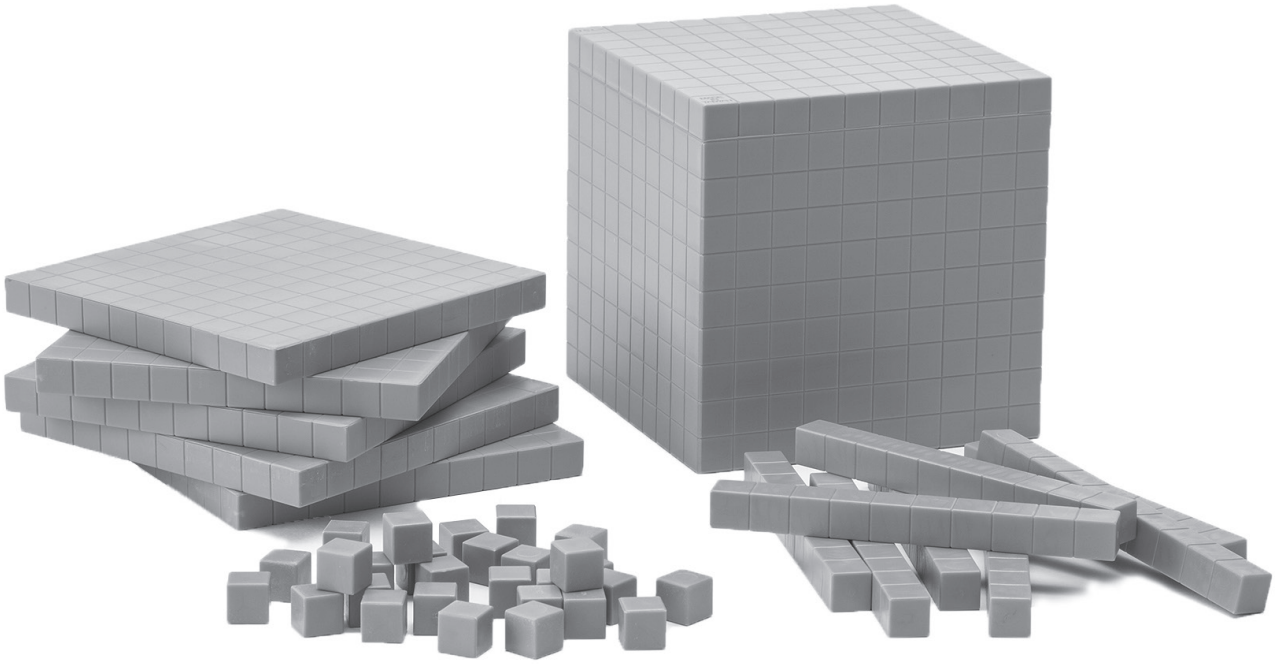
WORKING WITH

BASE TEN BLOCKS

Hands-on Games and Activities for Understanding Place Value



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Contents

Chapter 1 Grades 1–2

Introduction

The Grades 1 and 2 activities and worksheets in this book can help children to meet current Math Standards with respect to place value, addition, and subtraction.

Place Value

By the end of Grade 2, children are expected to understand that "the three digits of a three-digit number represent amounts of hundreds, tens, and ones."

They are also expected to understand that 1 hundred can be exchanged for 10 tens, and vice versa, and that 1 ten can be exchanged for 10 ones, and vice versa.

The activities that begin on page 11 and the worksheets that begin on page 25 will help your students to master both of these concepts.

Addition

By the end of Grade 2 children are expected to be able to add "within 1000, using *concrete models* or *drawings* and *strategies* based on place value." (emphasis added)

The requirement for Grade 1 is the same, but limited to numbers within 100.

Base ten blocks are an ideal *concrete model*.

Base ten drawings (in particular, icons) are ideal *drawings*.

Now let's talk about *strategies*.

