

<b>Grade 3-5 Mathematics Item Specification Claim 2</b>	
<p>Problem solving, which of course builds on a foundation of knowledge and procedural proficiency, sits at the core of <i>doing</i> mathematics. Proficiency at problem solving requires students to choose to use concepts and procedures from across the content domains and check their work using alternative methods. As problem solving skills develop, student understanding of and access to mathematical concepts becomes more deeply established. (<i>Mathematics Content Specifications, p.56</i>)</p>	
<p><b>Primary Claim 2: Problem Solving</b> Students can solve a range of well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies.</p>	
<p><b>Secondary Claim(s):</b> Items/tasks written primarily to assess Claim 2 will necessarily involve some Claim 1 content targets. Related Claim 1 targets should be listed below the Claim 2 targets in the item form. If Claim 3 or 4 targets are also directly related to the item/task, list those following the Claim 1 targets in order of prominence.</p>	
<p><b>Primary Content Domain:</b> Each item/task should be classified as having a primary, or dominant, content focus. The content should draw upon the knowledge and skills articulated in the progression of standards leading up to and including the targeted grade within and across domains.</p>	
<p><b>Secondary Content Domain(s):</b> While tasks developed to assess Claim 2 will have a primary content focus, components of these tasks will likely produce enough evidence for other content domains that a separate listing of these content domains needs to be included where appropriate. The standards in the NBT domain in grades 3-5 can be used to construct higher difficulty items for the adaptive pool. The integration of the OA, G, and MD domains with NBT allows for higher content limits within the grade level than might be allowed when staying within the primary content domain.</p>	
<b>DOK Levels</b>	1, 2, 3
<b>Allowable Response Types</b>	<p><b>Response Types:</b> Multiple Choice, single correct response (MC); Multiple Choice, multiple correct response (MS); Equation/Numeric (EQ); Drag and Drop, Hot Spot, and Graphing (GI); Matching Tables (MA); Fill-in Table (TI)</p> <p>No more than five choices in MS and MA items.</p> <p>Short Text–Performance tasks only</p> <p><b>Scoring:</b> Scoring rules and answer choices will focus on a student’s ability to solve problems and/or to apply appropriate strategies to solve problems. For some problems, multiple correct responses and/or strategies are possible.</p> <ul style="list-style-type: none"> <li>• MC and MS items will be scored as correct/incorrect (1 point)</li> <li>• If MA items require two skills, they will be scored as:</li> </ul>

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	<ul style="list-style-type: none"> <li>○ All correct choices (2 points); at least ½ but less than all correct choices (1 point)</li> <li>○ Justification<sup>1</sup> for more than 1 point <b>must be</b> clear in the scoring rules</li> <li>○ Where possible, include a “disqualifier” option that if selected would result in a score of 0 points, whether or not the student answered ½ correctly.</li> <li>• EQ, GI, and TI items will be scored as:             <ul style="list-style-type: none"> <li>○ Single requirement items will be scored as correct/incorrect (1 point)</li> <li>○ Multiple requirement items: All components correct (2 points); at least ½ but less than all correct (1 point)</li> <li>○ Justification for more than 1 point <b>must be</b> clear in the scoring rules</li> </ul> </li> </ul>
<b>Allowable Stimulus Materials</b>	Effort must be made to minimize the reading load in problem situations. Use tables, diagrams with labels, and other strategies to lessen the reading load. Use simple subject-verb-object (SVO) sentences; use contexts that are familiar and relevant to students at the targeted grade level. Target-specific stimuli will be derived from the Claim 1 targets used in the problem situation. All real-world problem contexts will be relevant to the age of the students. Stimulus guidelines specific to task models are given below.
<b>Construct Relevant Vocabulary</b>	Refer to the Claim 1 specifications to determine Construct Relevant Vocabulary associated with specific content standards.
<b>Allowable Tools</b>	Any mathematical tools appropriate to the problem situation and the Claim 1 target(s). Some tools are identified in Standard for Mathematical Practice #5 and others can be found in the language of specific standards.
<b>Target-Specific Attributes</b>	CAT items should take from 2 to 5 minutes to solve; Claim 2 items that are part of a performance task may take 2 to 8 minutes to solve.
<b>Accessibility Guidance:</b>	<p>Item writers should consider the following Language and Visual Element/Design guidelines<sup>2</sup> when developing items.</p> <p>Language Key Considerations:</p> <ul style="list-style-type: none"> <li>• Use simple, clear, and easy-to-understand language needed to assess the construct or aid in the understanding of the context</li> <li>• Avoid sentences with multiple clauses</li> <li>• Use vocabulary that is at or below grade level</li> <li>• Avoid ambiguous or obscure words, idioms, jargon, unusual names and references</li> </ul> <p>Visual Elements/Design Key Considerations:</p> <ul style="list-style-type: none"> <li>• Include visual elements only if the graphic is needed to assess the construct or it aids in the</li> </ul>

<sup>1</sup> For a CAT item to score multiple points, either distinct skills must be demonstrated that earn separate points or distinct levels of understanding of a complex skill must be tied directly to earning one or more points.

<sup>2</sup> For more information, refer to the General Accessibility Guidelines at: <http://www.smarterbalanced.org/wordpress/wp-content/uploads/2012/05/TaskItemSpecifications/Guidelines/AccessibilityandAccommodations/GeneralAccessibilityGuidelines.pdf>

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	<p>understanding of the context</p> <ul style="list-style-type: none"><li>• Use the simplest graphic possible with the greatest degree of contrast, and include clear, concise labels where necessary</li><li>• Avoid crowding of details and graphics</li></ul> <p>Items are selected for a student's test according to the blueprint, which selects items based on Claims and targets, not task models. As such, careful consideration is given to making sure fully accessible items are available to cover the content of every Claim and target, even if some item formats are not fully accessible using current technology.<sup>3</sup></p>
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<sup>3</sup> For more information about student accessibility resources and policies, refer to [http://www.smarterbalanced.org/wordpress/wp-content/uploads/2014/08/SmarterBalanced\\_Guidelines.pdf](http://www.smarterbalanced.org/wordpress/wp-content/uploads/2014/08/SmarterBalanced_Guidelines.pdf)

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<b>Development Notes</b>	<p>Tasks generating evidence for Claim 2 in a given grade will draw upon knowledge and skills articulated in the progression of standards up through that grade, though more complex problem-solving tasks may draw upon knowledge and skills from lower grade levels.</p> <p>Claim 1 <i>Specifications</i> that cover the following standards should be used to help inform an item writer’s understanding of the difference between how these standards are measured in Claim 1 versus Claim 2. Development notes have been added to many of the Claim 1 specifications that call out specific topics that should be assessed under Claim 2.</p> <p>There are some other useful distinctions between Claim 1 and Claim 2 in grades 3-5 that have supported the approach to alignment. The following points describe some attributes of items in Claim 2:</p> <ul style="list-style-type: none"> <li>• Multiple approaches are feasible or a range of responses is expected (e.g., if a student can solve a word problem by identifying a key word or words and selecting operations, then it is Claim 1).</li> <li>• The use of tools in Claim 2 is intended to support the problem solving process. In some cases, students may be asked to display their answer on the tool (e.g., by clicking the appropriate point or interval on a number line or ruler).</li> <li>• Assessing the reasonableness of answers to problems is a Claim 2 skill with items that align to Target C.</li> </ul> <p>In grades 3-5, Claim 2 tasks should be written to support two key themes:</p> <ul style="list-style-type: none"> <li>• Solving problems with fractions</li> <li>• Solving problems with the four operations</li> </ul> <p>As noted in the table below, the Measurement/Data and Geometry clusters should be used to support these two key themes.</p> <p>At least 80% of the items written to Claim 2 should primarily assess the standards and clusters listed in the table.</p>
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Grade 3	Grade 4	Grade 5
3.OA.A	4.OA.A	5.NBT.B
3.OA.D	4.NBT.B	5.NF.A
3.NBT.A*	4.NF.A	5.NF.B
3.MD.A	4.NF.B	5.MD.A*
3.MD.B*	4.NF.C	5.MD.C
3.MD.C	4.MD.A*	5.G.A*
3.MD.D*	4.MD.C*	

\* Denotes additional and supporting clusters

## Grades 3-5, Claim 2

**Assessment Targets:** Any given item/task should provide evidence for two or more Claim 2 assessment targets. Each of the following targets should not lead to a separate task: it is in *using* content from different areas, including work studied in earlier grades, that students demonstrate their problem solving proficiency. Multiple targets should be listed in order of prominence as related to the item/task.

