2:8 Fluency within the Addition Table

Teacher Notes

Central math concepts

Task 2:8 draws on memory, fluency, and conceptual understanding. In terms of conceptual understanding, the central mathematical idea in task 2:8 is that $C - A$ is the unknown factor in $A + ? = C$. This idea expresses the mathematical relationship between addition and subtraction, whether for whole numbers, fractions, decimals, variables, variable expressions, or complex numbers. The 66 brief problems in task 2:8 involve different permutations of this relationship, as shown in the table.

Example Equation	Equation Type	How many are in task 2:8?
11 - 6 = □	Unknown Difference	34
□ + 2 = 10 5 + □ = 12	Unknown Addend	18
□ - 9 = 5	Unknown Total[†]	7
10 - □ = 6	Unknown Addend	7

Task 2:8 doesn't include equations of type Unknown Sum (for example, 3 + 8 = □), because sums like 3 + 8 are the topic of task **2:5 Sums of Single-Digit Numbers**. Whereas the problems in that task simply ask for the value of an expression like 3 + 8, the problems in task 2:8 ask for an unknown number that makes an equation true.

Remembering single-digit sums and being fluent with related differences is an important goal that supports a great deal of students' mathematical work in grades 3 and beyond. This goal needs to be reached by an intellectually valid, emotionally supportive learning path. The stages of that path are articulated in the *Progression* document,[‡] pp. 14–27.[§]

Relevant prior knowledge

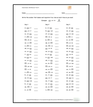
The following mathematics knowledge may be activated, extended, and deepened while students work on the task: the relationship between addition and subtraction; and remembered single-digit sums.

Extending the task

How might students drive the conversation further?

- Checking the equations with subtraction signs by adding can offer additional procedural practice and reinforce the relationship between multiplication and division ($C - A$ is the unknown factor in $A + \square = C$).

2:8 Write the number that makes each equation true. Use as much time as you need.



Click here for student handout 2:8

Answer

Click here for an answer key.

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

Refer to the Standards

2.OA.B.2; MP.6, 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:

Procedural skill and fluency

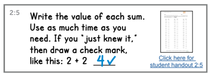
Additional notes on the design of the task

- The task is designed to be worked on after all the sums and related differences in the addition table have been understood and practiced.
- The instructions say, "Use as much time as you need." Reasons for this include: (1) Differentiating between students on the basis of their speed isn't the purpose of the task. (2) More generally, speed isn't an important disciplinary value in mathematics. (3) Emphasizing speed in the mathematical community of the classroom can have negative effects on students' mathematical identity.

- Similarly, given a handful of cases of a completed equation (such as 15 - 7 = 8), students could write an equivalent equation (such as 8 + 7 = 15 or 15 - 8 = 7).

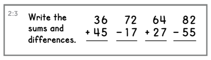
Related Math Milestones tasks

2:5


2:5 Write the value of each sum. Use as much time as you need. If you "just knew it," then draw a check mark, like this: 2 + 2 4✓

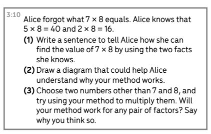
Click here for student handout 2:5

2:3


2:3 Write the sums and differences. 36 + 45, 72 − 17, 64 + 27, 82 − 55

Task **2:5 Sums of Single-Digit Numbers** asks for the values of sums in the addition table. Single-digit sums and related differences are involved in many calculations in grade 2 tasks, including **2:3 Fluency within 100 (Add/Subtract)** as well as the word problems (see the [Map of Addition and Subtraction Situations in K-2 Math Milestones]).

3:10

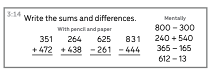

3:10 Alice forgot what 7 × 8 equals. Alice knows that 5 × 8 = 40 and 2 × 8 = 16.

(1) Write a sentence to tell Alice how she can find the value of 7 × 8 by using the two facts she knows.

(2) Draw a diagram that could help Alice understand why your method works.

(3) Choose two numbers other than 7 and 8, and try using your method to multiply them. Will your method work for any pair of factors? Say why you think so.

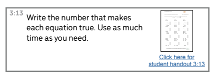
3:14


3:14 Write the sums and differences.

With pencil and paper: 351 + 472, 264 + 438, 625 − 261, 831 − 444

Mentally: 800 − 300, 240 + 540, 365 − 165, 612 − 13

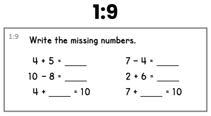
3:13


3:13 Write the number that makes each equation true. Use as much time as you need.

Click here for student handout 3:13

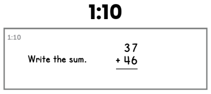
In later grades, fluency with sums and differences plays a role in multiplication strategies; see task **3:10 Alice's Multiplication Fact**. Fluency within the addition table is also a component in multi-digit addition and subtraction; see task **3:14 Fluency within 1000 (Add/Subtract)**. Task **3:13 Fluency within the Multiplication Table** is the analog of task 2:8 for multiplication and division.

1:9

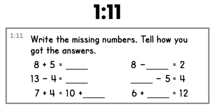

1:9 Write the missing numbers.

4 + 5 = ____ 7 − 4 = ____
10 − 8 = ____ 2 + 6 = ____
4 + ____ = 10 7 + ____ = 10

1:10


1:10 Write the sum. 37 + 46

1:11


1:11 Write the missing numbers. Tell how you got the answers.

8 + 5 = ____ 8 − ____ = 2
13 − 4 = ____ ____ − 5 = 4
7 + 4 = 10 + ____ 6 + ____ = 12

In earlier grades, tasks **1:9 Fluency within Ten**, **1:10 Two-Digit Addition**, and **1:11 Using Properties and Relationships** focus on addition and subtraction within 20.

Curriculum connection

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

† From the *Progression*, p. 8: "Formal vocabulary for subtraction ('minuend' and 'subtrahend') is not needed for Kindergarten, Grade 1, and Grade 2, and may inhibit students seeing and discussing relationships between addition and subtraction. At these grades, the terms 'total' and 'addend' are sufficient for classroom discussion."

‡ 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.

§ For further discussion of such an interwoven process, see "Fluency Development Within and Across the Grades in IM K–5 Math™, part 1: Addition and Subtraction" (blog post by Caban and Aminata, 2021).

* 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?