PARCC Model Content Frameworks

Mathematics

Grade 4

Version 3.0

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Partnership for Assessment of Readiness for College and Careers

Examples of Key Advances from Grade 3 to Grade 4

- In grade 3, students studied multiplication in terms of equal groups, arrays and area. In grade 4, students extend their concept of multiplication to make multiplicative comparisons (4.OA.1).[1]
- Students in grade 4 apply and extend their understanding of the meanings and properties of addition and subtraction of whole numbers to extend addition and subtraction to fractions (4.NF.3).[2]
- Fraction equivalence is an important theme within the standards that begins in grade 3. In grade 4, students extend their understanding of fraction equivalence to the general case, $a/b = (n \times a)/(n \times b)$ (3.NF.3 $\rightarrow$ 4.NF.1).[3] They apply this understanding to compare fractions in the general case (3.NF.3d $\rightarrow$ 4.NF.2).
- Students in grade 4 apply and extend their understanding of the meanings and properties of multiplication of whole numbers to multiply a fraction by a whole number (4.NF.4).
- Students in grade 4 begin using the four operations to solve word problems involving measurement quantities such as liquid volume, mass and time (4.MD.2).
- Students combine their understanding of the meanings and properties of multiplication and division with their understanding of base-ten units to begin to multiply and divide multidigit numbers (4.NBT.5–6; this builds on work done in grade 3, cf. 3.NBT.3).
- Students generalize their previous understanding of place value for multidigit whole numbers (4.NBT.1–3). This supports their work in multidigit multiplication and division, carrying forward into grade 5, when students will extend place value to decimals.

Fluency Expectations or Examples of Culminating Standards

4.NBT.4 Students fluently add and subtract multidigit whole numbers using the standard algorithm.

[1] In an additive comparison problem (grades 1–2), the underlying question is *what amount would be added to one quantity to result in the other?* In a multiplicative comparison problem, the underlying question is *what factor would multiply one quantity to result in the other?*

[2] This work is limited to equal denominators in grade 4 to give students more time to build their understanding of fraction equivalence, before adding and subtracting unlike denominators in grade 5.

[3] Students who can generate equivalent fractions can also develop strategies for adding fractions with different denominators, but this is not a requirement in grade 4.

Examples of Major Within-Grade Dependencies

- Students' work with decimals (4.NF.5–7) depends to some extent on concepts of fraction equivalence and elements of fraction arithmetic. Students express fractions with a denominator of 10 as an equivalent fraction with a denominator of 100; comparisons of decimals require that students use similar reasoning to comparisons with fractions.

- Standard 4.MD.2 refers to using the four operations to solve word problems involving measurement quantities such as liquid volume, mass, time, and so on. Some parts of this standard could be met earlier in the year (such as using whole-number multiplication to express measurements given in a larger unit in terms of a smaller unit — see also 4.MD.1), while others might be met only by the end of the year (such as word problems involving addition and subtraction of fractions or multiplication of a fraction by a whole number — see also 4.NF.3d and 4.NF.4c).

- Standard 4.MD.7 refers to word problems involving unknown angle measures. Before this standard can be met, students must understand concepts of angle measure (4.MD.5) and, presumably, gain some experience measuring angles (4.MD.6). Before that can happen, students must have some familiarity with the geometric terms that are used to define angles as geometric shapes (4.G.1).

Examples of Opportunities for Connections among Standards, Clusters or Domains

- The work that students do with units of measure (4.MD.1–2) and with multiplication of a fraction by a whole number (4.NF.4) can be connected to the idea of "times as much" in multiplication (4.OA.1).

- Addition of fractions (4.NF.3) and concepts of angle measure (4.MD.5a and 4.MD.7) are connected in that a one-degree measure is a fraction of an entire rotation and that adding angle measures together is adding fractions with a denominator of 360.

Examples of Opportunities for In-Depth Focus

4.NBT.5 When students work toward meeting this standard, they combine prior understanding of multiplication with deepening understanding of the base-ten system of units to express the product of two multidigit numbers as another multidigit number. This work will continue in grade 5 and culminate in fluency with the standard algorithms in grade 6.

4.NBT.6 When students work toward meeting this standard, they combine prior understanding of multiplication and division with deepening understanding of the base-ten system of units to find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors. This work will develop further in grade 5 and culminate in fluency with the standard algorithms in grade 6.

4.NF.1 Extending fraction equivalence to the general case is necessary to extend arithmetic from whole numbers to fractions and decimals.

4.NF.3 This standard represents an important step in the multigrade progression for addition and

subtraction of fractions. Students extend their prior understanding of addition and subtraction to add and subtract fractions with like denominators by thinking of adding or subtracting so many unit fractions.

4.NF.4 This standard represents an important step in the multigrade progression for multiplication and division of fractions. Students extend their developing understanding of multiplication to multiply a fraction by a whole number.

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 decompose numbers into sums of multiples of base-ten units to multiply them (4.NBT.5), they are seeing and making use of structure (MP.7). As they illustrate and explain the calculation by using physical or drawn models, they are modeling (MP.4), using appropriate drawn tools strategically (MP.5) and attending to precision (MP.6) as they use base-ten units in the appropriate places.

- To compute and interpret remainders in word problems (4.OA.3), students must reason abstractly and quantitatively (MP.2), make sense of problems (MP.1), and look for and express regularity in repeated reasoning (MP.8) as they search for the structure (MP.7) in problems with similar interpretations of remainders.

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

Operations and Algebraic Thinking

- ■ Use the four operations with whole numbers to solve problems.
- ▣ Gain familiarity with factors and multiples.
- ○ Generate and analyze patterns.

Number and Operations in Base Ten

- ■ Generalize place value understanding for multi-digit whole numbers.
- ■ Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations — Fractions

- ■ Extend understanding of fraction equivalence and ordering.
- ■ Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
- ■ Understand decimal notation for fractions, and compare decimal fractions.

Measurement and Data

- ▣ Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
- ▣ Represent and interpret data.
- ○ Geometric measurement: understand concepts of angle and measure angles.

Geometry

- ○ Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

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

- Gain familiarity with factors and multiples: Work in this cluster supports students' work with multidigit arithmetic as well as their work with fraction equivalence.

- Represent and interpret data: The standard in this cluster requires students to use a line plot to display measurements in fractions of a unit and to solve problems involving addition and subtraction of fractions, connecting it directly to the Number and Operations — Fractions clusters.