

Kindergarten: Mathematics Highlight Lesson

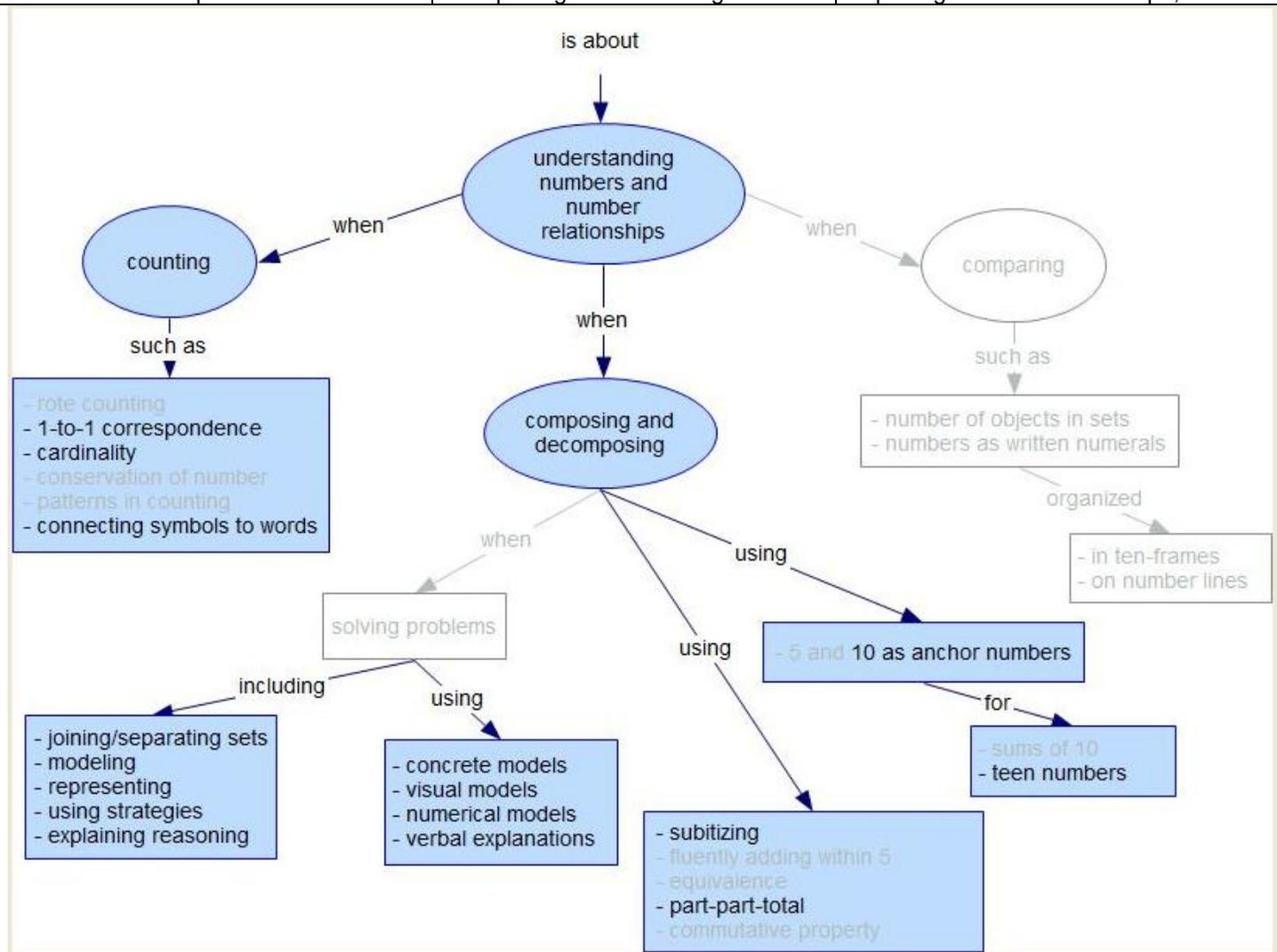
Unit 5: Deepening and Extending Number

Overarching Question: Why are there different ways to count?

