Numbers Incognito

Grade 3

Activity 308

Relevant chapters in the *Digi-Block Comprehensive Teacher Guide:*
    Book III: Unit 1-6: Exploring Equivalent Representations, page 37

Overview

Students apply their understanding of the base ten number "code" to identify a partially packed number.

Objectives

Thinking Skills: Students explore different ways to model 3-place numbers, and identify patterns in these representations.

Mastery Skills: Students learn to recognize multiple representations of a number. This skill greatly enhances their ability to "regroup" when performing operations.

Materials

Each pair/small group of students needs:
- 3-digit number written on an index card
- Supply of blocks, enough for each pair/group to build its number
- Place mat
- Chart paper
- Digi-Block rectangle pieces: Cut rectangles that match actual Digi-Block sizes of hundreds, tens, and ones. Use green paper, if available.
- Glue

For a warm-up, play "Pack a Ten."

- Have student pairs count out 45 single blocks. Ask*, **How many blocks-of-10 do you see? (0) How many single blocks**? (45) Say*, **Pack a ten**. Have students once again name the number of blocks-of-10 (1) and singles (35). Continue until the blocks are packed as much as possible. Make a table to show tens and ones:

Blocks-of-10	Ones
0	45
1	35
2	25
3	15
4	5

- Discuss patterns in the table and have students explain them. Note that the final, packed-as-much-as-possible, representation is the easiest to read. The other representations also show 45, but they are disguised, or "incognito." Students will enjoy using this new word!

Next, explore different representations of a 3-place number. In small groups, have students place 3 blocks-of-100, 8 blocks-of-10, and 2 ones on a mat. Agree that there are 382 single blocks packed as much as possible. Explain that just as they represented 45 in different ways, they will be disguising 382, or showing 382 incognito!

- Draw a 3-column table showing hundreds, tens, and ones. Record the 3, 8, and 2 blocks in each place.
- Have students predict what their mats will look like if they unpack a block-of-10. Unpack a ten and record the 3 hundreds, 7 tens and 12 ones. Ask, **Do we still have 382 blocks on our mats? How do you know?** Have students predict what their mats will look like if they unpack a block-of-100. Then have them unpack a hundred, placing ten tens where they belong. Record the number of blocks in each place. Ask, **Do we still have 382 blocks on our mats? How do you know?**

- Have students suggest additional ways to represent 382. Record the number of blocks in each new representation and discuss how and why the numbers change. Continue to reinforce the idea that the quantity remains constant: it is simply INCOGNITO!

Student Activity (20 minutes)

Explain to students that they will "secretly" disguise a number for their classmates to identify.

- Give each pair or small group of students a card with a 3-place number on it.
- Have students build their number with blocks, showing it packed as much as possible.
- Next, have them disguise it by breaking apart some of the tens and hundreds.
- Distribute chart paper and Digi-block rectangle pieces and have pairs/groups paste the number of each size block on their paper in an organized way. They may also write how many of each block their poster shows. For example, for 347, they may show and write:

  1 hundred   23 tens   17 ones

Closure (20 minutes)

When students have completed their posters, collect the number cards and posters. Display the posters for all to view and shuffle the number cards.

- Show one number card at a time. As a whole class, have students think independently, then discuss which poster matches the card.
- Have students justify their reasoning as they match posters with cards. Have them model their thinking with the blocks, if necessary. Provide markers for student "detectives" as they reveal the numbers incognito. They may decide to loop groups of ten blocks to illustrate the packed-as-much-as-possible number.

Assessment

During the class demonstration, observe students and note:

Do they -

- Understand the relationship between the unpacked, *partially* packed, and packed views of the number?
- Recognize and explain patterns in the place value chart?
- Relate the patterns to the blocks?
- Understand that the total quantity remains constant, even though it is represented in different ways?

As students create and match posters to numbers, further observe and note:

Do they-

- "See" 10 of one size block also as 1 of the next larger size block (and vice versa)?
- Express their thinking clearly, using the poster, blocks, and marker to demonstrate their understanding to classmates.

Extension

- ❑ Have students make lists of "All the Ways." Give them a 2- or 3-place number and have them build and record different representations of the number. Have students prove that they have found **all the ways**. This will encourage them to organize their lists!
- ❑ To build on "All the Ways," challenge students to see if they can find a way to predict the total number of ways a 2-digit number can be represented. In other words, can they find a "rule" by which they can tell beforehand how many different representations are possible? They will need to study the tens digit and use what they know about decomposing a number to come up with the answer. Can they predict the total number of representations of a 3-digit number?