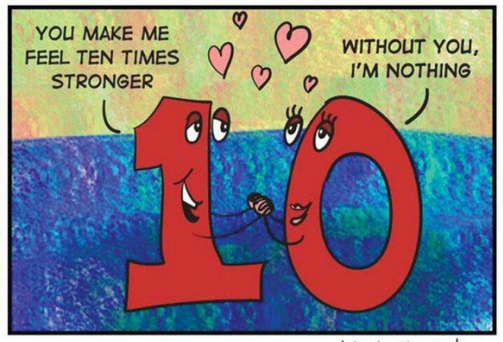
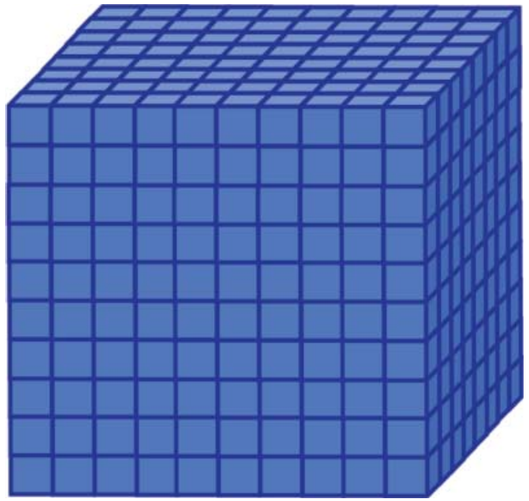


Grade 2



Essential Lessons

- Counting and Patterns
- What is in This Cube?
- Race to 200
- Race to a Cube
- Counting and Place Value
- Building Three Digit Numbers
- Place Value Equivalent Expression Match
- Hungry, Hungry Block Hippo

Place Value

Storybook

References:
1) “Progressions Documents for the Common Core Math Standards.” The University of Arizona. Brookhill Foundation, 2007.

2) “Mathematics Framework Chapters.” Curriculum Frameworks (CA Dept of Education). 2013.

Standards Addressed

Numbers in Base Ten (NBT)

1) Understand that three digits of a three-digit number represents numbers of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:
a. 100 can be thought of as a bundle of 10 tens – called a "hundred".
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).

2) Count within 1,000; skip count by 2's, 5's, 10's, and 100's. CA

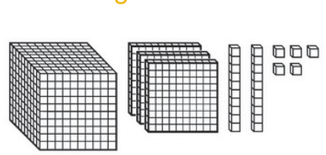
3) Read and write numbers to 1,000 using base ten numeral, number names, and expanded form.

4) Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits using >, =, and < symbols to record results of the **comparisons.**

Unit Story

THE REASONING BEHIND THE FLOW

The unit begins with students estimating the number of pennies in a jar to both formatively assess and begin the process of exploring number beyond 120 in the hook lesson The Piggy Bank. Students then begin to count to 1,000 by 1's, 10's and 100's examining the patterns within the digits using the support of base ten blocks to make connections between oral counting and number sense in the lesson Counting and Patterns.



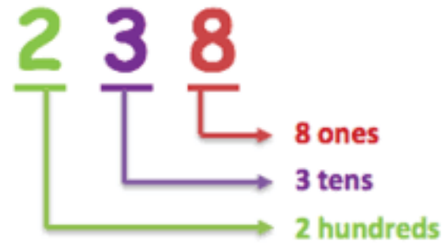
Further investigation of place value patterns and the concept of exchanging tens for hundreds and hundreds for a thousand will be done in the lesson What is in this cube? Using a place value mat, students will use ones to fill a ten frame. As they continue to accumulate blocks, they then exchange ten ones for a rod (a ten). Students will continue to count until they have ten rods (or tens). They will then bundle their ten rods for a flat (one hundred). Lastly, students will exchange ten flats (hundreds) for a cube (one thousand). Games (Race to 200 and Race for Cube) will be played to practice the concept of regrouping with base ten blocks in preparation for later work to be done with adding and subtracting within 1,000. These games involve taking turns with a partner and rolling a die to determine how many ones or tens should be placed on the place value mat. Students are in a race to be the first to 200 or a cube (one thousand), exchanging 10 of a smaller unit for 1 of a larger as they go.

Students will then expand their counting by 1's and skip counting to 2's, 5's, 10's & 100's connecting the base ten blocks to a place value chart in the lesson Counting and Place Value. The teacher will lead the class in counting aloud from 1 to a given number. As they count, students should be laying out the blocks to represent each number. As soon as the teacher says "ten", students should shout "trade" and physically exchange 10 ones for a ten block. This should occur on any multiple of ten (including exchanging 10 tens for 1 hundred). Once the given number is reached, the class will tell you how many of each block they have, and record this on the place value chart. The same process will then be followed but counting by 2's, then 5's, then 10's and finally 100's.

