TAKE IT TO THE MAT

A NEWSLETTER ADDRESSING THE FINER POINTS OF MATHEMATICS INSTRUCTION

Math Audit Team
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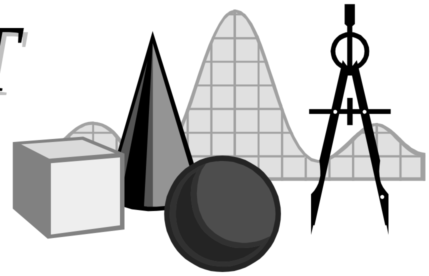

Operations with decimal numbers are a major element of the middle school curriculum. The necessity that students are able to compute with decimals cannot be understated, especially in a dynamic economy. We instruct our students to add, subtract, multiply, and divide with all the requisite rules to get the right answer. But do we tell them enough of the *why* behind those rules?

The multiplication of decimals is one topic where very often we teach the algorithm, but do not impress the reasons behind it. The physical arithmetic of the process is usually not an issue; it has been practiced since third or fourth grade. Students in middle school routinely can evaluate 365×43. So when the question of multiplying 3.65 and 4.3 comes up, we simply drag out the old multiplication algorithm. But, we very casually add the last step: *Count the total number of places to the right of the decimal point in the two factors—this will be the number of decimal places to the right of the decimal point in the product.*

So, why? To answer, let's focus on a simpler example. Take the expression, 0.5×0.3. When we read it, it merely says, "Five tenths times three tenths." Since decimals are simply a type of fraction, think of them for a moment as common fractions, then do the arithmetic.

$$0.5 \times 0.3 = \frac{5}{10} \times \frac{3}{10} = \frac{15}{100}$$

Five tenths times three tenths is fifteen hundredths. Fifteen hundredths! That's 0.15. See the connection? So it's really the product of the denominators that determines the number of decimal places in the overall product.

Extending this idea to the original problem, 3.65×4.3, we can imagine 3.65 as three hundred sixty-five hundredths, and 4.3 as forty-three tenths.

$$3.65 \times 4.3 = \frac{365}{100} \times \frac{43}{10} = \frac{15695}{1000} = 15.695$$

As usual, we multiply 365 and 43 to get 15695 in the numerator above; the denominators multiply to 1000. So, the result is 15695 thousandths, or more appropriately 15.695. Of course, the algorithm also told us that there were three decimal places in the product since there were a total of three in the factors.

This makes it even more important that students read decimal numbers properly. Students should be able to read decimals in word form and know the number of decimal places in the products of them.

$$\begin{array}{r} 365 \\ \underline{\times 43} \\ 1095 \\ \underline{14600} \\ 15695 \end{array}$$

$$\begin{array}{r} 3.65 \\ \underline{\times 4.3} \\ 1095 \\ \underline{14600} \\ 15.695 \end{array}$$

It's important that standard algorithms be taught—about that there is no question. But, it is also important that they not appear to be arbitrary procedures with no rationale behind them. We as teachers realize the logic of the methods, but it is often lost on students. Giving the *why* to kids, in addition to the *how*, will help them understand mathematics as well as be able to do it.