

# Mathematical Practices Look-Fors (Math Tool 3a)

MP.1: Make sense of problems and persevere in solving them. (problem solving)		
The Math Task:	The Student:	The Teacher:
<ul style="list-style-type: none"> <li>• Is an interesting problem</li> <li>• Has more than one solution path which may be unpredictable</li> <li>• Creates discussion</li> <li>• Requires cognitive effort</li> <li>• Connects to real world</li> <li>• Relates to grade level CCSS</li> <li>• Builds student understanding of grade level standard</li> <li>• Leads students to look back and reflect on answer</li> <li>• Explicitly asks for justification or explanation</li> </ul> <p>(from: Implementing Standards-Based Mathematics Instruction; Stein, Smith Henningsen &amp; Silver,1998)</p>	<ul style="list-style-type: none"> <li>• Analyzes information given</li> <li>• Looks for different ways to solve the problem (i.e. situation vs. solution)</li> <li>• Knows and uses different representations (i.e. equation vs. table or graph) and/or manipulative</li> <li>• Evaluates progress and changes plan if needed</li> <li>• Explains using both pictures and words</li> <li>• Makes connection to the way they solved the problem and how others solved the problem</li> <li>• Uses basic fact fluency or fact strategies</li> </ul>	<ul style="list-style-type: none"> <li>• Promotes visible thinking using pictures and equations</li> <li>• Gives time for students to discuss with others or class</li> <li>• Encourages students to keep trying and builds supportive math community</li> <li>• Uses explicit and precise language when using representations and definitions and expects students to do the same in their discussions</li> <li>• Helps students make connections between representations, equations, and student thinking</li> <li>• Engages students in metacognition</li> <li>• Models problem situation, not problem solution.</li> </ul>
MP.2: Reason abstractly and quantitatively. (number sense)		
The Math Task:	The Student:	The Teacher:
<ul style="list-style-type: none"> <li>• Is an interesting problem</li> <li>• Has more than one solution path which may be unpredictable</li> <li>• Creates discussion</li> <li>• Requires cognitive effort</li> <li>• Connects to real world</li> <li>• Relates to grade level CCSS</li> <li>• Builds student understanding of grade level standard</li> <li>• Leads students to look back and reflect on answer Task explicitly asks for justification or explanation</li> </ul> <p>(from: Implementing Standards-Based Mathematics Instruction; Stein, Smith Henningsen &amp; Silver,1998)</p>	<ul style="list-style-type: none"> <li>• Makes sense of quantities and their relationship in problem situations</li> <li>• Recognizes that quantities can be represented in different ways</li> <li>• Uses numbers and words to make sense of a problem</li> <li>• Gives attention to the meaning of the numbers and knows which operation to choose</li> <li>• Performs operations flexibly, accurately, and efficiently</li> <li>• Uses multiple representations</li> <li>• Connects numbers, symbols or units to quantities</li> <li>• Justifies solutions</li> <li>• Makes connections to how they solved a problem and how others solved the problem</li> <li>• Reasons with attributes of geometric figures</li> </ul>	<ul style="list-style-type: none"> <li>• Promotes visible thinking using pictures and equations</li> <li>• Uses physical representations (manipulatives, drawings) to model what happens to a variable when it changes and how that effects the other variable</li> <li>• Gives time for students to discuss with others or class</li> <li>• Encourages students to keep trying</li> <li>• Uses explicit and precise language when using representations and definitions and expects students to be the same in their discussion</li> <li>• Builds a supportive math community</li> <li>• Helps make connections between representations, equations, student thinking, and content standard</li> </ul>

