

<b>Claim 1:</b> Concepts and Procedures Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.	
Content Domain: <b>Measurement and Data</b>	
<b>Target I [s]:</b> 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 0.62 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.	
Standards: 4.MD.A, 4.MD.A.1, 4.MD.A.2, 4.MD.A.3	<b>4.MD.A Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.</b>  <b>4.MD.A.1</b> 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. <i>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), ...</i>  <b>4.MD.A.2</b> 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.  <b>4.MD.A.3</b> Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. <i>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.</i>
Related Below-Grade and Above-Grade Standards for Purposes of Planning for Vertical Scaling:  3.MD.A, 3.MD.A.1, 3.MD.A.2, 3.MD.C, 3.MD.C.7, 3.MD.C.7a, 3.MD.C.7b, 3.MD.C.7c,	<b>Related Grade 3 Standards</b>  <b>3.MD.A Solve problems involving measurement and estimation of intervals of time, liquid volumes and masses of objects.</b>  <b>3.MD.A.1</b> 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.  <b>3.MD.A.2</b> Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (L). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same

<p>3.MD.C.7d, 3.MD.D, 3.MD.D.8</p> <p>5.MD.A, 5.MD.A.1</p>	<p>units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.</p> <p><b>3.MD.C Geometric measurement: understand concepts of area and relate area to multiplication and to addition.</b></p> <p><b>3.MD.C.7</b> Relate area to the operations of multiplication and addition.</p> <ol style="list-style-type: none"> <li>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.</li> <li>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.</li> <li>Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths <math>a</math> and <math>b + c</math> is the sum of <math>a \times b</math> and <math>a \times c</math>. Use area model to represent the distributive property in mathematical reasoning.</li> <li>Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real-world problems.</li> </ol> <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> <p><b>Related Grade 5 Standards</b></p> <p><b>5.MD.A Convert like measurement units within a given measurement.</b></p> <p><b>5.MD.A.1</b> 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.</p>
DOK Levels:	1, 2
<b>Achievement Level</b>	<b>Descriptors:</b>
<p><b>RANGE</b></p> <p><b>Achievement</b></p> <p><b>Level Descriptor</b></p> <p><b>(Range ALD)</b></p> <p>Target I: Solve problems involving measurement and conversion of measurements from</p>	<p><b>Level 1</b> Students should be able to know relative sizes of measurement units within one system of units, including in, ft, yd; km, m, cm; kg, g; lb, oz.; L, mL; and hr, min, sec.</p> <p><b>Level 2</b> Students should be able to express measurements in a larger unit in terms of a smaller unit within a single system of measurement, record measurement equivalents in a two-column table, and apply the perimeter formula to rectangles in mathematical problems.</p> <p><b>Level 3</b> Students should be able to use the four operations to solve</p>

a larger unit to a smaller unit.	<p>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; and apply the area formula to rectangles in mathematical problems.</p> <p><b>Level 4</b> Students should be able to apply the perimeter and area formulas to rectangles in word problems.</p>
Evidence Required:	<ol style="list-style-type: none"> <li>1. The student converts measurements from larger units to smaller units <b>within</b> a single system of units.</li> <li>2. The student records measurement equivalents in a two-column table.</li> <li>3. The student identifies measurement quantities from diagrams, such as number line diagrams that feature a measurement scale, and uses the information to solve word problems.</li> <li>4. The student uses the area and perimeter formulas for rectangles to solve problems in mathematical and real-world contexts.</li> </ol>
Allowable Response Types:	Equation/Numeric; Graphing; Matching Tables; Fill-in Tables
Allowable Stimulus Materials:	Number lines featuring measurement scales, diagrams, tables, graphics of rectangles, equations, whole numbers, decimals (to the hundredths), fractions (limited to denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100), measurements (in units of km, m, cm; kg, g; lb, oz; L, mL; hr, min, sec)
Construct-Relevant Vocabulary:	equivalent, mass, volume, interval, area, perimeter, square units
Allowable Tools:	None
Target-Specific Attributes:	<ul style="list-style-type: none"> <li>• Conversion factors will not be given to students.</li> <li>• All conversions are within one system of measurement, from a larger unit to a smaller unit.</li> <li>• Multiplication items are limited to four-digit by one-digit or two-digit by two-digit. Items may not include multiplication with decimals, but may include a whole number times a fraction.</li> <li>• Division items are limited to four-digit by one-digit division of whole numbers. No division with decimals or fractions.</li> <li>• Operations on fractions may include addition or subtraction of fractions with like denominators, including mixed numbers.</li> <li>• Required conversions may include converting from fractions (including improper fractions and mixed numbers), decimals (to the hundredths), or whole numbers to fractions, decimals, or whole numbers.</li> </ul>
Non-Targeted Constructs:	None

