

Module 2  
Participant Guide

Focus on Content Standards

## Section 5

# Connecticut Core Standards for Mathematics



Grades K-5

*Systems of Professional Learning*

### **Connecticut Core Standards Systems of Professional Learning**

The material in this guide was developed by Public Consulting Group in collaboration with staff from the Connecticut State Department of Education and the RESC Alliance. The development team would like to specifically thank Ellen Cohn, Charlene Tate Nichols, and Jennifer Webb from the Connecticut State Department of Education; Leslie Abbatiello from ACES; and Robb Geier, Elizabeth O'Toole, and Cheryl Liebling from Public Consulting Group.

The Systems of Professional Learning project includes a series of professional learning experiences for Connecticut Core Standards District Coaches in English Language Arts, Mathematics, Humanities, Science, Technology, Engineering, Mathematics (STEM), and Student/Educator Support Staff (SESS).

Participants will have continued support for the implementation of the new standards through virtual networking opportunities and online resources to support the training of educators throughout the state of Connecticut.

Instrumental in the design and development of the Systems of Professional Learning materials from PCG were: Sharon DeCarlo, Debra Berlin, Jennifer McGregor, Judy Buck, Michelle Wade, Nora Kelley, Diane Stump, and Melissa Pierce.

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Section 5

## Section 5: Supporting Change

### Video Observation Sheets

**Instructions:** As you watch the videos look for the instructional shifts required by the CCS-Math Content Standards (focus, coherence, and the three aspects of rigor) and reviewed during Module 2 as well as students exhibiting the Standards for Mathematical Practice (focus of Module 1). The video can be found here: <https://www.teachingchannel.org/videos/skip-counting-with-kindergarteners>.

#### KINDERGARTEN VIDEO: SKIP COUNTING WITH COUNTING COLLECTIONS

Did you see evidence of the following and if so, what was the teacher doing and what were the students doing?

Element	Evidence
Development of Conceptual Understanding	
Development of Procedural Skill and Fluency	
Students Working through Tasks that Require the Application of Mathematics	
Use of Cognitively Rigorous Tasks	
Development of the Practice Standards	
Additional Instructional Strategies Used by the Teacher:	

**GRADE 5 VIDEO: WHAT FRACTION OF THE SHAPE IS RED**

The video can be found here: <https://www.teachingchannel.org/videos/teaching-fractions>.

