Compare and contrast the listed standards to describe coherence. Don’t forget that the domain and cluster descriptions provide important information about the standards.

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| --- | --- |
| Standards, cluster, or domain | What is the relationship between them? |
| 8th grade and High School | |
| 8.F.1 with F-IF.1 | What ***new knowledge*** is in the F-IF.1 standard? The 8th grade standard uses inputs and outputs while the high school standard shifts to having students think about a function as a correspondence of two sets. How can the new knowledge be built on the old knowledge?  Function notation is not required in 8th grade, but is in high school. In both, the description of function is general, not specific to types of functions. |
| 8.F.2 with F-IF.9 | These two standards are identical except in the example. The example in the later standard suggests that the comparison could be between different types of functions.  This would be a good place to ask teachers if they have an example of a problem that would target this standard. (Note: the Intersections task used in March and April workshops was written mostly to target this standard.) |
| Use of ‘graph’ in 8.F.1 and use of ‘graph’ in F-IF.7 | Notice the shift from noun to verb. Graph is described conceptually in 8.F.1, and in the later standards is used as a procedure. The 8th grade standards focus on developing it *conceptually* so that it is usable as a procedure in high school. |
| 8.F.4, F-IF.4, and F-BF.1 | The 8th grade standard has a lot packed in. The part about interpreting rate of change and initial value builds a foundation for meaningful interpretations of functions. F-IF.4 requires similar ways of thinking about functions. The first part of 8.F.4 has students construct linear functions whereas F-BF doesn’t restrict attention to linear functions, and opens up rules to include recursive processes and descriptions of steps. |
| Within HS standards | |
| F-BF.1 and A-CED.2 | This is a good place to ask how functions and equations are related.  In A-CED.2, students need to be able to create equations in two or more variables and graph the equation, while F-BF.1 also includes a relationship between two variables (if it is a functional relationship) but also allows for recursive definitions of functions and steps in a process. When a function is defined by an expression, then it is a relationship between two variables, but A-CED.2 may include equations that are not functions and/or equations in which one variable is not defined by an expression in the other variable. |
| F-IF.8 and A-SSE.2-3 | These are very much the same, but A-SSE is focused on examining the expressions that define the function whereas F-IF.8 is about analyzing the function and identifying key features of a function based on the form of the expression that defines it. |

Possible questions to push thinking:

Give an example of a problem or question you might give/ask students to help them develop this new knowledge. How does it build on the prior knowledge?

How can the prior knowledge be used to develop the new knowledge?

Does the standard seem to define a concept or a procedure (or both)? How?

How can we develop conceptual understanding of domain and range, and of function notation? What are the strengths of using function notation? Why do students have a difficult time with it?

How are functions and expressions related?

How are functions and equations related?

Why isn’t A-REI.11 in the Functions Conceptual Category? Compare and contrast ‘equation’ and ‘function’. What distinctions do you want your students to make? How are variables used differently?

Discuss the final question: How does coherence relate to our theme? *How we learn something affects how we know it.*