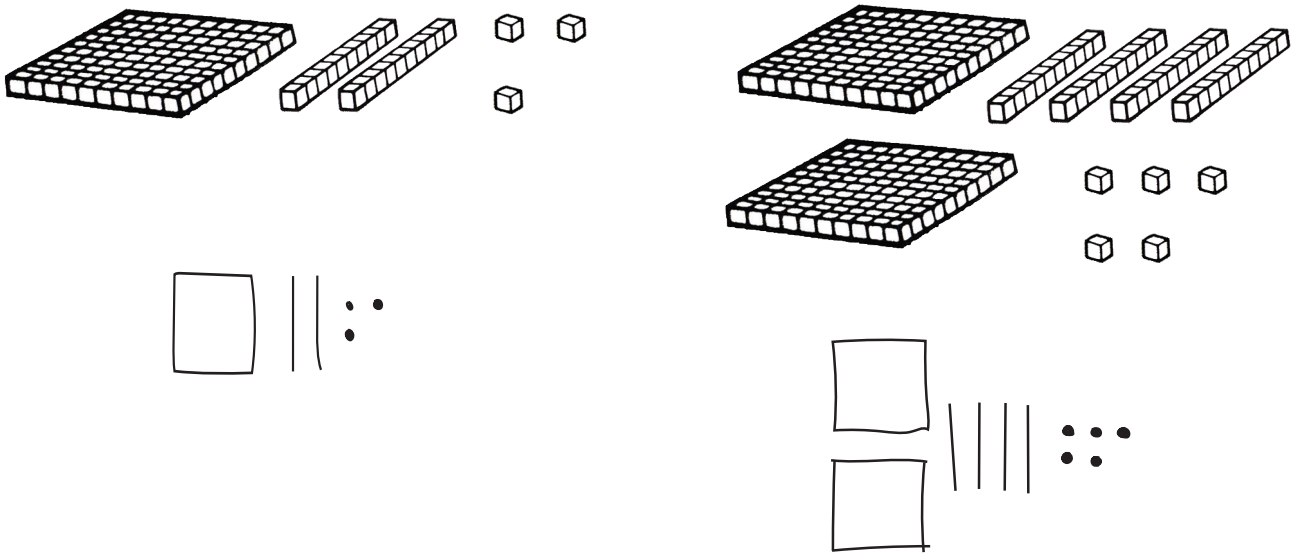
The most basic strategy for solving an addition problem is one-by-one counting. If I have 2 red apples and 3 green apples, then I can find the total number of apples by counting them together, "one, two, three, four, five." But this strategy is so basic, that I hesitate to even call it a strategy. If I don't know that I can find the total number of apples altogether by counting them, then I would say that I don't even understand the problem. A strategy for adding is a way of solving addition problems that is more efficient than one-by-one counting.

Now suppose that I have 123 red apples and 245 green apples. I could count them one by one to find that I have

1, 2, . . . , 368

apples altogether. That would show that I understand the meaning of "how many apples are there altogether?" I could also count on from 123, "123 – 124, 125, . . . , 368." That's a strategy—great for adding small numbers, not so efficient for larger numbers. The particular strategy that the standards expect is adding "hundreds and hundreds, tens and tens, ones and ones."

But I cannot add "hundreds and hundreds, tens and tens, ones and ones" if I don't first understand base ten and place value. I have to "see" the numeral 123 as 1 hundred, 2 tens, and 3 ones. And I have to "see" 245 as 2 hundreds, 4 tens, and 5 ones.



Once children can represent number names and numerals with base ten blocks and/or their icons, they are ready to learn the strategy of adding hundreds to hundreds, tens to tens, and ones to ones. It is not quite as obvious as one might think. The activities that begin on page 18 and the worksheets that begin on page 45 were designed with that strategy in mind.

Subtraction

The main expectation for subtraction in Grades 1 and 2 is identical to that for addition. Children are expected to be able to use "concrete models or drawings and strategies based on place value."

As in the case of addition, I like to distinguish between understanding a subtraction problem and having a strategy for solving it.

For example, if I have 368 dollars and I spend 123 of them, I can count out 368 one-dollar bills, separate out 123 of them, and then count those that remain one by one; that shows that I understand the situation. But that ability, important as it is, does not qualify as a strategy.

The Math Standards require that children have strategies, and in particular, by the end of Grade 2 they are expected to be able to take hundreds from hundreds, tens from tens, and ones from ones.

