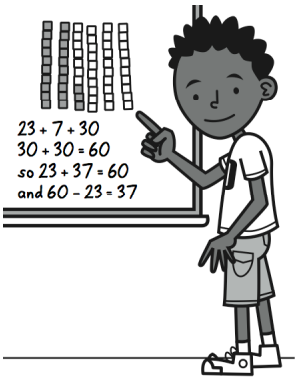
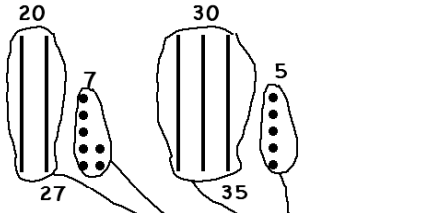
Grade 3, Unit Two: Place Value Structures & Multi-Digit Computation

In this unit your child will:

- read, write, order, model, compare, and identify the place value of digits in numbers to 999
- estimate and calculate sums (addition) of 2-digit numbers with and without regrouping (i.e., carrying)
- estimate and calculate differences (subtraction) between 2-digit numbers with and without regrouping (i.e., borrowing)
- estimate and measure length in centimeters
- continue to master basic addition and subtraction facts



Your child will learn and practice these skills by solving problems like those shown below. Keep this sheet for reference when you're helping with homework.

Problem	Comments
Marc loves to read. Yesterday he read 27 pages. Today he read 35 pages. How many pages has he read in all? Use pictures, numbers, and/or words to show how you solved this problem.  First I added the tens. 20 + 30 = 50 Then I added the ones. 7 + 5 = 12 Then I added it all together. 50 + 12 = 62 27 + 35 = 62 so he read 62 pages altogether.	Students think of different ways to solve addition problems in this unit. In the example at left, the student made a sketch of the tens and ones in each number. She added the tens and the ones separately, and then found the total. This strategy draws on a strong understanding of our number system, which is based on groups of ones, tens, hundreds and so on. A student who feels comfortable with this strategy would likely be prepared to learn the algorithm that many people use to add multi-digit numbers, which condenses these steps. (Shown at right.) $\begin{array}{r} {}^{1}27 \\ +\ 35 \\ \hline 62 \end{array}$ Another student might solve this problem by thinking: "35 plus 30 is 65. 27 is 3 less than 30, so 35 plus 27 is 3 less than 65: it's 62." This strategy might easily be performed mentally and draws on a solid grasp of the basic facts. Using a variety of strategies strengthens students' number sense and allows them to approach a wide range of problems—from those that can be solved mentally to those that require careful computing with a calculator or paper-and-pencil—with flexibility and confidence.

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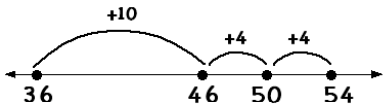
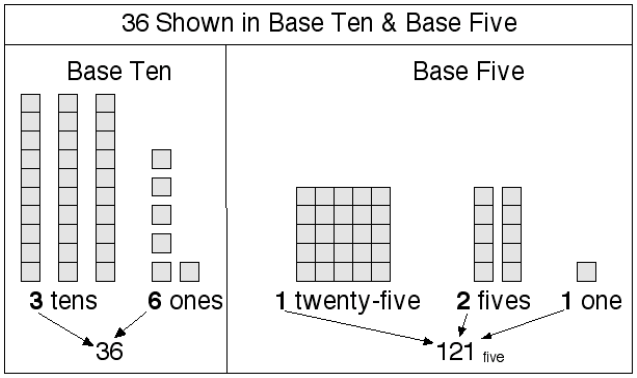
Shauna has 54 trading cards. Rachel has 36 trading cards. How many more trading cards does Shauna have than Rachel? Use pictures, numbers, and/or words to show how you solved this problem. **36 = 30 + 6** **First I took away 30.** **54 - 30 = 24** **Then I took away 6.** **24 - 6 = 18** **54 - 36 = 18, so Shauna has 18 more cards than Rachel.**	The strategy at left is similar to the one for addition on the previous page because the student works first with the tens and then with the ones, drawing on a strong sense of place value. To subtract, this student thought about taking the smaller number away from the larger number. A student could also think of subtraction as a process of finding the difference, determining how much larger one number is than another. In fact, this story problem frames subtraction as a process of finding the difference. Many students find the difference between two numbers by adding up from the smaller number to the larger number: the amount added is the difference. In this unit, we teach students to use a number line to show this process. The number line encourages students to think of helpful landmark numbers (see the example at right), which is useful for mental computation. The number line also provides a reliable method for solving subtraction problems, even when the student is still making sense of other methods, including the algorithm (i.e., borrowing).  **10 + 4 + 4 = 18** **so 54 - 36 = 18**

Frequently Asked Questions about Unit Two

Q: Why do you start this unit by working in base five? What is base five, and why is it useful?

A: Our number system is based on powers of ten (groups of ones, tens, hundreds, etc.). Base five is based on powers of five (groups of ones, fives, twenty-fives, etc.). The smaller groups in base five provide more opportunities for students to build and take apart numbers through processes called regrouping and decomposing. These processes are essential to calculating with larger numbers. Exploring a new base also sheds new light on the way we write numbers, with the position of each digit (its place value) showing the size of the group it represents (e.g., the 2 in 325 represents 2 groups of 10).



Q: These strategies work well for adding and subtracting 2-digit numbers, but what about larger numbers? Won't students need other strategies to compute with 3-digit numbers (and beyond)?

A: Some of the strategies students develop in this unit are most useful for estimating and calculating with 2-digit numbers. Others, including the number line and the algorithm, which teachers can address in Unit Five, are easily transferable to calculations with larger numbers. Some of the most valuable skills students will develop in this unit and in Unit Five are related to estimating sums and differences of larger numbers. In and out of school, people often use calculators for such problems because of their speed and accuracy. Nonetheless, it is crucial to know whether the answer produced by the calculator is reasonable, because we can easily make mistakes when typing in the numbers. The flexibility that students develop by exploring a variety of strategies also helps them approach problems in a sensible way. We hope, for example, that students will be able to see quickly that the difference between 189 and 90 is 99, without going through the trouble of performing an algorithm or using a calculator.