families ask: *take-home page*

Families often ask a question like this:

My child sometimes comes up with answers that do not make sense. How can I help my child recognize that the answer is not reasonable?

"It's just common sense!" We have heard people say this often. What we do not hear often enough is "number sense." When common sense combines with numbers, we call it *number sense*. Both are part of our daily lives. Number sense stems from having experience with numbers. It allows children and adults to understand many things: the ways numbers are represented; number relationships; number size; and the effect of addition, subtraction, multiplication, and division. Number sense also enables students to apply numbers in useful ways, such as creating more efficient counting and calculating strategies, measuring, and estimating amounts. It also enables people to identify when their answer does not make sense.

Just as common sense is developed over time through a variety of real-life experiences, number sense also develops gradually from exploring numbers in many ways. Children begin to develop number sense informally before they go to school. Once in school, they move beyond counting to understanding the size and composition of numbers. They learn that the number 26 is composed of two 10's and six 1's and that they can count to 26 faster if they count by 5's until they get to 25, then add 1. To help students develop number sense, teachers focus instruction on a set of numbers that we call *benchmarks*. Whole-number benchmarks of 10, 100, and 1000 are used in real-world situations. Other benchmarks, such as 0, 1/2, and 1, help students better understand fractions and decimals. Number sense also refers to a person's ability to develop strategies for solving problems and to make good mathematical decisions (Reys 1991).

In middle school, students work with problems that involve fractions and decimals. Students need to understand the meaning of the numerator and denominator, the size of the parts represented by a fraction, and the size of the fraction compared with another fraction. Consider comparing the fractions 2/9 and 9/10. A student must understand that 2/9 represents something divided into 9 equal pieces, of which 2 would be *less* than half the number of pieces. The fraction 9/10 represents something divided into 10 equal pieces, of which 9 would be *more* than half the number of pieces. The fraction 9/10 is close to 1, which would be represented by the fraction 10/10. The student could identify 9/10 as being the larger fraction without having to use the traditional approach of finding a common denominator. Although such procedures result in a correct answer, students often calculate without considering the value of the fractions. When comparing 4/9 and 7/9, students use number sense when they determine that 7/9 is a greater fraction because it has more of the same-sized parts. The rationale is that the fractions represent objects cut into the same number and size of pieces but that 7 pieces are more than 4. When comparing 4/5 with 4/9, students use number sense to determine that 4/5 is greater because it has the same number of parts but different sizes. Fifths would be larger than ninths, so four larger pieces (4/5) would be more.

Teaching number sense has become more important since researchers have investigated how well students use this type of thinking. A study showed that students often do not use number sense to estimate the answer to addition and subtraction problems involving fractions. For example, when thirteen-year-olds were asked to estimate the sum of 12/13 and 7/8, they responded in the following way:

Response	Percent of Thirteen-Year-Olds
1	7
2	24
19	28
21	27
Don't know	14

If the students applied number sense to this problem, they would have estimated that 12/13 is almost 1 and that 7/8 is almost 1, so the sum is about 2. However, only 24 percent of the students selected this answer.

Number sense is an important part of mathematics in school, but it is an even more important part of mathematics in everyday experiences. As a parent, you can help develop your child's number sense. Encourage him or her to estimate the grocery bill before reaching the checkout. Point out numbers and ask why they are there and what they mean. Play "over and under" games; before driving by the bank's thermometer, ask whether the temperature will be over or under a certain number. Before making your purchase at the concession stand, ask your child to estimate whether the total will be over or under five dollars.

Number sense continues to develop in people of all ages. It is used often in games and puzzles that involve strategically placing numbers in boxes. Number sense also abounds on such game shows as *The Price Is Right*.

These types of games bring out the playful nature of numbers. Over time, number sense as well as common sense will develop.

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many seconds old they are in reality.

Students move from estimation to computation in the process of finding out just how many seconds old they are and discuss and rationalize their original estimates. Some convert years to days, hours to minutes, and minutes to seconds. Others try shortcuts, use calculators, and convert months to weeks to days to hours. Throughout this process, students think rigorously about the best way to arrive at their age in seconds, discuss their methods with peers, and share results.

Middle school students have a strong sense of being a part of a group. The groups may differ, but students want to be reassured that they are normal. In studying numbers and patterns, they can explore what is happening to others like themselves. For example, they can research data through various media and create a class project titled "Kids Like Us." They might be surprised to find out that the majority of students in the United States or the world share a bedroom with another family member or that most middle schoolers are not allowed to date. They gain insight into the role of data (numbers) in the world, in marketing, and in the media. They can learn how numbers are used in our culture to influence young people or to market products to them. This is a very human use of number sense.

We study mathematics not just for its relevance to our daily lives but also to imagine what we cannot hold or see. Although numbers are used to describe our galaxy, they are so large that most of us cannot imagine the enormity. Although many of us may wish we had a million dollars, we do not know offhand what size container to bring should someone offer us a million one-dollar bills. These are large numbers; sometimes we speak of them growing exponentially rather than in a straight-line fashion. Whether introducing large or miniscule numbers, calculations, estimations, or their interrelationships, we can be assured that beginning with meaningful contexts, like being human, will result in student interest, engagement, and success.

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