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MP.3: Construct viable arguments and critique the reasoning of others. (math talk)		
The Math Task:	The Student:	The Teacher:
<ul style="list-style-type: none"> <li>• Is an interesting problem</li> <li>• Has more than one solution path which may be unpredictable</li> <li>• Creates discussion</li> <li>• Requires cognitive effort</li> <li>• Connects to real world</li> <li>• Relates to grade level CCSS</li> <li>• Builds student understanding of grade level standard</li> <li>• Leads students to look back and reflect on answer</li> <li>• Explicitly asks for justification or explanation</li> </ul> <p>(from: Implementing Standards-Based Mathematics Instruction; Stein, Smith Henningsen &amp; Silver,1998)</p>	<ul style="list-style-type: none"> <li>• Communicates by using mathematical reasoning with objects, drawings, diagrams, equations ...</li> <li>• Justifies solutions</li> <li>• Makes connections between their own thinking and that of others</li> <li>• Demonstrates actively listening by asking questions of others</li> <li>• Makes statements to prove or disprove concepts or presented ideas</li> <li>• Students understand different forms of reasoning (ie. deductive reasoning) and when to apply them</li> <li>• Uses accurate vocabulary</li> </ul>	<ul style="list-style-type: none"> <li>• Promotes math talk and the critiquing of presented solutions</li> <li>• Asks higher-order questions to facilitate discussion and presses for justification</li> <li>• Gives time for students to construct their own ideas before small or large group discussions</li> <li>• Expects students to be explicit and precise when using representations, definitions, and symbols</li> <li>• Builds a supportive math community</li> <li>• Helps make connections between the reasoning of students and content standard</li> </ul>
MP.4: Model with mathematics. (representations and graphs)		
The Math Task:	The Student:	The Teacher:
<ul style="list-style-type: none"> <li>• Is an interesting problem</li> <li>• Has more than one solution path which may be unpredictable</li> <li>• Creates discussion</li> <li>• Requires cognitive effort</li> <li>• Connects to real world</li> <li>• Relates to grade level CCSS</li> <li>• Builds student understanding of grade level standard</li> <li>• Leads students to look back and reflect on answer</li> <li>• Explicitly asks for justification or explanation</li> </ul> <p>(from: Implementing Standards-Based Mathematics Instruction; Stein, Smith Henningsen &amp; Silver,1998)</p>	<ul style="list-style-type: none"> <li>• Identifies important elements and quantities needed for a model</li> <li>• Describes relationships of models and equation</li> <li>• Chooses a representation</li> <li>• Applies formulas/equations</li> <li>• Uses models to draw conclusion</li> <li>• Explains why it is a good model for the problem</li> <li>• Recognizes and uses parts of a graph (i.e. title, labels, symbols, key)</li> </ul>	<ul style="list-style-type: none"> <li>• Expects students to justify their choice in models</li> <li>• Gives students opportunity to evaluate the appropriateness of their model and that of others</li> <li>• Helps make connections with the relationships between representation, equation, answer, student thinking, and content standard</li> </ul>

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MP.5: Use appropriate tools strategically. (calculators, rulers, manipulative)		
The Math Task:	The Student:	The Teacher:
<ul style="list-style-type: none"> <li>• Is an interesting problem</li> <li>• Has more than one solution path which may be unpredictable</li> <li>• Creates discussion</li> <li>• Requires cognitive effort</li> <li>• Connects to real world</li> <li>• Relates to grade level CCSS</li> <li>• Builds student understanding of grade level standard</li> <li>• Leads students to look back and reflect on answer</li> <li>• Explicitly asks for justification or explanation</li> </ul> <p>(from: Implementing Standards-Based Mathematics Instruction; Stein, Smith Henningsen &amp; Silver,1998)</p>	<ul style="list-style-type: none"> <li>• Uses mental computations fluently</li> <li>• Knows which tools are appropriate for the task</li> <li>• Knows when to use a tool</li> <li>• Understands and uses properties of operations</li> <li>• Uses estimation to find errors and check answer for reasonableness</li> <li>• Justifies tool selection</li> </ul>	<ul style="list-style-type: none"> <li>• Allows students to choose appropriate learning tools</li> <li>• Uses appropriate tools to represent, explore and deepen student understanding</li> <li>• Models how different representations are tools</li> <li>• Uses technology tools to deepen students' understanding of a concept</li> <li>• Helps make connections between tool, equation, student thinking, and content standard</li> </ul>
MP.6: Attend to precision. (vocabulary, labeling, answers)		
The Math Task:	The Student:	The Teacher:
<ul style="list-style-type: none"> <li>• Is an interesting problem</li> <li>• Has more than one solution path which may be unpredictable</li> <li>• Creates discussion</li> <li>• Requires cognitive effort</li> <li>• Connects to real world</li> <li>• Relates to grade level CCSS</li> <li>• Builds student understanding of grade level standard</li> <li>• Leads students to look back and reflect on answer</li> <li>• Explicitly asks for justification or explanation</li> </ul> <p>(from: Implementing Standards-Based Mathematics Instruction; Stein, Smith Henningsen &amp; Silver,1998)</p>	<ul style="list-style-type: none"> <li>• Uses appropriate math vocabulary</li> <li>• Uses clear definitions in discussion</li> <li>• Calculates accurately and efficiently</li> <li>• Explains their reasoning with accurate mathematical language</li> <li>• Uses proper unit labels with measuring</li> <li>• Uses appropriate labels when graphing and solving story problems</li> <li>• Determines when different levels of precision are needed and how precision affects results</li> </ul>	<ul style="list-style-type: none"> <li>• Communicates precisely using clear definitions</li> <li>• Emphasizes the importance of precise communication</li> <li>• Emphasizes the importance of precision of measurement</li> <li>• Helps make connections between vocabulary, student thinking, unit labels, calculations, and content standard</li> </ul>

