

## Appendix A • Grading and Criteria

### Grading

Mathematics and English language arts experts devised content-specific criteria (see below) to evaluate the quality of a state’s standards.<sup>1</sup> Based on this comparison and using a common grading metric (also below), they assigned a composite score based on how well a given set of standards fared in two categories: “Content and Rigor” and “Clarity and Specificity.” States could earn up to seven points for Content and Rigor and up to three points for Clarity and Specificity (for a total of ten possible points). Final scores were then converted into a letter grade according to the following scale:

**Table A-1: Grading Scale**

Grade	Points
A	10
A-	9
B+	8
B	7
C	5 or 6
D	3 or 4
F	0, 1, or 2

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## Common Grading Metric

### Content and Rigor

7 points: Standards meet all of the following criteria:

- » Standards are top-notch in terms of the content chosen. The coverage of the subject is suitable, good decisions have been made about what topics to include, and nothing of importance has been overlooked. (No more than 5 percent of the content outlined in the subject-specific content expectations is missing.)
- » Not only is the appropriate content covered by the standards, but it is covered well (i.e., in a high-quality manner).
- » Good decisions have also been made about what content should be left out. Excellent standards do not include much superfluous material. (No more than 5 percent of the content in the standards is unnecessary.)
- » Standards distinguish between more important and less important content and skills either directly (i.e., by articulating which are more or less important) OR via the number of standards dedicated to particular content and skills (i.e., more important content/skills have more standards while less important content/skills have fewer standards). The standards do not overemphasize topics of little importance or underemphasize topics of great importance.
- » The level of rigor is appropriate for the targeted grade level(s). Students are expected to learn the content and skills in a sensible order and an appropriately increasing level of difficulty. The standards, taken as a whole, define a core literacy for all students in the subject under review; at the same time, the standards that run through grade 12 are sufficiently challenging to ensure that students who achieve proficiency by the final year of high school will be ready for college or work and citizenship.
- » The standards do not overemphasize the importance of students’ life experiences or “real-world” problems. They do not embrace fads, suggest political bias, or teach moral dogma. They do not imply that all interpretations are equally

valid (regardless of logic or the adequacy of supporting evidence). The standards also avoid other major subject-specific problems identified by the reviewers. While the standards are not perfect, any defects are marginal.

6 points: Standards fall short in one or more of the following ways:

- » Some crucial content (as specified in the content-specific criteria) is missing (at least 5 percent and up to 20 percent).
- » The content is covered satisfactorily but not in a high-quality manner.
- » Some of the content in the standards is unnecessary (at least 5 percent and up to 20 percent).
- » Standards do not fully distinguish between more- and less-important content and skills (i.e., importance is neither expressly articulated nor conveyed via the number of standards dedicated to particular topics). In other words, the standards overemphasize no more than one or two topics of little importance or underemphasize no more than one or two topics of great importance.
- » Standards at particular grade levels are not quite as rigorous as they could be, or are too rigorous (i.e., expectations are slightly too high or too low).
- » There are minor problems or shortcomings (e.g., one or more of the problems listed in the last paragraph under the 7-point score affects the standards in a small way, or there are other minor subject-specific problems).

5 points: Standards fall short in one or more of the following ways:

- » Some crucial content is missing (at least 20 percent and up to 35 percent).
- » While most of the appropriate content is covered by the standards, the content is nonetheless covered in a manner that is not satisfactory (i.e., the standards cover the right material but do not cover that material robustly; thus, the material is shortchanged in some way).
- » Some of the content in the standards is unnecessary (at least 20 percent and up to 35 percent).
- » Standards do not distinguish between more- and less-important content and skills (i.e., importance is not articulated or conveyed in any way). The standards often overemphasize topics of little importance or underemphasize topics of great importance.
- » Standards generally need to be more or less rigorous than they are at certain grade levels (i.e., expectations are too high or too low).
- » There is an important shortcoming (perhaps one of the problems listed in the last paragraph of the 7-point score, or there are other subject-specific problems).

