Grade Level/Course: 3-4

Lesson/Unit Plan Name: If I Can Multiply, Then I Can Divide! – Using Base 10 Blocks to Multiply and Divide

Rationale/Lesson Abstract: Understand the relationship between multiplication and division

Timeframe: 3 days

Common Core Standards:

3.OA.6 – Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.*

4.NBT.6 – Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

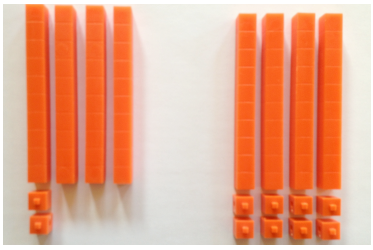
California State Standards:

3NS 2.3 - Use the inverse relationship of multiplication and division to compute and check results.

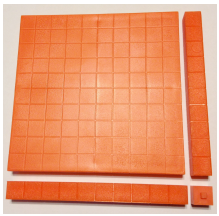
4NS 3.2 - Demonstrate an understanding of, and the ability to use, standard algorithms for multiplying a multi digit number by a two-digit number and for dividing a multi digit number by a one-digit number; use relationships between them to simplify computations and to check results.

Instructional Resources/Materials: Bag of Base 10 Blocks for each student that includes one flat, 12 rods, and 15 units.

Activity/Lesson: Day 1 – Use base 10 blocks to build a product (area) given factors (l x w).



Example 1 - Build 4 units x 12 units.
Place 4 rods and count the edge of the rods as 4 units in length.
Place 2 units under the first rod to count the edge of the width as 12 units.
Complete the area by placing remaining units to make a rectangle.
Emphasize a rectangle has opposite sides that are parallel and equal. This is why we build on only two dimensions.
Count 4 rods by 10s to 40 units and 8 units for an area of 48 square units.



Example 2 – Build 11 units x 11 units.
Will these factors make a square or rectangle?
[a square because the units for length and width are the same]
Use one flat and one rod to count the edge of 11 units in length.
Place one rod horizontally below the flat to count 11 units in width.
Did we make a square? [No] What do we need to complete the area?
[one unit]

What is the area?
[one flat equals 100 units, two rods equal 20 units, and one unit for an area of 121 square units]

Two ways to write this example: $factor \times factor = product$ $\quad 11 \times 11 = 121$ ***or*** $length \times width = area$ $\quad 11\ units \times 11\ units = 121\ square\ units$

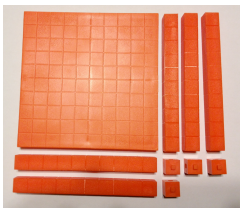
Allow students to work independently and with partners on several You Tries. Give them time to explore and create their own area models.
Assess students each day with a check off list on building area models.

Activity/Lesson: Day 2 – Use base 10 blocks to build a given area (product) to find the dimensions length and width (factors).

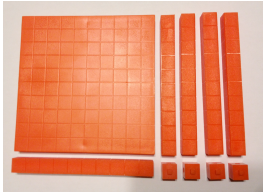
Example 1 - Build an area (product) of 154 square units. What are the dimensions (factors) for this area?

$= 154\ units$
$= 100u + 50u + 4u$

Students take one flat (hundreds), 5 rods (tens), and 4 units (ones) from their bag.



With these blocks, what shape will we be making? [a rectangle or square]
What is special about a rectangle or square? [opposite sides are parallel and equal]
Model how to arrange blocks and how to count the edge of each dimension.
It is important to build and think aloud in front of students to show the process of trial and error to arrive at the correct area model.
Is this possible? [No because it is not a rectangle]



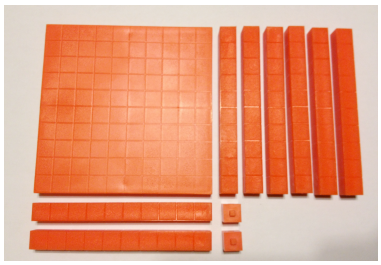
What would you move to make it a rectangle?
[one rod and one unit]
What are the dimensions in units of the rectangle?
Count together the edge of each dimension.
[14 units x 11 units]
Therefore: 14 units x 11 units = 154 square units or 14 x 11 = 154

Activity/Lesson continued:

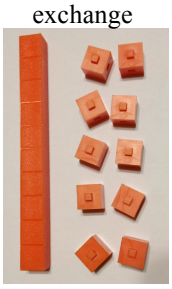
Example 2 - Build an area (product) of 182 square units. What are the dimensions (factors) for this area?

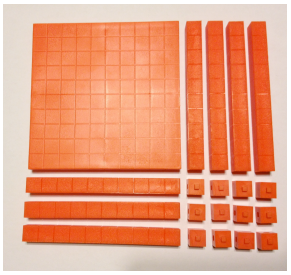
$= 182 units$ Students take one flat (hundreds), 8 rods (tens),
$= 100u + 80u + 2u$ and 2 units (ones) from their bag.

Try several ways to make an area model with the base 10 blocks. Conclude that more units are needed.
How could we get more units without adding units to our area? [exchange one rod for 10 units]



exchange





For an area (product) of 182 square units the dimensions (factors) are 14 units x 13 units or 14 x 13 = 182

You Tries (work with a partner)

1. Build an area (product) of 132 square units. What are the dimensions (factors) for this area? [11 units x 12 units]
2. Build an area (product) of 168 square units. What are the dimensions (factors) for this area? [14 units x 12 units]
3. Build an area (product) of 196 square units. What are the dimensions (factors) for this area? [14 units x 14 units] Students will need to exchange one rod for 10 units.

Assess students each day with a check off list on building area models.