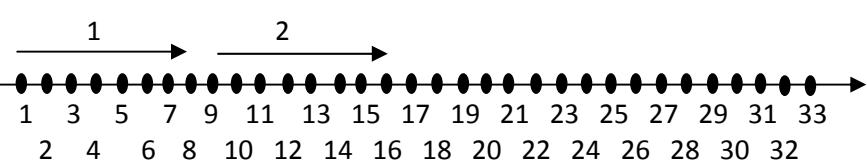


<b>3<sup>rd</sup> Grade</b>	
<b>Task: Selling Vegetables</b>	
<p><b>A. Easton has been raising vegetables in his garden all summer. He plans to sell some of his vegetables at a local farmer’s market. He has selected 24 radishes, 30 onions, 16 heads of lettuce and 25 tomatoes to sell. He wants to display the radishes together, the onions together the lettuce together and the tomatoes together and to place them in sets with equal rows for each kind of vegetable. He plans to put each kind of vegetable in at least 2 rows. Show all the different ways that he can display equal rows for each kind of the vegetables at the market. Write an equation for each way you find.</b></p>	
<b>Teacher Notes:</b>	
<p>Students’ understanding of multiplication is enhanced when they have opportunities to think about and model it in various ways. Although it is easy to show students how we picture a situation, we learn a great deal about how they understand the quantities and operations involved in the situation when they create their own representations of problems (Quintero 1986). The inverse relationship between multiplication and division provides the mathematical basis for the fact families, such as the following:  <math>7 \times 3 = 21</math>; <math>3 \times 7 = 21</math>; <math>21 \div 3 = 7</math>; <math>21 \div 7 = 3</math>.</p>	
<b>Common Core State Standards for Mathematical Content</b>	<b>Common Core State Standards for Mathematical Practice</b>
<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.</p> <p><b>3.OA.B.5</b> Apply properties of operations as strategies to multiply and divide. <i>Example: If <math>6 \times 4 = 24</math> is known, then <math>4 \times 6 = 24</math> is also known. (Commutative property of multiplication.) <math>3 \times 5 \times 2</math> can be found by <math>3 \times 5 = 15</math>, then <math>15 \times 2 = 30</math>, or by <math>5 \times 2 = 10</math>, then <math>3 \times 10 = 30</math>. (Associative property of multiplication.) Knowing that <math>8 \times 5 = 40</math> and <math>8 \times 2 = 16</math>, one can find <math>8 \times 7</math> as <math>8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56</math>. (Distributive property.)</i></p> <p><b>3.OA.B.6</b> Understand division as an unknown-factor problem. For example, find <math>32 \div 8</math> by finding the number that makes 32 when multiplied by 8.</p>	<ol style="list-style-type: none"> <li>1. Make sense of problems and persevere in solving them.</li> <li>2. Reason abstractly and quantitatively.</li> <li>3. Construct viable arguments and critique the reasoning of others.</li> <li>4. Model with mathematics.</li> <li>5. Use appropriate tools strategically.</li> <li>6. Attend to precision.</li> <li>7. Look for and make use of structure.</li> <li>8. Look for and express regularity in repeated reasoning.</li> </ol>

