Connecticut SAT School Day Alignment Study

Alignment of the Connecticut Core Standards to the Connecticut SAT School Day

Presented to the Connecticut State Department of Education by

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INTRODUCTION

In 2015, Governor Malloy sought and won approval for a waiver from the U.S. Department of Education to use the SAT as the high school accountability measure for Connecticut in lieu of the Grade 11 Smarter Balanced assessment. The switch to the SAT also satisfies the requirements of Connecticut Public Act No. 15-238, which states that effective in the 2015-16 school year students enrolled in Grade 11 should be administered a nationally recognized college readiness assessment that is approved by the State Board of Education and that measures essential and grade-appropriate skills in reading, writing, and mathematics.

The Connecticut SAT School Day has two sections: 1) Evidence-Based Reading and Writing and 2) Mathematics. The Evidence-Based Reading and Writing section includes a Reading Test and a Writing and Language Test. The Connecticut SAT School Day was administered to all Grade 11 students on March 2, 2016, at no cost to districts or students.

While the Connecticut SAT School Day is the primary Grade 11 assessment for all students, the Connecticut Alternate Assessment will be administered to a small percentage of students with significant cognitive disabilities.

METHODOLOGY

In this section, we explain and describe the study's purpose, panelists, materials, and data collection and analysis procedures.

PURPOSE

Alignment is the study of the degree to which an assessment matches the content standards it was designed to measure. While there are numerous ways to examine alignment, the procedures for this study were constrained because the Connecticut SAT School Day was not specifically created to measure the content identified in the Connecticut Core Standards. In addition, the SAT was designed by the College Board, who completed their own alignment study of the relationship between the SAT and the Connecticut Core Standards[1]. Thus, this study was designed to replicate the approach used in the College Board study to allow for comparison of the results of the two studies.

The purpose of this study was to conduct an independent evaluation of the alignment between the Connecticut SAT School Day and the Connecticut Core Standards for English Language Arts (ELA) and Mathematics. Our guiding question was: Which Connecticut SAT School Day content dimensions can be associated with each of the Connecticut Core Standards for Mathematics and English Language Arts?

[1] College Board. (2015). *College Board's SAT Suite of Assessments and Their Alignment to the Connecticut Standards*.

The study procedures were designed to identify which Connecticut SAT School Day content dimensions are associated with each of the Connecticut Core Standards for Mathematics and ELA. Panelists used the Connecticut Core Standards for ELA and Mathematics as the foundation for the alignment process. For each Anchor Standard in ELA and each Standard in Mathematics, panelists identified relevant SAT content dimensions and made note of them on their Alignment Study form.

PANELISTS

The study required the creation of two expert panels, one consisting of English Language Arts specialists and one of Mathematics specialists. Panelists were Connecticut educators and administrators recruited by consultants at the State Department of Education (SDE) for English Language Arts and Mathematics. Panelists were recruited based on their expertise and were expected to be very familiar with Connecticut Core Standards and the Connecticut SAT School Day.

The panelists were experienced educators. Of the 34 panelists, 82% (*n* = 28) had 10 or more years of teaching experience, 82% (*n* = 28) had a Master's degree, and 18% (*n* = 6) had a doctorate. Sixteen of the panelists identified themselves as a classroom teacher and 13 identified themselves as a district administrator; the remaining panelists were state personnel or university faculty. The panelists also represented Connecticut's diverse landscape: 12% (*n* = 4) were from rural areas, 30% (*n* = 10) were from suburban schools, and 58% (*n* = 19) were from urban schools.

Nineteen of the panelists were Mathematics specialists and 15 of the panelists were English Language Arts specialists. A list of the panelists is included in Appendix A.

MATERIALS

The Connecticut Core Standards for English Language Arts and Mathematics were the foundation of the study (see Appendix B). For English Language Arts, we used Anchor Standards for Literature, Informational Text, Writing, and Language. The panel did review the Standards for Speaking and Listening to gain a full appreciation of the Connecticut Core Standards, even though the Connecticut SAT School Day does not measure this content. The Mathematics Standards for High School are articulated in multiple Conceptual Categories. Within each Conceptual Category, there are Domains, Clusters, and Standards. "Standards" were the unit of analysis selected for this study. The Conceptual Categories were: Number and Quantity, Algebra, Functions, Geometry, and Statistics and Probability. Within the Mathematics Standards, Modeling is included as a Mathematics Conceptual Category. However, it is noted that, "Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards" (Common Core State Standards for Mathematics, p. 73, Available at: http://www.corestandards.org/wp-content/uploads/Math_Standards1.pdf). The Common Core State Standards do not include a set of standards specifically written to express Modeling, but rather Modeling Standards are incorporated into other Mathematics Conceptual Categories.

Content specifications for the Connecticut SAT School Day were provided directly by the College Board. Within the content specifications for the Connecticut SAT School Day, the content in each subject area is defined by content dimensions. Specifications for SAT Reading, SAT Writing and Language, and SAT Math are included in Appendix C.

DATA COLLECTION PROCEDURES

Researchers from the University of Connecticut (UConn) led the alignment study on January 29, 2016. The meeting began with an orientation to the task with all panelists in one room. This orientation included an overview of the

Connecticut SAT School Day structure and the planned alignment procedures. After the orientation, the panelists completed the demographic form. Panelists for ELA and Mathematics were then reconvened in separate rooms where the alignment process was described in greater detail. Panelists were engaged in a dialogue, led by a UConn researcher, in order to ensure that the alignment process was fully understood by all panelists.

The panelists were then asked to attempt to align the first several Connecticut content standards in each content dimension with the SAT specifications. When this task was completed, the UConn researchers led a discussion and review of the panelists' results. Each panelist shared their results with the entire panel along with a rationale for why the choices were made. After discussion, panelists were allowed to edit their choices. After panelists indicated that they understood their charge and were comfortable proceeding, they were allowed to complete the review process working at their own pace.

The UConn team used a point-by-point alignment approach to match the procedures used by the College Board in their alignment report for the Connecticut SDE. This process is used to determine substantial similarities and differences between the two sets of standards.

Because the data collection procedures were designed to model the College Board alignment study, the panelists were only asked to identify which Connecticut SAT School Day content dimension(s) were associated with each Connecticut Core Standard. Panelists were not asked to comment on the degree of match or the nature of the match. This procedure is in accordance with the College Board study. In this study, we did not examine the extent to which the Connecticut Core Standards are covered on the Connecticut SAT School Day.

Panelists reviewed the documents in their subject groups. Within each group, the panelists were asked to discuss their ratings for the first three standards. Panelists shared their reasoning and some debate ensued. The purpose of the discussion was to better define the task for the group at large. Panelists were asked to work independently for the balance of the study. The procedures did not incorporate consensus-building exercises or discussions. Independent work was chosen to help identify variability in the associations between the two documents.

Data Analysis Procedures

After the meeting, the UConn team reviewed the panelist feedback. For each Connecticut Core Standard, we noted the associated Connecticut SAT School Day content dimensions. We also calculated the frequency with which each Connecticut SAT School Day content dimensions was associated with each Connecticut Core Standard.

For each Connecticut Core Standard, the associated Connecticut SAT School Day content dimensions were considered either a strong match or a moderate match based on the proportion of associations identified by the study panelists. Different cut-points were used for each subject area to account for differences in group size. The cut-points are detailed in Table 1, below.

Table 1
Number of Panelist Matches Required for Each Alignment Level, by Subject Area

Level of Match	Mathematics	English Language Arts
Strong Match	10+	8+
Moderate Match	3-9	3-7
No Match	0-2	0-2

If the panelists identified at least one strong match with a Connecticut SAT School Day content dimension, the Connecticut Core Standard was considered to have a strong match with the Connecticut SAT School Day. A strong match may also be associated with more than one additional moderate match. Further, if there was at least one moderate match with one or more Connecticut SAT School Day content dimensions, the Connecticut Core Standard was considered to have a moderate match, even if a large proportion of the panelists noted no match.

Policy Decisions

We conducted the study based on the following assumptions, based on discussions with the SDE:

- This research was designed as a one-way alignment study. Stated differently, we examined the extent to which the Connecticut SAT School Day covered the Connecticut Core Standards, but did not examine the degree to which the Connecticut Core Standards matched the Connecticut SAT School Day.
- The SAT Essay was not included in the study because it will not be included as part of the Connecticut SAT School Day.
- The panel did not review Connecticut Core Standards for Speaking and Listening as they are not tested on the Connecticut SAT School Day.

Results

In this study, panels of Connecticut educators associated each content dimension of the Connecticut SAT School Day content specifications with the Connecticut Core Standards. These associations were quantified and summarized as strong matches, moderate matches, and weak/no matches. In the sections below, we present the results of the panelists' alignment for English Language Arts and Mathematics, followed by a more detailed discussion of each subject area.

English Language Arts

English Language Arts Panel Alignment

The panel results for ELA are presented in Tables 2 through 5, below. The results show each Connecticut Core Standard and its associated content dimensions from the panelists. Strong matches are noted in bold; weak/no matches are not included.

Table 2
Language

Study Notation	CT Standard	Alignment to Writing & Language SAT
	Conventions of Standard English	
L1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a) Apply the understanding that usage is a matter of convention, can change over time, and is sometimes contested.	• **Conventional expression** • Sentence boundaries • Subordination and coordination • Parallel structure • Modifier placement

	b) Resolve issues of complex or contested usage, consulting references (e.g., *Merriam-Webster's Dictionary of English Usage, Garner's Modern American Usage*) as needed.	• Verb tense, mood, and voice • Pronoun person and number • Pronoun clarity • Possessive determiners • Pronoun-antecedent agreement • Subject-verb agreement • Noun agreement • Frequently confused words • Logical comparison
L2	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a) Observe hyphenation conventions. b) Spell correctly.	• **End-of-sentence punctuation** • **Within-sentence punctuation** • **Items in a series** • **Unnecessary punctuation** • Frequently confused words • Conventional expression • Possessive nouns and pronouns • Nonrestrictive and parenthetical elements
KNOWLEDGE OF LANGUAGE		
L3	Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. a) Vary syntax for effect, consulting references (e.g., Tufte's *Artful Sentences*) for guidance as needed; apply an understanding of syntax to the study of complex texts when reading.	• **Style and tone** • **Syntax** • Precision • Sentence boundaries • Conventional expression
VOCABULARY ACQUISITION AND USE		
L4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 11–12 reading and content,* choosing flexibly from a range of strategies. a) Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b) Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *conceive, conception, conceivable*).	• Precision • Pronoun-antecedent agreement • Subject-verb agreement • Noun agreement • Frequently confused words • (No match)

	c) Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage. d) Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	
L5	Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a) Interpret figures of speech (e.g., hyperbole, paradox) in context and analyze their role in the text. b) Analyze nuances in the meaning of words with similar denotations.	• Precision • Frequently confused words • Logical comparison • Conventional expression • (No match)
L6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	• **(No match)** • Precision • Concision

