3-DIGIT NUMBERS AND PLACE VALUE

2.NBT.1

CONTENTS

The types of documents contained in the unit are listed below. Throughout the unit, the documents are arranged by lesson.

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3-Digit Numbers and Place Value

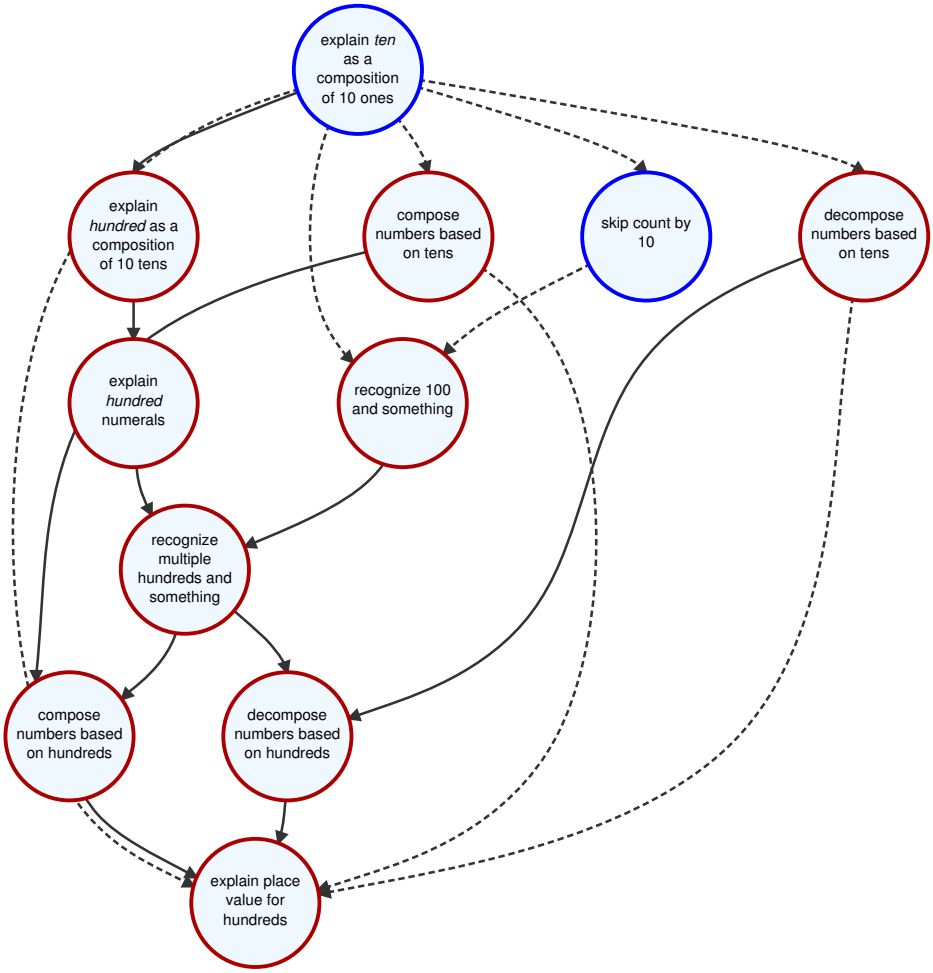
LEARNING MAP INFORMATION

STANDARDS

2.NBT.1 Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:

2.NBT.1.a 100 can be thought of as a bundle of ten tens – called a "hundred."

2.NBT.1.b The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).



**Learning map model of* 2.NBT.1

Node Name	Node Description
COMPOSE NUMBERS BASED ON HUNDREDS	Write a three-digit number in standard form when given the number of hundreds, tens, and ones that compose the number or when given a representation of the number using concrete manipulatives and/or drawings. For example, when given two hundreds, four tens, and three ones, write the number 243.
COMPOSE NUMBERS BASED ON TENS	Write a two-digit number in standard form when given the number of tens and the number of ones that compose the number or when given a representation of the number using concrete manipulatives and/or drawings. For example, when given five tens and three ones, write the number 53.
DECOMPOSE NUMBERS BASED ON HUNDREDS	When given a three-digit number in standard form, decompose the number by identifying the number of hundreds, tens, and ones using concrete manipulatives, words, and/or drawings. For example, when given the number 613, identify that there are six hundreds, one ten, and three ones.
DECOMPOSE NUMBERS BASED ON TENS	When given a two-digit number in standard form, decompose the number by identifying the number of tens and the number of ones using concrete manipulatives, words, and/or drawings. For example, when given the number 74, identify that there are seven tens and four ones.
EXPLAIN *HUNDRED* AS A COMPOSITION OF 10 TENS	Make known your understanding that 100 is a composition of 10 tens.
EXPLAIN *HUNDRED* NUMERALS	Make known your understanding that hundred numerals (100, 200, 300, etc.) are one, two, three, four, five, six, seven, eight, or nine hundreds (and zero tens and zero ones).
EXPLAIN PLACE VALUE FOR HUNDREDS	Make known your understanding that the value of a digit is determined by its position in the number. A digit in the hundreds place is worth that many hundreds.
EXPLAIN *TEN* AS A COMPOSITION OF 10 ONES	Make known your understanding that "ten" is a composition of 10 ones.
RECOGNIZE 100 AND SOMETHING	Recognize that numbers from 100 to 199 are composed of 100 and some other amount. For example, 136 is 100 and 36.
RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING	Recognize that numbers 200 and larger are composed of multiple hundreds and some other amount. For example, 354 is three hundreds and 54.
SKIP COUNT BY 10	Start at 10 and count by multiples of 10 (e.g., 10, 20, 30, 40,...).

3-Digit Numbers and Place Value

TEACHER NOTES

This unit includes the following documents:

- Learning Map Information
- Instructional Activity (three lessons)
- Instructional Activity Student Handout (for Lesson 3)
- Instructional Activity Supplement (for Lesson 2)
- Student Activity (Word Version)
- Student Activity Solution Guide

In this unit, students will build on their understanding of tens and ones to establish an understanding of hundreds. Using a variety of manipulatives, students will develop a flexible understanding of three-digit numbers, compose and decompose numbers based on hundreds, and explain place value for hundreds.

RESEARCH

In kindergarten and first grade, students learn to count to 100 and begin to think about groups of 10 as a unit (Van de Walle, Lovin, Karp, & Bay-Williams, 2014). In second grade, students should work more with compositions and decompositions of three-digit numbers (Van de Walle et al., 2014). Asking students to count a set of more than 20 objects can provide insight regarding whether or not the student is thinking of "ten" as a unit yet; grouping the objects into piles of 10 indicates understanding "ten" as a unit, while arranging the objects without creating groups of equal sizes (i.e., 10) indicates that the student does not yet possess understanding of "ten" as a unit (Van de Walle et al., 2014). To develop this understanding, teachers are encouraged to begin with what the student knows about counting by ones, then work to integrate grouping by tens and eventually by hundreds into their counting methods (Van de Walle et al., 2014).

Place value understanding is foundational for computation; understanding the structure of numbers is a necessary component for students to operate with understanding (Richardson, 2012). Developing a deep understanding of numbers in relation to each other takes time, but is well worth it (Richardson, 2012). Additionally, students who acquire proficiency with whole number concepts of place value, order, and comparisons can build on this understanding to make sense of decimals in later grades (Richardson, 2012), thereby developing a complete and symmetric view of the base-ten system.

In contrast, students who learn place value concepts primarily by the position of digits in a multi-digit number generally do not develop a strong sense of number structure; for example, they may be able to state, but not explain, that 10 tens are equal to one hundred (Richardson, 2012). Instead, students should organize quantities of concrete objects or pictures of objects into groups, count the groups, and determine the total value or total number of objects as some number of groups (of 10) objects in each group (Richardson, 2012). This activity quite naturally prepares students to consider groups of any number of objects when they study multiplication in later years. In addition, it is important to encourage students to think flexibly about numbers—to represent the same number using different numbers of ones, tens, and hundreds. For example,

students should be able to think about 400 as four hundreds, 40 tens, or 400 ones. Similarly, students should understand that a number such as 703, if composed entirely of ones, would contain 703 ones (as opposed to three ones). This understanding that groups of hundreds, tens, and ones can be taken apart in different but equivalent ways is a significant component of understanding place value (Van de Walle et al., 2014).

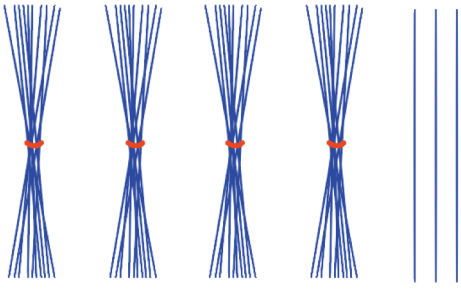
Concrete manipulatives can contribute significantly to productive activities aimed at developing student understanding of place value. Similar to how students benefit from measuring with informal units, they also benefit from working with informal concrete objects that they can manually put into groups of 10 and 100. There are two types of concrete manipulatives students can work with: informal groupable models and pregrouped (or trading) models (Van de Walle et al., 2014). Examples of informal groupable models include beans in cups or bundles of coffee stirrers or popsicle sticks (Van de Walle et al., 2014). Pregrouped (or trading) models cannot be taken apart or put together (e.g., base-ten blocks) and require extra effort to ensure students understand that a tens piece is really the same as 10 ones (Van de Walle et al., 2014).

It is important for students to construct the idea that 10 ones are equivalent to one ten and impose this understanding on the model they are working with (Van de Walle et al., 2014). The understanding that each ten is composed of 10 ones allows students to think flexibly about tens, which is useful for solving addition and subtraction problems where regrouping is necessary (Fuson, 1998). For this reason, it is critical that students' initial experiences are with informal groupable models and proportional pregrouped base-ten models; 10 ones must really be the same size as one ten (Van de Walle et al., 2014). Students should first engage with groupable models, where they must compose their own groups of 10, which helps to establish understanding of the place value relationships they model; using pregrouped physical models before constructing their own groups of 10 poses the risk that students will use them without reflecting on the relationships they represent (Van de Walle et al., 2014).

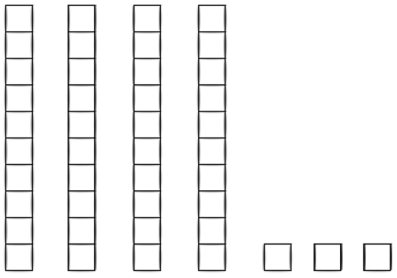
AN EXAMPLE

The following graphics are representations of 43 using groupable and pregrouped models.

GROUPABLE MODELS



PREGROUPED MODELS



After sufficient experience with groupable and pregrouped models, semi-abstract pictorial (or drawn) dot-stick-square models can be used (Van de Walle et al., 2014). Advantages of pictorial models are that they are easier to manage, require only paper and pencil, remain available as records of children's thinking, facilitate conversation, and allow students to link mathematical notation to the base-ten manipulatives (Fuson, 1998). The linking of objects to their corresponding quantities helps students construct meaning for number words and written notation (Fuson, 1998). In addition, pictorial models provide a record of student thinking and allow students to communicate their understanding about numerical quantities, thereby promoting the use of language, either spoken or written, to describe the numerical relationships (Fuson, 1998). Nonproportional models such as coins and dollar bills should not be used to introduce place value but can be used once students have a conceptual understanding of place value (Van de Walle et al., 2014). These models can cause confusion because the "ten to one" relationship is not clearly evident in the model itself. That is, one dollar bill does not look or feel like 10 dimes, and a dime does not look or feel like 10 pennies.

