### Mathematics Claim #1

#### CONCEPTS AND PROCEDURES

Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.

#### Rationale for Claim #1

This claim addresses procedural skills and the conceptual understanding on which developing skills depend. It is important to assess how aware students are of how concepts link together, and why mathematical procedures work in the way that they do. This relates to the structural nature of mathematics:

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see $7 \times 8$ equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as $2 \times 7$ and the 9 as $2 + 7$. (Practice 7, CCSSM)

They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers $x$ and $y$. (Practice 7, CCSSM)

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through $(1, 2)$ with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results. (Practice 8, CCSSM)

Assessments should include items/tasks that test the precision with which students are able to carry out procedures, describe concepts and communicate results.

Mathematically proficient students … state the meaning of the symbols they choose, including...

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using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. (Practice 6, CCSSM)

Items/tasks should also assess how well students are able to use appropriate tools strategically.

Students are able to use technological tools to explore and deepen their understanding of concepts. (Practice 5; CCSSM)

Many individual content standards in CCSSM set an expectation that students can explain why given procedures work.

One hallmark of mathematical understanding is the ability to justify, in a way appropriate to the student’s mathematical maturity, why a particular mathematical statement is true or where a mathematical rule comes from. There is a world of difference between a student who can summon a mnemonic device to expand a product such as \((a + b)(x + y)\) and a student who can explain where the mnemonic comes from. The student who can explain the rule understands the mathematics, and may have a better chance to succeed at a less familiar task such as expanding \((a + b + c)(x + y)\). Mathematical understanding and procedural skill are equally important, and both are assessable using mathematical tasks of sufficient richness. (CCSSM, p.4).

Finally, throughout the K-6 standards in CCSSM there are also individual content standards that set expectations for fluency in computation (e.g., fluent multiplication and division within the times tables in Grade 3). Such standards are conclusions of progressions of learning, often spanning several grades, involving conceptual understanding, thoughtful practice, and extra support where necessary. Technology may offer the promise of assessing fluency more thoughtfully than has been done in the past. This, too, is part of measuring the full range of the standards.’

Following our discussion of the types of evidence appropriate for contributing to assessment of Claim #1, we describe specific grade-level content emphases.

What sufficient evidence looks like for Claim #1

Evidence on each student’s progress along the progressions of mathematical content is the focus of attention in assessing this claim.

Essential properties of items and tasks that assess this claim: Items and tasks that could provide evidence for this claim include brief items – selected response and short constructed response items – that focus on a particular procedural skill or concept. Brief items could also include items that require students to translate between or among representations of concepts (words, diagrams, symbols) and items that require students to identify an underlying structure. Brief constructed response items can include items that provide scaffolded support for the student; it is probably possible for a Computer
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Adaptive environment to adjust the level of scaffolding that is provided depending on the student’s performance level.

**Selected response items**, including computer-enhanced items, can probe conceptual understanding, particularly when the distractors are chosen to embody common misconceptions. In designing such items, it is essential to try to make sure that students do not obtain correct answers because of “test taking skills” rather than understanding of the mathematical content. Computer administration of the assessment affords the possibility of assessing student fluency with mathematical operations by means of monitoring the response time.

**Short Constructed response** items can assess mathematical thinking directly; short items of this kind can provide direct evidence on students’ mastery of standard procedures. Among items/tasks that require students to produce a response, short constructed response items are the most likely to be able to be machine scored.

**Highly scaffolded tasks**, where the student is guided through a series of short steps set in a common problem context, offer another approach to the design of short constructed response items.

**Extended Response** items, requiring a more solid demonstration of conceptual understanding and procedural skills that students may be expected to have learned and practiced, may also provide evidence for this claim. These can include the following task types:

- **Application tasks** using exercises to assess relatively standard applications of mathematical principals. Here, students can be expected to use important concepts and skills to tackle problem situations that should be in the learned part of the curriculum.

- **Translation tasks**, where students are asked to represent concepts in different ways and translate between representations (words, numbers, tables, graphs, symbolic algebra).

- **Explanation tasks**, where students are asked to explain why a given standard procedure works. This may involve the straightforward adaptation of a standard procedure.

**Accessibility & Claim #1:** This claim clarifies the importance of conceptual understanding and procedural knowledge underlying the important core content in CCSSM. The standards refer to the ability to carry out procedures, describe concepts, communicate results, use appropriate tools strategically, and explain why specific procedures make sense. Neither the claim itself nor the CCSSM explicitly address the challenges that some students with disabilities face in the area of mathematical calculations. Because of the importance of building skills in computation in early schooling, the explication of the content may be different in early school grades compared to later school grades. Providing assistive technologies such as an abacus or calculator may not be considered appropriate up through about grade 4. At some point during intermediate grades, however, the use of these tools is considered an appropriate avenue of access to allow students to demonstrate that they are able to “calculate accurately and efficiently.”

It is also important to address access to mathematics via decoding text and written expression. The uses
of alternative means of access and expression are ones used by successful individuals (Reitz, 2011) to demonstrate high levels of success, and thus are an appropriate avenue of access to the content for students with disabilities in the areas of reading decoding and fluency as well as for those with blindness or visual impairments. Likewise, allowing students alternative ways to express their understanding of mathematics content is important. Students who are unable to explain mathematical processes via writing or computer entry might instead provide their explanation via speech to text technology (or a scribe) or via manipulation of physical objects.

A major aspect of all the claims, including Claim #1, is communication, especially students' ability to explain why or how given procedures or approaches work. To maximize access to English learners who are at a lower proficiency in writing and speaking, it is important for Smarter Balanced to explore allowing EL student to use diagrams, drawings, equations, and mathematical models, as well as words. It will also be useful to provide opportunities for ELL students to communicate their understanding through performance tasks or other approaches where multiple domain input can be provided. Furthermore, when a major performance difference exists between tasks such as expanding and explaining, it will be important to allow students to express their views through the use of native language, where that is appropriate.

**Assessment Targets for Claim #1**

**Cluster headings as assessment targets:** In the CCSSM the cluster headings usually serve to communicate the larger intent of a group of standards. For example, a cluster heading in Grade 4 reads: “Generalize understanding of place value for multi-digit numbers.” Individual standards in this cluster pinpoint some signs of success in the endeavor, but the important endeavor itself is stated directly in the cluster heading. In addition, the word “generalize” signals that there is a multi-grade progression in grades K-3 leading up to this group of standards. With this in mind, the cluster headings can be viewed as the most effective means of communicating the focus and coherence of the standards. Therefore, this content specifications document *uses the cluster headings as the targets of assessment* for generating evidence for Claim #1. For each cluster, guidance is provided that gives item developers important information about item/task considerations for the cluster. Sample items are also be provided that illustrate the content scope and range of difficulty appropriate to assess a cluster. Claim #1 assessment targets are shown below for Grades 3, 5 and 8. Content emphases for the remaining grades are shown in Appendix A. Assessment targets for these other grades will be developed in conjunction with the development of item specifications.

**Content emphases in the standards:** In keeping with the design principles of focus and coherence in the standards as a whole, not all content is emphasized equally in the Standards for Mathematical Content.

- The standards communicate emphases in many ways, including by the use of domain names that vary across the grades, and that are sometimes much more fine-grained than the top-level
organizers in previous state standards (e.g., Ratios and Proportional Relationships). These and other features of the standards and their progressions point to the major work of each grade.¹

- Standards for topics that are not major emphases in themselves are generally written in such a way as to support and strengthen the areas of major emphasis. This promotes valuable connections that add coherence to the grade. Still other topics that may not connect tightly or explicitly to the major work of the grade would fairly be called additional.

