

Record Division by Single-Digit Numbers

How can we use numbers to record dividing the blocks?

Students work as a class and in pairs to record on paper what happens when they divide blocks. After seeing the standard algorithm, students do their own recording of 2 problems. Students review the standard algorithm and use multiplication to check their answers.

Objectives

- To connect concrete division with blocks to symbolic division using numbers
- To solve problems with single-digit divisors
- To understand the steps of the traditional division algorithm

Materials

- 500 blocks-of-100 for demonstration
- 4 paper plates or blank sheets of paper
- blank paper for all students
- both *Recording Division* activity sheets **for each student**

Each group will need:

- 250 blocks and holders

◆ Class Introduction

30 MIN.

- Write this problem on the board or on a large sheet of paper:

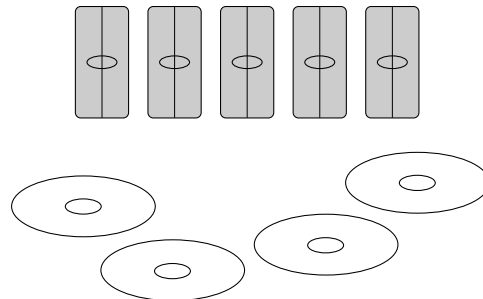
$$500 \div 4$$

What does this mean? (*500 split into 4 equal groups*) or (*500 split into groups of 4, with the number of groups unknown*)

Ask a volunteer to build the number 500 on the table with blocks.

Ask for suggestions for how to find the solution. Students could use repeated subtraction by removing 4 single blocks at a time and finding out how many groups. This would take a long time. Instead, suggest that they use the sharing model to solve the problem.

How many equal shares are we making? (4) Set up 4 paper plates to indicate this.



$$500 \div 4$$

Have the volunteer begin sharing the blocks. Guide him or her if necessary to begin sharing the biggest blocks first—4 of the blocks-of-100 can be handed out immediately.

Narrate the action for the rest of the class, guiding the volunteer through the steps if necessary:

- ◆ Unpack the remaining block-of-100 to get 10 blocks-of-10
- ◆ Share the blocks-of-10, distributing 2 blocks-of-10 per plate and 2 blocks-of-10 left over.
- ◆ Unpack the remaining blocks-of-10 to get 20 single blocks.
- ◆ Share the single blocks, distributing 5 single blocks per plate.

How many blocks are on each plate? (125) So we have found the answer: $500 \div 4 = 125$

Write the answer on the board.

- Clear away the blocks and give the students a new problem:

$$434 \div 3$$

Pass out blank paper to each student. Ask another volunteer to model the new problem, setting up the blocks and 3 empty plates. Have students draw the starting blocks on their papers. The volunteer should STOP after each step or decision he or she makes, while the rest of the class records that step in their own words or pictures.

For example, when the volunteer decides to start sharing with the hundreds, repeat that decision aloud and pause while the other students record it.

This problem has a remainder. If necessary, explain the notation for remainders. Once the problem has been completed, write the answer on the board: $434 \div 3 = 144 \text{ r}2$

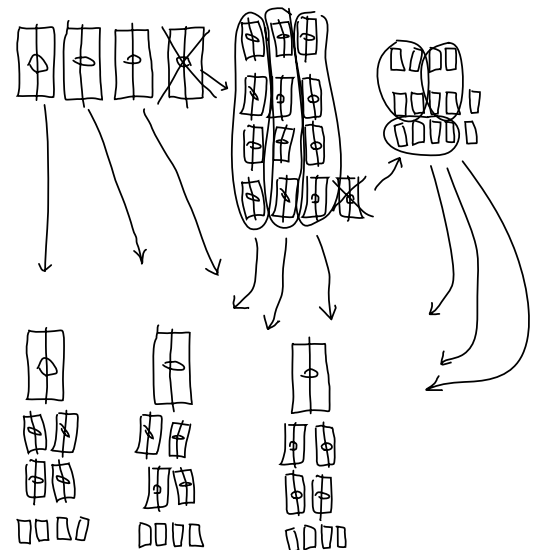
- Have another volunteer re-pack the blocks to show the starting number, 434, again. The volunteer should stand by.

Now let's see how well we recorded what happened. Who would like to share their recording with the class?

Ask a student to come to the front of the room and explain his or her record (*see figure*).

Our explainer will tell the class what she has in her record. As she does so, our volunteer will do with the blocks whatever is described. If the record was done well, the volunteer will complete the problem just as described.