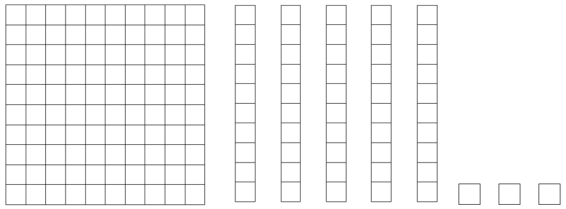
Students need opportunities to work with place value manipulatives (either virtual or concrete), organizing ones to model tens and tens to model hundreds, to explain three-digit numbers as groups of hundreds, tens, and ones (Richardson, 2012; Burris, 2013). As students initially develop these understandings, it is important that they do not trade one block for another, but rather that they work with what is already present and either create groups or disassemble groups (Richardson, 2012). Students need to recognize that trades or exchanges of base-ten materials are the result of either disassembling or assembling groups. Note that a students' ability to correctly label the tens and ones place in a two-digit number or identify a "ten" with base-ten manipulatives does not guarantee that the student understands that one ten has the same value as 10 ones; students should be able to demonstrate and explain their understanding using models (Van de Walle et al., 2014). Base-ten blocks (or paper versions of base-ten blocks) are appropriate; paper versions of base-ten blocks allow for counting, marking, circling, and cutting to understand equivalent amounts (Richardson, 2012). When working with concrete manipulatives, it is critical that students regularly reflect on their actions in order to build mathematical meaning for the manipulatives they use (Clements, 2000).

To extend students' understanding that one ten can be represented as 10 ones or vice versa, it is important to help students see that the same number can be represented or thought of in many different ways, an understanding that is attained as students physically reorganize models and participate in conversations with their peers and their teacher (Richardson, 2012). In addition, students with solid place value understanding should be successful in situations where they are given quantities in a non-traditional order (e.g., six tens, 11 ones, and seven hundreds) (Richardson, 2012). Students' work with models should eventually lead to a level of understanding where models are no longer needed, although even after students are using only numerical methods, it is beneficial to ask them to explain their thinking in terms of base-ten manipulatives (Richardson, 2012; Fuson, 1998).

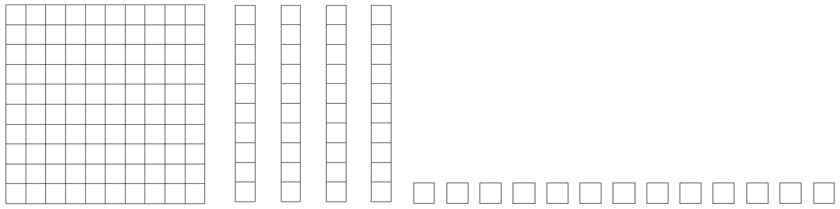
AN EXAMPLE

The following examples are three equivalent representations of 153 using base-ten manipulatives.

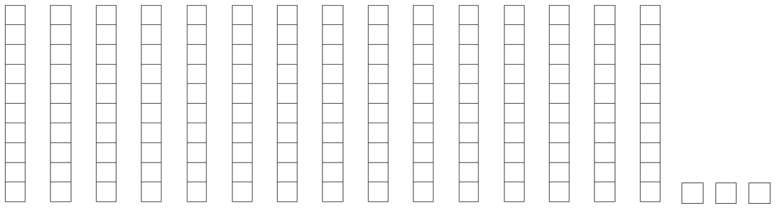
1. 1 hundred, 5 tens, 3 ones:



2. 1 hundred, 4 tens, 13 ones:



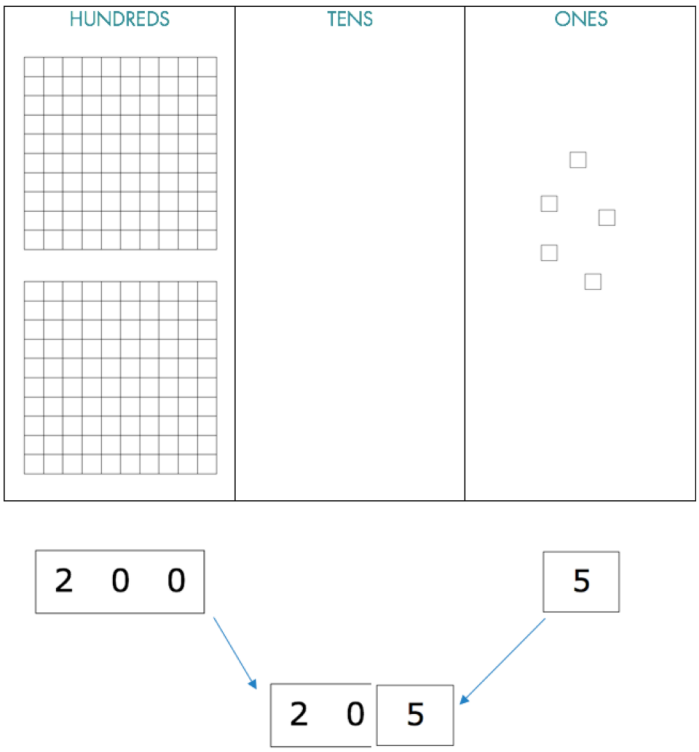
3. 15 tens, 3 ones:



Unlike the relationships among quantities and the structure and pattern within numbers, the way we say and write numbers are conventions that must be directly taught to students, rather than discovering them through problem-based activities (Van de Walle et al., 2014). It is recommended that as students work with base-ten materials, they write the base-ten name (e.g., three hundreds, four tens, and two ones) as well as standard form (e.g., 342) for the number they are modeling (Van de Walle et al., 2014). Note that the word "and" should be used with caution; it is appropriate to use "and" when listing base-ten materials that compose a number, but not when reading a whole number in standard form. For example, reading 342 as "three hundred *and* forty-two" (rather than "three hundred forty-two") is inaccurate and must be unlearned in later grades as students work with decimals and the word "and" is specifically used to read the decimal point. Place value mats can help organize this work with base-ten manipulatives (Van de Walle et al., 2014). The use of number cards paired with base-ten manipulatives can help students properly build numbers in standard form (Van de Walle et al., 2014).

AN EXAMPLE

The following graphic is a representation of 205 using base-ten manipulatives and number cards.



MISCONCEPTIONS

Student misunderstandings often result from a lack of place value understanding or incomplete knowledge of number structure. Children may see multi-digit numbers as concatenated single-digits (e.g., viewing 42 as the single-digits four and two) (Fuson, 1998). This perspective is common among students and carries into multi-digit addition and subtraction, causing many types of well-documented errors (Fuson, 1998). It is important to model proper vocabulary and encourage the same in students to avoid this misconception (e.g., refer to the "4" in 42 as "forty" or "four tens" rather than "four") (Fuson, 1998). In addition, making connections among numerals and the corresponding concrete base-ten representation can help students better understand the difference between the value of a digit in the tens place compared to the value of a digit in the ones place.

In addition, look for and point out common mistakes, such as writing 342 as "300402" (Van de Walle et al., 2014). This misunderstanding is likely the result of the way numbers are pronounced. For example, 703 is read "seven hundred three" and therefore may be written as it sounds, "7003" (Fuson, 1998). If students hold this misconception, continue using mathematically accurate number names while emphasizing place value understanding and the structure of base-ten numerals. The use of place value cards in conjunction with base-

ten manipulatives can help scaffold understanding of the standard form of multi-digit numbers (Van de Walle et al., 2014). Strategies for teaching three-digit numbers, in addition to strategies for addressing student misconceptions, can be extended to multi-digit numbers with more than three digits as many of the same principles apply.

LEARNING MAP INFORMATION

The learning map section for this sequence of activities begins with student understanding of "ten" as a composition of 10 ones. Students' experiences prior to explaining "ten" as a composition of 10 ones should include demonstrating the concept of addition, representing addition with equations, and composing numbers up to 10. This understanding leads to students' ability to skip count by 10, a prerequisite to explaining repeated addition, and to compose and decompose number based on tens. In addition, students' ability to explain a ten as a composition of 10 ones supports the transition to explaining a hundred as a composition of 10 tens.

Early understanding of the relationships between tens and ones, along with the understanding that a hundred is composed of 10 tens or 100 ones, prepares students to explain hundreds numerals, recognize multiple hundreds and something, and compose and decompose numbers based on hundreds. Once students are able to compose and decompose numbers based on hundreds, they are ready to explain place value for hundreds.

INSTRUCTIONAL ACTIVITIES

The activities in this unit are designed to foster student understanding of place value and three-digit numbers in terms of hundreds, tens, and ones.

In Lesson 1, students review ones and tens using groupable models, then extend their understanding of ones and tens to model values greater than 100 using hundreds, tens, and ones.

In Lesson 2, students transition from representing three-digit numbers with groupable models to representing three-digit numbers using base-ten manipulatives. In addition, students will attach numerals to concrete representations to build number sense and place value understanding for numerals.

Finally, in Lesson 3, students transition from representing three-digit numbers using physical manipulatives to representing three-digit numbers using drawings of base-ten manipulatives. Students continue to attach numerals to drawings of base-ten representations to build number sense and place value understanding for numerals.

REFERENCES

Burris, J. T. (2013). Virtual place value. *Teaching children mathematics*, *20*(4), 228-236.

Clements, D. H. (2000). 'Concrete' manipulatives, concrete ideas. *Contemporary Issues in Early Childhood, 1*(1), 45-60.

Fuson, K. C. (1998). Pedagogical, mathematical, and real-world conceptual-support nets: A model for building children's multidigit domain knowledge. *Mathematical Cognition*, *4*(2), 147-186.

Richardson, K. (2012). *How children learn number concepts: A guide to the critical learning phases*. Bellingham: Math Perspectives Teacher Development Center.

Van de Walle, J. A., Karp, K. S., Lovin, L. A. H., & Bay-Williams, J. M. (2014). *Teaching Student-centered Mathematics: Developmentally Appropriate Instruction for Grades Pre-K-2* (Vol. 1). Pearson Higher Ed.

3-Digit Numbers and Place Value

Overview of Instructional Activities

Lesson	Learning Goal	Nodes Addressed
Lesson 1	Students will review ones and tens using groupable models, then extend their understanding of ones and tens to model values greater than 100 using hundreds, tens, and ones.	▶ EXPLAIN *TEN* AS A COMPOSITION OF 10 ONES ▶ SKIP COUNT BY 10 ▶ COMPOSE NUMBERS BASED ON TENS ▶ DECOMPOSE NUMBERS BASED ON TENS ▶ EXPLAIN HUNDRED AS A COMPOSITION OF 10 TENS ▶ RECOGNIZE 100 AND SOMETHING ▶ EXPLAIN HUNDRED NUMERALS
Lesson 2	Students will transition from representing three-digit numbers with groupable models to representing three-digit numbers using base-ten manipulatives. In addition, students will attach numerals to concrete representations to build number sense and place value understanding for numerals.	▶ EXPLAIN *TEN* AS A COMPOSITION OF 10 ONES ▶ SKIP COUNT BY 10 ▶ EXPLAIN *HUNDRED* AS A COMPOSITION OF 10 TENS ▶ RECOGNIZE 100 AND SOMETHING ▶ EXPLAIN HUNDRED NUMERALS ▶ RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING ▶ COMPOSE NUMBERS BASED ON HUNDREDS ▶ DECOMPOSE NUMBERS BASED ON HUNDREDS ▶ EXPLAIN PLACE VALUE FOR HUNDREDS
Lesson 3	Students will transition from representing three-digit numbers using physical manipulatives to representing three-digit numbers using drawings of base-ten manipulatives. Students will continue to attach numerals to drawings of base-ten representations to build number sense and place value understanding for numerals.	▶ EXPLAIN *HUNDRED* NUMERALS ▶ RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING ▶ COMPOSE NUMBERS BASED ON HUNDREDS ▶ DECOMPOSE NUMBERS BASED ON HUNDREDS ▶ EXPLAIN PLACE VALUE FOR HUNDREDS

3-Digit Numbers and Place Value

INSTRUCTIONAL ACTIVITY

Lesson 1

LEARNING GOAL

Students will review ones and tens using groupable models, then extend their understanding of ones and tens to model values greater than 100 using hundreds, tens, and ones.

PRIMARY ACTIVITY

Students will start the lesson by counting several objects, going all the way up to 100. Students will then, if they did not initially, create groups of 10 to make counting the objects easier. Next, students will be provided with more of the same object, so that they have more than 100 items, and they will create groups of 100, 10, and the single remaining objects. Finally, students will combine their object with other students' objects, consider the total value and determine how the objects can be grouped, and discuss how different groupings can model the same number.