Essential Understandings	
<ul style="list-style-type: none"> <li>• Multiplication can be used to find the total number of objects when there are a specific number of groups with the same number of objects.</li> <li>• Each multiplicative expression developed in the context of a problem situation has an accompanying explanation, and different representations and ways of reasoning about a situation can lead to different expressions or equations.</li> <li>• Multiplication and division have an inverse relationship and can be used to find division or multiplication facts.</li> </ul>	
Explore Phase	
Possible Solution Paths	Assessing and Advancing Questions
<p>Students may use manipulatives or drawings to make arrays for the various mathematical combinations.</p> <p>24 Radishes: <math>6 \times 4</math>, <math>4 \times 6</math>, <math>3 \times 8</math>, <math>8 \times 3</math>, <math>12 \times 2</math>, <math>2 \times 12</math>            30 Onions: <math>5 \times 6</math>, <math>6 \times 5</math>, <math>3 \times 10</math>, <math>10 \times 3</math> (<math>2 \times 15</math>; <math>15 \times 2</math>)            25 Tomatoes: <math>5 \times 5</math>            16 Lettuce: <math>2 \times 8</math>, <math>8 \times 2</math>, <math>4 \times 4</math></p>	<p><u>Assessing Question:</u> (For 16 heads of lettuce)</p> <ul style="list-style-type: none"> <li>– Can you use 16 tiles to show me an array for the lettuce?</li> <li>– I see you have a drawing of 2 rows of 8. Can you make a different array?</li> <li>– What is special about this other array? (<math>4 \times 4</math>)</li> </ul> <p><u>Advancing Question:</u></p> <ul style="list-style-type: none"> <li>– Can you use a number line to show the array you have drawn?</li> <li>– Can you write more than one equation for an array?</li> <li>– How can you know when you have used all of the possible combinations?</li> <li>– Explain the relationship between this problem and fact families.</li> </ul>
<p>Students may list multiplication facts based on fluency, prior knowledge or trial and error.</p>	<p><u>Assessing Question:</u></p> <ul style="list-style-type: none"> <li>– Explain how you know that these numbers would represent equal rows.</li> <li>– How can you know when you have used all of the possible combinations?</li> </ul> <p><u>Advancing Question:</u></p> <ul style="list-style-type: none"> <li>– Are there any other numbers that would make equal rows of (selected vegetable)?</li> <li>– Explain the relationship between this problem and fact families.</li> </ul>
<p>Students may use division facts based on fluency, prior knowledge or trial and error.</p>	<p><u>Assessing Question:</u></p> <ul style="list-style-type: none"> <li>– Explain how you know what numbers to divide by.</li> <li>– How can you know when you have used all of the possible combinations?</li> </ul> <p><u>Advancing Question:</u></p> <ul style="list-style-type: none"> <li>– Are there any other numbers that would make equal rows of (selected vegetable)?</li> <li>– Explain the relationship between this problem and fact families?</li> </ul>
<p>Students may use a number line showing the number of each vegetable and skip count to show equal groups. (2 groups of 8 heads of lettuce)</p> 	<p><u>Assessing Question:</u></p> <ul style="list-style-type: none"> <li>– What do the numbers you used represent?</li> <li>– Can you show another way to illustrate this solution?</li> </ul> <p><u>Advancing Question:</u></p> <ul style="list-style-type: none"> <li>– Show me an equation for each number line. Can you use one set of numbers to make more than one equation? Explain your answer.</li> <li>– How can you know when you have used all of the possible combinations?</li> </ul>

<b>Possible Student Misconceptions</b>	
<p>Student does not understand the question.  Student is not fluent with multiplication facts.  Student does not recognize the Commutative Property of Multiplication.</p>	<p><u>Assessing Questions:</u></p> <ul style="list-style-type: none"> <li>- What does this problem want you to find?</li> <li>- How can you use this information to solve the problem?</li> <li>- WIs there a model you could draw to help you solve this problem?</li> </ul> <p><u>Advancing Question:</u></p> <ul style="list-style-type: none"> <li>- Since the vegetables must be placed in more than one row, show how many ways each of them can be displayed.</li> </ul>
<b>Entry/Extensions</b>	
<p>If students can't get started....</p>	<p><u>Assessing Questions:</u></p> <ul style="list-style-type: none"> <li>- What does this problem want you to find?</li> <li>- How can you use this information to solve the problem?</li> <li>- What model could you draw to help you solve this problem?</li> </ul> <p><u>Advancing Question:</u></p> <ul style="list-style-type: none"> <li>- If the vegetables need to be placed in more than one row, can you show more than one way that each of them could be displayed?</li> </ul>
<p>If students finish early....</p>	<p><u>Assessing Question:</u></p> <ul style="list-style-type: none"> <li>- Did you check your work to make sure you answer shows/represents what the question wants you to find out?</li> <li>- Does your answer make sense?</li> </ul> <p><u>Advancing Question:</u></p> <ul style="list-style-type: none"> <li>- Can you create any "rules" that would help someone know how to break numbers into parts that represent equal rows?</li> <li>- Can you create any "rules" that would help someone know if they have found all combinations for the numbers in this problem?</li> </ul>
<b>Discuss/Analyze</b>	
<b>Whole Group Questions</b>	
<ul style="list-style-type: none"> <li>• How were the strategies that you shared similar and different?</li> <li>• What strategies did you use to find the numbers combinations for the arrays?</li> <li>• How did you know there was more than one combination for most of the numbers?</li> <li>• Both 16 and 25 are square numbers. Does that make a difference in the number of fact combinations that they have?</li> <li>• Explain why 25 only had one combination.</li> <li>• Is it helpful to label the numbers to show what they represent? If so, can you explain why?</li> <li>• Does the order in which you make the array or write the equation make a difference in the solution to this problem?</li> <li>• Explain the relationship between division and multiplication.</li> </ul>	