**Target A: Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace. (DOK 2, 3)**

Under Claim 2, the problems should be completely formulated, and students should be asked to find a solution path from among their readily available tools.

**Target B: Select and use appropriate tools strategically. (DOK 1, 2)**

Tasks used to assess this target should allow students to find and choose tools; for example, using a “Search” feature to call up a formula (as opposed to including the formula in the item stem) or using a protractor in physical space.

**Target C: Interpret results in the context of a situation. (DOK 2)**

Tasks used to assess this target should ask students to link their answer(s) back to the problem’s context. In early grades, this might include a judgment by the student of whether to express an answer to a division problem using a remainder or not based on the problem’s context. In later grades, this might include a rationalization for the domain of a function being limited to positive integers based on a problem’s context (e.g., understanding that the number of buses required for a given situation cannot be  $32\frac{1}{2}$ , or that the negative values for the independent variable in a quadratic function modeling a basketball shot have no meaning in this context).

**Target D: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (DOK 1, 2, 3)**

For Claim 2 tasks, this may be a separate target of assessment explicitly asking students to use one or more potential mappings to understand the relationship between quantities. In some cases, item stems might suggest ways of mapping relationships to scaffold a problem for Claim 2 evidence.

**What sufficient evidence looks like for Claim 2 (Problem-Solving)<sup>4</sup>:**

"Although items and tasks designed to provide evidence for this claim must primarily assess the student's ability to identify the problem and to arrive at an acceptable solution, mathematical problems nevertheless require students to apply mathematical concepts and procedures."

**Properties of items/tasks that assess Claim 2:** The assessment of many relatively discrete and/or single-step problems can be accomplished using short constructed response items, or even computer-enhanced or selected response items.

More extensive constructed response items can effectively assess multi-stage problem solving and can also indicate unique and elegant strategies used by some students to solve a given problem, and can illuminate flaws in student's approach to solving a problem. These tasks could:

- Present non-routine<sup>5</sup> problems where a substantial part of the challenge is in deciding what to do, and which mathematical tools to use; and
- Involve chains of autonomous<sup>6</sup> reasoning, in which some tasks may take a successful student 2 to 5 minutes, depending on the age of student and complexity of the task.

"A distinctive feature of both single-step and multi-step items and tasks for Claim 2 is that they are "well-posed." That is, whether the problem deals with pure or applied contexts, the problem itself is completely formulated; the challenge is in identifying or using an appropriate solution path."

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<sup>4</sup> Text excerpted from the Smarter Balanced Mathematics Content Specifications (p. 56-57).

<sup>5</sup> As noted earlier, by "non-routine" we mean that the student will not have been taught a closely similar problem, so will not be expected to *remember* a solution path but will have to *adapt* or *extend* their earlier knowledge to find one.

<sup>6</sup> By "autonomous" we mean that the student responds to a single prompt, without further guidance within the task.

<p><b>Grade 3 Content Combinations:</b></p>	<p><b>The following standards can be effectively used in various combinations in Grade 3 Claim 2 items:</b></p> <p><b>Primary emphasis for Claim 2 items: Operations and Algebraic Thinking</b></p> <p><b>Operations and Algebraic Thinking (OA)</b></p> <p><b>3.OA.A: Represent and solve problems involving multiplication and division.</b></p> <p><b>3.OA.A.1</b> Interpret products of whole numbers, e.g., interpret <math>5 \times 7</math> as the total number of objects in 5 groups of 7 objects each. <i>For example, describe a context in which a total number of objects can be expressed as <math>5 \times 7</math>.</i></p> <p><b>3.OA.A.2</b> Interpret whole-number quotients of whole numbers, e.g., interpret <math>56 \div 8</math> as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. <i>For example, describe a context in which a number of shares or a number of groups can be expressed as <math>56 \div 8</math>.</i></p> <p><b>3.OA.A.3</b> Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.<sup>1</sup></p> <p><b>3.OA.A.4</b> Determine the unknown whole number in a multiplication or division equation relating three whole numbers. <i>For example, determine the unknown number that makes the equation true in each of the equations <math>8 \times ? = 48</math>, <math>5 = \square \div 3</math>, <math>6 \times 6 = ?</math>.</i></p> <p><b>3.OA.D: Solve problems involving the four operations, and identify and explain patterns in arithmetic.</b></p> <p><b>3.OA.D.8</b> Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.<sup>3</sup></p> <p><b>3.OA.D.9</b> Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. <i>For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.</i></p> <p><b>Standards to integrate with the focus on whole number operations:</b></p> <p><b>Numbers and Operations—Base Ten (NBT)</b></p> <p><b>3.NBT.A: Use place value understanding and properties of operations to perform multi-digit arithmetic.</b></p> <p><b>3.NBT.A.1</b> Use place value understanding to round whole numbers to the nearest 10 or 100.</p> <p><b>3.NBT.A.2</b> Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.</p> <p><b>3.NBT.A.3</b> Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., <math>9 \times 80</math>, <math>5 \times 60</math>) using strategies based on place value and properties of operations.</p>
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**Measurement and Data (MD)**

**3.MD.A: Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.**

**3.MD.A.1** Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

**3.MD.A.2** Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).<sup>6</sup> Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.<sup>7</sup>

**3.MD.B: Represent and interpret data.**

**3.MD.B.3** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

**3.MD.B.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

**3.MD.C: Geometric measurement: understand concepts of area and relate area to multiplication and to addition.**

**3.MD.C.5** Recognize area as an attribute of plane figures and understand concepts of area measurement.

- a. A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area, and can be used to measure area.
- b. A plane figure which can be covered without gaps or overlaps by  $n$  unit squares is said to have an area of  $n$  square units.

**3.MD.C.6** Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

**3.MD.C.7** Relate area to the operations of multiplication and addition.

- a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
- b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
- c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths  $a$  and  $b + c$  is the sum of  $a \times b$  and  $a \times c$ . Use area models to represent the distributive property in mathematical reasoning.
- d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-



	<p>overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.</p> <p><b>3.MD.D: Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.</b></p> <p><b>3.MD.D.8</b> 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.</p>
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<p><b>Grade 4 Content Combinations:</b></p>	<p><b>The following standards can be effectively used in various combinations in Grade 4 Claim 2 items:</b></p> <p><b>Primary emphasis for Claim 2 items at Grade 4: Operations and Algebraic Thinking, Number and Operations—Base Ten, and Number and Operations—Fractions</b></p> <p><b>Operations and Algebraic Thinking (OA)</b></p> <p><b>4.OA.A: Use the four operations with whole numbers to solve problems.</b></p> <p><b>4.OA.A.1</b> Interpret a multiplication equation as a comparison, e.g., interpret <math>35 = 5 \times 7</math> as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.</p> <p><b>4.OA.A.2</b> Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.<sup>1</sup></p> <p><b>4.OA.A.3</b> Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.</p> <p><b>Number and Operations—Fractions (NF)</b></p> <p><b>4.NF.A: Extend understanding of fraction equivalence and ordering.</b></p> <p><b>4.NF.A.1</b> Explain why a fraction <math>a/b</math> is equivalent to a fraction <math>(n \times a)/(n \times b)</math> by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.</p> <p><b>4.NF.A.2</b> Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as <math>1/2</math>. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols <math>&gt;</math>, <math>=</math>, or <math>&lt;</math>, and justify the conclusions, e.g., by using a visual fraction model.</p> <p><b>4.NF.B: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.</b></p>
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- 4.NF.B.3** Understand a fraction  $a/b$  with  $a > 1$  as a sum of fractions  $1/b$ .
- Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
  - Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples:*  $3/8 = 1/8 + 1/8 + 1/8$  ;  $3/8 = 1/8 + 2/8$  ;  $2\ 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8$ .
  - Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
  - Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
- 4.NF.B.4** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.
- Understand a fraction  $a/b$  as a multiple of  $1/b$ . *For example, use a visual fraction model to represent  $5/4$  as the product  $5 \times (1/4)$ , recording the conclusion by the equation  $5/4 = 5 \times (1/4)$ .*
  - Understand a multiple of  $a/b$  as a multiple of  $1/b$ , and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express  $3 \times (2/5)$  as  $6 \times (1/5)$ , recognizing this product as  $6/5$ . (In general,  $n \times (a/b) = (n \times a)/b$ .)*
  - Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat  $3/8$  of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*
- 4.NF.C: Understand decimal notation for fractions, and compare decimal fractions.**
- 4.NF.C.5** Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.<sup>4</sup> *For example, express  $3/10$  as  $30/100$ , and add  $3/10 + 4/100 = 34/100$ .*
- 4.NF.C.6** Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite  $0.62$  as  $62/100$ ; describe a length as  $0.62$  meters; locate  $0.62$  on a number line diagram.*
- 4.NF.C.7** Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols  $>$ ,  $=$ , or  $<$ , and justify the conclusions, e.g., by using a visual model.
- Number and Operations—Base Ten (NBT)**
- 4.NBT.B: Use place value understanding and properties of operations to perform multi-digit arithmetic.**
- 4.NBT.B.4** Fluently add and subtract multi-digit whole numbers using the standard algorithm.
- 4.NBT.B.5** Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate

and explain the calculation by using equations, rectangular arrays, and/or area models.

**4.NBT.B.6** Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

**Standards to integrate with the focus on operations:**

**Measurement and Data (MD)**

**4.MD.A: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.**

**4.MD.A.1** Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*

**4.MD.A.2** Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

**4.MD.A.3** Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*

**4.MD.C: Geometric measurement: understand concepts of angle and measure angles.**

**4.MD.C.5** Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:

a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through  $\frac{1}{360}$  of a circle is called a “one-degree angle,” and can be used to measure angles.

b. An angle that turns through  $n$  one-degree angles is said to have an angle measure of  $n$  degrees.

**4.MD.C.6** Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

**4.MD.C.7** Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

<p><b>Grade 5 Content Combinations:</b></p>	<p>The following standards can be effectively used in various combinations in Grade 5 Claim 2 items:</p> <p><b>Primary emphasis for Grade 5 Claim 2 items: Number and Operations—Base Ten and Number and Operations—Fractions</b></p> <p><b>Number and Operations—Base Ten (NBT)</b></p> <p><b>5.NBT.B: Perform operations with multi-digit whole numbers and with decimals to hundredths.</b></p> <p><b>5.NBT.B.5</b> Fluently multiply multi-digit whole numbers using the standard algorithm.</p> <p><b>5.NBT.B.6</b> Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.</p> <p><b>5.NBT.B.7</b> Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.</p> <p><b>Number and Operations—Fractions (NF)</b></p> <p><b>5.NF.A: Use equivalent fractions as a strategy to add and subtract fractions.</b></p> <p><b>5.NF.A.1</b> Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. <i>For example,</i>  <math display="block">\frac{2}{3} + \frac{5}{4} = \frac{8}{12} + \frac{15}{12} = \frac{23}{12}.</math> <i>(In general, <math>\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}.</math>)</i></p> <p><b>5.NF.A.2</b> Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. <i>For example, recognize an incorrect result <math>\frac{2}{5} + \frac{1}{2} = \frac{3}{7}</math>, by observing that <math>\frac{3}{7} &lt; \frac{1}{2}</math>.</i></p> <p><b>5.NF.B: Apply and extend previous understandings of multiplication and division to multiply and divide fractions.</b></p> <p><b>5.NF.B.3</b> Interpret a fraction as division of the numerator by the denominator (<math>\frac{a}{b} = a \div b</math>). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. <i>For example, interpret <math>\frac{3}{4}</math> as the result of dividing 3 by 4, noting that <math>\frac{3}{4}</math> multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size <math>\frac{3}{4}</math>. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?</i></p>
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- 5.NF.B.4** Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
- Interpret the product  $(a/b) \times q$  as  $a$  parts of a partition of  $q$  into  $b$  equal parts; equivalently, as the result of a sequence of operations  $a \times q \div b$ . *For example, use a visual fraction model to show  $(2/3) \times 4 = 8/3$ , and create a story context for this equation. Do the same with  $(2/3) \times (4/5) = 8/15$ . (In general,  $(a/b) \times (c/d) = ac/bd$ .)*
  - Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.
- 5.NF.B.5** Interpret multiplication as scaling (resizing), by:
- Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
  - Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence  $a/b = (n \times a)/(n \times b)$  to the effect of multiplying  $a/b$  by 1.
- 5.NF.B.6** Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
- 5.NF.B.7** Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.<sup>1</sup>
- Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for  $(1/3) \div 4$ , and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that  $(1/3) \div 4 = 1/12$  because  $(1/12) \times 4 = 1/3$ .*
  - Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for  $4 \div (1/5)$ , and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that  $4 \div (1/5) = 20$  because  $20 \times (1/5) = 4$ .*
  - Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share  $1/2$  lb of chocolate equally? How many  $1/3$ -cup servings are in 2 cups of raisins?*

**Standards to integrate with the focus on operations:**

**Measurement and Data (MD)**

**5.MD.A: Convert like measurement units within a given measurement system.**

- 5.MD.A.1** Convert among different-sized standard measurement units within a given measurement

system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

**5.MD.C: Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**

**5.MD.C.3** Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

- a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.
- b. A solid figure which can be packed without gaps or overlaps using  $n$  unit cubes is said to have a volume of  $n$  cubic units.

**5.MD.C.4** Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

**5.MD.C.5** Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

- a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.
- b. Apply the formulas  $V = l \times w \times h$  and  $V = b \times h$  for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems.
- c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

**Geometry (G)**

**5.G.A: Graph points on the coordinate plane to solve real-world and mathematical problems.**

**5.G.A.1** Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g.,  $x$ -axis and  $x$ -coordinate,  $y$ -axis and  $y$ -coordinate).

**5.G.A.2** Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Grades 3-5, Claim 2

<b>Range ALDs – Claim 2 Grades 3-5</b>	<b>Level 1</b> Students should be able to identify important quantities in the context of a familiar situation and translate words to equations or other mathematical formulation. When given the correct math tool(s), students should be able to apply the tool(s) to problems with a high degree of scaffolding.
	<b>Level 2</b> Students should be able to identify important quantities in the context of an unfamiliar situation and to select tools to solve a familiar and moderately scaffolded problem or to solve a less familiar or a non-scaffolded problem with partial accuracy. Students should be able to provide solutions to familiar problems using an appropriate format (e.g., correct units, etc.). They should be able to interpret information and results in the context of a familiar situation.
	<b>Level 3</b> Students should be able to map, display, and identify relationships, use appropriate tools strategically, and apply mathematics accurately in everyday life, society, and the workplace. They should be able to interpret information and results in the context of an unfamiliar situation.
	<b>Level 4</b> Students should be able to analyze and interpret the context of an unfamiliar situation for problems of increasing complexity and solve problems with optimal solutions.

**Target 2A: Apply mathematics to solve well-posed problems in pure mathematics and those arising in everyday life, society, and the workplace.****General Task Model Expectations for Target 2A**

- The student is asked to solve a well-posed problem arising in a mathematical context or everyday life, society, or the workplace.
- Mathematical information from the context is presented in a table, graph, or diagram, or is extracted from a verbal description or pictorial representation of the context.
- Solving the problem requires one or more steps consisting of one of the four operations with whole numbers or fractions (division of fractions is limited to division of a whole number by a unit fraction or a unit fraction by a whole number).
- Understandings from geometry or measurement may be needed to determine the operations to be performed.
- The task does not indicate by key words or other scaffolding which operations are to be performed or in what order.
- Difficulty of the task may be adjusted by varying (a) the difficulty of extracting information from the context, (b) the number of steps, (c) the complexity of the numbers used, or (d) the complexity of the interpretation required.
- Tasks have DOK Level 2 or 3

**Task Model 2A.1****Expectations:**

- The student solves a multi-step problem with the four operations in a context involving measurement quantities.
- Items in this task model require the student to identify quantities of interest and map their relationships, often via diagrams or equations.
- Dimensions along which to vary the item include (a) varying the context, (b) varying the type of operations to be used, or (c) varying the magnitude or the types of numbers to be used.



Grades 3-5, Claim 2

**Example Item 2A.1a (Grade 3):**

Primary Target 2A (Content Domain MD), Secondary Target 1D (CCSS 3.OA.D), Tertiary Target 1G (CCSS 3.MD.A), Quaternary Target 2D

James gets home from school at 3:30 p.m. He completes 2 chores. Then he plays his computer game until 5:00 p.m.

Chore	Time to Complete
Walk dog	20 minutes
Clean room	40 minutes

Enter the **greatest** number of minutes that James can play his computer game.

