Topic: Composing and Decomposing 10

Stage 1 - Desired Results

Context:

So far this year, kindergarten mathematicians have done significant work with:

- Numbers to 10
- Counting to 100 by 1s and 10s
- Understanding numbers 11-19 as 10 ones and some ones ● 2d and 3d shapes

- Comparing numbers to 10
- Composing/decomposing numbers and addition and subtraction to 10
- Fluently adding and subtracting within 5

Our two most recent topics have been focused on K.NBT.1 and then K.G.A/B. This lesson sequence aims to extend students' existing understanding of composing and decomposing numbers to the special case called for by K.OA.A.4 -- finding the number that makes 10 when given a number 1-9.

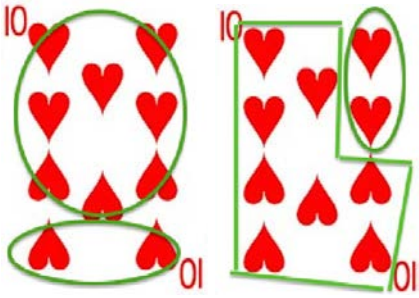
Goals:

- CCSS.MATH.CONTENT.K.OA.A.3 Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).
- CCSS.MATH.CONTENT.K.OA.A.4 For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

Understandings:

- numbers 1-10 can be broken into smaller groups in many different ways
- the count sequence can be used to count individual items as well as groups of items
- we can represent number compositions/decompositions with addition number sentences that are connected to the smaller groups that compose the whole
- finding the number that makes 10 given a number 1-9 is a special composing/decomposing context

Essential Questions:

- When we decompose numbers (ex. 3+4=7), which part of the decomposed set of objects is represented by the 3? the 4? the 7?
- How are decompositions like this the same? How are they different?
-  (both represent 10=2+8)
- If there are only __ groups, how can the total be 7? 8? 9? 10?

Students will know / students will be able to… [LTs]

- Decompose numbers less than or equal to 10 into pairs in more than one way .. and record each decomposition with a drawing or equation
- For any number 1-9, find the number that makes 10 when added to the given number (by using objects or drawings)

Stage 2 - Assessment Evidence

Performance tasks: ● Daily work (decompositions on playing cards with equations) -- multiple small problems to check for understanding	**Other Evidence:** ● ideas surfaced through talk

Stage 3 - Learning Plan

Lesson 1. Decomposing the Number Seven[1]

Lesson Steps	Anticipated Student Responses	T responses, prompts, talk moves; language supports
Introducing (15-20 minutes) 1. Gather students on the carpet. Show students one large copy of a 6 of hearts playing card. As a class, count the hearts. Ask students: "What does the 6 on the top and the bottom of the card tell us?" 2. Ask students: "When you look at these 6 hearts, do you see any little groups inside there? a. If no one volunteers a correct response, volunteer a group that I see: for example,I see 3 hearts here. What else do you see?" 3. Call on a volunteer to come up and circle other groups. Ask student to describe what he or she circled. Then ask other students to repeat first student's description. 4. Note that all of the hearts have been circled. 5. Record a number sentence for what the student saw. Explain how each part of the number sentence relates to the drawing. For example, if the student circled a group of 3 and a group of 3, say: "This is how a mathematician might record these groups. I'm going to write a 3 because it goes with this group (point to group). *Write +3.* [Student] also saw this group of 3 hearts (point to group). How many hearts does that make all together?" When students say 6, write =6 so the number sentence reads 3+3=6. 6. Move this card to the side. Project another blank copy of the 6 of hearts card. Wait at least 10 seconds before calling on a student to draw and describe the groups that he or she sees. Then ask the other students to repeat the description of what their classmate circled. Record a number sentence for this student's thinking at the bottom of the cart. Connect each part of the number sentence back to the groups of hearts on the card. For example: "The number sentence shows a 4. Where do you see four on the card?" 7. Practice counting whole groups as a whole class.		**Clarify and share thoughts.** Wait time, turn and talk, stop and jot, say more, revoicing, tell us more, give an example **Orient to the thinking of others.** Who can repeat? Who can say that again? Who can put it in their own words? Tell us what your friend said?

[1] Based on *Classroom Discussions in Math* (Math Solutions, 2012).

