Lesson: Place Values Using Base-Ten Blocks
Math Academy
Student Notes

Goals:

- Show that the four digits of a four-digit natural number represents amounts of thousands, hundreds, tens, and ones respectively starting from the leftmost position in the number.
- Summarize that in a multi-digit number, a digit in one place represents ten times what it represents in the place to its right.

Prerequisite Knowledge:

- Ability to count to 100

Activities

1. Working with a partner,
    a. You are tasked with counting the number of blocks as accurately and as quickly as possible. Decide with your partner how you will go about counting. There are different ways. Pick the one you think is best. Be prepared to share your counting strategies with the class.
    b. Organize the blocks so that anyone can easily check the total number of blocks you have.
    c. Write the numeric representation for the total number of blocks.

    d. Whole Class Discussion: What counting strategies were used? Were there any strategies that seem easier than others? Harder? Less efficient? Any surprising strategies?

2. Working with a partner,
    a. You are tasked with counting the number of rods as accurately and as quickly as possible. Decide with your partner how you will go about counting. There are different ways. Pick the one you think is best. Be prepared to share your counting strategies with the class.
    b. Organize the rods so that anyone can easily check the total number of rods you have.
    c. Write the numeric representation for the total number of blocks.

    d. Whole Class Discussion: What counting strategies were used in this task? How do these strategies differ from the previous problem (#1)?

3. Whole Class Discussion:
    a. What is the number represented by a block?

    b. What is the number represented by a rod?

    c. What is the number represented by a flat?

    d. What would 1,000 look like using base-ten blocks?

4. Working with a partner, use the space below to draw what 1,327 would look like using the fewest base-ten blocks. Be prepared to share your drawing with the class.

Lesson: Place Values Using Base-Ten Blocks
Math Academy
Instructor Notes

Goals:

- Show that the four digits of a four-digit natural number represents amounts of thousands, hundreds, tens, and ones respectively starting from the leftmost position in the number.
- Summarize that in a multi-digit number, a digit in one place represents ten times what it represents in the place to its right.

Prerequisite Knowledge:

- Ability to count to 100

Lesson Materials:

- Base-Ten Blocks
- Baggies
- White board markers or chalk

Preparation

- Sort and organize base-ten unit blocks into baggies of 73 blocks each
- Sort and organize base-ten rods into baggies of 26 rods each.

Lesson Breakdown:

Activity	Size of Group	Time in Activity Total Time: 55 minutes
Count 73 blocks accurately using various strategies	Groups of 2	20 minutes
Count 26 rods accurately using various strategies	Groups of 2	20 minutes
Discuss numbers represented by blocks, rods, flats, and cubes	Whole class	5 minutes
Represent a given number with base-ten blocks	Groups of 2	10 minutes

---

Note: Students should not see a rod, flat, or a big cube. They should only have access to the small cube until you start the concept of trades. We want students to visual the place value, base-ten system. Trades up require a new shape. We want students to be thinking of the shape of the next trade up – i.e. what would the geometric shape of a 1000 cubes look like? If students are shown this ahead of time, it will take the student thinking out of this lesson plan.

Amber Schreve and Thomas Geil

Activities

5. Working with a partner,
    a. You are tasked with counting the number of blocks as accurately and as quickly as possible. Decide with your partner how you will go about counting. There are different ways. Pick the one you think is best. Be prepared to share your counting strategies with the class.

       Give each group a baggie with 73 cubes. Students are tasked with counting these accurately and quickly.

    b. Organize the blocks so that anyone can easily check the total number of blocks you have.

       You should be able to 'see' what the total is as you walk around the room. We are hoping to see 7 sets of blocks in groups of ten and 3 separate blocks. Let them know it is not incorrect to group in other ways but that groups of 10 are best. As groups of 10 there is a connection to the base ten decimal system.

    c. Write the numeric representation for the total number of blocks.

       They should write '73'. Talk about what the 7 represents and what the 3 represents.

    d. Whole Class Discussion: What counting strategies were used? Were there any strategies that seem easier than others? Harder? Less efficient? Any surprising strategies?

       Check for students who are already counting in tens. For those who are not, encourage them to group the blocks into tens. For example, show them that 14 groups of 5 is more difficult to verify visually than 7 groups of 10. If they are struggling, organize ten blocks into a rod and place a base-ten rod on their desks. Say "Could this be a useful way to organize the blocks?"

       Have students clean up and set aside the baggies of 73 blocks.

6. Working with a partner,
    a. You are tasked with counting the number of rods as accurately and as quickly as possible. Decide with your partner how you will go about counting. There are different ways. Pick the one you think is best. Be prepared to share your counting strategies with the class.

       Again watch to see how they attack this problem. Make sure they count each rod as 10. The unit in this case is still the single small block.

    b. Organize the rods so that anyone can easily check the total number of rods you have.

       You should be able to 'see' what the total is as you walk around the room. We are looking for 10 rods to be grouped together. In all there should be two groups of 10 rods and 6 remaining rods.

    c. Write the numeric representation for the total number of blocks.

They should write '260', not just '26' and not '26 rods'. Relate the 'value' of the rod to 10 blocks from Activity 1.

d. Whole Class Discussion: What counting strategies were used in this task? How do these strategies differ from the previous problem (#1)?

Some may already try to count in tens. They should see that the unit is the small cube, 1 block = 1 unit and that THE ROD IS NOT THE UNIT. Talk about what would happen if the rod was the unit. This would represent 26. It is critical to know the unit when using blocks. Check for students who are already grouping into tens. For those who are not, encourage them to group the rods into tens. If they are struggling, organize ten rods into a flat and place a base-ten flat on their desks. Say "Could this be a useful way to organize the rods?"

Have students clean up and set aside the baggies of 26 rods.

7. Whole Class Discussion:
   a. What is the number represented by a block?

   (1 block = 1).

   b. What is the number represented by a rod?

   (1 rod = 10 blocks = 10).

   c. What is the number represented by a flat?

   (1 flat = 10 rods = 100). Emphasize that we are grouping by tens.

   d. What would 1,000 look like using base-ten blocks?

   Students should figure this out themselves. This should lead to the building of the big cube made out of 10 flats. Draw this shape so the students are ready to draw it in the next problem.

8. Working with a partner, use the space below to draw what 1,327 would look like using the fewest base-ten blocks. Be prepared to share your drawing with the class.

   Have one group present the result to the classroom by posting/drawing on the board.

Make sure their flats and cubes are very different sizes. The students must first determine what the unit will be represented by. In this problem the only choice is to use the small cube as a unit. The result should be 1 big cube, 3 flats, 2 rods and 7 small cubes.

We say the fewest number of blocks because 1327 small cubes would work along with many other possible combinations.