

The Power of Connections: Deepening Place Value Understanding K-2

National Council of Teachers of Mathematics

April 27, 2018

Sue O'Connell
@SueOConnellMath

Beginning Understandings

Have students show 13 counters on a ten frame.

Do they fit? What do they notice?

Have them show 13 with other materials including rekenreks or double ten frames.

What do they notice?

Linking Tens

Count 13 linking cubes.

Link 10 cubes together and find the total again.

How did you find the total this time?

Did you count them all?

Could you count on?

Would the total always be the same? Why?

13 is 10 and __ more

Do more trials, record, and discuss.

Connect to previous investigations:

- How is this like what we found before?
- How is it different?

Model and Compare

Students all use a different model to show 15.

Count out 15 individual units.

Bundle and observe.

- Counters in cups
- Links in a chain
- Bear counters on a ten frame
- Sticks and rubber bands
- Trains of unifix cubes

Did we all get the same thing? Why?

Is 15 always 10 and 5 more?

Consider Context

There are 12 markers on the table.

10 of them fit in the box.

How many will not fit in the box?

What do you think?

How do you know?

How could you check to see if you are right?

Investigating 2-digit Numbers

1. Have partners count out 25 unifix cubes.
2. Have them put the cubes on ten frames and then check the total.

How did you find the total each time?

Do the different ways of counting give you the same answer? Why?

How many filled ten frames in 25?

How many leftover ones?

Create a chart to record students' data.

Observe and Consider

Number of Counters	Filled Ten Frames	Leftover Ones
25	2	5
32	3	2
14	1	4
26	2	6
38	3	8

What do you notice?

What do you wonder?

Predict how many tens and ones are in 38.

Try it and see if you were right.

Can you figure out how many ten frames will be filled without actually filling them? How?

MATH PRACTICE

Building Numbers with Ten Frames Moving from Discrete Objects

- Try ten frame cards.
- Build a number with 2 tens and 3 ones. Find the total.
- How did you find the total?
 - Count each dot on all of the frames?
 - Skip count by tens and add to it?
- Model more two-digit numbers, record, and discuss.



Place Value Explorations

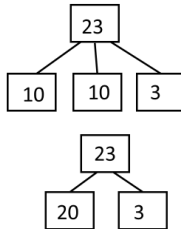
Using materials (e.g., base-ten rods or ten frame cards), find...



- the value of 6 tens. $6 \text{ tens} = 60$
- the value of 9 tens. $9 \text{ tens} = 90$
- The value of 10 tens. $10 \text{ tens} = 100$
- the value of 20 tens. $20 \text{ tens} = 200$
- the value of 13 tens. $13 \text{ tens} = 130$
- the value of 21 tens. $21 \text{ tens} = 210$

What do you notice?

Connecting Ten-Frames to Number Bonds



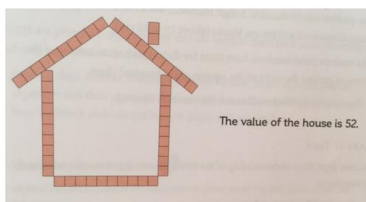
$$23 = 20 + 3$$

Connecting Place Value to Counting

Place 23 where it belongs on a 1-100 number line with only tens marked.

- *Between 20-30? Why?*
- *Closer to 20 or 30? Why?*

Build a House



MATH PRACTICE

Drawing Numbers with Sticks and Dots Making Connections to Representational Drawings

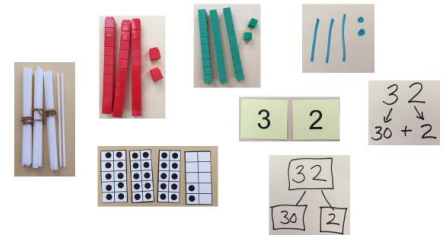
Show 34 with base-ten blocks.

Draw 34 with sticks for tens and dots for ones.

