The purpose of the 2017 Mathematics SOL Institutes is to provide teachers with professional development focused on the instruction that supports implementation of the 2016 *Mathematics Standards of Learning*.

[**2016 Mathematics Standards of Learning Resources**](http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/2016/index.shtml)

* **2016 Standards of Learning**
* **2016 Curriculum Frameworks**
* **Crosswalks (Summary of Revisions 2009-2016)**
* **Summary of Revisions (Narrated PPT 2009-2016)**

**Professional Development Instructions**

A product of the 2017 Mathematics Institutes is a set of online professional development modules designed to be used by a group of teachers of a specific grade level or course, facilitated by a member of the team. Modifications could be made to adapt the professional development for more than one grade level/course or for large groups. Facilitators should review the PowerPoint, the Facilitator Guide, and the resources prior to facilitating this professional development.

| **Approximate Time**  | **Facilitator Instructions**  | **Links to Materials** |
| --- | --- | --- |
| **45 minutes total** | **Module 1: New 2016 Standards of Learning** **Essential Question: What are the new 2016 Standards of Learning and how might the VDOE documents support understanding of these standards?** | * [Grade Band K-2 Session PowerPoint](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/k-2-institute-2017-session.pptx)
* 2009 to 2016 Crosswalks (Summary of Revisions)
* [Kindergarten](http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/2016/crosswalk/gradek_crosswalk.pdf)
* [Grade 1](http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/2016/crosswalk/grade1_crosswalk.pdf)
* [Grade 2](http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/2016/crosswalk/grade2_crosswalk.pdf)
* [Scavenger Hunt](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/k-2scav-hunt.docx)
* [Scavenger Hunt Key](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/k-2scav-hunt-key.docx)
* [Unpacking Template](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/k-2-unpacking-template.docx)
* [SOL 1.8 Curriculum Framework Page](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/k-2unpack-1.8CF.docx)
* Narrated Crosswalk Presentations
* [Kindergarten](http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/2016/crosswalk/gradek-sol-2016.pptx)
* [Grade 1](http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/2016/crosswalk/grade1-sol-2016.pptx)
* [Grade 2](http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/2016/crosswalk/grade2_sol_2016.pptx)
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|  | Agenda of the entire Grade Band K-2 Session. (Slides 1-2)1. Revisions to Standards and Purpose (Slides 3-7)
* It is important to note that with the 2016 standards revision the mathematical process goals are still driving mathematical understanding. Students will learn the math content through the process goals of problem solving, connections, communication, representations, and reasoning.
* We will be looking at the *Principles to Actions: Ensuring Mathematical Success for All* by NCTM. Consider how these principles are connected to one another and the importance of these for high leverage mathematics teaching practices. We will consider these in each of the following modules.
	+ Turn and Talk: What do these principles mean to you?
* Format changes to be aware of are listed here in the PowerPoint. With your group, find examples of each of these changes in the documents.
1. The Crosswalk document summarizes the revisions made to each grade level. (Slides 8-12)

Play the VDOE Narrated Crosswalk presentation sample slides 10-12. Note: Narrated Crosswalk PPTs are available for each grade level K-8, Algebra I, Geometry, and Algebra II.1. Scavenger Hunt (Slides 13-14)
* With a partner, use the crosswalk documents to help you complete the scavenger hunt. Following a brief time, pass out the answer key. When you are finished, compare your answers to the answer key. What did you notice? What stood out to you as you looked at the crosswalk documents? Have participants share what they noticed. (You may hear ideas such as more developmental, better progression/alignment – example of fluency, etc.)
1. Unpacking a Standard (Slides 15-20)
* Unpacking standards is especially important to understand the new standards. Using the unpacking template provided (or the unpacking template your district uses), with your group unpack SOL 1.8.
* It may be helpful to complete the first two columns of the unpacking template whole group. Ask the group, what will you need to be mindful of in thinking about standard 1.8? Ideas might include – limited to like coins, etc.
* After groups have had a chance to complete the unpacking of SOL 1.8, discuss common misconceptions whole group. Common responses might include: value (worth) definition; size does not correlate to value of each coin; counting by 25s not part of SOL for grade level – students working on using five and ten as a benchmark, unitizing – understanding the dime represents ten cents.
1. Debriefing Module 1 – Have participants stand, make eye contact with someone across the room and share their favorite part of the new standards thus far.
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| **Approximate Time**  | **Facilitator Instructions**  | **Links to Materials** |
| --- | --- | --- |
| **225 minutes total**(45 minute content specific modules) | **Module 2: Emphasis on Specific Content****Essential Question:** * **What standards are new and may be most challenging for students to learn and/or teachers to teach?**
* **What instructional implications do these changes present?**
* **What instructional strategies and activities will assist in teaching and learning this content?**
* **What assessment implications do these changes present?**
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| **45 minutes** | **Part 2a: Composing and Decomposing Numbers****Essential Question: What instructional strategies promote students’ flexibility with numbers?**  | * [SOL Progression - K.4, 1.7, 2.5](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/progression-K.4-1.7-2.5.pdf)
* [Vocabulary Matching Cards](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/k-2vocab-cards.docx)

