grade levels.
- Given the purpose and design of the PSAT/NMSQT, the English Language Arts alignment is focused on the areas of reading and writing and does not include state standards in speaking, listening, or media literacy. Additionally, these alignments excluded genre-specific state standards (such as those related to American, British, or World literature), although the essential PSAT/NMSQT skills in Reading can be used to support instruction in literature.
- The organization and hierarchy of standards varies on a state-by-state basis. During the alignment process, the College Board aligned the PSAT/NMSQT skills to the most specific level of the state's standards. Coverage of the Skills Categories across a state standards document is dependent upon the specific state standards and on the degree of specificity of language employed within the standards.

- In Writing, generally there is strong correspondence between the PSAT/NMSQT Skills Categories and state standards that focus on grammar, usage, language conventions, and the role of editing and revising in writing.
- In Reading, there is strong correspondence between the PSAT/NMSQT Skills Categories and state standards in the essential areas of vocabulary development (determine the meaning of unfamiliar words or of words with multiple meanings by understanding context and by analyzing roots, prefixes, and suffixes) and reading comprehension (determine the main idea and supporting details; understand the organization of passages; analyze the various elements of an author's craft, including purpose, perspective, word choice, and use of rhetorical and literary devices and understand literary elements such as plot, characterization, and setting).

Summary

In summary, the PSAT/NMSQT Skills Categories correspond well to state standards. Educators can use these alignments to connect the PSAT/NMSQT to their local curricula and state standards to monitor student learning and to build a coherent instructional plan for their students.