



REVIEW OF THE DRAFT K-12 COMMON CORE STANDARDS

SHEILA BYRD CARMICHAEL, W. STEPHEN WILSON,
GABRIELLE MARTINO, CHESTER E. FINN, JR.,
KATHLEEN PORTER-MAGEE, AMBER M. WINKLER

March 2010

The Thomas B. Fordham Institute is a nonprofit organization that conducts research, issues publications, and directs action projects in elementary and secondary education reform at the national level and in Ohio, with special emphasis on our hometown of Dayton. It is affiliated with the Thomas B. Fordham Foundation, and this publication is a joint project of the Foundation and the Institute. For further information, please visit our website at www.edexcellence.net or write to the Institute at 1016 16th St. NW, 8th Floor, Washington, DC 20036. This report is available in full on the Institute's website. The Institute is neither connected with nor sponsored by Fordham University.

TABLE OF CONTENTS

- 1 **Foreword**
CHESTER E. FINN, JR., KATHLEEN PORTER-MAGEE, AND AMBER M. WINKLER
- 5 **The Common Core Reviews**
- 5 **Common Core Standards for Mathematics (K-12)**
W. STEPHEN WILSON AND GABRIELLE MARTINO
- 13 **Common Core Standards for English Language Arts and
Literacy in History/Social Studies and Science (K-12)**
SHEILA BYRD CARMICHAEL
- 25 **Appendix: The Grading Scale and Content
Criteria**
DEVELOPED JOINTLY BY FORDHAM AND THE REVIEWERS
- 27 **The Common Grading Metric**
- 31 **Math Content-Specific Criteria for K-12 Standards**
- 36 **English Language Arts Content-Specific Criteria**



FOREWORD


CHESTER E. FINN, JR., KATHLEEN PORTER-MAGEE, AND AMBER M. WINKLER

Two weeks ago, American education approached a possible turning point, when the National Governors Association (NGA) and Council of Chief State School Officers (CCSSO) released drafts of proposed new academic standards in English language arts and math for kindergarten through high school. Already the object of much interest—and some controversy—these are standards that, once revised and finalized, will be candidates for adoption by individual states in place of those they’re now using.

For months before they were made public, the “Common Core” standards were much discussed. Between now and April 2—the end of the public comment period on this draft—there will be plenty more. That is a healthy thing, both because the more thoughtful scrutiny these drafts receive, the better the final product is apt to be, and because the only way for these standards ever to gain traction in our far-flung, highly-decentralized, and loosely-coupled public education system is if people from all walks of life—parents, educators, employers, public officials, scholars, etc.—take part in reading, commenting, and shaping the final product.

But ought they gain traction? We think so. Assuming this draft only improves in the process of revision, the Common Core represents a rare opportunity for American K-12 education to re-boot. A chance to set forth, across state lines, a clear, ambitious, and actionable depiction of the essential skills, competencies, and knowledge that our young people should acquire in school and possess by the time they graduate. Most big modern nations—including our allies and competitors—already have something like this for their education systems. If the U.S. does it well and if—this is a big if—the huge amount of work needed to operationalize these standards is earnestly undertaken in the months and years to follow, this country could find itself with far-better educated citizens than it has today. Many more of them will be “college- and career-ready” and that means the country as a whole will be stronger, safer, and more competitive.

That’s surely worth doing—provided it’s done right.



In this report, the Thomas B. Fordham Institute, as part of its continuing scrutiny of academic standards across the states, the nation, and the world, offers its own appraisal of the draft Common Core standards. Our purpose is neither to praise nor to bury them. It’s to give constructive feedback during a comment period that is intended to yield later improvements.

As it happens, while there are definitely some changes we would like to see made, our expert reviewers (see “Meet the Experts” on page 4) think these drafts are pretty darned good.

On the math side, our reviewers found clear, rigorous standards that set forth most of the essential content that students in grades K-12 must master. While some tweaks are needed—particularly at the high-school level—this draft “embodies internationally-competitive expectations for students in mathematics” and earns an impressive A-.¹

On the English language arts (ELA) side, the standards are also strong, though in need of a few more adjustments. While NGA and CCSSO have made clear from the outset that these expectations would concentrate on the reading, writing, speaking, and listening skills that students should master to be ready to succeed in college and the workforce, the standards-drafters have also woven in clear recommendations about the level of reading that young people should be doing, the sorts of fiction and non-fiction books they ought to read, and some of the essential content they’ll need to master to attain these skills. As written, the standards earn a solid B. With some clarification of vague spots and the addition of more specific references to essential content, these standards will be top-notch expectations that help push the rigor of reading (and writing, etc.) instruction across the country.

While there is much to applaud in these drafts, they could and should be even better. Our main job at this stage is to help the responsible parties make those improvements. And we will, of course, evaluate the final product upon release to see whether it in fact sets a world-class standard for our students. As in the past, we are also appraising states’ current standards—this time with an eye towards how they compare to the Common Core. Those reviews will come out in the months ahead. At this preliminary stage, we sense that most states would benefit from adopting the Common Core and hope all will appraise the present draft with that possibility in mind. Still, it is likely that a handful of states will decide they are better off with the standards they have got today. But that leaves forty-plus states, which together educate the overwhelming majority of U.S. school kids.

It’s important, as you read on, to keep three things in mind:

First, recall that we’re dealing here only with math and ELA. Educated children also need science, history, art, and much more. As part of its standards review pro-

¹ This review employs the same rubrics and scoring criteria that were developed for *Stars by Which to Navigate?*, released in October 2009 and available on the Fordham website at http://edexcellence.net/doc/20091008_National-Standards.pdf. The corresponding letter grades, however, have been slightly modified to create some needed distinctions within the “honors” category. The grading scale now includes: A, A-, B+, B, C, D, and F.



cess, we hope that every state that doesn't already have rigorous standards across the entire core curriculum will bestir itself to rectify this.

Second, as the Common Core drafters acknowledge, without strong curricula (and, we would add, effective instruction and quality assessments), standards don't get us anywhere. They merely describe the destination we'd like to reach. In the case of the ELA standards in particular, states (and districts, schools, and educators) bear a special responsibility, because the thrust of Common Core is to set forth the skills that students must possess to be college- and career-ready. To realize the promise of these standards, those who adopt and implement them must supplement them with a solid, content-rich curriculum.