In the tables that follow and in Appendix A, these designations—major” and additional/supporting” — are provided at the cluster level.

Working at the cluster level helps to avoid obscuring the big ideas and getting lost in the details of specific standards (which are individually important, but impossible to measure in their entirety within the bounds of reasonable testing time). Clusters work provides an appropriate grain size for following the contours of important progressions in the standards across grades, for example: the integration of place value understanding and the meanings and properties of operations that must happen as students develop computation strategies and algorithms for multi-digit numbers during grades K-6; or the appropriate development of functional thinking in middle school leading to the emergence of functions as a content domain in Grade 8.

Identifying some standards within —major” clusters and others within —additional/supporting” clusters is not to say that anything in the standards can be neglected. To do so would leave gaps in student preparation for later mathematics. In other words, all content is eligible for and should be encompassed in the assessment. However, evidence for Claim #1 will strongly focus on the major clusters and take into account ways in which the standards tie supporting clusters to the major work of each grade, such that the items/tasks seen by every student will sample in much greater proportion from clusters representing the major work of each grade. Appendix B provides a sampling scheme for the CAT engine that reflects the structure of the standards and captures emphases appropriately at each grade.

In what follows, Claim #1 Assessment Targets are provided for grades 3 through 8 and high school.

¹ Further emphases can be seen in the Progressions documents drafted by members of the Common Core State Standards Working Group, and published through the Institute for Mathematics and Education of the University of Arizona: http://ime.math.arizona.edu/progressions/
GRADE 3 Summative Assessment Targets
Providing Evidence Supporting Claim #1

Claim #1: Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.

Content for this claim may be drawn from any of the Grade 3 clusters represented below, with a much greater proportion drawn from clusters designated “m” (major) and the remainder drawn from clusters designated “s” (additional/supporting) – with these items fleshing out the major work of the grade. Sampling of Claim #1 assessment targets will be determined by balancing the content assessed with items and tasks for Claims #2, #3, and #4. Grade level content emphases are summarized in Appendix A and CAT sampling proportions for Claim 1 are given in Appendix B.

### Operations and Algebraic Thinking

**Target A [m]: Represent and solve problems involving multiplication and division.** (DOK 1, 2)

Items/tasks for this target require students to use multiplication and division within 100 to solve straightforward, one-step contextual word problems in situations involving equal groups, arrays, and measurement quantities such as length, liquid volume, and masses/weights of objects. These problems should be of the equal-groups and arrays-situation types, but can include more difficult measurement quantity situations. All of these items/tasks will code straightforwardly to standard 3.OA.3. Few of these tasks coding to this standard will make the method of solution a separate target of assessment. Other tasks associated with this target will probe student understanding of the meanings of multiplication and division (3.OA.1,2).

Non-contextual tasks that explicitly ask the student to determine the unknown number in a multiplication or division equation relating three whole numbers (3.OA.4) will support the development of items that provide a range of difficulty necessary for populating an adaptive item bank (see section Understanding Assessment Targets in an Adaptive Framework, below, for further explication.).

**Target B [m]: Understand properties of multiplication and the relationship between multiplication and division.** (DOK 1)

Whereas Target A focuses more on the practical uses of multiplication and division, Target B focuses more on the mathematical properties of these operations, including the mathematical relationship between multiplication and division. Tasks associated with this target are not intended to be vocabulary exercises along the lines of “which of these illustrates the distributive property?” As indicated by the CCSSM, students need not know the formal names for the properties of operations. Instead, tasks are to probe whether students are able to use the properties to multiply and divide.

Note, tasks that code directly to Target B will be limited to the 10x10 times table. (But see Target E under 3.NBT below.)

**Target C [m]: Multiply and divide within 100.** (DOK 1)

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5 For example, if under Claim #2, a problem solving task in a given year centers on a particular topic area, then it is unlikely that this topic area will also be assessed under Claim #1 in a selected response item.
6 See CCSSM, Table 2, p. 89 for additional information.
7 Note the examples given in italics in CCSSM for these two standards. [CCSSM p. 23]
8 See CCSSM, footnote on page 23.
The primary purpose of tasks associated with this target is to assess fluency and/or memory within the 10x10 times table. We note that the standard connotation of the word “fluency” with regard to standards such as 3.OA.7 means “quickly and accurately.” An expansion of this concept would be useful, to include both the ability to use certain facts and procedures with enough facility that using them does not slow down or derail the problem solver as he or she works on more complex problems, and the notion of conceptual fluency - being able to use the relevant ideas or procedures in a wide range of contexts. In an adaptive framework, straight multiplication and division problems that assess students' ability to multiply and divide within 100 may serve as the assessment floor for the Operations and Algebraic Thinking domain (See section Understanding Assessment Targets in an Adaptive Framework).

**Target D [m]: Solve problems involving the four operations, and identify and explain patterns in arithmetic. (DOK 2)**

These tasks will primarily consist of contextual word problems requiring more than a single operation or step. Most of these will be straightforward two-step contextual word problems coding straightforwardly to 3.OA.8. These problems serve an important purpose in showing that students have solidified addition and subtraction problem solving from previous grades and integrated it correctly alongside their new understandings of multiplication and division.

Multiplication and division steps should be limited to the 10x10 times table, but addition and subtraction steps should often involve numbers larger than 100 (cf. 3.NBT.2).

In some tasks associated with this target, the representation of the problem with equations and/or the judgment of the reasonableness of an answer should be the explicit target for the task (cf. 3.OA.8).

**Number and Operations—Base Ten**

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**Target E [a/s]: Use place value understanding and properties of arithmetic to perform multi-digit arithmetic. (DOK 1)**

Tasks associated with this target will be non-contextual computation problems that assess fluency in addition and subtraction within 1000. Some of these tasks should provide information about the strategies and/or algorithms students are using, in order to ensure that they are general (based on place value and properties of operations).

Other tasks will assess either rounding (with an emphasis on conceptual understanding, if possible) or the more important multi-digit computations specified in 3.NBT.3. Because the answers to such multiplications are easily found by mnemonic tricks, these items should be of a conceptual nature to assess reasoning with place value and properties of operations.

**Number and Operations—Fractions**

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9 In other words, this standard does not refer to *procedural fluency* as that term is used in Claim #1 generally. (See *Adding It Up: Helping Children Learn Mathematics*. NRC, 2001, p. 121.)

10 The word —fluently” in standard 3.NBT.2 means “quickly and accurately” rather than referring to procedural fluency as that term is used in Claim #1 generally. (See *Adding It Up: Helping Children Learn Mathematics*. NRC, 2001, p. 121.)
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**Target F [m]: Develop understanding of fractions as numbers. (DOK 1, 2)**

Some of these tasks should assess conceptual understanding of unit fractions and other fractions as detailed in 3.NF.1 and 3.NF.2. Other tasks for this cluster should involve equivalence of fractions as detailed in 3.NF.3. Tasks should attempt to cover the range of expectations in the standard, such as understanding, recognizing, generating, and expressing, although explanations and justifications may also be assessed under Claim #3.

The cluster heading refers to understanding fractions as numbers. To assess whether students have met this goal, tasks for this target should include fractions greater than 1 as well as fractions less than or equal to 1; and tasks should not handle fractions differently based on whether they are greater than, less than, or equal to 1. Fractions equal to whole numbers (such as 3/1) should also commonly appear in these tasks. Two equal fractions may be referred to as equal, without need for the term — equivalent” (e.g., — which fraction equals 3?”), and fractions may be referred to simply as numbers (e.g., — which number is greatest?” with fractions among the answer choices).

