Multiplication Sample Lesson

• Lesson II on Multi-Digit Multiplication

> Many students who have difficulty with the traditional algorithm find this method much easier. But, our primary purpose for including it is to give meaning to the multiplication process as a direct application of Place Value and the Distributive Property.

Example 1

Last Christmas, St. Anthony's Guild filled 48 gift packages for poor families. Each package contained 76 items. How many items is this altogether?

This is clearly a multiplication situation:

48 packages × 76 items per package = ? items

In order to focus on the numbers themselves, we will omit their labels during this discussion.

> Lead the class, slowly and carefully, through each step of the thinking process.

We begin with: ⟶ 48×76

Suppose the 76 items in each package consisted of 70 food items and 6 toys. Then this would be a good way to write the product: ⟶ $48 \times (70 + 6)$

Or, we could think of it as (48 packages × 70 food items) + (48 packages × 6 toys) ⟶ $(48 \times 70) + (48 \times 6)$

Now suppose that the 48 packages consisted of 40 boxes and 8 baskets. Then we might think of the situation as:

[40 boxes + 8 baskets] × 70 food items in each
+
[40 boxes + 8 baskets] × 6 toys in each

⟶ $([40+8] \times 70) + ([40+8] \times 6)$

Finally, we could look at all the items like this:

(40 boxes × 70 food items in each)
+
(8 baskets × 70 food items in each)
+
(40 boxes × 6 toys in each)
+
(8 baskets × 6 toys in each)

⟶ $[40 \times 70] + [8 \times 70] + [40 \times 6] + [8 \times 6]$

Therefore, the total number of items is ⟶ $2800 + 560 + 240 + 48$

And this sum is 3648 items.

If we do all of this in the traditional vertical format, it looks like this:

$$\begin{array}{rl} 48 & \\ \underline{\times\ 76} & \\ 48 & (6 \times 8) \\ 240 & (6 \times 40) \\ 560 & (70 \times 8) \\ \underline{+\ 2800} & (70 \times 40) \\ 3648 & \text{items} \end{array}$$

There are several significant advantages to this process, when compared with the familiar algorithm:

- It makes sense!
- It deepens students' understanding of Place Value and the Distributive Property.
- Since addition and multiplication are both commutative and associative, the partial products can be found in any order.
- There are fewer chances for careless errors because the multiplication doesn't involve any "carrying" or shifting to the left.

Example 2

There are 26 members of the JFK Middle School Band. New uniforms cost $^{\$}89$ each. What will be the total cost of the new uniforms?

Again, this is obviously a multiplication situation:

26 uniforms × $^{\$}89$ per uniform = $^{\$}?$

$$\begin{array}{rl} 26 & \\ \underline{\times\ 89} & \\ 54 & (9 \times 6) \\ 180 & (9 \times 20) \\ 480 & (80 \times 6) \\ \underline{+\ 1600} & (80 \times 20) \\ {}^{\$}2314 & \end{array}$$

Students should be required to include all these products in parentheses. They give meaning to the process, and they help students avoid mistakes in counting "tail-end" zeros.

If you think your class needs to see the Distributive Property "unfolding" another time, this process could be thought of as 20 medium and 6 small uniforms, each being funded by two donations—one of $^{\$}80$, and one of $^{\$}9$.

Example 3

Find this product: 75×63

Follow this process:

$$
\begin{array}{rl}
75 & \\
\underline{\times\ 63} & \\
15 & (3 \times 5) \\
210 & (3 \times 70) \\
300 & (60 \times 5) \\
\underline{+\ 4200} & (60 \times 70) \\
4725 &
\end{array}
$$