PARCC MODEL CONTENT FRAMEWORKS

MATHEMATICS

GRADE 7

Version 3.0

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Examples of Key Advances from Grade 6 to Grade 7

- In grade 6, students learned about negative numbers and the kinds of quantities they can be used to represent; they also learned about absolute value and ordering of rational numbers, including in real-world contexts. In grade 7, students will add, subtract, multiply, and divide within the system of rational numbers.

- Students grow in their ability to analyze proportional relationships. They decide whether two quantities are in a proportional relationship (7.RP.2a); they work with percents, including simple interest, percent increase and decrease, tax, markups and markdowns, gratuities and commission, and percent error (7.RP.3); they analyze proportional relationships and solve problems involving unit rates associated with ratios of fractions (e.g., if a person walks $1/2$ mile in each $1/4$ hour, the unit rate is the complex fraction ½ / ¼ miles per hour or 2 miles per hour) (7.RP.1); and they analyze proportional relationships in geometric figures (7.G.1).

- Students solve a variety of problems involving angle measure, area, surface area, and volume (7.G.4–6).

Fluency Expectations or Examples of Culminating Standards

7.EE.3   Students solve multistep problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. This work is the culmination of many progressions of learning in arithmetic, problem solving and mathematical practices.

7.EE.4   In solving word problems leading to one-variable equations of the form $px + q = r$ and $p(x + q) = r$, students solve the equations fluently. This will require fluency with rational number arithmetic (7.NS.1–3), as well as fluency to some extent with applying properties operations to rewrite linear expressions with rational coefficients (7.EE.1).

7.NS.1–2 Adding, subtracting, multiplying, and dividing rational numbers is the culmination of numerical work with the four basic operations. The number system will continue to develop in grade 8, expanding to become the real numbers by the introduction of irrational numbers, and will develop further in high school, expanding to become the complex numbers with the introduction of imaginary numbers. Because there are no specific standards for rational number arithmetic in later grades and because so much other work in grade 7 depends on rational number arithmetic (see below), fluency with rational number arithmetic should be the goal in grade 7.

Examples of Major Within-Grade Dependencies

- Meeting standard 7.EE.3 in its entirety will involve using rational number arithmetic (7.NS.1–3) and percents (7.RP.3). Work leading to meeting this standard could be organized as a recurring activity that tracks the students' ongoing acquisition of new skills in rational number arithmetic and percents.

- Because rational number arithmetic (7.NS.1–3) underlies the problem solving detailed in 7.EE.3 as well as the solution of linear expressions and equations (7.EE.1–2, 4), this work should likely begin at or near the start of the year.

- The work leading to meeting standards 7.EE.1–4 could be divided into two phases, one centered on addition and subtraction (e.g., solving $x + q = r$) in relation to rational number addition and subtraction (7.NS.1) and another centered on multiplication and division (e.g., solving $px + q = r$ and $p(x + q) = r$) in relation to rational number multiplication and division (7.NS.2).

Examples of Opportunities for Connections among Standards, Clusters or Domains

- Students use proportional reasoning when they analyze scale drawings (7.G.1).

- Students use proportional reasoning and percentages when they extrapolate from random samples and use probability (7.SP.6, 8).

Examples of Opportunities for In-Depth Focus

7.RP.2 Students in grade 7 grow in their ability to recognize, represent, and analyze proportional relationships in various ways, including by using tables, graphs, and equations.

7.NS.3 When students work toward meeting this standard (which is closely connected to 7.NS.1 and 7.NS.2), they consolidate their skill and understanding of addition, subtraction, multiplication and division of rational numbers.

7.EE.3 This is a major capstone standard for arithmetic and its applications.

7.EE.4 Work toward meeting this standard builds on the work that led to meeting 6.EE.7 and prepares students for the work that will lead to meeting 8.EE.7.

7.G.6 Work toward meeting this standard draws together grades 3–6 work with geometric measurement.

Examples of Opportunities for Connecting Mathematical Content and Mathematical Practices

Mathematical practices should be evident *throughout* mathematics instruction and connected to all of the content areas highlighted above, as well as all other content areas addressed at this grade level. Mathematical tasks (short, long, scaffolded, and unscaffolded) are an important opportunity to connect content and practices. Some brief examples of how the content of this grade might be connected to the

practices follow.

- When students compare arithmetic and algebraic solutions to the same problem (7.EE.4a), they are identifying correspondences between different approaches (MP.1).

- Solving an equation such as $4 = 8(x - 1/2)$ requires students to see and make use of structure (MP.7), temporarily viewing $x - 1/2$ as a single entity.

- When students notice when given geometric conditions determine a unique triangle, more than one triangle or no triangle (7.G.2), they have an opportunity to construct viable arguments and critique the reasoning of others (MP.3). Such problems also present opportunities for using appropriate tools strategically (MP.5).

- Proportional relationships present opportunities for modeling (MP.4). For example, the number of people who live in an apartment building might be taken as proportional to the number of stories in the building for modeling purposes.

Content Emphases by Cluster

Not all of the content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. All standards figure in a mathematical education and will therefore be eligible for inclusion on the PARCC assessment. However, the assessments will strongly focus where the standards strongly focus.

In addition to identifying the Major, Additional, and Supporting Clusters for each grade, suggestions are given following the table on the next page for ways to connect the Supporting to the Major Clusters of the grade. Thus, rather than suggesting even inadvertently that some material not be taught, there is direct advice for teaching it, in ways that foster greater focus and coherence.

Key: ■ Major Clusters; ▢ Supporting Clusters; ◯ Additional Clusters

Ratios and Proportional Reasoning
■ Analyze proportional relationships and use them to solve real-world and mathematical problems.

The Number System
■ Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers.

Expressions and Equations
■ Use properties of operations to generate equivalent expressions.

■ Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Geometry

○ Draw, construct and describe geometrical figures and describe the relationships between them.

○ Solve real-life and mathematical problems involving angle measure, area, surface area and volume.

Statistics and Probability

▫ Use random sampling to draw inferences about a population.

○ Draw informal comparative inferences about two populations.

▫ Investigate chance processes and develop, use, and evaluate probability models.

Examples of Linking Supporting Clusters to the Major Work of the Grade

- Use random sampling to draw inferences about a population: The standards in this cluster represent opportunities to apply percentages and proportional reasoning. To make inferences about a population, one needs to apply such reasoning to the sample and the entire population.

- Investigate chance processes and develop, use, and evaluate probability models: Probability models draw on proportional reasoning and should be connected to the major work in those standards.