**Rubric:** (1 point) The student enters the correct number of minutes (30 or 30 min).

**Response Type:** Equation/Numeric

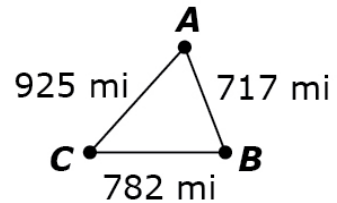
**Commentary:** This item requires the student to identify the relationship between given start and end times and the elapsed times presented in the table, and to identify the unknown quantity as the elapsed time remaining between the start and end times given. Seeing these different quantities and mapping their relationships draws on the skill set identified in Target 2D.

Grades 3-5, Claim 2

**Example Item 2A.1b (Grade 4):**

Primary Target 2A (Content Domain OA), Secondary Target 1A (CCSS 4.OA.A)

Pia's family drove from City A to City B, then City C, and back to City A. The map shows the distances.



How many miles did they drive all together? Enter your answer in the response box.

**Rubric:** (1 point) The student enters the correct total distance (2424 or 2424 mi).

**Response Type:** Equation/Numeric

**Commentary:** The level of difficulty for this item can be raised by changing the number of cities or having distances in the diagram that are not needed to answer the question, although adding in these extra levels of complexity moves the item closer to a Claim 4 task.

Grades 3-5, Claim 2

**Example Item 2A.1c (Grade 5):**

Primary Target 2A (Content Domain OA), Secondary Target 1A (CCSS 5.NF.B), Tertiary Target 2D

Luke buys a bicycle that is on sale for  $\frac{1}{2}$  of the original price. The sale price is \$80 less than the original price. What is the original price, in dollars, of the bicycle?

Enter your answer in the response box.

**Rubric:** (1 point) The student enters the correct original price (160 or \$160).

**Response Type:** Equation/Numeric

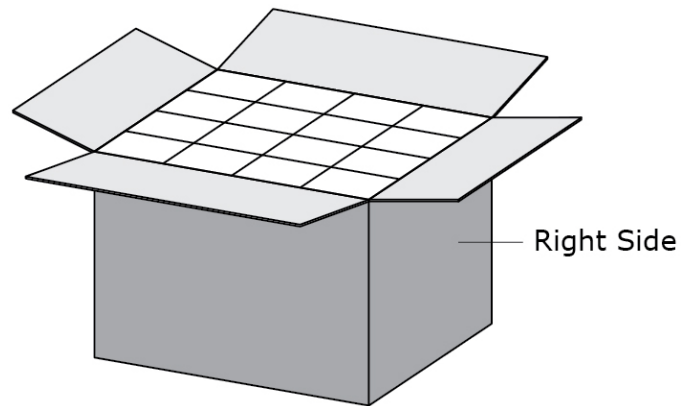
**Commentary:** This item requires the student to identify the sale price and the original price of a bicycle as the quantities of interest in this problem and to identify the relationship between them, and so draws on the skill set identified in Target 2D. Changing the fraction would change the difficulty level.

Grades 3-5, Claim 2

**Example Item 2A.1d (Grade 5):**

Primary Target 2A (Content Domain MD), Secondary Target 1I (CCSS 5.MD.C), Tertiary Target 1B (CCSS 4.OA.B), Quaternary Target 2D

A rectangular box is completely filled with 48 same-sized cubes arranged as shown. Julie opens the top of the box and sees 16 cubes.



Julie closes the top and then opens the right side of the box. How many cubes should she see?

Enter your answer in the response box.

**Rubric:** (1 point) The student provides the correct number of cubes for the right side of the box (12).

**Response Type:** Equation/Numeric

**Commentary:** This item requires the student to identify the volume and areas of the faces of the rectangular box as quantities of interest and to use the small cubes (and their faces) as units in order to relate the two quantities, and so draws on the skill set identified in Target 2D.

Grades 3-5, Claim 2

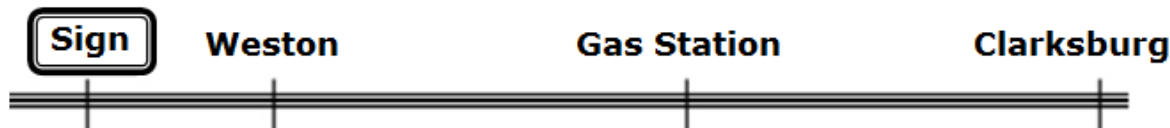
**Example Item 2A.1e (Grade 5):**

Primary Target 2A (Content Domain NF), Secondary Target 1F (CCSS 5.NF.B), Tertiary Target 2D

Mia is traveling along a road toward Clarksburg and sees the following sign.

<b>Weston</b>	<b>5 miles</b>
<b>Clarksburg</b>	<b>35 miles</b>

Mia knows there is a gas station located halfway between Weston and Clarksburg, as shown on this diagram.



How many miles is it from Weston to Clarksburg?  
Enter your answer in the first response box.

How many miles is it from the sign to the gas station?  
Enter your answer in the second response box.

**Rubric:** (2 points) The student enters the correct distances for each question (30 or 30 mi; 20 or 20 mi).  
(1 point) The student enters only one correct distance (e.g., 30 or 20).

**Response Type:** Equation/Numeric (2 response boxes)

**Commentary:** This item requires the student to identify the distances between the sign and the different cities as well as the distances between cities and understand the relationships between these quantities, and so draws on the skill set identified in Target 2D.

Grades 3-5, Claim 2

## Task Model 2A.2

### Expectations:

- The student solves a problem in a real-world or mathematical context that requires understanding of the base-ten number system.
- Items in this task model require the student to interpret base-ten numbers in terms of the context.
- Dimensions along which to vary the item include: (a) varying the context, (b) varying the type of operations to be used, or (c) varying the magnitude of the numbers to be used.

### Example Item 2A.2a (Grade 3):

Primary Target 2A (Content Domain NBT), Secondary Target 1E (CCSS 3.NBT.A), Tertiary Target 2C

Sabina has a jar full of dimes. A pack of cards costs 76 cents. How many dimes would she need to buy the cards if she uses no other coins?

Enter your answer in the response box.

**Rubric:** (1 point) The student enters the correct number of dimes (8).

**Response Type:** Equation/Numeric

**Commentary:** This item requires the student to interpret the value of a collection of dimes as a multiple of ten, and so draws on the skill set identified in Claim 2C.

Grades 3-5, Claim 2

**Example Item 2A.2b (Grade 4):**

Primary Target 2A (Content Domain NBT), Secondary Target 1E (CCSS 4.NBT.B)

Drag one number into each box to complete the subtraction problem shown.

$$\begin{array}{r}
 50\boxed{\phantom{0}}6 \\
 - \boxed{\phantom{0}}48\boxed{\phantom{0}} \\
 \hline
 16\boxed{\phantom{0}}8
 \end{array}$$

**Interaction:** The student drags digits 0-9 from the multi-use palette.

**Rubric:** (1 point) The student drags the correct digits to complete the subtraction problem ( $5096 - 3488 = 1608$ ).

**Response Type:** Drag and Drop

**Commentary:** Small changes to this item change the complexity considerably. The reason that there is a unique solution is that the placement of the unknown digits and the value of the digits was highly engineered; just changing the 8 in the second number to a 5, for example, means that there will be four solutions instead of 1:

$$\begin{aligned}
 5096 - 3458 &= 1638 \\
 5086 - 3458 &= 1628 \\
 5076 - 3458 &= 1618 \\
 5066 - 3458 &= 1608
 \end{aligned}$$

Allowing an unknown digit in the hundreds place instead of the ones place changes the complexity significantly.

Grades 3-5, Claim 2

### Task Model 2A.3

#### Expectations:

- The student makes estimations about quantities in a context.
- Dimensions along which to vary the item include (a) varying the context, (b) requiring no operations (easier) or requiring computations with estimated quantities or estimating the result of computations with quantities (harder), (c) varying the magnitude of the numbers to be used.

#### Example Item 2A.3a (Grade 4):

Primary Target 2A (Content Domain NBT), Secondary Target 1E (CCSS 4.NBT.B), Tertiary Target 1I (CCSS 4.MD.A)

Select the response that correctly completes this statement:

41 inches is between \_\_\_\_\_.

- A. 2 feet and 3 feet.
- B. 3 feet and 4 feet.
- C. 4 feet and 5 feet.
- D. 5 feet and 6 feet.