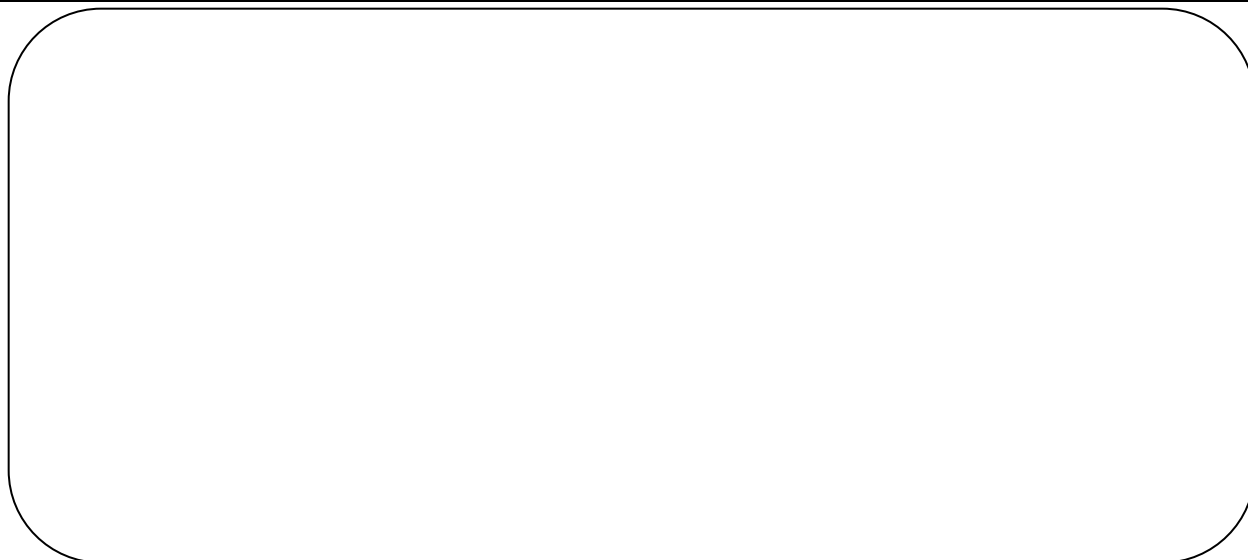
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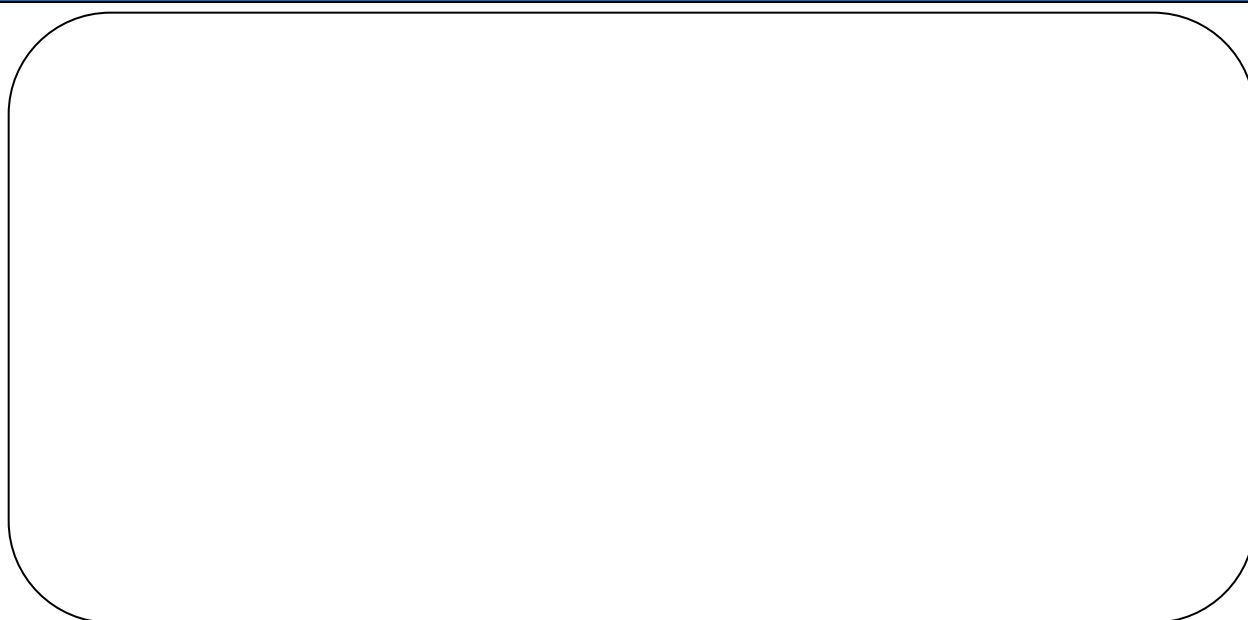
## A New Spin on Old Strategies

**Instructions:** Use the space below to make notes on important points/ideas that you want to bring back to teachers at your school.