Table 3
Reading/Informational Text

Study Notation	CT Standard	Alignment to Reading SAT
	KEY IDEAS AND DETAILS	
RIT1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	• **Explicit** • **Implicit** • **Textual evidence** • Evidence
RIT2	Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.	• **Central** • **Summarizing** • **Relationships** • **Part-whole** • Implicit • Reasoning1
RIT3	Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.	• **Relationships** • **Part-whole** • Implicit • Reasoning1
	CRAFT AND STRUCTURE	
RIT4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10).	• **Interpret** • **Word choice** • Implicit

RIT5	Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.	• **Overall** • **Part-whole** • **Purpose** • **Claims** • Reasoning2 • Evidence
RIT6	Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness or beauty of the text.	• **POV** • **Purpose** • Implicit • Word choice • Reasoning2 • Evidence
RIT7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	• **Multiple** • **Quantitative** • Reasoning1 • Relationships
INTEGRATION OF KNOWLEDGE AND IDEAS		
RIT8	Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., *The Federalist*, presidential addresses).	• **Claims** • **Reasoning2** • Implicit • Reasoning1 • Central • Summarizing • Relationships • Interpret • POV • Purpose • Evidence • Multiple
RIT9	Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including The Declaration of Independence, the Preamble to the Constitution, the Bill of Rights, and Lincoln's Second Inaugural Address) for their themes, purposes, and rhetorical features.	• **Central** • **Purpose** • Explicit • Implicit • Reasoning1 • Relationships • Interpret • Word choice • Overall • Part-whole • POV • Claims • Reasoning2
RANGE OF READING AND LEVEL OF TEXT COMPLEXITY		
RIT10	By the end of grade 11, read and comprehend literary nonfiction in the grades 11-CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	• **(No match)** • Explicit • Implicit • Reasoning1 • Textual evidence • Central • Summarizing

	By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11-CCR text complexity band independently and proficiently.	• Relationships • Interpret • Word choice • Overall • Part-whole • POV • Purpose • Claims • Reasoning2 • Evidence • Multiple • Quantitative

Table 4
Reading/Literature

Study Notation		Alignment to Reading SAT
	KEY IDEAS AND DETAILS	
RL1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	• **Explicit** • **Implicit** • **Textual evidence**
RL2	Determine two or more themes or central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to produce a complex account; provide an objective summary of the text.	• **Central** • **Summarizing** • **Relationships** • **Part-whole** • Implicit
RL3	Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters are introduced and developed).	• **Relationships** • **Part-whole** • Implicit • Word choice • Overall • POV • Purpose
	CRAFT AND STRUCTURE	
RL4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (Include Shakespeare as well as other authors.)	• **Interpret** • **Word choice** • Explicit • Implicit • Part-whole • Purpose
RL5	Analyze how an author's choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact.	• **Overall** • **Part-whole** • Relationships • Purpose
RL6	Analyze a case in which grasping a point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement).	• **Explicit** • **Implicit** • **POV**

		• Interpret • Word choice • Purpose
INTEGRATION OF KNOWLEDGE AND IDEAS		
RL7	Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.)	• **Multiple** • Reasoning1 • Relationships • POV • (No match)
RL8	(Not applicable to literature)	
RL9	Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics.	• **Multiple** • Reasoning1 • Central • Relationships • POV • Purpose
RANGE OF READING AND LEVEL OF TEXT COMPLEXITY		
RL10	By the end of grade 11, read and comprehend literature, including stories, dramas, and poems, in the grades 11-CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 11-CCR text complexity band independently and proficiently.	• **(No match)** • Explicit • Implicit • Reasoning1 • Textual evidence • Central • Summarizing • Relationships • Interpret • Word choice • Overall • Part-whole • POV • Purpose • Claims • Reasoning2 • Evidence • Multiple • Quantitative

Table 5
Writing

Study Notation	CT Standard	Alignment to Writing & Language SAT
TEXT TYPES AND PURPOSES		
W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. a) Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that	• **Proposition** • **Support** • **Focus** • **Logical sequence** • **Introductions** • **Style and tone** • Precision

	logically sequences claim(s), counterclaims, reasons, and evidence. b) Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases. c) Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d) Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e) Provide a concluding statement or section that follows from and supports the argument presented.	• Concision • Syntax • (No match)
W2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. a) Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b) Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c) Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d) Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic. e) Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f) Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).	• **Proposition** • **Support** • **Focus** • **Logical sequence** • **Introductions** • **Precision** • **Style and tone** • **Syntax** • Quantitative • Concision • (No match)

W3	Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. a) Engage and orient the reader by setting out a problem, situation, or observation and its significance, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events. b) Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters. c) Use a variety of techniques to sequence events so that they build on one another to create a coherent whole and build toward a particular tone and outcome (e.g., a sense of mystery, suspense, growth, or resolution). d) Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters. e) Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.	• **Proposition** • **Logical sequence** • **Introductions** • **Precision** • **Style and tone** • Support • Focus • Concision • Syntax • (No match)
PRODUCTION AND DISTRIBUTION OF WRITING		
W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3 above.)	• **Style and tone** • Proposition • Support • Focus • Logical sequence • Precision • Concision • Syntax • (No match)
W5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1-3 up to an including grades 11-12 on page 55.)	• **Proposition** • **Focus** • **Precision** • **Concision** • **Style and tone** • Support • Logical sequence • Introductions • Syntax
W6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.	• **(No match)**
RESEARCH TO BUILD AND PRESENT KNOWLEDGE		

W7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	• **(No match)**
W8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.	• **(No match)** • Quantitative
W9	Draw evidence from literary or informational texts to support analysis, reflection, and research. a) Apply *grades 11–12 Reading standards* to literature (e.g., "Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics"). b) Apply *grades 11–12 Reading standards* to literary nonfiction (e.g., "Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning [e.g., in U.S. Supreme Court Case majority opinions and dissents] and the premises, purposes, and arguments in works of public advocacy [e.g., *The Federalist*, presidential addresses]").	• **(No match)** • Support
RANGE OF WRITING		
W10	Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.	• **(No match)** • Focus

ENGLISH LANGUAGE ARTS SUMMARY

In ELA, there was a high proportion of strong matches for Reading/Informational Text and Reading/Literature. For Language, there was a mix of strong and moderate matches. For Writing, there was a mix of strong, moderate, and weak/no matches. The matches between the Connecticut Core Standards for ELA and the Connecticut SAT School Day content dimensions are detailed in Table 6 below.

For Language, there are six standards. Three of these standards had a strong match (50%) to Connecticut SAT School Day content dimensions, and three had moderate matches (50%). In Reading/Information Text, nine of the 10 Connecticut Core Standards had a strong match (90%); the remaining standard had a moderate match (10%). There was a similar pattern for Reading/Literature: eight of the nine standards had a strong match (89%), and one standard had a moderate match (11%). Within Writing, five of the 10 standards had a strong match (50%), 3 standards had a moderate match (30%), and 2 standards had a weak match or no match (20%).

Table 6
Matches for Each Anchor Standard in English Language Arts

Anchor Standards	Level of Match Strong	Moderate	Weak/None
Language	50%	50%	0%
Reading/Informational Text	90%	10%	0%
Reading/Literature	89%	11%	0%
Writing	50%	30%	20%
All Anchor Standards*	**71%**	**23%**	**6%**

**Summarizes the overall coverage of the Connecticut Core Standards.*

MATHEMATICS

MATHEMATICS PANEL ALIGNMENT

The panel results for Mathematics are presented in Tables 7 through 11, below. The results show each Connecticut Core Standard and its associated content dimensions from the panelists. Strong matches are noted in bold; weak/no matches are not included.

Table 7
Number and Quantity

Study Notation	CT Content Dimension	CT Content Description	Alignment to Math SAT
		THE REAL NUMBER SYSTEM N-RN	
N-RN1	1. Extend the properties of exponents to rational exponents.	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.*	**Passport3** Passport1 Passport2
N-RN2	2. Extend the properties of exponents to rational exponents.	Rewrite expressions involving radicals and rational exponents using the properties of exponents.	**Passport3** Passport2
N-RN3	3. Use properties of rational and irrational numbers.	Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	**(No match)** Passport2
		QUANTITIES N-Q	
N-Q1	1. Reason quantitatively and use units to solve problems.	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	**PSD3** PSD5 (No match)

N-Q1	2. Reason quantitatively and use units to solve problems.	Define appropriate quantities for the purpose of descriptive modeling.	Algebra3 PSD3 (No match)
N-Q3	3. Reason quantitatively and use units to solve problems.	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	**(No match)** PSD3
THE COMPLEX NUMBER SYSTEM N-CN			
N-CN1	1. Perform arithmetic operations with complex numbers.	Know there is a complex number *i* such that $i^2 = -1$, and every complex number has the form $a + bi$ with *a* and *b* real.	**AddTop3** (No match)
N-CN2	2. Perform arithmetic operations with complex numbers.	Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	**AddTop3**
N-CN7	7. Use complex numbers in polynomial identities and equations.	Solve quadratic equations with real coefficients that have complex solutions.	Passport5 (No match)

Table 8
Algebra

Study Notation	CT Content Dimension	CT Content Description	Alignment to Math SAT
SEEING STRUCTURE IN EXPRESSIONS A-SSE			
A-SSE1	1. Interpret the structure of expressions.	Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)^n$ *as the product of P and a factor not depending on P.*	**Algebra8** **Passport10** Algebra1
A-SSE2	2. Interpret the structure of expressions.	Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$*, thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$.	**Passport4** Passport2 Passport3 Passport11 Passport14
A-SSE3	3. Write expressions in equivalent forms to solve problems.	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines.	**Passport4** Passport1 Passport2 Passport3 Passport5 Passport11 Passport14

		b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*	
A-SSE4	4. Write expressions in equivalent forms to solve problems.	Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.*	**(No match)**
ARITHMETIC WITH POLYNOMIALS AND RATIONAL EXPRESSIONS A-APR			
A-APR1	1. Perform arithmetic operations on polynomials.	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	**Passport6** Passport9
A-APR2	2. Understand the relationship between zeros and factors of polynomials.	Know and apply the Remainder Theorem: For a polynomial *p(x)* and a number *a*, the remainder on division by $x - a$ is *p(a)*, so *p(a)* = 0 if and only if $(x - a)$ is a factor of *p(x)*.	**Passport11** (No match)
A-APR3	3. Understand the relationship between zeros and factors of polynomials.	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	**Passport11**
A-APR4	4. Use polynomial identities to solve problems.	Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.*	**(No match)** Passport4
A-APR6	6. Rewrite rational expressions.	Rewrite simple rational expressions in different forms; write *a(x)/b(x)* in the form *q(x) + r(x)/b(x)*, where *a(x), b(x), q(x),* and *r(x)* are polynomials with the degree of *r(x)* less than the degree of *b(x)*, using inspection, long division, or, for the more complicated examples, a computer algebra system.	**Passport9**
CREATING EQUATIONS A-CED			
A-CED1	1. Create equations that describe numbers or relationships.	Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*	**Algebra1** **Algebra2** Passport1