Manipulatives:* collection of string of beads (bracelets of 10, bracelets of 20, string of 100)
* beaded number racks
* dot cards
* five and ten frames
* other manipulatives for exploration
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|  | 1. Recap (Slide 21-22): Some of the most significant changes in 2016 K-2 Standards include decomposing and composing whole numbers, conceptual understanding of fractions, and computational fluency.
2. Principles to Action (Slides 23 - 24): As we work through this section of the module, we will focus on principle #6: Build procedural fluency from conceptual understanding. What does this principle mean to you? Computational Fluency has been defined for in the 2016 Standards and Curriculum Framework documents and included here in the PowerPoint. Please consider with your team what this might look like at your grade level.
3. Vertical Progression of Computational Fluency (Slide 25): Please review the progression documents for K.4, 1.7, 2.5 and consider the following questions.
* What do students need to know?
* How do these standards connect?
* How does the progression of these standards build number sense?

 4) Number as a Quantity (Slides 26-27): In small group, please use the matching vocabulary set to help you define keywords related to the understanding of numbers. * Talk with a shoulder partner about any ideas or words that stood out to you.
* As a whole group ask: What did you notice? What did you talk about? (As the facilitator, be prepared to model any terms that the participants may not be familiar.)

5) Tools to Support Understanding Parts of Numbers (Slide 28): Have on your participant tables a collection of string of beads (bracelets of 10, bracelets of 20, string of 100), beaded number racks, dot cards, five frames and ten frames, and manipulatives for exploration. There are many tools that will help students develop their flexibility with numbers. You will want to use these strategies and tools including: finger patterns, string of beads, beaded number rack, dot cards, and five & ten frames. Which of these do you already have in your building? What might you want to explore more? **Finger Patterns (Slide 29)**Your hands are an important tool in building early number sense. The following are suggested activities for utilizing finger patterns. Your hands will need to be free.* Using one hand, show me three. Can you show me five? Can you show me two? (With this, we are looking for the ability for students to ‘flash it’ – do they have an understanding of that number? – do they have to count? We are looking for the flashing versus the counting.)
* Using both hands- show me six, show me six a different way. Turn to your neighbor did they do it a different way? Can you show me six another way?
* Put both hands on your head – can you show me eight? Can you show eight another way (have your students built that mental image)? Can you close your eyes and show me?
* Informal assessments can be conducted here - are students building one by one or are they able to flash it?
* You just showed eight; how could you show 48?
* Bring one group to the front – this group will show us one way to make 48; how can we be sure this is 48? Count – painstakingly count by ones until someone suggests you could count by fives or tens. This will show the purpose and value of skip counting; it allows you to count faster (more efficiently).
* The group was able to show the oneness and the ten-ness at the same time.
* Other questions to ask: What is the greatest number you can make alone? With a partner? With your group? In our class? School?
* These strategies help build stronger base ten understanding.

**String of Beads (Slide 30)*** Have small group discussion about what is noticed about the string of beads: some are utilizing the benchmarks of five and some benchmarks of ten.
* Start position is that all beads start on the right and moved to left to show number. When utilizing bead bracelets, beads start at the bottom.
* With the bracelets, show 7. How did you make 7? Is there another way? (Looking for counting by ones or was a five moved first and then 2 more.)
* Work together at your table – show 27; have groups share how they showed it - can someone show it in fewer pushes? Is there a faster way to show that? A bigger push (i.e., push 30 and remove 3)?
* String of beads can also be an effective tool for developing an understanding of ten more, ten less. Ask: you have 27, show ten less, how did you do that? How did you know to do that?
* Who thought about it differently? Be sure to validate all responses similarly. This is working to help students develop flexibility; students need a safe place to practice and build computation flexibility with numbers.