**Target G [m]: Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects. (DOK 1, 2)**

Tasks for this target generally require students to solve straightforward one-step contextual word problems using the four operations in a situation involving time intervals in minutes, liquid volume in liters, and mass/weight in grams and kilograms. Situations involving intervals of time are limited to addition and subtraction. Some foundational tasks that assess telling and writing time to the nearest minute may be appropriate for building a range of difficulty in the adaptive item bank. The emphasis for this target is not on cultural aspects of time such as clocks but rather on time as a measurement quantity that can be operated on arithmetically like other more tangible measurement quantities.

**Target H [a/s]: Represent and interpret data. (DOK 2, 3)**

Tasks associated with this target should involve using information presented in scaled bar graphs to solve one- and two-step — how many more” and — how many less” problems. Technology might be used to enable students to draw a scaled picture graph and a scaled bar graph to represent a data set with up to four categories. Other tasks can involve the cycle indicated in 3.MD.4 (measure to generate data, and show the data by making a line plot); such tasks should indeed involve fractional measurement values.

**Target I [m]: Geometric measurement: understand concepts of area and relate area to multiplication and to addition. (DOK 1, 2)**

Some tasks associated with this target should assess conceptual understanding of area as a measurable

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11 Note that area models, strip diagram models, and number line models of a/b are all essentially special cases of the core fraction concept as defined in 3.NF.1: namely, a parts when a whole is partitioned into b equal parts. In the case of a number line, the — whole” in question is the interval from 0 to 1.
12 Tasks for this target will not involve fractional quantities. Tasks will not require students to distinguish between mass and weight. Tasks will exclude compound units such as cm3 and exclude finding the geometric volume of a container. (See CCSSM page 25 footnote 6.) Tasks will not include “times as much” problems (cf. 4.OA.1,2 and CCSSM Glossary Table 2, p. 89).
13 The “uptick” in this progression from Grade 2 is that in Grade 2, bar graphs are not scaled. The introduction of scaled graphs in Grade 3 connects with the introduction of multiplication in Grade 3.

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attribute of plane figures. All figures in such problems should be rectilinear and coverable without gaps or overlaps by a whole number of unit squares without having to dissect the unit squares (e.g. partition them into two triangles). Tasks in this group will generally involve finding areas by direct counting of unit squares, not by using multiplication or formulas, or otherwise reasoning about areas on this basis.

Other tasks should center on relating area to multiplication and addition. Most of these should involve the use of area models to represent whole-number products and the distributive property. For example, —Draw a picture to show why Amber can add 5x5 and 2x5 to find 7x5.” Problems can involve finding areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts.

Some of the expectations in this cluster (such as using tiling to show that area of a rectangle with whole-number side lengths is the same as would be found by multiplying the side lengths) may be more suitable for Claims #3 and #4 or for in-class assessments.

**Target J [a/s]: Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures. (DOK 1)**

Tasks associated with standard (3.MD.8) will assess students’ ability to solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

**Geometry**

**Target K [a/s]: Reason with shapes and their attributes. (DOK 1, 2)**

These tasks should support Grade 3 fraction and area work. Technology-enhanced tasks could involve partitioning a shape into parts with equal areas; more traditional tasks could involve expressing the area of each part as a unit fraction of the whole. For these tasks, shapes may be partitioned into non-rectangular parts; for example, students will use intuitive ideas about area to reason that a square with both diagonals drawn has been partitioned into four equal parts.14

Other tasks for this target will connect less directly to other material in the grade, continuing instead the standards’ progression of increasingly sophisticated spatial and logical reasoning about shapes and their attributes (cf. 2.G.1). Most of these tasks will assess understanding of the hierarchy of quadrilaterals as detailed in 3.G.1. A few tasks may involve categories of shapes not explicitly mentioned in the standard, so as to assess understanding of property-based categorization per se at this level. For example, a regular octagon and a rectangle might be shown and the student asked to select a category to which both figures belong—e.g., figures that can be partitioned into triangles—and then to produce a figure not belonging to that category (e.g., a circle).

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Grade 4 SUMMATIVE ASSESSMENT TARGETS
Providing Evidence Supporting Claim #1

Claim #1: Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.

Content for this claim may be drawn from any of the Grade 4 clusters represented below, with a much greater proportion drawn from clusters designated as “m” (major) and the remainder drawn from clusters designated as “a/s” (additional/supporting) – with these items fleshing out the major work of the grade. Sampling of Claim #1 assessment targets will be determined by balancing the content assessed with items and tasks for Claims #2, #3, and #4. Grade level content emphases are summarized in Appendix A and CAT sampling proportions for Claim 1 are given in Appendix B.15

Operations and Algebraic Thinking (4.OA)

Target A [m]: Use the four operations with whole numbers to solve problems. (DOK 1, 2)

Tasks for this target will require students to use the four operations to solve straightforward, one-step contextual word problems in situations involving equal groups, arrays, and finding an unknown number, including problems where the remainder must be interpreted. Some of these tasks will draw on contexts in 4.MD Target I using measurement quantities such as time, liquid volume, and masses/weights of objects, and money (with decimal representations limited to those described in standards 4.NF.6 and 4.NF.7).

Multi-step word problems using the four operations and mathematical problems that relate the four operations to angle addition (part of 4.MD Target C) will be assessed in Claims 2-4.

Target B [a/s]: Gain familiarity with factors and multiples. (DOK 1)

Tasks for this target will ask students to find factor pairs and determine whether a whole number (1-100) is a multiple of a given one digit number and whether a whole number (1-100) is prime or composite. Item difficulty may be increased using tasks outside of the range (1-100) using limits based on content standard 4.NBT.5.

Target C [a/s]: Generate and analyze patterns. (DOK 2, 3)

Tasks for this target will ask students to generate and analyze number and shape patterns. Analyses should include explanations of features of the pattern (other than the rule itself).

Number and Operations in Base Ten (4.NBT)

Target D [m]: Generalize place value understanding for multi-digit whole numbers. (DOK 1, 2)

Tasks for this target will ask students to compare multi-digit numbers using >, =, and <. Tasks should tap into students’ understanding of place value (e.g., by asking students to give a possible digit for the empty box in 4357 < 43□9 that would make the inequality true). A smaller number of these tasks will incorporate student understanding of rounding (e.g., explaining why rounding to a certain place would change the symbol < or > to =).

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15 For example, if under claim #2, a problem solving task in a given year centers on a particular topic area, then it is unlikely that this topic area will also be assessed under claim #1 in a selected response item.
In Claims 2-4, students should see contextual problems associated with this target that highlight issues with precision, including problems in Claim 3 that ask students to explain how improper estimation can create unacceptable levels of precision and/or lead to flawed reasoning.

**Target E [m]: Use place value understanding and properties of operations to perform multi-digit arithmetic. (DOK 1, 2)**

Tasks for this target will ask students to add and subtract multi-digit whole numbers; multiply whole numbers (up to and including four digits by one digit or two digits by two digits); and find whole number quotients and remainders (up to four-digit dividends and one-digit divisors). When possible, the focus of such multiplication and division problems should be on the strategies students use.

**Number and Operations – Fractions (4.NF)**

**Target F [m]: Extend understanding of fraction equivalence and ordering. (DOK 1, 2)**

Tasks for this target will ask students to recognize and generate equivalent fractions or compare fractions with different numerators and different denominators, sometimes using <, =, and >. These may include the use of visual fraction models or number lines to tap student understanding of equivalence and relative size with respect to benchmarks, such as ½.

**Target G [m]: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers. (DOK 1, 2)**

Tasks for this target will ask students to identify and generate equivalent forms of a fraction a/b with a>1, including mixed numbers with like denominators. Some tasks should incorporate unit fractions and the operations addition and subtraction to express equivalent forms. Other tasks should represent a/b as multiplication of a whole number and unit fraction, with a/b sometimes expressed as the product of a whole number and fraction (e.g., 3 x (2/5) = 6 x (□/5)).