**Rubric:** (1 point) The student selects the correct range (B).

**Response Type:** Multiple Choice, single correct response



Grades 3-5, Claim 2

**Example Item 2A.3b (Grade 5):**

Primary Target 2A (Content Domain NF), Secondary Target 1F (CCSS 5.NF.B)

Graciela walked her dog every day for the last 5 days. The time for each walk was between  $\frac{1}{2}$  and  $\frac{3}{4}$  of an hour. Make an estimate for the total number of minutes she walked her dog in the last 5 days.

Enter your estimate, in minutes, in the response box.

**Rubric:** (1 point) The student enters a value in the correct range (any number from 150 to 225, inclusive).

**Response Type:** Equation/numeric

**Task Model 2A.4**

**Expectations:**

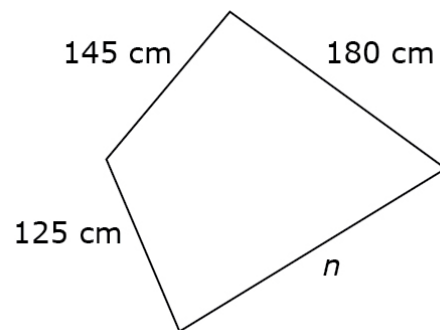
- The student solves a multi-step problem with the four operations involving whole-numbers and fractions in a purely mathematical context.
- Items in this task model require the student to identify quantities of interest and map their relationships, often via diagrams or equations.
- Dimensions along which to vary the item include (a) varying the context, (b) varying the type of operations to be used, or (c) varying the magnitude or the types of numbers to be used.

Grades 3-5, Claim 2

**Example Item 2A.4a (Grade 3):**

Primary Target 2A (Content Domain MD), Secondary Target 1D (CCSS, 3.OA.D), Tertiary Target 1J (CCSS 3.MD.D)

This quadrilateral has a perimeter of 680 centimeters.



Enter the length, in centimeters, of side  $n$ .

**Rubric:** (1 point) The student correctly enters the length of the unknown side (230 or 230 cm).

**Response Type:** Equation/Numeric

Grades 3-5, Claim 2

**Example Item 2A.4b (Grade 4):**

Primary Target 2A (Content Domain OA), Secondary Target 1A (CCSS 4.OA.A)

Tina and Marco play a number game. Tina gives Marco a number and he does three computations.

- He multiplies the number by 2.
- He adds 7 to the answer.
- Then, he subtracts 2 from that answer.

What number should Tina give Marco so that the final answer is 37 ?

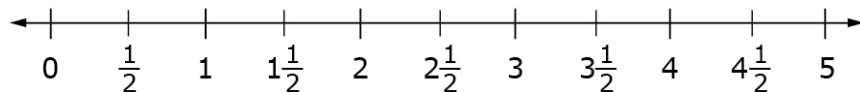
**Rubric:** (1 point) The student enters the correct number (16).

**Response Type:** Equation/Numeric

**Example Item 2A.4c (Grade 4):**

Primary Target 2A (Content Domain NF), Secondary Target 1G (CCSS 4.NF.B), Tertiary Target 2B

Plot the value of  $5 \times \frac{1}{2}$  on the number line shown.



**Rubric:** (1 point) The student correctly plots a point at  $2\frac{1}{2}$  (with a graphing tolerance of  $\pm \frac{1}{16}$  or points snap to tick marks).

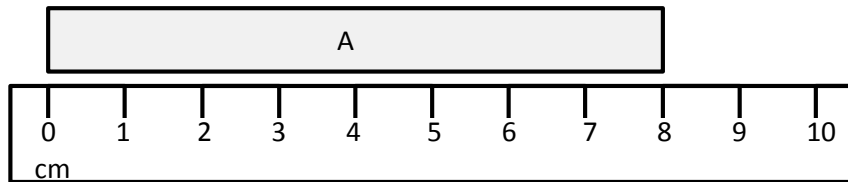
**Response Type:** Graphing (Interaction: The student is able to plot a single point somewhere on the line.)

**Commentary:** A variation on this item would show points on a number line and ask which one represents the product, or shows one point and asks which of four products it could be (MC). Asking for the approximate location on the number line for the results of computations would also be appropriate.

**Example Item 2A.4d (Grade 5):**

Primary Target 2A (Content Domain NF), Secondary Target 1F (CCSS 5.NF.B)

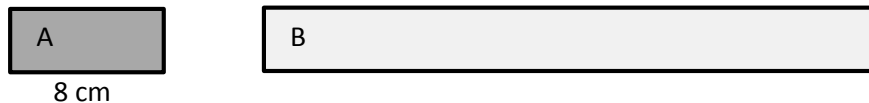
Rectangle A (shown) is  $\frac{1}{4}$  as long as rectangle B (not shown). How long is rectangle B?



- A. 2 cm
- B. 6 cm
- C. 8 cm
- D. 32 cm

OR

Rectangle A is  $\frac{1}{4}$  as long as rectangle B. How long is rectangle B?



- A. 2 cm
- B. 6 cm
- C. 8 cm
- D. 32 cm

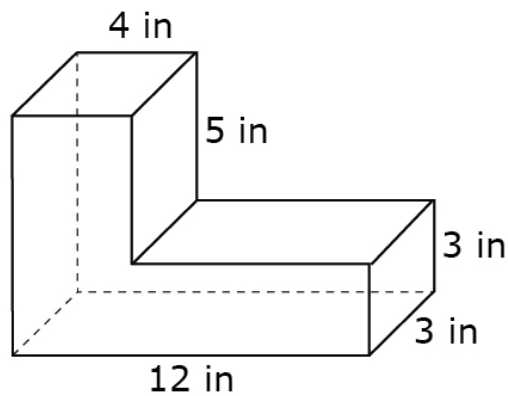
**Rubric:** (1 point) The student selects the correct option (D).

**Response Type:** Multiple Choice, single correct response

**Example Item 2A.4f (Grade 5):**

Primary Target 2A (Content Domain MD), Secondary Target 1I (CCSS 5.MD.C)

The figure shown was created by joining two rectangular prisms.



What is the total volume, in cubic centimeters, of the figure?

Enter your answer in the response box.

**Rubric:** (1 point) The student correctly enters the total volume of the figure in cubic centimeters (168 or  $168 \text{ cm}^3$ ).

**Response Type:** Equation/Numeric

Grades 3-5, Claim 2

## **Target 2B: Select and use appropriate tools strategically.**

### **General Task Model Expectations for Target 2B**

- Mathematical information from the context is presented in a table, graph, or diagram, or is extracted from a verbal description or pictorial representation of the context.
- The student uses tools or makes strategic selection of tools.
- Tasks may require the student to use a familiar tool in a non-standard way, for example using a ruler from a non-standard starting point or using a number line to represent time.
- Difficulty of the task may be adjusted by varying (a) the difficulty of extracting information from the context (b) the number of steps (c) the complexity of the numbers used or (d) the complexity of the interpretation required.
- Task has DOK Level 1 or 2

### **Task Model 2B.1**

#### **Expectations:**

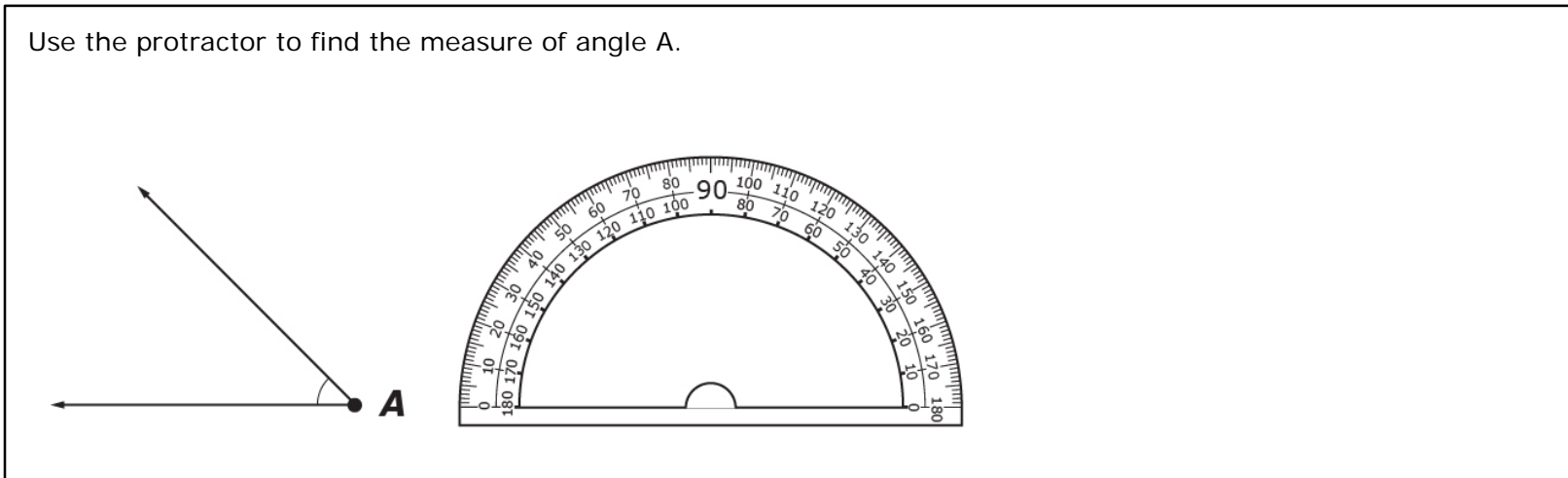
- The student demonstrates proficiency with a tool specifically identified in the content standards.
- Tasks aligned to this task model focus on using tools (rather than selecting tools).
- Tools include measurement tools, such as rulers, protractors, and clocks, presented virtually, or number lines.
- Dimensions along which to vary the item include (a) varying the context, (b) varying the tool to be used, or (c) varying the complexity of the numbers to be used.