Previous Unit:
Data and Data Representation

This Unit:
Deepening and Extending Number

Next Unit:
Exploring Attributes and Shape, Part 2



Question to Focus Assessment and Instruction:

1. What methods can we use to solve number stories?
2. How could you justify your answer to someone else?
3. What are some ways we can decompose numbers and show the same number in different ways?
4. How do teen numbers lay the foundation for place value?
5. How might you recognize a number of objects (e.g., dots on a card) without counting?
6. What is the difference between more and less?

Intellectual Processes

(Standards for Mathematical Practice)

Students have opportunities to...

- **Reason abstractly and quantitatively** when they use numbers to represent quantities and when they use objects and visual representations to express word problem situations.
- **Construct viable arguments and critique the reasoning of others** when they explain their thinking and respond to the reasoning of others.
- **Model with mathematics** when they represent problem situations with mathematical language, objects, and graphics and when they use ten-frames to model teen numbers; and

- **Look for and make use of structure** when finding number pairs for 10 and when decomposing teen numbers into ten ones and more ones.

Key Concepts

count	compare	equivalence	ten	put together/ take apart situations
cardinality	compose	complements of ten	ones	addend unknown situations
subitize	decompose	teen numbers	conservation of number	part-part-total relationships

Lesson Abstract:

This lesson focuses on teen numbers, the numbers 11-19. Students have been saying the words for these numbers all year as they rote count. They have seen the numerals as they count the numbers on a calendar and count on a number line. They will now examine those numbers in a way that will lay the foundation for place value that will be a focus of first grade. In kindergarten, students will be taught to think of 10 as *ten ones*, continuing the understanding developed all year that each number is one more than the one preceding it. One more than nine ones is ten ones. Considering ten ones as a new unit, *one ten*, is a concept that will be developed and assessed in first grade. That is an important distinction to make. For example, students will decompose 13 into *ten ones* and three *more* (ones). Using a ten-frame to model teen numbers visibly establishes 10 as a landmark number.

Depending on the experiences students have had prior to this unit, you may decide to break up this initial lesson and teach it over more than one day, focusing on different aspects of the concept. Students will benefit from many experiences with ten-frames to develop an understanding of teen numbers as ten ones and some more.

Common Core Standards

Kindergarten, Counting and Cardinality

K.CC.A Know number names and the count sequence.

- K.CC.A.1 Count to 100 by ones and by tens.
- K.CC.A.2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).
- K.CC.A.3 Write numbers from 0 to 19 (20). Represent a number of objects with a written numeral 0 to 19 (20) (with 0 representing a count of no objects).

K.CC.B Count to tell the number of objects.

- K.CC.B.4 Understand the relationship between numbers and quantities; connect counting to cardinality.
 - K.CC.B.4.a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
 - K.CC.B.4.b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
 - K.CC.B.4.c. Understand that each successive number name refers to a quantity that is one larger.
- K.CC.B.5. Count to answer "how many?" questions about as many as 19 (20) things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–19 (20), count out that many objects.

Kindergarten, Number and Operations in Base Ten

K.NBT Work with numbers 11–19 to gain foundations for place value.

- K.NBT.1 Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (e.g., $18 = 10 + 8$); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

Instructional Resources

- Floor ten-frame
- Blank Ten-frame, blackline master (in the Lesson Resources)
- Building Teen Numbers student worksheet, blackline master (in the Lesson Resources)
- Bags of 20 counters for each student
- PowerPoint, Numbers 1-10_Ten-frame (in the Lesson Resources)
- PowerPoint, Number Pairs_5-9 (in the Lesson Resources)

- PowerPoint, Numbers 10-19_Ten-frames (not specified in this lesson, but available in the Lesson Resources)

Sequence of Lesson Activities

Lesson Title: Teen Numbers

One Class Period (Depending on the background skills students bring to this lesson)

