

**Grouping and Place Value.** Students organize large quantities of buttons and find efficient ways to group and count the buttons. Students also use benchmark referents to help them estimate the number of buttons in a collection. This unit extends students' counting experiences to multiple representations of larger numbers and to ways of organizing objects to reflect the ten ones in ten and the ten groups of ten in one hundred. These counting and organizing activities also provide an opportunity for students to compare quantities of buttons and solve problems involving the button collections.

“Making a transition from viewing ‘ten’ as simply the accumulation of 10 ones to seeing it both as 10 ones and as 1 ten is an important first step for students toward understanding the structure of the base-ten number system” (NCTM, 2000).

A similar transition needs to take place between 10 groups of 10 and 1 hundred. These connections between grouping and the base-ten number system need to be made explicitly, and students need multiple experiences to make these connections. It is also important that students see the same quantity grouped in multiple ways (e.g., 53 is 5 groups of ten and 3 ones or 4 groups of ten and 13 ones.) This relational thinking helps students gain a sense of number that will help them develop efficient mental math strategies and procedures for the operations.

**Estimation.** Throughout the school year, students will be asked to estimate measurements, quantities, and an expected range for answers to computations. In this unit, students develop skills with estimation while gathering data, solving problems, and grouping buttons. The ability to make a reasonable estimate is a valuable skill, both on the practical level of evaluating the reasonableness of one's answers and on a deeper level as an indicator of number sense and mathematical thinking. It is dependent upon being able to draw upon one's past experience in order to make a fair prediction of an unknown.

To many students, the rationale behind making an estimate is mystifying. For some, estimation is confused with rounding—you perform a calculation to get an answer, then round to get an estimate. It is an unsatisfying exercise in getting an answer that is not even exact. For others, an estimate is simply a wild guess, made without rhyme or reason. Estimation is

neither of these. Rather, it involves a sophisticated understanding of both the problem itself and the mathematical relationships implicated in it.

In the early grades, it is important that students experience estimation situations in familiar contexts, so they develop a comfort level with the process of making an estimate. When appropriate, they use a referent set for comparison. For example, in this unit, they estimate the number of buttons in a small bag by comparing it with bags of 20, 50, and 80 buttons.

“Estimation requires a flexibility of calculation that emphasizes adaptive reasoning and strategic competence, guided by children's conceptual understanding of both the problem situation and the mathematics underlying the calculation” (National Research Council, *Adding it Up: Helping Children Learn Mathematics*, p. 216, 2001).

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### **Math Facts and Mental Math**

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**Addition Facts with Sums to Ten.** In this unit, students continue to systematically review the addition facts. Daily Practice and Problems items in this unit can be used to assess students' fluency with the addition facts with sums to ten in Group C (1 + 9, 2 + 7, 2 + 8, 3 + 6, 3 + 7, 4 + 6, 5 + 5.) Students should also be developing reasoning strategies to solve the addition facts with sums larger than ten in Group C (2 + 9, 3 + 8, 4 + 7, 5 + 6.) The making-ten and using-ten strategies are commonly used to solve these facts.

**Fact Families for Addition Facts with Sums to Ten.** Students have been connecting addition to subtraction and using the addition facts to solve subtraction problems since First Grade. A student proficient with addition facts can also find the related subtraction facts. Daily Practice and Problems items in this unit can be used to assess students' abilities to name the fact families related to each fact with a sum to ten in Group C. As students develop fluency with the facts with larger sums, they will be able to name the related facts in the fact family.

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## Resources

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- National Research Council. “Developing Proficiency with Whole Numbers.” In *Adding It Up: Helping Children Learn Mathematics*, pp. 181–229. J. Kilpatrick, J. Swafford, and B. Findell (Eds.). National Academy Press, Washington, DC, 2001.
- *Principles and Standards for School Mathematics*. National Council of Teachers of Mathematics, Reston, VA, 2000.
- Sowder, J. “Estimation and Number Sense.” In *Handbook of Research on Mathematics Teaching and Learning*, pp. 371–389. D.A. Grouws (Ed.). MacMillan, New York, 1992.