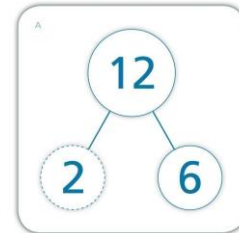# Singapore Math
with Dawn Swartz

Lesson 5: Place Value with Multiplication and Division

Outline:

Place Value for Second Graders
- You may start with concrete objects, however, they are also ready to use proportional disks.
- In third through sixth grade they will know what to do with proportional disks on a place value chart.

Multiplication Problems using the Place Value Chart
- At the end of first grade, multiplication is introduced as repeated addition.
- **Concrete Stage**
  - Making up a story about the problem is a way to draw them in (04:00).
    - Look at this as 3 groups of 13 on the place value chart.
    - Draw a number bond, looking for the whole with multiplication.
    - You want the students to see the numbers in different ways (rather than only in an algorithm). The students default to a way that works best for them.
    - You could copy the place value chart so they can see the three groups.
    - You might use a **small magnetic white board** or a **document camera (which projects onto the board)** so that the students can see what you are doing.
    - An understanding a place value allows you to work from left to right.
    - In fifth grade, the place value chart extends to include decimals.
- Place Value Strips for Multiplication (20:45)
  - 3 x 213:
    - What is value of the 2 in the 100s digit place?
    - What is the value of the 1 in the 10s digit place?
    - What is the value of the 3 in the 1s digit place?
    - Multiply each of these values by 3.
    - What is 200 x 3? What is 10 x 3? What is 3 x 3? Now add the partial products. They won't always multiply like this, but in

doing this they will gain conceptual understand (rather than only procedural understanding).

- Algorithms as Another Tool for Multiplication (24:55)
    - o Still move from left to right. Remind them how to use their place value literacy while using the algorithm. Add the partial products.
    - o This builds a conceptual understand of what they are doing with multiplication.
    - o Use place value cards to reinforce conceptual understand while also learning procedural understanding.
- Place Value and the Area Model (30:00)
    - o Whatever you multiply that's what you get. If you are multiplying groups of puppies, you are going to get more groups of puppies. If you are multiplying 100s, you are going to get 100s.
    - o Combine partial products, notice there is no renaming. Always look at the numbers and how they are combined. Look at the place value before combining them.
    - o You could draw this on the board, students could do this on the white board, or you could provide print outs for students of the area model (around third grade).
    - o Use place value cards for students in pairs, and possibly have them use them down on the floor.
    - o If we have a whole and only one part, how will we find this other part? They will learn that this becomes a division problem.

Place Value and Division (39:00)
- The long division algorithm is a complicated and confusing algorithms for young students. We want students to understand the concept.
- Begin with the concrete, move to pictorial, and then to the abstract.
- Your number bonds can be drawn in multiple shapes and orientations.
- **Begin division problem by circling equal groups for number disks.** We want to put the whole of 264 into 2 equal groups. Count one of the equal groups (or both groups to show that they are equal).
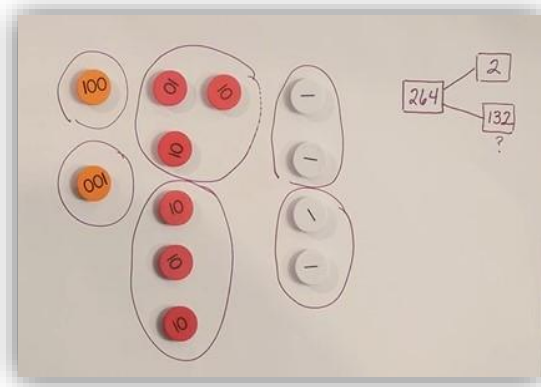
- o How do we know what is the whole and what is the part (from the story)?
- o What if we want to divide a single stack equally? We would unwrap the stack (package) of 10. Continue to discuss the problem in terms of the story with question and answer.
- **Practice Division using the Place Value Chart** (51:35)
  - o Divide the place value chart into two so that you can see the two equal parts.
  - o Tell the students the story, and then ask the students to fill in the number bond.
    - ▪ Do we have the whole? What do we need to do in order to divide these?
    - ▪ How many will we keep and how many will we give? Divide by 2.
  - o Ask students to watch to ensure that the right number of place value of disks are placed to represent to value of the number.
  - o After you rename, it is a good idea to recount to show that the value has not changed.
  - o It is time consuming, but important to get the idea of equal distribution to learn the concept of division.
  - o **A division problem with a remainder** (59:25):
    - ▪ Teach from the known to the new. Show them how the number bond can be represented with a number sentence including a division symbol.
    - ▪ Show how the units that don't distribute evenly are written as a remainder.

Long Division Algorithm, Abstract (01:07:00)
- In the beginning you will have the concrete right along beside you.
- The number bond helps them to know what is being divided. The whole is always the part being divided. The divisor is always one of the known parts. The answer becomes the other unknown part.

- Show place value cards again to remind children what the digits in each place value represent.
- Practice in order to demonstrate this process this fluently for your students.
  - Eventually it is ok to say, "How many times does 2 go into 3?" Say, "If we divide 300 into 2 groups, how many 100s will be in each group?" Show how the number that you write corresponds with your number disks.
  - What value have you used up in the two disks that you used up? Write that number down, and subtract.
  - Now write in the 10s place because we are looking at 14 tens. Rename any 100s into groups of 10s.
  - Use "ghost" 0s to show the actual value when doing subtraction steps.
  - When students don't know where to put the answer in the quotient, it is because they can't picture the place value.
  - When you check your answer, try to get back to the whole by multiplication of the two parts.
  - Good questions to ask at the beginning of a problem:
    - Where will I put the whole?
    - Where will I put the known part?
    - Where will I put the unknown part?
- If students are struggling with long division, pull out the disks again.