

012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789

STEP NUMBERS

Antal E. Fekete

With a color-reproduction of the rainbow digits
and of the Sierpinski triangles (mod 3, 5, 7) for the binomial coefficients
and for the Stirling numbers of the first and second kind

Scarbantia
2010

ala ale ali alo alu alla alle alli allo alli ela ele eli elo elu ella elle eli ello ellu ila ile ili ilo ilu illa ille illi illo illu ola ile oli olo

hale hali halo halu halia halie halii hallo haluu hela hele heli helo helu hela helle helii hello heluu hila hile hii hio hitu hilla hille hiii hillo hiltu hola hole

mala bala trala quadrata pentata hexata heptata octata novata hale male bale trale quadratale pentale hexale heptale octale novale hali bali traili quadrati

In lieu of copyright notice

Authors hoping for the widest exposure are working at cross purposes when they limit others' access to their ideas through copyright notices and requests for credit lines. God knows there are plenty of editors, referees, and reviewers out there trying to limit that access by hook or crook. Why help them?

It is with these thoughts in mind that the author of this work waives his Copyright©2009. He imposes no further obligation on those who find his ideas useful in their own writings or otherwise than to admit this fact to themselves.

aefekete@hotmail.com

Notice. This E-book edition is not complete. Order the missing Chapters directly from the author: Professor Fekete, Antal, Budapest 1025, Ali utca 9/B, Hungary, E-mail: aefekete@hotmail.com

NOTE ABOUT THE FRIEZES ON THE TITLE PAGE

012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789

is the list of the first one hundred rainbow digits (see p 9). Read as a single stepnumber, it is the largest one that can't be written down with fewer than 99 digits. The expansion of the next stepnumber that in fact is the 100th Bell number b_{100} , takes 100 digits: **100...0** (the digit **1** followed by 99 digits of **0**). The decimal expansion of the same number takes 118 decimal digits.

The stepnumber expansion of b_{1000} consists of 1000 digits. The decimal expansion of the same number consists of 1928 decimal digits — almost twice as many! When it comes to very large numbers, there is no match for the stepnumber system that offers the shortest string of digits to represent them. Although it calls for infinitely many digits, the introduction of any new digit is delayed as long as possible, and once introduced, it is used most sparingly.

ala ale ali alo alu alla alle alli allo alli ela ele eli elo elu ella elle elli ello ellu ila ile ili ilo ilu illa ille illi illo illu ola ile oli olo

is the list of the names of the rainbow digits from **0** to **3** (see p 16). With the aid of this list we can read out any given stepnumber, and we can count in the stepnumber system. These names are easily remembered in spite of having infinitely many of them, because their formation is based on a systematic way of permuting the five vowels **a, e, i, o, u**, and doubling the consonants **l** in between.

mala bala trala quadrala pentala hexala heptala octala novala hale male bale trale quadrale pentale hexale heptale octale

lists the names of the milestones, i.e., Bell numbers 10_n from $10_1 = 2$ to $10_{18} = 68,207,686,159$ (see p 3).

hale hali halo halu halla halle halli hallo hallu hela hele heli helo helu hella helle helli hello hellu hila hile hili hilo hilu hilla hille

lists the names of the secondary milestones 10_{10n} from $10_{10} = 678,570$ to 10_{260} , the decimal expansion of which takes 383 digits (see p 4).