Subtraction activities, designed with that strategy in mind, begin on page 22. Subtraction worksheets begin on page 61.

Place Value Activities

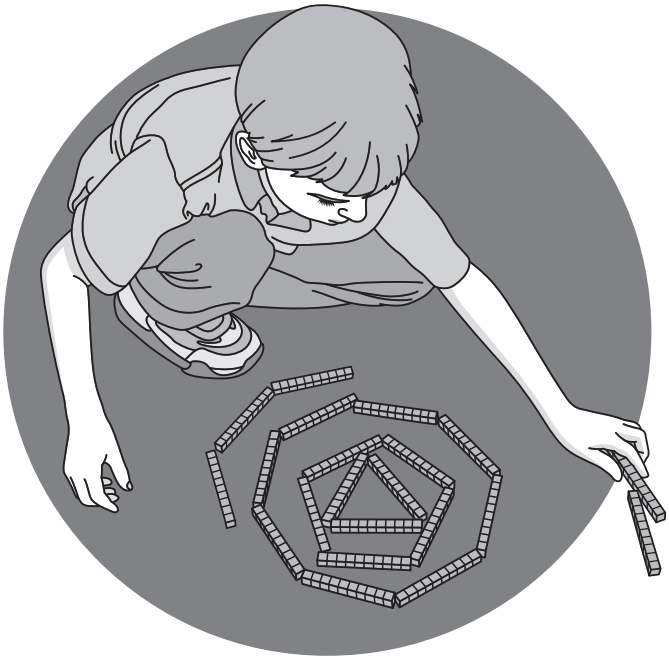
1. Naming and Counting

The first step in learning about base ten is learning the names of the base ten blocks.

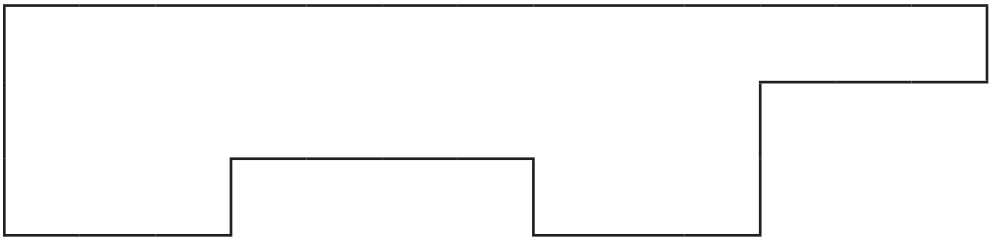
Building with the blocks is a good way to learn their names and to start to notice the important relationships—10 ones make a ten, 10 tens make a hundred, 10 hundreds make a thousand. (And maybe even 100 ones make a hundred and 100 tens make a thousand.)

Encourage your students to count collections of blocks.

- "I think Eva needs 3 more tens to finish her garden fence."
- "How many tens long is Rose's arm?"
- "Get Trixie 4 hundreds and 2 ones for her farm."
- "How many hundreds do you think it will take to cover this piece of paper?"
- "How many thousands do you think we will need to fill this bin?"



You could draw and cut out shapes like this one and have children count the ones, or tens and ones that it takes to cover them.



Don't expect that your students will know that 3 tens makes 30 or even that 6 hundreds makes the number "six hundred." At this point, "I have 6 hundreds" simply means that I have 6 blocks, each of which is called "a hundred." (Eventually, of course, they will make these connections.)

2. Trading

The youngest of children can be formally introduced to the idea of trading tens and ones, hundreds and tens, thousands and hundreds even before they have any real understanding of these blocks as representing numbers. For example, in the following game it can simply be a rule of the game that 10 ones should be traded for 1 ten.

Materials

- "Bank" of 10 tens and 20 ones for each child
- Ordinary 6-sided die
- Paper plate, or other container, for each child

Number of Students: 2 to 4

What to Do

1. Children take turns rolling the die and adding the corresponding number of ones from the bank to their paper plates.
2. Every time there are 10 ones on a plate they must be traded for 1 ten from the bank.
3. The first child to have 10 tens on his or her plate wins.

The same game can be played trading tens for hundreds or hundreds for thousands.