One-step, contextual word problems involving addition and subtraction of fractions referring to the same whole and having like denominators and those involving multiplication of a fraction by a whole number should also be included in this target.

**Target H [m]: Understand decimal notation for fractions, and compare decimal fractions. (DOK 1, 2)**

Tasks for this target will ask students to express a fraction with denominator 10 as an equivalent fraction with denominator 100 and express fractions with either denominator as decimals. Some tasks will ask students to add fractions with unlike denominators (limited to 10 and 100). Other tasks will ask students to compare decimals to hundredths, using symbols (<, =, or >) or by location on a number line.

Tasks written for Claim 2 or 4 will contextualize the concepts in this target using measurement conversion and displaying data as described in 4.MD Targets I and J B. Problems for Claim 3 may explicitly connect addition of decimals to reasoning about fractions with denominators 10 and 100, using flawed reasoning or justification.

**Measurement and Data (4.MD)**
Target I [a/s]: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. (DOK 1, 2)

Tasks for this target generally require students to solve straightforward one-step contextual word problems using the four operations in a situation involving one or more of the following: measurement conversion within a single system (including decimal representations, such as expressing 62 centimeters as .62 meters), distances, time intervals, liquid volume in liters, mass, money, area and perimeter of rectangles.

Tasks written for Claims 2 and 4 will connect the concepts from this target to the operations described in 4.OA Target A and 4.NF Targets G and H.

Target J [a/s]: Represent and interpret data. (DOK 1, 2)

Tasks for this target will ask students to create or use a line plot and provide context for 4.NF Target G (specifically, addition and subtraction of fractions with like denominators).

Target K [a/s]: Geometric measurement: understand concepts of angle and measure angles. (DOK 1, 2)

Tasks for this target will ask students to construct and measure angles using a protractor; to provide multiple ways to decompose a larger angle into two or more smaller angles that have the same sum as the original angle; and to determine an unknown angle measure in a diagram. Some tasks will connect the angle measure back to the number of adjacent one degree angles that comprise the whole.

Geometry (4.G)

Target L [a/s]: Draw and identify lines and angles, and classify shapes by properties of their lines and angles. (DOK 1, 2)

Tasks for this target will ask students to draw or identify points, lines, line segments, rays, and parallel and perpendicular lines; to classify angles as right, acute, or obtuse (often paired with 4.MD Target K); to classify two-dimensional figures based on angles and parallel or perpendicular lines; and to draw or identify lines of symmetry in two-dimensional figures. More difficult items for this target may use symmetry as the basis for classification of two-dimensional figures (e.g., What lines of symmetry does a rectangle have to have for it to be considered a square?).

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Grade 5 SUMMATIVE ASSESSMENT TARGETS
Providing Evidence Supporting Claim #1

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<tr>
<th>Claim #1: Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.</th>
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<tbody>
<tr>
<td>Content for this claim may be drawn from any of the Grade 5 clusters represented below, with a much greater proportion drawn from clusters designated “m” (major) and the remainder drawn from clusters designated “a/s” (additional/supporting) – with these items fleshing out the major work of the grade. Sampling of Claim #1 assessment targets will be determined by balancing the content assessed with items and tasks for Claims #2, #3, and #4. Grade level content emphases are summarized in Appendix A and CAT sampling proportions for Claim 1 are given in Appendix B.</td>
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<td><strong>Target A [a/s]</strong>: Write and interpret numerical expressions. (DOK 1)</td>
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<tr>
<td>Tasks for this target will require students to write expressions to express a calculation and evaluate and interpret expressions. Some of these tasks should incorporate the work of using the associative and distributive properties in writing and evaluating expressions, but expressions will not contain nested grouping symbols.</td>
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</table>

| **Target B [a/s]**: Analyze patterns and relationships. (DOK 2) |
| Tasks for this target will ask students to compare two related numerical patterns and explain the relationships within sequences of ordered pairs. Tasks for this target may incorporate the work of 5.G Target J. |

<table>
<thead>
<tr>
<th>Number and Operations—Base Ten</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target C [m]</strong>: Understand the place value system. (DOK 1, 2)</td>
</tr>
<tr>
<td>Tasks for this target ask students to explain patterns in the number of zeros for powers of 10, including simple calculations with base 10 and whole number exponents as well as tasks that demonstrate a generalization of the pattern for larger whole number exponents (e.g., How many zeros would there be in the answer for $10^{42}$?). Other tasks for this target ask students to write, compare, and round decimals to thousandths. Some decimals should be written in expanded form. Comparing and rounding may be combined in some items to highlight essential understandings of connections (e.g., What happens if you compare 3.67 and 3.72 after rounding to the nearest tenth?).</td>
</tr>
</tbody>
</table>

| **Target D [m]**: Perform operations with multi-digit whole numbers and with decimals to hundredths. (DOK 1, 2) |
| Some tasks associated with this target will be non-contextual computation problems that assess fluency |

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16 For example, if under Claim #2, a problem solving task in a given year centers on a particular topic area, then it is unlikely that this topic area will also be assessed under Claim #1 in a selected response item. 

Excerpt from: Smarter Balanced Assessment Consortium
Content Specifications for the Summative Assessment of the "Common Core State Standards for Mathematics"
DRAFT TO ACCOMPANY GOVERNING STATE VOTE ON ASSESSMENT CLAIMS
March 20, 2012
Posted by Oregon Department of Education, May 2012 - to be updated following future updates from Smarter Balanced
in multiplication of multi-digit whole numbers.¹

Other tasks will ask students to find quotients of whole numbers with up to four-digit dividends and two-digit divisors and use the four operations on decimals to hundredths. These tasks may be presented in the context of measurement conversion (5.MD Target G). Other tasks should highlight students' understanding of the relationships between operations and use of place value strategies, which may be done as part of tasks developed for Claim #3.

### Number and Operations—Fractions

**Target E [m]: Use equivalent fractions as a strategy to add and subtract fractions. (DOK 1, 2)**

Tasks associated with this target ask students to add and subtract fractions with unlike denominators, including mixed numbers. Contextual word problems that ask students to apply these operations should be included (often paired with one or more targets from Claim #2). Other tasks should focus on the reasonableness of answers to addition and subtraction problems involving fractions, often by presenting "flawed reasoning" (paired with one or more targets from Claim #3).

**Target F [m]: Apply and extend previous understandings of multiplication and division to multiply and divide fractions. (DOK 1, 2)**

Tasks for this target will ask students to multiply and divide fractions, including division of whole numbers where the answer is expressed by a fraction or mixed number. Division tasks should be limited to those that focus on dividing a unit fraction by a whole number or whole number by a unit fraction. Extended tasks posed as real world problems related to this target will be assessed with targets from Claims #2 and #4.

Other tasks will ask students to find the area of a rectangle with fractional side lengths or use technology enhanced items to build visual models of multiplication of fractions, where the student is able to partition and shade circles or rectangles as part of an explanation.

Students' ability to interpret multiplication as scaling will be assessed with the targets for Claim #3.

### Measurement and Data

**Target G [a/s]: Convert like measurement units within a given measurement system. (DOK 1)**

Tasks for this target ask students to convert measurements and should be used to provide context for the assessment of 5.NBT Target D. Some tasks will involve contextual problems and will contribute evidence for Claim #2 or Claim #4.

**Target H [a/s]: Represent and interpret data. (DOK 1, 2)**

Tasks for this target ask students to make and interpret line plots with fractional units and should be used to provide context for the assessment of 5.NF Target E and 5.NF Target F. Some tasks will involve contextual problems and will contribute evidence for Claim #2 or Claim #4.
**Overview of Claims and Evidence for CCSS Mathematics Assessment**

**Target I [m]: Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. (DOK 1, 2)**

Tasks for this target will ask students to find the volume of right rectangular prisms with whole number edge lengths using unit cubes and formulas. Some tasks should ask students to consider the effect of changing the size of the unit cube (e.g., doubling the edge length of a unit cube) using values that do not cause gaps or overlaps when packed into the solid. Other tasks will ask students to find the volume of two non-overlapping right rectangular prisms, often together with targets from Claim #2 or #4.

<table>
<thead>
<tr>
<th>Geometry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target J [a/s]: Graph points on the coordinate plane to solve real-world and mathematical problems. (DOK 1)</strong></td>
</tr>
<tr>
<td>Tasks for this target ask students to plot coordinate pairs in the first quadrant. Some of these tasks will be created by pairing this target with 5.OA Target B, which would raise the DOK level.</td>
</tr>
<tr>
<td><strong>Target K [a/s]: Classify two-dimensional figures into categories based on their properties. (DOK 2)</strong></td>
</tr>
<tr>
<td>Tasks for this target ask students to classify two-dimensional figures based on a hierarchy. Technology enhanced items may be used to construct a hierarchy or tasks may ask the student to select all classifications that apply to a figure based on given information.</td>
</tr>
</tbody>
</table>
### Overview of Claims and Evidence for CCSS Mathematics Assessment

#### Grade 6 SUMMATIVE ASSESSMENT TARGETS

**Providing Evidence Supporting Claim #1**

**Claim #1: Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.**

Content for this claim may be drawn from any of the Grade 6 clusters represented below, with a much greater proportion drawn from clusters designated —“m” (major) and the remainder drawn from clusters designated —“a” (additional/supporting) – with these items fleshing out the major work of the grade. Sampling of Claim #1 assessment targets will be determined by balancing the content assessed with items and tasks for Claims #2, #3, and #4. Grade level content emphases are summarized in Appendix A and CAT sampling proportions for Claim 1 are given in Appendix B.

#### Ratios and Proportional Relationships (6.RP)

**Target A [m]: Understand ratio concepts and use ratio reasoning to solve problems. (DOK 1, 2)**

Tasks for this target will require students to make sense of problems that use ratio and rate language and find unit rates associated with given ratios. Students will be asked to display equivalent ratios in tables and as coordinate pairs, using information to compare ratios or find missing values.

Other tasks for this target ask students to find a percent as a rate per hundred.

Problems involving rates, ratios, percents (finding the whole, given a part and the percent), and measurement conversions that use ratio reasoning will also be assessed in Claims 2-4.

#### The Number System (6.NS)

**Target B [m]: Apply and extend previous understandings of multiplication and division to divide fractions by fractions. (DOK 1, 2)**

Tasks for this target will ask students to divide fractions by fractions, including using this as a strategy to solve one-step contextual problems.

**Target C [a/s]: Compute fluently with multi-digit numbers and find common factors and multiples. (DOK 1)**

Tasks for this target will ask students to divide multi-digit numbers and add, subtract, multiply and divide multi-digit decimals. Other tasks will ask students to find the greatest common factor of two whole numbers less than or equal to 100; the least common multiple of two whole numbers less than or equal to 12; and express the sum of two whole numbers 1-100 with a common factor as a multiple of the sum of two whole numbers with no common factor or find the missing value in an equation representing such equivalence (see connections to 6.EE Targets E and F to generate items with greater range of difficulty).

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17 For example, if under Claim #2, a problem solving task in a given year centers on a particular topic area, then it is unlikely that this topic area will also be assessed under Claim #1 in a selected response item.
Overview of Claims and Evidence for CCSS Mathematics Assessment

Target D [m]: Apply and extend previous understandings of numbers to the system of rational numbers. (DOK 1, 2)

Tasks for this claim will ask students to place numbers on a number line (positive and negative rational numbers, including those expressed using absolute value notation). Some tasks will ask students to interpret the meaning of zero in a context related to other given quantities in the problem.

Claim 3 tasks will integrate the work of this target by incorporating students’ understanding of interpretations and explanations of common misconceptions related to inequalities for negative rational numbers (e.g., explaining that -3°C is warmer than -7°C). Claims 2 and 4 will include items that ask students to solve problems in the four quadrants of the coordinate plane, including distances between points with the same first and second coordinate.

Expressions and Equations (6.EE)

Target E [m]: Apply and extend previous understandings of arithmetic to algebraic expressions. (DOK 1, 2)

Tasks for this target will ask students to write and evaluate expressions (numerical expressions with whole-number exponents; algebraic expressions; and expressions arising from formulas in real world problems). Other tasks will ask students to identify or generate equivalent expressions using understanding of properties or operations.

Target F [m]: Reason about and solve one-variable equations and inequalities. (DOK 1, 2)

Tasks for this target will ask students to solve and write one-variable equations and inequalities, some of which provide substitution of given numbers as an entry point to a solution.

Claim 3 tasks will tap into students’ ability to explain inequalities as a set of infinitely many solutions (some connecting the content of this target to 6.NS Target D).

Target G [m]: Represent and analyze quantitative relationships between dependent and independent variables. (DOK 1, 2)

Tasks for this target will ask students to select or write an equation that expresses one quantity in terms of another. Some tasks will target the relationship between the variables in an equation and their representation in a table or graph.

Some tasks may connect the content of this target with 6.EE Target F.

Geometry (6.G)

Target H [a/s]: Solve real-world and mathematical problems involving area, surface area, and volume. (DOK 2)

Tasks for this target will ask students to find area (triangles, special quadrilaterals, and polygons) using...
composition and decomposition; to find volume of right rectangular prisms with fractional edge lengths (see connections to 6.NS Target A); identify and use nets of three-dimensional figures to find surface area; and draw polygons in the coordinate plane with given coordinates or determine one or more missing coordinates to generate a given polygon.

Many tasks for this target will provide context for Claims 2-4 and connect the content of this target to several other targets across Claim 1 (see, for example, 6.NS Targets B and C, 6.EE Targets E, F, and G).

Statistics and Probability (6.SP)

Target I [a/s]: Develop understanding of statistical variability. (DOK 1, 2)

Tasks for this target will ask students to identify and pose questions that lead to variable responses; identify a reasonable center and/or spread for a given context. Some flawed reasoning tasks will be used as part of evidence for Claim 3 (e.g., explaining why a given measure of center is unreasonable for a dataset or context – without performing any calculations).

Target J [a/s]: Summarize and describe distributions. (DOK 1, 2)

Tasks for this target will ask students to create number lines, dot plots, histograms, and boxplots. The reporting of quantitative measures (median and/or mean, interquartile range and/or mean absolute deviation) may be included in these tasks or delivered as separate tasks.

Other tasks for this target will ask students to match the shape of a data distribution to its quantitative measures.
## Grade 7 SUMMATIVE ASSESSMENT TARGETS

### Providing Evidence Supporting Claim #1

**Claim #1:** Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.

Content for this claim may be drawn from any of the Grade 7 clusters represented below, with a much greater proportion drawn from clusters designated —m‖ (major) and the remainder drawn from clusters designated —a‖ (additional/supporting) – with these items fleshing out the major work of the grade. Sampling of Claim #1 assessment targets will be determined by balancing the content assessed with items and tasks for Claims #2, #3, and #4. Grade level content emphases are summarized in Appendix A and CAT sampling proportions for Claim 1 are given in Appendix B.