Advanced Preparation:	
<ul style="list-style-type: none"> ▪ Floor ten-frame: <ul style="list-style-type: none"> - Using a shower curtain or other piece of material of comparable size, use masking tape to create a ten-frame large enough for a student to stand in each cell. The stiffer the material, the easier it will be to use. - An alternative is to tape such a ten-frame on the floor of the classroom. - The first option provides a tool that can be used from year-to-year. 	
Selecting and Setting Up a Mathematical Task	
<p>Objective: By the end of this lesson what do you want your students to understand, know, and be able to do?</p> <p>In what ways does the task build on students' previous knowledge?</p> <p>What questions would you ask to help students access their prior knowledge?</p>	<p>By the end of the lesson, students will be able to</p> <ul style="list-style-type: none"> • read teen numbers, 11-19, out of order • represent teen numbers on a ten-frame • say "10 and ___ more" when explaining the way they represented the numbers <p>During the year students have been working on</p> <ul style="list-style-type: none"> • rote counting • one-to-one counting • reading and writing numbers • decomposing number to 10 into number pairs • working with linking cube trains and ten-frames to represent numbers to 10 • subitizing numbers to 10 • knowing 10 on a ten-frame without counting • counting on from any number <p>There are two PowerPoint documents in the Lesson Resources for reviewing prior knowledge. The first one, Number Pairs_5-9, displays numbers 5 to 9 decomposed into number pairs, a review of work students have been working on since Unit 2. As you display each slide, ask students</p> <ul style="list-style-type: none"> • <i>What did you see?</i> • <i>How did you see it?</i> <p>Ask for the expression for the number pairs on the slide. These slides can be used as Quick Images to give students experiences subitizing numbers decomposed into number pairs. Subitizing number pairs for 5 will help students with the kindergarten standard to "Fluently add and subtract within 5." Display the slide for 2-3 seconds. Click the "period" key to blacken the screen or the "comma" key to whiten it. After students have answered the questions you pose, restore the image by clicking the same key again. Kindergarten students may not subitize <i>number pairs</i> for numbers greater than 5, but they will continue to develop this skill in first grade.</p> <p>The second PowerPoint, Numbers 1-10_Ten-frame, is intended to prepare students for the work they will be doing in this unit with teen numbers. The ten-frame is a helpful tool for organizing and representing teen numbers. In this lesson, numbers above ten are displayed off to the side of the ten-frame. Following this initial lesson, it is recommended that the numbers above ten be displayed in a second ten-frame. These slides preview for students what numbers 1-10 look like on a ten-frame. Students may learn to subitize 5 in the top row and count on from five to determine the total number of dots. A goal would be for students to immediately know-without-counting and be able to explain that a <i>full</i> ten-frame has ten dots. All the slides afford opportunities for rich number talks.</p>

Ask questions such as

- *How do you see ____, e.g., 6?*
- *Does anyone see it the same way as ____ does?*
- *Does anyone see it in a different way?*
- *How could you prove there are ____ dots?*

Questions relevant to THIS lesson:

- *How many dots are in a full ten-frame?*
- *How do you know?*
- *How could you prove this?*
- *How could you remember this without counting?*

NOTE: The goal is to recognize the number of dots, NOT to talk about how many more dots would be needed to get ten dots. This is not a focus of this unit or any kindergarten standard.

Launch:

How will you introduce students to the activity so as to provide access to all students while maintaining the cognitive demands of the task?

Have students gather around the ten-frame floor mat. Have ten students come up to the front of the room.

- *Do you think there are enough boxes on this floor mat for all the students standing here?*
- *How could we find out?*

One at a time, have students fill in the “top” row, moving into a box starting at the upper left corner.

- *How many students are on the mat?*
- *Do you think there are enough boxes for the remaining students? How can we find out?*
- *How many of you agree with this?*
- *Does anyone have a different idea?*

Have the remaining students, one at a time; fill in the bottom row, again starting with the left box. Filling in the boxes in this way both reinforces the direction in which students are learning to read and introduces a common protocol for working with ten-frames, helpful when students are modeling and explaining their thinking to others.