OTHER VOCABULARY

Students will need to know the meaning of the following terms:

- Ones
- Tens
- Hundreds

MATERIALS

- Coffee stirrers, popsicle sticks, pencils, or other objects that can be counted (Recommend 100-150 objects for every two students.)
- Twist ties, yarn, string, or other material to create groups of 10 objects (Recommend 10-15 for every two students.)
- Large, clear bags (Recommend one for every two students.)

IMPLEMENTATION

Begin the lesson by reviewing representations of two-digit numbers using groupable models.

Provide pairs of students with 50-99 coffee stirrers, popsicle sticks, pencils, or similar objects.

Ask pairs of students to count how many objects they have.

Observe how pairs of students count their objects. Based on experiences in earlier grades, students should be familiar with groups of 10.

> NOTE: To avoid confusion in writing, a single group of 10 items is collectively referred to as a *ten*, and *tens* refers to more than one *ten*.

Once students have counted their objects, **ask** several pairs to share how many objects they had and what strategy they used to count. If possible, **select** pairs of students who counted each object individually, pairs of students who created groups of 10, and pairs of students who used other counting strategies.

Ask students who used groups of 10 why they chose to make groups of 10 as they were counting.

Establish that groups of 10 makes counting easier and more efficient than counting by ones when there are several objects to count.

Provide pairs of students with twist ties, yarn, string, or other materials to make groups of 10 with their objects.

Once pairs of students have created groups of 10 (or *tens*), **ask** students to try representing the same number with a different number of tens and a different number of ones. This will require students to unbundle one or more groups of 10. For example, if students have 83 objects, they will have previously created eight groups of 10 and three single objects. Unbundling one group of 10 would result in seven groups of 10 and 13 single objects, which also represents 83 total objects.

Ask the following guiding questions as students work.

GUIDING QUESTIONS

Elicit student thinking:

- How would you count these objects?
- How do you keep track while you are counting?
- Can you think of ways to count more quickly/efficiently?

Determine if the student can EXPLAIN *TEN* AS A COMPOSITION OF 10 ONES:

- [Point to a group of 10.] In this group of 10, how many ones are there?
- How many ones do you have to put together to make a ten?

Determine if the student can SKIP COUNT BY 10:

- How would you count these groups of 10?

Determine if the student can COMPOSE NUMBERS BASED ON TENS:

- If there are six groups of 10 and eight ones, how many total objects are there?
- If there are five groups of 10 and 29 ones, how many total objects are there?

Determine if the student can DECOMPOSE NUMBERS BASED ON TENS:

- If there are 93 objects, how many groups of 10 can you make? How many ones would be left over?
- Is there a different way to model 82 objects other than eight tens and two ones? How many different ways can you come up with?

Next, students will consider more than 100 objects.

Provide pairs of students with additional objects, so that each pair of students has between 100 and 150 total objects.

Ask students to count the objects in whatever way is meaningful to them to determine the total.

Once students have counted their objects, **ask** several pairs to share how many objects they have and what strategy they used to count. If possible, **select** pairs of students who counted the objects in different ways.

Ask students if they can think of a number larger than 10 that would also make counting easier and more efficient. **Allow** students to suggest a variety of numbers that they think would make counting easier, but **ensure** 100 is mentioned as an option.

Establish that groups of 100 make counting easier and more efficient when numbers are greater than 100.

Ask students how many single objects it takes to make 100. (100)

Next, **ask** students how many groups of 10 are needed to make 100. **Allow** pairs of students ample time to investigate this question using their objects and by making groups of 10.

Bring students back together as a class and **discuss** how many groups of 10 are needed to make 100.

After establishing that 100 is composed of 10 tens, **provide** pairs of students with a large, clear bag for students to fill with 10 groups of 10 objects. **Ensure** that each group of 10 in the large, clear bag is grouped using a twist tie, yarn, or string.

Require students to make groups of 10 using the remaining objects that are not part of the 100 objects in the bag, so that each pair of students has modeled one hundred, a few tens, and the remaining ones.

Ask the following guiding questions as students work.

GUIDING QUESTIONS

Elicit student thinking:

- How would you count these objects?
- Can you think of ways to count more quickly/efficiently?

Determine if the student can EXPLAIN *TEN* AS A COMPOSITION OF 10 ONES:

- [Point to a group of 10.] In this group of 10, how many ones are there?
- How many ones do you have to put together to make a ten?

Determine if the student can EXPLAIN *HUNDRED* AS A COMPOSITION OF 10 TENS:

- How many groups of 10 does it take to make 100?
- In this bag of 100 objects, how many groups of 10 are there?

Determine if the student can RECOGNIZE 100 AND SOMETHING:

- How many objects do you have total? How many objects are in the bag? How many other objects are there?
- If I gave you 146 objects and asked you to make a group of 100, how many objects would be left over?

Next, pairs of students will combine their objects with other pairs to consider numbers greater than 200.

Create groups of four to six students by combining pairs of students and the objects they have been working with. This should mean that each group has 200-500 total objects.

Ask groups to count how many objects they have altogether.

Encourage groups to use counting strategies they have learned to count efficiently.

Prompt students to consider whether they now have enough tens to make another hundred, or enough ones to make another ten.

Ask the following guiding questions as students work.

GUIDING QUESTIONS

Elicit student thinking:

- How would you count these objects?
- Can you think of ways to count more quickly/efficiently?

Determine if the student can EXPLAIN *TEN* AS A COMPOSITION OF 10 ONES:

- [Point to a group of 10.] In this group of 10, how many ones are there?
- How many ones do you have to put together to make a ten?

Determine if the student can EXPLAIN *HUNDRED* AS A COMPOSITION OF 10 TENS:

- How many groups of 10 does it take to make 100?
- In this bag of 100 objects, how many groups of 10 are there?

Determine if the student can EXPLAIN *HUNDRED* NUMERALS:

- If you have exactly 500 objects, how many hundreds are there? How many tens? How many ones?
- If you have exactly three hundreds bags, how many total objects are there?
- [Point to the hundreds bags.] How many objects are in these bags? How would you write that number?

Once groups have counted all their objects, **ask** groups to share with the class how many total objects they have.

In addition to giving the number, **require** groups to report how many hundreds, how many tens, and how many ones they have.

Write each group's total in a place that is visible.

Once each group has reported how many objects they have, **challenge** groups to change the way their objects are grouped while keeping the same number of total objects (determine an *equivalent grouping*).

Require students to record their new grouping of hundreds, tens, and ones next to or under the number they recorded previously, once they have determined an equivalent grouping. For example, if

a group previously reported that they had 374 objects grouped as three hundreds, seven tens, and four ones, they could remove 10 tens from the bag to represent 374 as two hundreds, 17 tens, and four ones.

As a class, **check** the equivalent groupings students came up with to determine whether they are accurate.

Incorporate discussion regarding why it is possible to represent multi-digit numbers in so many different ways. Flexibility with and understanding of the structure of numbers provides the foundation for students to operate with understanding.

At the end of the activity, provide students with a three-digit number (e.g., 832) and ask students to describe a number of hundreds, tens, and ones that would compose the given number. Allow for students to use the standard representation of that number (e.g., eight hundreds, three tens, and two ones) or any other equivalent representation.

3-Digit Numbers and Place Value

INSTRUCTIONAL ACTIVITY

Lesson 2

LEARNING GOAL

Students will transition from representing three-digit numbers with groupable models to representing three-digit numbers using base-ten manipulatives. In addition, students will attach numerals to concrete representations to build number sense and place value understanding for numerals.

PRIMARY ACTIVITY

Students will start the lesson by representing the same three-digit number using groupable models and base-ten manipulatives. After connecting these representations, students will model several three-digit numbers using base-ten manipulatives on place value mats while also modeling their corresponding numerals. For each three-digit number, students will identify how many hundreds, tens, and ones compose the number and identify the standard form of the number.

OTHER VOCABULARY

Students will need to know the meaning of the following terms:

- Ones
- Tens
- Hundreds
- Standard form/base-ten numerals

MATERIALS

- Coffee stirrers, popsicle sticks, pencils, or other objects that can be counted (Recommend 100-150 objects for every two students.)
- Twist ties, yarn, string, or other material to create groups of 10 objects (Recommend 10-15 for every two students.)
- Large, clear bags (Recommend one for every two students.)
- Scissors (Recommend one pair for every student.)
- Instructional Activity Supplement (Recommend one copy for every two students.)
- Word version Instructional Activity Supplement

IMPLEMENTATION

Begin the lesson by reviewing representations of three-digit numbers using groupable models.

Provide pairs of students with:

- 100-150 coffee stirrers, popsicle sticks, pencils, or similar objects
- 10-15 twist ties, pieces of yarn, or pieces of string
- a large, clear bag

Ask pairs of students to count how many objects they have while creating groups of hundreds, tens, and ones using the materials provided.

Observe pairs of students as they work to ensure accuracy, and **use** questioning to correct misconceptions as needed.

Once students have counted their objects and created groups based on place value understanding, **ask** several pairs to share how many objects they have total, as well as how many hundreds, how many tens, and how many ones they have.

Remind students that groups of 100 and groups of 10 make counting easier and more efficient than counting by ones when there are several objects to count.

Ask the following guiding questions as students work.

GUIDING QUESTIONS

Elicit student thinking:

- How would you count these objects?
- How do you keep track while you are counting?
- What strategies make counting more efficient?

Determine if the student can EXPLAIN *TEN* AS A COMPOSITION OF 10 ONES:

- [Point to a group of 10.] In this group of 10, how many ones are there?
- How many ones do you have to put together to make a ten?

Determine if the student can SKIP COUNT BY 10:

- [Point to several groups of 10.] How would you count these groups of 10?

Determine if the student can EXPLAIN *HUNDRED* AS A COMPOSITION OF 10 TENS:

- How many groups of 10 does it take to make 100?
- In this bag of 100 objects, how many groups of 10 are there?

Determine if the student can RECOGNIZE 100 AND SOMETHING:

- How many objects do you have total? How many objects are in the bag? How many other objects are there?
- If I gave you 146 objects and asked you to make a group of 100, how many objects would be left over?

Students should keep their groups of objects from the beginning of the lesson available during the next activity as they are introduced to grouped base-ten manipulatives.

Provide each pair of students with the first page of the INSTRUCTIONAL ACTIVITY SUPPLEMENT.

Ask students how many squares are in the image on Page 1.

Allow pairs of students time to count the number of squares. (100)

Observe how pairs of students go about counting the squares. Some pairs may count each individual square, while others may notice that there are 10 rows (or 10 columns) of 10 squares and decide to skip count by tens.

Once students have had time to count the squares, **ask** how many squares they counted.

Establish that there are 100 squares total.

Provide each student with a pair of scissors and ask one of the students in each pair to cut around the outside of the image on Page 1 of the INSTRUCTIONAL ACTIVITY SUPPLEMENT (all 100 squares should remain in tact).

Ask students to determine the group of objects from the first activity that the hundreds square corresponds to. Students should identify that the hundreds square corresponds to the 100 objects (or 10 groups of 10 objects) in the large clear bag.

Ask students to describe how 10 groups of 10 are represented in the hundreds square. Students should refer to the structure of the hundreds square, 10 rows and 10 columns, 10 columns with 10 squares per column, or 10 rows with 10 squares per row, to answer this question.

Next, **provide** Page 2 of the INSTRUCTIONAL ACTIVITY SUPPLEMENT to pairs of students.

