**Goals of activity**: Teachers will be bringing student work from a formative assessment task they created in the September workshop. There are four main goals to this activity:. Teachers will:

* Notice and interpret students’ thinking through the lens of SMP; we will model and suggest that it is important to be open to many ideas when interpreting students’ thinking (e.g. the student *could have been* thinking… rather than the student *was* thinking).
* Analyze student work for student thinking through the lens of SMP to gain information about how students understand the math of the concept progression created by teachers in the last workshop (I.e. *so that teachers can understand how students’ understanding of this concept may develop*.)
* Determine how well their task elicited information about student understanding (think about the cognitive complexity of the task, how well it assessed and aligned with the standards, and whether or not it provided *new information that provided teachers with sufficient information to inform instruction*).
* Determine SMP that students need to work on and create new tasks (like Number Talks) that can be practiced before the next workshop.

**Mathematical/SMP goal**: Use SMP as a lens to thinking about student learning. Model teaching of SMP (or teaching of content using SMP 6: Attend to Precision). Have teachers create short tasks related to the SMP they noticed students were missing and practice using them with students. They should reflect on their students’ change in awareness and use of this SMP.

**Pedagogical Content Knowledge**: The overarching goals of this activity are to:

* Use FA tasks and student work on the tasks to help teachers understand how students develop an understanding of a concept.
* Think about and use the principles of how students learn: students’ and teachers’ use of students’ prior knowledge consists of both understanding the mathematical ideas the student brings to the lesson and the learning strategies (SMP) students bring.
* PCK consists of the ways teachers connect students’ prior mathematical knowledge and the learning targets.

**Process:**

1. Discuss within your PLC:
   1. Review the concept(s) you were targeting when developing this formative assessment question.
   2. Where did the concept(s) fit in your Concept Progression?
2. Examine Student Work: Protocol:
   1. Choose 10 students’ work randomly (and only one problem if your FA had many) Label each student’s work with A, B, C,…J
   2. Each person ***individually*** examines each piece of work and records a hypothesis of what students could have been thinking and what ***evidence*** you have for your hypothesis.
3. As a PLC:
   1. Compare, discuss and sort into piles of similar student thinking. Describe each pile.
   2. Look through other student work and see if they all fit in the piles as described or if there are ideas that did not arise in the first ten papers.
   3. Refine your piles and descriptions of your piles.
4. Inferences: What ideas arise from the student work?
   1. What type of thinking is needed for students to be able to determine when equations are equivalent and justify it mathematically? (From the example) They need to:
   2. Know the meaning of equivalent equations and be able to use this to justify,
   3. Distinguish equivalent equations from equivalent expressions,
   4. Understand what an equation is,
   5. Understand and articulate precisely what operations on equations will maintain equivalence.
5. Describe several inferences you can make about what students need to learn. That is, what concepts and procedures should be targeted based on students’ current conceptions? Are these on your Concept Progression? How are the ideas related to your Concept Progression?
6. Evaluate your task:
   1. How well did your task elicit information about student understanding?
   2. What was the cognitive complexity of the task? How did the cognitive complexity relate to SMP?
   3. How well did it align with the standards?
   4. Did it provide new information that gave you new insight to inform instruction?
7. Reflect on the process: In what ways did this process allow you to re-think your teaching of this particular idea?

An Example Problem from Algebra Concepts Exam 1:

1. Which of the following equations are equivalent to , when none of the variables represents zero? Justify.

a)  Yes No Justification:

b)  Yes No Justification:

c)  Yes No Justification:

d)  Yes No Justification:

Worksheet:

