

Getting Ready to Teach Unit 2

Learning Path in the Common Core Standards

In this unit, children work with place value, representing numbers in different ways, and comparing numbers. They add two, three, or four 2-digit numbers, sometimes resulting in new tens or new hundreds, with sums to 200.

Visual models and real world situations are used throughout the unit to help children understand the value of 2- and 3-digit numbers and how to find the sum of 2-digit numbers.

Help Children Avoid Common Errors

Math Expressions gives children opportunities to analyze and correct errors, explaining why the reasoning was flawed.

In this unit we use Puzzled Penguin to show typical errors that children make. Children enjoy teaching Puzzled Penguin the correct way, why this way is correct, and why Puzzled Penguin made the error. Common errors are presented in the Puzzled Penguin feature in the following lessons:

- ▶ **Lesson 3:** Miscounting the number of Quick Tens and ones in a math drawing
- ▶ **Lesson 5:** Starting with the digits in the ones place when comparing multidigit numbers
- ▶ **Lesson 7:** When using the Show All Totals Method to add 2-digit numbers, incorrectly lining up the tens total and the ones total
- ▶ **Lesson 9:** Forgetting to record the new ten when adding
- ▶ **Lesson 10:** Incorrectly recording tens and ones digits when adding
- ▶ **Lesson 14:** Recording the wrong number of new tens

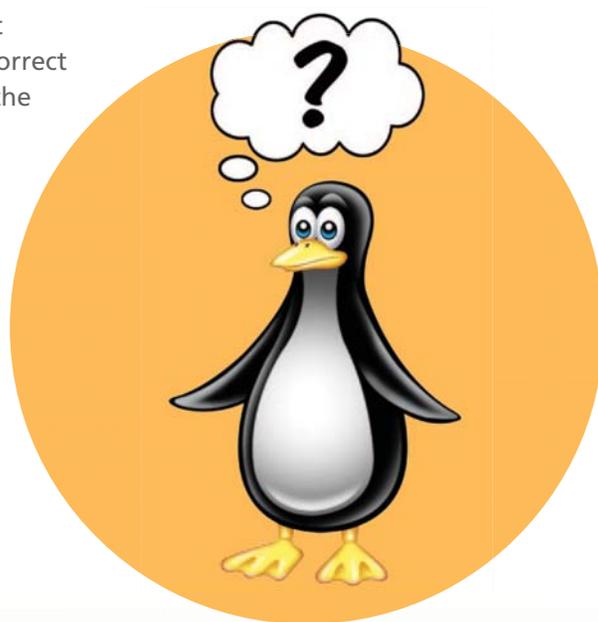
In addition to Puzzled Penguin, there are other suggestions listed in the Teacher Edition to help you watch for situations that may lead to common errors. As a part of the Unit Test Teacher Edition pages, you will find a common error and prescription listed for each test item.

Math Expressions VOCABULARY

As you teach this unit, emphasize understanding of these terms.

- number flash
- proof drawing

See the *Teacher Glossary*.



Investigate Structure of the Base-Ten System

Lesson

1

This lesson lays the foundation for understanding the role of place value in the base-ten number system. Writing numbers, using layered place value cards, and making drawings help children connect quantities and numbers and understand the relationship of ones, tens, and hundreds.

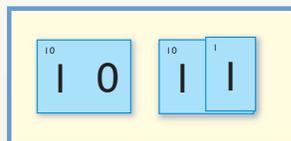
Writing Numbers to 110 As children write the numbers from 1 to 110 in columns on their MathBoards, they continually see the grouping of ones to make tens and observe the patterns formed within the number sequence.

1	11	21	31	41	51	61	71	81	91	101
2	12	22	32	42	52	62	72	82	92	102
3	13	23	33	43	53	63	73	83	93	103
4	14	24	34	44	54	64	74	84	94	104
5	15	25	35	45	55	65	75	85	95	105
6	16	26	36	46	56	66	76	86	96	106
7	17	27	37	47	57	67	77	87	97	107
8	18	28	38	48	58	68	78	88	98	108
9	19	29	39	49	59	69	79	89	99	109
10	20	30	40	50	60	70	80	90	100	110