**Beaded Number Rack (Slide 31)** * What do you notice about the way the number rack is built compared to the beaded string? How is it the same? This is still broken into fives – five red, five white and same on the bottom. Ensure that students start with numbers to the right – students will show numbers on the left.
* Show me five. If you did it this way (four on the top, one on the bottom), give your board a little shake so I can see it. How did you pull your four over? How did you know to leave one behind? (I know four and one is five)
* Who did it a different way? Did anybody build five a different way?
* Repeat with different numbers.
* Another number sense building game is ‘Guess my Way’ (build the number eight, but hide your rack). Say: I am building the number eight. What way do you think I’m building eight? Hold up your board when you have one way to make eight. Have participants say how they built eight, if it does not match your hidden way say, “Yes, that’s one way to build eight but not my way.”
* Doubles/doubles +one can also be modeled and discussed here.
* Suggestion: If making your own number racks, pipe cleaners are useful as they do not allow the beads to slide when students move their boards.

**Dot Images (Slides 32-46)*** *Dot images* are great for working on subitizing numbers. You can create cards that are made with one color or use 2 colors to show the parts of a number.
* When looking at dot images quickly, you are going to have to say how many you see and how you see it.
* Flash a dot image. Ask: How did you see that? Anybody see it a different way?
* You may start recording how students see the different combinations. For kindergarten, write 4 and 1 (the addition symbol is not used in kindergarten).
* REPEAT with other slides/dot images.
* If this is a new activity, it is helpful to just show the image and talk about how students know how many and how they saw it – some modeling initially.
* *Dot plates* – create different dot patterns on paper plates.
* Dot plate dance – play music, music stops, flash your new partner, how many? Trade cards – music plays, repeat.
* Leave dot plates out as a center.
* *Subitizing War* – Have a collection of dot cards in a pile for each partner. Each partner flips over a card, if you have the largest amount you get to take the card. Continue to play until all cards are used. (You can change the rules to take the smallest amount.)

**Five and Ten Frames (Slide 46-47)** * Using a *magnetic frame set*, model how to use five and ten frames. To start show three dots in a five frame. Ask: How many dots do you see? How did you see it? How do you know there are three dots? (Make sure there is a discussion about the relationship to five.) In a ten frame, put eight dots. How many dots do you see? How did you see it? (Make sure there is a discussion about the relationship to 10.)
* Being intentional in your number display can encourage identification or usage of certain relationships. For instance, flashing nine with five and four, you might make the fifth dot on top a different color, assisting kids in seeing the 4 + 4 double and one more.
* Practicing the recording of what is seen will allow for students to see the different combinations.
* For the game: *Make Tens Go Fish* – have a collection of mini ten frame cards for students. Each student is given 5 cards; extras go in a pile in between them. They will ask each other for a number that when added to their card will total 10. If I have a 4, what number am I asking for? (Make Ten Go Fish cards can be found online at numerous websites.)

As time allows, provide opportunity for participants to play Make Ten Go Fish, Dot War, and Dot Plate Flash or build numbers using tools you have provided on the tables. 6) Reflection (Slide 47-48): How will these activities help to support computational fluency?  |
| **45 minutes** | **Part 2b: Computation - Problem Types****Essential Question: What instructional strategies promote students’ understanding of problem solving using various problem types?** | * [Problem Type -Connie and Juan for Sequencing](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/k-2prob-type-CJ-seq.docx)
* [Problem Types -Connie and Juan Key](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/k-2prob-type-CJ-key.docx)
* [Problem Types Graphic Organizer](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/k-2prob-type-org.docx)
* [Problem Types for Poster](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/k-2prob-type-poster.docx)
* [SOL Progression - K.6, 1.6, 2.6](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/progression-K.6-1.6-2.6.pdf)
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|  | 1. (Slides 49-50) As an opening to this section, pass out two index cards to each participant. On the index cards, have each participant write two story problems that you might give to your students - one subtraction and one addition.
2. Principles to Action (Slide 51): As we work through this section of the module, we will focus on principle #2: Implement tasks that promote reasoning and problem solving. Please consider with your team what this might look like at your grade level.
3. Solve and Sort (Slides 52-53)
* Provide for each small group a copy of the Connie and Juan problems for sequencing and the problem types graphic organizer.
* Have each group use various manipulatives to set up and solve each problem. Use the graphic organizer to record thinking.
* Once all problems have been solved within the small group, discuss how these problems could be sorted.

