**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…? |
| **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? |
| **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? |
| **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? |
|  | **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…? |
| **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? |
| **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? |
| **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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