K:5 Adding to Make a Group of Ten

Teacher Notes

Central math concepts

Building on their ongoing work with counting and cardinality, students in kindergarten explore the ways in which collections of objects can be composed and decomposed, translating those patterns into relationships between numbers. This launches students on a years-long journey of developing understanding, procedural skill, and problem solving power with problems involving addition and subtraction.[†] In addition to solving contextual problems involving addition and subtraction,[‡] students also explore number relationships, especially when decomposing numbers 1–10 into pairs in more than one way (CCSS K.OA.A.4) and finding the partners of ten (CCSS K.OA.A.5). Finding partners of ten means that for any number 1–9, students find the number that makes 10 when added to the given number. Mathematically, this problem has an unknown-addend structure. Students might find the unknown addend using objects or drawings, and they record the answer with a drawing or, as in task K:5, an equation.

Part of task K:5 involves writing a numeral. Kindergarten students write numbers from 0 to 20 and represent a number of objects with a written numeral 0–20 (with 0 representing a count of no objects) (CCSS K.CC.A.3). As explained in *Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity*,[§]

> Learning to write number symbols (numerals) is a much more difficult task than is reading them and often is not begun until kindergarten. Writing numerals requires children to have an accurate mental image of the symbol, which entails left-right orientation, and a motor plan to translate the mental image into the correct sequence of motor actions to form a numeral.... Some numerals are much easier than others. The loops in 6 and 9, the curve and straight line in the 2, and the crossovers in the 8 are difficult but can be mastered by kindergarten children with effort. The easier numerals 1, 3, 4, 5, and 7 can often be mastered earlier. Whenever children do learn to write numerals, learning to write correct and readable numerals is not enough. They must become fluent at writing numerals (i.e., writing numerals must become overlearned) so that writing them as part of a more complex task is not so slow or effortful as to be discouraging when solving several problems. It is common for children at this step and even later to reverse some numerals (such as 3) because the left-right orientation is difficult for them. This will become easier with age and experience. (p. 138)

Finding partners of 10 in kindergarten is important preparation for strategies such as making ten in grade 1 that allow students to extend addition and subtraction beyond the single digits to problems within 20. For example, to add 7 + 8, students in grade 1 can think that the partner of 10 for 7 is 3, and for this reason decompose 8 as 3 + 5, which changes the problem 7 + 8 into the easier problem (7 + 3) + 5 or 10 + 5, which (based on an understanding of the teen numbers) equals 15.

K:5

[Teacher puts 3 red counters on table.] **Put some blue counters here to make 10 counters in all.** [Student completes this task.] **How many counters did you add?** [Student determines the answer.]

Write the missing number: 3 + ____ = 10

Answer

7.

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

Task K:5 is designed for use with manipulatives or objects. Students might also use manipulatives to support their work on other tasks.

Refer to the Standards

K.OA.A.4; MP.1, MP.2, MP.5, 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

Relevant prior knowledge

The following mathematics knowledge may be activated, extended, and deepened while students work on the task: cardinal counting; counting out a collection; conceptual subitizing; saying the counting sequence through 10; and concepts of addition and subtraction.

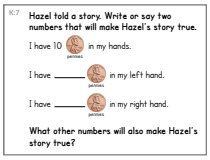
Extending the task

How might students drive the conversation further?

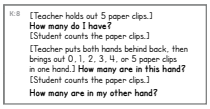
- The task could be repeated, with different known addends each time.
- Students could pose the task to the teacher, a partner, or a caregiver or family member.
- Students could show all decompositions of 10 and reflect on the patterns.

Related Math Milestones tasks

K:7

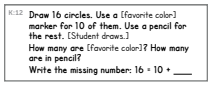


K:8



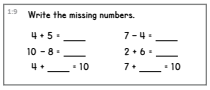
K:1

K:12

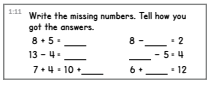


Task **K:7 Ten Pennies, Two Hands** involves decomposing 10 into pairs in more than one way. Task **K:8 Five Behind the Back** has an unknown-addend structure. **K:1 How Many Blocks?** involves counting and cardinality. Task **K:12 Make Ten and Some More** involves a decomposition of 16.

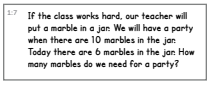
1:9



1:11



1:7



In later grades, partners of 10 are part of task **1:9 Fluency within Ten**, and partners of 10 play a role in strategies useful for the problems in task **1:11 Using Properties and Relationships**. Task **1:7 Class Marble Jar** involves partners of 10 in context, in a situation of "Add To with Change Unknown." (See the Map of Addition and Subtraction Situations in K–2 Math Milestones.)

Additional notes on the design of the task

- The equation 3 + 7 = 10 in the task reflects a mental process of joining red counters and blue counters into a total group of—simply—counters. The choice of unit (what gets counted) is thus central in the task. The task would make less sense, for example, if the 3 red counters and 7 blue counters had been instead 3 red counters and 7 cups of water.
- As a warm-up question, the student could initially be asked, "How many red counters are there?" before being asked to put some blue counters here to make 10 counters in all.

Curriculum connection

1. In which unit of your curriculum would you expect to find tasks like K:5? Locate 2-3 similar tasks in that unit. How are the tasks you found similar to each other, and to K:5? In what specific ways do they differ from K:5?
2. Thinking about the curriculum unit you identified, at what point in the unit might a task like K:5 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?*

† For additional discussion, see pp. 4–11 of *Progressions for the Common Core State Standards in Mathematics (draft): K, Counting and Cardinality; K–5, Operations and Algebraic Thinking* (Common Core Standards Writing Team, May 29, 2011. Tucson, AZ: Institute for Mathematics and Education, University of Arizona).

‡ See the Map of Addition and Subtraction Situations in K–2 Math Milestones.

§ National Research Council. (2009). *Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity*. Committee on Early Childhood Mathematics, Christopher T. Cross, Taniesha A. Woods, and Heidi Schweingruber, Editors. Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

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

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Teacher Notes

Math Milestones™

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?