Assessment

Big Idea #3: How do I compare numbers to 1,000 using an inequality symbol?

- Place Value War, Hungry, Hungry Block Hippo, and Roll & Build are all games that can be used to formatively assess students on their ability to compare numbers. These games should be played towards the end of the unit allowing the teacher to formatively assess student's abilities to represent, compare, and order numbers. Students compare the numbers using place value cards, base ten blocks and digits using inequality symbols.



Tips For Lesson Planning

#1 Always work through the activity/lesson before doing the lesson with the class.

#2 Know how far into the activity you want to be at the end of the period and understand your main objective for the day. What is it that you want the students to walk away with as they leave class?

#3 Decide where and how you want to "chunk the activity". How much of the activity will groups/students do before sharing out with the class? How will you have them report out?

#4 Set time limits for the "chunks" and use a timer. This helps keep you and the students focused, on task, and moving forward through the lesson.

General Strategies For Formative Assessments

Use the following strategies throughout the unit

Thumbs up/down/ sideways

Ask students to rate their understanding. A thumbs up means they understand the topic, thumbs down means they don't and in the middle means they get part of it but still need additional support.

Mini White Boards

Can be used in a variety of ways. Suggestion: Give students problems to solve on white boards and have them raise their boards to show you their answer.

Writing a Summary Statement

Ask students to write a summary of the day's/week's lesson.

Fist to Five

Similar to thumbs up/down, students rate their understanding on a scale of zero (fist) to 5, with 5 being fully understand.

Ticket Out The Door (Exit Ticket)

In the last couple minutes of class, give students a problem or two to complete on a slip of paper. Collect the paper as students are leaving the class.

Sentence Frames & Starters

Here are some options to provide to students throughout the activities.

- I agree with _____ because _____.
- I disagree with _____ because _____.
- I did not understand _____.
- I prefer _____method/ strategy because _____.
- I think that _____.
- What do you mean by _____?
- I think _____ means _____.

Formative & Flow

AND INTENTION OF EACH LESSON

Big Idea #1: How do we orally count beyond 120 including skip counting by 2's, 5's, 10's and 100's and counting on from a number other than 1?

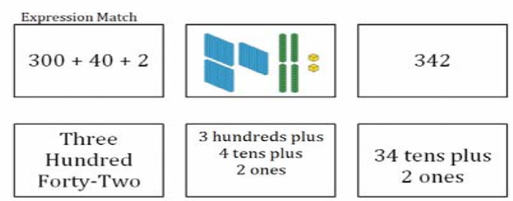
- Students can be formatively assessed by simply counting early and often in the unit. Students need opportunities to count orally but also need the opportunity to count actual objects. Listen carefully as the class, small groups, or individuals count orally practicing with skip counting and starting from a number other than 1. Students need practice crossing the decades and into the next hundred (e.g., "Count starting at 198 to 213" i.e.,199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213) Students can use objects such as base ten blocks or place value discs to support them while formatively assessing their counting skills with activities such as Counting and Patterns and Counting and Place Value.

Big Idea #2: How are numbers composed and decomposed to 1,000 using multiple representations?

- The activities Place Value Equivalent Expression Match and I Have, Who Has can be used to formatively assess student knowledge of place value understanding. Place Value Equivalent Expression Match can be a collaborative activity where pairs can be assessed together while matching the activity game cards with multiple representations of numbers. The follow up student page in the Place Value Equivalent Expression Match activity can be used as an individual assessment after the matching cards have been used and students have had the opportunity to have additional practice. Students are given one representation and have to complete the remaining representations for that given number, composing and decomposing numbers to 1,000. I Have, Who Has allows the teacher to formatively assess pairs or individuals throughout the unit on their ability to recognizing equivalent expressions by listening to find the question with the expression that matches their own card.

Previously in grade 1, students have only worked with a place value chart going through 120. Continuing their investigation of numbers and patterns in Building Three Digit Numbers, students integrate additional representations and tools such as expanded form, number bonds, place value discs, and place value cards to their repertoire. These representations reinforce the concept of place value meaning, (e.g., that the digit "5" in the number 524 represents 5 hundreds). After some additional practice with building numbers, students will use base ten blocks in the activity How Many Ways to 43? Two and three digit numbers will be decomposed multiple ways with base ten blocks, decomposing numbers into groups of hundreds, tens, ones or just tens and ones, or all ones. To support work with regrouping in subtraction later in the year, the concept that a number can be represented as different combination of tens and ones is crucial (e.g., 43 – 17; 43 can be represented as 3 tens and 13 ones allowing for the necessary regrouping when subtracting 17). Students will then work with pennies again in the The Piggy Bank Revisited exploring methods to efficiently count and now applying what they have learned about numbers to 1,000 to the original hook lesson at the start of the unit. Students will design a piggy bank and estimate how many pennies it will hold. Students will then get a sense for how big numbers are by looking at the lengths of numbers of pennies laid side by side, with numbers of pennies between 0 and 1,000.

