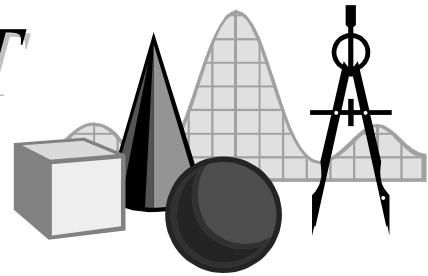


TAKE IT TO THE MAT

A NEWSLETTER ADDRESSING THE FINER POINTS OF MATHEMATICS INSTRUCTION

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How we compute and apply mathematics has much to do with the *number system* we use. Nearly every number system since man began to do mathematics has had two basic building blocks: *numbers* and *numerals*. Later, the notion of *digits* appeared—the present-day system is derived from the Hindus and Arabs. This issue of *Take It to the MAT* is a discussion of the differences between *numbers*, *numerals*, and *digits*.

As you read through this, an analogy to consider is how we use language. A cat is a furry animal with pointy ears and a long tail. The word “cat” is a way to represent the idea of that furry animal in written form. When we read “cat”, our mind pictures the animal. The word is composed of letters, which are symbols representing sounds. We say the first *letter* of the *word* is “c”. Just as words are composed of letters and represent things, actions, etc., numerals are composed of digits and represent numbers.

Number is simply the concept of quantity, a result of counting. From the time our earliest ancestors walked the Earth, there was a need to compare relative sizes of sets. Were there as many animals in a herd as men in a hunting party? Thus was born the concept of number. The need to quantify groups of things is the basis of numerical systems. *Number is the concept of quantity.*

Once man had developed this abstract notion of number, a method to express it in written form was needed. Symbols were devised to represent numbers. These symbols are called *numerals*.

The earliest numerals were simple tally marks. The Egyptians used | for 1,  for 10, and  for 100. The Romans used I to denote 1, V to denote 5, and X to denote 10. Combining these symbols generates representations for different numbers—XVII represents 17. The Egyptian numeral is shown at right. Roman and Egyptian numerals are additive systems, that is, the numbers corresponding to each symbol are added (with some exceptions in the Roman system). 

We all have experience with Roman *numerals* (see the bottom of this page) and we describe them as just that: numerals. We do not call them Roman *numbers*, which is awkward as well as incorrect. Number is the concept of quantity and is the same in all number systems.

Our system is a positional system, or more commonly, a place-value system. Each position in the numeral contains a symbol, that symbol describing how many of the value of *that place* are in the number. The value of each place depends on the base of the system. We use a base *ten* system where each place is a power of ten—ten times the value of the previous place. Thus, the number seventeen—a quantity—is represented in written form by 17, one ten and seven ones.

But what are “1” and “7”? They are symbols that are used throughout the numeral, sometimes repeatedly. We call them *digits*. Digits are the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. In the Roman system, “I” is one one and “X” is one ten. Two symbols for one, in a sense. Yet we use the symbol “1” for both one one and for one ten, depending on *where* we place it.

When we write 153, that is a numeral. It represents the quantity one hundred fifty-three and is composed of the digits 1, 5, and 3. We say that 1 is the digit in the hundreds place. We do not refer to the “number” in the hundreds place, but the *digit*.