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<b>MP.7: Look for and make use of structure.</b> (how numbers and shapes are organized)		
The Math Task:	The Student:	The Teacher:
<ul style="list-style-type: none"> <li>• Is an interesting problem</li> <li>• Has more than one solution path which may be unpredictable</li> <li>• Creates discussion</li> <li>• Requires cognitive effort</li> <li>• Connects to real world</li> <li>• Relates to grade level CCSS</li> <li>• Builds student understanding of grade level standard</li> <li>• Leads students to look back and reflect on answer</li> <li>• Explicitly asks for justification or explanation</li> </ul> <p>(from: Implementing Standards-Based Mathematics Instruction; Stein, Smith Henningsen &amp; Silver,1998)</p>	<ul style="list-style-type: none"> <li>• Recognizes that quantities can be represented in different ways</li> <li>• Uses properties of operations to make sense of problems</li> <li>• Recognizes how numbers and shapes are organized</li> <li>• Looks for patterns and structures in the number system</li> <li>• Justify strategy for basic facts</li> <li>• Uses models to prove equations</li> <li>• Recognize how symbols help represent relationships and can be applied to new situations</li> </ul>	<ul style="list-style-type: none"> <li>• Gives students time to discuss connections</li> <li>• Brings students back to the rule or properties being used</li> <li>• Helps students look for patterns and structures in the number system</li> <li>• Helps make connections between the structure used, equation, student thinking, and content standard</li> <li>• Helps make connections to real world</li> </ul>
<b>MP #8: Look for and express regularity in repeated reasoning.</b> (number pattern)		
The Math Task:	The Student:	The Teacher:
<ul style="list-style-type: none"> <li>• Is an interesting problem</li> <li>• Has more than one solution path which may be unpredictable</li> <li>• Creates discussion</li> <li>• Requires cognitive effort</li> <li>• Connects to real world</li> <li>• Relates to grade level CCSS</li> <li>• Builds student understanding of grade level standard</li> <li>• Leads students to look back and reflect on answer</li> <li>• Explicitly asks for justification or explanation</li> </ul> <p>(from: Implementing Standards-Based Mathematics Instruction; Stein, Smith Henningsen &amp; Silver,1998)</p>	<ul style="list-style-type: none"> <li>• Notices number patterns</li> <li>• Notices if calculations are repeated</li> <li>• Applies more efficient computation strategies using number patterns</li> <li>• Looks both for general methods and for shortcuts</li> </ul>	<ul style="list-style-type: none"> <li>• Encourages students to connect task to prior concepts taught</li> <li>• Helps make connections between pattern, equation, student thinking, and content standard</li> </ul>