Variations

The game can be played in reverse—each child starts with 10 tens on her plate. If she rolls say a 3, she must trade with the bank—1 ten for 10 ones—in order to give the bank 3 ones. The first child to give all her blocks to the bank wins.

By the way, these same games could be played with chips of two different colors, say red and blue. There could be a rule that 5 blue chips can be traded for 1 red chip. There could even be chips of a third color, say yellow, with 5 red chips equivalent to 1 yellow chip. And of course there is nothing special about the number 5. The trades could be 3 for 1, or 12 for 1, or anything else. This family of games will give children experiences with bases other than 10.

3. A New Way to Think About Numbers

Beginners think of "sixteen" as 16 ones, "twenty-three" as 23 ones, "two hundred forty-four" as 244 ones. Of course it is not wrong to think of "sixteen" as 16 ones, but children also have to be able to think of it as 1 ten and 6 ones. This simple activity should help.

Number of Students: 2 to 4

Materials

- Large quantity of ones
- Large quantity of tens
- Large quantity of sandwich bags

What to Do

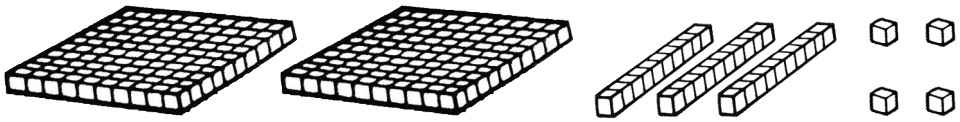
1. Place a handful of ones into each of several sandwich bags.
2. Label the bags and keep track of how many ones you put into each bag.
3. Have children count the ones and record the count. Children should also trade ones for tens and count the tens and the leftover ones. A typical record might look like this.

23 ones	
2 tens	3 ones

For many children it will not be obvious that, say, 23 ones becomes 2 tens and 3 ones after the trades. But this activity will give you the opportunity to discuss this fact with them.

4. Skip Counting by 10s and 100s

I call the ability to count a collection of hundreds, tens, and ones "base ten counting." I am using base ten counting when I point in turn to each object in the picture below and say, "one hundred, two hundred, two hundred ten, two hundred twenty, two hundred thirty, two hundred thirty-one, two hundred thirty-two, two hundred thirty-three, two hundred thirty-four."



A very basic place value skill is the ability to use base ten counting. But one cannot count in base ten if one cannot first:

- skip count by 10s, and
- skip count by 100s.

Mathematics isn't often a place for rote learning, but skip counting is one place where it makes sense. Skip counting is like learning a telephone number—you have to learn to say certain number names in a certain order. For skip counting by 10s those words are:

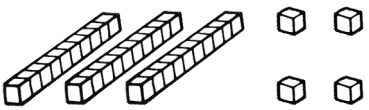
"ten, twenty, thirty, forty, fifty, sixty, seventy, eighty, ninety, one hundred."

For this content, group chanting works well.

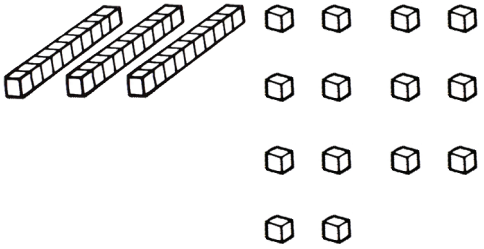
- Say, "Altogether, 'ten, twenty, . . .'"
- Next, try skip counting starting from an arbitrary multiple of 10. For example, have the class start the count from "thirty."
- Try skip counting backwards from "one hundred"—or from, say, "eighty."
- Practice skip counting by 100s. This should be easy. After all, it is not very different from rote counting by ones.