Third, as the arguments heat up and more critics of Common Core emerge, let's bear in mind that perfection is the wrong criterion by which to appraise these standards. Perfect standards do not exist. The right questions to ask as you consider these reviews, other commentators' opinions, and the draft standards themselves are: Are they significantly better than what we're using today? And how could they be improved?

Acknowledgments

We extend deepest thanks to content-area experts and report authors, Sheila Byrd Carmichael for ELA and W. Stephen Wilson and Gabrielle Martino for math. Besides providing thoughtful analysis and concrete suggestions for improving the Common Core draft, they worked on exceptionally tight deadlines to ready these insightful reviews within the twenty-day public-comment period.

Our thanks also go to the Bill and Melinda Gates Foundation for its support of our ongoing work to evaluate national, state, and international standards, to the Brookhill Foundation for its support of our reviews of state and international math standards, and to the Louis Calder Foundation for its support of our work in the pursuit of content-rich curricula. This report was also supported by the Fordham Institute's sister organization, the Thomas B. Fordham Foundation. A huge thanks also goes out to the crack Fordham Institute team for stalwart work in getting this interim report ready so quickly and so well.

Washington, D.C.
March 2010

MEET THE EXPERTS

SHEILA BYRD CARMICHAEL served as reviewer for English language arts. Ms. Carmichael is an education consultant based in Washington, D.C., who has taught English in the District of Columbia Public Schools and in Italy and Japan. She was the founding director of the American Diploma Project and is the former deputy executive director of the California Academic Standards Commission. She is the co-author of *Stars by Which to Navigate? Scanning National and International Education Standards* (Thomas B. Fordham Institute, 2009), *Why We're Behind: What Top Nations Teach Their Students But We Don't* (Common Core, 2008) and *Advanced Placement and International Baccalaureate: Do They Deserve Gold Star Status?* (Thomas B. Fordham Institute, 2007). In addition, Sheila served as an external reviewer of the Common Core English Language Arts Standards for the National Governors Association and the Council of Chief State Schools Officers.

W. STEPHEN WILSON served as co-reviewer for mathematics. Dr. Wilson is Professor of Mathematics at the Johns Hopkins University, where he has chaired the Department of Mathematics. In 2006, he was the Advisor for Mathematics in the Office of Elementary and Secondary Education at the U.S. Department of Education. Dr. Wilson also helped revise Washington State's K-12 mathematics standards and evaluated textbooks for the state. He has participated in numerous projects on standards, curricula, and textbooks and co-authored *Stars by Which to Navigate? Scanning National and International Education Standards* (Thomas B. Fordham Institute, 2009) and *The State of State Math Standards* (Thomas B. Fordham Institute, 2005). More recently, he reviewed drafts of the Common Core Mathematics Standards for the National Governors Association and the Council of Chief State School Officers. Dr. Wilson received his Ph.D. in mathematics from M.I.T. in 1972 and has published over sixty mathematics research papers in the field of algebraic topology.

GABRIELLE MARTINO served as co-reviewer for mathematics. Dr. Martino has worked as an adjunct instructor in mathematics and as a writer and consultant. Her projects have included developing elementary hands-on science curricula, developing science content for a radio show airing on National Public Radio, and reviewing the mathematics content delivery system for Shepherdstown University. In 2009 she co-authored a report for the Abell Foundation entitled *Doing the Math* about the relationship between high school mathematics curricula and college expectations in Maryland. Dr. Martino is also the author of a forthcoming paper, "Notes on Providing a Formal Definition of Equivalence," which will appear in a special issue of the *Journal of Anthropological Theory*. She received her Ph.D. in Mathematics from Johns Hopkins University.

THE COMMON CORE REVIEWS

Common Core State Standards for Mathematics (K-12)

W. STEPHEN WILSON AND GABRIELLE MARTINO

Documents Reviewed	Common Core State Standards Initiative. 2010. K-12 Common Core State Standards for Mathematics: Draft for review and comment. National Governors Association Center and Council for Chief State School Officers. March 10. http://www.corestandards.org/Files/K12MathStandards.pdf
--------------------	---

Introduction

The draft Common Core standards are exemplary in many ways. They are generally well written and clearly presented, and cover much mathematical content with both depth and rigor. The development of arithmetic in elementary school is a primary focus of these standards and that content is thoroughly covered. The often-difficult subject of fractions is developed beautifully, with clear and careful guidance. The high school content is often excellent, though the presentation is disjointed and mathematical coherence suffers. In addition, without some clarification, the geometry standards appear to represent a significant departure from traditional Euclidean geometry. Like all standards, there is certain room for improvement, but the strengths of this document are considerable, and it embodies internationally-competitive expectations for students in mathematics.

Organization

The K-8 standards are organized into broad content strands called “domains” such as “Number—Fractions” and “Expressions and Equations.” The domains are further divided into topic “clusters” and the grade-level standards are listed within these topic clusters. Both the domains and the topic clusters change as the grades progress. Each grade includes an overview of the most important content for that year. The standards are introduced with a set of eight over-arching “Standards for

Mathematical Practice,” which are basically process standards and are intended to be integrated into the teaching of mathematics at all levels.

The high school standards follow a slightly different structure. First, they are organized into five “conceptual categories,” such as “Functions” and “Algebra.” Each category comes with an introduction to the mathematics covered in that category and a list of topics. The standards are then presented by topic, and more advanced standards (intended for students pursuing mathematics-intensive careers) are labeled “STEM standards.”²

Clarity and Specificity

With some exceptions, the K-8 standards are well organized and easy to read. The variation of the content domains and topic clusters from grade-to-grade is an unusual, but excellent, way to sequence the material. Students do learn different things in different grades, so an organization scheme that reflects this is entirely appropriate and results in relatively few extraneous or overly-inflated standards.

