

Principles to Action

- **Clear Mathematical Goals for Student Learning**
- **Coherent Activities and Problems Aligned With Mathematical Goals**
- **Assess and Advance Student Understanding**
- **Allow Productive Struggle**
- **Facilitate Discourse To Foster Conceptual Understanding and Procedural Fluency**
- **Use Mathematical Representations to Support Learning**
- **Use Evidence of Student Thinking to Modify and Improve Instruction**

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.



- **What would your learning objective be that would allow you to use this activity?**
- **What previous knowledge do students need in order to complete this task?**
- **What questions would you ask students during the activity to help them make progress?**
- **What would you have students do after completing the task?**

Strength in Numbers: Collaborative Learning in Secondary Mathematics, Ilana Seidel Horn, NCTM, 2012

Strength In Numbers: Selecting And Setting Up A Task

- Mathematical Goals
- Prior Knowledge, Knowledge Needed, What Questions
- Ways To Solve (Student Eays)?
- What Misconceptions? What Errors?
- Expectations: Resources/Tools, Classroom Structure, Recording/Reporting
- Access to *ALL*, Ensuring Understanding

Strength In Numbers: Supporting Students' Exploration

Questions to:

- Get Started/Make Progress
- Focus Thinking on Key Mathematical Ideas
- Access Student Understanding Mathematical Ideas
- Advance Understanding of Mathematical Ideas
- Encourage All Students to Share Thinking With Others or to Assess Their Understanding of Their Peers Ideas

- How will you ensure students remain engaged?
- What assistance will you give or what questions will you ask frustrated groups?
- What will you do if a group finished immediately? How will you extend the task?

- What will you do if a student/group focuses on nonmathematical aspects of the task?

Strength In Numbers: Sharing and Discussing the Task

- How will you orchestrate classroom discussion?
- What solution paths will be shared? What order? Why?
- How will this help with the goals of the lesson?

What specific questions will you ask so that students will:

- make sense of the mathematical ideas?
- expand on, debate and question the solutions being shared?

What specific questions will you ask so that students will:

- make connections among the different strategies that are presented?
 - look for patterns?
 - begin to form generalizations?
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- How will you ensure all students have the opportunity to share their reasoning and thinking?