Ask students how many squares are grouped together in each stick. (10)

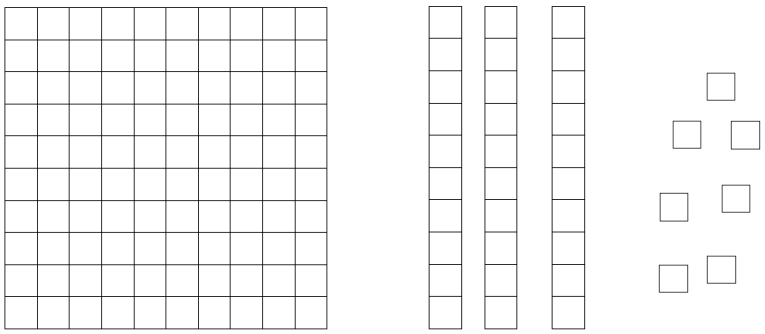
Require that students cut out as many tens from the page as they have groups of 10 objects from the first part of the lesson. For example, if the students have three groups of 10 objects tied together, they should cut out three tens sticks from the page (the remaining tens sticks will be used during the lesson).

Finally, **ask** students how they could use the remaining tens sticks to obtain the number of ones necessary to complete the representation of the number of objects they began with. Students should come to the realization that cutting up a tens stick into individual ones would accomplish this goal.

Instruct students to go ahead and decompose a ten into 10 ones to model the number of objects they began the lesson with.

Pairs of students should now have the same number represented two different ways: with groupable models and with grouped models.

For example, if the student began the lesson with 137 objects, their base-ten manipulatives should appear as follows:



Collect the grouped objects from the beginning of the lesson and pass out the remaining pages of the INSTRUCTIONAL ACTIVITY SUPPLEMENT to pairs of students (Pages 3 – 10).

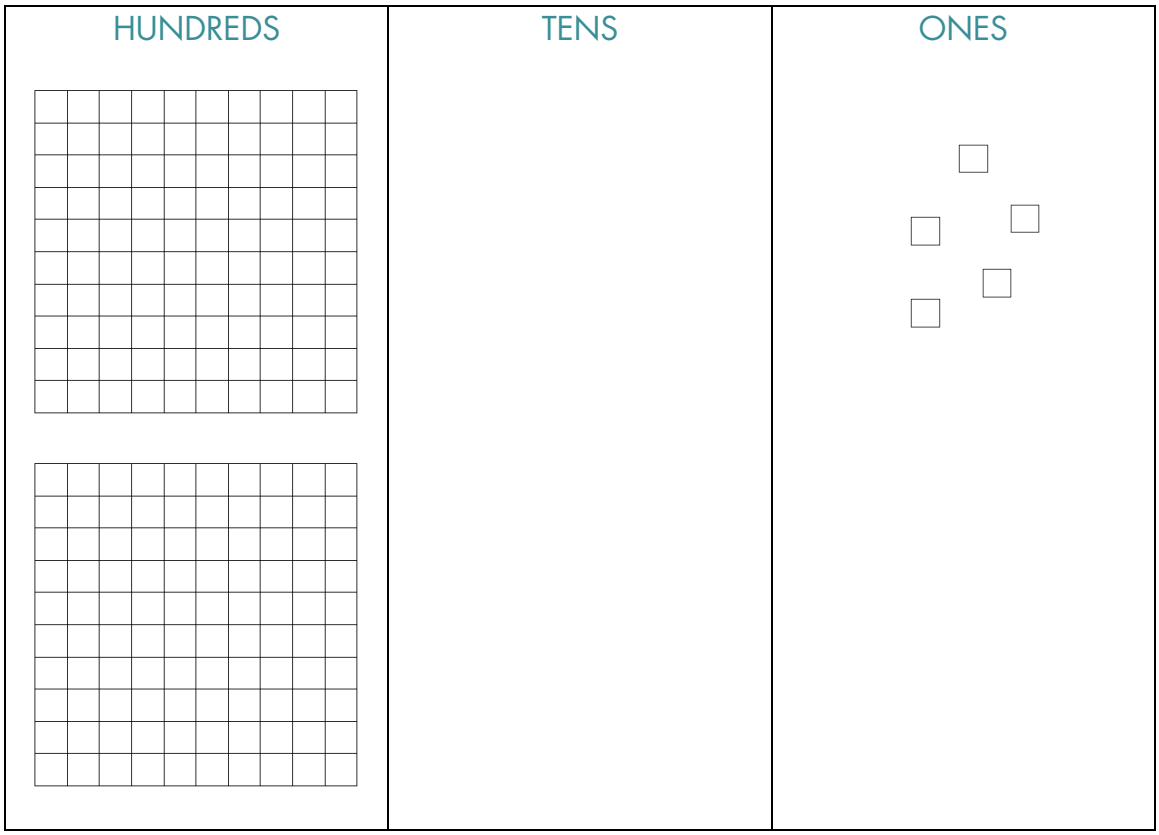
Direct students to cut out the remaining tens on Page 2 and the hundreds squares on Pages 3 – 5 of the INSTRUCTIONAL ACTIVITY SUPPLEMENT. Pairs of students should now have four hundreds, nine tens, and 10 ones.

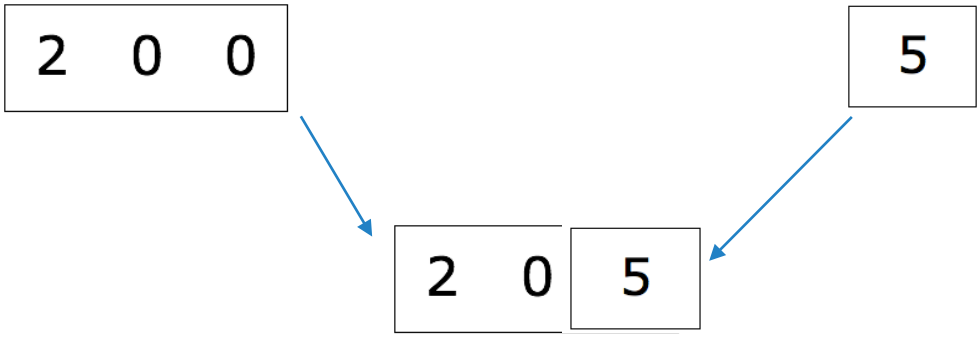
In addition, students should place the hundreds, tens, and ones place value mats on their desks (Pages 6 – 8 of the INSTRUCTIONAL ACTIVITY SUPPLEMENT) and cut out the hundreds, tens, and ones numerals (Pages 9 – 10 of the INSTRUCTIONAL ACTIVITY SUPPLEMENT).

Provide students with a variety of three-digit numbers to model using their base-ten manipulatives. Numbers should be from 100 to 499 at this time so pairs of students have enough manipulatives to represent each number. **Include** numbers with zero in the tens place, or in the ones place, or in both the tens place and the ones place.

For each number provided, students should model the number with the base-ten manipulatives and the numerals. Begin with the hundreds, tens, and ones numerals shown separately, corresponding to the base-ten manipulatives. Then, overlap the numerals to represent the three-digit number in standard form.

The following is an example representation of 205.





Ask the following guiding questions as students represent a variety of three-digit numbers from 100 to 499.

GUIDING QUESTIONS

Elicit student thinking:

- [Provide a three-digit number, e.g., 410.] What do you know about this number?
- [Provide a collection of hundreds, tens, and ones using base-ten manipulatives.] What do these models mean? What information do you have based on these models?

Determine if the student can EXPLAIN *HUNDRED* NUMERALS:

- In the number 400, how many hundreds are there? How many tens? How many ones?
- [Show three hundreds using base-ten manipulatives.]? What number do these model?

Determine if the student can RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING:

- If you were to model the number 275, how many hundreds would you use? What would be left to model using tens and ones?
- If you were to model the number 440, how many hundreds would you use? What would be left to model using tens and ones?
- If you were to model the number 308, how many hundreds would you use? What would be left to model using tens and ones?

Determine if the student can COMPOSE NUMBERS BASED ON HUNDREDS:

- If there are two hundreds, three tens, and eight ones, how many total objects are there? How would you write this number in standard form?
- If there are four hundreds and one ten, how many total objects are there? How would you write this number in standard form?
- If there is one hundred and seven ones, how many total objects are there? How would you write this number in standard form?

Determine if the student can DECOMPOSE NUMBERS BASED ON HUNDREDS:

- If there are 193 objects, how many hundreds are there? How many tens? How many ones?
- If there are 203 objects, how many hundreds are there? How many tens? How many ones?
- If there are 380 objects, how many hundreds are there? How many tens? How many ones?

Determine if the student can EXPLAIN PLACE VALUE FOR HUNDREDS:

- In the number 476, what is the value of the four? What is the value of the seven? What is the value of the six?
- In the number 310, what is the value of the three? What is the value of the one? What is the value of the zero?
- In the number 105, what is the value of the one? What is the value of the zero? What is the value of the five?

Next, pairs of students will combine their base-ten manipulatives with other pairs to consider numbers greater than or equal to 500. Students will continue to use the hundreds, tens, and ones place value mats and the hundreds, tens, and ones numerals.

Create groups of four students by combining pairs of students and the objects they have been working with. This should mean that each group has eight hundreds, 18 tens, and 20 ones.

Provide students with a variety of three-digit numbers to model using their base-ten manipulatives. Numbers can now range from 100 to 999. **Note** that numbers greater than 899 will require students to utilize 10 tens as the ninth hundred; numbers greater than 989 will also require students to use 10 ones as the ninth ten.

For each number provided, students should model the number with the base-ten manipulatives and the numerals. Begin with the hundreds, tens, and ones numerals shown separately, corresponding to the base-ten manipulatives. Then, overlap the numerals to represent the three-digit number in standard form.

After students model the number provided in one way and before moving to a new number, **ask** students to provide an equivalent representation of the same number using the base-ten manipulatives. For example, if students first model 873 with eight hundreds, seven tens, and three ones, they could model the same value using eight hundreds, six tens, and 13 ones.

Include numbers with zero in the tens place, or in the ones place, or in both the tens place and the ones place.

Ask the following guiding questions as students represent a variety of three-digit numbers from 100 to 999.

GUIDING QUESTIONS

Elicit student thinking:

- [Provide a three-digit number, e.g., 802.] What do you know about this number?
- [Provide a collection of hundreds, tens, and ones using base-ten manipulatives.] What do these models mean? What information do you have based on these models?

Determine if the student can EXPLAIN *HUNDRED* NUMERALS:

- In the number 600, how many hundreds are there? How many tens? How many ones?
- [Show five hundreds using base-ten manipulatives.]? What number do these model?

Determine if the student can RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING:

- If you were to model the number 718, how many hundreds would you use? What would be left to model using tens and ones?
- If you were to model the number 890, how many hundreds would you use? What would be left to model using tens and ones?
- If you were to model the number 504, how many hundreds would you use? What would be left to model using tens and ones?

Determine if the student can COMPOSE NUMBERS BASED ON HUNDREDS:

- If there are nine hundreds, two tens, and seven ones, how many total objects are there? How would you write this number in standard form?
- If there are six hundreds and three tens, how many total objects are there? How would you write this number in standard form?
- If there are seven hundreds and nine ones, how many total objects are there? How would you write this number in standard form?
- If there are five hundreds and 23 ones, how many total objects are there? How would you write this number in standard form?
- If there are seven hundreds and 12 tens, how many total objects are there? How would you write this number in standard form?
- If there are six hundreds, 15 tens, and 31 ones, how many total objects are there? How would you write this number in standard form?

Determine if the student can DECOMPOSE NUMBERS BASED ON HUNDREDS:

- If there are 593 objects, how many hundreds are there? How many tens? How many ones? Is there a different way you could model this number?
- If there are 906 objects, how many hundreds are there? How many tens? How many ones? Is there a different way you could model this number?
- If there are 850 objects, how many hundreds are there? How many tens? How many ones? Is there a different way you could model this number?

Determine if the student can EXPLAIN PLACE VALUE FOR HUNDREDS:

- In the number 913, what is the value of the nine? What is the value of the one? What is the value of the three?
- In the number 840, what is the value of the eight? What is the value of the four? What is the value of the zero?
- In the number 609, what is the value of the six? What is the value of the zero? What is the value of the nine?

> **Incorporate** discussion regarding why it is possible to represent multi-digit numbers in so many different ways. Flexibility with and understanding of the structure of numbers provides the foundation for students to operate with understanding.