<p>Accessibility Guidance:</p>	<p>Item writers should consider the following Language and Visual Element/Design guidelines<sup>1</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 understanding of the context</li> <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>2</sup></p>
<p>Development Notes:</p>	<p>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.</p> <p>Items for which the student uses the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money will be presented in Claim 2.</p> <p>Items that involve making conversions using compound measurements, e.g., 5 ft 2 in, will be presented in Claim 2.</p> <p>Items requiring the student to read a measurement off a diagram and use that data to solve a word problem will be presented in Claim 2.</p> <p>Solving problems that involve finding the area/perimeter of a rectangle given one dimension and the other of area/perimeter will be assessed in Claim 2.</p> <p>Solving multi-step problems that involve comparing areas or perimeters of different rectangles will be assessed in Claim 2.</p>

<sup>1</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>

<sup>2</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)

<p><b>Task Model 1a</b></p> <p><b>Response Type:</b> Equation/Numeric</p> <p><b>DOK Level 1</b></p> <p><b>4.MD.A.1</b> 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. <i>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), ...</i></p> <p><b>Evidence Required:</b> 1. The student converts measurements from larger units to smaller units within a single system of units.</p> <p><b>Tools:</b> None</p>	<p><b>Prompt Features:</b> The student converts measurements within one system of units.</p> <p><b>Stimulus Guidelines:</b></p> <ul style="list-style-type: none"> <li>• Conversion must be from larger unit to smaller unit within the same system of measurement.</li> <li>• Items will involve one of these:             <ul style="list-style-type: none"> <li>◦ Distances (km, m, cm; in, ft, yd)</li> <li>◦ Intervals of time (hr, min, sec)</li> <li>◦ Liquid volumes (L, mL)</li> <li>◦ Masses of objects (kg, g; lb, oz)</li> </ul> </li> <li>• Item difficulty can be adjusted via these example methods:             <ul style="list-style-type: none"> <li>◦ Conversions involving one or two levels of separation within the same system of measurement (e.g., feet to inches would be one level of separation; yards to inches would be two levels of separation)</li> <li>◦ Use of fractions and decimals</li> </ul> </li> </ul> <p><b>TM1a</b> <b>Stimulus:</b> The student is presented with a measurement.</p> <p><b>Example Stem 1:</b> Enter the unknown number that makes the statement true.</p> <p>3.5 centimeters = □ millimeters</p> <p><b>Example Stem 2:</b> Enter the unknown number that makes the statement true.</p> <p>6 feet = □ inches</p> <p><b>Rubric:</b> (1 point) The student enters the correct value (e.g., 35; 72).</p> <p><b>Response Type:</b> Equation/Numeric</p>
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<p><b>Task Model 1b</b></p> <p><b>Response Type:</b> <b>Matching Tables</b></p> <p><b>DOK Level 1</b></p> <p><b>4.MD.A.1</b> 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. <i>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), ...</i></p> <p><b>Evidence Required:</b> 1. The student converts measurements from larger units to smaller units within a single system of units.</p> <p><b>Tools:</b> None</p>	<p><b>Prompt Features:</b> The student converts measurements within one system of units.</p> <p><b>Stimulus Guidelines:</b></p> <ul style="list-style-type: none"><li>Measurements in the table must be in smaller units than the measurement in the stem.</li><li>Answer choices should be in the form of whole number, decimal (only if dealing with money), or fractional units from the same system.</li><li>Items will involve one of these:<ul style="list-style-type: none"><li>Distances (km, m, cm; in, ft, yd)</li><li>Intervals of time (hr, min, sec)</li><li>Liquid volumes (L, mL)</li><li>Masses of objects (kg, g; lb, oz)</li></ul></li><li>Item difficulty can be adjusted via this example method:<ul style="list-style-type: none"><li>Conversions involving one or two levels of separation within the same system of measurement (e.g., feet to inches would be one level of separation; yards to inches would be two levels of separation)</li></ul></li></ul> <p><b>TM1b</b> <b>Stimulus:</b> The student is presented with one measurement in the stem.</p> <p><b>Example Stem:</b> Decide whether each measurement is equal to 5 yards. Select Yes or No for each measurement.</p> <table><tr><th></th><th>Yes</th><th>No</th></tr><tr><td>180 inches</td><td></td><td></td></tr><tr><td>27 inches</td><td></td><td></td></tr><tr><td>15 feet</td><td></td><td></td></tr></table> <p><b>Rubric:</b> (1 point) Student correctly selects yes or no for each of the given equivalencies (e.g., Y, N, Y).</p> <p><b>Response Type:</b> Matching Tables</p>		Yes	No	180 inches			27 inches			15 feet		
	Yes	No											
180 inches													
27 inches													
15 feet													

**Task Model 2****Response Type:**  
**Fill-in Table****DOK Level 2****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), ...*