5. Base Ten Counting

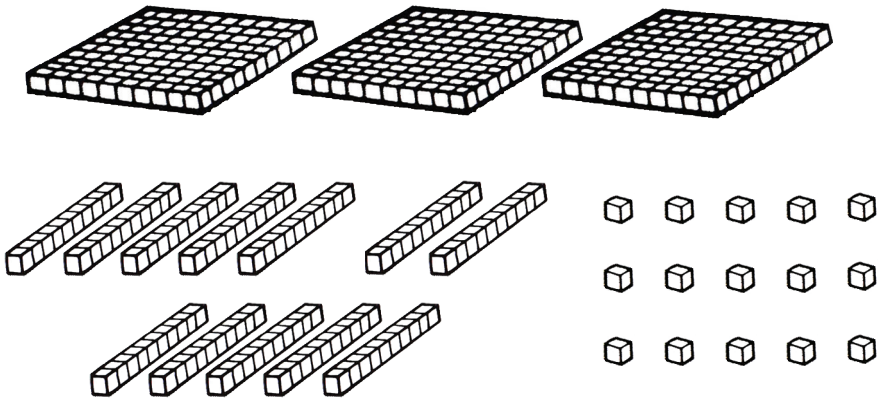
Having learned the names of the blocks (the thousands, the hundreds, the tens, and the ones) and with some ability to skip count by 10s and by 100s, children are ready to learn base ten counting. For example, the Math Standards require that they be able to count "ten, twenty, thirty, thirty-one, thirty-two, thirty-three, thirty-four" for this collection of blocks.



They even need to be able to count this collection.



In Grade 2 they are required to be able to count collections that include hundreds—even collections like this one.