First I shared the hundreds
I used 3 and had 1 left over
I unpacked it and got 13 tens
I shared 4 tens to each plate
Then I opened the left over ten and
had 14 ones
I shared 4 for each plate and had 2 left



While the class looks on, the explainer reads his or her record aloud, as you write each instruction on the board. Check the answer with multiplication: see 3 groups of 144 with remainder of 2.

$$(3 \times 144) + 2 = 432 + 2 = 434$$

If there is time, repeat with other students' records.

$$\begin{array}{r} 144r2 \\ 3 \overline{) 434} \\ \underline{3} \\ 13 \\ \underline{12} \\ 14 \\ \underline{12} \\ 2 \end{array}$$

- As a final step, summarize the steps using a standard algorithm like the one shown at left:

◆ Group Activity

20 MIN.

- Pass out the activity sheets to the students. They will work in pairs, modeling each problem with blocks, recording what they do using drawings or words, then recording with numbers.
- While students are working, ask them to explain their written records:

What were you doing with the blocks at this step?

Did you model the problem with fair shares or with repeated subtraction? Why? Does it matter which method you use?

◆ Closure

15 MIN.

- When students have finished, go over the problem from the second sheet, $183 \div 3 (= 61)$, showing them step-by-step how to record the algorithm.
- Compare the methods of repeated subtraction vs. fair shares.

What does the context of the problem tell us? Does the problem describe fair shares or repeated subtraction? (*repeated subtraction*)

Most students probably solved the problem using fair shares, because that is quicker. Remind them that as they saw in lesson 4.1, either method gives the same answer, so it is their choice how to solve the problem. Once they get the answer, they will need to refer back to the problem to know whether the answer describes the number of groups or the group size.

After solving this problem, you might have ended with 3 groups of 61 blocks. But what is the complete answer to the original question? (*The store clerk can make 61 groups (packages) of 3 (tennis balls).*)

- Remind the class that division is the inverse of multiplication. Have the class multiply 3×61 and verify the answer is 183.

We can always check our division results using multiplication.

We can write these related number sentences:

$$61 \times 3 = 183 \quad 3 \times 61 = 183 \quad 183 \div 3 = 61 \quad 183 \div 61 = 3$$

- Present a new problem and discuss a common error with students—show them this example, and if there is time, model it with blocks.

$$\begin{array}{r} 16 \\ 6 \overline{)636} \\ \underline{-6} \\ 36 \\ \underline{-36} \\ 0 \end{array}$$

Is this solution correct? What did I do wrong? (*You should have recorded a 0 in the tens place when you couldn't share any of the 3 tens. Then the 6 belongs in the ones place. The answer should be 106.*)

Encourage students to think about what they do with the blocks to solve the problem. This will help them see that the “1” in the answer is a block-of-100, not a block-of-10. Since no blocks-of-10 were distributed, there should be a zero in the tens place of the quotient.

◆ Assessment

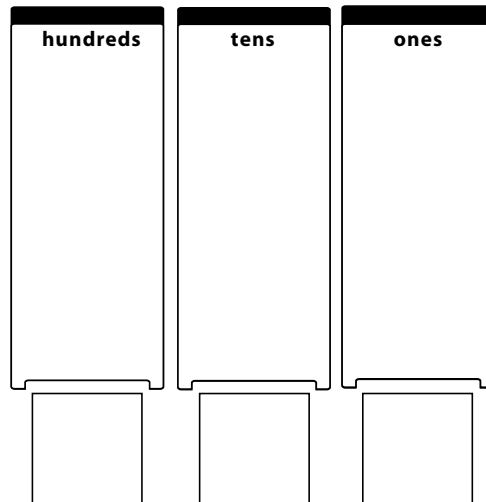
- Do students understand that modeling fair shares will give them the same answer as modeling repeated subtraction?
- Are students able to record division with the blocks using reasonably accurate descriptions or pictures?
- When using numbers, do students' recordings accurately reflect the procedure and the answer?
- Do students follow the meaning of the steps in the traditional numeric method?
- Do students connect the steps in the physical division of the blocks to the corresponding steps in the algorithm?

Name

Recording Division

Use blocks to model $256 \div 8$.

1. Draw your starting blocks on the place value mat.



2. Draw what you did with the blocks.

3. Use numbers to describe what you did.

Name

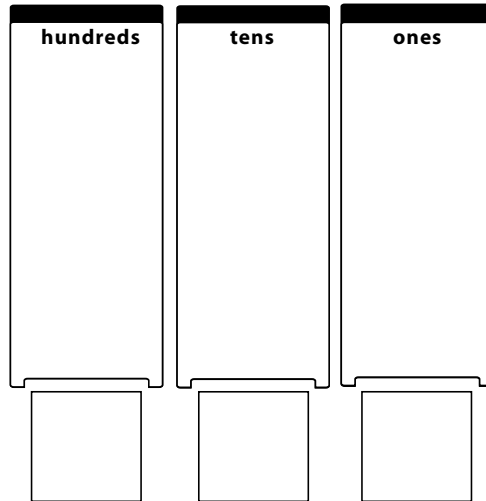
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Recording Division

Use blocks to model this problem:

A sporting goods store has 183 tennis balls.
They need to be packaged in groups of 3.
How many packages can the clerk make?

4. Draw your starting blocks on the place value mat.



5. Draw what you did with the blocks.

6. Use numbers to describe what you did.