Modeling Multiplication

*"A critical area of instruction is to develop student understanding of the **meanings of multiplication** and division of whole numbers through activities and problems involving equal- sized groups, arrays, and area models (NGA/CCSSO 2010c)."*

-**Grade Three, California Mathematics Framework**

"In grade four, students extend multiplication and division to include whole numbers greater than 100. The standards (4.NBT.5-6) call for students to use visual representations such as area and array models that students draw and connect to equations…With larger numbers, such array models become too difficult to draw, so students can make sketches of rectangles and then label the resulting product as the number of things or square units."

- Grade Four, California Mathematics Framework

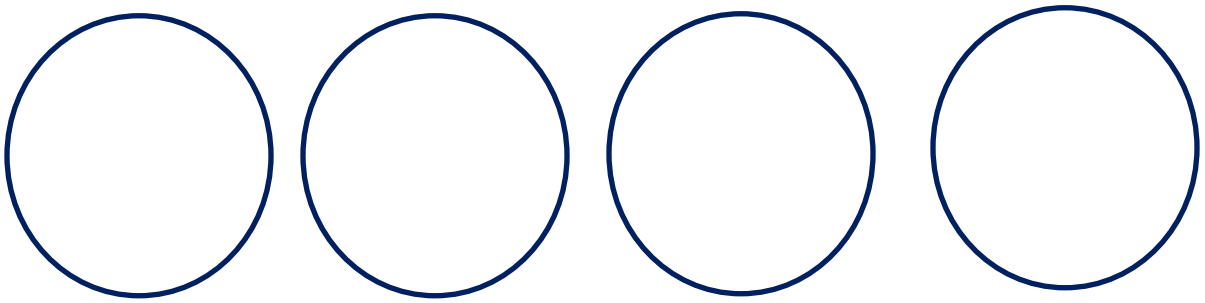
"In previous grades, students built a conceptual understanding of multiplication with whole numbers as they applied multiple strategies to compute and solve problems. Students can continue to use different strategies and methods learned previously-as long as the methods are efficient- but they must also understand and be able to use the standard algorithm."

-Grade Five, California Mathematics Framework

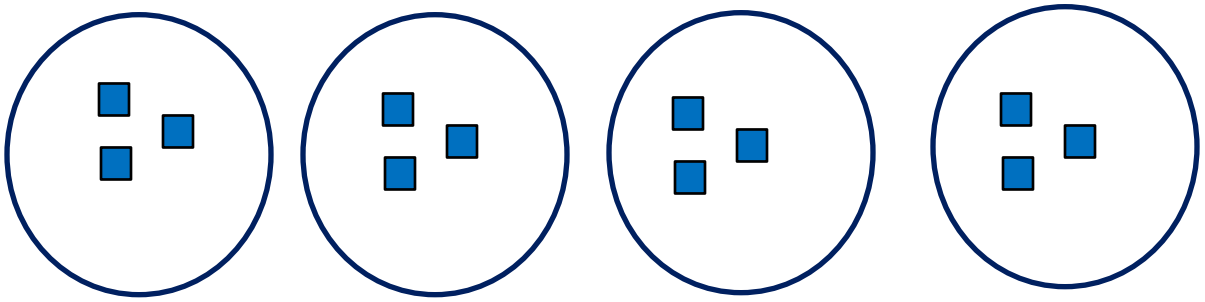
<u>Groups</u> (3.OA.1, 3.OA.3)

4 x 3 is 4 groups of 3.

Step 1: Create 4 groups. Draw a circle.



Step 2: Put 3 blocks or objects in each group.

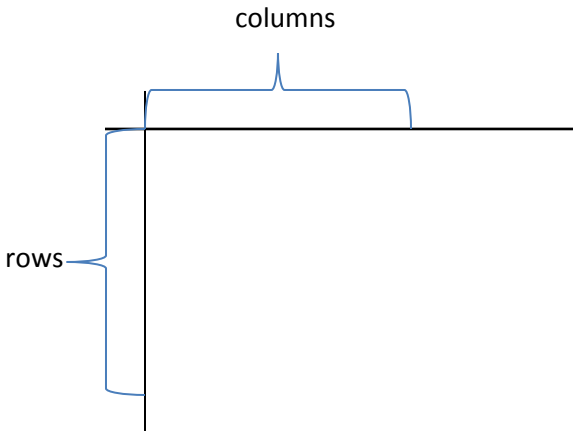


Step 3: Find the total number of objects using different strategies: skip counting, adding repeatedly, etc.