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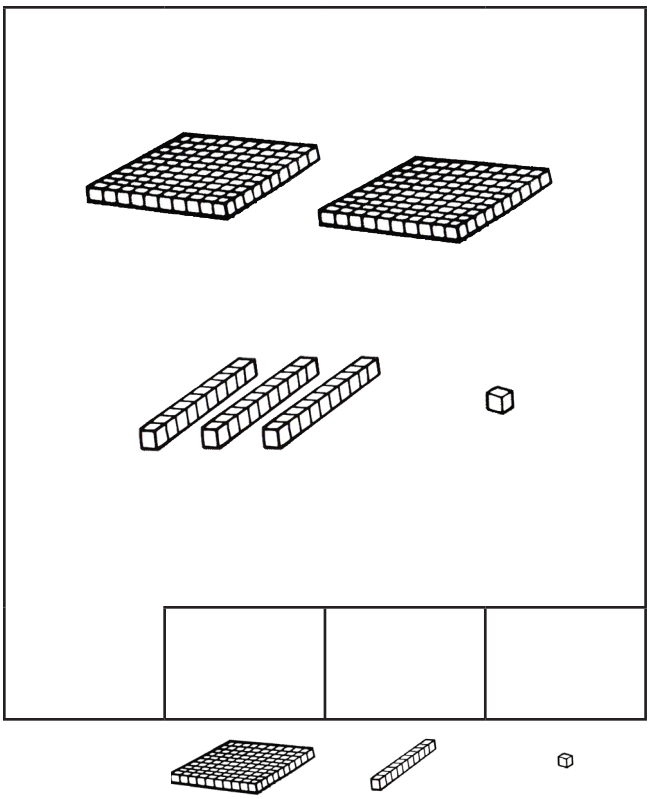
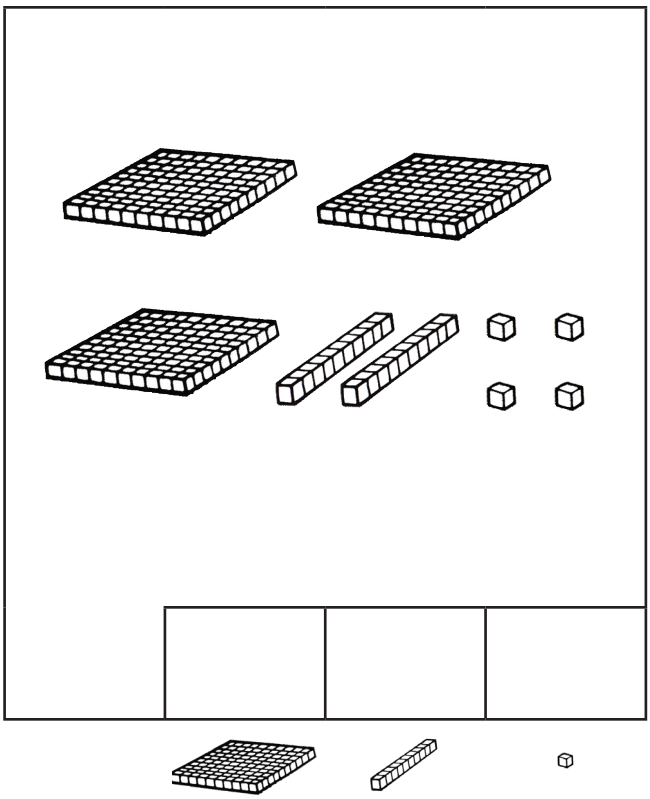
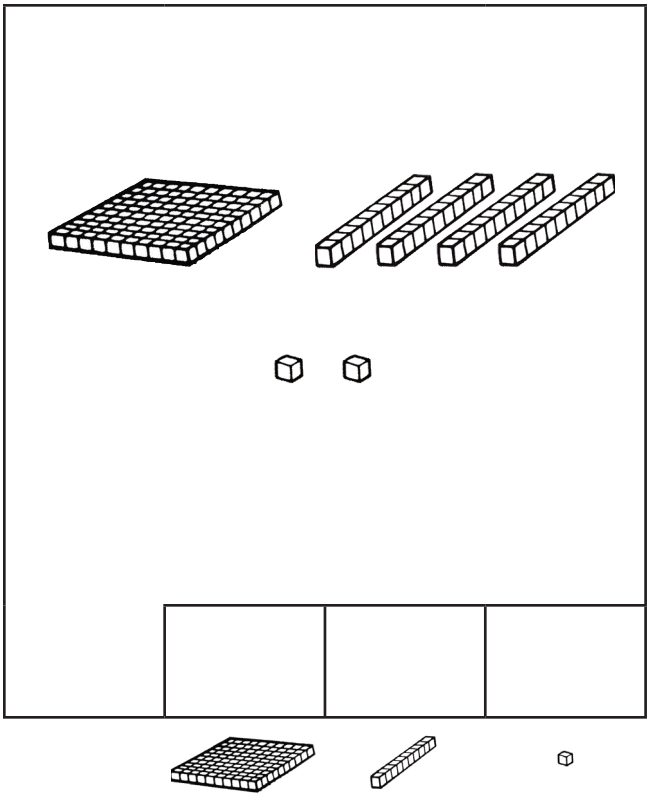
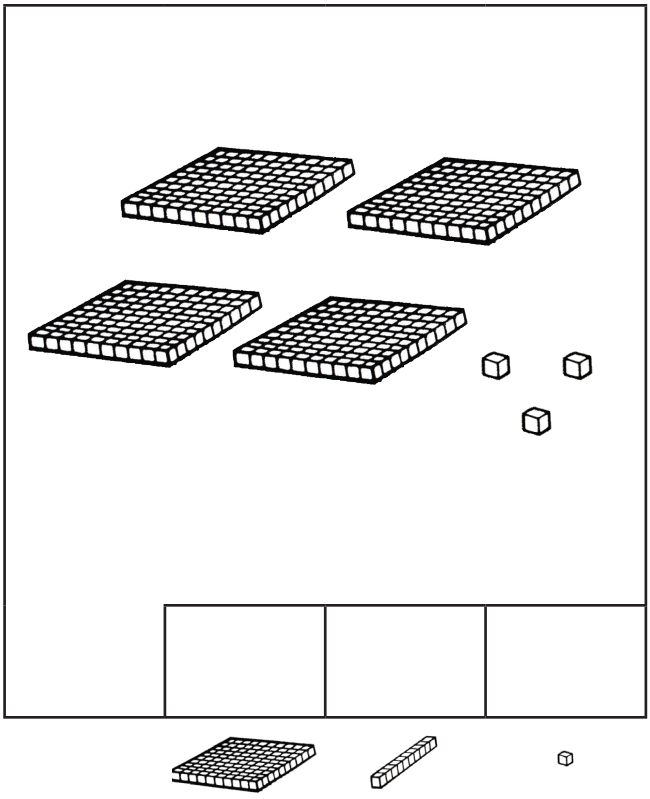
Write the numeral.









Name _____ Date _____

Write the numeral. □ | •

Name _____ Date _____

Make the picture.