Multiplying Numbers Parents' Guide

Teaching Mathematics That Makes Sense

Multiplication

Students often learn how to multiply numbers one way. Yet, there are many ways to think about how to multiply numbers.

Think about how you learned to multiply:

$$\begin{array}{r} 23 \\ \times\, 17 \\ \hline \end{array}$$

What is the "traditional" way of finding the answer? You follow these steps:

1) Multiply 7 x 3, get 21, and put the 1 under the 7 and "carry" the 2
2) Multiply 7 x 2, get 14, add the 2 above the 2, get 16 and write this in front of the 1
3) Put a zero in the ones place under the 1
4) Multiply 1 x 3, get 3, and write this under the 6
5) Multiply 1 x 2, get 2, and write this under the 1
6) Add 161 and 230, getting 391

Here's what your work might look like:

$$\begin{array}{r} {\scriptstyle 2} \\ 23 \\ \times\, 17 \\ \hline 161 \\ +\, 230 \\ \hline 391 \end{array}$$

Now, two questions:

1) When you multiply 7 x 3, why does the 1 go down below, but the 2 goes up above?
2) Why, exactly, do you put a zero in the one's place before multiplying 1 x 3?

You may be able to follow the steps reliably, but do you *really* know what's going on, and why these steps work?

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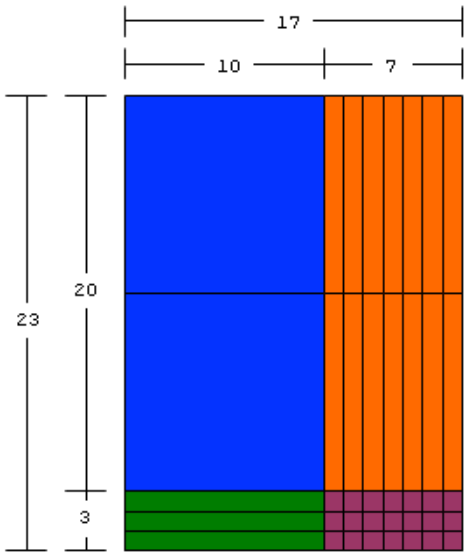
Using Area Models as a Way to Understand Multiplication

You can also visualize multiplying numbers. Instead of following mechanics we don't fully understand let's think about things in a more intuitive, concrete way. Think of multiplying two numbers as calculating the area of a rectangle, where the two numbers are the lengths of the rectangle's sides – see diagram below.

Consider the original problem:

$$\begin{array}{r} 23 \\ \times\, 17 \\ \hline \end{array}$$



When we are asked to multiply 23 by 17, we are being asked to calculate the area of a rectangle that is 23 units high and 17 units wide.

Partial Products focuses on place value

Now, let's calculate our answer again, this time using the picture above to guide us:

23		
x 17		
21	← 7×3	**purple** 1 x 1 squares
140	← 7×20	**orange** 1 x 10 rectangles
30	← 10×3	**green** 10 x 1 rectangles
+ 200	← 10×20	**blue** 10 x 10 squares
391		

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Multiplication: Generic Area Model

You can also multiply numbers by using what we call the generic area model — in other words, the sides of the rectangle are not proportional.

Consider the original problem:

$$\begin{array}{r} 23 \\ \times\, 17 \\ \hline \end{array}$$

Since we are multiplying a 2-digit number by a 2-digit number, create a 2 X 2 rectangle and think of it like a multiplication chart:

	20	3
10	200	30
7	140	21

200 + 30 + 140 + 21 = 391

Notice we get the same numbers as we did with partial products and the area model methods.

Multiplication: Distributive Property

There is yet another way to think about multiplying numbers — we can multiply numbers using the distributive property.

$$23 \times 17$$

$$= (20+3) \times (10+7)$$ First distributing the 20 to (10 + 7) and distributing the 3 to (10 + 7)

$$= 20(10+7) + 3(10+7)$$ Now distributing the 20 to 10 and 7 and distributing the 3 to 10 and 7

$$= 200 + 140 + 30 + 21$$

$$= 391$$

Understanding the connections among all of these methods will help students in Algebra and higher mathematics courses.