A-CED2	2. Create equations that describe numbers or relationships.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	**Algebra3** Algebra4 Algebra5 Algebra9
A-CED3	3. Create equations that describe numbers or relationships.	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non- viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*	**Algrebra4** **Algrebra5** Algrebra2 Algrebra6 Algrebra7
A-CED4	4. Create equations that describe numbers or relationships.	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*	**Passport14**
REASONING WITH EQUATIONS AND INEQUALITIES A-REI			
A-REI1	1. Understand solving equations as a process of reasoning and explain the reasoning.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	Algrebra1 Algrebra6 (No match)
A-REI2	2. Understand solving equations as a process of reasoning and explain the reasoning.	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	**Passport7**
A-REI3	3. Solve equations and inequalities in one variable.	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	**Algebra1** **Algebra2** Algebra6 Passport14
A-REI4	4. Solve equations and inequalities in one variable.	Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2$ = q that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., for x^2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.	Algebra2 Passport5
A-REI5	5. Solve systems of equations.	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.	Algrebra5 Algrebra7 (No match)

A-REI6	6. Solve systems of equations.	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	**Algebra7** Algebra5
A-REI7	7. Solve systems of equations.	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line $y = –3x$ and the circle $x^2 + y^2 = 3$.*	**Passport8**
A-REI10	10. Represent and solve equations and inequalities graphically.	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	**Algebra9** PSD5 Passport12 (No match)
A-REI11	11. Represent and solve equations and inequalities graphically.	Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	Algebra9 PSD5 (No match)
A-REI12	1. Represent and solve equations and inequalities graphically.	Graph the solutions to a linear inequality in two variables as a half- plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	Algebra4 (No match)

Table 9
Functions

Study Notation	CT Content Dimension	CT Content Description	Alignment to Math SAT
	INTERPRETING FUNCTIONS F-IF		
F-IF1	1. Understand the concept of a function and use function notation.	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then $f(x)$ denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation $y = f(x)$.	**Passport13** (No match)
F-IF2	2. Understand the concept of a function and use function notation.	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	**Passport13**
F-IF3	3. Understand the concept of a function and use function notation.	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.*	**(No match)** Passport13

F-IF4	4. Interpret functions that arise in applications in terms of the context.	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*	Algebra8 Algebra9 PSD5 Passport12
F-IF5	5. Interpret functions that arise in applications in terms of the context.	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*	**(No match)** PSD5
F-IF6	6. Interpret functions that arise in applications in terms of the context.	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	Algebra8 PSD1 (No match)
F-IF7	7. Analyze functions using different representations.	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	**Passport12** Algebra9 PSD5 Passport11 (No match)
F-IF8	8. Analyze functions using different representations.	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. Use the properties of exponents to interpret expressions for exponential functions. *For*	Passport2 Passport10 Passport11 Passport12 (No match)

		example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, *and classify them as representing exponential growth or decay.*	
F-IF9	9. Analyze functions using different representations.	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*	Algebra9 Passport12 (No match)
BUILDING FUNCTIONS F-BF			
F-BF1	1. Build a function that models a relationship between two quantities.	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*	Algebra1 Algebra3 PSD4 Passport1 Passport13 (No match)
F-BF2	2. Build a function that models a relationship between two quantities.	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	**(No match)**
F-BF3	3. Build new functions from existing functions.	Identify the effect on the graph of replacing *f(x)* by *f(x) + k, k f(x), f(kx)*, and *f(x + k)* for specific values of *k* (both positive and negative); find the value of *k* given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*	Passport12 Passport13 (No match)
F-BF4	4. Build new functions from existing functions.	Find inverse functions. a. Solve an equation of the form *f(x) = c* for a simple function *f* that has an inverse and write an expression for the inverse. *For example, f(x) =2 x3 or f(x) = (x+1)/(x–1) for x ≠ 1.*	**(No match)**
LINEAR, QUADRATIC, AND EXPONENTIAL MODELS F-LE			
F-LE1	1. Construct and compare linear, quadratic, and exponential models and solve problems.	Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that	**PSD6** PSD4

		exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	
F-LE2	2. Construct and compare linear, quadratic, and exponential models and solve problems.	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	Algebra3 PSD6 Passport1 (No match)
F-LE3	3. Construct and compare linear, quadratic, and exponential models and solve problems.	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	PSD5 PSD6 (No match)
F-LE4	4. Construct and compare linear, quadratic, and exponential models and solve problems.	For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.	**(No match)**
F-LE5	5. Interpret expressions for functions in terms of the situation they model.	Interpret the parameters in a linear or exponential function in terms of a context.	Algebra8 Passport10 Passport12
TRIGONOMETRIC FUNCTIONS F-TF			
F-TF1	1. Extend the domain of trigonometric functions using the unit circle.	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	**AddTop4**
F-TF2	2. Extend the domain of trigonometric functions using the unit circle.	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	**AddTop4** (No match)
F-TF5	5. Model periodic phenomena with trigonometric functions.	Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.	**(No match)** AddTop4
F-TF8	8. Prove and apply trigonometric identities.	Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.	**(No match)** AddTop2

Table 10
Geometry

Study Notation	CT Content Dimension	CT Content Description	Alignment to Math SAT
		CONGRUENCE G-CO	
G-CO1	1. Experiment with transformations in the plane.	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	**(No match)** AddTop5 AddTop6
G-CO2	2. Experiment with transformations in the plane.	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).	**(No match)**
G-CO3	3. Experiment with transformations in the plane.	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	**(No match)**
G-CO4	4. Experiment with transformations in the plane.	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	**(No match)**
G-CO5	5. Experiment with transformations in the plane.	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.	**(No match)**
G-CO6	6. Understand congruence in terms of rigid motions.	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.	**(No match)** AddTop6
G-CO7	7. Understand congruence in terms of rigid motions.	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	**(No match)** AddTop6
G-CO8	8. Understand congruence in terms of rigid motions.	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.	**(No match)** AddTop6
G-CO9	9. Prove geometric theorems.	Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are*	AddTop6 (No match)

		exactly those equidistant from the segment's endpoints.	
G-CO10	10. Prove geometric theorems.	Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*	**AddTop6** (No match)
G-CO11	11. Prove geometric theorems.	Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*	**(No match)** AddTop6
G-CO12	12. Make geometric constructions.	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*	**(No match)**
G-CO13	13. Make geometric constructions.	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	**(No match)**
SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY G-SRT			
G-SRT1	1. Understand similarity in terms of similarity transformations.	Verify experimentally the properties of dilations given by a center and a scale factor: a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	**(No match)** AddTop6
G-SRT2	2. Understand similarity in terms of similarity transformations.	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.	**(No match)** AddTop6
G-SRT3	3. Understand similarity in terms of similarity transformations.	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	**(No match)** AddTop6
G-SRT4	4. Prove theorems involving similarity.	Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and*	AddTop6 AddTop7 (No match)

		conversely; the Pythagorean Theorem proved using triangle similarity.	
G-SRT5	5. Prove theorems involving similarity.	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	**AddTop6** AddTop7 (No match)
G-SRT6	6. Define trigonometric ratios and solve problems involving right triangles.	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.	**AddTop7** AddTop2 AddTop4 AddTop6
G-SRT7	7. Define trigonometric ratios and solve problems involving right triangles.	Explain and use the relationship between the sine and cosine of complementary angles.	AddTop2 AddTop7 (No match)
G-SRT8	8. Define trigonometric ratios and solve problems involving right triangles.	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	**AddTop2** AddTop7
CIRCLES G-C			
G-C1	1. Understand and apply theorems about circles.	Prove that all circles are similar.	**(No match)** AddTop5
G-C2	2. Understand and apply theorems about circles.	Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*	**AddTop5**
G-C3	3. Understand and apply theorems about circles.	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	**(No match)** AddTop5
G-C5	5. Understand and apply theorems about circles.	Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.	AddTop4 AddTop5 (No match)
EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS G-GPE			
G-GPE1	1. Translate between the geometric description and the equation for a conic section.	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.	**AddTop8** (No match)

G-GPE2	2. Translate between the geometric description and the equation for a conic section.	Derive the equation of a parabola given a focus and directrix.	**(No match)**
G-GPE4	4. Use coordinates to prove simple geometric theorems algebraically.	Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).*	**(No match)**
G-GPE5	5. Use coordinates to prove simple geometric theorems algebraically.	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).	**(No match)**
G-GPE6	6. Use coordinates to prove simple geometric theorems algebraically.	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	**(No match)**
G-GPE7	7. Use coordinates to prove simple geometric theorems algebraically.	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.	**(No match)**
GEOMETRIC MEASUREMENT AND DIMENSION G-GMD			
G-GMD1	1. Explain volume formulas and use them to solve problems.	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*	**AddTop1** (No match)
G-GMD3	3. Explain volume formulas and use them to solve problems.	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	**AddTop1**
G-GMD4	4. Visualize relationships between two-dimensional and three-dimensional objects.	Identify the shapes of two-dimensional cross-sections of three- dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	**(No match)**
MODELING WITH GEOMETRY G-MG			
G-MG1	1. Apply geometric concepts in	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	**(No match)**

	modeling situations.		
G-MG2	2. Apply geometric concepts in modeling situations.	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	**(No match)** PSD3
G-MG3	3. Apply geometric concepts in modeling situations.	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).	**(No match)**

Table 11

Statistics and Probability

Study Notation	CT Content Dimension	CT Content Description	Alignment to Math SAT
INTERPRETING CATEGORICAL AND QUANTITATIVE DATA S-ID			
S-ID1	1. Summarize, represent, and interpret data on a single count or measurement variable.	Represent data with plots on the real number line (dot plots, histograms, and box plots).	**(No match)**
S-ID2	2. Summarize, represent, and interpret data on a single count or measurement variable.	Use 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.	**PSD9**
S-ID3	3. Summarize, represent, and interpret data on a single count or measurement variable.	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	**PSD9** (No match)
S-ID4	4. Summarize, represent, and interpret data on a single count or measurement variable.	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	**PSD9** (No match)
S-ID5	5. Summarize, represent, and interpret data on two categorical and quantitative variables.	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	**PSD7** PSD8

S-ID6	6. Summarize, represent, and interpret data on two categorical and quantitative variables.	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.* b. Informally assess the fit of a function by plotting and analyzing residuals.	**PSD4** PSD6
S-ID7	7. Interpret linear models.	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	Algebra8 PSD4 (No match)
S-ID8	8. Interpret linear models.	Compute (using technology) and interpret the correlation coefficient of a linear fit.	**(No match)** PSD4
S-ID9	9. Interpret linear models.	Distinguish between correlation and causation.	**(No match)** PSD10
MAKING INFERENCES AND JUSTIFYING CONCLUSIONS S-IC			
S-IC1	1. Understand and evaluate random processes underlying statistical experiments.	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	**PSD8** PSD10 (No match)
S-IC2	2. Understand and evaluate random processes underlying statistical experiments.	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*	**(No match)** PSD10
S-IC3	3. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	PSD10 (No match)
S-IC4	4. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.	**PSD8** PSD10
S-IC5	5. Make inferences and justify conclusions from sample	Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	PSD8 PSD9 PSD10 (No match)

	surveys, experiments, and observational studies.		
S-IC6	6. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	Evaluate reports based on data.	**PSD10** PSD9
CONDITIONAL PROBABILITY AND THE RULES OF PROBABILITY S-CP			
S-CP1	1. Understand independence and conditional probability and use them to interpret data.	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").	**(No match)** PSD7
S-CP2	2. Understand independence and conditional probability and use them to interpret data.	Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.	**PSD7** (No match)
S-CP3	3. Understand independence and conditional probability and use them to interpret data.	Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.	**PSD7** (No match)
S-CP4	4. Understand independence and conditional probability and use them to interpret data.	Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*	**PSD7**
S-CP5	5. Understand independence and conditional probability and use them to interpret data.	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*	**PSD7** (No match)

S-CP6	6. Use the rules of probability to compute probabilities of compound events in a uniform probability model.	Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model.	**PSD7** (No match)
S-CP7	7. Use the rules of probability to compute probabilities of compound events in a uniform probability model.	Apply the Addition Rule, *P*(*A* or *B*) = *P*(*A*) + *P*(*B*) – *P*(*A* and *B*), and interpret the answer in terms of the model.	**(No match)** PSD7

MATHEMATICS SUMMARY

In Mathematics, there was a high proportion of strong matches for Number and Quantity, Algebra, and Statistics and Probability. For Functions and Geometry, the matches were not as strong. The matches between the Connecticut Core Standards for Mathematics and the Connecticut SAT School Day content dimensions are detailed in Table 12 below.