After the participants have had time to solve and sort the Connie and Juan problems, call out the problems below to create a “wall poster” of the various problem types. (Put the problem types for poster in page protectors so that you can write on them with a dry erase marker.) After each problem is read (you can have a participant volunteer to read them as you call out the letters), discuss how the problem was solved, what equation(s) could be used to represent it, and label the problem type. Use the Juan and Connie Key (cheat sheet) for the order of creating the poster.Careful consideration to develop the meaning of the operation for these problems could be enhanced using questions like those below with your team:* What is happening in this problem?
* What number sentence represents how you solved this problem? What *action* did you represent?
* What do we know about this problem?
* What is unknown? How might we represent the unknown here?
* What do you notice about where the answer is in these problems?
* Where is the equal sign? (The equal sign does not always mean the answer is next.)
* Anybody solve it differently? (This may provide an opportunity to highlight how one person used subtraction to solve the problem and another used counting up.)

Use the Problem Types for Poster to reflect on the various types of story problems.* + Which of these problems might be the easiest for students to solve? Why? (Example: Separate and Join problems have more action implied which can be easier to model.)
	+ Which of these problems might be the most difficult? Why? (Example: Part-Part-Whole problems do not represent an explicit action which can be difficult to interpret. The Start Unknown problems are difficult to model directly because there is no beginning quantity to represent.)
	+ Which of these problems are students most likely to see? Why? (Example: Join and Separate problems are very common, particularly the Result Unknown types.)
1. View the video of Dr. Sybilla Beckmann (Slide 54) discussing problem types. (Link is included in PowerPoint.) What does Dr. Beckmann say about using key words for solving word problems? How does this connect with our experience with these problem types?
2. Vertical Progression of Problem Solving (Slide 55): Please review the progression documents for K.6, 1.6, and 2.6.
* What do students need to know?
* How do these standards connect?
* How does the progression of these standards support problem solving?
1. Share the Common Addition and Subtraction Problem Types Chart (Slides 56-58) located within the 2016 Mathematics Standards of Learning Curriculum Framework for kindergarten, first grade, and second grade.
2. Reflection (Slides 59-60): Revisit the story problems that were written. Each participant will take two dot stickers and place on the correct problem type on the poster created earlier.
* What does the data tell us?
* Why do you think this is the case? (Look for trends in the most/least common problem types represented.)
* Why would doing this activity with a group be beneficial?
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| **45 minutes** | **Part 2c: Fractions****Essential Question: What instructional strategies promote students’ understanding of fractions as fair share?**  | * [SOL Progression - K.5, 1.4, 2.4](http://www.doe.virginia.gov/instruction/mathematics/professional_development/institutes/2017/k-2/progression-K.5-1.4-2.4.pdf)
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|  | 1. Principles to Action (Slides 61-62): As we work through this section of the module, we will focus on principle #3: Use and connect mathematical representations. Please consider with your team what this might look like at your grade level.
2. Vertical Progression of Fractional Sense (Slide 63): Please review the progression documents for K.5, 1.4, 2.4.
* What do students need to know?
* How do these standards connect?
* How does the progression of these standards build understanding of fractions?
1. Empson and Levi (Slides 64-66) have done a great deal of research on the development of fraction understanding. Consider the message from Empson and Levi. Discuss the practices currently a part of your classroom that connect with this research.
2. (Slides 67-70) Have blank poster paper hanging around the room with markers below for the groups to use to write. In grade level groups, please solve the problem with the grade level parameters in mind. Have each group label their poster with their grade level.
* Kindergarten: 2 children sharing 6 brownies
* First: 4 children sharing 1 piece of paper
* Second: 4 children sharing 5 sandwiches

 What strategies might a student use to solve this problem? 1. Reflection (Slides 71): How do equal sharing problems support understanding of fractions? How might teachers choose purposeful numbers to promote greater understanding of fractions?
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| **30 minutes total** | **Module 3: Support for Implementation****Essential Questions: In what ways can I support my colleagues in implementation of the 2016 Standards of Learning? What resources are available from VDOE to assist with implementation?**  | * [2016 Mathematics Standards of Learning Documents](http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/2016/index.shtml)
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|  | 1. 2016 Standards of Learning Support Resources (Slide 77)
* Share the VDOE mathematics website listing the new standards, the new curriculum frameworks, the Crosswalk documents, narrated PowerPoints (Summary of Revisions) for each grade level, and location of the materials from these Modules.
1. Implementation Support (Slide78)
* Review the various roles as the new standards are being implemented.
* What has VDOE provided?
* What will individual divisions provide?
1. Implementation timeline (Slide79)
* What does curriculum development mean for the rest of the 2016-2017 school year?
* What does the Crossover Year mean for the 2017-2018 school year?
* What does Full-Implementation Year mean for the 2018-2019 school year?

Closure: What are your next steps in preparing to implement the 2016 Standards of Learning?  |