<table>
<thead>
<tr>
<th>Ratios and Proportional Relationships (7.RP)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target A [m]:</strong> Analyze proportional relationships and use them to solve real-world and mathematical problems. (DOK 1, 2)</td>
</tr>
</tbody>
</table>

Tasks for this target will require students to identify and represent proportional relationships in various formats (tables, graphs, equations, diagrams, verbal descriptions) and interpret specific values in context. (See 7.G Target E for possible context.) Other tasks will require students to compute unit rates, including those associated with ratios of fractions.

Multistep problems involving ratio and percent will be assessed by tasks in Claims 2 and 4.

<table>
<thead>
<tr>
<th>The Number System (7.NS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target B [m]:</strong> Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. (DOK 1, 2)</td>
</tr>
</tbody>
</table>

Tasks for this target will require students to add and subtract rational numbers, including problems that connect these operations to distance between numbers on a number line and the concept of absolute value as it relates to distance on a number line. Other tasks will ask students to multiply and divide rational numbers and convert rational numbers to decimals.

Tasks for Claim 3 related to this target will incorporate student understanding of zero as a divisor, quotients of integers being rational, and termination in 0s or repeating for decimal representation of rational numbers.

Tasks for Claims 2 and 4 related to this target will integrate operations with rational numbers.

<table>
<thead>
<tr>
<th>Expressions and Equations (7.EE)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target C [m]:</strong> Use properties of operations to generate equivalent expressions. (DOK 1)</td>
</tr>
</tbody>
</table>

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18 For example, if under Claim #2, a problem solving task in a given year centers on a particular topic area, then it is unlikely that this topic area will also be assessed under Claim #1 in a selected response item.

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Excerpt from: Smarter Balanced Assessment Consortium

Content Specifications for the Summative Assessment of the "Common Core State Standards for Mathematics"

DRAFT TO ACCOMPANY GOVERNING STATE VOTE ON ASSESSMENT CLAIMS

March 20, 2012

Posted by Oregon Department of Education, May 2012 - to be updated following future updates from Smarter Balanced
### Overview of Claims and Evidence for CCSS Mathematics Assessment

<table>
<thead>
<tr>
<th>Target D [m]:</th>
<th>Solve real-life and mathematical problems using numerical and algebraic expressions and equations. (DOK 1, 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks for this target will require students to add subtract, factor and expand linear expressions with rational coefficients.</td>
<td></td>
</tr>
<tr>
<td>Tasks for this target will require students to calculate with numbers in any form and convert between forms. Other tasks will require students to solve word problems leading to the equations $px + q = r$ and $p(x + q) = r$ or leading to inequalities of the form $px + q &gt; r$ or $px + q &lt; r$, where $p$, $q$, and $r$ are specific rational numbers. Some tasks associated with this target will contribute evidence for Claims 2 and 4. Tasks associated with this target that ask students to assess the reasonableness of answers using mental computation and estimation will contribute evidence to Claim 3.</td>
<td></td>
</tr>
</tbody>
</table>

#### Geometry (7.G)

<table>
<thead>
<tr>
<th>Target E [a/s]:</th>
<th>Draw, construct and describe geometrical figures and describe the relationships between them. (DOK 2, 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks associated with this target will ask students to create scale drawings or apply an understanding of scale factor to solve a problem, often paired with 7.RP Target A. Other tasks for this target will require students to draw geometric shapes with given conditions. Some tasks, such as those that require students to provide reasoning to explain why certain conditions cannot lead to a particular shape, will lead to evidence for Claim 3.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Target F [a/s]:</th>
<th>Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. (DOK 1, 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks for this target will require students to solve problems for circumference, area, volume, and surface area of two- and three-dimensional objects. Other tasks (paired with 7.EE Target D) will require students to write and solve equations to determine an unknown angle in a figure.</td>
<td></td>
</tr>
</tbody>
</table>

#### Statistics and Probability (7.SP)

<table>
<thead>
<tr>
<th>Target G [a/s]:</th>
<th>Use random sampling to draw inferences about a population. (DOK 1, 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks for this target will ask students to evaluate statements about a sample relative to a population. Other tasks will require students to explain variability in estimates or predictions using data from multiple samples of the same size.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Target H [a/s]:</th>
<th>Draw informal comparative inferences about two populations. (DOK 1, 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks for this target will require students to make informal inferences about two populations based on measures of center and variability.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Target I [a/s]:</th>
<th>Investigate chance processes and develop, use, and evaluate probability models. (DOK 1, 2)</th>
</tr>
</thead>
</table>

Excerpt from: Smarter Balanced Assessment Consortium
Content Specifications for the Summative Assessment of the "Common Core State Standards for Mathematics"
DRAFT TO ACCOMPANY GOVERNING STATE VOTE ON ASSESSMENT CLAIMS
March 20, 2012
Posted by Oregon Department of Education, May 2012 - to be updated following future updates from Smarter Balanced
Tasks for this target will ask students to find probabilities of events, including compound events, with some focusing specifically on understanding the likelihood of an event as a probability between 0 and 1. Some tasks will target comparisons between predicted and observed relative frequencies.
Overview of Claims and Evidence for CCSS Mathematics Assessment

<table>
<thead>
<tr>
<th>Grade 8 SUMMATIVE ASSESSMENT TARGETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing Evidence Supporting Claim #1</td>
</tr>
</tbody>
</table>

Claim #1: Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.

Content for this claim may be drawn from any of the Grade 8 clusters represented below, with a much greater proportion drawn from clusters designated "m" (major) and the remainder drawn from clusters designated "a/s" (additional/supporting) – with these items fleshing out the major work of the grade. Sampling of Claim #1 assessment targets will be determined by balancing the content assessed with items and tasks for Claims #2, #3, and #4. For example, if under Claim #2, a problem solving task in a given year centers on a particular topic area, then it is unlikely that this topic area will also be assessed under Claim #1 in a selected response item. Grade level content emphases are summarized in Appendix A and CAT sampling proportions for Claim 1 are given in Appendix B.

The Number System

Target A [a/s]: Know that there are numbers that are not rational, and approximate them by rational numbers. (DOK 1)

Tasks for this target will require students to convert between rational numbers and decimal expansions of rational numbers.

Other tasks will ask students to approximate irrational numbers on a number line or as rational numbers with a certain degree of precision. This target may be combined with 8.EE Target B (e.g., by asking students to express the solution to a cube root equation as a point on the number line).

Expressions and Equations

Target B [m]: Work with radicals and integer exponents. (DOK 1)

Tasks for this target will require students to select or produce equivalent numerical expressions based on properties of integer exponents.

Other tasks will ask students to solve simple square root and cube root equations, often expressing their answers approximately using one of the approximations from 8.NS Target A.

Other tasks will ask students to represent very large and very small numbers as powers of 10, including scientific notation, and perform operations on numbers written as powers of 10.

Target C [m] Understand the connections between proportional relationships, lines, and linear equations. (DOK 2)

Tasks for this target will ask students to graph one or more proportional relationships and connect the unit rate(s) to the context of the problem.

Other tasks will ask students to apply understanding of the relationship between similar triangles and slope.

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19 For example, if under Claim #2, a problem solving task in a given year centers on a particular topic area, then it is unlikely that this topic area will also be assessed under Claim #1 in a selected response item.

20 For example, a task might say that starting from a point on a line, a move ¾ to the right and one unit up puts you back on the line. If you start at a different point on the line and move to the right 8 units, how many units up do you have to move to be back on the line?
Target D [m]: Analyze and solve linear equations and pairs of simultaneous linear equations. (DOK 2)

Tasks for this target will ask students to solve systems of two linear equations in two variables algebraically and estimate solutions graphically. Some problems will ask students to recognize simple cases of two equations that represent the same line or that have no solution. This target may be combined with 8.F Target F to create problems where students determine a point of intersection given an initial value and rate of change, including cases where no solution exists.