Strengths


The standards are generally succinct, clear, and easy to understand. They make frequent and exemplary use of examples to clarify intent, as in these:

Addition is commutative. For example, if 3 cups are added to a stack of 8 cups, then the total number of cups is the same as when 8 cups are added to a stack of 3 cups; that is, $8 + 3 = 3 + 8$. (Grade 1)

Understand that a statistical question is one that anticipates variability in the data related to the question and accounts for it in the answers. For example, “How old am I?” is not a statistical question, but “How old are the students in my school?” is a statistical question because one anticipates variability in students’ ages. (Grade 6)

Sometimes the standards’ specificity is almost at the level of a textbook, as with the development of fractions. (In fact, the excellent guidance included here would improve the presentation of fractions in most textbooks.) The often-confused concept of fractions as numbers is introduced early and clearly as demonstrated by the third grade topic, “Fractions as Representations of Numbers.” For example, this standard provides excellent guidance:

² Science, Technology, Engineering, and Math



Understand that a unit fraction corresponds to a point on a number line. For example, $\frac{1}{3}$ represents the point obtained by decomposing the interval from 0 to 1 into three equal parts and taking the right-hand endpoint of the first part. In Grade 3, all number lines begin with zero. (Grade 3)

Clear and specific standards on fractions continue:

Adding or subtracting fractions with the same denominator means adding or subtracting copies of unit fractions. For example, $\frac{2}{3} + \frac{4}{3}$ is 2 copies of $\frac{1}{3}$ plus 4 copies of $\frac{1}{3}$, or 6 copies of $\frac{1}{3}$ in all, that is $\frac{6}{3}$. (Grade 3)

Understand that the meaning of multiplying a fraction by a whole number comes from interpreting multiplication by a whole number as repeated addition. For example, $3 \times \frac{2}{5} = \frac{6}{5}$ because $3 \times \frac{2}{5} = \frac{2}{5} + \frac{2}{5} + \frac{2}{5} = \frac{6}{5}$. (Grade 4)

Understand that multiplying a fraction by $\frac{a}{b}$ means taking a parts of a decomposition of the fraction into b equal parts. For example, to multiply $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$, one may decompose a whole of size $\frac{4}{5}$ into 3 equal parts; each part has size $\frac{4}{15}$. Two of these parts then make $\frac{8}{15}$, so $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$. (In general, $\frac{a}{b} \times \frac{p}{q} = \frac{ap}{bq}$.) This standard includes multiplication of a whole number by a fraction, by writing the whole number as fraction with denominator 1. (Grade 5)

Weaknesses

Some standards are too broadly stated to be clear or measurable, such as the following:

Understand that functions can describe situations where one quantity determines another. (Grade 8)

Without further clarification, it is not clear what students are expected to know or what kinds of problems they should be able to solve.

Turning to high school, there are serious problems with the organization of the standards, which are too numerous and presented in disjointed fashion. Grouping them into conceptual categories does not mirror the structure of the content, and it sacrifices coherence. Standards on related mathematical material are often artificially separated by the conceptual categories so that the mathematical structure is not clear.

The treatment of quadratics illustrates this problem. A complete and coherent analysis of quadratics provides experience with deep mathematics and exposure to

many real-world applications. Yet the basic analysis of quadratics is spread over four different conceptual categories and six different topics. For example, these two closely-related standards appear far removed from each other in the draft document:

Factor, expand, and complete the square in quadratic expressions. (High School)

Transform quadratic polynomials algebraically to reveal different features of the function they define, such as zeros, extreme values, and symmetry of the graph. (High School)

The second of those standards can be viewed as a culmination of the study of quadratics, and it requires the techniques of the first standard, yet these standards appear unrelated in the document. The underlying structure and theory of quadratics are thus obscured. Although the essential content exists in these standards, organizing them by conceptual categories simply does not work as well as organization by content.

High school geometry, an important topic in mathematics, has excellent and detailed coverage that by most criteria would be considered exemplary. But there are some problems with both clarity and content that should be addressed in the upcoming revision.

Importantly, the theoretical framework that undergirds geometry is not explained in what are otherwise well-written standards. For example, there are excellent standards on proof, including:

Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180° , base angles of isosceles triangles are congruent, the triangle inequality, the longest side of a triangle faces the angle with the greatest measure and vice-versa, the exterior-angle inequality, and the segment joining midpoints of two sides of a triangle parallel to the third side and half the length. (High School)

Yet nowhere in the standards are axioms or postulates mentioned, so the theoretical foundation for this standard, and others, is unclear. The traditional Euclidean formulation of geometry might be assumed, but this is not specified. Without some particular framework, it is not clear what, exactly, constitutes “proof.” This ambiguity leaves the standards subject to interpretation on the part of the reader, but they could easily be fixed with the addition of one or two explanatory standards. The lack of foundation for high school geometry is common in state standards, but the Common Core Standards should aim to do better.



Clarity and Specificity Conclusion

The K-8 Common Core standards are generally well organized and presented. They are usually easy to read and understand, and many standards are clear and specific. An excellent feature is the use of examples to clarify intent. Still, some standards are not easily measurable, and the scope and sequence of the material in high school is “not completely apparent or sensible” (see the “Common Grading Metric” in the Appendix). This results in an overall Clarity and Specificity score of 2 out of 3.

Content and Rigor

Priorities

One important purpose that standards should serve is to explain what is most important for students to learn—something that many extant standards do not do well. To their credit, the Common Core drafters have set excellent priorities that are expressed both explicitly and implicitly. The grade-level overviews for elementary school offer explicit guidance by identifying the three or four areas that students are expected to master in each grade and making it clear that arithmetic is the most important topic in the early grades. This is further supported by the standards themselves, of which well over 50 percent are about arithmetic. This prioritization of arithmetic, which provides the foundation for the subsequent study of mathematics, is exemplary.

Strengths

The standards have many strong features and cover a lot of rich mathematics. The K-8 standards are well presented and not overly numerous. In particular, and in marked contrast to many existing standards, they are not overwhelmed with extraneous standards in the early grades. Many states lack such focus and detract from foundational mathematics with a profusion of standards in data analysis and pattern recognition, as well as with superfluous geometry standards. Such expectations are often poorly stated and inappropriate, so it is refreshing that the Common Core has focused so well on the essential, core mathematical content.

The structure of arithmetic operations is developed and described well. Whole-number arithmetic culminates in capstone standards that stipulate fluency with the powerful standard algorithms, such as this admirably-stated expectation:

Fluently add, subtract and multiply whole numbers using the standard algorithm for each operation. (Grade 5)

There is a similar standard for division in sixth grade. A minor improvement would be to move the addition and subtraction part of this standard to grade 3.

The number line is introduced early and referenced frequently in the standards. Word problems are also introduced early and appear throughout, including multi-step problems. As noted above, the development of fractions is excellent, as is the development of length, area, and volume. In the middle grades, the exemplary work with fractions is well utilized in the coverage of percents, rates, and ratios, which are covered with rigor and include many strong standards.

