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| **Summary of Standards for Mathematical Practice** | **Questions to Develop Mathematical Thinking** |
| 1. **Make sense of problems and persevere in solving them.**   * Interpret and make meaning of the problem looking for starting points. Analyze what is given to explain to themselves the meaning of the problem. * Plan a solution pathway instead of jumping to a solution. * Can 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. * Can understand various approaches to solutions. * Continually ask themselves; “Does this make sense?” | * 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, and show? |
| 2. **Reason abstractly and quantitatively.**   * Make sense of quantities and their relationships. * Are able to 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? How 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 math they know to solve problems in everyday life. * 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 or 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’s 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? * Would it help to create a diagram, graph, table? * What are some ways to visually represent? * What formula might apply in this situation? |
| 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 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. * Is there a 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, 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. | * Will the same strategy work in other situations? * Is this always true, sometimes true or never true? * How would we prove that. ? * What do you notice about. ? * What is happening in this situation? * What would happen if. ? * What Is there a mathematical rule for. ? * What predictions or generalizations can this pattern support? * What mathematical consistencies do you notice? |