After working with multiple methods to decompose numbers to 1,000, students will then compose numbers in the activity Place Value Equivalent Expression Match. Students will see various representations of decomposed numbers and then find the numeral match for that number (e.g., nine hundred fifty three = 900 + 50 + 3 = 9 hundreds, 5 tens, 3 ones = 953). Connecting multiple representations is an essential part of student's place value understanding. To continue practicing this idea, I Have, Who Has Equivalent Expression Place Value allows students to further recognize equivalent expressions as their classmates say the representation of the number while pairs listens for their match.



Unit Overview

Students expand their place value knowledge to numbers to 1,000 beginning with the concrete, then expanding to pictoral representations, then lastly, the abstract. Using base ten blocks, students see how a bundle of 10 tens can be regrouped to a hundred and a bundle of 10 hundreds can be exchanged for a thousand.

After working with concrete models, students bridge to sketches of the base ten blocks (see "drawings to support" pic) as well as the use of place value cards, charts and discs. Students also count orally by 1's, 2's, 5's 10's, and 100's as well as counting on from numbers other than 1. Students culminate the unit by comparing numbers within 1,000 again using concrete models before bridging to the abstract (comparing digits without visual models).

SBAC Claims

- CLAIM #1: CONCEPTS AND PROCEDURES (40% STUDENT SCORE)
- CLAIM #2: PROBLEM SOLVING (20% STUDENT SCORE)
- CLAIM #3: COMMUNICATING AND REASONING (20% STUDENT SCORE)
- CLAIM #4: MODELING AND DATA ANALYSIS (20% STUDENT SCORE)

Types Of Knowledge

- **MEMORIZATION (QUICK RECALL)**
- **PROCEDURAL (FOLLOW STEPS/ DO SOMETHING)**
- **CONCEPTUAL (UNDERSTND BIG IDEA/ EXPLAIN/ DERIVE)**
- **RELATIONAL (APPLY/ ANALYZE/ EVALUATE)**

Unit

The unit wraps up with three engaging games - Place Value War, Hungry, Hungry Block Hippo, and Roll & Build. Each of these games reinforces concepts and applies tools used throughout the unit. Students also compare numbers in each of the games. Place Value War applies place value cards and asks student to compare and say the numbers orally. Hungry, Hungry Block Hippo also asks students to compare two and three digit numbers after building those numbers with base ten blocks to see who has a larger pile and thus a larger quantity. Students are challenged to choose where to place the digit they rolled with a decadie to build the bigger number to win the game. Thus, this lesson combines concepts of place value as students learn to compare two numbers less than 1,000.

Where Does

Grades K-5

Place value is a topic that is addressed in each grade K-5 with the exception of grade 3. Students begin with place value to the number 19 in Kindergarten, which is then expanded to the number 120 in grade 1. First grade students connect their place value understanding to adding within 100. Students then expand their place value knowledge to 1,000 in grade 2, also connecting place value to adding and subtracting within 1,000. Grade 3, students continue working with adding and subtracting within 1,000, but do not continue place value learning. In grade 4, students not only continue place value work to 1 million (as well as adding and subtracting within 1 million) but also learn about decimal place value to the hundredths place. Another emphasis in grades 4 and 5 is the role of the number ten in our place value system and that each place value to the left is ten times greater than the place value to its right in multi-digit numbers. Students close out the Numbers and Base Ten Operations (NBT) domain in grade 5 with more decimal place value work to the thousandths place.

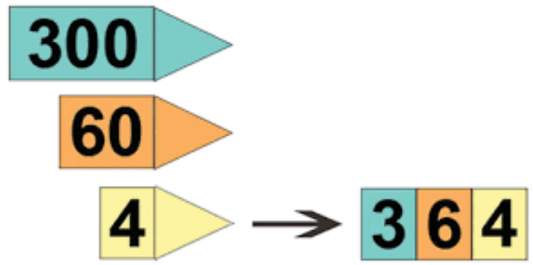
Misconceptions

Counting Numbers

Because the English language does always support the structure of the base ten system, students can sometimes find the counting numbers and place value confusing (e.g., “two hundred” accurately reflects the place value using the number “two”, but twenty does not use the digit two although the word “twenty” means “two tens”). Counting orally early and often sometimes using songs and videos allow student to practice and recall the number names.