8. Push on the idea of the difference between the number of hearts and the number of groups. For example, if a student draws a group of 2, a group of 2, and a group of 2, say: "I'm confused. If there are only three groups here, how can there be 6 hearts?" Share ideas 9. Discuss what is the same and different between the		
Exploring / Extending (15 minutes) 1. Invite students to go back to their tables with copies of the 7 of hearts card. Invite them to find as many different ways as possible to decompose that number by circling groups and recording their decomposition using a number sentence. 2. Circulate to support students and engage them in productive talk. 3. Extensions include decomposing 8 and decomposing 9.	Some students will be able to decompose by drawing groups, but will need support: ● linking these groups to the total ● using numbers or equation symbols to represent their decomposition I will point these students to appropriate resources, and also ask them to engage with their peers in checking, explaining, or discussing their work at their tables.	**Deepen own thinking.** Why do you think that? How did you get the answer? What is your evidence? Why do you think that worked? Can you prove that? Can you explain step by step?
Summarizing (15 minutes) 1. Invite students to come back to the carpet and share their decompositions with a partner. 2. After everyone has had a chance to share, invite 1-2 students to come up and explain how they decomposed the 7 of hearts, 8 of hearts, or 9 of hearts.		**Orient to the thinking of others.** **Deepen own thinking.** **Engage with reasoning of others**. Do you agree or disagree? What do you think about that? Who can add on? Can you think of a different way? Does anyone have more evidence?

b. Reflect on the lesson you have just planned and note which of the Core Action indicators you think this lesson illustrates particularly well.

c. Tell us anything else you feel is important to know about this lesson that is not captured above or in the lesson plan.

Lesson 2. Decomposing the Number Ten

CCSS.MATH.CONTENT.K.OA.A.3 Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).

Lesson Steps	Anticipated Student Responses	T responses, prompts, talk moves; language supports
Introducing (10 minutes) 1. Remind the students that they worked yesterday on decomposing the 7, 8, or 9 of hearts in many different ways. 2. Present students with two decompositions of the 10		
of hearts card. Both will represent the 10=2+8, but the decompositions will be visually different. 3. Ask a student to describe what they see; ask other students to repeat the first student's description. 4. Ask students what is the same and what is different about the two cards (both show 2+8, but the group of 2 and the group of 8 are in different places). 5. Once students have come to agree (or perhaps disagree) that these decompositions are described by the same equation (or that the quantity of each group is the same even though the two decompositions are visually different), students move into the independent work phase of the lesson to find find as many different possible decompositions of 10 as possible.	Depending on students' developmental levels, I expect that it may be very difficult for some students to accept that two visually different representations of the same decomposition are the same, even if they accept that the quantities and equations are the same. If this happens, I will focus the discussion on what is the same (the group of 8, the group of 2, and the total 10).	**Clarify and share thoughts.** Wait time, turn and talk, stop and jot, say more, revoicing, tell us more, give an example **Orient to the thinking of others.** Who can repeat? Who can say that again? Who can put it in their own words? Tell us what your friend said? **Engage with reasoning of others**. Do you agree or disagree? What do you think about that? Who can add on? Can you think of a different way? Does anyone have more evidence? **Deepen own thinking.** Why do you think that? How did you get the answer? What is your evidence? Why do you think that worked? Can you prove that? Can you explain step by step?

Exploring / extending (20 minutes) 1. Students work to decompose 10 in as many different ways as possible by circling groups on their 10 of hearts cards; they will record these decompositions using equations. 2. Push students who are finding multiple decompositions that are visually different but mathematically identical to articulate that difference -- and move to finding a different combination. 3. An extension is for students to find as many different ways (visually) to represent the same decomposition.	Some students will be able to decompose by drawing groups, but will need support: ● linking these groups to the total ● using numbers or equation symbols to represent their decomposition	
Summarizing (15 minutes) 1. Bring students to the carpet. Give them time to share their work with the person sitting next to them. 2. Collect work. 3. Have students discuss work from two students that are visually different but represent the same combination (ex. 3+7=10). Push students to describe using precise mathematical language what is the same (the number in the groups) and what is different (where the groups are visually).		

b. Reflect on the lesson you have just planned and note which of the Core Action indicators you think this lesson illustrates particularly well.