Grades 3-5, Claim 2

**Example Item 2B.1a (Grade 4):**

Primary Target 2B (Content Domain MD), Secondary Target 1G (CCSS 4.MD.C)

Use the protractor to find the measure of angle A.



Enter the measure of angle A, to the nearest whole degree, in the response box.

**Interaction:** The student can move the protractor to any point on the screen and rotate the protractor to align it with a side of the angle. See an example for how this could work here:

[http://sandcastle.kasandbox.org/media/castles/Khan:master/exercises/measuring\\_angles.html](http://sandcastle.kasandbox.org/media/castles/Khan:master/exercises/measuring_angles.html)

**Rubric:** (1 point) Student enters the correct angle measure in degrees (45+/-?).

**Response Type:** Equation/numeric

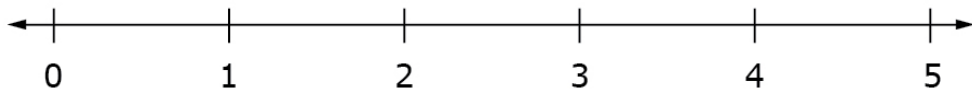
**Commentary:** Note that this technology is not currently available. An item that could assess the same construct with current technology would show a protractor with an angle whose vertex is aligned to the center point of the angle but whose rays are not aligned to the 0 or 180 marks on the protractor. This item type would fall under task model 2B.

Grades 3-5, Claim 2

**Example Item 2B.1b (Grades 5):**

Primary Target 2B (Content Domain NF), Secondary Target 1J (CCSS 5.NF.B)

Plot the value of  $\frac{1}{3} \times \frac{5}{2}$  on the number line below. Add more tick marks and make sure the point is on a tick mark.



**Interaction:** The student sees a number line that has tick marks denoting the whole numbers. There is a slider or some other widget that allows the student to select the appropriate number of tick marks between whole numbers. See an example for how this could work here: [https://www.youtube.com/watch?v=TEzH\\_PbHZIw](https://www.youtube.com/watch?v=TEzH_PbHZIw)

**Rubric:** (1 point) The student chooses a refinement of the number line that includes sixths and correctly plots a point at  $\frac{5}{6}$  (with a graphing tolerance of  $\pm \frac{1}{16}$  or there is a snap-to feature and points snap to tick marks).

**Response Type:** Graphing

**Commentary:** Note that this technology is not currently available. An item that could assess the same construct with current technology could show two or more number lines with different refinements and ask the student to use one to plot the product or to plot the product as close as possible to the correct location and have a tolerance around the location for scoring.



Grades 3-5, Claim 2

### Task Model 2B.2

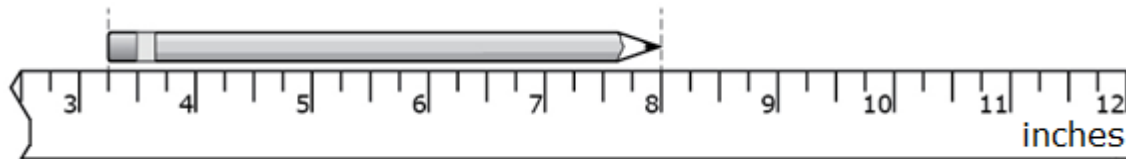
#### Expectations:

- The student uses a familiar tool in a non-standard way, in multi-step problem, or a problem that requires identifying quantities of interest and mapping the relationships between them.
- Dimensions along which to vary the item include (a) varying the context, (b) varying the type of operations to be used, or (c) varying the complexity of the numbers to be used (d) varying the complexity of the interpretation required.

#### Example Item 2B.2a (Grade 4):

Primary Target 2B (Content Domain MD), Secondary Target 1G (CCSS 4.NF.B), Tertiary Target 1H (CCSS 3.MD.B)

What is the length, in inches, of the pencil shown?



Enter your answer in the response box.

**Rubric:** (1 point) The student enters the correct length in inches ( $4\frac{3}{4}$ ).

**Response Type:** Equation/Numeric

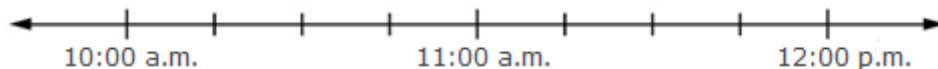
Grades 3-5, Claim 2

**Example Item 2B.2b (Grade 3):**

Primary Target 2B (Content Domain MD), Secondary Target 1G (CCSS 3.MD.A), Tertiary Target 2D

Math class begins at 10:45 a.m. and is 45 minutes long.

Use the Add Point tool to put a point on the number line that shows when math class ends.



**Rubric:** (1 point) Student places a point on the number line at the correct location (11:30 p.m.).

**Response Type:** Graphing

**Scoring/Interaction:** Scoring/interaction must allow for point to “snap to” tick marks or allow for a tolerance of +/- 5 minutes on the number line.

**Commentary:** This item requires the student to identify the start time, end time, and elapsed time as quantities of interest and map the relationship between them using the number line, and so draws on the skill set identified in Target 2D.

Grades 3-5, Claim 2

**Example Item 2B.2c (Grade 3):**

Primary Target 2B (Content Domain MD), Secondary Target 1G (CCSS 3.MD.A), Tertiary Target 2D

Mary started her homework 25 minutes before the time shown on the clock.



Fill in the table to show the time when Mary started her homework.

__ : __
---------

**Rubric:** (1 point) The student shows the correct time (4:25).

**Response Type:** Fill-in-table

**Commentary:** This item requires the student to identify the start time, end time, and elapsed time as quantities of interest and map the relationship between them, and so draws on the skill set identified in Target 2D.

Grades 3-5, Claim 2

### Task Model 2B.3

#### Expectations:

- The student makes strategic choices about using tools.
- The student has access to a tool that is more appropriate for some problems than others. The student may choose to use the tool or not.
- Dimensions along which to vary the item include: (a) varying the context, (b) varying the tool to be used, (c) varying the complexity of the numbers to be used.

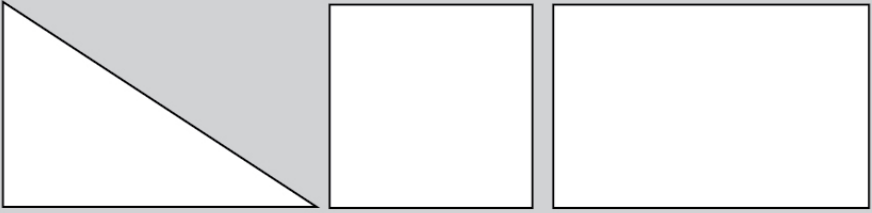
#### Example Item 2B.3b (Grade 3):

Primary Target 2B (Content Domain MD), Secondary Target 1G (CCSS 3.MD.C)

Order all three figures so that the one on the left has the largest perimeter and the one on the right has the smallest perimeter.

Drag each figure into the space in order of its perimeter.

**Largest Perimeter.....>.....>.....Smallest Perimeter**



**Rubric:** (1 point) The student correctly orders the figures with the square first, the triangle second, and the rectangle third.

**Response Type:** Drag and drop.

Grades 3-5, Claim 2

**Interaction:** A GI background is given with active measuring and drawing tools. All three figures are presented in the bottom non-refreshable palette and the student must drag each figure into a correct arrangement, largest to smallest perimeter.

