

Iteration: Part One!

Iteration means doing something over and over. It's a very important idea in math and computer science. The name may be new to you, but we've all experienced it. For example, counting is an iterative procedure: start with one, add one, then add one to that answer, etc. Or doubling: 1, 2, 4, 8, 16...

In 1949 the mathematician D. R. Kaprekar from India came up with a new kind of iteration that features a certain "magic number." Here's how it works. Pick any four-digit number, as long as the digits are not all the same. (Don't use 2,222, etc.) Rearrange the digits to make the largest possible number with those digits, and the smallest possible number. Then subtract the smallest from the largest. And then iterate! Do it all over again with that number!

1) Pick a starting four-digit number and do Kaprekar's operation over and over. (Repeat it eight times, unless something magical happens earlier!) Keep a neat record of your work, as in the beginning work of the example below:

Starting number:	3,194	
Highest:	9,431	9,431
Lowest:	1,349	-1,349
Second number:	8,082	8,082

- 2) What happened with your first starting number after about eight iterations?
- 3) Now choose a different four-digit number and try again. What do you notice?
- 4) What is Kaprekar's magic number? Will every four-digit number lead to the same magic number? Why?!
- 5) (For those who are adventurous!) What will happen if you try this game with three-digit numbers? With five-digit numbers?
- 6) (For those who are fearless, intrepid and indefatigable!) Try Kaprekar's procedure in other bases!
- 7) Have fun! Then have fun again! Then have fun again....