- *Explain your drawing.*
- *How did you decide how to show 34?*

$$34 \quad ||| \cdot \cdot \cdot$$

Moving Toward Abstract Making Connections



Make It True

28 = ___ tens and 8 ones

2 tens and 8 ones = ___

2 tens + 8 ones = ___

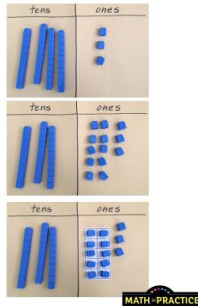
8 ones and 2 tens = ___

28 = ___ tens and ___ ones

Can numbers be named in different ways?

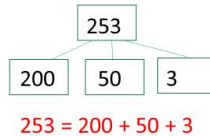
Show It Another Way

Start with materials that can be bundled.
Show 43 with unifix cubes on a place value mat.
Record 4 tens and 3 ones.
Can you show 43 in a different way?
Record options – 3 tens and 13 ones.



Build a 3-Digit Number

Pose a number: 253
Build the number.
Tell how many hundreds, tens, and ones.
Make connections to number bonds and expanded form.



Exploring Place Value with 3-digit Numbers

253 = 2 hundreds, 5 tens, 3 ones

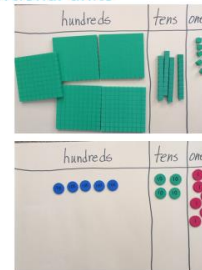


253 = 2 hundreds, 4 tens, 13 ones
What do you notice?

Exploring Number Disks

Non-proportional units

Partners use different materials.
Each shows 546.
What do you notice about your models?
How are they alike?
How are they different?
What are the benefits of number disks as a model?



Comparing Base-ten Block Animals

1. Create an animal with a value that is greater than 200 and less than 700.
2. Find the value of your animal.
3. Express the value in standard and expanded form.
4. Switch with a partner to check the value.
5. Compare the value of your animal to your partner's animal and use $<$, $>$, or $=$ to show the comparison.
6. Order the class' animals from the least to greatest values.

Mentally Add and Subtract 10 or 100 to/from a 3-digit Number

Start with a Problem

The Boys and Girls Club was preparing for a cookout.

They already had 121 paper plates, but knew they needed more, so they bought a package of 100 paper plates.

How many paper plates did they have for the cookout?

Model It

Add 100.

Where do you place the hundred? Why?

What is the new number?

Hundreds	Tens	Ones
12	2	1

Figuring Out the Rule

Repeat with other numbers.

121	435	648	283	336
221	535	748	383	436

What do you notice?

What digit changes? Why?

Predict $378 + 100 = \underline{\quad}$.

Check your prediction with the blocks. Were you correct?

How did you know?

How could you find 100 more without using blocks?

Journal Writing/Sharing

- How does a 3-digit number change when you add 100? Explain.
- Carlie says that $342 + 100 = 352$. Do you agree or disagree. Justify your answer.




Exploring Adding 10

Brendan had 142 baseball cards in his collection.

His mom gave him a package with 10 more cards.

How many cards did he have in his collection then?

How would you show adding 10?
Where do you place the ten rod? Why?
What is the new number?

Hundreds	Tens	Ones
		
1	45	2

Figuring Out the Rule

Repeat with other numbers.

What do you notice?

142	235	421	648	783
152	245	431	658	793

What digit changes? Why?

Predict: What is $368 + 10$?

Check your prediction with a model.

Does this make sense? Explain.

What is the rule?

Next Steps

Observe what happens to the following:

$$590 + 10$$

$$397 + 10$$

$$493 + 10$$


What do you notice? Can you explain it?




Comparing Numbers

Literature Link

Just Enough Carrots by Stuart J. Murphy

Compare



Fewer	Same	More
		

Roll a 1-6 cube.
Place (or draw) that number of objects in center.
Show fewer and more.

Center

- Spill two-color counters.
- One has red. Other has yellow.
- Who has more?
- Write the numbers. Circle which is more.

Refining the Ideas

Jenny had 42 straws and Ali had 35 straws. Who had more straws?

Build and Compare

Jenny had 42 straws and Ali had 35 straws.
Who had more straws?

42
35

Which is greater?