Linear functions are also covered thoroughly. The standards include two excellent, but subtle, standards that are often overlooked but are important to the foundation of linear functions:

Understand that the slope of a non-vertical line in the coordinate plane has the same value for any two distinct points used to compute it. This can be seen using similar triangles. (Grade 8)

Understand that the graph of a linear equation in two variables is a line, the set of pairs of numbers satisfying the equation. (Grade 8)

In addition, the coverage of other important high school mathematics is generally strong. Despite the lack of coherence discussed above, quadratic functions are well covered. The standards also cover most STEM-ready topics, including trigonometric identities, series, exponential functions, and inverse trigonometric functions.


Weaknesses

The foundation of school mathematics is whole-number arithmetic. The basic number facts are the building blocks for such arithmetic, and instant recall of these facts should be required. Students should not have to concern themselves with computing such facts as they attempt to master more difficult techniques. Yet the Common Core standards state only:

Fluently add and subtract within 20. By end of Grade 2, know from memory sums of one-digit numbers. (Grade 2)

It is unusual and seemingly arbitrary that subtraction facts are missing from this standard. And, sadly, division suffers the same fate—only multiplication facts are to be memorized.

The development of fractions is excellent, but the level of high-quality detail is not maintained as the grade levels rise, noticeably in the standards covering division



of fractions. In grade 5, unit fractions are divided by whole numbers and whole numbers by unit fractions. Division of fractions by fractions should follow, but the following standard does not accomplish this:

Understand that division of fractions is defined by viewing a quotient as the solution for an unknown-factor multiplication problem. For example, $(2/3) \div (5/7) = 14/15$ because $(5/7) \times (14/15) = (2/3)$. (Grade 6)

Although this is a well-stated standard about the inverse nature of multiplication and division, it does not actually show how to compute the quotient.

Still, Common Core contains much more detail than usually appear in standards. Formulas for the arithmetic of fractions are rarely, if ever, derived in standards. Common Core's work here is path breaking.

The problem with clarity of the high school geometry standards has already been noted but some content is also problematic. The Common Core standards should be clear as to the foundation of geometry and the methodologies that are required, and they should ensure rigor in the development of geometry at the high school level. The geometry standards, as they stand, are not clear enough to ensure this.³ The Common Core drafters should make the necessary adjustments to clarify these issues.

There is also an ancient, and easily corrected, error in the standards. A minor oversight leads to a standard that is sometimes impossible, as the ancient Greeks learned when they discovered irrational numbers:

Understand that rectangular regions can be tiled with squares in rows and columns, or decomposed into such arrays. (Grade 3)

If the ratio of length to width is irrational, this tiling cannot be done.

³ Even simple reflections need a logical foundation, such as axioms to describe their properties, or axioms to prove their properties, or an alternative logical structure. There is no mathematical structure evident in the geometry standards. The following two standards illustrate the problem:

Understand that dilating a line produces a line parallel to the original. (In particular, lines passing through the center of the dilation remain unchanged.)

Understand that the assumed properties of dilations can be used to establish the AA [angle-angle], SAS [side-angle-side], and SSS [side-side-side] criteria for similarity of triangles.

The logic here is circular. Proving the first statement requires the results about similarity, so the second seems to use the results about similarity to establish the results about similarity. There are no hints that this is to be fixed with appropriate axioms (providing the properties of a dilation) but there is evidence that this is to take place in the Cartesian coordinate plane, in which case the results of similarity are already assumed.

There are a few omissions in the STEM-ready content for high school. These include polar coordinates, done only for complex numbers, and the arithmetic of rational expressions. The latter is particularly important in college STEM courses.

Pedagogy is kept to a minimum in the standards, but it creeps in from time to time, as in this standard:

Use hands-on activities to demonstrate and describe properties of: parallel lines in space, the line perpendicular to a given line through a given point, lines perpendicular to a given plane, lines parallel to a given plane, the plane or planes passing through three given points, and the plane perpendicular to a given line at a given point. (Grade 8)

Real content is included here, but the explicitly-stated goal is to “use hands-on activities,” which is not mathematics.

Content and Rigor Conclusion

Taken together, the vast majority of the K-12 math standards are good. They are rigorous, and the authors have made sound prioritization decisions and not left out crucial mathematics content. To be sure, there are ways (outlined above) that the drafters can and should revise this draft to ensure that states adopt standards that will lay the groundwork for the kinds of rigorous instruction and assessment that will drive outstanding math achievement in this country. But most of these revisions are relatively minor tweaks to an otherwise excellent compilation of K-12 standards. According to our criteria (see the “Common Grading Metric” in the Appendix), these standards merit a 7 out of 7, indicating that the standards cover nearly all the essential K-12 content in a “high-quality” manner with little “superfluous material,” and that fewer than 5 percent of essential mathematic content is missing or irrelevant.

Final Grade

Clarity	Content	Total	Grade
2	7	9	A-



Common Core State Standards for English Language Arts and Literacy in History/Social Studies and Science (K-12)

SHEILA BYRD CARMICHAEL

Documents Reviewed	Common Core State Standards Initiative. 2010. K-12 Common Core State Standards for English Language Arts and Literacy in History/Social Studies and Science: Draft for review and comment. National Governors Association Center and Council for Chief State School Officers. March 10. http://www.corestandards.org/Files/K12ELASTandards.pdf
--------------------	--

Introduction

The “Common Core State Standards for English Language Arts and Literacy in History/Social Studies and Science” is a sixty-page document (with three voluminous appendices) that seeks to provide clear, rigorous standards for reading, writing, listening and speaking, and English language conventions (language), as well as for literacy in science and history. Despite some fixable flaws, the standards do an admirable job of providing a roadmap for students to become college- and career-ready by the time they finish high school. Although these standards are skills-centered—and would benefit from being richer in content, especially in literature and literary analysis—they admirably weave much essential content into their grade-level expectations, which makes them fairly rigorous.

Organization

The document includes two categories of standards. The first is a list of ten College and Career Readiness (CCR) standards in each of four content strands (reading, writing, listening and speaking, and language). These CCR standards are broad statements about what students should know and be able to do in each content strand by the time they complete their schooling. The second is the list of grade-specific standards that translates each of the ten CCR standards into grade-appropriate learning expectations.

