**Questions to Promote Math Practice Standards**

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|  | **Summary of Standards for** **Mathematical Practice** | **Question to Develop** **Mathematical Thinking** |
| 1. **Make sense of problems and persevere in solving them.**
 | * Interpret and make meaning of the problem to find a starting point. Analyze what is given in order to explain to themselves the meaning of the problem.
* Plan a solution pathway instead of jumping to a solution. Monitor their progress and change the approach if necessary.
* See relationships between various representations. Relate current situations to concepts or skills previously learned and connect mathematical ideas to one another.
* Continually ask themselves, “Does this make sense?”
* Can understand various approaches to solutions.
 | * How would you describe the problem in your own words? How would you describe what you are trying to find?
* What do you notice about…?
* What information is given in the problem?
* Describe the relationship between the quantities.
* Describe what you have already tried. What might you change?
* Talk me through the steps you’ve used to this point.
* What steps in the process are you most confident about? What are some other strategies you might try?
* What are some other problems that are similar to this one?
* How might you use one of your previous problems to help you begin?
* How else might you organize… represent… show…?
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| **2. Reason abstractly and quantitatively.** | * Make sense of quantities and their relationships.
* Decontextualize (represent a situation symbolically and manipulate the symbols) and contextualize (make meaning of the symbols in a problem) quantitative relationships.
* Understand the meaning of quantities and are flexible in the use of operations and their properties.
* Create a logical representation of the problem.
* Attends to the meaning of quantities, not just how to compute them.
 | * What do the numbers used in the problem represent? What is the relationship of the quantities?
* How is \_\_\_\_\_ related to \_\_\_\_\_?
* What is the relationship between \_\_\_\_\_ and \_\_\_\_\_? What does \_\_\_\_\_ mean to you? (e.g. symbol, quantity, diagram)
* What properties might we use to find a solution?
* How did you decide in this task that you needed to use…?
* Could we have used another operation or property to solve this task? Why or why not?
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| **3. Construct viable arguments and critique the reasoning of others.** | * Analyze problems and use stated mathematical assumptions, definitions, and established results in constructing arguments.
* Justify conclusions with mathematical ideas.
* Listen to the arguments of others and ask useful questions to determine if an argument makes sense.
* Ask clarifying questions or suggest ideas to improve/revise the argument.
* Compare two arguments and determine correct or flawed logic.
 | * What mathematical evidence would support your solution? Who can we be sure that…? How could you prove that…? Will it still work if…?
* What were you considering when…? How did you decide to try that strategy?
* How did you test whether your approach worked?
* How did you decide what the problem was asking you to find? (What was unknown?)
* Did you try a method that did not work? Why didn’t it work? Would it ever work? Why or why not?
* What is the same and what is different about…? How could you demonstrate a counter-example?
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| **4. Model with mathematics** | * Understand this is a way to reason quantitatively and abstractly (able to decontextualize and contextualize).
* Apply the mathematics they know to solve everyday problems. Are able to simplify a complex problem and identify important quantities to look at relationships.
* Represent mathematics to describe a situation either with an equation or a diagram and interpret the results of a mathematical situation.
* Reflect on whether the results make sense, possibly improving/revising the model.
* Ask themselves, “How can I represent this mathematically?
 | * What number model could you construct to represent the problem?
* What are some ways to represent the quantities?
* What is an equation or expression that matches the diagram, number line.., chart.., table..?
* Where did you see one of the quantities in the task in your equation or expression?
* How would it help to create a diagram, graph, table…? What are some ways to visually represent…?
* What formula might apply in this situation?
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|  | **Summary of Standards for****Mathematical Practice** | **Question to Develop****Mathematical Thinking** |
| **5. Use appropriate tools strategically.** | * Use available tools recognizing the strengths and limitations of each.
* Use estimation and other mathematical knowledge to detect possible errors.
* Identify relevant external mathematical resources to pose and solve problems.
* Use technological tools to deepen their understanding of mathematics.
 | * What mathematical tools could we use to visualize and represent the situation?
* What information do you have?
* What do you know that is not stated in the problem? What approach are you considering trying first?
* What estimate did you make for the solution?
* In this situation would it be helpful to use... a graph…, number line…, ruler…, diagram…, calculator…, manipulative?
* Why was it helpful to use…?
* What can using a \_\_\_\_\_ show us that \_\_\_\_\_ may not? In what situations might it be more informative or helpful to use…?
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| **6. Attend to precision** | * Communicate precisely with others and try to use clear mathematical language when discussing their reasoning.
* Understand the meanings of symbols used in mathematics and can label quantities appropriately.
* Express numerical answers with a degree of precision appropriate for the problem context.
* Calculate efficiently and accurately.
 | * What mathematical terms apply in this situation? How did you know your solution was reasonable? Explain how you might show that your solution answers the problem.
* What would be more efficient strategy?
* How are you showing the meaning of the quantities?
* What symbols or mathematical notations are important in this problem?
* What mathematical language… definitions… properties can you use to explain…?
* How could you test your solution to see if it answers the problem?
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| **7. Look for and make use of structure.** | * Apply general mathematical rules to specific situations. Look for the overall structure and patterns in mathematics.
* See complicated things as single objects or as being composed of several objects.
 | * What observations do you make about…? What do you notice when…?
* What parts of the problem might you eliminate…, or simplify…?
* What patterns do you find in…?
* How do you know if something is a pattern?
* What ideas that we have learned before were useful in solving this problem?
* What are some other problems that are similar to this one?
* How does this relate to…?
* In what ways does this problem connect to other mathematical concepts?
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| **8. Look for and express regularity in repeated reasoning** | * See repeated calculations and look for generalizations and shortcuts.
* See the overall process of the problem and still attend to the details.
* Understand the broader application of patterns and see the structure in similar situations.
* Continually evaluate the reasonableness of their intermediate results.
 | * Explain how this strategy works in other situations? Is this always true, sometimes true or never true? How could we probe that…?
* What do you notice about…?
* What is happening in this situation? What would happen if…?
* Is there a mathematical rule for…?
* What predictions or generalizations can this pattern support?
* What mathematical consistencies do you notice?
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