K:8 Five Behind the Back

Teacher Notes

Math Milestones™

Central math concepts

In task K:8, the student answers a succession of three questions. The first and second questions are "how-many" questions—that is, questions about cardinality (CCSS K.CC). Cardinal counting (counting to tell how many) is both procedural and conceptual. Cardinal counting a group of objects uses the procedure of saying 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. This procedure depends on students becoming fluent in saying the count sequence, so that they have enough attention to focus on the pairings involved in counting objects. And conceptually, cardinal counting involves principles of cardinality:

- Understanding that the last number name said tells the number of objects counted.
- Understanding that each successive number name in the count sequence refers to a quantity that is one larger.
- Understanding that the number of objects is the same regardless of their arrangement or the order in which they were counted.

Students might answer the two "how-many" questions in task K:8 by counting or (given the small numbers involved) by perceptual or conceptual subitizing. *Perceptual subitizing* is the term for when students instantly recognize and name the number of objects in a set. *Conceptual subitizing* is the term for when students use pattern recognition to quickly determine the number of objects in a set, such as seeing 2 things and 2 things and knowing this makes 4 things in all.[†]

As for the third question in task K:8, mathematically it has the structure of an unknown-addend problem—for example, 4 + □ = 5 in a case where 4 paper clips are shown. Kindergarten students don't routinely work with unknown-addend word problems, but kindergarten students do decompose numbers such as 5 into pairs in more than one way, for example, by using objects or drawings (CCSS K.OA.A.3). More generally, 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.

Relevant prior knowledge

The following mathematics knowledge may be activated, extended, and deepened while students work on the task: perceptual subitizing; conceptual subitizing; saying the counting sequence through 5; cardinal counting; and concepts of addition and subtraction.

K:8

[Teacher holds out 5 paper clips.]
How many do I have?
[Student counts the paper clips.]
[Teacher puts both hands behind back, then brings out 0, 1, 2, 3, 4, or 5 paper clips in one hand.] **How many are in this hand?**
[Student counts the paper clips.]
How many are in my other hand?

Answer

First question: 5. *Second question*: Answers vary depending on the number of paper clips shown. *Third question*: Answers vary depending on the number of paper clips shown, but the sum of the answer and the number of paper clips shown must be 5.

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

Task K:8 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; MP.1, MP.2. 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

Extending the task

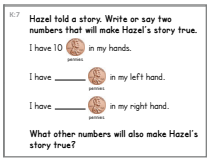
How might students drive the conversation further?

- The task could be repeated, with different numbers of paper clips shown in one hand each time.
- Students could pose the task to the teacher, a partner, or a caregiver or family member.
- Students could show all decompositions of 5 and reflect on the patterns.

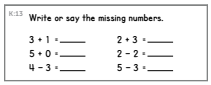
Related Math Milestones tasks

K:1

K:7



K:13



Task **K:1 How Many Blocks?** involves counting and cardinality. Task **K:7 Ten Pennies, Two Hands** has the situation type "Put Together/Take Apart with Both Addends Unknown." Task **K:13 Fluency within Five** focuses on the fluency goal for kindergarten.

In later grades, see the Map of Addition and Subtraction Situations in K–2 Math Milestones.

Additional notes on the design of the task

- Because the total number of paper clips (5) matches the fluency goal for kindergarten (CCSS K.OA.C.5; see the Teacher Notes for task **K:13 Fluency within Five**), task K:8 can provide teachers with information about students' development towards fluency.
- The task refers to paper clips, but other small objects could be used.

Curriculum connection

1. In which unit of your curriculum would you expect to find tasks like K:8? Locate 2-3 similar tasks in that unit. How are the tasks you found similar to each other, and to K:8? In what specific ways do they differ from K:8?
2. Thinking about the curriculum unit you identified, at what point in the unit might a task like K:8 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?*

† See p. 356 of *Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity* (National Research Council. 2009. Washington, DC: The National Academies Press. https://doi.org/10.17226/12519).

‡ 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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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?