4 points: Standards fall short in one or more of the following ways:

- » At least 35 and up to 50 percent of crucial content is missing.
- » Some of the content in the standards is unnecessary (at least 35 percent, and up to 50 percent).
- » There are a few critical shortcomings (as listed above) although the standards contain no serious errors.

3 points: Standards fall short in one or more of the following ways:

- » At least 50 and up to 65 percent of crucial content is missing.
- » At least 50 percent and up to 65 percent of the content in the standards is unnecessary.
- » There are serious problems, shortcomings, or errors in the standards, although the standards have some redeeming qualities and there is some evidence of rigor.

2 points: Standards fall short in one or more of the following ways:

- » At least 65 and up to 80 percent of crucial content is missing.
- » At least 65 percent and up to 80 percent of the content in the standards is unnecessary.
- » There are several serious problems, shortcomings, or errors (as listed above).

1 point: Standards fall short in one or more of the following ways:

- » At least 80 percent of crucial content is missing.
- » At least 80 percent of the content in the standards is unnecessary.
- » There are numerous problems, shortcomings, or errors (as listed above).

0 points: Standards fall short in one or more of the following ways:

- » The content of the standards does not address or barely addresses the subject-specific content expectations.
- » The content is poorly chosen and fails to provide the level of rigor appropriate for the targeted grade level(s).
- » Content is full of problems, shortcomings, and errors (as listed above).

## **Clarity and Specificity**

3 points: Standards are coherent, clear, and well organized.

The scope and sequence of the material is apparent and sensible. They provide solid guidance to users (students, teachers, curriculum directors, test developers, textbook writers, etc.) about the content knowledge and skills required to do well on the exam. The right level of detail is provided.

The document(s) are written in prose that the general public can understand and are mostly free from jargon. The standards describe things that are measurable (i.e., can lead to observable, comparable results across students and schools). The standards as a whole clearly illustrate the growth expected through the grades.

2 points: The standards are somewhat lacking in coherence, clarity, or organization.

The scope and sequence of the material is not completely apparent or sensible. The standards do not quite provide a complete guide to users as to the content knowledge and skills required to do well on the exam (i.e., as a guide for users, there are shortcomings that were not already addressed by the Content and Rigor score). The standards provide insufficient detail. The prose is generally comprehensible but there is some jargon and some vague or unclear language. Some standards are not measurable.

1 point: The standards are somewhat coherent, clear, and organized.

They offer limited guidance to users (students, teachers, curriculum directors, textbook writers, etc.) about the content knowledge and skills required to do well on the exam, but there are significant shortcomings (as a guide for users) that were not already addressed by the content and rigor score. The standards are seriously lacking in detail, and much of their language is vague enough to leave unclear what is being asked of students and teachers.

0: The standards are incoherent and/or disorganized.

They are not helpful to users. The standards are sorely lacking in detail. Scope and sequence is a mystery.

## English Language Arts Content-Specific Criteria

### Overview

These criteria contain many examples to clarify the type (and level) of concepts and skills that are expected in quality standards at the designated grade spans. The criteria and examples for each grade should be understood to include, cumulatively, the criteria and examples for the grades that precede them.

### Elementary School (Grades K-4)

#### *Reading*

1. The standards delineate explicit and systematic expectations in phonemic awareness, phonics, fluency, and comprehension skills.
2. The standards address systematic vocabulary development (e.g., basic prefixes and suffixes; common synonyms, antonyms, and compound words; multiple meaning words; and dictionary use).
3. The standards outline specific expectations for reading and analyzing literary and non-literary texts (e.g., recognizing and interpreting genres; structures; literary elements; and stylistic devices).
4. The standards reflect the importance of reading grade-appropriate works of outstanding American literature that reflect our common heritage.
5. The standards describe the amount, quality, and complexity of both literary and non-literary texts to be studied through the use of lists (authors and/or titles), sample passages, and/or commentary.

#### *Writing*

6. The standards delineate expectations for writing that address the characteristics and quality of writing products appropriate to the grade level (e.g., organization of ideas and focus; introduction, body, and conclusion; elements of a paragraph; and evaluation and revision skills).
7. The standards require students to recognize, explain, and produce writing that reflects the defining characteristics of various grade-appropriate writing genres (e.g., narration and exposition).
8. The standards describe or reference the use of specific criteria for evaluating writing (e.g., logically organized and detailed genre- or prompt-specific rubrics) that include examples regarding the quality of writing expected.

#### *Listening and Speaking*

9. The standards clearly address active listening and effective speaking skills (e.g., summarizing information presented orally; asking and answering relevant questions).
10. The standards address the ability to make formal oral presentations (e.g., recitation; story retelling; and sequencing).
11. The standards describe or reference the use of specific criteria for evaluating oral presentations (e.g., content; organization; and presentation style).
12. The standards include specific expectations for participation in group discussions (e.g., turn-taking; and applying agreed-upon rules for decision making).

#### *Oral and Written Language Conventions*

13. The standards specify expectations for the correct use of Standard English, describing a grade-appropriate facility with the parts of speech, sentence structure, usage, and mechanics appropriate to the grade level (e.g., nouns, verbs, adjectives, adverbs, conjunctions, prepositions, and nominative/objective/interrogative pronouns; sentence types; complete/incomplete sentences; subject/verb (S/V) agreement; initial, internal, and ending punctuation; and basic spelling rules, such as plurals, contractions, and inflections).

*Research*

14. The standards require students to learn the research process, outlining specific expectations for the essential components of the process (e.g., identifying or finalizing a research question; locating information; evaluating and compiling information; presenting findings; and acknowledging sources using a standard format).

*Media*

15. The standards require students to analyze and evaluate information presented in multimedia formats (e.g., the effect of various visual and aural techniques; how information presented in print is different from that which is presented through the use of multimedia).
16. The standards require that students learn about multimedia techniques for presenting information.

**Middle School (Grades 5-8)***Reading*

1. The standards address vocabulary development (e.g., knowledge of roots and affixes; connotation and denotation; figurative language; and use of the dictionary for clarifying multiple meanings, etymology, and pronunciation).
2. The standards specify strategies/skills for reading and analyzing both literary and non-literary texts (e.g., analysis of genres, structures, literary elements, rhetorical techniques, and stylistic devices; strategies for comprehension and interpretation).
3. The standards reflect the importance of reading grade-appropriate works of outstanding American literature that reflect our common heritage.
4. The standards describe the amount, quality, and complexity of both literary and non-literary texts to be studied through the use of lists (authors and/or titles), sample passages, and/or commentary.

*Writing*

5. The standards delineate expectations for writing that address the characteristics and quality of writing products appropriate to the grade level (e.g., increasingly sophisticated understanding of audience and purpose; clear organization and consistent focus; development of ideas through multi-paragraph essays; use of transitions; reflective peer review and revision processes).
6. The standards require students to interpret and produce writing that reflects the defining characteristics of various grade-appropriate writing genres (e.g., argument).
7. The standards describe or reference the use of specific criteria for evaluating writing (e.g., logically organized and detailed genre- or prompt-specific rubrics) that include examples regarding the quality of writing expected.

*Listening and Speaking*

8. The standards clearly address active listening and effective speaking skills (e.g., give, restate, and execute multi-step directions; convey ideas orally and interpret spoken ideas; make inferences from spoken information; ask and answer clarifying questions).
9. The standards address the ability to make formal oral presentations (e.g., recitation; informative and persuasive presentations that offer supporting details and evidence; and address anticipated counterclaims and include a call to action when appropriate).
10. The standards describe or reference the use of detailed criteria for evaluating formal oral presentations.
11. The standards include specific expectations for participation in group discussions (e.g., designation of roles; and eliciting and considering suggestions).