How do you know which is greater?

Repeat with two more 2-digit numbers.

Record and Observe

42 34 51 41
35 46 43 36

What do you notice?

What do you wonder?

Predict which is greater: 63 or 57

Use a model to check your prediction.

Were you right? How did you know?

Does that make sense? Explain.

How could you find which is greater without models?

Four Corners

Create a series of number cards in a sequence (e.g., 20-45).

Give each student a card.

Have them find their corner of the room based on intervals like the following:

1. Less than 27
2. Greater than 26 but less than 33
3. Greater than 32 but less than 39
4. Greater than 38 but less than 46

Clothesline Numbers

Put some numbers (e.g., 24, 27, 32, 36, 41) on cardstock number tents and have them hang them in the correct order on a clothesline.

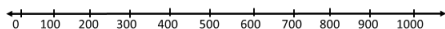
How did you know where to place the numbers?

What do you notice about the numbers to the left or to the right on the clothesline?

Bailey's book had 342 pages.

Blake's book had 286 pages.

Whose book had more pages? Explain.



Does thinking about a number line help?

Exploring Connections

- How will connecting varied number models help deepen students' place-value understanding?
- How might connecting new ideas to previously-learned skills help students continue to build their place-value understanding?
- How might connecting place-value concepts to real situations deepen students' understanding?

Teacher Resource Books by Sue O'Connell
Published by Heinemann (www.heinemann.com)

***Math in Practice* (www.mathinpractice.com)**

This series is filled with lesson ideas, instructional strategies, practice tasks, and many online printable resources to make teaching K-5 math more meaningful and more fun. There is a book for each grade level K-5 that contains a wealth of grade-specific activities, as well as a *Guide for Teachers* filled with instructional strategies and an *Administrator's Guide*. Visit the website or www.mathinpractice.com to view the materials.

***Putting the Practices into Action - Implementing the Common Core Standards for Mathematical Practice K-8*
with John SanGiovanni**

The Standards for Math Practice are the heart and soul of the Common Core State Standards. This book explains each standard in teacher-friendly terms and highlights practical activities to make the standards come alive in classrooms. It contains PLC study group questions and online resources.

***Mastering the Basic Math Facts for Addition and Subtraction*
Mastering the Basic Math Facts for Multiplication and Division
with John SanGiovanni**

Through investigations, discussions, visual models, children's literature, and hands-on explorations, students explore the math operations, and through engaging, interactive practice achieve fluency with basic facts. A teacher-friendly CD filled with customizable activities, templates, recording sheets, and teacher tools simplifies your planning and preparation. Over 450 pages of reproducible forms are included in English and Spanish translation.

The Math Process Standards Series

Each book in this series is a practical guide for helping students refine their skills in the highlighted math process (problem solving, communication, reasoning, representations, connections). You will find specific teaching strategies and tips to help all students strengthen their skills. Included with each book is a CD filled with teacher tools and customizable student activities to allow you to change names, data, or spacing for a quick way to differentiate instruction within your classroom.

<i>Introduction to Problem Solving</i>	<i>Introduction to Communication</i>
<i>Introduction to Representation</i>	<i>Introduction to Reasoning and Proof</i>
<i>Introduction to Connections</i>	

All books in this series are available for Grades PK-2, Grades 3-5, and Grades 6-8.

Now I Get It: Strategies for Building Confident and Competent Mathematicians, K-6

Good teaching is the critical factor that helps students "get" math. This book is a practical handbook for the teaching of mathematics, with chapters addressing the teaching of problem solving, the use of manipulatives, differentiating instruction, effective teacher questioning, increasing math talk, and much more. The book includes a CD with over 100 pages of resources to support teachers including manipulative templates, math facts game templates, a bibliography of math-related literature, center ideas, math websites, problem-solving and writing tasks, and a variety of other practical resources.

For additional resources, visit Sue's website at www.qualityteacherdevelopment.com

Follow Sue on Twitter @SueOConnellMath

Like Sue's Facebook page – Quality Teacher Development

Join the Math in Practice Facebook Group