K:12 Make Ten and Some More

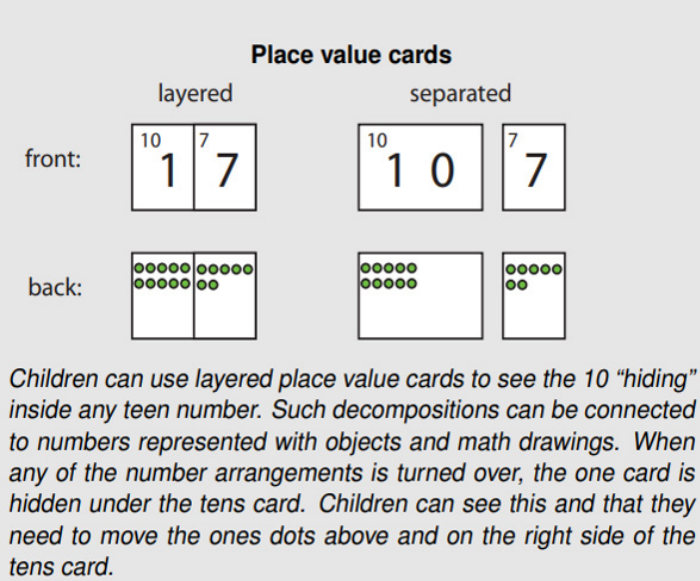
Teacher Notes

Central math concepts

The number names *zero, one, two, three, four, five, six, seven, eight,* and *nine* follow no mathematical system. There's also no system to the corresponding symbol sequence 0, 1, 2, 3, 4, 5, 6, 7, 8, 9—just a few suggestive hints of meaning, such as the symbol 1 consisting of a single stroke, or the symbol 3 having three "points." Then with the larger numbers 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19, systematic patterns appear. These two-digit numbers are a kind of code for naming quantities: for example, 17 refers to a quantity of ten ones and seven more ones. In later grades, students decode a larger number like 463 as the quantity 4 hundreds, 6 tens, and 3 ones. And in later grades still, they decode a decimal number like 3.7 as 3 ones and 7 tenths. The learning progression in understanding and calculating with numbers that are encoded this way is detailed in the relevant *Progression* document.[†] This learning progression begins in kindergarten, where students explore the numbers 11–19 as a foundation for place value in later grades.

Here are some relevant notes about that work excerpted from the *Progression* document (p. 5):

"A difficulty in the English-speaking world is that the words for teen numbers do not make their base-ten meanings evident. For example, 'eleven' and 'twelve' do not sound like 'ten and one' and 'ten and two.' The numbers 'thirteen, fourteen, fifteen, ..., nineteen' reverse the order of the ones and tens digits by saying the ones digit first. Also, 'teen' must be interpreted as meaning 'ten' and the prefixes 'thir' and 'fif' do not clearly say 'three' and 'five.' In contrast, the corresponding East Asian number words are 'ten one, ten two, ten three,' and so on, fitting directly with the base-ten structure and drawing attention to the role of ten. Children could learn to say numbers in this East Asian way in addition to learning the standard English number names.



Children can use layered place value cards to see the 10 "hiding" inside any teen number. Such decompositions can be connected to numbers represented with objects and math drawings. When any of the number arrangements is turned over, the one card is hidden under the tens card. Children can see this and that they need to move the ones dots above and on the right side of the tens card.

K:12 **Draw 16 circles. Use a** [favorite color] **marker for 10 of them. Use a pencil for the rest.** [Student draws.]
How many are [favorite color]**? How many are in pencil?**
Write the missing number: 16 = 10 + ____

Answer

10 circles are [favorite color]. 6 circles are in pencil. 16 = 10 + 3.

Click here for a student-facing version of the task.

Refer to the Standards

K.NBT.A.1; MP.1, MP.2, MP.7. Standards codes refer to www.corestandards.org. One purpose of the codes is that they may allow a task to shed light on the Standards cited for that task. Conversely, reading the cited Standards may suggest opportunities to extend a task or draw out its implications. Finally, Standards codes may also assist with locating relevant sections in curriculum materials, including materials aligned to comparable standards.

Aspect(s) of rigor:

Concepts

Additional notes on the design of the task

- The task is designed for an interactive format, with the teacher posing the question to a student or group of students.
- Being able to follow the instruction to "Draw 16 circles" is similar to being able to count out 16 objects; task K:12 is designed for use after a student can perform such Counting and Cardinality tasks (CCSS K.CC; *Progression* document[§] pp. 4, 5).
- In the equation 16 = 10 + 6, the operation is on the right-hand side. This decomposition equation emphasizes the meaning of the equal sign ("is the same as").

