Standards Central
Fordham's Reviews from the U.S. and Abroad

Arkansas

This state adopted the Common Core, so the review below is Fordham's review of the Common Core standards. To read our review of the state's standards in place prior to adopting the Common Core, click here.

Overview

The final version of the Common Core State Standards for math is exemplary in many ways. The expectations are generally well written and presented, and cover much mathematical content with both depth and rigor. But, though the content is generally sound, the standards are not particularly easy to read, and require careful attention on the part of the reader.

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 rigorously, with clear and careful guidance. The high school content is often excellent, though the presentation is disjointed and mathematical coherence suffers. In addition, the geometry standards represent a significant departure from traditional axiomatic Euclidean geometry and no replacement foundation is established.

Despite some weaknesses, the Common Core standards provide a solid framework for learning rigorous mathematics.

General Organization

The K-8 standards are organized into grade-specific content domains such as Numbers and Operations Fractions and Expressions and Equations. The domains are further divided into grade-specific topic clusters and the grade-level standards are listed within these topic clusters. Each grade includes an overview that describes the most important content for that year.

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 the list of topics. The standards are then presented by topic, and more advanced standards (that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics) are given a special label.

Finally, the standards are introduced with a set of eight overarching Standards for Mathematical Practice which are basically process standards and are intended to be integrated into the teaching of mathematics at all levels.

Clarity & Specificity

Content & Rigor

With some exceptions, the K-8 standards are well organized. While many states apply one set of strands or topics to all grade levels, the Common Core varies the content domains and topic clusters from grade to grade, which results in relatively few extraneous or overly inflated standards.

Many standards are clear and specific. In addition, they make frequent and exemplary use of examples to clarify intent, such as:

Tell and write time in hours and half-hours using analog and digital clocks (grade 1)

Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure (grade 4)

Solve unit rate problems including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed? (grade 6)

Though the standards are not succinct, which detracts from the ease of reading, careful reading reveals that they are generally both literate and mathematically correct a rare combination in standards. The following excessively specific standard illustrates this:

Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps (grade 1)

Unfortunately, despite the inclusion of examples, some standards are not specific enough to determine the intent, and they are subject to quite a bit of interpretation on the part of the reader. For example:

Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time (grade 6)

This dense standard is difficult to follow, and the example does not provide enough guidance to help the reader understand what, precisely, students should know and be able to do.

The high school standards, in particular, are often too broadly stated to interpret. For example:

Define appropriate quantities for the purpose of descriptive modeling (high school)
Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods (high school)
Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant (high school)

The high school standards also manifest organizational problems. Grouping them into conceptual categories rather than by content artificially separates standards covering related topics. A clearer organizational structure would group such standards together in a mathematically coherent way.

The treatment of quadratics illustrates this problem. A complete and coherent analysis of quadratics provides students with experience with deep mathematics and exposure to many real-world applications, yet the basic analysis of quadratics is not placed in one coherent section. Instead, standards dealing with quadratics appear in three conceptual categories, and are even further separated by topic within the conceptual category of algebra. An example of this is the following two closely related standards. The first is found under algebra, and the second under functions:

Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x p)2 = q that has the same solutions. Derive the quadratic formula from this form (algebra)

Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context (functions)

This presentation is artificial; it would be improved by presenting these related standards together to reflect a rigorous development of theory and techniques.

The conceptual category of functions is particularly problematic. Ideally, linear functions and equations should be grouped together, and quadratic equations and functions should be grouped together. The Common Core, however, includes expectations that lump all of this content together. Take, for example, the following:

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
a. Graph linear and quadratic functions and show intercepts, maxima, and minima (functions)

In this standard, linear and quadratic functions are inappropriately lumped together and then maxima and minima are asked for, and this only applies to quadratics.

Clarity and Specificity Conclusion

The K-8 Common Core standards are generally well organized and presented. An excellent feature is their use of examples to clarify intent. However, the standards are often long and difficult to read, and some of them are not clear. In addition, in high school, the presentation is not always coherent. The standards do not quite provide a complete guide to users and therefore receive a Clarity and Specificity score of two points out of three. (See Common Grading Metric.)

- Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line
- Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line (grade 3)

- For example, use a visual fraction model to represent 5/4 as the product 5 Ã— (1/4), recording the conclusion by the equation 5/4 = 5 Ã— (1/4) (grade 4)

- For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd) (grade 5)

THE BOTTOM LINE

Despite their imperfections, the Common Core mathematics standards are far superior to those now in place in many states, districts, and classrooms. They are ambitious and challenging for students and educators alike. Accompanied by a properly aligned, content-rich curriculum, they provide K-12 teachers with a sturdy instructional framework for this most fundamental of subjects.

Math (Common Core Grade): B+