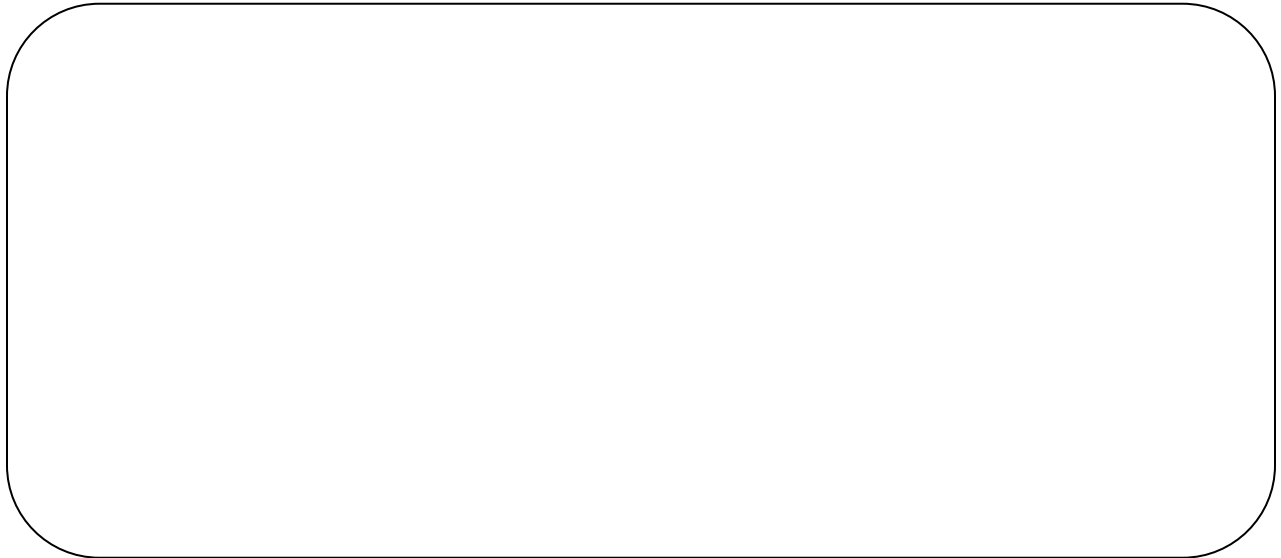
### Group 1: Math Journals



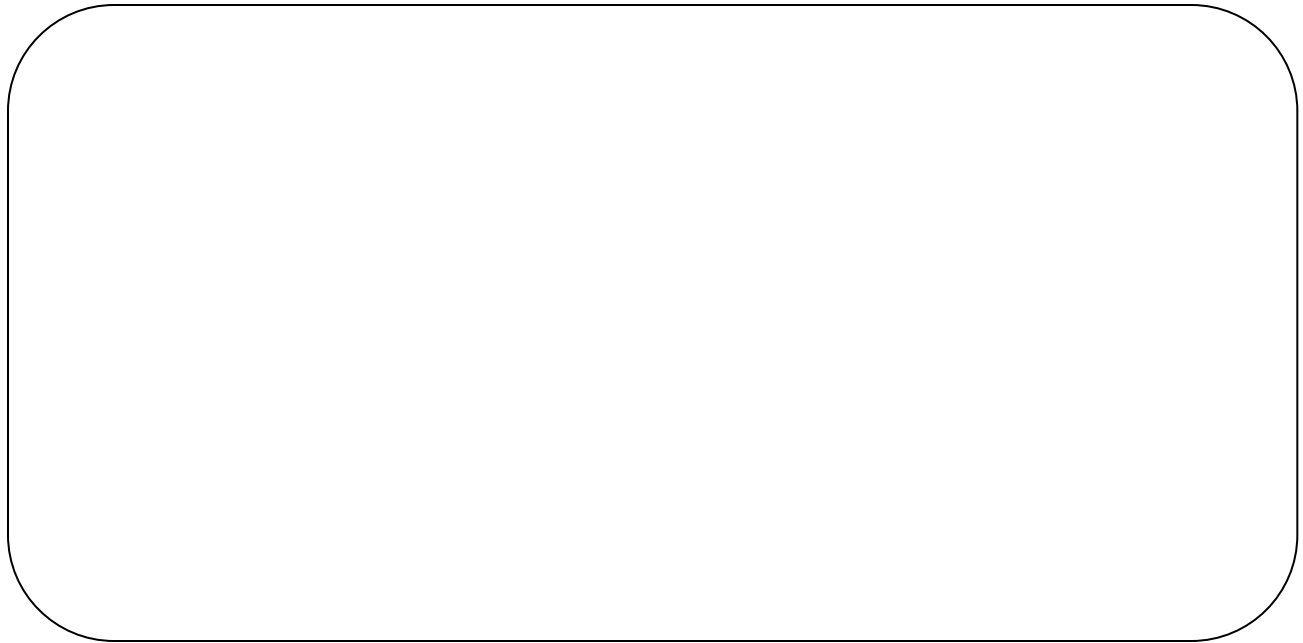
### Group 2: Mathematical Language



**Group 3: Engagement Strategies**



**Group 4: Group Work & Decision Making**



## Group 1: Math Journals

Math journals have been a staple in many mathematics classrooms over the years. Journals have been used to record notes, to complete homework, to answer writing prompts, and so forth. Today, however, math journals are taking on a slightly different role in the Common Core classroom. As students work to deepen their understanding of the mathematics content, teachers are working to help students develop the Math Practices. A student’s math journal, or problem solving notebook as they are known by many, are playing a key role in Content and Practice Standards development.