*Oral and Written Language Conventions*

- The standards specify expectations for the correct use of Standard English, describing a grade-appropriate facility with the parts of speech, sentence structure, usage, and mechanics appropriate to the grade level (e.g., parts of the verb; interjections, possessive/demonstrative/relative/indefinite pronouns; tenses; analysis of sentence structure; types of phrases and clauses; fragments and run-on sentences; and facility with mechanics grounded in understanding of sentence structure).

*Research*

- The standards require students to employ the research process, outlining specific expectations for the essential components of the process (e.g., identifying and refining a research question; locating information; evaluating the quality of information/sources; selecting information that supports a thesis; presenting findings; citing sources correctly using standard guidelines; and avoiding plagiarism).

*Media*

- The standards require students to analyze and evaluate information presented in multimedia formats (e.g., how information presented in print is different from that which is presented through the use of multimedia; noting what is conveyed through the use of various visual and aural techniques, such as bias and propaganda).
- The standards require that students know how to use multimedia techniques to present information.

**High School (Grades 9-12)***Reading*

- The standards address vocabulary development and skills for building content-area vocabulary (e.g., applying knowledge of roots and affixes to help determine meanings of words; tracing etymology; and determining shades of meaning).
- The standards describe specific expectations for reading and analyzing both literary and non-literary texts (e.g., analyzing the clarity of structures, the development of literary elements, the effectiveness of rhetorical techniques, and the manipulation of stylistic devices; describing the truth and/or validity of an argument; and recognizing and explaining the presence of fallacious reasoning).
- The standards reflect the importance of reading grade-appropriate works of outstanding American literature that reflect our common literary heritage.
- The standards describe the amount, quality, and complexity of both literary and non-literary texts to be studied through the use of lists (authors and/or titles), sample passages, and/or commentary.

*Writing*

- The standards delineate expectations for writing that address the characteristics and quality of writing products appropriate to the grade level (e.g., strong organization and development of ideas; facility with selection and blending of genres appropriate to audience and purpose; and the use of sophisticated transitions, active rather than passive voice, and other stylistic elements for rhetorical effect).
- The standards require students to analyze and produce writing that reflects the defining characteristics of various grade-appropriate writing genres (e.g., persuasion).
- The standards describe or reference the use of specific criteria for evaluating writing (e.g., logically organized and detailed genre- or prompt-specific rubrics) that include examples regarding the quality of writing expected.

*Listening and Speaking*

- The standards clearly address active listening and effective speaking skills (e.g., interpret complex information and ideas presented orally; and convey complex information or ideas orally).
- The standards address the ability to make formal oral presentations (e.g., recitation; and complex informative or persuasive oral presentations that require a logical structure, well-chosen supporting evidence/details, skillful rhetorical techniques, and a strong presentation style).

10. The standards describe or reference the use of detailed criteria for evaluating formal oral presentations.
11. The standards include specific expectations for participation in group discussions (e.g., tolerating ambiguity; building on the ideas of others; and reaching consensus).

*Oral and Written Language Conventions*

12. The standards specify expectations for the correct use of Standard English, describing a grade-appropriate facility with the parts of speech, sentence structure, usage, and mechanics (e.g., demonstrate control of sentence structure, usage, and mechanics).

*Research*

13. The standards require students to conduct the research process, outlining specific expectations for the essential components of the process (e.g., identifying and refining a research question; locating information; evaluating the quality of information/sources; selecting information that supports a thesis; excluding extraneous information; presenting findings in a format appropriate for the audience and purpose; citing sources correctly in a standard format; and avoiding plagiarism).

*Media*

14. The standards require students to analyze and evaluate information presented in multimedia formats (e.g., noting instances of manipulation, bias, propaganda, and potential fallacies).
15. The standards require that students use multimedia techniques to present information when possible.

## Mathematics Content-Specific Criteria

### Arithmetic

Arithmetic should include standards for number sense as well as developmental and precursor standards for the essential capstone expectations, such as counting, comparing, place value, and common denominators.

In elementary and early middle school (high-priority grade levels for arithmetic), students must demonstrate:

- » Clear understanding and instant recall of the single-digit addition and multiplication facts and the corresponding subtraction and division facts.
- » Clear understanding of the properties of arithmetic, such as the inverse nature of addition and subtraction as well as the inverse nature of multiplication and division.
- » Clear understanding of fractions as parts of a set, parts of a whole, and as numbers (e.g., the number line).