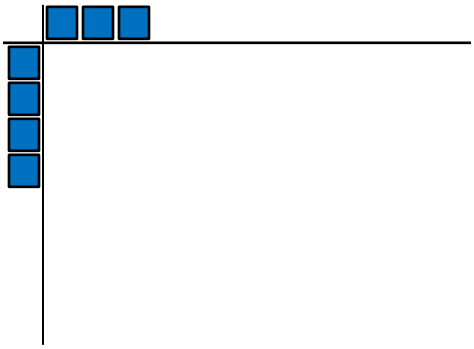
<u>Array and Area Model</u> (3.OA.1, 3.OA.3)

4 x 3 is 4 rows of 3 or **4 rows** and **3 columns**

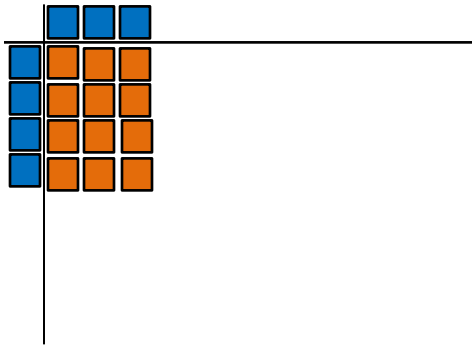
Step 1: Identify the number of rows and columns. Use the Multiplication Mat.



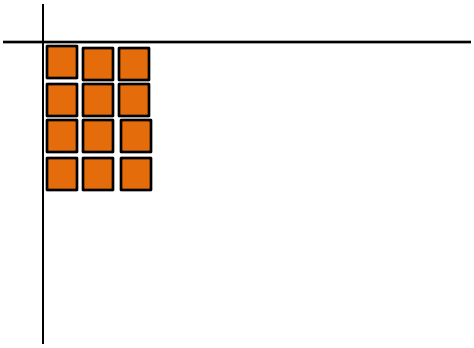
Step 2: Put the right number of rows and columns as guide.



Step 3: Fill in the area with blocks.



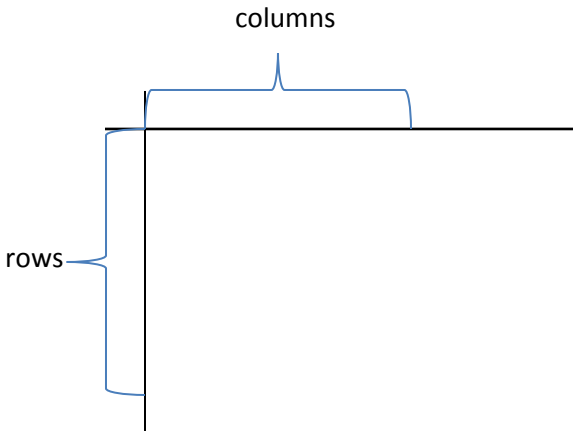
Step 4: Remove the guide and find the total number of blocks on the mat.



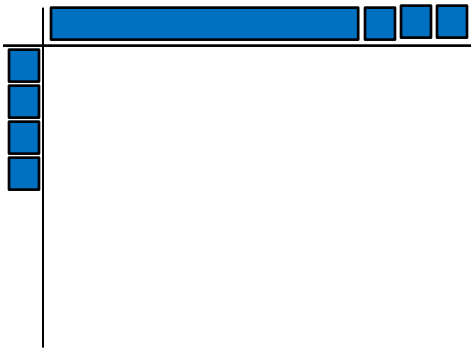
Area Model and Partial Products (4.NBT.5)

4 x 13 is 4 rows of 13 or **4 rows** and **13 columns**

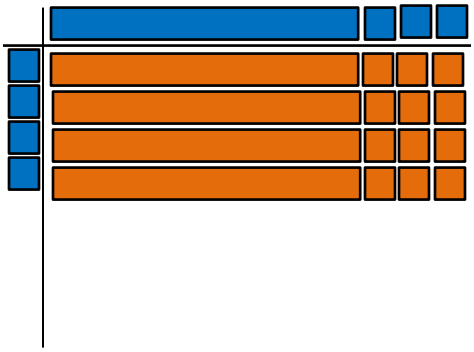
Step 1: Identify the number of rows and columns. Use the Multiplication Mat.



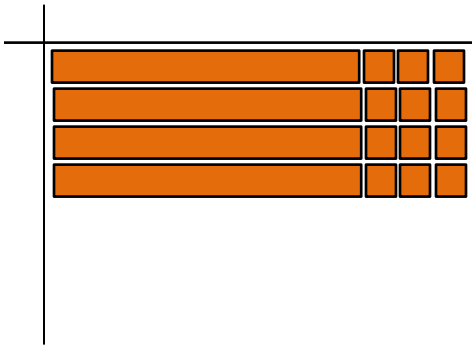
Step 2: Put the right number of rows and columns as guide.



Step 3: Fill in the area with blocks.



Step 4: Remove the guide and find the total number of blocks on the mat.



Find the **total value** of the **tens** and **the total value** of the **ones** using previously learned strategies. Add the **partial products**.