The latter expectations are presented in two bands: grades K-5 and 6-12. Both include grade-specific standards for each of the four content strands, but the 6-12 standards also include a separate section on “literacy for history/social studies and

science,” which breaks the reading and writing CCRs into science- and history-specific grade-span expectations.

The three long appendices supply: (1) the research rationale that supports key decisions that standards’ drafters made, (2) a list of many “exemplar” literary and informational texts by grade spans, and (3) annotated writing samples to demonstrate what is expected of students across the grades.

Clarity and Specificity

Strengths and Weaknesses

The standards are mostly as clear and specific as skills-based standards can be, but are marred by two solvable problems: an occasional lack of clarity and precision of language (in both the CCR and grade-level standards) and some unnecessary repetition of standards across grades, which makes it difficult to determine how to scaffold the teaching of many of the skills from grade-to-grade.

Lack of Clarity and Precision

While the grade-level expectations frequently help to translate the often vaguely-worded CCR standards into teacher-friendly learning expectations, they occasionally miss the mark and leave the reader unclear about what, exactly, the authors expect students to know and be able to do.


Consider, for example, CCR standard 3:

Analyze in detail where, when, why, and how events, ideas, and characters develop and interact over the course of a text. (CCR Standard 3)

Because this standard must be applied to both literary and informational text, it attempts too much, and is ultimately meaningless without some clear guidance incorporated into the grade-level expectations. Unfortunately, the degree to which these grade-level expectations clarify the intent varies significantly. This literature standard, for example, is clear:

Analyze how complex characters, including those with conflicting motivations or divided loyalties, develop over the course of a text, interact with other characters, and advance the plot or theme. (Grades 9-10)

But the same grade-level expectation for informational text is quite vague:



Analyze the interactions between and among ideas and events, including how ideas and events influence one another. (Grades 9-10)

A little tightening up of the language in both the CCR and the grade-level expectations would go a long way towards helping teachers better understand what exactly is being asked of students—and their instructors.

Similarly, the CCR standard for “reasoning and rhetoric” is problematic:

Delineate and evaluate the reasoning and rhetoric within a text, including assessing whether the evidence provided is relevant and sufficient to support the text’s claims. (CCR Standard 8)

This statement either confuses “reasoning” and “rhetoric,” or simply fails to make clear an intended distinction. Especially where logic is concerned, it is important to clarify the expectation. It might make more sense to say something like: “Analyze, evaluate, and distinguish between the reasoning and the rhetoric within a text, and assess whether the validity of the reasoning and the evidence provided supports the truth of the text’s claims.”

This problem persists across grade levels, with standards that are sometimes blurry and do not clearly distinguish between types of reasoning, or between the truth and validity of arguments. Worse, the standards prioritize the “relevance” and “sufficiency” of “supporting details” and “evidence” over truth and validity. These are essential distinctions in logic. At grades 9 and 10, for example, the standard states:

Assess the truth of an argument’s explicit and implicit premises by determining whether the conclusions reached are justified by the evidence presented in the text. (Grades 9-10)

The truth of the argument’s premises cannot be determined by whether the conclusions are justified, which is a question about the validity of the reasoning. Precisely put, the conclusions reached are justified by the combination of the truth of the premises and the validity of the reasoning. Again, some tightening of the language would improve this standard immensely.

Finally, in a number of places, the standards include vague language that puts the focus on process skills over outcomes and/or renders the standards immeasurable. For example, CCR 10 asks students to:

Read complex texts independently, proficiently, and fluently, sustaining concentration, monitoring comprehension, and, when useful, rereading. (CCR 10)

Unfortunately, the grade-level expectations remain equally vague. For example:

Read literature independently, proficiently, and fluently in the grades 6–8 text complexity band; read texts at the high end of the range with scaffolding as needed. (Grade 6)

This is a laudable but immeasurable goal.

Among the most troublesome examples of favoring process over outcomes is the CCR Standard that asks students to:

Synthesize and apply information presented in diverse ways (e.g., through words, images, graphs, video) in print and digital sources in order to answer questions, solve problems, or compare modes of presentation. (CCR 7)

When translated into grade-specific expectations, this standard frequently holds students accountable to the processes that a good reader might use to understand a text, rather than their actual comprehension of the text, as demonstrated in the grade-level expectation below:

Integrate information from illustrations and other visual elements (e.g., maps, photographs) in print and digital texts as aids to comprehending where, when, why and how key events occur. (Grade 3)

The focus of this standard is the integration of visual elements to aid text comprehension. To be sure, this could be a useful cognitive strategy and one that good readers use to understand texts, particularly in the early grades. Ultimately, though, standards should describe the destination, not the road map to get there. The standard should, therefore, specify comprehension mastery.


Unnecessary Repetition

Some repetition across grades is inevitable in a K-12 standards document. And for the most part, these standards avoid the worst of it, making mostly innocuous repetitions and often some good distinctions between levels, as in the following standards for writing:

Use a combination of drawing, dictating, and writing to compose opinions in which they tell a reader the name of a book or the topic they are “writing” about and give an opinion about the topic (e.g., My favorite book is . . .). (Kindergarten)

Write opinions in which they introduce the topic or the name of the book they are writing about, state an opinion, and provide a reason for their opinion. (Grade 1)

Write opinions in which they introduce the topic or book(s) directly, state an opinion, provide reasons and details to support opinions, use words to link opinions and reason(s) (e.g., because, and, also), and provide a sense of closure. (Grade 2)



In this example, the distinctions from level to level are useful, if small. In other areas, however, such as early writing, standards are repeated nearly verbatim and without sufficient differentiation, as in standard 5:

With guidance and support from adults, add details to strengthen writing as needed through revision. (Kindergarten)

With guidance and support from adults, add details to strengthen writing as needed through revision. (Grade 1)

With guidance from adults, strengthen writing as needed by revising and editing. (Grade 2)

How should a teacher scaffold this skill from Kindergarten to first grade? And what, if any, distinction is being made between the Kindergarten and the grade 2 standard? It would be easy to clarify these grade-level expectations by making the kind of small but meaningful distinctions the authors made to the first three writing standards cited above.

Clarity and Specificity Conclusion

While the grade-level expectations go a long way toward clarifying the broad CCR standards, there remains some vague language and creeping pedagogy that prevent these standards from providing as clear a roadmap as teachers need to guide rigorous instruction. The standards therefore earn 2 out of 3 on clarity and specificity (see the “Common Grading Metric” in the Appendix).