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"The numerals 11, 12, 13, …, 19 need special attention for children to understand them…. For example, initially, a numeral such as 16 looks like 'one, six,' not '1 ten and 6 ones.' Layered place value cards [see figure] can help children see the 0 'hiding' under the ones place and that the 1 in the tens place really is 10 (ten ones).

"By working with teen numbers in this way in kindergarten, students gain a foundation for viewing 10 ones as a new unit called a ten in Grade 1."

Relevant prior knowledge

The following mathematics knowledge may be activated, extended, and deepened while students work on the task: saying the count sequence; counting out a number of objects; counting to tell how many; perceptual subitizing; and conceptual understanding of addition.

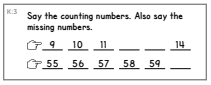
Extending the task

How might students drive the conversation further?

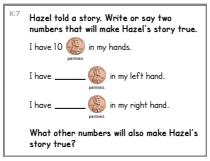
- Students could choose another number besides 16 (such as 13), repeat the drawing step, and say a conclusion statement such as "13 is 10 and 3 more."
- By looking at several cases, students could make a generalization about what the digits of a teen number mean (CCSS MP.8).

Related Math Milestones tasks

K:3

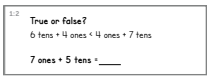


K:7

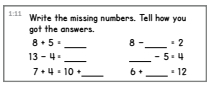


Task **K:3 Say the Numbers (Teens, Decades)** involves reading and saying the count sequence for a range of teen numbers. Task **K:7 Ten Pennies, Two Hands** involves decomposing 10 (whereas task K:12 involves decomposing 16).

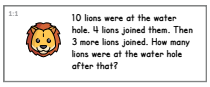
1:2



1:11



1:1



In later grades, task **1:2 Tens and Ones** involves the idea of a tens unit. Task **1:11 Using Properties and Relationships** involves addition and subtraction within 20, in cases like 8 + 5 = □ that may involve strategies that rely on the meaning of teen numbers, such as 8 + 5 = 8 + 2 + 3 = 10 + 3 = 13. Task **1:1 Lions at the Watering Hole** involves teen numbers in context.

Curriculum connection

1. In which unit of your curriculum would you expect to find tasks like K:12? Locate 2–3 similar tasks in that unit. How are the tasks you found similar to each other, and to K:12? In what specific ways do they differ from K:12?
2. Thinking about the curriculum unit you identified, at what point in the unit might a task like K:12 help students converge toward grade-level thinking about the important mathematics in the task? What factors would you consider in choosing when to use such a task in the unit?*

† Common Core Standards Writing Team. (2015, March 6). *Progressions for the Common Core State Standards in Mathematics (draft)*. Grades K–5, *Number and Operations in Base Ten*. Tucson, AZ: Institute for Mathematics and Education, University of Arizona.

§ Common Core Standards Writing Team. (2011, May 29). *Progressions for the Common Core State Standards in Mathematics (draft)*. K, *Counting and Cardinality; K–5, Operations and Algebraic Thinking*. Tucson, AZ: Institute for Mathematics and Education, University of Arizona.

* Math Milestones™ tasks are not designed for summative assessment. Used formatively, the tasks can reveal and promote student thinking.

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Anticipating and responding to student thinking about the task

Imagine how students might think about the task, and what you might see and hear while they work.

On this page, you can write your thoughts on the following questions.

Solution Paths

- What solution paths might you expect to see?
- What representations might you see? What correspondences between those representations might be noticed by students (or be worth pointing out to students) and discussed by them?
- What misconceptions or partial understandings might be revealed as students work on the task? How could you respond to these positively and productively?

Language

- What might you expect to hear from students engaged with the task? What does that language reveal about their mathematical thinking, and how might you respond to different ways of thinking?
- If students are using early English or using multiple languages in an integrated communication system, how might you help their classmates see those mathematical ideas as valuable?
- Even when using nascent language, students are thinking and communicating their thinking. What might it look like to respond positively and productively to the mathematics in their thinking before giving feedback on the language used?

Identity, Agency, and Belonging

- How can you engage students' interests, experiences, or funds of knowledge?
- How can you build students' self-confidence as learners, thinkers, and doers of mathematics?
- What choices are there for a student to make in the task? How can you build students' agency to the point where they notice and make these choices to solve problems?
- How might one use feedback to build student agency? Where might there be opportunities to build students' self-confidence?

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