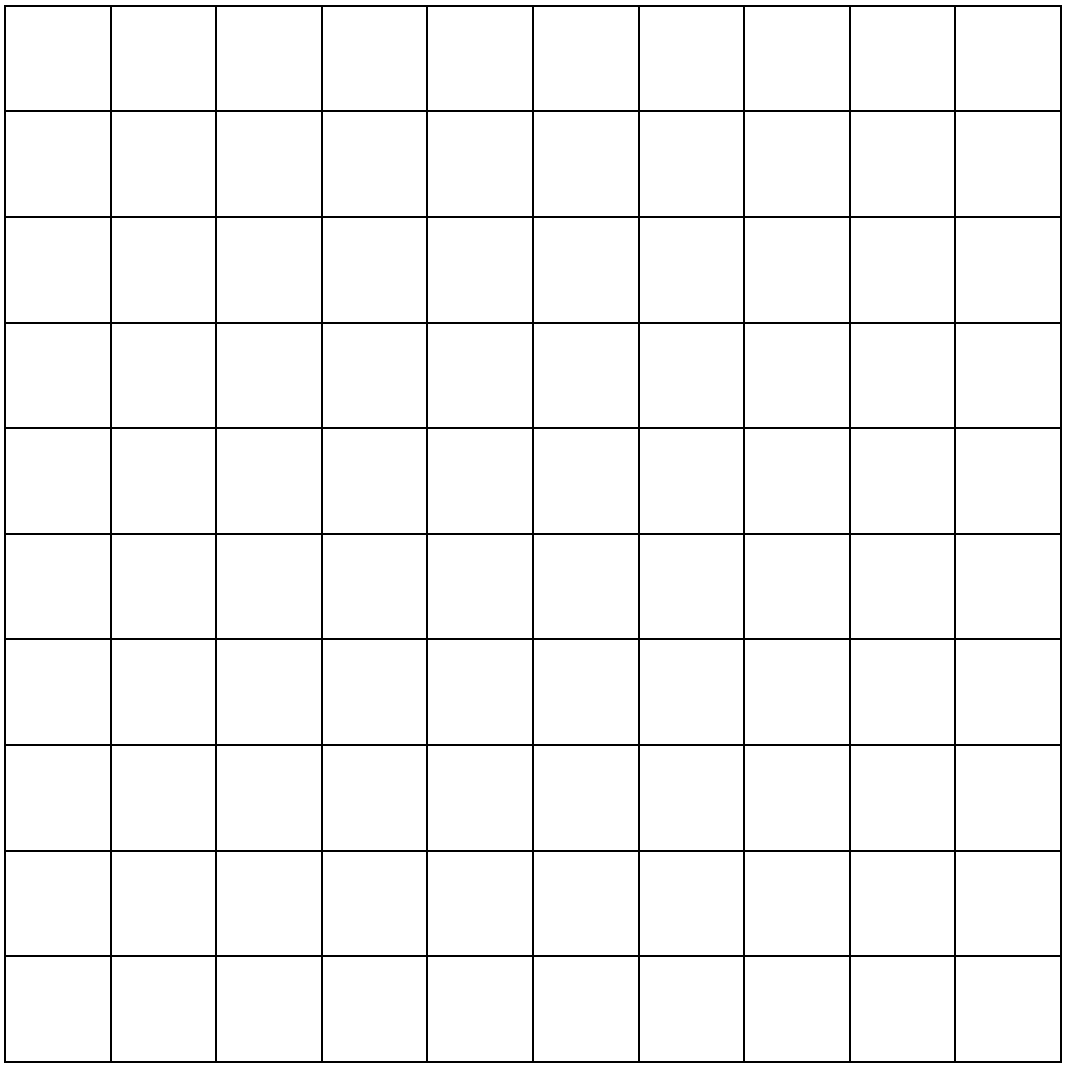
At the end of the activity, provide students with a three-digit number (e.g., 543) and ask students to use their base-ten manipulatives to model the number and then to draw the base-ten manipulatives they used on a blank piece of paper to represent the given number. Allow for students to use the standard representation of that number (e.g., five hundreds, four tens, and three ones) or any other equivalent representation.

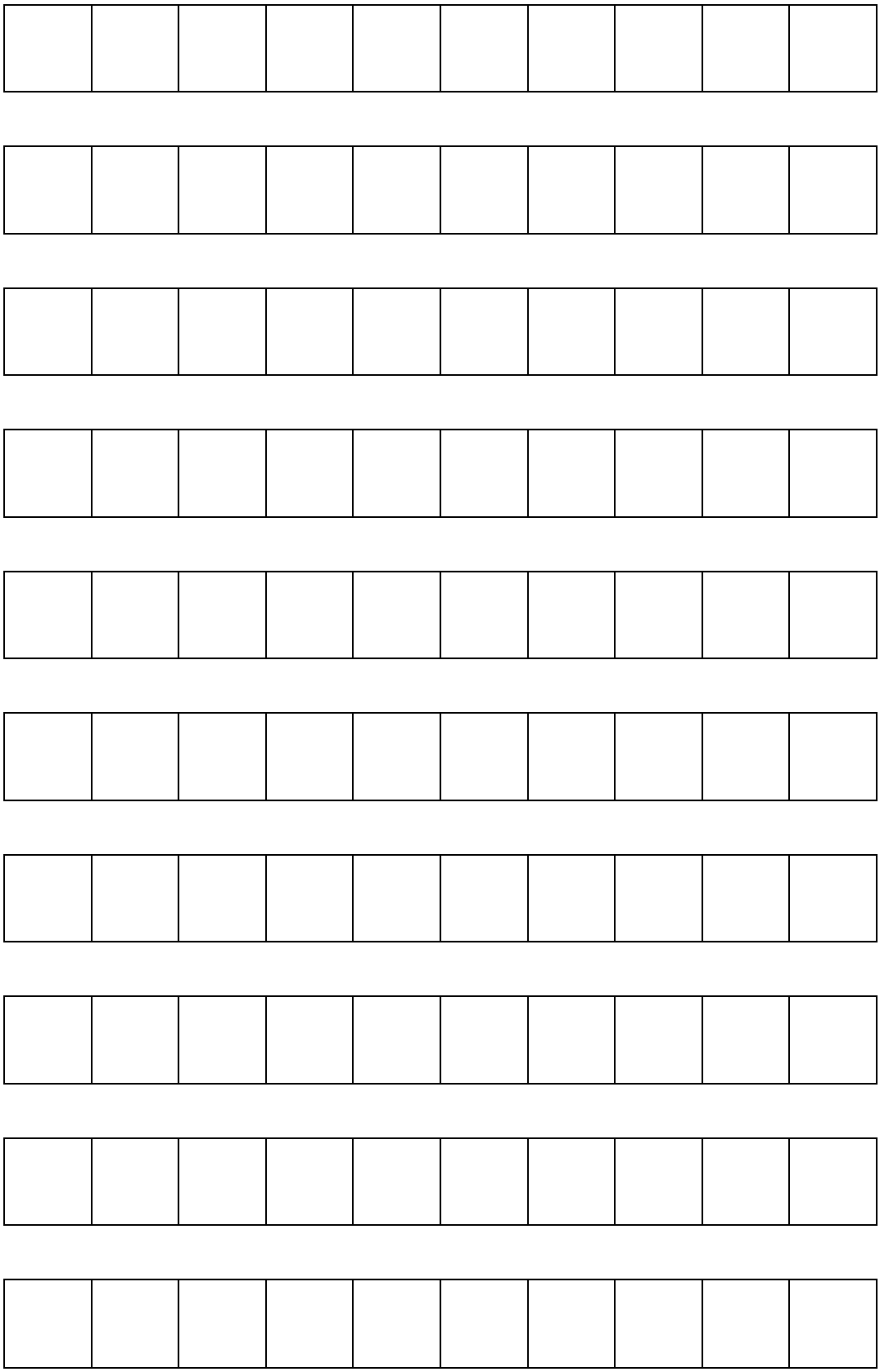
Collect student work to check for understanding.

