1:3 Paper Clip Length Units

Teacher Notes

Central math concepts

Building on their experiences with comparing measurable attributes directly in kindergarten (CCSS K.MD.A), students in grade 1 measure lengths using an object as a length unit. Far from being a procedural task, length measurement in this grade is an imaginative act that involves "choosing a unit of measure and *subdividing* (mentally and physically) the object by that unit, placing that unit end to end (*iterating*) alongside the object" (*Progression* document,[†] p. 4). The length of an object is thus the number of units required to iterate from one end of the object to the other, without gaps or overlaps. This last phrase, "without gaps or overlaps," will recur throughout geometric measurement—for area in grade 3, for angle in grade 4, and for volume in grade 5 (see, respectively, the Teacher Notes for tasks **4:13 Area Units**, **4:8 Shapes with Given Positions**, and **5:3 Neighborhood Garden**).

As noted in the *Progression* document (p. 3), "The concept of unit is crucial."[‡] The concept of a unit underlies not only geometric measurement, but also measurement of every quantity, whether that be mass, time, or a derived quantity such as speed, population density, person-hours, and so on. Additionally, the concept of a unit is essential to thinking about fractions and about place value. For example, grade 1 students begin the study of place value by working with units of tens and ones (see the Teacher Notes for tasks **1:2 Tens and Ones** and **1:8 Subtracting Units**).

Returning to the topic of task 1:3, "Length is a core concept for several reasons. It is the basic geometric measurement. It is also involved in area and volume measurement, especially once formulas are used. Length and unit iteration are critical in understanding and using the number line.... Length is also one of the most prevalent metaphors for quantity and number... the master metaphor for magnitude" (p. 4).

Relevant prior knowledge

The following mathematics knowledge may be activated, extended, and deepened while students work on the task: spatially structuring a line into sections.

Extending the task

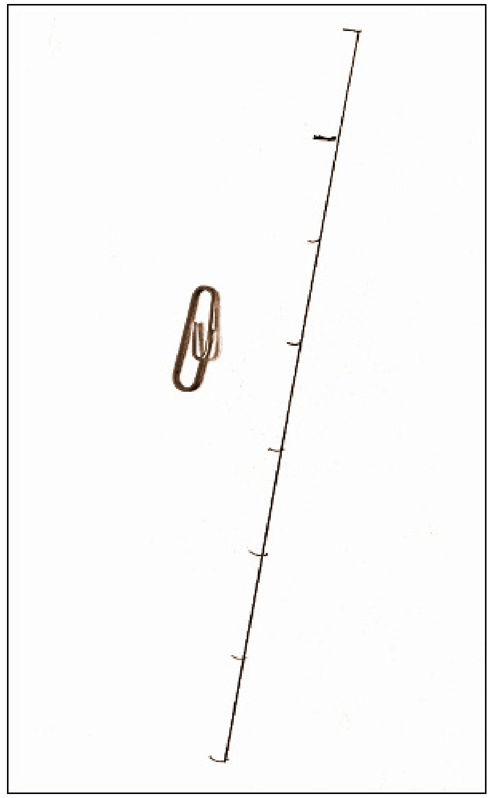
How might students drive the conversation further?

- Students could use their drawing to cut out a rectangle 7 paper-clip-units long (shaped like a ruler). They could use the rectangle as a measurement scale to measure objects in the classroom in units of paper-clip-lengths.
- If the students put all their cut-out rectangles together on one desk, are they all pretty close to the same length? What is the value of having all of the rulers at the school-supply store marked the same way?

1:3 Using a paper clip as a unit of length, draw a straight line 7 units long.

Answer

See example picture.



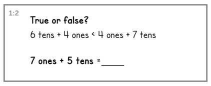
Click here for a student-facing version of the task.

Refer to the Standards

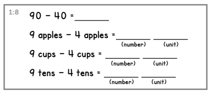
1.MD.A; MP.2, MP.5. Standards codes refer to www.corestandards.org. One purpose of the codes is that they may allow a task to shed light on the Standards cited for that task. Conversely, reading the cited Standards may suggest opportunities to extend a task or draw out its implications. Finally, Standards codes may also assist with locating relevant sections in curriculum materials, including materials aligned to comparable standards.

Related Math Milestones tasks

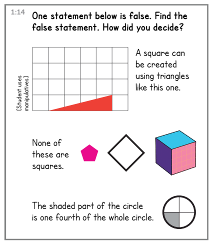
1:2



1:8

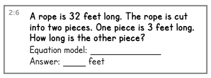


1:14

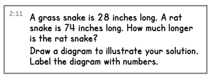


Tasks **1:2 Tens and Ones** and **1:8 Subtracting Units** involve place value units. Task **1:14 Shape True/False** involves squares, which have a defining attribute based on length (all four sides the same length).

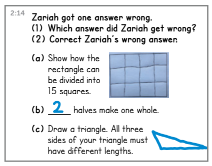
2:6



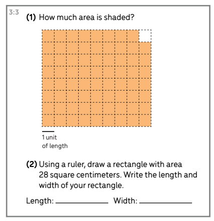
2:11



2:14



3:3



In later grades, tasks **2:6 Cutting a Rope** and **2:11 Grass Snake vs. Rat Snake** both involve addition, subtraction, and length in context. Task **2:14 Correcting a Shape Answer** involves side lengths in a triangle as well as spatial structuring. Task **3:3 Length and Area Quantities** relates and distinguishes between these two quantities and their units.

K:14

In earlier grades, task **K:14 Animals from Land and Sea** involves a choice of unit (either “animals” or a more specific choice of “land animals”/”sea animals”), which equates to a choice of what to count.

Aspect(s) of rigor

Concepts

Additional notes on the design of the task

The task involves producing a figure with given length; this lays greater emphasis on the *concept* of measurement and less emphasis on the *procedure* of measurement (as compared with a task that only asks students to measure a given object).

Curriculum connection

1. In which unit of your curriculum would you expect to find tasks like 1:3? Locate 2-3 similar tasks in that unit. How are the tasks you found similar to each other, and to 1:3? In what specific ways do they differ from 1:3?
2. Thinking about the curriculum unit you identified, at what point in the unit might a task like 1:3 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. (2012, June 23). *Progressions for the Common Core State Standards in Mathematics (draft). Grades K–5, Geometric Measurement*. Tucson, AZ: Institute for Mathematics and Education, University of Arizona. Page numbers in these Teacher Notes refer to this *Progression* document.

‡ See also Zimba (2013), “Units, a Unifying Theme in Measurement, Fractions, and Base Ten.”

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

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?

