**Questioning for Evidence of the**

**Standards for Mathematical Practice**

**SMPs 2 & 3**

**Reasoning and Explaining**

This document can be used for teacher moves to support the instruction of the standards for mathematical practice. It can also be used when observing students to see their trajectory towards proficiency.

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| **Standard for Mathematical Practice** | **California Framework Examples** | **Questions to Develop Mathematical Thinking** |
| **SMP 2 Reason abstractly and quantitatively.**  **Mathematically proficient students:**   * Make sense of quantities and relationships in problem situations. * Represent abstract situations symbolically and understand the meaning of quantities. * Create representations of the problem. * Consider the units involved. * Flexibly use properties of operations. | Younger students begin to recognize that a number represents a specific quantity and connect the quantity to written symbols. Quantitative reasoning entails creating a representation of a problem while attending to the meaning of the quantities. Students draw pictures, manipulate objects or use diagrams or charts to express quantitative ideas. They decontextualize tasks into numbers and symbols. Students translate the situation into an equation to solve the problem. Students apply their understanding of the meaning of the equal sign “as the same as” to interpret an equation with an unknown. Students are encouraged to answer questions such as “How do you know?” | * 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 \_\_\_\_\_\_ (e.g. symbol, quantity, diagram) mean to you? * What properties might we use to find a solution? * How did you decide that you needed to use \_\_\_\_ in this task? * Could we have used another operation or property to solve this task? Why or why not? |
| **Standard for Mathematical Practice** | **California Framework Examples** | **Questions to Develop Mathematical Thinking** |
| **SMP 3 Construct viable arguments and critique the reasoning of others.**  **Mathematically proficient students:**   * Use definitions and results in constructing arguments. * Make conjectures and use counterexamples to build a logical progression of statements to explore and support ideas. * Communicate and defend mathematical reasoning using objects, drawings, diagrams, and/or actions. * Listen to or read the arguments of others. * Decide if the arguments of others make sense and ask questions to clarify or improve the arguments. | Younger students construct arguments using actions and concrete materials, such as objects, pictures and drawings. They develop mathematical communication skills as they participate in mathematical discussions involving questions such as “How did you get that?” and “Why is that true?” They explain their thinking to others and respond to other’s thinking. Students use a variety of strategies to solve the task and then share and discuss their problem-solving strategies with their classmates. They decide if the explanations make sense and ask appropriate questions. For example, to solve 74-18, students might use a variety of strategies and discuss and critique each other’s reasoning and strategies. In upper grades, students explain and defend their answers and solution strategies as they answer questions that require an explanation, justifying their work to others. | * What mathematical evidence would support your solution? * How can we be sure that \_\_\_\_? How could you prove that \_\_\_\_\_\_\_? * Will it still work if \_\_\_\_\_\_\_? * What are 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? * 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? * I think it might be clearer if you said \_\_\_\_\_\_\_. Is that what you mean? * Is your method like Shawna’s method? If not, how is your method different? |