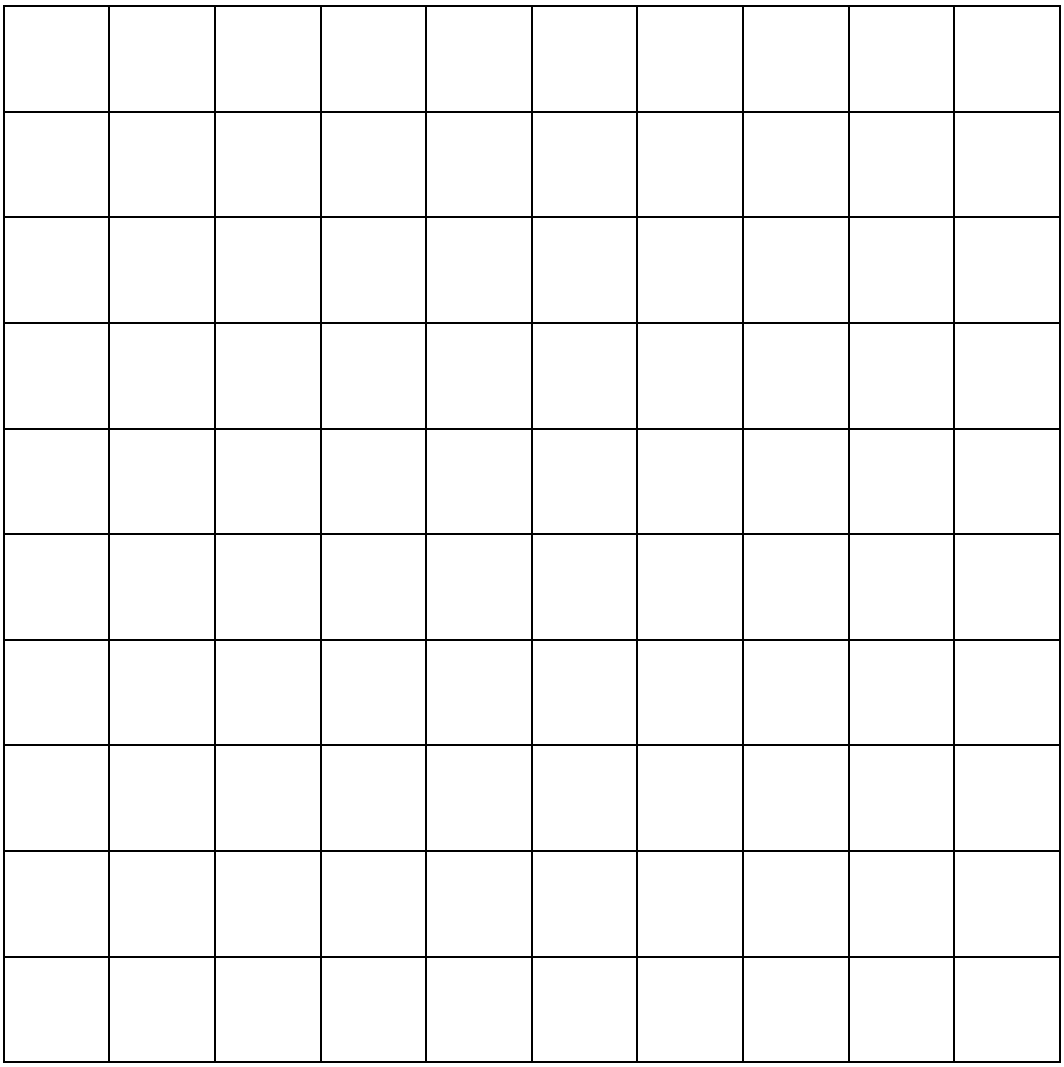
3-Digit Numbers and Place Value

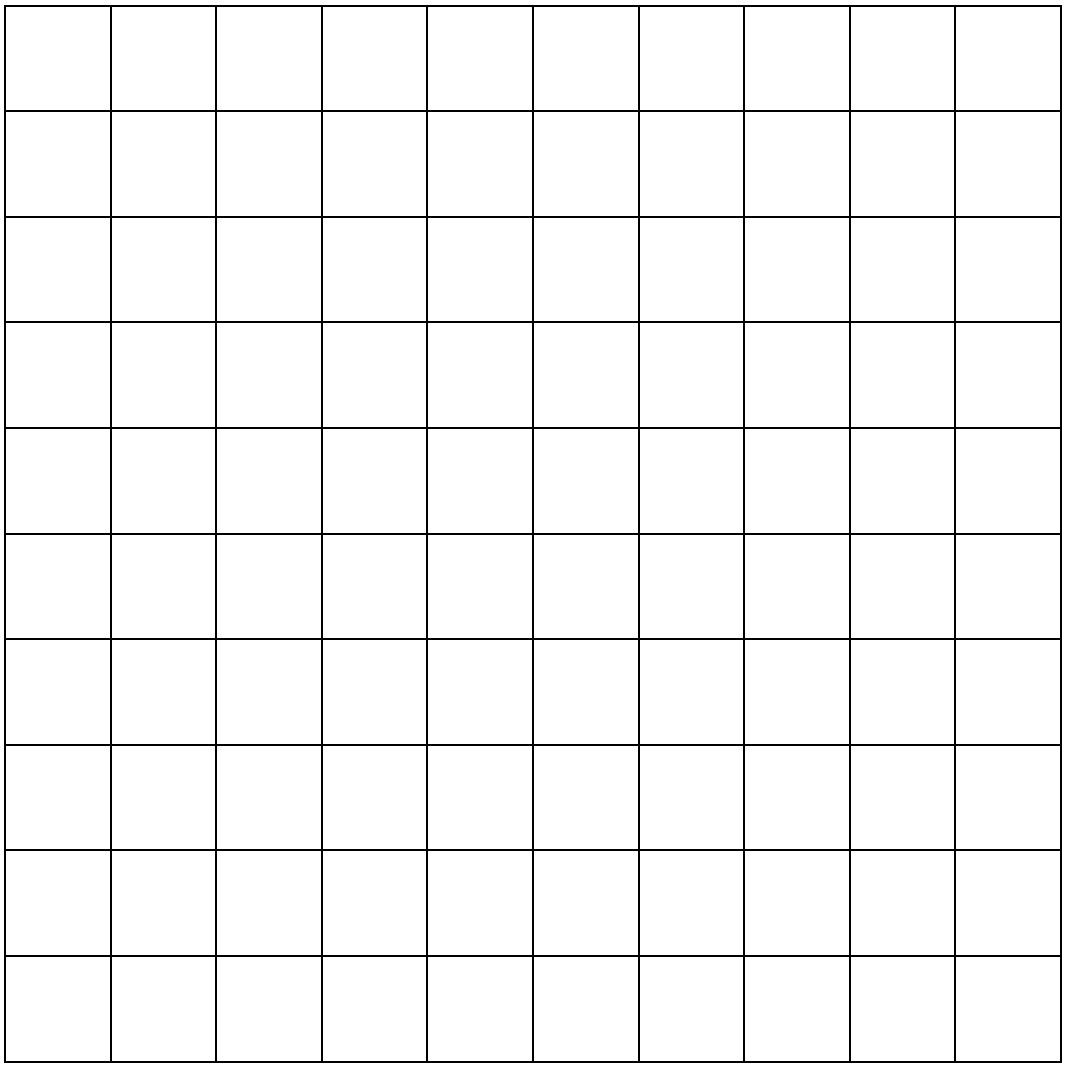
INSTRUCTIONAL ACTIVITY SUPPLEMENT

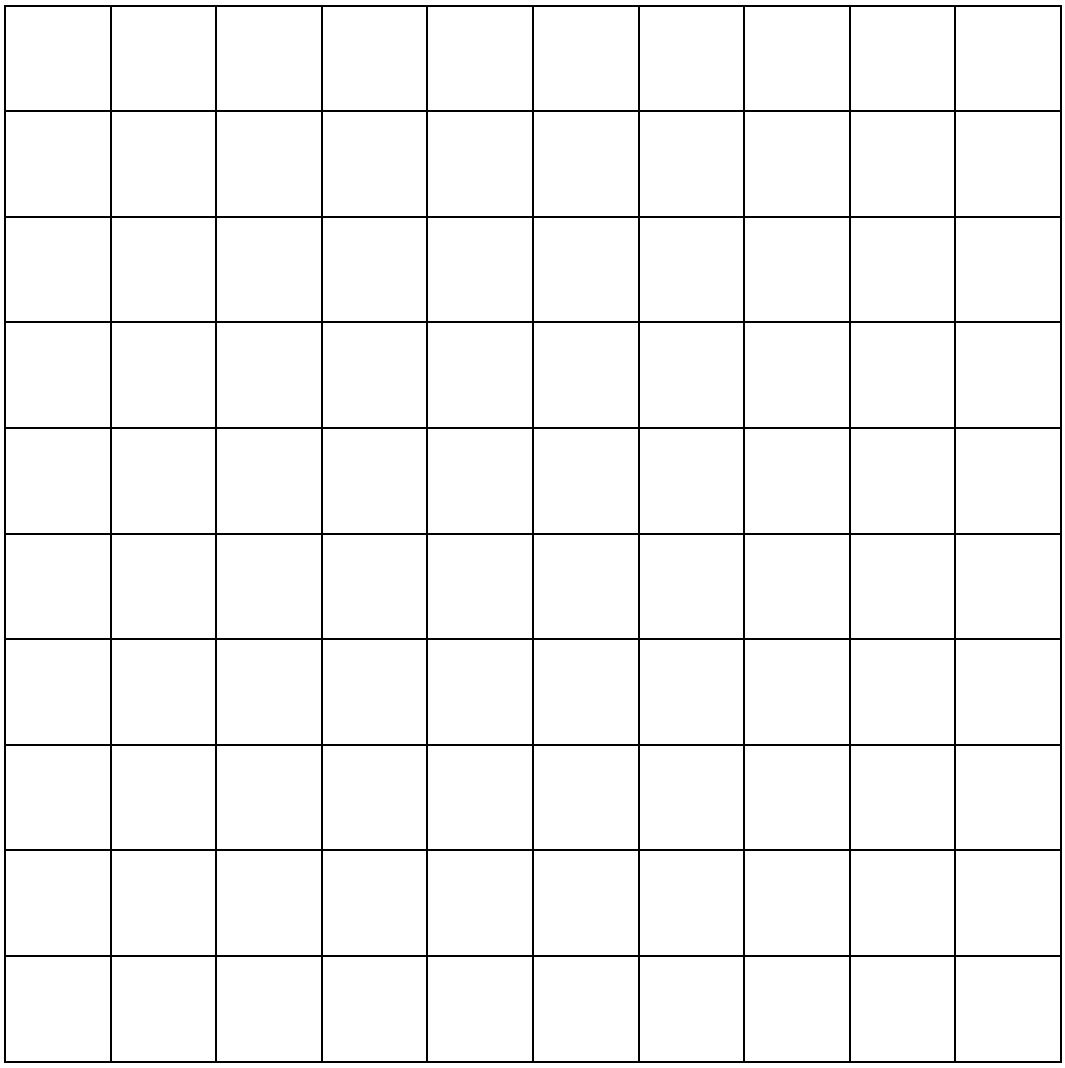
Lesson 2











HUNDREDS

TENS

ONES

1	0	0
2	0	0
3	0	0
4	0	0
5	0	0

6	0	0
7	0	0
8	0	0
9	0	0

1	0
2	0
3	0
4	0
5	0
6	0

7	0
8	0
9	0

1
2
3
4
5
6

7
8
9

3-Digit Numbers and Place Value

INSTRUCTIONAL ACTIVITY

Lesson 3

LEARNING GOAL

Students will transition from representing three-digit numbers using physical manipulatives to representing three-digit numbers using drawings of base-ten manipulatives. Students will continue to attach numerals to drawings of base-ten representations to build number sense and place value understanding for numerals.

PRIMARY ACTIVITY

Students will start the lesson by representing the same three-digit number using base-ten manipulatives and drawings of base-ten manipulatives. After connecting these representations, students will model several three-digit numbers using drawings of base-ten manipulatives, the number of hundreds, tens, and ones, and the corresponding numeral.

OTHER VOCABULARY

Students will need to know the meaning of the following terms:

- Ones
- Tens
- Hundreds
- Numeral
- Standard form/base-ten numerals

MATERIALS

- Base-ten manipulatives from Lesson 2 (Recommend a set of 10 ones, 10 tens, and one hundred for the teacher to display in addition to 10 ones, 10 tens, and one hundred for every one to two students.)
- Individual student white boards (or paper)
- Dry erase markers (if using student white boards)
- Instructional Activity Student Handout
- Word version Instructional Activity Student Handout

IMPLEMENTATION

Begin the lesson by connecting the base-ten manipulatives students used in LESSON 2 to drawings of base-ten manipulatives. This will require 10 ones, 10 tens, and one hundred for the teacher to display for the class using a document camera or similar technology, as well as 10 ones, 10 tens, and one hundred for every one or two students.

Display a single unit (a "one") and ask students to locate a single unit (a "one") in their set of base-ten manipulatives.

Inform students that, for ease of representation, a single unit can be drawn as a dot (•). (Using this representation will create a greater distinction between drawings of ones and hundreds; additionally, this representation allows for a simpler representation of tens.)

Ask students to draw a single unit (a "one") on their whiteboard and check their drawing.

Next, **ask** students to represent seven using this representation. **Check** to ensure students draw seven dots on their whiteboard.

Next, **ask** students to represent 47 using ones (individual dots).

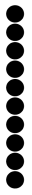
Observe whether students organize the ones in any way as they draw.

After students have drawn 47 dots, **discuss** that a representation with 47 dots that are not organized in any way would be difficult to use and count. If any students organized the ones they drew, **ask** them to share their work at this time.

Establish, through discussion, that 10 ones can be grouped together to make them easier to work with. This idea is consistent with the bundles of objects students created in LESSON 1.

Guide students through the following steps to establish a drawn representation of one ten.

- Line up 10 ones so that they fall in a column.



- Connect the ones with a line.

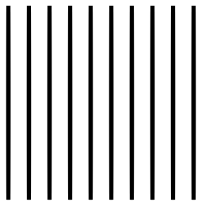
- Transition to drawing only a vertical line to represent one ten.

Connect the drawn representation of one ten to the base-ten manipulative students used in LESSON 2.

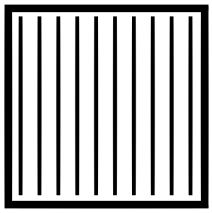
Using a vertical line to represent one ten and a small dot to represent one one, **require** students to model a variety of two-digit numbers by drawing on their white boards (or paper).

Guide students through the following steps to establish a drawn representation of one hundred.

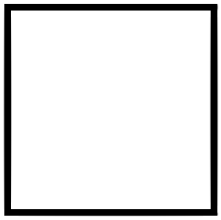
- Line up 10 tens in a row.



- Group the tens using a square.



- Transition to drawing only a square to represent one hundred.



Connect the drawn representation of one hundred to the base-ten manipulative students used in LESSON 2.

Using a square to represent one hundred, a vertical line to represent one ten, and a small dot to represent one one, **require** students to model a variety of three-digit numbers by drawing on their white boards (or paper).

Ask the following guiding questions as students represent a variety of three-digit numbers from 100 to 999.

GUIDING QUESTIONS

Elicit student thinking:

- [Provide a three-digit number, e.g., 802.] What do you know about this number?
- [Provide a collection of drawn base-ten representations of hundreds, tens, and ones.] What do these models mean? What information do you have based on these models?

Determine if the student can EXPLAIN *HUNDRED* NUMERALS:

- In the number 600, how many hundreds are there? How many tens? How many ones?
- [Show eight hundreds using drawings of base-ten manipulatives.] What number do these model?

Determine if the student can RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING:

- If you were to model the number 718, how many hundreds would you draw? What would be left to model using tens and ones drawings?
- If you were to model the number 890, how many hundreds would you draw? What would be left to model using tens and ones drawings?
- If you were to model the number 504, how many hundreds would you draw? What would be left to model using tens and ones drawings?