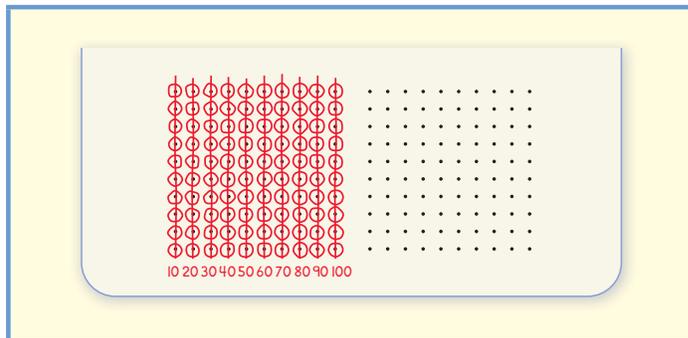
from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON NUMBER AND OPERATIONS IN BASE TEN

Understand Place Value In Grade 2, students extend their understanding of the base-ten system by viewing 10 tens as forming a new unit called a “hundred.” This lays the groundwork for understanding the structure of the base-ten system as based in repeated bundling in groups of 10 and understanding that the unit associated with each place is 10 of the unit associated with the place to its right.

Model Tens and Ones The Secret Code Cards are research-based manipulatives for modeling numbers. In two-digit numbers, their purpose is to help children see the underlying structure of tens and ones. As children model numbers, they build understanding of place value concepts.



Drawing Numbers in Groups of 10 By using circles to represent ones and using lines to group the ones into tens, children reinforce place value concepts. They can name numbers as ones, as tens, or as hundreds. This work prepares them for using Quick Hundreds and Quick Tens to represent numbers in later lessons.



Problem Solving and Fluency Practice Throughout Unit 2, children will build fluency with addition and subtraction within 20 and will practice solving one- and two-step word problems for the addition and subtraction problem subtypes covered in Unit 1.

5. In the lunchroom, 16 children have apples. Nine of these children have red apples and the rest have green apples. Then 5 more children come with green apples. How many children have green apples now?



apple

12

children

label

Represent Numbers

Lessons

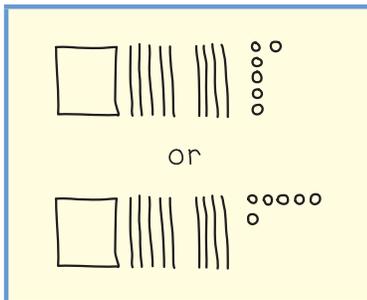
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3

4

Different Ways to Represent Numbers By using math drawings, expanded form, Secret Code Cards, and numerals to represent numbers with hundreds, tens, and ones, children continually build understanding of place value. The examples below are for the number 196.

Math Drawings Quick Hundreds, Quick Tens, and circles are used to represent hundreds, tens, and ones. Notice that the math drawings are similar to base ten blocks. Using 5-groups within each place helps children see each number and be more accurate.



Expanded Form Children write an equation to show a number as the sum of the values of the digits in each place.

Secret Code Cards When children assemble these layered place value cards to represent the hundreds, tens, and ones in a number, they can see the place value of each digit in the small number printed on the top left corner of each card. When the cards are assembled, these numbers show the values of the expanded form of the number.

$196 = 100 + 90 + 6$

100 1 0 0	90 9 0	6 6
Hundreds Card	Tens Card	Ones Card

100 1	90 9	6 6
Assembled Cards		

Numerals Children connect number names and numerals as they practice reading and writing numbers.

one hundred ninety-six ↔ 196

Addition of 1, 10, or 100 to a Number To prepare for 2-digit addition, children investigate patterns that occur when 1, 10, or 100 is added to a number, and begin to make these computations mentally.

from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON NUMBER AND OPERATIONS IN BASE TEN

Understand Place Value

Representations such as manipulative materials, math drawings, and layered three-digit place value cards afford connections between written three-digit numbers and hundreds, tens, and ones. Number words and numbers written in base-ten numerals and as sums of their base-ten units can be connected with representations in drawings and place value cards, and by saying numbers aloud and in terms of their base-ten units, e.g., 456 is “Four hundred fifty-six” and “four hundreds five tens six ones.”

Compare Numbers

Lesson

5

Children have used the symbols $<$, $>$, and $=$ to show relationships between numbers up to 20. Now they will use them to show the results of comparing numbers with up to 3 digits. They will discuss and explore ways of comparing two numbers as they develop an efficient method for doing this.