Real world and mathematical problems that lead to two linear equations in two variables will be assessed in connection with targets from Claims 2 and 4.

**Functions**

Target E [m]: Define, evaluate, and compare functions. (DOK 1, 2)

Tasks associated with this target ask students to relate different functional forms (algebraically, graphically, numerically in tables, or by verbal descriptions). Some tasks for this target will ask students to produce or identify input and output pairs for a given function. Other tasks will ask students to compare properties of functions (e.g., rate of change or initial value).

Other tasks should ask students to classify functions as linear or non-linear when expressed in any of the functional forms listed above. Some of these may be connected to 8.SP Target J.

Target F [m]: Use functions to model relationships between quantities. (DOK 1, 2)

Technology enhanced items will ask students to identify parts of a graph that fit a particular qualitative description (e.g., increasing or decreasing) or sketch a graph based on a qualitative description.

Other tasks for this target will ask students to determine the rate of change and initial value of a function from given information. Some tasks will ask students to give the equation of a function that results from given information.

**Geometry**

Target G [m]: Understand congruence and similarity using physical models, transparencies, or geometry software. (DOK 2)

Technology enhanced items will be used to allow students to “draw” lines, line segments, angles, and parallel lines after undergoing rotations, reflections, and translations. Similar technology enhanced items will ask students to produce a new figure or part of a figure after undergoing dilations, translations, rotations, and/or reflections.

Other tasks will present students with two figures and ask students to describe a series of rotations, reflections, translations, and/or dilations to show that the figures are similar, congruent, or neither. Many of these tasks will contribute evidence for Claim #3, asking students to justify their reasoning or critique given reasoning within the task.

Target H [m]: Understand and apply the Pythagorean theorem. (DOK 2)

Tasks associated with this target will ask students to use the Pythagorean Theorem to solve real-world and
mathematical problems in two and three dimensions, including problems that ask students to find the distance between two points in a coordinate system.

Some applications of the Pythagorean Theorem will be assessed at deeper levels in Claims #2 and #4. Understanding of the derivation of the Pythagorean Theorem would contribute evidence to Claim #3.

**Target I [a/s]: Solve real-world and mathematical problems involving volume of cylinders, cones and spheres. (DOK 2)**

Tasks for this target will ask students to apply the formulas for volume of cylinders, cones and spheres to solve problems. Many of these tasks will contribute evidence to Claims #2 and #4.

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**Statistics and Probability**

**Target J [a/s]: Investigate patterns of association in bivariate data. (DOK 1, 2)**

Tasks for this target will often be paired with 8.F Target F and ask students to determine the rate of change and initial value of a line suggested by examining bivariate data. Interpretations related to clustering, outliers, positive or negative association, linear and nonlinear association will primarily be presented in context by pairing this target with those from Claims #2 and #4.
# Overview of Claims and Evidence for CCSS Mathematics Assessment

## Grade 11 SUMMATIVE ASSESSMENT TARGETS

### Providing Evidence Supporting Claim #1

<table>
<thead>
<tr>
<th>Claim #1: Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.</th>
</tr>
</thead>
</table>
| Content for this claim may be drawn from any of the high school clusters represented below, with a much greater proportion drawn from clusters designated “m” (major) and the remainder drawn from clusters designated “a/s” (additional/supporting) – with these items fleshing out the major work of the grade. Sampling of Claim #1 assessment targets will be determined by balancing the content assessed with items and tasks for Claims #2, #3, and #4. 

Grade level content emphases are summarized in Appendix A and CAT sampling proportions for Claim 1 are given in Appendix B. |

### Number and Quantity (9-12.N)

**Target A [a/s]: Extend the properties of exponents to rational exponents. (DOK 1, 2)**

Tasks for this target will require students to rewrite expressions involving radicals and rational exponents. Claim 3 tasks will tap student understanding of the properties of exponents and their ability to identify flawed reasoning applied to this target.

**Target B [a/s]: Use properties of rational and irrational numbers. (DOK 1, 2)**

Tasks for this target will require students to demonstrate understanding of operations with rational and irrational numbers leading to generalizations about their sums and products. These will range from providing concrete examples (e.g., give or choose three examples to show that the sum of two rational numbers is rational) to abstract generalizations (e.g., reasoning related to understanding that the sum of any two rational numbers is rational).

**Target C [m]: Reason quantitatively and use units to solve problems. (DOK 1, 2)**

Tasks for this target will require students to choose and interpret units in formulas and the scale in a graph. In Claims 2-4, this reasoning will be extended to include defining appropriate quantities when modeling and choosing appropriate levels of accuracy for units in the context of a real or mathematical problem (e.g., explaining the effects of rounding π to the nearest whole number in an area calculation).

### Algebra (9-12.A)

**Target D [m]: Interpret the structure of expressions. (DOK 1)**

Tasks for this target will require students to recognize equivalent forms of an expression as determined by the expression’s structure. Tasks for Claims 2 and 4 will ask students to interpret expressions or parts of expressions in the context of a problem.

**Target E [m]: Write expressions in equivalent forms to solve problems. (DOK 1, 2)**

Tasks for this target will require students to choose or produce an equivalent form of an expression including factoring a quadratic expression, completing the square, and using properties of exponents. Some of these tasks will connect the form of the expression to a property of the quantity represented by the expression.

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21 For example, if under Claim #2, a problem solving task in a given year centers on a particular topic area, then it is unlikely that this topic area will also be assessed under Claim #1 in a selected response item.
Overview of Claims and Evidence for CCSS Mathematics Assessment

Target F [a/s]: Perform arithmetic operations on polynomials. (DOK 1)
Tasks for this target will require students to add, subtract, and multiply polynomials.

Target G [a/s]: Create equations that describe numbers or relationships. (DOK 1, 2)
Tasks for this target will require students to create equations and inequalities in one variable to solve problems. Other tasks will require students to create and graph equations in two variables to represent relationships between quantities.

Claim 4 tasks associated with this target will ask students to represent constraints in a modeling context using equations and inequalities.

Target H [m]: Understand solving equations as a process of reasoning and explain the reasoning. (DOK 1, 2)
Tasks for this target will require students to solve radical and rational equations in one variable. Tasks that ask students to critique or justify a particular solution method will contribute evidence to Claim 3.

Target I [m]: Solve equations and inequalities in one variable. (DOK 1, 2)
Tasks for this target will require students to solve linear equations and inequalities in one variable and solve quadratic equations in one variable.

Target J [m]: Represent and solve equations and inequalities graphically. (DOK 1, 2)
Tasks for this target will require students to interpret a line or curve as a solution set of an equation in two variables, including tasks that tap student understanding of points beyond the displayed portion of a graph as part of the solution set. Some of these tasks should explicitly focus on non-integer solutions (e.g., give three points on the graph of \( y = 7x + 2 \) that have \( x \)-values between 1 and 2).

Other tasks for this target will require students to approximate solutions to systems of equations represented graphically, including linear, polynomial, rational, absolute value, exponential and logarithmic functions (often paired with 9-12.F Target L).

Other tasks for this target will require students to graph solutions to linear inequalities and systems of linear inequalities in two variables. In some of these tasks, students may be given points, sets of points, or regions and asked to determine whether the indicated point(s) or regions are part of a solution set.

Functions (9-12.F)

Target K [m]: Understand the concept of a function and use function notation. (DOK 1)
Tasks for this target will require students to distinguish between relationships that represent functions and those that do not, including recognizing a sequence as a function. Other tasks will require students to identify the domain and range of a function, often in the context of problems associated with Claims 2-4.