**Evidence Required:**

2. The student records measurement equivalents in a two-column table.

**Tools:** None

**Prompt Features:** The student is prompted to complete a table of equivalent measurements.

**Stimulus Guidelines:**

- The left column represents larger units and the right is for smaller units.
- The right column should be empty.
- Items will involve one of these:
  - Distances (km, m, cm; in, ft, yd)
  - Intervals of time (hr, min, sec)
  - Liquid volumes (L, mL)
  - Masses of objects (kg, g; lb, oz)
- Item difficulty can be adjusted via these example methods:
  - Conversions involving one or two levels of separation within the same system of measurement (e.g., feet to inches would be one level of separation; yards to inches would be two levels of separation)
  - The use of fractions or decimals
  - The number of conversions the student must make (from 2 to 4 conversions per item)

**TM2**

**Stimulus:** The student is presented with a two-column table.

**Example Stem:** Enter the unknown numbers to complete the table of equal measurements.

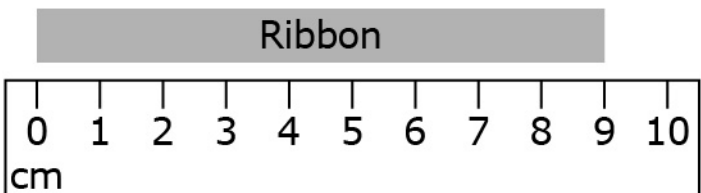
Feet	Inches
3	
5	

**Interaction:** The student enters the number of inches into the response boxes.

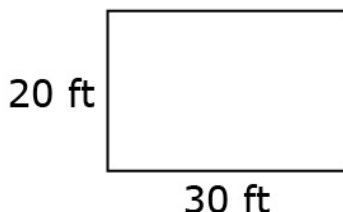
**Rubric:** (1 point) The student enters the correct equivalencies for the given measurements (e.g., 36, 60).