Core Action 1 A, B, and D -- This lesson is based entirely on CCSS.MATH.CONTENT.K.OA.A.3. At this point in time in the year, the students understand how to decompose (a procedural fluency), so our opening discussion is focused on the meaning of "in more than one way," trying to push students to understand that this is not just describing the visual representation of the decomposition, but rather the quantities within the two groups represented in the equation. This lesson is part of an intentional sequence that builds on what students already know about decomposition, leading towards the conceptual understanding that decomposition of 10 and K.OA.A.4 are inherently related.

Core Action 1 C -- K.OA.A.3 calls for procedural skill in being able to decompose and represent that decomposition with an equation, and this lesson gives students the opportunity to decompose 10 and represent that decomposition multiple times over the course of the exploring extending block. K.OA.A.3 also implies conceptual understanding in decomposing "in more than one way" -- kindergarteners need lots of experience and focused conversation around decomposition to understand that visually different decompositions may still be represented by the same equation because the quantities within the decomposed groups are identical.

Core Action 2 A -- The playing card is a representation that makes the mathematics of the lesson explicit -- it invites decomposition of 10 hearts in many different ways. It also allows students to focus on the important work of decomposing (rather than drawing sets of 10 objects repeatedly), reducing cognitive load and allowing students to focus on decomposing and representing decompositions with equations.

Core Action 2 B and F -- These lessons are focused around high quality questioning that falls into a 4 categories: clarify and share thoughts, orient to the thinking of others, engage with the reasoning of others, and deepen own thinking. The questioning and commensurate student responses drive the instruction; there is no direct instruction or teacher modeling phase in this lesson.

Core Action 2 C, D, and E -- A significant amount of time is built in for students to work and constructively struggle; students are doing multiple short problems to allow me to check for understanding. I will also be able to identify students who need additional support or small group conferring based on the work and conversation from the previous lesson.

Core Action 3 -- The planning of this lesson experience and work I put into facilitating conversations is going to provide all students with the opportunity to demonstrate mathematical practices in the context of the lesson.

c. Tell us anything else you feel is important to know about this lesson that is not captured above or in the lesson plan.

Lesson 3. How many more do you need to make 10?

CCSS.MATH.CONTENT.K.OA.A.4 For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

Lesson Steps	Anticipated Student Responses	T responses, prompts, talk moves; language supports
Introducing (10 minutes) 1. Remind the students that they were working on decomposing 10. 2. Have students look at the 10=9+1 decomposition (student work from previous day). Have students turn and talk and describe what they see to their partner. Have one student share out. 3. After students agree that they see 10=9+1, show them a set of 9 hearts. Ask students: "How many more hearts do I need to get to 10?" Wait to give students thinking time; then allow individual students to explain their thinking. Have students draw the additional heart -- and write an equation. Ask students to explain their thinking; ask other students to repeat the first student's description. 4. Prompt students to explain what is similar between the decomposition that they looked at at the		Continue to use questioning / talk moves: 1. clarify / share thoughts 2. orient to the thinking of others 3. engage with the reasoning of others 4. deepen own thinking
beginning of the lesson and the 9+1=10 composition that they just made. 5. Note that the equation for both the decomposition of 10 and composition we just made is the same. 6. If needed, run through a second parallel example -- look at a 10=8+2 example from the previous day. Repeat steps 3, 4, and 5.	Students should see that these are analogous -- 9+1=10 is related to a decomposition of 10 into 9+1. If students are still expressing partial understandings, run through a second example.	
Exploring / Extending (20 minutes) 1. Students go to tables. Each student will have a set of 1-9 of hearts. Students will figure out how many more they need to make 10; then they will draw the additional hearts needed and write an equation.		
Summarizing (15 minutes) 1. Closure discussion will talk about what is similar and different from experience yesterday. If a student found that given 7 you need 3 more to make 10, focus on the decomposition 10=7+3. Ask students for both previous day's work and todays work: Where is the 7? Where is the 3? What's similar? What's different?		

b. Reflect on the lesson you have just planned and note which of the Core Action indicators you think this lesson illustrates particularly well.

Similar to my reflections on Lesson 2 -- except **Core Action 1 C** reflects K.OA.A.4.