- *How many students were standing at the front of the room?*
- *How many students fit onto the mat?*
- *We call this a ten-frame because there are ten boxes in this big frame, 5 on the top and 5 on the bottom. (If students are familiar with this tool, ask them what it is called and why it is called a ten-frame.)*

Have these students sit down and call up thirteen students without counting them out-loud.

- *Do you think there are enough frames for each of these students?*
- *Why/why not?*
- *How can we find out?*

Fill in the floor ten-frame as before.

- *What do we see this time?*

Take student responses, then say what you want students to learn to say:

- *There are 10 students and 3 more.*

Have the class count the students, starting with those on the floor mat. After the count, say,

- *So if we have 10 students and 3 more, we have how many students? 13.*

Have the students sit down.

Using a document camera, white board, or SMART board, and linking cubes or counters, demonstrate what students have just modeled. For this lesson, you will only use one ten-frame to clearly demonstrate that teen numbers are *ten ones and some more*. Restate that

- *Since each counter is “one,” we can see that there are ten ones on the board and 3 more ones on the side.*

Continue by saying,

- *Today we're going to work with a special set of numbers. Watch while I write the numbers.*

Write numbers 11-19, each number under the one before to clearly show the order of the numbers.

- *What do you notice about this list of numbers?*
- *What's alike about them? What's different?*
- *We call these "teen numbers." Let's say these numbers and see if you can think of why they might be called "teen numbers."*

Lead this discussion, including talking about what's special about 11 and 12. They are still considered teen numbers, even though they don't have the word "teen" in their name.

Have students do an additional problem together. Display one demonstration ten-frame and place 15 markers above it.

- *Do you think there are enough boxes to hold all these counters?*
- *Will there be any left over?*

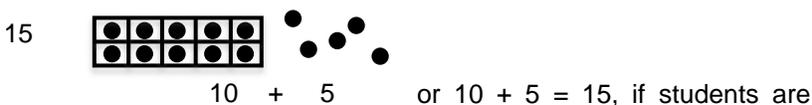
These questions ask students to make a prediction before they count for an exact answer. Take up student responses, asking them to justify their answers. Then have students count chorally to determine how many counters you have displayed. After they have counted 15 counters, write the number 15 next to the ten-frame. Have students count as you place counters on the ten-frame, starting in the upper left box, filling in the top row before placing counters in the second row, again from left to right.

- *How many counters are in the ten-frame? Point to the ten-frame as students say, "10." Write 10 below the ten-frame.*
- *What do you see here? Point to the five you have placed off to the side. Write 5 below the 5 loose counters.*

Repeat as you point,

- *We have ten ones here and 5 more here. And how many are 10 ones and 5 ones?*

When you have finished, your model will look like this.



familiar with this convention.

Explain the task students will be exploring.

- *Now you're going to have an opportunity to show how you can use a ten-frame to show teen numbers. At your table you will find a bag of counters, and I'm going to give you this paper to work on.*

Display the page so that all students can see it. Point to the model for 15 and demonstrate the directions as you explain them.

- *There is a teen number listed next to each ten-frame.*
 1. *Count the number of counters for that number.*
 2. *Then fill in the ten-frame boxes first, and put the leftover counters to the side. Show students where to begin and how to fill in the top row before putting counters in the bottom row.*
 3. *Draw dots for each counter.*
 4. *Below the ten-frame, write how many counters are in the ten-frame. Below the loose ones, write how many more dots you have drawn.*
- *You'll show each number just like we did up here.*

- *What is the special name for the numbers we're talking about today?*

Display the page students will be working on.

- *Turn to your shoulder buddy and talk about what you are going to do when you go back to your table.*

After 1-2 minutes, ask,

What will be heard that indicates that the students understood what the task is asking them to do?