### MATH JOURNAL FAQs

- **How can math journals be used to promote mathematical understanding and help meet the goals of the Common Core Standards?** Part of students developing deep understandings in mathematics is being able to articulate their mathematical thinking and understanding. Math journals can be used to provide students with the opportunity to practice organizing their thoughts, to test out solution strategies, to use mathematics vocabulary, to clarify and reflect on their learning, to solve rich math problems, and so forth. When students are presented with a rich problem they can record their solution, along with the strategy and thought processes used to arrive at the solution. Math journals can also be a place for students to write about their learning. They can answer questions about what they already know about a topic before a lesson or unit is started and/or what they know about the topic at the end of the lesson or unit. A combination of prompts and problems can be used to develop a clearer picture of what students understand and are able to do.
- **What can I expect from my students as I introduce math journals?** Initially students will need extra support and guidance when learning how to record their thinking. You can expect students, especially young students, to use drawings and pictures to help support their thinking. It is important to note here that the use of pictures and/or multiple representations can continue to support students thinking, and help them to make connections, even after students are able to better articulate their thinking in words, so their use should be strongly encouraged. Provide several models for students to examine, complete journal entries together in large and small groups, and make sure to stress the importance of developing complete solutions (solutions that include words, pictures, charts, or graphs, and an explanation of thinking) versus one ‘right’ way to solve the problem even though students may, at first, be looking for the ‘right’ way. Encourage students to develop solutions that make sense to them even if the person next to them is doing something different. This may be difficult for students at first, but over time students will become more comfortable with the idea of creating multiple solutions over time.
- **What makes a good journal prompt or problem?** Good journal prompts and problems are no different from other problems and/or prompts that students are asked to complete. These problems and/or prompts:
  - Allow for multiple entry points into the mathematics and recording techniques. These multiple entry points build differentiation into the discussion and tasks.



- Provide the opportunity for students to learn by answering the questions and for the teacher to learn about the student by examining their responses.
- Have more than one solution or a variety of possible solution paths that range from simple to complex and require more than just remembering a fact or reproducing a skill.
- Provide opportunities for students to represent their mathematical ideas using models and written language.
- Provide opportunities for students to justify their reasoning and evaluate the reasoning of others.
- Have clear, concise directions.
- Provide opportunities for group work and discussions.
- **How do I get started?** First, decide what type of notebook you want students to use for their journal. It is suggested that students use a notebook that pages cannot easily be removed from and are durable so that pages stay in place throughout the year. Then, determine what information you want all students to have on the first few pages of their journal. It is a good idea to have either a rubric or general expectations for journal entries that students can use as guidelines when completing their work. For example:
  - Try new ideas.
  - Use pictures, words, and math symbols.
  - Tell what you did and why (or, explain your thinking).
  - Don't erase. (This is important because you want to see how students thinking has changed over the course of solving a problem. You may ask older students to write in pen.)
  - Put the date on every entry.
  - Write down your questions.
  - Check your work.
  - Don't give up!
- Determine how often you will send the journals home. Sending journals home once a month or so is a good way for parents to see a record of their students' work and growth over time.

#### ADDITIONAL TIPS:

- Revisit problems that were particularly challenging for students and challenge them to think of another way to solve the problem now that they know more.
- Have students go back to questions they wrote in their journal about things they were unsure of and see if they can answer them on their own at a later date.
- Have students reflect on earlier entries and tell how their thinking about a topic or concept has changed.

- Use students' journals to show mastery/non-mastery of concepts.
- Provide students' notebooks to the teacher at the next grade level whenever possible so that students' have the resource for the next school year.

### RESOURCE: K–5 MATH TEACHING RESOURCES

- <http://www.k-5mathteachingresources.com/math-journals.html>
- Additional Resources: Strategies to Support Math Recording  
<http://www.k-5mathteachingresources.com/math-recording.html>

## Group 2: Mathematical Language

### CONCEPT CARD: MODIFIED FRAYER MODEL

#### Description

The Frayer Model was developed by Dorothy Frayer and her colleagues at the University of Wisconsin. This model is used to help students graphically represent new concepts and/or terms.