For Number and Quantity, there are nine standards. Five of these standards had a strong match (56%) to Connecticut SAT School Day content dimensions, and four had moderate matches. In Algebra, 17 of the 23 Connecticut Core Standards had a strong match (74%). Of the remaining six Algebra standards, five had a moderate match (22%). Within Functions, six of the 22 standards had a strong match (27%), 13 standards had a moderate match (59%), and three standards had a weak/no match or no match (14%). There was a similar pattern for Geometry: eight of the 37 standards had a strong match (22%), 15 standards had a moderate match (41%), and 14 standards had a weak match or no match (38%). Finally, for Standards and Probability, 13 of the 22 standards had a strong match (59%), eight standards had a moderate match (36%), and one standard had a weak match or no match (5%).

Table 12
Matches for Each Conceptual Category in Mathematics

	Level of Match		
Conceptual Category	Strong Match	Moderate Match	Weak/No Match
Number and Quantity	56%	44%	0%
Algebra	74%	22%	4%
Functions	27%	59%	14%
Geometry	22%	41%	38%
Statistics and Probability	59%	36%	5%
All Conceptual Categories*	**43%**	**40%**	**17%**

**Summarizes the overall coverage of the Connecticut Core Standards.*

PANELIST FEEDBACK

After the panelists completed the alignment exercise, they were asked to comment on the process. Specifically, the panelists were asked, "After reviewing both sets of standards and completing the alignment exercise, what do you have to say?"

The English language arts panelists felt that the Connecticut Core Standards were specific and deep, while the Connecticut SAT School Day specifications were broad and could be taught at a more surface level. The panelists also raised specific concerns with the Language standards.

The mathematics panel recommended additional alignment studies. The panelists commented that the SAT specifications were broad and questioned whether the individual items on the SAT were aligned to the specifications. Additionally, the panelists felt that an alignment of the Connecticut SAT School Day to the Connecticut Core Standards would provide useful information for educators. They questioned the alignment between the depth of knowledge required on the Connecticut Core Standards and the SAT specifications. Many of the Connecticut Core Standards begin with verbs such as 'prove' and 'construct' that cannot be assessed with a multiple choice question. The panelists felt that the Smarter Balanced assessment was more complex, required deeper thinking, and was a better reflection of their classroom activities.

Panelists in both groups were concerned that given the Connecticut SAT School Day may not be as deep or as broad as the Connecticut Core Standards, that Connecticut educators may begin to limit their instruction to only those topics addressed on the Connecticut SAT School Day.

DISCUSSION

The alignment of the Connecticut SAT School Day to the Connecticut Core Standards in English Language Arts was very solid. The strong match of 71% of the Connecticut Core Standards to at least one content dimension of the Connecticut SAT School Day was a positive finding (see Table 6). Also, the fact that an additional 23% of the standards were found to be a moderate match to the Connecticut SAT School Day content lends further support for the alignment of the standards and the test content. A final positive observation concerning the results for ELA is that all of the anchor standards in the Language, Reading/Informational Text, and Reading/Literature sections were found to match at least one content dimension on the Connecticut SAT School Day. Restating this observation, 100% of the standards for Language, Reading/Informational Text, and Reading/Literature standards had a strong or moderate match to content dimensions from the Connecticut SAT School Day.

There are two elements of misalignment in ELA that warrant discussion. The first concerns the area of Writing. Two (20%) of the Connecticut Core Standards in Writing were found to have no match in the content specifications for the Connecticut SAT School Day. This is a direct result of the policy decision to not include the SAT essay as part of the Connecticut SAT School Day (and to also exclude this portion of the test from this study). Given the importance of evaluating student writing samples in the measurement of students' writing skills, it is actually surprising that 80% of the Connecticut Core Standards in Writing were judged to have at least a moderate match in the Connecticut SAT School Day absent the essay.

The second element bearing on the alignment of the Connecticut Core Standards and the Connecticut SAT School Day concerns the depth of knowledge involved in the measurement of the ELA standards. Depth of knowledge is a dimension that examines the thoroughness and complexity demanded by each content standard. It is routine for alignment studies to consider this dimension. However, while the formal examination of depth of knowledge (DOK) was technically omitted from the current study (for reasons discussed earlier in this report), many of the panelists commented on the fact that they noticed discrepancies between the DOK required by the Connecticut Core

Standards and the Connecticut SAT School Day. Panelists observed that, in many areas, the DOK required by the Connecticut Core Standards was greater than the specifications of the Connecticut SAT School Day.

This observation regarding the DOK relationship between the Connecticut Core Standards and the Connecticut SAT School Day was one factor affecting the ratings of the alignment by the panelists. When panelists encountered a core standard that they judged to require a higher DOK than did the associated content dimensions on the Connecticut SAT School Day, they generally split on their alignment ratings. Some panelists indicated there were no matches, reasoning that the Connecticut SAT School Day was too simplistic or superficial to adequately tap the Connecticut Core Standard. However, other panelists identified several content dimensions on the Connecticut SAT School Day that had a modest relationship to the Connecticut Core Standard being rated. Their reasoning was that a large number of content dimensions on the Connecticut SAT School Day could jointly measure the Connecticut Core Standard. For example, the ratings for Reading/Literature (Appendix D, Table D5) for Range of Reading and Level of Text Complexity (RL10) reveal that 8 panelists judged there to be no matches while the remaining panelists judged there to be a partial match with as many as 18 content dimensions on the Connecticut SAT School Day. This apparent discrepancy among panelists' judgments actually reflects the broadly held view of the entire panel that the DOK requirements of the Connecticut CT Core Standards exceed those of the Connecticut SAT School Day.

For Mathematics, the panelists did not find or identify strong alignment between the Connecticut Core Standards for Mathematics and the Connecticut SAT School Day. Only 43% of the Mathematics standards were judged to be a strong match to the Connecticut SAT School Day (see Table 12). While another 40% of the standards were found to match at least moderately, this still left 17% of the standards as having no representation on the Connecticut SAT School Day. This means that, according to the panelists, almost one-fifth of the Connecticut Core Standards in Mathematics would not be measured on the test.

An examination of the alignment of the Connecticut Core Standards to the Connecticut SAT School Day by conceptual categories reveals some interesting patterns. Three of the categories, Number & Quantity, Algebra, and Statistics & Probability appear to be well aligned with the Connecticut SAT School Day, with the majority of standards judged to be a strong match and almost all of the remaining standards exhibiting at least a moderate match. Only one standard in Algebra and one in Statistics & Probability did not have a match with the content dimensions of the Connecticut SAT School Day.

The categories of Functions and Geometry were where most of the misalignment occurred. For Functions, 27% of the standards strongly matched, 59% matched to a moderate degree and 14% were found to be unmatched. For Geometry, 22% matched strongly, 41% matched moderately and 38% were unmatched. These results raise a concern about the representativeness of the CONNECTICUT SAT SCHOOL DAY in these conceptual categories. It is difficult to consider an assessment aligned to content standards when it fails to address over one quarter of the Functions standards and over one third of the Geometry standards.

CONCLUSIONS

In both ELA and Mathematics, the majority of the Connecticut Core Standards have a strong or moderate match to the Connecticut SAT School Day. In ELA, the alignment of the Connecticut SAT School Day with the Anchor Standards for Language, Reading/Informational Text and Reading/Literature is solid. The alignment of Writing with the Connecticut SAT School Day is somewhat lower due to the policy decision to exclude the SAT essay, though the remaining parts of the Connecticut SAT School Day do address most of the Connecticut Core Standards in Writing.

In Mathematics, the alignment of the Connecticut Core Standards to the Connecticut SAT School Day is more variable across Conceptual Categories. The alignment for Number & Quantity, Algebra, and Statistics & Probability is solid as almost all Connecticut Core Standards are represented on the Connecticut SAT School Day. There were coverage gaps in the other two Conceptual Categories, where a significant proportion of the Connecticut Core Standards for Functions and Geometry were not represented on the Connecticut SAT School Day.

APPENDIX A: PANELISTS

ENGLISH LANGUAGE ARTS PANELISTS

Name	District/Affiliation
Brigid Barry	Greenwich High School
Amy Bastiaanse	Bristol
Katherine Brodaski	New London
Jonathan Budd	Trumbull
Jennifer DeRagon	Coventry
Anastasia DiFedele-Dutton	Hartford
Deirdre Ducharme	CSDE
Simon Edgett	New Haven
Lalitha Kasturirangan	CTHSS
Nadine Keane	Griswold
Tina Manus	CTHSS
Stephanie McKenna	Wethersfield
Tom Paleologopoulos	West Hartford
Ashley Vargas	East Hartford
Barbette Warren	CREC

MATHEMATICS PANELISTS

Name	District/Affiliation
Lisa Bernabe	Bristol
Kate Close	New Haven
Tim Craine	CCSU
Craig Crellar	Norwalk
Scott Fellows	Housatonic Valley Regional HS
Keegan Finlayson	New Fairfield
Michelle Graveline	West Hartford
Joy Griffin	Parish Hill HS
Rana Hafiz	Windham
Ross Hanson	Bloomfield
John Keogh	CES
Jennifer Michalek	CSDE
George Mitesser	Region 7
Eric Nelson	New Britain
Matt Parsons	CT River Academy
Anne Pember	ACES
Amanda Peterson	Danbury
Paul Rasmussen	Fairfield
Angela Swanepoel	Stratford

