

# Families ASK

## Take-Home Page

### Families often ask about basic skills:

*Why aren't students learning to add, subtract, multiply, and divide like we did?*

Consider the following reply:

In today's middle schools, much more emphasis is placed on the *meaning* of number operations, geometry, statistics, and so forth, than it once was. Students are still being taught to add fractions and to find the percent of a number, but they are not necessarily being taught these skills in the same way as their parents and grandparents were. Today, *understanding* mathematics is as much a classroom focus as finding the correct answer is.

Consider the following recent incident:

In a restaurant, a cashier attempted to add two bills, one for \$4.50 and one for \$5.50, by carefully lining up the decimals and "carrying," like this:

$$\begin{array}{r} 5.50 \\ +4.50 \\ \hline 10.00 \end{array}$$

Although the procedure used was correct, the customer wondered why the cashier did not just add  $4 + 5$ , see that 50 cents + 50 cents is another dollar, and know that the total was \$10. Certainly people should be able to perform this type of computation mentally, without a calculator or even a piece of paper. Many people cannot do so, however, partly because they lack number sense. The cashier learned the procedure in school but may not have learned enough about the nature of numbers to add them mentally.

A look back at history shows that difficulty with fractions and decimals has been with us for decades. For example, when eighth graders were asked in 1977 to estimate the sum of  $12/13 + 7/8$ , only 10 percent of them selected the correct answer on a multiple-choice national examination. When those same students were asked to "add the fractions"  $7/15$  and  $4/9$ , about 40 percent of them were able to find the common denominator and add the fractions. In other words, four out of ten students could *do* the computation, but only one out of ten could *think* about the fractions  $12/13$  and  $7/8$ , realize that both were close to 1, and estimate their sum to be 2. The authors of a report on the perform-

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ance of students on this national exam in 1977 wrote that "only about 40 percent of the 17-year-olds appear to have mastered basic fraction computation" (Carpenter et al. 1980). Such reports set the tone for changes in the way that mathematics should be taught. This year, the National Research Council released a report highlighting research trends that show that students in the United States can often perform computation but have difficulty applying basic skills to simple problems (NRC 2001).

Think, for example, about how you learned to divide fractions in school. To do a problem such as  $3 \div 1/4$ , you were probably taught to invert and multiply, like this:  $3/1 \times 4/1 = 12/1 = 12$ . Although this answer is correct, did you understand why you were inverting or what the answer meant? Moreover, could you have created a word problem that would require using this division problem to solve it?

In the contemporary classroom, we might look at the division problem in the following manner: Think of each of the circles below as representing 1. The shaded slice in the first circle represents  $1/4$ . The question is, How many one-fourths are in 3? We can see that twelve of the one-fourth pieces, four "slices" per circle, are needed to fill all three of the circles.



We might apply this situation in the real world, as in the following problem: Jason has 3 pounds of hamburger and wants to make patties that each weigh  $1/4$  of a pound. How many patties can he make? The answer is 12 patties. We could also think of the problem as asking how many quarters are needed to make \$3. Through such thinking, we not only know what the answer is but also have a picture of it in our minds and real-life applications that go with it. These connections allow us to move on to more difficult problems, then to create strategies for dealing with fractions. Eventually, students will be able to perform basic operations on fractions, and through using hands-on materials, visual aids, and real-life problems, they are more apt to understand why the operations work the way they do. Today's students will not struggle with fraction, decimal, and percent concepts; unlike the cashier, they will be very comfortable performing mental-math operations in these areas.

### References

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- National Research Council (NRC). *Adding It Up: Helping Children Learn Mathematics*. Washington, D.C.: Center for Education, 2001.