- *When you see your paper, what will you do first?* Elicit the directions from students in the order in which you want them to work.
- *What questions do you have about this activity or what you are supposed to do?*

Supporting Students' Exploration of the Task:

What questions will be asked to focus students' thinking on the key mathematics ideas?

Observe students as they work. Ask clarifying, refocusing, and probing questions as you note what students are doing.

- *What will you do first?*
- *How do you know how many counters to take out of your bag?*
- *What will you do with the counters once you have counted them?*
- *Do you think you will have more counters than will fit into the ten-frame?*
- *How many counters will fit into the ten-frame?*
- *What will you do when you have filled in your ten-frame?*
- *How are you showing this number with your counters?*
- *How are you counting? Is there another way you could count?*
- *How does the ten-frame help us show ___?*
- *Can you tell how many counters are in the ten-frame without counting them?*
- *Do you and your neighbor have the same answer for ___ problem? If different, ask, Can they both be correct? How can you check to see which one is correct?*

If you determine that students are struggling with certain aspects of the task, either work with a small group of students or clarify the task for the whole class. Modify the task if necessary.

How will you extend the task to provide additional challenge?

If students need an additional challenge, have a set of cards with two ten-frames, each card displaying a teen number with one ten-frame filled and the "extra" number of dots displayed on the second ten-frame. Working alone or with a partner, have the student(s) look at the card and see if they can identify the teen number without counting. This would involve being able to subitize 1-10 on ten-frames and add $10+ _ _$ mentally.

Summary (Sharing and Discussing the Task):

What specific questions will be asked so that students make connections between the different strategies that are presented?

Bring students together to discuss this task. Project the work of a student who has done careful work, so that students will have a visual model to facilitate the discussion.

- *What did you notice about building teen numbers?*
 - *What was alike about all the numbers on your paper?*
 - Every number has a 1. *How did you build this "1"?* Reinforce that this 1 is really a group of ten ones.
 - *What was different about all your numbers?*
 - Reinforce the standard "that each successive number name refers to a quantity that is one larger."
- *How did you build the number with your counters?*
- *How did you use a ten-frame to show a teen number?*
- Looking at a filled ten-frame, ask, *how do you know this is 10? How can you prove it?*
- Looking at an example of student work, ask, *how did you know this was (12)? How can you prove it to us?*
- Point to one of the numbers on a student's paper: *Turn to your shoulder buddy. What do the dots next to the number (14) show?* Encourage students to say, "ten and 4 more" or "ten ones and four more."
- Point to the loose dots next to a ten-frame. *What do these dots show?*
 - Repeat this process for each problem the students did during this work time. Having students talk with a partner affords every student an opportunity to practice the language of this task.

What will be seen or heard that indicates all students understand the mathematical ideas you intended them to learn?

Students will demonstrate their understanding in the following ways.

1. The numbers on their work page were in random order. Students read the numbers and counted out the correct number of counters.
2. Students represented the number with counters and dots, filling in the ten-frame and having the correct number of "extra" counters.
3. Students wrote the number of dots they drew for the number as "10 + _____"
4. Students could "read" their visual representation as "ten ones and _____ more."

Resources Specific to This Lesson

Both John Van de Walle and Marilyn Burns write about the importance of the 5-frame 10-frame as models for establishing five and ten as anchor numbers.

Beyond Fingers: Place Value and the Numbers 11-19

<https://www.teachingchannel.org/videos/kindergarten-counting-cardinality-lesson>

Using the ten-frame to develop teen numbers. Teacher also talks about the enabling skills that have been part of students' learning and the other standards that are addressed in this lesson. Teaching Channel video, 8 minutes

Understanding Teen Numbers – Kindergarten/First Grade

<http://howtomathblog.wordpress.com/2014/03/12/understanding-teen-numbers-kindergartenfirst-grade/>

Very good modeling of how to work with students at home with teen numbers. Models the conceptual process used at school to develop understanding. A good suggestion to send home to families.