<u>Open Area Model</u> (4.NBT.5)

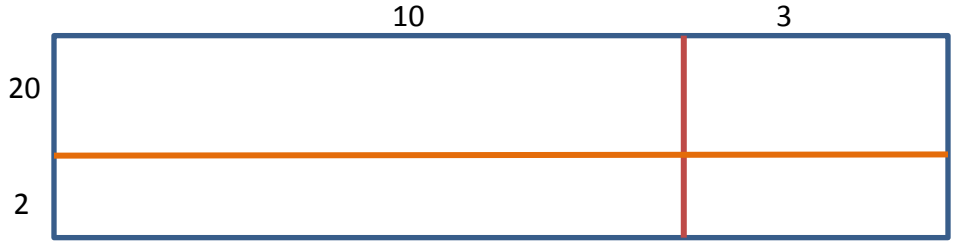
22 x 13

Step 1: Decompose each number by place value: (20 + 2) x (10 + 3).

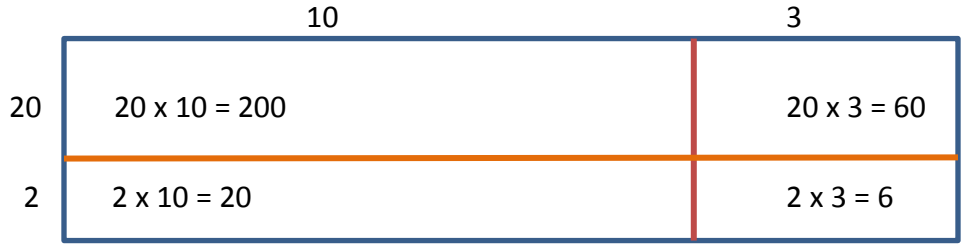
Step 2: Draw a rectangle large enough to write numbers inside. Leave space outside to write decomposition of given numbers.

Step 3: Draw a vertical and horizontal line on the rectangle. Modeling ….

Step 4: Write the decomposition of numbers as dimensions of the rectangles.



Step 5: Find the area of each section of the largest rectangle.

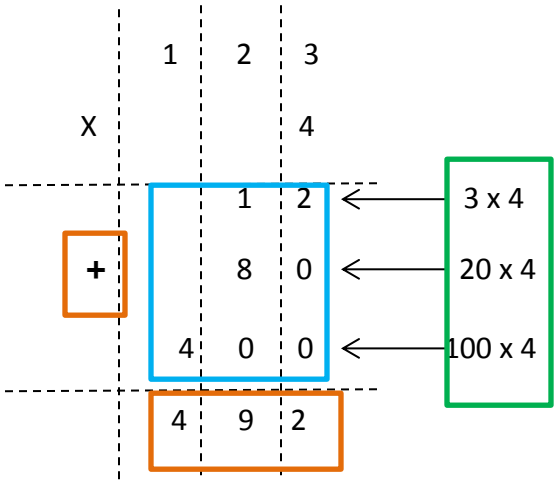


Step 6: Add the partial areas to find the area of the whole rectangle.

200 + 60 + 20 + 6 = 286

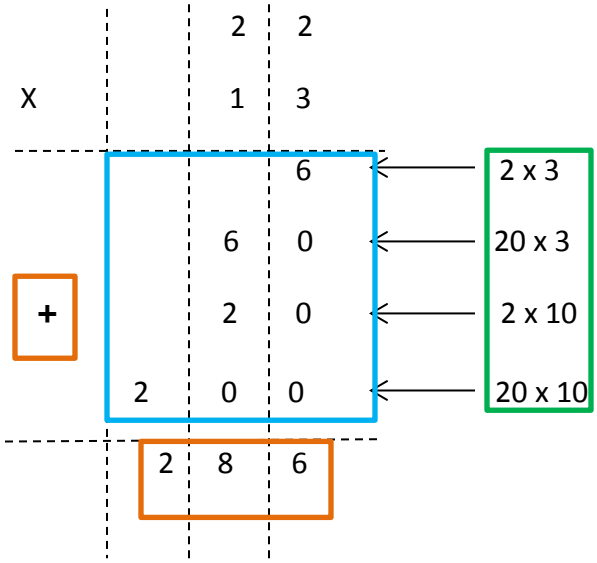
<u>Multiplication Algorithm and Partial Products</u> (4.NBT.5)

123 x 4



1. Multiply the value of the digit in **each place value** by the multiplier. Ex. 3 x 4, 20 x 4, 100 x 4
2. Write the product from each place value (**partial products**). Ex. 12, 80, 400
3. Add the **partial products** to find the product of the given problem.

22 x 13



1. Multiply the value of the digits in each place value by the value of each digit in the multiplier.
2. Write the product from each place value (**partial products**).
3. Add the **partial products** to find the product of the given problem.