

Cracking the Code (Mathematics) – What Does It Mean for Me?

High School

(Prompts and Suggested Responses)

Now that you have viewed the Cracking the Code Power Point, you will revisit some of the essential points of the presentation in order to expand your learning and create a common vocabulary. To do this, you will engage in an exercise that enables you to interact with the Common Core State Standards (CCSS) for your particular grade span (K-5, 6-8, high school).

With your grade span or course colleagues you will complete and discuss a collection of tasks aimed at contextualizing the information from *Cracking the Code*. Following this exercise, you will be asked to reflect on your experience and consider actions that you will be able to take as a result of your new learning.

1. The Power Point states that there are three major components to the CCSS for Mathematics: Standards for Mathematical Practice, Standards for Mathematical Content, and a Glossary. The Standards for Mathematical Practice are described on pages 6-8 of the document. They trace their lineage to “processes and proficiencies” from two well regarded sources. **Name these two sources and discuss the “processes and proficiencies” as they currently apply to your practice.**

Suggested Response:

- NCTM process standards: problem solving, reasoning and proof, communication, representation, and connections.
- Strands of mathematical proficiency specified in the National Research Council’s report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy).

2. The eight Standards for Mathematical Practice appear repeatedly throughout the document, but are only described on pages 6-8. These descriptions relate “how” mathematically proficient students engage in the study of mathematics. **Skim through the descriptions of these two practices: “Model with mathematics” and “Use appropriate tools strategically.” Cite examples of how the practices may be displayed by a high school student.**

Suggested Response:

- **Model with mathematics:** By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another.
- **Use appropriate tools strategically:** For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data.

3. As visually depicted in the Venn diagram in “Cracking the Code”, the Standards for Mathematical Practice and the Standards for Mathematical Content should be intertwined during instruction. The concluding paragraphs of the Standards for Mathematical Practice offer guidance as to when the content standards lend themselves to integration with the practices. ***What word in the content expectations signal a prime opportunity to link these two sets of standards? Why do you think this is the case?***

Suggested Response:

- *Understand.* The Mathematical Practices are behaviors that students should increasingly engage in as they become more mature practitioners of mathematics. They assist in deepening a student’s understanding of content and their ability to apply their knowledge in new, non-routine, and practical situations. The CCSS for Mathematics call for a “balanced combination of procedure and understanding”. If a student lacks a deep understanding of content they may be inclined to rely too heavily on procedural knowledge thus hindering their ability to truly use mathematics. Often the content standards that include the word “understand” are those that are foundational to the discipline of mathematics and “merit” focused attention.

4. Recall that the high school standards are arranged by conceptual category¹ as opposed to grade level as in elementary and middle school. Each conceptual category has its own introductory page that provides a brief descriptive overview and insight into the content. ***Locate and read the introductory page for the conceptual category of Modeling. Discuss some of the implications of this category in reference to instruction.***

Sample Response:

- It is necessary to link instruction to phenomenon in everyday life.
- The incorporation of technology is useful when teaching through the lens of modeling.
- Models can take a variety of forms and levels of complexity.
- Formulating a model requires a systematic approach that incorporates a series of sophisticated steps.

5. *Domains* are large groups of related standards. One domain ranges across grades K- 8 (Geometry), while other domains span only grades within the 6-8 continuums (The Number System). In the 6-8 sequence, there is one domain that is isolated to a particular grade level. ***What is that domain and in what grade level does it appear? Why do you feel this domain may be isolated to this grade? Why is this important to know as a high school teacher?***

Suggested response:

- Functions in grade 8
- The CCSS Mathematics strives to establish strong foundational knowledge prior to advancing to more complex concepts. Content in grade 8 seems to simultaneously wrap up K-7 content while paving the way for the rigors of high school mathematics. The work with linear equations that begins in middle school serves as a natural segue to the concept of function. Additionally, the use of functions to model relationships sets the stage for the profound role of modeling in high school mathematics. Function work in eighth grade is pivotal. High school content builds on the premise that students understand the basics of functional relationships. Since 8th grade instruction is aimed at all students becoming proficient with foundational knowledge with respect to function, high school teachers should be empowered to move their students along this content progression with a minimal amount of remediation extended to a limited number of students.

¹ Recall that Appendix A makes a suggestion as to how the high school standards can be arranged into traditional or integrated courses.

6. *Cluster Headings* are bolded within the CCSS document. They describe smaller groups of related standards, clusters, within a domain. **List the four cluster headings in the domain of *Arithmetic with Polynomials and Rational Expressions* for the Algebra Conceptual Category.**

Suggested Response:

- Perform arithmetic operations on polynomials
- Understand the relationship between zeros and factors of polynomials
- Use polynomial identities to solve problems
- Rewrite rational expressions

7. The *standards* describe what students should know and be able to do. In order to facilitate communication around the standards, a code has been developed. **What can you say about the standard that is coded as *(+)G-SRT10*?**

Suggested Response:

- It appears in the Conceptual Category of Geometry.
- It appears in the domain of Similarity, Right Triangles, and Trigonometry.
- It is a plus standard designating that it is essential for all students intending to take advanced math courses such as calculus.
- It is standard number ten and reads, "Prove the Laws of Sines and Cosines and use them to solve problems."

8. On page 69 of the Common Core State Standards, locate the standard typed below. **How would you code this standard and what should you keep in mind when designing instruction for it?**

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*

c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

Suggested Response:

- F-IF.7c
- It is essential to instruct the standard through the lens of modeling as indicated by the star (*).