A Brief Introduction to Armstrong Numbers

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The concept of the Armstrong number is not a hard one to grasp, but due to the utter uselessness of same some thought must be devoted to the subject if complete comprehension is desired. The following DEFINITIONS will serve to introduce the Armstrong numbers of the first and second kind.

I. DEFINITION. Any number N is an Armstrong number of the first kind iff:
Where n is the number of digits d_i composing N,

$$N = \sum_{i=1}^{n} d_i^n \quad .$$

II. DEFINITION. Any number N is an Armstrong number of the second kind iff:
Where n is the number of digits d_i composing N,

$$N = \sum_{i=1}^{n} d_i^i \quad .$$

It can immediately be seen that an analytical means of determining the Armstrong numbers, given the field of whole positive integers to choose from, would be difficult if not impossible to derive at the present stage of the art. The use of high-speed automatic machinery has made it possible, however, to determine the first few Armstrong numbers algorithmically, and the search for more Armstrong numbers is, of course, continually progressing.

With research in the field of these interesting* numbers going so well, some thought was given to extending the concept fundamental to Armstrong numbers, thus arriving at Armstrong numbers of the third, fourth, etc., kind, hopefully carrying the art far enough to found a new branch of number theory.

Some success has been achieved, with the following definitions resulting.

III. DEFINITION. Any number N is an Armstrong Number of the third kind iff:
Where n is the number of digits d_i composing N,

$$N = \sum_{i=1}^{n} d_i^{d_i}$$

IV. DEFINITION. Any number N is an Armstrong Number of the fourth kind, of order p, iff:
Where n is the number of digits d_i composing N,

$$N = \sum_{i=1}^{n} d_i^{p}$$

NOTE. In all the above DEFINITIONS, the d_i are ordered as follows:

$$d_n d_{n-1} d_{n-2} \ldots\ldots d_1.$$

That is,

$$N = \sum_{i=1}^{n} d_i * 10^{i-1}$$

To date, admittedly, no use has been found for these Numbers, but such is Number Theory. The first few Armstrong Numbers of each kind are appended, for those who may be interested. Inquiries, comment, and advice are welcomed.