What Does It Mean To Teach Basic Facts?

What are the basic facts?

The basic facts for addition and multiplication are simply the facts that are a single digit plus (times) a single digit. For addition, the addends or parts are single digits even though the sum or whole might be a two-digit number. For multiplication, each of the factors must be a single digit. Accordingly, there are 100 possibilities combined with each of 10 possibilities for the 2 digits to be added (multiplied) or 100 basic facts for each of addition and multiplication.

For subtraction, the whole might be a two-digit number, but the parts must be single digits just as with addition, however, the whole can be a two-digit number. In fact, if 13 - 8 is treated as if it is a renaming problem, when you rename, you still get 13 - 8. When you rename for larger numbers, you change the subtraction in each place value column to a basic fact. When you rename a basic fact in subtraction, you get the same problem again.

Addition and subtraction facts can be matched in fact families. For two addition facts with the same parts, there are two subtraction facts with the same parts. For example, for 3 + 5 and 5 + 3, the subtraction facts are 8 - 5 and 8 - 3. Consequently, there are 100 subtraction facts.

$$20 \div 4 = \_?\_ \text{ means the same as } 4 \times \_?\_ = 20$$

If you know the answer to one of these equations, you also know the answer to the other. Similarly,

$$3 \div 0 = \_?\_ \text{ means the same as } 0 \times \_?\_ = 3$$

However, what can you multiply by 0 to get 3? It is impossible. As an aside, what is 0 ÷ 0? In this case, if you write the multiplication sentence, any number can be used to solve the equation.

$$0 \div 0 = \_?\_ \text{ means the same as } 0 \times \_?\_ = 0$$

For this special case, any number solves the multiplication sentence above. But since we want one and only one answer for each division problem, and since every number satisfies the multiplication sentence, we cannot find a unique solution. Therefore, we cannot divide by zero in this case either.

Why do we have to learn basic facts?

Each of the four basic operations has a set of facts that must be learned if children are going to be able to use those operations with larger numbers. For example, to add 357 + 298, students simply add 7 + 8, 5 + 9 and remember to add the carry number, and 3 + 2 with the carry number. Knowing the basic facts enables students to solve computation problems with larger numbers to compute mentally, and to estimate. These are skills, especially mental mathematics and estimation, are needed for students to become a productive member of society. In fact, we want students to be fluent enough and flexible enough in using these

mental and estimation strategies that they actually will take the time to use them in everyday situations. If it takes a person more than just a few seconds to solve a basic fact, that person will probably not take the time to use that fact for mental math or estimation.

Children, who learn to use basic facts thinking strategies for mental mathematics and estimation, are the ones who are most likely to develop good number sense and to understand computation of all types, including paper-and-pencil computation. Furthermore, these children have positive attitudes about learning mathematics and have confidence that they can make sense with numbers. It is important to know note that rote memorization of the basic facts does not lead to the same flexibility and fluency with larger numbers. In fact, students who struggle to rotely memorize the basic facts are the most likely to struggle in making sense with numbers and they are most likely to lack confidence in their abilities to be successful in mathematical situations. Understanding various thinking strategies for basic facts is an important component of children's learning that helps them understand numbers and make this giant step towards making sense with numbers.

What should our goals be when we teach basic facts?

Over fifty years ago, William Brownell indicated that his goals for teaching basic facts were to have students be able to provide (1) an immediate response and (2) an explanation or verification that the fact is correct. Those two goals are still appropriate today. The second goal may not be as commonly accepted today as the first one is, but it is important. Research has shown that students, who can explain or verify basic facts, learn the facts sooner, are able to use them in mental computation with larger numbers, and remember them longer. Also, without these student explanations, it is more difficult for teachers to know if students understand, just know rotely, or were guessing.

Just how fast is an immediate response? There is no right or wrong answer to this. Each of you will have to make your own decision. Realistically, many students will never be able to respond to some of the facts in 1 second. Teachers, who expect students to complete all 100 facts for an operation in 2 minutes or less, are creating a situation where many students can not succeed. It simply takes many students longer than 1.2 seconds per problem to process the information and write their answer. On the other hand, if it takes as long as 10 seconds for a student to figure out a fact, will that student take the time and effort to use that fact in an estimation situation? Probably not.

From years of experience, almost all students can learn to solve facts in about 3 seconds. As teachers help the class work towards that goal of 3 seconds, many of the students are able to solve the fact problems in 2 seconds or less. You may decide to select a different number of seconds as your goal. Just be realistic in your expectations for students. Do not set up goals that many students can never achieve.

Why are subtraction facts so hard for children to learn?

Subtraction facts are difficult for students to learn. They are generally much harder to learn than addition facts.

First, the language that is used for subtraction tends to be independent of the language that we use for addition. Consequently, students do not connect the two operations. They tend to learn subtraction as an independent operation. Using part-part-whole language helps students better understand the relationship between addition and subtraction.

Second, the easy thinking strategies only help children with about half of the subtraction facts. The other facts can not be easily solved without using some derived fact strategy. These are generally more difficult for students to learn. In fact, many students do not learn these derived fact strategies without careful instruction. In contrast, generalizations, counting on, and doubles help children with almost all of the addition facts.