#### New Spin

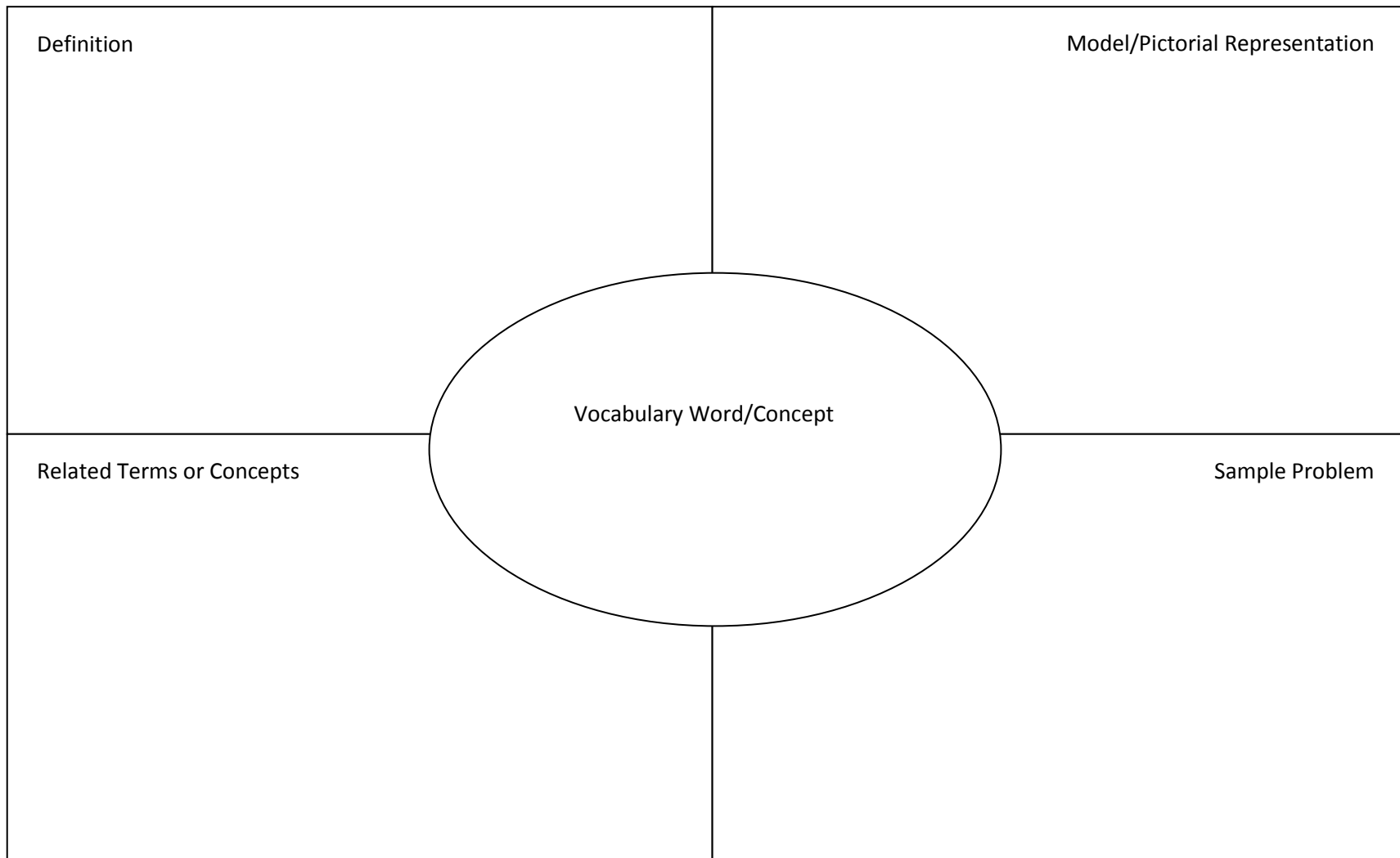
The traditional Frayer Model has students provide a definition, characteristics, examples, and non-examples of the term or concept. To help students make connections between terms and concepts and to learn through models and multiple representations, the *new spin* on the Frayer Model asks students to provide a definition, a model or pictorial representation, identify related terms and/or concepts, and to use the term or concept in a mathematics problem. Teachers may choose to customize the Frayer Model further by adding back in the non-examples when appropriate as well.