Representations Comparing numbers symbolically may be difficult for children to do immediately, so using Math Drawings or Secret Code Cards to represent the numbers provides the needed support to help children build understanding. Children need to understand that the most efficient way to compare numbers is to start comparing the value of each place with the leftmost digit. Using the drawings or cards lets children see that by comparing the quantities in each place from left to right they can easily find the first (and so the greatest) place in which one number has a greater digit.

Because some children will have a tendency to start by comparing the ones digits first, guide them to see how that method can lead to making an error. For example, $20 > 15$, even though 5 ones is more than 0 ones.

Place Value Working with Math Drawings or Secret Code Cards leads children to see that the most efficient way to compare numbers is to start at the leftmost digit, and that they can simply compare the value of the digit in each place moving from left to right. Some children may benefit from a transitional step in which they first write each number in expanded form and then compare the hundreds, the tens, and the ones, in that order.

from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON NUMBER AND OPERATIONS IN BASE TEN

Understand place value Comparing magnitudes of two-digit numbers draws on the understanding that 1 ten is greater than any amount of ones represented by a one-digit number. Comparing magnitudes of three-digit numbers draws on the understanding that 1 hundred (the smallest three-digit number) is greater than any amount of tens and ones represented by a two-digit number. For this reason, three-digit numbers are compared by first inspecting the hundreds place.

Two-Digit Addition Methods

Lessons

6

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8

Explore Methods Children begin two-digit addition with situations that lead to an extra (or new) ten or an extra (or new) hundred. They use math drawings or other methods, some remembered from last year, to see how the new ten or new hundred is formed.

Show All Totals In this method, children find the total for each place and then add the place totals to find the total. Although work in this unit is limited to adding two 2-digit numbers, the method can be extended to as many places as desired.

$$\begin{array}{r}
 78 \\
 + 56 \\
 \hline
 120 \\
 \hline
 14 \\
 \hline
 134
 \end{array}$$

the added tens →

the added ones →

the hundreds, tens, and ones total ↗

In this unit, children carry out this method working from left to right, starting with the tens place; however, children may instead work from right to left, starting with the ones place.

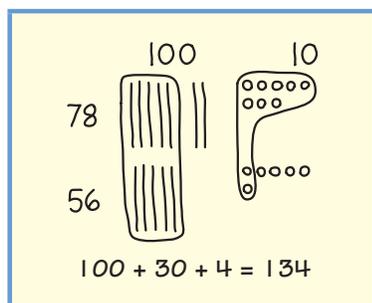
New Groups Below As children add, they write the small 1 for a new ten at the bottom of the tens column. This method has two advantages: (1) writing the 1 below helps children see that the new ten came from the 10 ones in the teen number total of the ones column, and (2) the last addition in the column will always be + 1, which is easy to find, since the children will have added the other two (usually greater) digits first.

$$\begin{array}{r}
 78 \\
 + 56 \\
 \hline
 134
 \end{array}$$

the new ten ↗

the new hundred ↗

Proof Drawings Just as mathematicians do, children should check their numerical work. To do this, children use math drawings as proof drawings. When they reconstruct the computation with a math drawing, if they find that the result is the same as the numerical computation, children can be sure that their work is correct.



However, using proof drawings has an even more important purpose. The proof drawings help make the steps of the numerical method meaningful to children. Guide children to explain how the parts of the proof drawing are connected to the parts of the numerical method. Children can use proof drawings for the two methods described and also for methods that they may generate themselves.

Compare Addition Methods

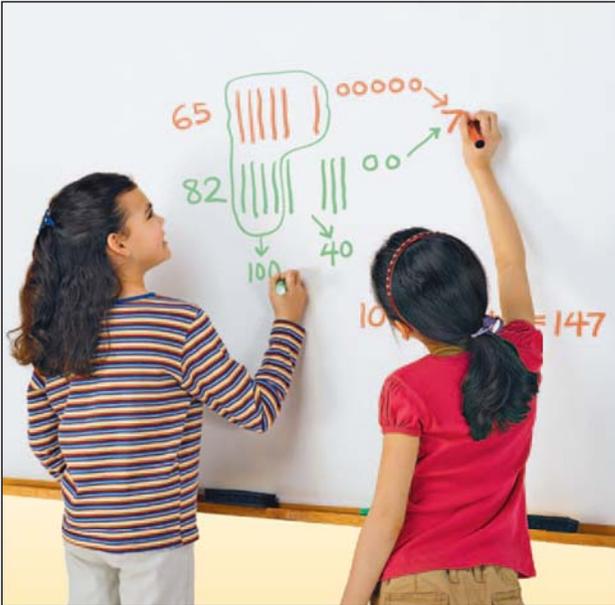
Lessons

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10

Because children learn and work in different ways, some children may be more comfortable with one method (either one they learned or one they generated themselves) than with the other methods. For example, some children may want to use Show All Totals working from right to left.