Content and Rigor

Although the standards are skills-centered, they admirably specify worthwhile content that students should master in each strand, particularly in reading and writing. Of course, each of the four strands (reading, writing, listening and speaking, and language) also exhibits gaps or inaccuracies that could (and should) be addressed in the revised draft. This section, organized by strand, analyzes the strengths and weaknesses of each as compared to our ELA content criteria. (See “English Language Arts Content-Specific Criteria” in the Appendix.)

Reading

Strengths

There is much that the reading standards do very well. They lay a clear foundation for reading development in the early grades by delineating explicit and systematic

expectations in phonemic awareness, phonics, fluency, and comprehension skills. In addition, across grade levels, they address systematic vocabulary development, including etymology, an often-overlooked but essential sub-strand.

In addition, qualitative and quantitative analyses of text complexity, which are explained in detail, undergird the choices of illustrative literary and informational texts that are organized by grade spans and appended to the document. This list sets forth a wide range of solid literature and informational text that includes titles for “science, mathematics, and technology,” as well as for “history/social studies.” They range from Christina Rossetti’s poetry and Aliko’s *My Five Senses* at the earliest grades to Mark Twain’s *The Adventures of Tom Sawyer* and Frederick Douglass’s memoir *Narrative of the Life of Frederick Douglass, an American Slave* in middle school, and on to Shakespeare’s *Macbeth* and Euclid’s *Elements* in high school. On the whole, it’s a very good list.

The inclusion of such solid exemplar texts demonstrates that the standards recognize the inextricably bound aspects of rigor in language arts, namely what students actually read and what they are asked to do with that reading. Of course, to ensure rigor, the exemplar reading lists must eventually be tied more directly to the standards, to curricula, and eventually to assessments, if they are going to gain traction in classrooms across the country.

Rigorous, college-readiness standards for American youngsters should put emphasis on reading grade-appropriate works of outstanding American literature. The Common Core standards make an attempt to do this through the following high school standard:

Analyze a wide range of nineteenth- and early-twentieth-century foundational works of American literature, comparing and contrasting approaches to similar ideas or themes in two or more texts from the same period. (High School)

It would be better, of course, not to discriminate against the eighteenth century, particularly since so much important American literature comes from that period, but this standard is a welcome addition, and one that few state standards now include. In other places, important American literature is more subtly included, as in the following high-school standard:

Analyze how various authors express different points of view on similar events or issues, assessing the authors’ assumptions, use of evidence, and reasoning, including analyzing seminal U.S. documents (e.g., *The Federalist*, landmark U.S. Supreme Court majority opinions and dissents). (High School)



This inclusion, as well as the expectation that students will read Shakespeare, contributes much to the rigor of the document as far as literature is concerned.

Weaknesses

Despite mostly-strong vocabulary expectations, like so many standards, these rely too much on the use of context clues to determine the meaning of words. Consider the following:

Determine word meanings: (a) Determine or clarify the meaning of unknown or multiple-meaning words through the use of one or more strategies, such as using semantic clues (e.g., sentence and paragraph context; the organizational pattern of the text); using syntactic clues (e.g., the word's position or function in the sentence); analyzing the word's sounds, spelling, and meaningful parts; and/or consulting reference materials, both print and digital...(Grade 8)

This (lengthy) standard directs students to do a lot of guesswork rather than examining word parts and consulting a dictionary, which might be the best use of their time in this situation. Looking then to the context will help students determine the author's intended denotation and connotation.

In addition, though the standards do identify specific expectations for reading and analyzing literary and non-literary texts, college-readiness standards should also reference essential terminology and concepts that enable students to master key skills. Unfortunately, the Common Core standards fail to provide this guidance relative to several skills. For example, in order to “analyz[e] the clarity of structures,” a student must first be able to identify and explain different genres and the structural characteristics of those genres before she or he can analyze the clarity of that structure. Unfortunately, similar foundational information is also *not* explicitly addressed in other areas (such as the development of literary elements, the effectiveness of rhetorical techniques, and recognizing and explaining the presence of fallacious reasoning). (See the Appendix for the complete “English Language Arts Content-Specific Criteria.”)

Similarly, the richness of the exemplar texts leaves this reviewer wishing there were more specific concepts and terminology delineated in the standards themselves. This would ensure, for instance, that students not only read a tragedy but also define and explain what one is and from whence the term came. To be sure, reasonable people disagree about whether these details must be included in a rigorous standards document—it appears that the Common Core drafters decided to

forego them—but these details are central to standards intended to provide a clear and thorough roadmap to college readiness.

Finally, in some cases, the standards are not sufficiently rigorous. Take, for example, the following standards linked to CCR 7:

Use information from illustrations and other visual elements in a text with the words to develop an understanding of the setting, characters, and plot. (Grade 3)

Integrate information from several illustrations and other visual elements in a text with the words to develop an understanding of how the characters, plot or settings change. (Grade 4)

Students should only consider illustrations as aspects of plot, setting, and characters in the very early grades. By grade 3, students should be able to glean this essential information from reading. Good readers should do this automatically.

Writing

Strengths and Weaknesses

The Common Core writing standards usefully offer student work samples that help the reader better understand the kind of writing that's expected of pupils across the grades. Thankfully, these samples are also annotated to help clarify the expectations laid out in the grade-specific standards.

One troublesome aspect of the writing standards, however, is the seemingly blurry line between an “argument” and an “informative/explanatory essay.” The standards for informative/explanatory essays require students to “introduce and develop a (sometimes complex) topic, and present a conclusion that follows logically from the information or explanation provided.” By contrast, the standards for arguments require “the introduction of a precise claim, its development, and a discussion of counterclaims.” The distinction between the two different types of writing is not made explicit and it doesn't help a teacher understand, for example, into which category fall the analysis of a novel's motif or to which standard such an essay should be held accountable. The annotated writing samples are helpful in this regard, but the standards themselves should more clearly differentiate between argument and informative/explanatory essays.

In addition, if a distinction is to be made between argumentative and persuasive writing—and such a distinction should be made—the standards must make specific reference to the essential characteristics of persuasive writing, which they do not.



Listening and Speaking

Strengths and Weaknesses

Standards for listening and speaking should clearly address active listening and effective speaking skills, as well as formal oral presentations. The Common Core standards focus more on the former, with only oblique references to formal oral presentations and no criteria for evaluating them.

Culminating high school standards also appear to address listening and speaking skills primarily for “group work,” and not for other kinds of in- or out-of-class discussions. In Standard 1 in high school, for example, the “group discussion” standard seems narrowly focused on completing a specific task together as a group, rather than defining what effective participation in a seminar-style conversation or Socratic dialogue would look like:

- Assist in the formulation and productive functioning of group discussions on grades 11–12 topics, texts, and issues being studied in class:
- a. Prepare for discussions by distilling the evidence or information about the material under study and explicitly draw on that preparation in discussions.
 - b. Cooperate with peers to set clear goals and deadlines, establish roles, and determine ground rules for decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views).
 - c. Propel conversations forward by asking questions that test the evidence and by sharing findings that clarify, verify, or challenge ideas and conclusions.
 - d. Summarize accurately the comments and claims made on all sides of an issue and determine what additional information, research, and tasks are required for the team to complete the task.
 - e. Evaluate whether the team has met its goals. (High School)

Again, because the purpose of this strand is to help students improve their listening and speaking skills, the standards should focus on listening and speaking outcomes. Properly revised, this standard would focus on what teachers should expect of students during a seminar class.

Oral and Written Language Conventions

Strengths and Weaknesses

To its credit, the Common Core Standards document explicitly addresses English language conventions in the grade-specific expectations. This inclusion is noteworthy

thy because college professors and employers consistently rate the use of proper English as their number one complaint about incoming students and entry-level workers.

Unfortunately, while the inclusion of this section is worthy of praise, there is still much work that needs to be done. For starters, too much of the essential content is treated nominally, but not systematically. For example, as early as grade 3, students are asked to “ensure subject-verb and pronoun-antecedent agreement,” a tall order, especially since pronouns have barely been introduced. In grade 1, students must “*use* [emphasis added] subject, object and possessive pronouns in speaking and writing,” but they never learn (even later) what the essential differences are among them. In grade 6, they are expected to “ensure that pronouns are in the proper case” and “recognize and correct vague pronouns,” but that’s it. Demonstrative, indefinite, interrogative, reflexive, and relative pronouns are never addressed. Students are expected to use certain grammatical structures, but never to learn and explain what they are in the first place, as in standard 1:

Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) and clauses (independent, dependent; noun, relative, adverbial) to add variety and interest to writing or presentations. (Grades 9-10)

In order to be able to use them correctly and effectively, students must first understand what they are.


The net result of these gaps is that all areas of grammar suffer from sporadic treatment. More thorough and systematic consideration of conventions is essential to ensure these standards lay the foundation for rigorous and explicit instruction in the proper use of English language conventions.

Research and Media

Strengths and Weaknesses

Research and Media are both addressed, though more could be done in both areas.

On the research side, while some essential content, such as standards requiring proper citation, are included, there are many gaps. Chief among them is that the standards never explicitly require students to complete a formal research paper. Even at the high school level, there is only one vague research standard that is repeated across grades 9-12:



Perform short, focused research projects and more sustained research; synthesize multiple sources on a subject to answer a specific question or solve a given problem. (Grades 9-12)

This standard leaves much open to teacher interpretation. Further, it does not ensure that students have completed a rigorous research project by the time they graduate high school, an essential pre-requisite for most college-level work and an expectation of rigorous, college-prep curricula.

The high school standards, in particular, would be much improved by specifying what “sustained research” should entail, how much effort (e.g., hours, pages, or drafts) should be expended, and how many and what kinds of sources are required. Where media is concerned, more could be done (and at earlier grades) to address the analysis and production of multimedia, but some interesting things are included, such as the following grade 9-10 standard:

Compare and contrast the representation of a subject or a key scene in two different artistic mediums (e.g., Auden’s “Musée de Beaux Arts” and Breughel’s *Landscape with the Fall of Icarus*). (Grades 9-10)

This standard not only addresses differently the treatment of a similar theme in varying media, but also embraces the arts in a logical integration.

Content and Rigor Conclusion

Taken as a whole, these K-12 standards help define clear and rigorous expectations for what students should know and be able to do across grades K-12. The reading strand in particular, while lacking some crucial content, includes many excellent standards, especially in the early grades. The list of exemplar texts is excellent and, if faithfully followed, provides teachers and assessment writers the kind of guidance they need to ensure that the level of rigor of reading instruction and quality of reading content remains high. The inclusion of annotated student samples in the writing strand is extremely useful and helps provide much-needed clarity of expectations to what could otherwise be vague standards.

Still, substantive gaps remain. Some crucial content is missing. And some critical content is not covered with enough depth and/or rigor to effectively guide teachers and assessment writers. For these reasons, the Common Core ELA Standards earn a 5 out of 7 for content and rigor.

Final Grade

Clarity	Content	Total	Grade
2	5	7	B



APPENDIX

The Grading Scale and Content Criteria

JOINTLY DEVELOPED BY FORDHAM AND THE REVIEWERS

Overview

In 2009, with financial support from several foundations, Fordham embarked on an ambitious, multi-year project to review state, national, and international standards with the goal of helping policymakers and the broader public to judge the respective merits of the most influential U.S. and international standards, and to shed light on how the draft Common Core standards stack up against these existing benchmarks.

While we have certainly reviewed state standards in the past, this project is more systematic. To make crucial comparisons easier and more transparent, we worked with content experts from English language arts, math, science, and history to develop common scoring rubrics that would be used by each review in each subject.⁴

Those are the metrics—supplied below—used in these reviews. They were also used in the reviews published last fall under the title *Stars by Which to Navigate? Scanning National and International Education Standards* (Thomas B. Fordham Institute, 2009), and will be reemployed in future reviews of finalized Common Core standards as well as other national and international standards and frameworks, including those for science and history.

We have, however, made two small changes, one in the letter grades that correspond to numerical scores for all content areas, and one that includes some adjustments to the math content-specific criteria.

First, *In Stars by Which To Navigate?*, we used only whole-letter grades:

Letter Grade	Metric Score
A	9-10 points
B	7-8 points
C	5-6 points
D	3-4 points
F	0-2 points

⁴ These experts were as follows: Sheila Byrd Carmichael (ELA), Carol Jago (ELA), W. Stephen Wilson (math), Richard Askey (math), Sheldon Stern (history), Luther Spoehr (history), Paul Gross (science), and Lawrence Lerner (science).