#### Promoting Student Learning

The modified Frayer Model promotes student learning by:

- Activating prior knowledge.
- Helps students clarify and communicate their understanding.
- Allows students to fill in the information with ideas, examples, etc. that make sense to them.
- Can be used as part of a Word Wall or in journals and used as reference for students as they work.
- Can be used as formative assessments.
- Can be completed at the beginning, during, or at the end of a lesson or unit.
- Should be shared as part of small and large group discussions so that students can add to what they have already written.

CONCEPT CARD: MODIFIED FRAYER MODEL



## Group 3: Fluency

### Developing Fluency with Any Operation

The following activities can be turned in to 5-minute lessons to move students towards fluency once a concept has been taught.

For additional ideas, please visit: <http://www2.carrollk12.org/instruction/elemcurric/math/tbasicfacts.HTM>.

Activities	Description
<b>Story Problems</b>	Have students use mental math to solve story problems that include basic facts. During the discussion of mental solution methods, the teacher should record strategies and challenge students to try strategies others have developed/shared.
<b>Closed Sorts of Math Facts</b>	(Sort by ONE Strategy) In small groups or as a class, present a collection of carefully pre-selected math fact cards and sort by whether a particular strategy (for example: doubles) may be useful to solve each fact or not. Discuss not only the facts that lend themselves to that particular strategy and why, but also why the other facts may <u>not</u> lend themselves to that strategy.
<b>Open Sorts of Math Facts</b>	(Student-directed sorting and reasoning) In pairs or small groups, present a collection of pre-selected math fact cards and students will sort into two or more groups based on their own strategies and reasoning. Sorts will vary and students will need to explain and defend their sort. Strategy anchor charts (mentioned in Classroom Conversations) would be helpful during this activity to serve as a resource.
<b>Flash Math</b>	Using a digital or overhead projector, flash a quantity of counters for just a few seconds (not long enough for students to point and count) and then cover or turn off. Ask students how many counters they think there were in all and to explain their strategy.
<b>If You Didn't Know</b>	Pose the following task to the group: If you did not know the answer to $8+5$ (or any fact you want students to think about) what are some really good ways you can use to get the answer? Explain that “really good” means that you don’t have to count and you can do it in your head. Encourage students to use think-pair-share and to generate more than one “really good” way.
<b>Near-Double or Helping Fact Match</b>	In small groups or as a class, present a collection of carefully pre-selected math fact cards, and students will match the double fact that helps you find the near-double. For example with addition, students should match $7+7$ with $7+8$ and explain how the double helps find the near-double. With multiplication, students should match $8 \times 2$ with $8 \times 3$ and explain how knowing double eights helps you figure out three eights.

### Number Talks

A Number Talk is a 5–10 minute review that takes place at the beginning of each mathematics lesson. During this time, the teacher acts as a recorder and facilitator and the students provide answers and identify their own mistakes.

#### How to Implement a Number Talk:

1. Have students either sit or stand in a large group in front of the teacher.
2. Orally present students with a computation problem. If you need to write the problem on the board, write it horizontally so that there is no suggestion of an algorithm.
3. Students work quietly on their own without the use of pencil or paper and are asked to give a thumbs up when they think they have the answer.
4. The teacher asks for four or five students to provide their answers and an explanation of how they got the answer. The teacher simply records what the students say on the board. While recording, the teacher does not give any indication of whether an answer is right or wrong, the answer and procedure is simply recorded.
5. After the answers and procedures used are written on the board, have students first talk with a partner and then as a large group about which answer they think is correct and why. Then have them work with partners to identify the mistakes made. Practice this type of talk with students so that they point out mistakes in the procedure and are not directing any negativity towards the student whom provided the wrong answer. To make this a low risk activity when first starting out, quietly ask one student to give a wrong answer on purpose so that students have the opportunity to practice identifying mistakes and suggesting corrections.