Relative Size Numbers

Students struggle with number sense regarding the relative size and magnitude of numbers (i.e., What does 100 vs. 1,000 of a given object look like or how much larger is 900 than 90?). Students explore these ideas in the Piggy Bank Revisited activity where they are challenged to estimate the length of a given number of pennies laid end to end on the ground. Students need opportunities to connect the oral counting to actual objects that reflect the magnitude such as base ten blocks. The game Hungry, Hungry Block Hippo also allows student to represent numbers using base ten blocks and then compare their magnitudes using the size of the pile of blocks in addition to the digits.



Student Talk Strategies

- Report to a partner
  Each student reports his/ her own answer to a peer. The students listen to their partner’s response. (“Turn to a partner on your left.” “Now turn to a partner on your right” etc.)
- Give one get one
  After brainstorming ideas, students circulate among other students sharing one idea and getting one. Students fold paper lengthwise they label the left side “give one” and the right side “get one”.
- Think, Pair, Share
  Students think about a topic suggested by the teacher. Pairs discuss the topic. Students individually share information from their discussion with the class.
- Inside-outside circle
  Two concentric circles of students stand or sit, facing one another. The teacher poses a question to the class, and the partner responds. At a signal, the outer of inner circle or outer circle rotates and the conversation continues.
- Appointment clock
  Partnering to make future discussion/work appointments.
- Jigsaw
  Group of students assigned a portion of a text; teach that portion to the remainder of the class.

Math Practice Standards

1) Make sense of problems and persevere in solving them.

2) Reason abstractly and quantitatively.

3) Construct viable arguments and critique the reasoning of others.

4) Model with mathematics.

5) Use appropriate tools strategically.

6) Attend to precision.

7) Look for and make use of structure.

8) Look for and express regularity in repeated reasoning.

Common

Place Value Meaning

Students sometimes have the misconception that the value of the number is only the value of the digit as opposed to its place value (e.g., 537 – the student believes the value of the digit 5 is actually 5 as opposed to 500). This is made obvious when a student reads the number as “five, three, seven”. Teachers can address this misconception by building numbers with students using multiple models such as base ten blocks, place value cards, place value discs, place value charts, and decomposing using number bonds. Seeing these representations over and over allow students to make connections between the digits and their value.

Comparing Numbers

Students sometimes erroneously believe that the number with a smaller digit at the start of the number is the smaller number again disregarding the place value of the digit (e.g.: 247 vs. 98 – student erroneous believes that 98 is the larger number because its leading digit is a 9). By representing numbers with base ten blocks initially, then bridging to other concrete representations, students can see the value of the digits, avoiding this misconception.

Decomposing Numbers with Base Ten Blocks

A misconception is that numbers can only decomposed based on their place value when using base ten blocks as opposed to multiple ways (e.g., 43 must be 4 tens and 3 ones and can’t be 3 tens and 13 ones, 2 tens and 23 ones, 1 ten and 33 ones, or 43 ones). The activity “How Many Ways to 43?” allows student to explore multiple ways to decompose numbers with base ten blocks.

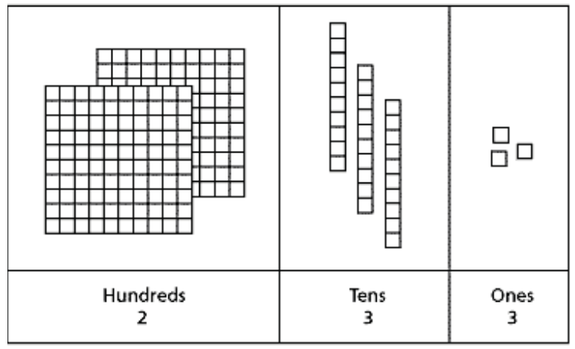
Flow Cont’d

Lastly, the unit culminates with the game Roll & Build which has students roll a 10-sided die three times to represent the digits of a three-digit number. Students will decide in which order to place the digits to create a number larger than the previous number and then build a string of inequalities from 0 to 999.

This Topic Fit?

Grades 6-8

In grade 6, students continue to expand their knowledge of the number system by learning about rational numbers, representing positive and negative numbers with algebra tiles and the number line. In 7th grade, students learn rational number operations also using algebra tiles and the number line. In grade 8, students culminate their study of the number system domain with learning about square roots and irrational numbers by estimating their location on a number line and exploring their properties.