Of the standards that were reviewed for that report, only one—TIMSS Math—earned an A (with a score of 9 out of 10.)

We now realize that this grading scale doesn't allow for essential distinctions among solid, very good, excellent, and (one can dream) perfect standards. So we have slightly modified the grading scale for this and later reviews:

Letter Grade	Metric Score
A	10 points
A-	9 points
B+	8 points
B	7 points
C	5-6 points
D	3-4 points
F	0-2 points

The only differences are in the A and B range where it's important to distinguish more precisely between good standards that could be better and those that have already reached the top. We have not, however, altered the scoring rubrics themselves. Hence the numerical grades remain consistent and comparable and will remain that way.

Second, our math content experts believed that subtle but important distinctions can (and should) be made between standards that inform benchmark assessments administered at fourth, eighth, and twelfth grades, and those used to inform grade-by-grade mathematics instruction. A simple example: When analyzing standards for a fourth grade benchmark assessment, we would expect to see standards that require students to demonstrate a firm understanding of addition, subtraction, multiplication, and division facts. A grade-by-grade standards document should, however, go at least one step further and demand that students demonstrate instant recall of these essential facts. That way, when students are faced with more difficult mathematics in the future, they do not have to spend time computing them.

The structure of the criteria has also been tweaked (see “Core Math Content Expectations for Grade-Level Math Standards”). Together these adjustments provide more substantive, content-driven feedback regarding the changes needed to ensure that all K-12 standards prepare students for college-level math and the workplace.⁵

⁵ The ELA criteria were initially designed to provide both curriculum-specific and assessment-driven feedback and guidance, so no modifications to these criteria have been made since last fall's *Stars By Which to Navigate?* report.



Common Grading Metric

Reviewers compared each set of standards to subject-specific content expectations. Based on that comparison, they assigned the standards two scores, one for “clarity and specificity,” the other for “content and rigor.” “Clarity and specificity” is scored on a 0-3 point scale, while “content and rigor” is scored on a 0-7-point scale, as follows.

Clarity and Specificity

3: 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: 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: 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.


Content and Rigor

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

- Some crucial content (as specified in the subject-specific content expectations) 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 score 7 affects the standards in a small way, or there are other minor subject-specific problems).

5: 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 may be an important shortcoming (perhaps one of the problems listed in the last paragraph of score 7, or there are other subject-specific problems).

4: 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 may be a few critical shortcomings (as listed above) although the standards contain no serious errors.

3: 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 or shortcomings or errors in the standards, although the standards have some redeeming qualities and there is some evidence of rigor.

2: 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 may be several serious problems, shortcomings, or errors (as listed above).

1: 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: 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).

Final grades

A final grade for each set of standards is calculated by adding the “content and rigor” score to the “clarity and specificity” score.

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



CORE MATH CONTENT EXPECTATIONS FOR GRADE-LEVEL K-12 STANDARDS

Overview

As is explained in the Appendix Overview, we made slight modifications to the math-specific content criteria that were used last fall to evaluate the national and international benchmark assessments in *Stars By Which To Navigate? Scanning National and International Education Standards in 2009*. Our content experts deemed that important distinctions needed to be made between the criteria used to judge fourth-, eighth-, and twelfth-grade benchmark assessments (such as TIMSS and PISA) and those used to appraise grade-by-grade content standards.

The differences between the K-12 “assessment criteria” (used in the *Stars* report) and these updated K-12 “content criteria” (used in this report and supplied below) are small, but mathematically important. First, some minor adjustments, which we explain in the Appendix Overview, were made to the content of the criteria.

Second, there is a key structural difference between the assessment criteria and the content criteria. Specifically, the assessment criteria were written to appraise national and international assessments administered at the fourth, eighth, and twelfth grades, and were therefore grouped according to those grade levels. By contrast, the content criteria are grouped by content area (arithmetic, measurement, algebra, and so on) rather than by grade level. (These content criteria will be used to evaluate all grade-by-grade K-12 standards, including each state’s standards when the time comes.)

To be sure, much mathematical content is cumulative and must be taught in a particular order to ensure that students have mastered essential foundational skills before moving on to more advanced content. However, within each content strand, decisions about the precise grade level at which a particular standard should be taught are largely driven by pedagogical preferences about how best to introduce, develop, and deepen content mastery.

For example, while addition and subtraction standards must be mastered before students can attack multiplication and division, decisions about whether to teach the multiplication and division algorithms together in the same grade, or whether to split them up and focus on multiplication in one grade and division in the next,

can vary without impacting student mastery of the content. Students can master essential multiplication and division standards regardless of whether they're taught together in fourth grade or separately in fourth and fifth.

Drafters of K-12 standards documents must make difficult decisions about the placement of standards. For the purposes of this review, however, we are examining whether the Common Core Mathematics standards demand mastery of core content, not *when* that content is mastered.⁶

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).

And 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.

⁶ That said, the criteria do note when particular content should be *prioritized* at the elementary, middle, and/or high school levels.



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. They should be.

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.

English Language Arts Content-Specific Criteria

Overview

The following criteria contain examples in many places 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 span should be understood to include the criteria and examples for the grade spans that precede them.

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; 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; 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; 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; 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 with 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.

Grades 5-8

Reading


1. The standards address vocabulary development (e.g., knowledge of roots and affixes; connotation and denotation; figurative language; 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 (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; 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; eliciting and considering suggestions).

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 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; facility with mechanics grounded in understanding of sentence structure).

Research

13. 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

14. 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).
15. The standards require that students know how to use multimedia techniques to present information.

Grades 9-12

Reading

1. 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; determining shades of meaning).


2. 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; recognizing and explaining the presence of fallacious reasoning).
3. The standards reflect the importance of reading grade-appropriate works of outstanding American literature that reflect our common literary 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., strong organization and development of ideas; facility with selection and blending of genres appropriate to audience and purpose; the use of sophisticated transitions, active rather than passive voice, and other stylistic elements for rhetorical effect).
6. The standards require students to analyze and produce writing that reflects the defining characteristics of various grade-appropriate writing genres (e.g., persuasion).
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., interpret complex information and ideas presented orally and convey complex information or ideas orally).
9. The standards address the ability to make formal oral presentations (recitation; 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; 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.