APPENDIX B: CONNECTICUT CORE STANDARDS

CONNECTICUT LANGUAGE STANDARDS GRADES 11-12

Study Notation	CT Standard	Alignment to Writing & Language SAT
	CONVENTIONS OF STANDARD ENGLISH	
L1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a) Apply the understanding that usage is a matter of convention, can change over time, and is sometimes contested. b) Resolve issues of complex or contested usage, consulting references (e.g., *Merriam-Webster's Dictionary of English Usage, Garner's Modern American Usage*) as needed.	
L2	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a) Observe hyphenation conventions. b) Spell correctly.	
	KNOWLEDGE OF LANGUAGE	
L3	Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. a) Vary syntax for effect, consulting references (e.g., Tufte's *Artful Sentences*) for guidance as needed; apply an understanding of syntax to the study of complex texts when reading.	
	VOCABULARY ACQUISITION AND USE	
L4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 11–12 reading and content,* choosing flexibly from a range of strategies. a) Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b) Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *conceive, conception, conceivable*). c) Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage. d) Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	

L5	Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a) Interpret figures of speech (e.g., hyperbole, paradox) in context and analyze their role in the text. b) Analyze nuances in the meaning of words with similar denotations.	
L6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	

CONNECTICUT READING STANDARDS FOR INFORMATIONAL TEXT GRADES 11-12

Study Notation	CT Standard	Alignment to Reading SAT
	KEY IDEAS AND DETAILS	
RIT1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	
RIT2	Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.	
RIT3	Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.	
	CRAFT AND STRUCTURE	
RIT4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10).	
RIT5	Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.	
RIT6	Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness or beauty of the text.	
RIT7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.	
	INTEGRATION OF KNOWLEDGE AND IDEAS	
RIT8	Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., *The Federalist*, presidential addresses).	
RIT9	Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including The Declaration of Independence, the Preamble to the Constitution, the Bill of Rights, and	

	Lincoln's Second Inaugural Address) for their themes, purposes, and rhetorical features.	
RANGE OF READING AND LEVEL OF TEXT COMPLEXITY		
RIT10	By the end of grade 11, read and comprehend literary nonfiction in the grades 11-CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11-CCR text complexity band independently and proficiently.	

CONNECTICUT READING STANDARDS FOR LITERATURE GRADES 11-12

Study Notation		Alignment to Reading SAT
KEY IDEAS AND DETAILS		
RL1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	
RL2	Determine two or more themes or central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to produce a complex account; provide an objective summary of the text.	
RL3	Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters are introduced and developed).	
CRAFT AND STRUCTURE		
RL4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (Include Shakespeare as well as other authors.)	
RL5	Analyze how an author's choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact.	
RL6	Analyze a case in which grasping a point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement).	
INTEGRATION OF KNOWLEDGE AND IDEAS		
RL7	Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.)	
RL8	(Not applicable to literature)	
RL9	Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics.	
RANGE OF READING AND LEVEL OF TEXT COMPLEXITY		
RL10	By the end of grade 11, read and comprehend literature, including stories, dramas, and poems, in the grades 11-CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	

	By the end of grade 12, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 11-CCR text complexity band independently and proficiently.	

CONNECTICUT HIGH SCHOOL MATHEMATICS STANDARDS

NUMBER AND QUANTITY

Study Notation	CT Content Dimension	CT Content Description	Alignment to Math SAT
THE REAL NUMBER SYSTEM N-RN			
N-RN1	1. Extend the properties of exponents to rational exponents.	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.*	
N-RN2	2. Extend the properties of exponents to rational exponents.	Rewrite expressions involving radicals and rational exponents using the properties of exponents.	
N-RN3	3. Use properties of rational and irrational numbers.	Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	
QUANTITIES N-Q			
N-Q1	1. Reason quantitatively and use units to solve problems.	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	
N-Q1	2. Reason quantitatively and use units to solve problems.	Define appropriate quantities for the purpose of descriptive modeling.	
N-Q3	3. Reason quantitatively and use units to solve problems.	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	

THE COMPLEX NUMBER SYSTEM N-CN			
N-CN1	1. Perform arithmetic operations with complex numbers.	Know there is a complex number *i* such that $i^2 = -1$, and every complex number has the form $a + bi$ with *a* and *b* real.	
N-CN2	2. Perform arithmetic operations with complex numbers.	Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	
N-CN7	7. Use complex numbers in polynomial identities and equations.	Solve quadratic equations with real coefficients that have complex solutions.	

ALGEBRA

Study Notation	CT Content Dimension	CT Content Description	Alignment to Math SAT
SEEING STRUCTURE IN EXPRESSIONS A-SSE			
A-SSE1	1. Interpret the structure of expressions.	Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)^n$ *as the product of P and a factor not depending on P.*	
A-SSE2	2. Interpret the structure of expressions.	Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$*, thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$.	
A-SSE3	3. Write expressions in equivalent forms to solve problems.	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines.	

		b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12}{}_t \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*	
A-SSE4	4. Write expressions in equivalent forms to solve problems.	Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.*	
ARITHMETIC WITH POLYNOMIALS AND RATIONAL EXPRESSIONS A-APR			
A-APR1	1. Perform arithmetic operations on polynomials.	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	
A-APR2	2. Understand the relationship between zeros and factors of polynomials.	Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x – a$ is $p(a)$, so $p(a) = 0$ if and only if $(x – a)$ is a factor of $p(x)$.	
A-APR3	3. Understand the relationship between zeros and factors of polynomials.	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	
A-APR4	4. Use polynomial identities to solve problems.	Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity $(x^2 + y^2)^2 = (x^2 – y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.*	
A-APR6	6. Rewrite rational expressions.	Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.	
CREATING EQUATIONS A-CED			

A-CED1	1. Create equations that describe numbers or relationships.	Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*	
A-CED2	2. Create equations that describe numbers or relationships.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	
A-CED3	3. Create equations that describe numbers or relationships.	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non- viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*	
A-CED4	4. Create equations that describe numbers or relationships.	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*	
REASONING WITH EQUATIONS AND INEQUALITIES A-REI			
A-REI1	1. Understand solving equations as a process of reasoning and explain the reasoning.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	
A-REI2	2. Understand solving equations as a process of reasoning and explain the reasoning.	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	
A-REI3	3. Solve equations and inequalities in one variable.	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	
A-REI4	4. Solve equations and inequalities in one variable.	Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives	

		complex solutions and write them as $a \pm bi$ for real numbers a and b.	
A-REI5	5. Solve systems of equations.	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.	
A-REI6	6. Solve systems of equations.	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	
A-REI7	7. Solve systems of equations.	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.*	
A-REI10	10. Represent and solve equations and inequalities graphically.	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	
A-REI11	11. Represent and solve equations and inequalities graphically.	Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	
A-REI12	1. Represent and solve equations and inequalities graphically.	Graph the solutions to a linear inequality in two variables as a half- plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	

FUNCTIONS

Study Notation	CT Content Dimension	CT Content Description	Alignment to Math SAT
INTERPRETING FUNCTIONS F-IF			

F-IF1	1. Understand the concept of a function and use function notation.	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f(x)* denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y = f(x).*	
F-IF2	2. Understand the concept of a function and use function notation.	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	
F-IF3	3. Understand the concept of a function and use function notation.	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.*	
F-IF4	4. Interpret functions that arise in applications in terms of the context.	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*	
F-IF5	5. Interpret functions that arise in applications in terms of the context.	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*	
F-IF6	6. Interpret functions that arise in applications in terms of the context.	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	
F-IF7	7. Analyze functions using different representations.	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.	

		b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	
F-IF8	8. Analyze functions using different representations.	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, *and classify them as representing exponential growth or decay.*	
F-IF9	9. Analyze functions using different representations.	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*	
BUILDING FUNCTIONS F-BF			
F-BF1	1. Build a function that models a relationship between two quantities.	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*	

F-BF2	2. Build a function that models a relationship between two quantities.	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	
F-BF3	3. Build new functions from existing functions.	Identify the effect on the graph of replacing *f(x)* by *f(x) + k, k f(x), f(kx)*, and *f(x + k)* for specific values of *k* (both positive and negative); find the value of *k* given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*	
F-BF4	4. Build new functions from existing functions.	Find inverse functions. a. Solve an equation of the form *f(x) = c* for a simple function *f* that has an inverse and write an expression for the inverse. *For example, f(x) =2 x3 or f(x) = (x+1)/(x–1) for x ≠ 1.*	
LINEAR, QUADRATIC, AND EXPONENTIAL MODELS F-LE			
F-LE1	1. Construct and compare linear, quadratic, and exponential models and solve problems.	Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	
F-LE2	2. Construct and compare linear, quadratic, and exponential models and solve problems.	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	
F-LE3	3. Construct and compare linear, quadratic, and exponential models and solve problems.	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	

F-LE4	4. Construct and compare linear, quadratic, and exponential models and solve problems.	For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.	
F-LE5	5. Interpret expressions for functions in terms of the situation they model.	Interpret the parameters in a linear or exponential function in terms of a context.	
TRIGONOMETRIC FUNCTIONS F-TF			
F-TF1	1. Extend the domain of trigonometric functions using the unit circle.	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	
F-TF2	2. Extend the domain of trigonometric functions using the unit circle.	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	
F-TF5	5. Model periodic phenomena with trigonometric functions.	Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.	
F-TF8	8. Prove and apply trigonometric identities.	Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.	

GEOMETRY

Study Notation	CT Content Dimension	CT Content Description	Alignment to Math SAT
CONGRUENCE G-CO			
G-CO1	1. Experiment with transformations in the plane.	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	
G-CO2	2. Experiment with transformations in the plane.	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).	
G-CO3	3. Experiment with transformations in the plane.	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	

G-CO4	4. Experiment with transformations in the plane.	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	
G-CO5	5. Experiment with transformations in the plane.	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.	
G-CO6	6. Understand congruence in terms of rigid motions.	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.	
G-CO7	7. Understand congruence in terms of rigid motions.	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	
G-CO8	8. Understand congruence in terms of rigid motions.	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.	
G-CO9	9. Prove geometric theorems.	Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.*	
G-CO10	10. Prove geometric theorems.	Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*	
G-CO11	11. Prove geometric theorems.	Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*	
G-CO12	12. Make geometric constructions.	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line*	

		parallel to a given line through a point not on the line.	
G-CO13	13. Make geometric constructions.	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	
SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY G-SRT			
G-SRT1	1. Understand similarity in terms of similarity transformations.	Verify experimentally the properties of dilations given by a center and a scale factor: a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	
G-SRT2	2. Understand similarity in terms of similarity transformations.	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.	
G-SRT3	3. Understand similarity in terms of similarity transformations.	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	
G-SRT4	4. Prove theorems involving similarity.	Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*	
G-SRT5	5. Prove theorems involving similarity.	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	
G-SRT6	6. Define trigonometric ratios and solve problems involving right triangles.	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.	
G-SRT7	7. Define trigonometric ratios and solve problems involving right triangles.	Explain and use the relationship between the sine and cosine of complementary angles.	