## Group 4: Group Work and Decision Making

### Helping Students Work in Groups

Teaching mathematics through the CCS provides opportunities for students to work with challenging mathematics tasks in different collaborative configurations: individually, in pairs, in small groups, and as a whole class. Each of the work arrangements can enhance student learning by providing opportunities to discuss the mathematics, to see other approaches to a problem, and to personalize the understanding for each student. The following are suggestions for making time spent in each work configuration beneficial to both the teacher and the students.

### Large Group/Whole Class Work

At the beginning of the lesson:

- Pose the problem to students and as a large group determine what the problem is asking and have students in their own words explain what the problem is about.
- Have students brainstorm and chart for everyone a list of possible methods and/or tools that may be useful in solving the problem based on prior problem solving experiences.

At the end of the lesson:

- Allow students to present their work and talk through how they solved the problem(s).
- Make sure that different strategies are presented and help students to see the mathematical connections between each strategy.
- Focus students attention on the strategies used, not on the students presenting the strategy.
- Have students summarize the lesson from their point of view and fill in any gaps and call attention to new vocabulary used if students do not do this specifically.

**Tip:** Create rituals/routines for what is expected during whole class instruction so that students are able to focus their thinking. For example, if during the end of lesson whole group time you want students to ask questions of the student presenters, provide a list of question starters to students that they can use as a scaffold for creating their question.

### Small Group/Pair Work

Working in small groups and/or in pairs allows students to work on challenging problems in a safe environment. However, there must be a balance between group work and individual accountability for learning.

Create guidelines that students will use every time they work collaboratively, such as:

- Move into your groups quickly.

- Allow each person to present their initial ideas about the problem before starting to work the problem out together.
- Don't interrupt a peer's presentation.
- If you are unsure or confused about something that is said, ask for clarification.
- Assign a number to each person in the group and then roll a number cube and have that person present the group's work to the rest of the class. Other members of the group are free to assist in the presentation but the person who's number is called is the main presenter.
- Ask questions of each group member during the presentation.
- Remember that mistakes are part of the foundation of learning. We learn from our mistakes in the real world and we can learn from our mathematical mistakes as well.

### Helping Students Make Decisions

When working alone or in large or small groups, students will come to a point in the lesson where they will have to make a decision about what to do to get started or what to do next. This is not always an easy step to take, especially for young students. Help students learn how to make decisions by doing the following:

- **Use Agreement Statements.** When someone presents an idea, students may choose to agree or disagree with a statement or to state that they need more information. In addition, they are asked to describe their thinking about why they agree, disagree, or are unsure. As a group students can describe what they can do to investigate the statement by testing their ideas, examining what is already known, or using other means of mathematical inquiry.
- **Use Agreement Circles.** *Agreement Circles* provide a kinesthetic way to activate thinking and engage students in discussing and defending their mathematical ideas. Students stand in a large circle as the teacher reads a statement. The students who agree with the statement step to the center of the circle. Those who disagree remain standing on the outside of the circle. Those in the inner circle face their peers still standing around the outside circle and then divide themselves into small groups of students who agree and disagree. The small groups then engage in discussion to defend their thinking. This is repeated with several rounds of statements relating to the same topic, each time with students starting by standing around the large circle.
- **When making generalizations make a determination of Always, Sometimes, or Never True.** *Always, Sometimes, or Never True* involves a set of statements that students examine and decide if they are always true, sometimes true, or never true. This strategy is useful in revealing whether students over-generalize or under-generalize a mathematical concept. In addition, they are asked to provide a justification for their answer.
- **Have students look back.** If unsure of what steps to take when solving a problem, have students look back at what they have learned over a given instructional period of time. Students recount



specific examples of things they know now that they didn't know before and describe how they learned them. This strategy provides students with an opportunity to look back on and summarize their learning. Asking students "how they learned it" helps them think about their own learning and the different ways, as learners, they are able to integrate new mathematical understandings.

(Keely & Tobey, 2011)

### Next Steps

**Instructions:** Review your work during Module 2 and generate a list of implementation steps you would like to do, think you can do, challenges you might face, and ways to work around the challenges. Be prepared to share with the group.

What do you think should be the next steps at your school to promote implementation of CCS-M?

What can teachers do now in to promote implementation of CCS-M?

What are some expected challenges?

How can you work around and through the challenges?