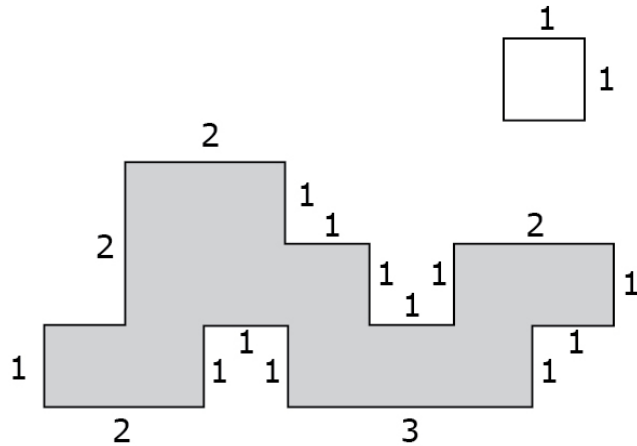
**Commentary:** The student has the choice of using the ruler in the Drawing and Measurement Tool or judging the perimeter without the use of tools. Strategic choices will make it easier for them to complete this item. It can be established that the rectangle has the largest perimeter by direct comparison, but it is harder to compare the perimeters of the square and the triangle without measuring the side-lengths.

Grades 3-5, Claim 2

**Example Item 2B.3a (Grade 3):**

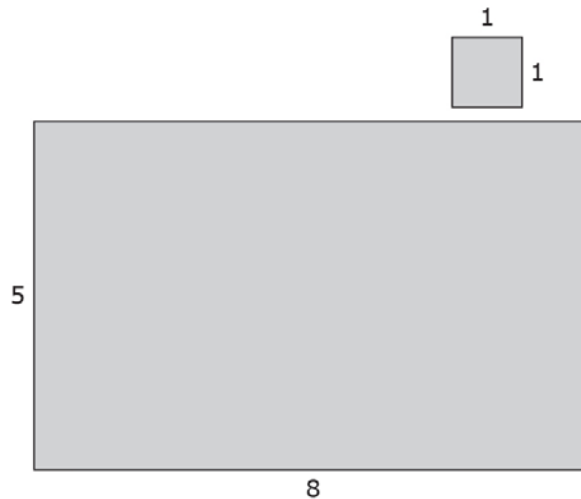
Primary Target 2B (Content Domain MD), Secondary Target 1G (CCSS 3.MD.C)

What is the area of each figure?



**Figure A**

The area of Figure A is  square units.



**Figure B**

The area of Figure B is  square units.

See how the interface might work here: <https://www.youtube.com/watch?v=EVokzudbrE4>

**Rubric:** (2 points) The student enters the correct area for each figure, 1 point for each (12 and 40).

**Response Type:** Equation/numeric with graphing and a combination of tiling and drag and drop as part of the unscored interaction.

**Commentary:** This item gives the student access to a tiling tool that can be used to cover a region with square units. The item has two parts, one where the tool can be profitably used to help the student keep track of the number of square units that are needed to cover the region without gaps or overlap, and one where knowing the relationship between the side-lengths and area of a rectangle is more efficient than using the tiling tool.

## **Target 2C: Interpret results in the context of a situation.**

### **General Task Model Expectations for Target 2C**

- The student provides a numeric answer to a problem where the context requires them to go beyond the result of a single computation.
- The student may be asked to choose a value that falls into a range of acceptable values limited by information given in a real-world context.
- The student may be asked to round up or round down based on the constraints of the context.
- The student may be asked to interpret the meaning of mathematical computations, for example, the different interpretations of arithmetic operations.
- The student may be asked to interpret the meaning of points on the number line or in the coordinate plane in a real-world context.
- The student may be asked to solve a problem that requires the integration of concepts and skills from multiple domains.
- Difficulty of the task may be adjusted by varying (a) the difficulty of extracting information from the context (b) the number of steps (c) the complexity of the numbers used or (d) the complexity of the interpretation required.
- Tasks have DOK Level 1 or 2.

### **Task Model 2C.1**

#### **Expectations:**

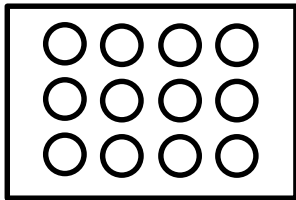
- The student chooses one value from a range of possible values that is determined by constraints in a context.
- Dimensions along which to vary the item include (a) varying the context, (b) varying the type of operations to be used, or (c) varying the type of numbers to be used.
- Tasks in this model have DOK Level 2-3.

Grades 3-5, Claim 2

**Example Item 2C.1a (Grade 3):**

Primary Target 2C (Content Domain OA), Secondary Target 1A (CCSS 3.OA.A)

Steven is baking cupcakes. A cupcake pan has 3 rows with a place to put 4 cupcakes in each row. He filled two pans completely and part of another pan.



How many cupcakes could Steven have made? Enter your answer in the response box.

**Rubric:** (1 point) The student enters a whole number between 25 and 35, inclusive.

**Response Type:** Equation/Numeric



Grades 3-5, Claim 2

**Example Item 2C.1b (Grade 4):**


Primary Target 2C (Content Domain OA), Secondary Target 1G (CCSS 4.NF.B), Tertiary Target 2A (Content Domain NF).

**43328**



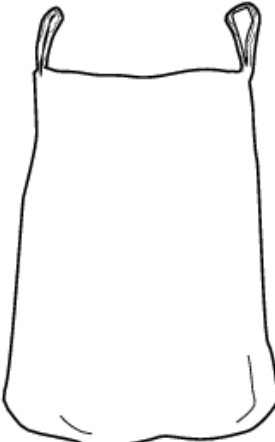
Jared is testing how much weight a bag can hold. He plans to put juice bottles into three bags. He wants each bag to have a total weight within the given range.

- Drag juice bottles into each bag so that the weight is within the given range.
- Leave the bag empty if the given range is not possible using juice bottles.

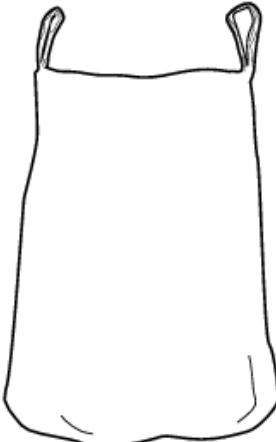


$3\frac{5}{8}$  lb

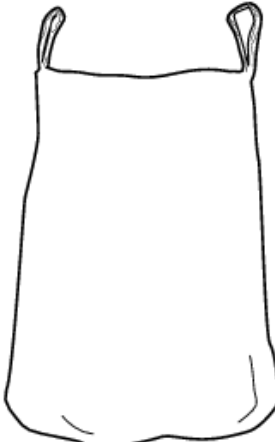
Delete



**Between  
6 lb and 7 lb**



**Between  
10 lb and 11 lb**



**Between  
14 lb and 15 lb**

**Rubric:** (2 point) The student enters the correct number of juice bottles for all three bags for 2 points or for two of the three bags for 1 point (no bottles, 3, 4).

**Response Type:** Drag and drop.

Grades 3-5, Claim 2

**Example Item 2C.1c (Grade 5):**

Primary Target 2C (Content Domain NF), Secondary Target 1E (CCSS 5.NF.A)

Janet has some money. She spends  $\frac{1}{2}$  of her money on books. She spends some more money on videos.

Which number is a reasonable choice for the fraction of Janet's total money that she spends on books and videos?

A.  $\frac{2}{7}$

B.  $\frac{3}{5}$

C.  $\frac{3}{2}$

D.  $\frac{1}{2}$

**Rubric:** (1 point) The student enters the most reasonable choice (B).

**Response Type:** Multiple Choice, single correct response

Grades 3-5, Claim 2

### Task Model 2C.2

#### Task Expectations:

- The student reports a number other than the direct result of the computations implied by the problem context because the context provides additional constraints on the allowable answers.
- Dimensions along which to vary the item include (a) varying the context, (b) varying the type of operations to be used, or (c) varying the type of numbers to be used.
- Tasks in this model have DOK Level 1 or 2.

#### Example Item 2C.2a (Grade 3)

Primary Target 2C (Content Domain OA), Secondary Target 1A (CCSS 3.OA.A)

Vera is making 6 picture frames. Each picture frame requires 8 craft sticks. Craft sticks are sold in packs of 10.

What is the **fewest** number of packs of craft sticks Vera can buy to get the total she needs?

