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September 24, 2015

<<kruse.sequencerationale.doc>>

Sequencing Rationale

 This unit covering functions will follow a linear path of progression from understanding simple definitions to creating real-world models. Classroom instruction should follow the sequence of sub-units expressed in the Unit Outcomes. Students should first focus on sub-unit one Define Functions, then Compare Functions, then Evaluate Functions, and lastly Model with Functions. A linear path is important for this curriculum design because the beginning sub-units set a foundation for understanding functions whereas the later sub-units build upon the prior knowledge and investigate more complex mathematical concepts. Students need to first master the prior sub-unit outcomes before being ready to move on to the following sub-unit. The individual outcomes specified in each sub-unit do not need to follow the sequence in which they are written, unless specified otherwise. The outcomes should be tailored to the needs of the student and instructional goals of the teacher.

In the first sub-unit, students will begin by engaging in the lower levels of Bloom’s revised taxonomy as they first learn about the rules of functions. After students understand the rules of functions, students will then begin identifying functions (and their rules) in real-world scenarios. Beginning the unit in this fashion is imperative in order to create a solid foundation for the rest of the unit. If students do not have a good conceptual understanding of the definition and rules of functions, then they will not be able to engage in the more complex application, analyzing, and creating outcomes. In the first sub-unit, students first learn the rule of functions and then follow it by understanding the graph of a function. Knowing the rule of functions and their graphical representation are two very important concepts with which to begin due to their prevalence in the study of functions. Therefore, a linear approach is necessary in order to guarantee students have the prior knowledge necessary to understand the more complex work with functions in later sub-units. Graphing functions creates the only visual representation of functions and is therefore commonly used – especially by younger students. Students have a hard time just looking at numbers, therefore beginning the unit with visual representations allows students to gain confidence in their ability to understand this unit. Within this first sub-unit, there are two outcomes that directly relate with understanding the mathematics. The other two outcomes address the application of the mathematics into real-world scenarios. The order in which these outcomes are addressed is up to the individual teacher or maybe even student. Some students learn mathematics better by first having the abstract concept and then contextualizing it to a real-world scenario. On the other hand, some students would like to explore a real-world scenario and then later decontextualize the mathematical concepts. Since this curriculum aims to make more mathematical proficient students, the order of the specific outcomes can be arranged based on the needs of the individual student and at the teacher’s discretion.

 The second sub-unit aims to compare functions by their related properties. Each outcome requires that students identify properties of functions all in relation to the real-world scenario. Therefore, students can explore the properties of functions by asking questions about a real-world scenario that leads to new mathematical discoveries. Instead of learning new mathematics and then applying it to a scenario, students begin with the scenario to ground their reasoning, which will result in a deeper understanding of the concepts. The order in which students identify properties (algebraically versus graphically) is up to the student/teacher to decide. It is suggested though, that students focus on outcome “e” last in this subunit since it requires the comparison of two different representations. Students need to know the properties of all the different types of representations of functions before they are prepared to compare between them. Additionally, since students previously learned the definition of functions in sub-unit one, students are now expected to use that knowledge to delve deeper into functions by engaging in a higher level of Bloom’s taxonomy – application. After students have demonstrated their understanding of the properties of functions in different representations, students are then ready to begin to evaluate functions.

 The third sub-unit deals with evaluating functions. In the previous two sub-units, the students learned different properties of functional representations. As a result, students begin to look at more complex real-world scenarios that can be modeled by the slope-intercept form of a linear function. Most students are unfamiliar with slope-intercept form in seventh and eighth grade and therefore time should be spent solely on understanding the equation and gradually progressing to more complex tasks (therefore, it is suggested the outcomes are followed in the sequence presented). After students understand the equation, students can begin to represent simple real-world scenarios with linear equations. If students can apply the formula in these abstract settings, then students most likely have a strong understanding of the conceptual meaning. Students then can identify properties of the linear function in relation to the real-world scenario. Being able to decontextualize the mathematics from the scenario and then contextualize the mathematical solution to answer the scenario’s question demonstrates a high level of cognitive ability on the students. Higher levels of cognitive operations (such as evaluating) come into play for the first time this unit in the last learning outcome in which students must differentiate between linear and non-linear functions. Note, the focus should be on linear functions currently but recognizing that some scenarios are not represented with a linear function are important concepts before moving onto the last sub-unit.

 The last sub-unit addresses how to model with functions. In the previous sub-unit, students learned how to represent real-life situations with linear equations, which typically deals with creating a function that produces the provided/gathered data about the scenario. Completing the previous sub-unit prior to the modeling sub-unit is important because students need the practice of working with equations to provide the desired function. Modeling is more open-ended and less definitive, more abstract, and thus more complex (evaluating and creating) than the previous sub-unit. Students must have all of the concrete prior knowledge before they are capable of being more abstract and open-ended with their work of functions. The outcomes in the last sub-unit can be addressed in any order since many of them can be used in conjunction with other outcomes. Note the last learning outcome, while only stating that students create their own model and use it to answer questions, actually requires a culmination of all previous addressed skills and abilities such as evaluating the accuracy of their model, sketching a graph, using multiple representations, and understanding properties. If students do not master all the previously addressed outcomes, they will struggle in their ability to fully address the final outcome. The final outcome is put last to act as the final and overarching theme of functions and why they are important – keeping the focus on real-world scenarios and their applicability to students’ everyday lives.