

One- and Two-Digit Multiplication For Teacher Use

In fourth and fifth grade one- and two-digit multiplication in WISD is to be taught conceptually and concretely. One- and two-digit multiplication will begin with a type of area model and progress to an algorithm. This algorithm may or may not be the standard algorithm (See Box 1), but it will be a version that permits students to function at their own level of competence.

Box 1

**Standard Algorithm for
Multidigit Multiplication**

$$\begin{array}{r}
 \frac{1}{2} \\
 57 \\
 \times \underline{23} \\
 171 \\
 \underline{114} \\
 1311
 \end{array}$$

The standard algorithm commonly taught in fourth and fifth grade is a complex procedure with the meaning and scaffolding forfeited for efficiency. The algorithm is taught with place value used to keep the steps organized, however, the students have little understanding of what is happening with the ones, tens, and hundreds.

Area models are powerful representations of multiplication and provide initial support for understanding of the effects of multiplying by 1, 10, and 100. (See Box 2)

Box 2

Models for Multidigit Multiplication: 57 x 23

Area Model

50 + 7

Abbreviated Area Model

	50	+	7	
20	1000		140	
+				
3	150		21	

Students use Base 10 blocks or Squared Grid paper to illustrate the area model on the left in Box 2. This clearly shows how all of the tens and ones digits in 57 and 23 are multiplied by each other and then added.

The abbreviated area model on the right in Box 2 is used after the students understand the effects of multiplying by tens and by ones. This model summarizes the steps in multidigit multiplication and the individual boxes show the partial products.

The algorithm in Box 3 illustrates an expanded form that supports the area model that is already familiar to the students. As students become competent with each aspect of multiplication, some of the written supports can be eliminated. This results in a streamlined version, the modified traditional algorithm, similar to the traditional algorithm. Some students may be able to move from the Abbreviated Area model to the Modified Traditional algorithm.

Box 3

Expanded Algorithm for Multidigit Multiplication	Modified Traditional Algorithm
$ \begin{array}{r} 57 = 50 + 7 \\ \times 23 = 20 + 3 \\ \hline 1000 = 20 \times 50 \\ 140 = 20 \times 7 \\ 150 = 3 \times 50 \\ \underline{21 = 3 \times 7} \\ 1311 \end{array} $	$ \begin{array}{r} 57 \\ \times 23 \\ \hline 21 \\ 150 \\ 140 \\ \underline{1000} \\ 1311 \end{array} $

In the traditional algorithm, students typically start at the right and multiply ones first. The model on the left in Box 3, the multiplication begins on the left, as students are naturally inclined to do. An additional advantage is that the first partial product is the largest number and the smaller products fall easily in their correct places. Writing the factors next to the product emphasizes what is actually occurring in each step. Beginning the multiplication with the larger factors is optional and you may wish to begin this step by multiplying from the right. As students become confident they may drop steps in this algorithm. This results in a process that resembles the standard algorithm except that it has four partial products instead of two. If students wish to do so, they may even collapse these four partial products to the two products seen in the common algorithm. These models permit students to function at their own level of competence and help them understand what they are doing.

The TEKS state that three-digit multiplication is not to be used without the aid of a calculator.

Many students may not have fluency with their basic multiplication facts as they begin multidigit multiplication. If this is the case, these students need help in working simultaneously on mastering basic facts and multiplying multidigit numbers. A times table should be provided to these students so they will be able to participate in the classwork.

Reference:

National Research Council. (2001). *Adding It Up*. Washington, DC: National Academy Press.