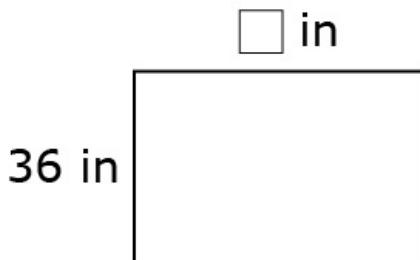
**Response Type:** Fill-in Table



<p><b>Task Model 3a</b></p> <p><b>Response Type:</b> Equation/Numeric</p> <p><b>DOK Level 2</b></p> <p><b>4.MD.A.2</b> 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.</p> <p><b>Evidence Required:</b> 3. The student identifies measurement quantities from diagrams, such as number line diagrams that feature a measurement scale, and uses the information to solve word problems.</p> <p><b>Tools:</b> None</p> <p><b>Version 3 update:</b> Revised the stem in TM3a to clarify the change in units. Retired TM3b.</p>	<p><b>Prompt Features:</b> The student uses a diagram, such as a number line that features a measurement scale, to solve word problems.</p> <p><b>Stimulus Guidelines:</b></p> <ul style="list-style-type: none"> <li>Items will involve one of these: <ul style="list-style-type: none"> <li>Distances (km, m, cm; in, ft, yd)</li> <li>Intervals of time (hr, min, sec)</li> <li>Liquid volumes (L, mL)</li> <li>Masses of objects (kg, g; lb, oz)</li> </ul> </li> </ul> <p><b>TM3a</b> <b>Stimulus:</b> The student is presented with an object or quantity that can be measured using a number line diagram with a measurement scale.</p> <p><b>Example Stem:</b> A ribbon is shown above a centimeter ruler. Enter the length, in <b>millimeters</b>, of the ribbon.</p> <div data-bbox="561 829 1258 1020" data-label="Figure">  </div> <p><b>Rubric:</b> (1 point) The student enters the correct measurement shown in the diagram (e.g., 90).</p> <p>Note: Depending on the diagram, a range of responses may need to be accepted. It is reasonable to allow 89-91 mm for the example shown above.</p> <p><b>Response Type:</b> Equation/Numeric</p>
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<p><b>Task Model 4a</b></p> <p><b>Response Type:</b> Equation/Numeric</p> <p><b>DOK Level 1</b></p> <p><b>4.MD.A.3</b> Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. <i>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.</i></p> <p><b>Evidence Required:</b> 4. The student uses the area and perimeter formulas for rectangles to solve problems in mathematical and real-world contexts.</p> <p><b>Tools:</b> None</p>	<p><b>Prompt Features:</b> The student uses the area formula and/or perimeter formula to solve a problem in a mathematical or real-world context.</p> <p><b>Stimulus Guidelines:</b></p> <ul style="list-style-type: none"> <li>Items may describe rectangles (in pure math context) or rectangular shapes (in a real-world context). The shapes presented in real-world contextual items must be described as “rectangular” (e.g., a rectangular garden, a rectangular kitchen, etc.).</li> <li>The dimensions should be whole numbers with units listed.</li> <li>Item difficulty can be adjusted via these example methods:             <ul style="list-style-type: none"> <li>How “friendly” the numbers are to work with</li> <li>Including a visual diagram with labeled sides</li> </ul> </li> </ul> <p><b>TM4a</b> <b>Stimulus:</b> The student is presented with the dimensions of a rectangle.</p> <p><b>Example Stem:</b> Use the diagram of the rectangular garden to solve the problem.</p> <div data-bbox="557 987 898 1197" data-label="Diagram">  </div> <p>Enter the area, in square feet, of the garden.</p> <p><b>Rubric:</b> (1 point) The student enters the correct number (e.g., 600).</p> <p><b>Response Type:</b> Equation/Numeric</p>
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<p><b>Task Model 4b</b></p> <p><b>Response Type:</b> Equation/Numeric</p> <p><b>DOK Level 2</b></p> <p><b>4.MD.A.3</b> Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. <i>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.</i></p> <p><b>Evidence Required:</b> 4. The student uses the area and perimeter formulas for rectangles to solve problems in mathematical and real-world contexts.</p> <p><b>Tools:</b> None</p>	<p><b>Prompt Features:</b> The student uses the area formula and/or perimeter formula to solve a problem in a mathematical or real-world context.</p> <p><b>Stimulus Guidelines:</b></p> <ul style="list-style-type: none"> <li>Items may describe rectangles (in pure math context) or rectangular shapes (in a real-world context). The shapes presented in real-world contextual items must be described as “rectangular” (e.g., a rectangular garden, a rectangular kitchen, etc.).</li> <li>The dimensions, areas, and perimeters should be whole numbers with units listed.</li> <li>Item difficulty can be adjusted via these example methods: <ul style="list-style-type: none"> <li>How “friendly” the numbers are to work with</li> <li>Including a visual diagram with labeled sides</li> </ul> </li> </ul> <p><b>TM4b</b> <b>Stimulus:</b> The student is presented with one dimension and either the area or perimeter of a rectangle and must find the unknown side length.</p> <p><b>Example Stem:</b> Use the diagram of the rectangle to solve the problem.</p> <div style="text-align: center;">  </div> <p>The perimeter of the rectangle is 192 inches. What is the length, in inches, of the unknown side?</p> <p><b>Rubric:</b> (1 point) The student enters the correct number (e.g., 60).</p> <p><b>Response Type:</b> Equation/Numeric</p>
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**Task Model 4c****Response Type:**  
**Matching Tables****DOK Level 2****4.MD.A.3**

Apply the area and perimeter formulas for rectangles in real-world 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.*

**Evidence Required:**

4. The student uses the area and perimeter formulas for rectangles to solve problems in mathematical and real-world contexts.

**Tools:** None

**Prompt Features:** The student is prompted to identify possible dimensions of a rectangle.

**Stimulus Guidelines:**

- Items may describe rectangles (in pure math context) or rectangular shapes (in a real-world context). The shapes presented in real-world contextual items must be described as “rectangular” (e.g., a rectangular garden, a rectangular kitchen, etc.).
- The dimensions, areas, and perimeters should be whole numbers with units listed.
- Item difficulty can be adjusted via this example method:
  - How “friendly” the numbers are to work with

**TM4c**

**Stimulus:** The student is presented with the area or perimeter of a rectangle.

**Example Stem 1:** The dimensions for three rectangles are shown. Decide whether each rectangle has an area equal to 100 square feet. Select Yes or No for each rectangle.

	Yes	No
Rectangle 1: <ul style="list-style-type: none"> <li>• Length = 5 ft</li> <li>• Width = 20 ft</li> </ul>		
Rectangle 2: <ul style="list-style-type: none"> <li>• Length = 10 ft</li> <li>• Width = 10 ft</li> </ul>		
Rectangle 3: <ul style="list-style-type: none"> <li>• Length = 4 ft</li> <li>• Width = 25 ft</li> </ul>		

**Example Stem 2:** The dimensions for three rectangular gardens are shown. Decide whether each garden has a perimeter equal to 100 meters. Select Yes or No for each garden.

	Yes	No
Garden 1: <ul style="list-style-type: none"> <li>• Length = 5 m</li> <li>• Width = 45 m</li> </ul>		
Garden 2: <ul style="list-style-type: none"> <li>• Length = 50 m</li> <li>• Width = 50 m</li> </ul>		
Garden 3: <ul style="list-style-type: none"> <li>• Length = 4 m</li> <li>• Width = 25 m</li> </ul>		

**Rubric:** (1 point) The student selects all of the correct dimensions for the rectangle (e.g., Y, Y, Y; Y, N, N).

**Response Type:** Matching Tables