Target L [m]: Interpret functions that arise in applications in terms of a context. (DOK 1, 2)
Tasks for this target will require students to sketch graphs based on given key features and interpret key features of graphs, with emphasis on interpreting the average rate of change over a specified interval. Interpretation of rate of change and other key features (intercepts, relative maximums and minimums, symmetries, and end behavior) will often be assessed in the context of problems associated with Claims 2-4.
Target M \([m]\): Analyze functions using different representations. (DOK 1, 2, 3)
Tasks for this target will ask students to graph functions by hand or using technology (linear, quadratic, square root, cube root, piecewise-defined, polynomial, exponential and logarithmic) and compare properties of two functions represented in different ways. Some tasks will focus on understanding equivalent forms that can be used to explain properties of functions, and may be associated with 9-12.A Target E.

Target N \([m]\): Build a function that models a relationship between two quantities. (DOK 1, 2)
Tasks for this target will require students to write a function (recursive or explicit, as well as translating between the two forms) to describe a relationship between two quantities.

Geometry (9-12.G)

Target O \([m]\): Prove geometric theorems. (DOK 2)
Tasks for this target will require students to explain proofs or reasoning related to theorems about lines, angles, triangles, circles or parallelograms, including algebraic proofs of geometric theorems. Tasks that require the development of a proof or line of reasoning or that ask students to identify and resolve flawed reasoning will be assessed in Claim 3.

Statistics and Probability (9-12.SP)

Target P \([m]\): Summarize, represent and interpret data on a single count or measurement variable. (DOK 2)
Tasks for this target will require students to use appropriate statistics to explain differences in shape, center and spread of two or more different data sets, including the effect of outliers.

Notes on Grades 9-12 Content Clusters Not Identified as Assessment Targets for Claim 1

Algebra
Content from the remaining Algebra clusters will also provide content and context for tasks in Claims 2-4, though these will be sampled in lesser proportion than those explicitly listed as targets for Claim 1. Clusters not explicitly identified as targets for Claim 1 are the following:

- Understand the relationship between zeros and factors of polynomials
- Use polynomial identities to solve problems
- Rewrite rational expressions
- Solve systems of equations*

*Content from this cluster may be sampled in greater proportion due to its interconnectivity to some of the targets listed under Claim 1.

Functions
Content from the remaining Functions clusters will also provide content and context for tasks in Claims 2-4, though these will be sampled in lesser proportion than those explicitly listed as targets for Claim 1. Clusters not explicitly identified as targets for Claim 1 are the following:

Excerpt from: Smarter Balanced Assessment Consortium
Content Specifications for the Summative Assessment of the "Common Core State Standards for Mathematics"
DRAFT TO ACCOMPANY GOVERNING STATE VOTE ON ASSESSMENT CLAIMS
March 20, 2012
Posted by Oregon Department of Education, May 2012 - to be updated following future updates from Smarter Balanced
Overview of Claims and Evidence for CCSS Mathematics Assessment

- Build new functions from existing functions
- Construct and compare linear, quadratic, and exponential models and solve problems*
- Interpret expressions for functions in terms of the situation they model*
- Extend the domain of trigonometric functions using the unit circle
- Model periodic phenomena with trigonometric functions
- Prove and apply trigonometric identities

*Content from these clusters may be sampled in greater proportion due to its interconnectivity to some of the targets listed under Claim 1.

Geometry

While only one content cluster from the Geometry domain\(^\text{22}\) is highlighted for task development under Claim 1, the remaining clusters will be used to build tasks for Claims 2-4. In general, the clusters listed below provide natural and productive opportunities to connect the work of algebra, functions and geometry in the context of problems for Claims 2-4:

- Use coordinates to prove simple geometric theorems algebraically
- Explain volume formulas and use them to solve problems
- Apply geometric concepts in modeling situations

Content from the remaining Geometry clusters will also provide content and context for tasks in Claims 2-4, though these will be sampled in lesser proportion than those listed above and that explicitly listed as a target for Claim 1.

- Experiment with transformations in the plane
- Understand congruence in terms of rigid motions
- Make geometric constructions
- Understand similarity in terms of similarity transformations
- Prove theorems involving similarity
- Define trigonometric ratios and solve problems involving right triangles
- Understand and apply theorems about circles
- Find arc lengths and areas of sectors of circles
- Translate between the geometric description and the equation for a conic section
- Visualize relationships between two-dimensional and three-dimensional objects

Statistics and Probability

While only one content cluster from the Statistics and Probability domain\(^\text{23}\) is highlighted for task development under Claim 1, the remaining clusters will be used to build tasks for Claims 2-4. In general, the clusters listed below provide productive opportunities to connect the work of algebra, functions and statistics and probability in the context of problems for Claims 2-4:

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\(^{22}\) The phrase “Conceptual Category” is used in place of domain in the CCSS document. “Domain” is used here to maintain consistency with Grades 3-8 for the purposes of task development and item tagging.

\(^{23}\) The phrase “Conceptual Category” is used in place of domain in the CCSS document. “Domain” is used here to maintain consistency with Grades 3-8 for the purposes of task development and item tagging.

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Overview of Claims and Evidence for CCSS Mathematics Assessment

- Summarize, represent, and interpret data on two categorical and quantitative variables
- Interpret linear models

Content from the remaining Statistics and Probability clusters will also provide content and context for tasks in Claims 2-4, though these will be sampled in lesser proportion than those listed above and that explicitly listed as a target for Claim 1.

- Understand and evaluate random processes underlying statistical experiments
- Make inferences and justify conclusions from sample surveys, experiments, and observational studies
- Understand independence and conditional probability and use them to interpret data
- Use the rules of probability to compute probabilities of compound events in a uniform probability model

Understanding Assessment Targets in an Adaptive Framework: In building an adaptive test, it is essential to understand how content gets adapted.” In a computer adaptive summative assessment, it doesn’t make much sense to repeatedly offer formulaic multiplication and division items to a highly fluent Grade 3 student, making the Grade 3 Target OA.C [m] less relevant for this student than it may be for another. The higher-achieving student could be challenged further, while a student who is struggling could be given less complex items to ascertain how much each understands within the domain. The table below illustrates several items for the Grade 3 Operations and Algebraic Thinking domain that would likely span the difficulty spectrum for this grade. The items generally get more difficult with each row (an important feature of adaptive test item banks). (Pilot data will be used to determine more precisely the levels of difficulty associated with each kind of task.)

Sample for Grade 3, Claim #1 – Operations and Algebraic Thinking

<table>
<thead>
<tr>
<th>Adapting Items within a Claim &amp; Domain</th>
<th>Claim #1 – Operations and Algebraic Thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 x 5 = □</td>
<td>Target C [m]: Multiply and divide within 100.</td>
</tr>
<tr>
<td>6 x □ = 30</td>
<td>Target A [m]: Represent and solve problems involving multiplication and division.</td>
</tr>
<tr>
<td>9 x 4 = □ x 9</td>
<td>Target B [m]: Understand properties of multiplication and the relationship between multiplication and division.</td>
</tr>
<tr>
<td>6 x 2 x □ = 60</td>
<td>Target B [m]: Understand properties of multiplication and the relationship between multiplication and division.</td>
</tr>
<tr>
<td>4 x 2 x □ = 5 x 2 x 2 x 2</td>
<td>Target B [m]: Understand properties of multiplication and the relationship between multiplication and division.</td>
</tr>
<tr>
<td>9 x 4 = 4 x □ x □ (May appear as a drag and drop TE item where “1” is not one of the choices for dragging.)</td>
<td>Target B [m]: Understand properties of multiplication and the relationship between multiplication and division.</td>
</tr>
</tbody>
</table>