While we do not hold K-12 standards accountable to coverage at particular grade levels, we do expect all of them to include the following capstone standards (though not necessarily verbatim):

Students must understand and be fluent with the standard algorithms for whole-number addition, subtraction, multiplication, and division, and students must understand and be fluent with the standard procedures for the four arithmetic operations with fractions and decimals.

Other topics that should be covered, most frequently in late-middle and high school, include negative numbers, rational exponents, scientific notation, estimation, radicals, rational numbers as repeating decimals, and the arithmetic of complex numbers.

### Measurement

In elementary or middle school, students should:

- » Be able to measure lengths in centimeters and inches.
- » Know and understand the formulas for the area of a rectangle and a triangle.
- » Know how to convert within and between measurement systems.
- » Be familiar with other types of measurement such as time, perimeter, angles, weight, volume, etc.

### Ratios

Students should understand and be able to use rates, ratios, proportions, and percentages.

### Algebra

In order to ensure college- and career-readiness, rigorous K-12 standards must include algebra standards that cover the following essential content.

Standards covering linear equations should ensure that students:

- » Are able to solve equations and inequalities that are linear or involve the absolute value and know how to graph them.
- » Know about slope and the various forms of linear equations and be able to write equations given different types of information, such as for a line through a given point with a given slope, a line through two points, or a line through a given point that is perpendicular to a given line.
- » Are able to solve a system of two linear equations in two unknowns. Students should be fluent with the four arithmetic operations with polynomials and elementary factoring.
- » Standards covering quadratic equations should ensure that students:
  - » Are able to graph quadratic equations and solve them by factoring, completing the square, and using the quadratic formula, including complex solutions.
  - » Are able to transform a quadratic equation into vertex form, find its vertex, its maximum or minimum, and its line of symmetry.

Finally, students should understand logarithmic and exponential functions as well as basic trigonometry and trigonometric functions.

### **Geometry**

Geometry should be given a solid logical foundation that is made clear in the standards; for example, a Euclid-style axiomatic approach. As part of the study of high school geometry, students should understand:

Proofs of standard results about angles of triangles and angles associated with lines crossing parallel lines, including perpendicular lines.

- » Proofs of the standard theorems about congruence and similarity of triangles as well as deeper results on triangles, including the Pythagorean Theorem and its converse.
- » Proofs of the standard theorems about circles, chords, tangents, and angles.
- » How to do standard geometric constructions.

In addition, students should be introduced to various aspects of geometry in K-8, especially basic vocabulary, as long as it does not interfere with the important K-8 arithmetic priorities.

### **Data Analysis, Statistics, and Probability (DASP)**

Students should be able to read, analyze, and make various kinds of graphs and tables, and they should know basic statistics and probability, particularly the counting arguments involving combinations and permutations. More DASP material is acceptable as long as it does not disturb the priorities of arithmetic, algebra, and geometry.

### **STEM-Ready Standards**

The material needed by students pursuing mathematics-intensive (STEM) majors in college should be outlined in K-12 standards documents (though not every student should be required to take advanced math to graduate from high school). While most such content—such as arithmetic, algebra, and geometry—is already included in typical college-ready standards, some advanced topics might not be included.

These advanced standards include:

- » The binomial theorem, geometric series, polar coordinates, and the arithmetic operations on rational expressions.
- » More trigonometry, including the inverse trigonometric functions, the laws of sines and cosines, and angle sum identities.

### **Problem Solving**

Across all grade levels, students should be able to use the essential material outlined in these criteria to solve complex multi-step exercises and word problems appropriate for each grade level.

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<sup>1</sup> Five experts participated in the development of the content-specific criteria: Sheila Byrd Carmichael and Carol Jago for ELA, and W. Stephen Wilson, Gabrielle Martino, and Richard Askey for mathematics.