Determine if the student can COMPOSE NUMBERS BASED ON HUNDREDS:

- If there are nine hundreds, two tens, and seven ones drawn, what number does this represent? How would you write this number in standard form?
- If there are six hundreds and three tens drawn, what number does this represent? How would you write this number in standard form?
- If there are seven hundreds and nine ones drawn, what number does this represent? How would you write this number in standard form?
- If there are six hundreds and 21 ones drawn, what number does this represent? How would you write this number in standard form?
- If there are five hundreds and 19 tens drawn, what number does this represent? How would you write this number in standard form?
- If there are eight hundreds, 15 tens, and 31 ones drawn, what number does this represent? How would you write this number in standard form?

Determine if the student can DECOMPOSE NUMBERS BASED ON HUNDREDS:

- If there are 471 objects, how many hundreds are there? How many tens? How many ones? Is there a different way you could model this number?
- If there are 604 objects, how many hundreds are there? How many tens? How many ones? Is there a different way you could model this number?
- If there are 910 objects, how many hundreds are there? How many tens? How many ones? Is there a different way you could model this number?

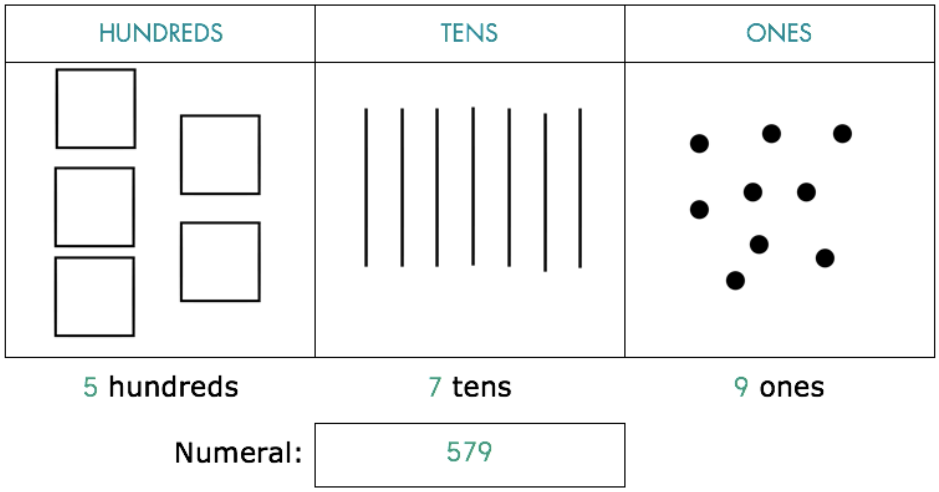
Determine if the student can EXPLAIN PLACE VALUE FOR HUNDREDS:

- In the number 827, what is the value of the two? What is the value of the eight? What is the value of the seven?
- In the number 530, what is the value of the zero? What is the value of the five? What is the value of the three?
- In the number 207, what is the value of the zero? What is the value of the two? What is the value of the seven?

After students have sufficient practice drawing models of three-digit numbers on white boards (or paper), provide the INSTRUCTIONAL ACTIVITY STUDENT HANDOUT to each student.

Require students to use the representation of a three-digit number provided to complete the remaining representations.

The following is an example of the provided information (black) and the expected student work (green) for the first problem on the INSTRUCTIONAL ACTIVITY STUDENT HANDOUT.



Ask the following guiding questions as students work on the problems in the INSTRUCTIONAL ACTIVITY STUDENT HANDOUT.

GUIDING QUESTIONS

Elicit student thinking:

- [Point to a three-digit number.] What do you know about this number?
- [Provide a collection of drawn base-ten representations of hundreds, tens, and ones.] What do these models mean? What information do you have based on these models?

Determine if the student can EXPLAIN *HUNDRED* NUMERALS:

- In the number 400, how many hundreds are there? How many tens? How many ones?
- [Point to the drawings of base-ten manipulatives in a hundreds column.] What number do these model?

Determine if the student can RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING:

- [Point to a three-digit number.] To model this number, how many hundreds would you draw? What would be left to model using tens and ones drawings?

Determine if the student can COMPOSE NUMBERS BASED ON HUNDREDS:

- [Point to a problem where the number of hundreds, tens, and ones are provided.] How would you write this number in standard form?
- [Point to a problem where drawings of hundreds, tens, and ones are provided.] How would you write this number in standard form?

Determine if the student can DECOMPOSE NUMBERS BASED ON HUNDREDS:

- [Point to a problem where the standard form of the number is provided.] In this number, how many hundreds are there? How many tens? How many ones?
- [Point to a problem where the standard form of the number is provided.] How many hundreds would you draw to represent the hundreds in this number? How many tens would you draw? How many ones would you draw?

Determine if the student can EXPLAIN PLACE VALUE FOR HUNDREDS:

- In the number 827, what is the value of the two? What is the value of the eight? What is the value of the seven?
- In the number 530, what is the value of the zero? What is the value of the five? What is the value of the three?
- In the number 207, what is the value of the zero? What is the value of the two? What is the value of the seven?

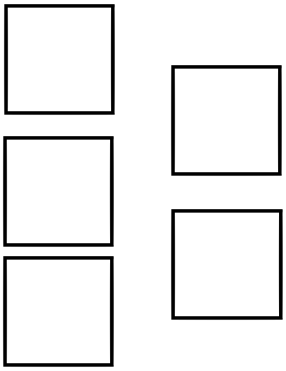
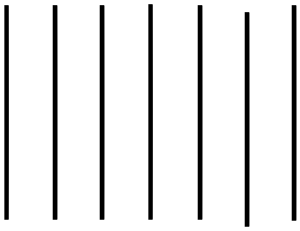
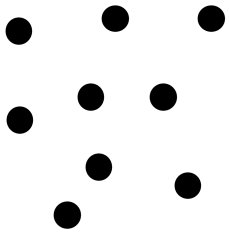
At the end of the activity, collect the INSTRUCTIONAL ACTIVITY STUDENT HANDOUT to check for student understanding. In addition, provide students with a three-digit number (e.g., 817) and ask them to provide the value of each digit in the number (e.g., 800, 10, and 7 in the example provided).

Name_____

3-Digit Numbers and Place Value

Lesson 3

For each problem, complete the missing parts.

HUNDREDS	TENS	ONES
		

_____ hundreds _____ tens _____ ones

Numeral:

HUNDREDS	TENS	ONES

_____ hundreds _____ tens _____ ones

Numeral: 306

Name_____

HUNDREDS	TENS	ONES

4 hundreds 3 tens 0 ones

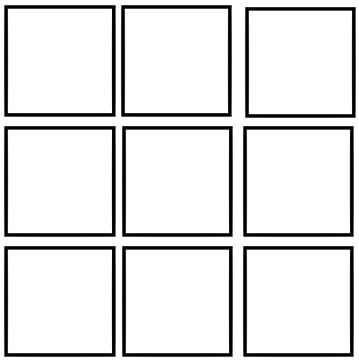
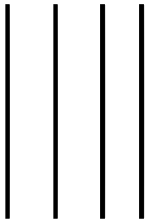
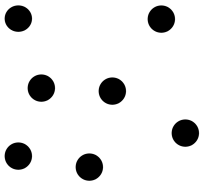
Numeral:

HUNDREDS	TENS	ONES

_____ hundreds _____ tens _____ ones

Numeral: 698

Name_____

HUNDREDS	TENS	ONES
		

_____ hundreds _____ tens _____ ones

Numeral:

HUNDREDS	TENS	ONES

4 hundreds 13 tens 22 ones

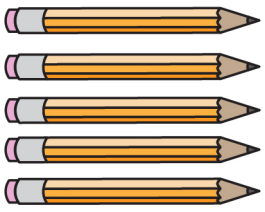
Numeral:

Name_____

3-Digit Numbers and Place Value

Lessons 1 – 3

1. Sandy has a bag of 100 pencils. The pencils are in groups of 10. How many groups of 10 make up the 100 total pencils in the bag?



2. Jerome has 700 pennies. How many hundreds are in the number 700?

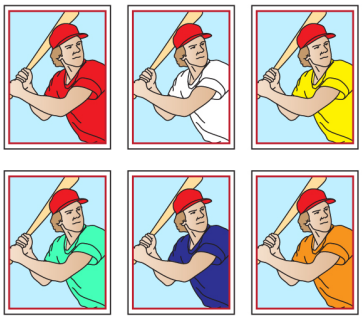
Name_____

3. Tanya models the number 238. She starts by showing the hundreds with base-ten models. Use words, numbers, or drawings to answer the following questions.

   3.a. How many hundreds should Tanya use?

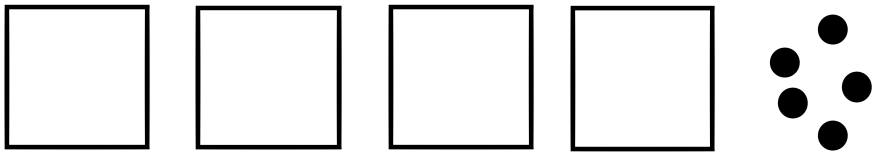
   3.b. How much is left for Tanya to model with tens and ones?

4. Manuel has a lot of baseball cards. Manuel makes groups so he can count his baseball cards. Manuel has a group of five hundreds, one ten, and eight ones. How many baseball cards does Manuel have? Write the number in standard form.



Name_____

5. Carson shows a number by drawing base-ten models.

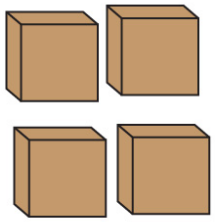


Write the number in standard form.

6. Julia has 940 stickers. Write how many hundreds, tens, and ones make 940.

_____ hundreds _____ tens _____ ones

7. Marco has 637 toy blocks.



7.a. What is one way to show 637 by drawing base-ten models?

Name_____

7.b. What is a different way to show 637 by drawing base-ten models?

8. Ms. Kenney writes the number 893.

8.a. What is the value of the 3?

8.b. What is the value of the 8?

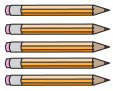
8.c. What is the value of the 9?

3-Digit Numbers and Place Value

STUDENT ACTIVITY SOLUTION GUIDE

Lessons 1 – 3

1. Sandy has a bag of 100 pencils. The pencils are in groups of 10. How many groups of 10 make up the 100 total pencils in the bag?



CORRECT ANSWER

> 10 groups of 10 make up 100.

ERRORS, MISCONCEPTIONS, AND MISSING KNOWLEDGE

Example Error	Misconception	Missing Knowledge
100	knows how many ones make up a hundred, but does not know how many tens make up a hundred	EXPLAIN *HUNDRED* AS A COMPOSITION OF 10 TENS
The student provides the number of pencils shown in the image.	lacks base-ten understanding; does not know how many tens compose a hundred	EXPLAIN *HUNDRED* AS A COMPOSITION OF 10 TENS

2. Jerome has 700 pennies. How many hundreds are in the number 700?

CORRECT ANSWER

> There are seven hundreds in the number 700.

ERRORS, MISCONCEPTIONS, AND MISSING KNOWLEDGE

Example Error	Misconception	Missing Knowledge
700	states the number of ones that compose 700 instead of the number of hundreds	EXPLAIN *HUNDRED* NUMERALS
70	states the number of tens that compose 700 instead of the number of hundreds	EXPLAIN *HUNDRED* NUMERALS
The student provides the number of pennies shown in the image.	lacks base-ten understanding; does not know how many hundreds compose 700	EXPLAIN *HUNDRED* NUMERALS

3. Tanya models the number 238. She starts by showing the hundreds with base-ten models. Use words, numbers, or drawings to answer the following questions.

   3.a. How many hundreds should Tanya use?

CORRECT ANSWER

> Tanya should use two hundreds to model 238. (The student may draw two hundreds as an acceptable response to this question.)
>
> NOTE: Students may state that Tanya should use zero or one hundred to model 238. While 238 could be modeled in alternative groupings (see part [b] of the question to check understanding of alternative groupings if a student answers in this way), the question states that she starts by showing the hundreds.