Discuss Methods As children discuss and solve the problems in these two lessons, they compare the methods, listen to advantages and disadvantages of the methods, and try different methods. This approach helps them decide which method they want to use.



It is important they understand that they do not have to choose and use only one method. Some children may decide that they want to use one method for one problem and a different one for a different problem, depending on the kinds of numbers in the problems.

One method may also lead children to understanding and using a different method. For example, children who work from right to left using Show All Totals may find with time that they are ready to use New Groups Below, because they now see how the total from the ones column may form a new ten for the tens column and that it is more efficient to write the small 1 at the bottom of the tens column than to write two separate totals.

from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON OPERATIONS AND ALGEBRAIC THINKING

Grade 2 Grade 2 students build upon their work in Grade 1 in two major ways. They represent and solve situational problems of all three types which involve addition and subtraction within 100 rather than within 20, and they represent and solve two-step situational problems of all three types.

Solve Word Problems Involving Money

Lessons

11

12

The Grade 2 Common Core State Standards for Measurement and Data ask that children solve word problems involving dollar bills, quarters, dimes, nickels, and pennies. These two lessons help meet that standard. Children will work with quarters in Unit 4.

Pennies, Dimes, and Dollars As children form amounts of money with pennies, dimes, and dollars, they see that these money units are related in the same way as ones, tens, and hundreds. They learn to use the dollar (\$) and cent (¢) symbols, and are introduced to the decimal point notation for money amounts that use the dollar symbol.

Pennies, Nickels, and Dimes Children examine the relationship among these money units and find an efficient way to count money—starting with the coin with the greatest value. They practice skip counting as a way to count the coins, and learn to shift the amount of skip counting with each different coin.

Create and Solve Real World Problems A real world setting—the Farm Stand at Mr. and Mrs. Green’s grocery store—is the context in which children create and solve problems involving money amounts. Children select two kinds of produce and find the cost of purchasing both. This open-ended situation helps children discover that when two money amounts are both more than 50¢, the total of the two will be greater than \$1.

from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON NUMBER AND OPERATIONS IN BASE TEN

Understand Place Value Students begin to work towards multiplication when they skip count by 5s, by 10s, and by 100s. This skip counting is not yet true multiplication because students don’t keep track of the number of groups they have counted.

Potatoes 65¢ 	Corn 56¢ 	Bananas 89¢ 	Peaches 77¢ 
Radishes 76¢ 	Lemons 88¢ 	Celery 57¢ 	Peppers 78¢ 

Develop Addition Fluency and Skills

Lessons

13

14

Children in Grade 2 are expected to fluently add within 100. This is important for satisfying the requirement of using addition and subtraction within 100 to solve one-step and two-step word problems. As children become more fluent in performing addition, they are better able to focus their attention on the meaning of a problem situation, to decide what situation type a problem involves, and to select a method for solving a problem.

Fluency for Addition Within 100 As children add two 2-digit numbers, they focus their attention on deciding whether a new 10 is formed during the addition. This helps them work more accurately and avoid errors.

More than Two Addends Children extend their addition skills to adding with 3 and 4 addends. They explore ways to do this and develop strategies for these additions.

Focus on Mathematical Practices

Lesson

15

The Standards for Mathematical Practice are included in every lesson of this unit. However, the last lesson in every unit focuses on all eight Mathematical Practices. In this lesson, students apply what they have learned about making sense of problems, modeling, and reasoning to what they have learned about adding two-digit numbers in order to solve problems about recycling.

from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON OPERATIONS AND ALGEBRAIC THINKING

Grade 2 The word *fluent* is used in the Standards to mean “fast and accurate.” Fluency in each grade involves a mixture of just knowing some answers, knowing some answers from patterns (e.g., “adding 0 yields the same number”), and knowing some answers from the use of strategies. It is important to push sensitively and encouragingly toward fluency of the designated numbers at each grade level, recognizing that fluency will be a mixture of these kinds of thinking which may differ across students.