G-SRT8	8. Define trigonometric ratios and solve problems involving right triangles.	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	
CIRCLES G-C			
G-C1	1. Understand and apply theorems about circles.	Prove that all circles are similar.	
G-C2	2. Understand and apply theorems about circles.	Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*	
G-C3	3. Understand and apply theorems about circles.	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	
G-C5	5. Understand and apply theorems about circles.	Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.	
EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS G-GPE			
G-GPE1	1. Translate between the geometric description and the equation for a conic section.	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.	
G-GPE2	2. Translate between the geometric description and the equation for a conic section.	Derive the equation of a parabola given a focus and directrix.	
G-GPE4	4. Use coordinates to prove simple geometric theorems algebraically.	Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).*	

G-GPE5	5. Use coordinates to prove simple geometric theorems algebraically.	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).	
G-GPE6	6. Use coordinates to prove simple geometric theorems algebraically.	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	
G-GPE7	7. Use coordinates to prove simple geometric theorems algebraically.	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.	
GEOMETRIC MEASUREMENT AND DIMENSION G-GMD			
G-GMD1	1. Explain volume formulas and use them to solve problems.	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*	
G-GMD3	3. Explain volume formulas and use them to solve problems.	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	
G-GMD4	4. Visualize relationships between two-dimensional and three-dimensional objects.	Identify the shapes of two-dimensional cross-sections of three- dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	
MODELING WITH GEOMETRY G-MG			
G-MG1	1. Apply geometric concepts in modeling situations.	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	
G-MG2	2. Apply geometric concepts in modeling situations.	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	
G-MG3	3. Apply geometric concepts in modeling situations.	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).	

PROBABILITY AND STATISTICS

Study Notation	CT Content Dimension	CT Content Description	Alignment to Math SAT
INTERPRETING CATEGORICAL AND QUANTITATIVE DATA S-ID			

S-ID1	1. Summarize, represent, and interpret data on a single count or measurement variable.	Represent data with plots on the real number line (dot plots, histograms, and box plots).	
S-ID2	2. Summarize, represent, and interpret data on a single count or measurement variable.	Use 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.	
S-ID3	3. Summarize, represent, and interpret data on a single count or measurement variable.	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	
S-ID4	4. Summarize, represent, and interpret data on a single count or measurement variable.	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	
S-ID5	5. Summarize, represent, and interpret data on two categorical and quantitative variables.	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	
S-ID6	6. Summarize, represent, and interpret data on two categorical and quantitative variables.	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.* b. Informally assess the fit of a function by plotting and analyzing residuals.	
S-ID7	7. Interpret linear models.	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	
S-ID8	8. Interpret linear models.	Compute (using technology) and interpret the correlation coefficient of a linear fit.	
S-ID9	9. Interpret linear models.	Distinguish between correlation and causation.	
MAKING INFERENCES AND JUSTIFYING CONCLUSIONS S-IC			

S-IC1	1. Understand and evaluate random processes underlying statistical experiments.	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	
S-IC2	2. Understand and evaluate random processes underlying statistical experiments.	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*	
S-IC3	3. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	
S-IC4	4. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.	
S-IC5	5. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	
S-IC6	6. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	Evaluate reports based on data.	
CONDITIONAL PROBABILITY AND THE RULES OF PROBABILITY S-CP			
S-CP1	1. Understand independence and conditional probability and use them to interpret data.	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").	

S-CP2	2. Understand independence and conditional probability and use them to interpret data.	Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.	
S-CP3	3. Understand independence and conditional probability and use them to interpret data.	Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.	
S-CP4	4. Understand independence and conditional probability and use them to interpret data.	Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*	
S-CP5	5. Understand independence and conditional probability and use them to interpret data.	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*	
S-CP6	6. Use the rules of probability to compute probabilities of compound events in a uniform probability model.	Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model.	
S-CP7	7. Use the rules of probability to compute probabilities of compound events in a uniform probability model.	Apply the Addition Rule, *P*(*A* or *B*) = *P*(*A*) + *P*(*B*) – *P*(*A* and *B*), and interpret the answer in terms of the model.	

APPENDIX C: SAT SPECIFICATIONS

SAT READING SPECIFICATIONS

Study Notation	SAT Content Dimension	SAT Content Description
-	**Text Complexity**	**The passages/pair on the SAT Reading Test represent a specified range of text complexities from grades 9–10 to postsecondary entry.**
-	**Information and Ideas**	**These questions focus on the informational content of text.**
-	Reading closely	These questions focus on the explicit and implicit meaning of text and on extrapolating beyond the information and ideas in a text.
Explicit	Determining explicit meanings	The student will identify information and ideas explicitly stated in text.
Implicit	Determining implicit meanings	The student will draw reasonable inferences and logical conclusions from text.
Reasoning1	Using analogical reasoning	The student will extrapolate in a reasonable way from the information and ideas in a text or apply information and ideas in a text to a new, analogous situation.
Textual evidence	Citing textual evidence	The student will cite the textual evidence that best supports a given claim or point.
Central	Determining central ideas and themes	The student will identify explicitly stated central ideas or themes in text and determine implicit central ideas or themes from text.
Summarizing	Summarizing	The student will identify a reasonable summary of a text or of key information and ideas in text.
Relationships	Understanding relationships	The student will identify explicitly stated relationships or determine implicit relationships between and among individuals, events, or ideas (e.g., cause-effect, comparison-contrast, sequence).

Interpret	Interpreting words and phrases in context	The student will determine the meaning of words and phrases in context.
-	**Rhetoric**	**These questions focus on the rhetorical analysis of text.**
Word choice	Analyzing word choice	The student will determine how the selection of specific words and phrases or the use of patterns of words and phrases shapes meaning and tone in text.
-	Analyzing text structure	These questions focus on the overall structure of a text and on the relationship between a particular part of a text and the whole text.
Overall	Analyzing overall text structure	The student will describe the overall structure of a text.
Part-whole	Analyzing part-whole relationships	The student will analyze the relationship between a particular part of a text (e.g., a sentence) and the whole text.
POV	Analyzing point of view	The student will determine the point of view or perspective from which a text is related or the influence this point of view or perspective has on content and style.
Purpose	Analyzing purpose	The student will determine the main or most likely purpose of a text or of a particular part of a text (typically, one or more paragraphs).
-	Analyzing arguments	These questions focus on analyzing arguments for their content and structure.
Claims	Analyzing claims and counterclaims	The student will identify claims and counterclaims explicitly stated in text or determine implicit claims and counterclaims from text.
Reasoning2	Assessing reasoning	The student will assess an author's reasoning for soundness.

Evidence	Analyzing evidence	The student will assess how an author uses or fails to use evidence to support a claim or counterclaim.
-	**Synthesis**	**These questions focus on synthesizing multiple sources of information.**
Multiple	Analyzing multiple texts	The student will synthesize information and ideas from paired texts. (Note: All of the skills listed above may be tested with either single or paired passages.)
Quantitative	Analyzing quantitative information	The student will analyze information presented quantitatively in such forms as graphs, tables, and charts and/or relate that information to information presented in text.

SAT Writing and Language Specifications

Study Notation	SAT Content Dimension	SAT Content Description
-	**Text Complexity**	**The passages on the SAT Writing and Language Test represent a specified range of text complexities from grades 9–10 to postsecondary entry.**
-	**Expression of Ideas**	**These questions focus on revision of text for topic development, accuracy (consistency between text and graphic[s]), logic, cohesion, and rhetorically effective use of language.**
-	Development	These questions focus on revising text in relation to rhetorical purpose. (Prior knowledge of the topic is not assessed, though consistency of the material within a passage may be.)
Proposition	Proposition	The student will add, revise, or retain central ideas, main claims, counterclaims, topic sentences, and the like to structure text and convey arguments, information, and ideas clearly and effectively.
Support	Support	The student will add, revise, or retain information and ideas (e.g., details, facts, and statistics) intended to support claims or points in text.

Focus	Focus	The student will add, revise, retain, or delete information and ideas in text for the sake of relevance to topic and purpose.
Quantitative	Quantitative information	The student will relate information presented quantitatively in such forms as graphs, charts, and tables to information presented in text.
-	Organization	These questions focus on revision of text to improve the logic and cohesion of text at the sentence, paragraph, and whole-text levels.
Logical sequence	Logical sequence	The student will revise text as needed to ensure that information and ideas are presented in the most logical order.

SAT MATHEMATICS SPECIFICATIONS

SAT HEART OF ALGEBRA DOMAIN

Study Notation	SAT Content Dimension	SAT Content Description
	APPLICATION	
Algebra1	1. Create, solve, or interpret linear equations in one variable.	The student will create, solve, or interpret a linear expression or equation in one variable that represents a context. The expression or equation will have rational coefficients, and multiple steps may be required to simplify the expression, simplify the equation, or solve for the variable in the equation.
Algebra2	2. Create, solve, or interpret linear inequalities in one variable.	The student will create, solve, or interpret a linear inequality in one variable that represents a context. The inequality will have rational coefficients, and multiple steps may be required to simplify or solve for the variable.
Algebra3	3. Build a linear function that models a linear relationship between two quantities.	The student will describe a linear relationship that models a context using either an equation in two variables or function notation. The equation or function will have rational coefficients, and multiple steps may be required to build and simplify the equation or function.
Alegbra4	4. Create, solve, and interpret systems of two linear inequalities in two variables.	The student will analyze one or more constraints that exist between two variables by creating, solving, or interpreting an inequality in two variables or a system of inequalities in two variables to represent a context. Multiple steps may be required to create the inequality or system of inequalities or to determine whether a given point is in the solution set.

Algebra5	5. Create, solve, and interpret systems of two linear equations in two variables.	The student will analyze one or more constraints that exist between two variables by creating, solving, or analyzing a system of linear equations to represent a context. The equations will have rational coefficients, and multiple steps may be required to simplify or solve the system.
FLUENCY		
Algebra6	6. Solve linear equations in one variable.	The student will algebraically solve an equation (or inequality) in one variable. The equation (or inequality) will have rational coefficients and may require multiple steps to solve for the variable; the equation may yield no solution, one solution, or infinitely many solutions. The student may also be asked to determine the value of a constant or coefficient for an equation with no solution or infinitely many solutions.
Algebra7	7. Solve systems of two linear equations in two variables.	The student will algebraically solve a system of two linear equations in two variables. The equations will have rational coefficients, and the system may yield no solution, one solution, or infinitely many solutions. The student may also be asked to determine the value of a constant or coefficient of an equation in which the system has no solution, one solution, or infinitely many solutions.
CONCEPTUAL UNDERSTANDING		
Algebra8	8. Interpret the variables and constants in expressions for linear functions within the context presented.	The student will make connections between a context and the linear equation that models the context and will identify or describe the real-life meaning of a constant term, a variable, or a feature of the given equation.
Algebra9	9. Understand connections between algebraic and graphical representations.	The student will select a graph described by a given linear equation, select a linear equation that describes a given graph, determine the equation of a line given a verbal description of its graph, determine key features of the graph of a linear function from its equation, or determine how a graph may be impacted by a change in its equation.

SAT PROBLEM SOLVING AND DATA ANALYSIS DOMAIN

Study Notation	SAT Content Dimension	SAT Content Description
APPLICATION		
PSD1	1. Use ratios, rates, proportional relationships, and scale drawings to solve single- and multistep problems.	The student will use a proportional relationship between two variables to solve a multistep problem to determine a ratio or rate; calculate a ratio or rate and then solve a multistep problem; take a given ratio or rate and solve a multistep problem.

PSD2	2. Solve single- and multistep problems involving percentages.	The student will solve a multistep problem to determine a percentage; calculate a percentage and then solve a multistep problem; take a given percentage and solve a multistep problem.
PSD3	3. Solve single- and multistep problems involving measurement quantities, units, and unit conversion.	The student will solve a multistep problem to determine a unit rate; calculate a unit rate and then solve a multistep problem; solve a multistep problem to complete a unit conversion; solve a multistep problem to calculate density; use the concept of density to solve a multistep problem.
PSD4	4. Given a scatterplot, use linear, quadratic, or exponential models to describe how the variables are related.	The student will, given a scatterplot, select the equation of a line or curve of best fit; interpret the line in the context of the situation; use the line or curve of best fit to make a prediction.
PSD5	5. Use the relationship between two variables to investigate key features of the graph.	The student will make connections between the graphical representation of a relationship and properties of the graph by selecting the graph that represents the properties described; using the graph to identify a value or set of values.
PSD6	6. Compare linear growth with exponential growth.	The student will infer the connection between two variables given a context in order to determine what type of model fits best.
PSD7	7. Use two-way tables to summarize categorical data and relative frequencies, and calculate conditional probability.	The student will summarize categorical data or use categorical data to calculate conditional frequencies; conditional probabilities; association of variables; independence of events.
PSD8	8. Make inferences about population parameters based on sample data.	The student will estimate a population parameter given the results from a random sample of the population. The sample statistics may mention confidence intervals and measurement error that the student should understand and make use of, but need not calculate.
PSD9	9. Use statistics to investigate measures of center of data and analyze shape, center, and spread.	The student will calculate measures of center and/or spread for a given set of data or use given statistics to compare two separate sets of data. The measures of center that may be calculated include mean, median, and mode, and the measures of spread that may be calculated include range. When comparing two data sets, the student may investigate mean, median, mode, range, and/or standard deviation.

PSD10	10. Evaluate reports to make inferences, justify conclusions, and determine appropriateness of data collection methods.	The student will evaluate reports to make inferences, justify conclusions, and determine appropriateness of data collection methods. The reports may consist of tables, graphs, and text summaries.

SAT PASSPORT TO ADVANCED MATH DOMAIN

Study Notation	SAT Content Dimension	SAT Content Description
	APPLICATION	
Passport1	1. Create quadratic or exponential functions.	The student will create a quadratic or exponential function or equation that models a context. The equation will have rational coefficients and may require multiple steps to simplify or solve the equation.
Passport2	2. Choose and produce equivalent forms of expressions to reveal and explain properties of a quantity.	The student will, given a context, determine the most suitable form of an expression or equation to reveal a particular trait.
	PROCEDURAL SKILL AND FLUENCY	
Passport3	3. Create equivalent expressions involving radicals and rational exponents.	The student will create equivalent expressions involving rational exponents and radicals, including simplifying or rewriting in other forms.
Passport4	4. Create equivalent forms of expressions by using structure.	The student will create an equivalent form of an algebraic expression by using structure and fluency with operations.
Passport5	5. Solve quadratic equations.	The student will solve a quadratic equation having rational coefficients. The equation can be presented in a wide range of forms to reward attending to algebraic structure and can require manipulation in order to solve.
Passport6	6. Perform arithmetic operations on polynomials.	The student will add, subtract, and multiply polynomial expressions and simplify the result. The expressions will have rational coefficients.
Passport7	7. Solve radical and rational equations in one variable, including examples where there are extraneous solutions.	The student will solve an equation in one variable that contains radicals or contains the variable in the denominator of a fraction. The equation will have rational coefficients, and the student may be required to identify when a resulting solution is extraneous.
Passport8	8. Solve a system of equations consisting of one linear and one quadratic equation in two variables.	The student will solve a system of one linear equation and one quadratic equation. The equations will have rational coefficients.

Passport9	9. Rewrite simple rational expressions.	The student will add, subtract, multiply, or divide two rational expressions or divide two polynomial expressions and simplify the result. The expressions will have rational coefficients.
CONCEPTUAL UNDERSTANDING		
Passport10	10. Interpret parts of nonlinear expressions in terms of their context.	The student will make connections between a context and the nonlinear equation that models the context to identify or describe the real-life meaning of a constant term, a variable, or a feature of the given equation.
Passport11	11. Understand the relationship between zeros and factors of polynomials; use it to sketch graphs.	The student will use properties of factorable polynomials to solve conceptual problems relating to zeros, such as determining whether an expression is a factor of a polynomial based on other information provided
Passport12	12. Understand a nonlinear relationship between two variables by making connections between their algebraic and graphical representations.	The student will select a graph corresponding to a given nonlinear equation, interpret graphs in the context of solving systems of equations, select a nonlinear equation corresponding to a given graph, and determine the equation of a curve given a verbal description of a graph, determine key features of the graph of a linear function from its equation, or determine the impact to a graph of a change in the defining equation.
Passport13	13. Use function notation, and interpret statements using function notation.	The student will use function notation to solve conceptual problems related to transformations and compositions of functions.
Passport14	14. Use structure to isolate or identify a quantity of interest in an expression or isolate a quantity of interest in an equation.	The student will rearrange an equation or formula to isolate a single variable or a quantity of interest.

SAT ADDITIONAL TOPICS IN MATH DOMAIN

Study Notation	SAT Content Dimension	SAT Content Description
APPLICATION		
AddTop1	1. Solve problems using volume formulas.	The student will use given information about figures, such as length of a side, area of a face, or volume of a solid, to calculate missing information. Any required volume formulas will be provided to students either on the formula sheet or within the question.
AddTop2	2. Use trigonometric ratios and the Pythagorean Theorem to solve applied problems involving right triangles.	The student will use information about triangle side lengths or angles presented in a context to calculate missing information using the Pythagorean theorem and/or trigonometric ratios.
PROCEDURAL SKILL AND FLUENCY		

AddTop3	3. Perform arithmetic operations on complex numbers.	The student will add, subtract, multiply, divide, and simplify complex numbers.
AddTop4	4. Convert between degrees and radians and use radians to determine arc lengths; use trigonometric functions of radian measure.	The student will convert between angle measures in degrees and radians in order to calculate arc lengths by recognizing the relationship between an angle measured in radians and an arc length, evaluating trigonometric functions of angles in radians.
AddTop5	5. Apply theorems about circles to find arc lengths, angle measures, chord lengths, and areas of sectors.	The student will use given information about circles and lines to calculate missing values for radius, diameter, chord length, angle, arc, and sector area.
CONCEPTUAL UNDERSTANDING		
AddTop6	6. Use concepts and theorems about congruence and similarity to solve problems about lines, angles, and triangles.	The student will use theorems about triangles and intersecting lines to determine missing lengths and angle measures of triangles. The student may also be asked to provide a missing length or angle to satisfy a given theorem.
AddTop7	7. Use the relationship between similarity, right triangles, and trigonometric ratios; use the relationship between sine and cosine of complementary angles.	The student will use trigonometry and theorems about triangles and intersecting lines to determine missing lengths and angle measures of right triangles. The student may also be asked to provide a missing length or angle that would satisfy a given theorem.
AddTop8	8. Create or use an equation in two variables to solve a problem about a circle in the coordinate plane.	The student will create an equation or use properties of an equation of a circle to demonstrate or determine a property of the circle's graph.

APPENDIX D: PANELIST RATINGS

The ratings by the panelists are presented below. For ease of interpretation and reading, numbers were assigned to each SAT standard as outlined in Tables D1 and D2. Each subsequent table contains the number of panelists who indicated alignment between the SAT standard and Connecticut standard. "Zeroes" are left blank. Rows have been deleted in cases where several consecutive SAT standards were not rated as being aligned with any of the Connecticut standards in a given table (i.e., rows of all zeroes). Such omissions are noted under each table.

Table D1

Reading, Language, and Writing SAT Standards Codebook

1. Proposition	26. Within-sentence punctuation
2. Support	27. Possessive nouns and pronouns
3. Focus	28. Items in a series
4. Quantitative	29. Nonrestrictive and parenthetical elements
5. Logical sequence	30. Unnecessary punctuation
6. Introductions	31. Explicit
7. Precision	32. Implicit
8. Concision	33. Reasoning1
9. Style and tone	34. Textual evidence
10. Syntax	35. Central
11. Sentence boundaries	36. Summarizing
12. Subordination and coordination	37. Relationships
13. Parallel structure	38. Interpret
14. Modifier placement	39. Word choice
15. Verb tense, mood, and voice	40. Overall
16. Pronoun person and number	41. Part-whole
17. Pronoun clarity	42. POV
18. Possessive determiners	43. Purpose
19. Pronoun-antecedent agreement	44. Claims
20. Subject-verb agreement	45. Reasoning2
21. Noun agreement	46. Evidence
22. Frequently confused words	47. Multiple
23. Logical comparison	48. Quantitative
24. Conventional expression	49. No match/Not applicable
25. End-of-sentence punctuation	

Table D2

Mathematics SAT Standards Codebook

1. Alegbra1	15. PSD6	29. Passport10
2. Alegbra2	16. PSD7	30. Passport11
3. Alegbra3	17. PSD8	31. Passport12
4. Alegbra4	18. PSD9	32. Passport13
5. Alegbra5	19. PSD10	33. Passport14
6. Algebra6	20. Passport1	34. AddTop1
7. Algebra7	21. Passport2	35. AddTop2
8. Algebra8	22. Passport3	36. AddTop3
9. Algebra9	23. Passport4	37. AddTop4
10. PSD1	24. Passport5	38. AddTop5
11. PSD2	25. Passport6	39. AddTop6
12. PSD3	26. Passport7	40. AddTop7
13. PSD4	27. Passport8	41. AddTop8
14. PSD5	28. Passport9	42. No match/Not applicable

Table D3

Panel Alignment for Language

SAT Content Dimension*	Connecticut Core Standards					
	L1	L2	L3	L4	L5	L6
1						1
2						1
3						1
4						1
5						1
6						1
7	2		3	3	3	6
8	1		2	1		3
9	1		8		2	2
10			11		1	2
11	6	1	3			1
12	5		2			1
13	4		2	1		1
14	4		1	1		1
15	4		2	2		1
16	5		1	1		1
17	5		1	1	1	1
18	5			2	1	1
19	4		1	3		1
20	4		1	4		1
21	4		1	4		1
22	3	4	2	7	4	2
23	4		1	1	3	1
24	9	3	3	2	4	1
25	1	8				1
26	1	10				1
27	1	3				1
28	1	8				1
29	1	6				1
30	1	10				1
31					1	1
32					1	1
38				2	2	1
39				2	2	1
49	2	2	2	5	6	8

*Content dimensions 33 – 37 and 40 – 48 were excluded from this table.