Coherence

Connections to other Grade 2 Topics

This unit connects to work 2nd graders will do later in the year with addition and subtraction within 1,000. Students rely on their place value understanding to decompose addends, subtrahends, and minuends to add & subtract using place value strategies.

Concrete representations such as base ten blocks, place value cards, place value mats, and place value discs will all be used to aid students in conceptual understanding of adding and subtracting. Student also use place value to learn about money, making connections with re-grouping whole numbers to coins and dollars.

Real-World Application

- Money
- Banking
- Sports Statistics
- Business
- Stock Market

The Math Behind The Unit!

Essential Question # 1
How do we orally count beyond 120 including skip counting by 2's, 5's, 10's and 100's and counting on from a number other than 1?

Essential Question # 2
How are numbers composed and decomposed to 1,000 using multiple representations?

Essential Question # 3
How do we compare numbers to 1,000 using an inequality symbol?

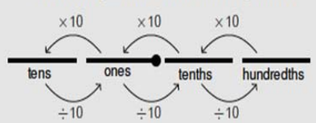
Position

The base ten number system is highly efficient in that there are a string of ten numbers 0-9 that are used repeatedly where the location of the digit within a multi-digit number determines its value. Whether the number represents a decimal or a whole number, the system is the same – the place value position when moving to the left is always 10 times that of the place value position to its immediate right (e.g., 99: 90 is ten times 9; or 0.99: 0.9 is ten times 0.09). Because of this consistency, algorithms for the arithmetic operations work for both whole numbers and decimals.

Base Ten Units

Each place of a number has a place value name (i.e., ones, tens, tenths, hundreds, hundredths, thousands, thousandths etc) with ones being the most basic unit in the system. Ten like units make one of the next larger unit, thus only requiring 10 digits 0 through 9 (with repetition) to represent all numbers. Each new place value to the left represents 10 of the unit to its immediate right. The opposite is true for decimals where the ones are partitioned into 10 equal sized pieces or "tenths", the tenths are partitioned into ten equal sized pieces or "hundredths" and so on. Each base ten unit has a relationship with the other base ten units that are a factor of a power of ten (e.g., 1,000 is ten thousand times 0.1).

Uniformity of the base-ten system



For any base-ten unit, 10 copies compose 1 base-ten unit of next-highest value, e.g., 10 ones are 1 ten, 10 tens are 1 hundred, etc.

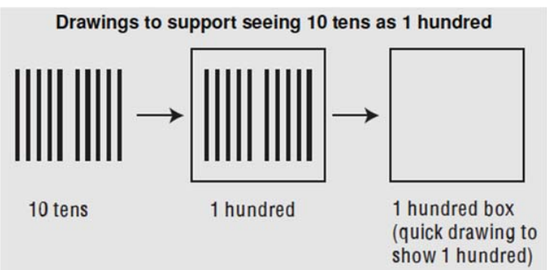
Place Value in the English Language

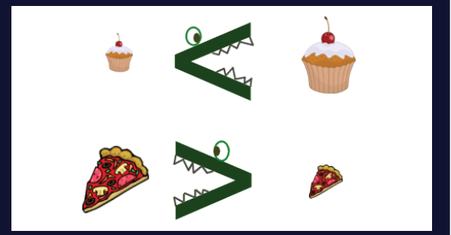
The words that represent each place value do not always support place value learning. The hundreds words support the base ten system and are more intuitive than the words representing the decades (e.g., four hundred, five hundred, six hundred vs. forty, fifty, sixty). Interpretation is needed to understand that fifty is 5 tens (although "–ty" means ten, it is not obvious), but five hundred is explicitly reflective of the place value itself. The system of naming is not always consistent: we can name 1,300 as "one thousand three hundred" or just as commonly "thirteen hundred", but the same does not hold for hundred thousands: 1,300,000 is always named "one million three hundred thousand," but never "thirteen hundred thousand." With structured discussion and practice, students see patterns in the oral counting sequence and written numerals.

Comparing Numbers

When comparing magnitudes of numbers, students rely on their understanding that one ten is greater than any digit used in the ones place. In addition, grade 2 students rely on their place value understanding when comparing three digit numbers, understanding that one hundred is greater than any tens and ones represented in a two digit number. This allows students to understand that when comparing numbers that we begin with the largest place value. Students use this understanding to then compare two digit numbers using the correct inequality symbol (i.e., < or >). Students begin their comparing concretely with base ten blocks that can be physically counted, then progress to comparing numerals.

Drawings to support seeing 10 tens as 1 hundred





Academic Language

- ones
- tens
- hundreds
- thousand
- unit
- rod
- flat
- cube
- expression
- numeral
- digit
- place value
- expanded notation
- compare
- inequality