Enter your answer in the response box.

**Rubric:** (1 point) The student enters the correct number of packs (5).

**Response Type:** Equation/Numeric

Grades 3-5, Claim 2

**Example Item 2C.2b (Grade 4):**

Primary Target 2C (Content Domain OA), Secondary Target 1A (CCSS 4.OA.A)

There are 70 students traveling to a soccer tournament. All of the vans can take 9 students each.

How many vans are needed to take all of the students to the tournament?

Enter your answer in the response box.

**Rubric:** (1 point) The student enters the correct number of vans needed (8).

**Response Type:** Equation/Numeric

**Example Item 2C.2c (Grade 5):**

Primary Target 2C (Content Domain NF), Secondary Target 1F (CCSS 5.NF.B)

Carl feeds his dog  $2\frac{1}{2}$  cups of dog food every day. Each bag contains 64 cups of dog food.

What is the **maximum** number of days that Carl can feed his dog exactly  $2\frac{1}{2}$  cups of dog food from one full bag?

Enter your answer in the response box.

**Rubric:** (1 point) The student is able to determine the total number of servings in one bag of food and interpret the remainder as not being enough for another whole serving (25).

**Response Type:** Equation/Numeric

Grades 3-5, Claim 2

**Example Item 2C.2d (Grade 5):**

Primary Target 2C (Content Domain NBT), Secondary Target 1D (CCSS 5.NBT.B)

Scott is buying water bottles and apples for his soccer team. The cost of buying packs of water bottles and bags of apples is shown in the table.

Item	Cost
One pack of 6 water bottles	\$4.80
One bag of 5 apples	\$3.20

What is the **least** amount of money that he can spend on whole packs of water bottles and bags of apple so that all 18 players on his team can have both a bottle of water and an apple?

Enter your answer, in dollars, in the response box.

**Rubric:** (1 point) The student enters the correct minimum cost (27.20).

**Response Type:** Equation/Numeric

Grades 3-5, Claim 2

### Task Model 2C.3

#### Expectations:

- The student is asked to interpret the meaning of symbolic statements in a real-world context.
- Dimensions along which to vary the item include (a) varying the context, (b) varying the type of operations to be used, or (c) varying the type of the numbers to be used.
- Tasks in this model have DOK Level 2.

#### Example Item 2C.3a (Grade 3):

Primary Target 2C (Content Domain OA), Secondary Target 1A (CCSS 3.OA.A)

Billy has 9 full cans of juice. He has  $9 \times 8$  ounces of juice all together. What could the 8 mean?

- A. There are 8 ounces of juice in one full can.
- B. There are 8 people who want juice.
- C. He already drank 8 cans of juice.
- D. He spilled 8 ounces of juice.

**Rubric:** (1 point) The student selects the correct option (A).

**Response Type:** Multiple choice, single correct response

Grades 3-5, Claim 2

**Example Item 2C.3b (Grade 4):**

Primary Target 2C (Content Domain OA), Secondary Target 1A (CCSS 4.OA.A)

Najoo is 10 years old. Her pet turtle is 40 years old. How do their ages compare?

- A. Najoo is 4 years older than her turtle.
- B. Her turtle is 4 years older than Najoo.
- C. Najoo is 4 times as old as her turtle.
- D. Her turtle is 4 times as old as Najoo.

**Rubric:** (1 point) The student selects the correct option (D).

**Response Type:** Multiple choice, single correct response

**Task Model 2C.4**

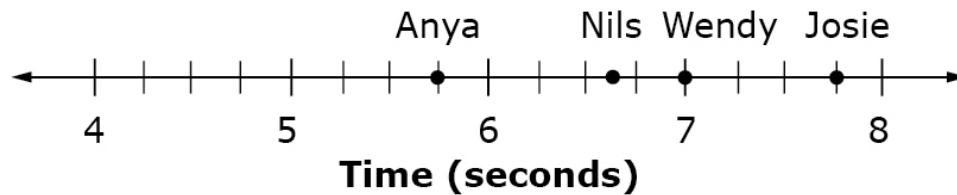
**Task Expectations:**

- The student is asked to interpret the meaning of points on a number line or in the coordinate plane in a real-world context.
- Dimensions along which to vary the item include (a) varying the context or (b) varying the type of the numbers to be used.
- Tasks in this model have DOK Level 1 or 2.

**Example Item 2C.4a (Grade 3):**

Primary Target 2C (Content Domain NF), Secondary Target 1F (CCSS 3.NF.A)

Three friends ran a race. The points on the number line represent the race times, in seconds, for each friend.



Who had the shortest time?

- A. Anya
- B. Nils
- C. Wendy
- D. Josie

**Rubric:** (1 point) The student selects the correct option (A).

**Response Type:** Multiple choice, single correct response

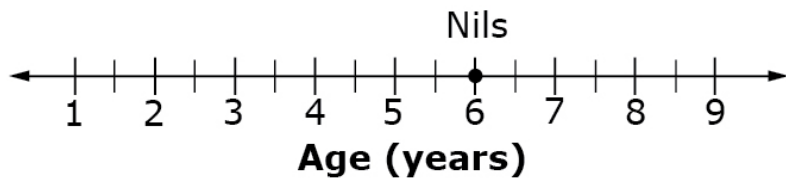


Grades 3-5, Claim 2

**Example Item 2C.4b (Grade 3):**

Primary Target 2C (Content Domain NF), Secondary Target 1F (CCSS 4.NF.C)

Hank is 8.5 years old. Nils' age in years is plotted on the number line shown.



How many years older is Hank than Nils?

Enter the number of years in the response box.

**Rubric:** (1 point) The student enters the correct age difference (2.5 or  $2\frac{1}{2}$ ).

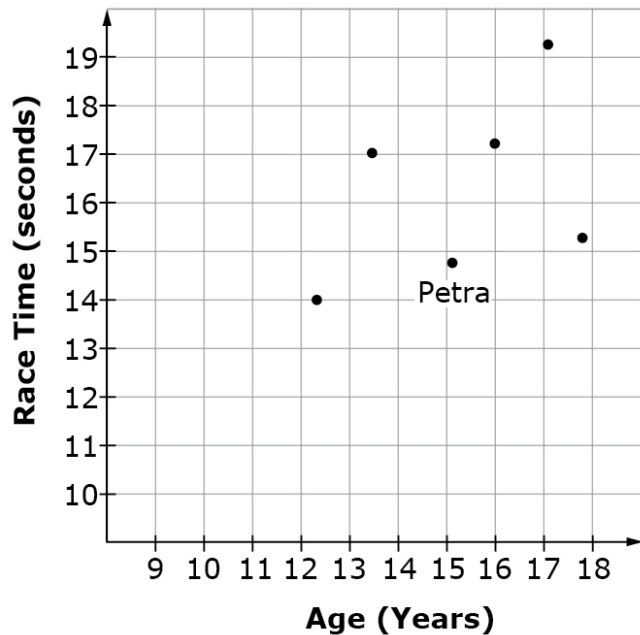
**Response Type:** Equation/numeric

Grades 3-5, Claim 2

**Example Item 2C.4c (Grade 5):**

Primary Target 2C (Content Domain G), Secondary Target 1J (CCSS 5.G.A)

Six students ran a race. The graph shows the ages and times of the six students.



What was Petra's time in seconds?

**Rubric:** (1 point) The student correctly identifies Petra's time (e.g., 14.8).

Note: Accept a tolerance of +/- 0.2 seconds

**Response Type:** Equation/Numeric

**Commentary:** Variations on this item include comparing quantities that are represented by the coordinates of points on the graph or asking the student to plot a point that satisfies a given condition, for example, asking the student to plot a point for Wendy, who has a shorter race time than Petra.

**Target 2D: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas).**

Target 2D identifies a key step in the modeling cycle, and is thus frequently present in problems with real-world contexts. Note that Target 2D is rarely the primary target for an item, but is frequently a Secondary or Tertiary Target for an item with primary alignment to 2A, 2B, or 2C. See Items 1, 3, 4, and 5 in Task Model 1a, Item 1 in Task model 1d, and Items 2 and 3 in Task model 2a for examples that draw upon the skill set described in Target 2D.

**General Task Model Expectations for Target 2D**

- The student is presented with a mathematical problem in a real-world context where the quantities of interest are not named explicitly, are named but represented in different ways, or the relationship between the quantities is not immediately clear.
- The student is asked to solve a problem that may require the integration of concepts and skills from multiple domains.