Table D4

Panel Alignment for Reading/Informational Text

SAT Content Dimension*	Connecticut Core Standards									
	RIT1	**RIT2**	**RIT3**	**RIT4**	**RIT5**	**RIT6**	**RIT7**	**RIT8**	**RIT9**	**RIT10**
31	14	1	1	2	1			2	3	6
32	14	5	6	3	2	3		4	4	6
33	1	5	3	2			5	5	3	5
34	14		1	1			1	1	1	5
35		14	1		1	1		3	9	6
36		15	2				1	3	1	6
37		9	14	1	2	1	3	5	4	5
38	2	1	1	13	1	1		3	4	6
39				13	1	6		1	5	5
40	2	2	2		11				3	5
41		10	8	2	9	1	1		3	5
42					2	15		4	7	5
43			1	1	4	13	1	7	9	5
44	2	1	1		5	1		10	5	5
45	1				6	3	1	11	3	5
46	3			1	6	3	1	6	2	5
47		1					13	3		5
48							13			5
49							1	1	1	9

*Content dimensions 1 – 30 were excluded from this table.

Table D5

Panel Alignment for Reading/Literature

SAT Content Dimension*	Connecticut Core Standards									
	RL1	**RL2**	**RL3**	**RL4**	**RL5**	**RL6**	**RL7**	**RL8**	**RL9**	**RL10**
31	15	2	2	3		10			2	7
32	15	6	3	4	1	13	1		2	7
33	1	2	2	1		2	5		5	6
34	15	1	2	1						6
35		15			1		1		7	7
36	1	14	1				1		1	7
37		8	10		3	1	3		3	6
38	2	1	2	13		4	1			7
39			4	15	1	5				6
40	1		6		13		2			6
41		8	10	5	13	1	2			6
42			4		1	14	5		4	6
43		1	3	3	3	5	2		3	6
44	1	1							1	6
45	1				1		2			6
46	2	1								6
47							12		13	6
48										6
49			1				3		2	8

*Content dimensions 1 – 30 were excluded from this table.

Table D6

Panel Alignment for Writing

SAT Content Dimension*	Connecticut Core Standards									
	W1	**W2**	**W3**	**W4**	**W5**	**W6**	**W7**	**W8**	**W9**	**W10**
1	11	9	8	4	9		2	1		2
2	11	11	4	4	7		2	2	3	1
3	8	9	4	7	9		2	1	1	3
4		6		1			2	3		1
5	11	11	9	7	6		1	1		1
6	11	10	10	2	6		1			1
7	5	11	10	5	9					1
8	4	4	5	4	9					1
9	11	11	8	9	11	1				3
10	7	10	7	3	3					1
11				1	1					1
12				1	1					1
13				1	1					1
14				1	1					1
15				1	1					1
16				1	1					1
17				1	1					1
18				1	1					1
19				1	1					1
20				1	1					1
21				1	1					1
22				1	1					1
23				1	1					1
24	1			1	1					1
25				1	1					1
26				1	1					1
27				1	1					1
28				1	1					1
29				1	1					1
30				1	1					1
34									1	
49	4	4	4	4	2	14	12	12	11	12

*Content dimensions 31 – 33 and 35 – 48 were excluded from this table.

Table D7

Panel Alignment for Numbers and Quantity

SAT Content Dimension*	Connecticut Core Standards								
	N-RN1	**N-RN2**	**N-RN3**	**N-Q1**	**N-Q2**	**N-Q3**	**N-CN1**	**N-CN2**	**N-CN3**
1					1	1			
2						1			
3					4				
8				2					
9				1					
10				2	1				
11					1	1			
12				14	5	5			
13					1				
14				3	1				
15					2				
16									
17									
18						1			
19									
20	4				2				
21	5	4	3						
22	17	18							
23		1							
24									9
25		1							
26									
27									1
28		2	1						
34							1		
35									
36							14	18	2
37								1	
42			15	3	8	14	4		9

*Content dimensions 4 – 7, 29 – 33, and 38 – 41 were excluded from this table.

Table D8

Panel Alignment for Algebra

	Connecticut Core Standards											
SAT Content Dimension*	**A-SSE1**	**A-SSE2**	**A-SSE3**	**A-SSE4**	**A-APR1**	**A-APR2**	**A-APR3**	**A-APR4**	**A-APR6**	**A-CED1**	**A-CED2**	**A-CED3**
1	3									16	1	2
2										16		3
3											12	
4											5	13
5											4	12
6										2		3
7												3
8	14	2								1	1	1
9											3	
10												
11												
12												
13	1										1	
14	1										1	
20			5	1						7	1	
21	1	3	9	2					1		1	
22	1	4	4	1					1	1		
23	2	10	11	2			2	3	2			
24			8				1			1		
25					15							
26												
27			1									
28					3	1			15			
29	10	1	2	1						1		
30		3	5			14	15		1	1		
31			1				1				2	
32												
33	1	3	3	2								
41											1	
42	1	2	2	13	2	4	2	16			2	1

*Content dimensions 15 – 19 and 34 – 40 were excluded from this table.

Table D8 (continued)

Panel Alignment for Algebra

	Connecticut Core Standards										
SAT Content Dimension*	**A-CED4**	**A-REI1**	**A-REI2**	**A-REI3**	**A-REI4**	**A-REI5**	**A-REI6**	**A-REI7**	**A-REI10**	**A-REI11**	**A-REI12**
1		6	1	10						1	
2		1		11	3						1
3	2		1						1	1	
4						1	2		1		8
5					1	7	6	1		1	
6		6	1	9		1	1				
7						5	15	1		2	
8	2				1						
9							1		10	3	1
10											
11											
12											
13					1						
14									3	3	1
15					1						
21	1										
22	1										
23	2				1						
24		1			15						
25											
26			14					1			
27						2		16		1	
28											
29											
30					1				1		
31							1		3	1	1
32										2	
33	13			3							
34	1										
41								1			
42	1	9	2		1	5		1	4	9	8

*Content dimensions 16 – 20 and 35 – 40 were excluded from this table.

Table D9

Panel Alignment for Functions

SAT Content Dimension*	Connecticut Core Standards										
	F-IF1	**F-IF2**	**F-IF3**	**F-IF4**	**F-IF5**	**F-IF6**	**F-IF7**	**F-IF8**	**F-IF9**	**F-BF1**	**F-BF2**
1										3	
2		1								1	
3		1		1		1				8	1
8		1		3	1	3				1	
9				6	2	2	8		7		
10	1					3					
11											
12						2					
13							1			3	
14				6	3	2	9		2		
15							1		1		
20										4	
21					1			7	2	1	
22							1	1			
23								1		1	
28									1		
29					1			3	1		
30				2			6	6	1		
31				8	1	1	10	4	5		
32	14	16	4	1	1					5	1
33		1							1		1
42	4		15	2	11	9	6	6	5	4	16

*Content dimensions 4 – 7, 16 – 19, 24 – 27, and 34 – 41 were excluded from this table.

Table D9 (continued)

Panel Alignment for Functions

SAT Content Dimension*	Connecticut Core Standards										
	F-BF3	F-BF4	F-LE1	F-LE2	F-LE3	F-LE4	F-LE5	F-TF1	F-TF2	F-TF5	F-TF8
1			2				2				
2											
3			1	3	1		2				
4											
5							2				
6											
7											
8			1	1			3				
9											
10			1								
11			1								
12							1				
13			5	2	2		1				
14		1		2	3						
15			12	9	8	1	2				
16				1							
17											
18											
19					1						
20			2	4							
21			2				1				
29			1				8				
30											
31	5		1	2	2		3				
32	8	1									
33		2									
34											
35										1	5
36								1			
37								17	11	3	
38								2			1
39											
40									1		2
41											
42	7	15	2	4	5	18	2	1	7	15	13

*Content dimensions 22 – 28 were excluded from this table.

Table D10

Panel Alignment for Geometry

	Connecticut Core Standards												
SAT Content Dimension*	**G-CO1**	**G-CO2**	**G-CO3**	**G-CO4**	**G-CO5**	**G-CO6**	**G-CO7**	**G-CO8**	**G-CO9**	**G-CO10**	**G-CO11**	**G-CO12**	**G-CO13**
32		1	2	2	2	1	1	1					
33		1											
34													
35										1			
36													
37													
38	3								1			1	
39	3					4	6	8	8	11	5		
40		1					1	1	2	2	1		
41													1
42	13	16	17	17	17	15	12	10	8	6	13	18	18

*Content dimensions 1 – 31 were excluded from this table.

Table D10 (continued)

Panel Alignment for Geometry

	Connecticut Core Standards											
SAT Content Dimension*	**G-SRT1**	**G-SRT2**	**G-SRT3**	**G-SRT4**	**G-SRT5**	**G-SRT6**	**G-SRT7**	**G-SRT8**	**G-C1**	**G-C2**	**G-C3**	**G-C5**
10	1	1				1						
35				1		4	5	16				
36												
37						3	1	1		1		5
38									4	16	4	8
39	5	4	5	6	10	3						
40	1	2	2	4	4	10	8	8				
41							1		1	1		
42	13	12	12	9	6	1	4		14	2	15	7

*Content dimensions 1 – 9 and 11 – 34 were excluded from this table.

Table D10 (continued)

Panel Alignment for Geometry

	Connecticut Core Standards											
SAT Content Dimension*	**G-GPE1**	**G-GPE2**	**G-GPE4**	**G-GPE5**	**G-GPE6**	**G-GPE7**	**G-GMD1**	**G-GMD3**	**G-GMD4**	**G-MG1**	**G-MG2**	**G-MG3**
1												
2												
3				1								
10				1	1						1	1
11												
12						1				1	7	1
13												
14		1										
34						1	10	19	1	2	2	2
35	1											
36												
37												
38			1						1			1
39			1	1	1							
40				1								
41	13		2	1	1	1						
42	5	18	15	14	16	16	9		17	16	10	14

*Content dimensions 4 – 9 and 15 – 33 were excluded from this table.

Table D11

Panel Alignment for Statistics and Probability

SAT Content Dimension*	Connecticut Core Standards										
	S-ID1	S-ID2	S-ID3	S-ID4	S-ID5	S-ID6	S-ID7	S-ID8	S-ID9	S-IC1	S-IC2
1							1				
2							1	1			
3							1				
4											
5											
6							1	1			
7											
8							5				
9							2				
10							1				
11											
12							1				
13	1					18	5	4	1		1
14	2					2	2				
15						4	2	1			2
16	2	1			17						
17			1	2	3	1	1			11	1
18	1	18	13	11							
19				1	1		1	1	5	5	6
42	13		5	6			3	12	13	5	10

*Content dimensions 20 – 41 were excluded from this table.

Table D11 (continued)

Panel Alignment for Statistics and Probability

SAT Content Dimension*	Connecticut Core Standards										
	S-IC3	S-IC4	S-IC5	S-IC6	S-CP1	S-CP2	S-CP3	S-CP4	S-CP5	S-CP6	S-CP7
11					1			1			
16	1				7	10	13	17	11	10	5
17	2	14	3	3							
18			3								
19	9	4	8	14	1	1	1	1	1		
42	8	2	6	2	11	8	5	1	7	9	14

*Content dimensions 1 – 10, 12-15, and 20 – 41 were excluded from this table.