ERRORS, MISCONCEPTIONS, AND MISSING KNOWLEDGE

Example Error	Misconception	Missing Knowledge
Tanya should use 238 hundreds.	rewrites the number or gives the number of ones that compose 238 instead of giving the number of hundreds	RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING
Tanya should use three hundreds.	gives the number of tens instead of the number of hundreds	RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING
Tanya should use eight hundreds.	gives the value in the ones place instead of the number of hundreds	RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING

3.b. How much is left for Tanya to model with tens and ones?

CORRECT ANSWER

Tanya still needs to model 38 with tens and ones.

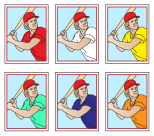
or

Tanya still needs to model three tens and eight ones. (The student may draw three tens and eight ones as an acceptable response to this question.)

ERRORS, MISCONCEPTIONS, AND MISSING KNOWLEDGE

Example Error	Misconception	Missing Knowledge
Tanya still needs to model three tens.	does not acknowledge the eight ones that also need to be modeled	RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING
Tanya still needs to model three.	does not identify that the three represents three tens and does not acknowledge the eight ones that also need to be modeled	RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING and DECOMPOSE NUMBERS BASED ON TENS
Tanya still needs to model eight.	does not acknowledge the three tens that also need to be modeled	RECOGNIZE MULTIPLE HUNDREDS AND SOMETHING

4. Manuel has a lot of baseball cards. Manuel makes groups so he can count his baseball cards. Manuel has a group of five hundreds, one ten, and eight ones. How many baseball cards does Manuel have? Write the number in standard form.



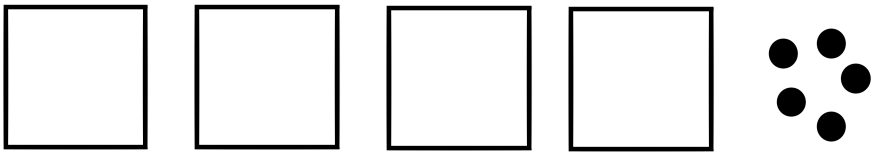
CORRECT ANSWER

Manuel has 518 baseball cards.

ERRORS, MISCONCEPTIONS, AND MISSING KNOWLEDGE

Example Error	Misconception	Missing Knowledge
Manuel has 500108 baseball cards.	writes out each number (500, 10, and 8) in its entirety without utilizing place value understanding	COMPOSE NUMBERS BASED ON HUNDREDS
Manuel has 5, 1, 8 baseball cards.	lists out the digits provided for the number of hundreds, tens, and ones but does not properly compose the three-digit numeral	COMPOSE NUMBERS BASED ON HUNDREDS
Manuel has 500, 10, 8 baseball cards.	lists out the hundreds, tens, and ones provided but does not compose the three-digit numeral	COMPOSE NUMBERS BASED ON HUNDREDS

5. Carson shows a number by drawing base-ten models.



Write the number in standard form.

CORRECT ANSWER

The number is 405.

ERRORS, MISCONCEPTIONS, AND MISSING KNOWLEDGE

Example Error	Misconception	Missing Knowledge
The number is 45.	mistakes the hundreds for tens or cannot account for zero tens when writing a number in standard form	COMPOSE NUMBERS BASED ON HUNDREDS
The number is 4005.	writes out each number (400 and 5) in its entirety without utilizing place value understanding	COMPOSE NUMBERS BASED ON HUNDREDS
The number is 40005 (or 400005).	writes out each number, including the number of tens (0 tens or 00 tens), in its entirety without utilizing place value understanding	COMPOSE NUMBERS BASED ON HUNDREDS
The number is 450.	mistakes the ones for tens or cannot account for zero tens when writing a number in standard form	COMPOSE NUMBERS BASED ON HUNDREDS
The number is 9.	counts the number of objects shown	COMPOSE NUMBERS BASED ON HUNDREDS

6. Julia has 940 stickers. Write how many hundreds, tens, and ones make 940.

_____ hundreds _____ tens _____ ones

CORRECT ANSWER

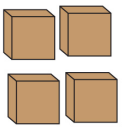
9 hundreds, 4 tens, 0 ones

NOTE: While the anticipated response is 9 hundreds, 4 tens, and 0 ones, students may provide an alternative representation of 940 as an acceptable response. Check alternative representations for accuracy.

ERRORS, MISCONCEPTIONS, AND MISSING KNOWLEDGE

Example Error	Misconception	Missing Knowledge
900 hundreds, 40 tens, 0 ones	writes the number of ones rather than the number of hundreds and tens	DECOMPOSE NUMBERS BASED ON HUNDREDS
9 tens, 4 ones	ignores the zero and reads the number as 94 instead of 940	DECOMPOSE NUMBERS BASED ON HUNDREDS
The student provides an incorrect alternative representation (e.g., 940 hundreds or 940 tens).	does not demonstrate place value understanding when decomposing 940 into hundreds, tens, and ones	DECOMPOSE NUMBERS BASED ON HUNDREDS

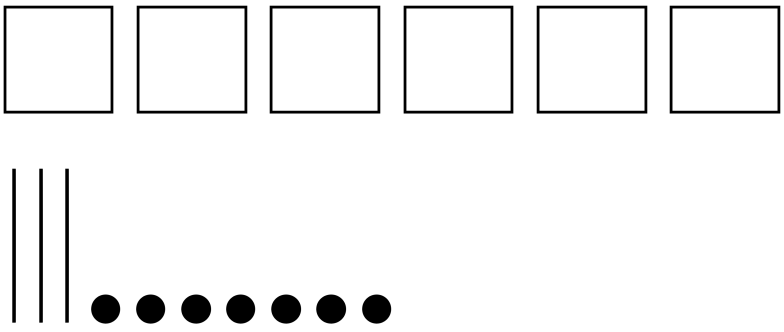
7. Marco has 637 toy blocks.



7.a. What is one way to show 637 by drawing base-ten models?

CORRECT ANSWER

Check student work for accuracy. The answer provided anticipates that students will use six hundreds, three tens, and seven ones in their first representation of 637. Accurate alternative representations of 637 are also acceptable.



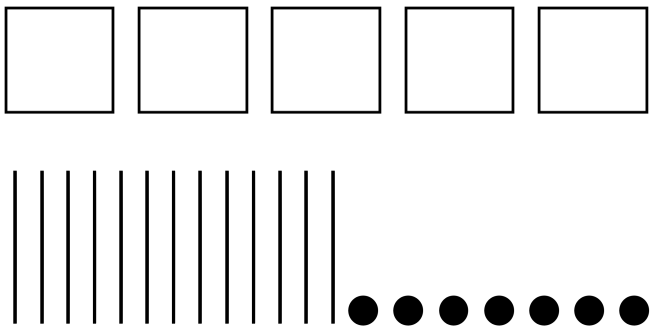
ERRORS, MISCONCEPTIONS, AND MISSING KNOWLEDGE

Example Error	Misconception	Missing Knowledge
The student draws six hundreds, seven tens, and three ones.	confuses the number of tens and ones in the number, or confuses the drawn representation of tens and ones	DECOMPOSE NUMBERS BASED ON HUNDREDS
The student draws three hundreds, six tens, and seven ones.	confuses the number of hundreds and tens in the number, or confuses the drawn representation of hundreds and tens	DECOMPOSE NUMBERS BASED ON HUNDREDS
The student draws three hundreds, seven tens, and six ones. *or* The student draws seven hundrds, six tens, and three ones.	confuses the number of hundreds, tens, and ones in the number, or confuses the meaning of each drawn representation	DECOMPOSE NUMBERS BASED ON HUNDREDS
The student draws seven hundreds, three tens, and six ones.	confuses the number of hundreds and ones in the number, or confuses the drawn representation of hundreds and ones	DECOMPOSE NUMBERS BASED ON HUNDREDS

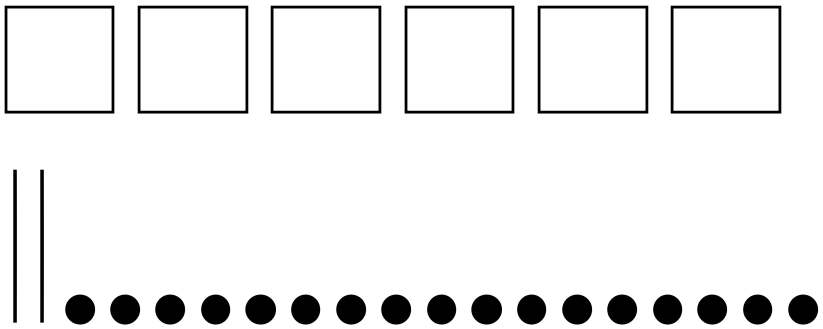
7.b. What is a different way to show 637 by drawing base-ten models?

CORRECT ANSWER

Check student work for accuracy. The answers provided anticipate that students will either represent one hundred as 10 tens or represent one ten as 10 ones. Accurate alternative representations of 637 are also acceptable.



or



ERRORS, MISCONCEPTIONS, AND MISSING KNOWLEDGE

Example Error	Misconception	Missing Knowledge
The student provides the same representation as they gave in part (a).	does not know how to represent a number in more than one way using hundreds, tens, and ones; may believe it is necessary to always use the maximum number of hundreds possible, then the maximum number of tens possible	DECOMPOSE NUMBERS BASED ON HUNDREDS
The student draws five hundreds, four tens, and seven ones. *or* The student draws five hundreds, five tens, and eight ones.	reduces the number of hundreds by one and either increases the number of tens by one or increases the number of ones by one, believing this adjustment represents a number with the same value as 637	DECOMPOSE NUMBERS BASED ON HUNDREDS
The student draws seven hundreds, two tens, and seven ones. *or* The student draws six hundreds, two tens, and eight ones.	reduces the number of tens by one and either increases the number of hundreds by one or increases the number of ones by one, believing this adjustment represents a number with the same value as 637	DECOMPOSE NUMBERS BASED ON HUNDREDS
The student draws seven hundreds, three tens, and six ones. *or* The student draws six hundreds, four tens, and six ones.	reduces the number of tens by one and either increases the number of hundreds by one or increases the number of tens by one, believing this adjustment represents a number with the same value as 637	DECOMPOSE NUMBERS BASED ON HUNDREDS

8. Ms. Kenney writes the number 893.

   8.a. What is the value of the 3?

CORRECT ANSWER

> The value of the 3 is three, or three ones.

ERRORS, MISCONCEPTIONS, AND MISSING KNOWLEDGE

Example Error	Misconception	Missing Knowledge
The value of the 3 is 300.	may assume the first part of the question is asking about the first digit in the number, the hundreds place; does not pay attention to the fact that the three is in the ones place, or may think each digit is worth that many hundreds because it is a three-digit number	EXPLAIN PLACE VALUE FOR HUNDREDS

8.b. What is the value of the 8?

CORRECT ANSWER

> The value of the 8 is 800, or eight hundreds.

ERRORS, MISCONCEPTIONS, AND MISSING KNOWLEDGE

Example Error	Misconception	Missing Knowledge
The value of the 8 is 80.	may assume the second part of the question is asking about the second digit in the number, the tens place; does not pay attention to the fact that the eight is in the hundreds place	EXPLAIN PLACE VALUE FOR HUNDREDS
The value of the 8 is eight.	views each digit as a separate number; does not understand that the position of a digit in a multi-digit number indicates its value	EXPLAIN PLACE VALUE FOR HUNDREDS

8.c. What is the value of the 9?

CORRECT ANSWER

> The value of the 9 is 90, or nine tens.

ERRORS, MISCONCEPTIONS, AND MISSING KNOWLEDGE

Example Error	Misconception	Missing Knowledge
The value of the 9 is nine.	may assume the third part of the question is asking about the third digit in the number, the ones place; does not pay attention to the fact that the nine is in the tens place or views each digit as a separate number; does not understand that the position of a digit in a multi-digit number indicates its value	EXPLAIN PLACE VALUE FOR HUNDREDS
The value of the 9 is 900.	may think each digit is worth that many hundreds because it is a three-digit number	EXPLAIN PLACE VALUE FOR HUNDREDS