

LETTERS TO THE EDITOR

	PAGE		PAGE
A Peculiar Gap-Filling Process for Powers of $(9)_n$. BY S. PARAMESWARAN	18	Characteristics of Indian Animal Fats. BY K. T. ACHAYA AND B. N. BANERJEE	23
The Effect of Colour on the Visual Observation of Long-Period Variable Stars. BY M. K. VAINU BAPPU	18	On the Preparation and Composition of Negatively Charged Ferric Phosphate Sol and Gel. BY S. P. MUSHRAN	24
Light-Scattering in Aqueous Timber Wood Extracts. BY D. VENKATESWARA RAO AND V. P. NARAYAN NAMBIYAR	19	Study of the Composition of Chloromeric Acids by the Electrical Conductivity Method. BY ARUN K. DEY	24
Selective Excitation of Spectra by High-Frequency Discharge. BY JAGDEO SINGH	20	Cytology of the Yeast. BY K. V. SRINATH	25
Tamarind Seed 'Pectin'. BY M. DAMODARAN AND P. N. RANGACHARI	20	Asparagine from Indian Pulses. BY M. R. RAGHAVENDRA RAO AND M. SREENIVASAYA	25
Potency of Injectable Digitalis Preparations. BY B. N. CHAUDHURY, B. C. BOSE AND B. MUKERJI	22	Wanted a Museum of Evolution. BY D. N. WADIA	26

A PECULIAR GAP-FILLING PROCESS FOR POWERS OF $(9)_n$

IN the B.U.J.* Mr. Kaprekar has considered a few examples in the gap-filling process for powers of $(9)_n$. In that note, he has taken powers only upto 5. In this note, I establish a method for the gap-filling process whatever be the power. Moreover in this method, we need not calculate the value of the different powers of 9, which are necessary in Mr. Kaprekar's method.

Notations.—(1) $(9)_n$ stands for the digit 9 repeated n times and $(9)_n^k$ stands for the k^{th} power of $(9)_n$.

(2) p is defined by the relation,

$$10^{p-1} < {}^k C_r \leq 10^p, \text{ where } r = \frac{k}{2} \text{ if } k \text{ is even,}$$

$$\text{and } = \frac{k-1}{2} \text{ if } k \text{ is odd.}$$

(3) k and n are positive integers and $n \geq p$.

(4) When we call (x) a p digit number; if x does not contain p digits, we mean that the necessary number of zeros are prefixed to x so as to make it a p digit number. e.g., if $p=3$ and $x=35$, we take $(x) = (035)$.

With these notations we will show that

$(9)_n^k = \dots (10^p - {}^k C_1) \dots ({}^k C_2 - 1) \dots (10^p - {}^k C_3) \dots ({}^k C_4 - 1) \dots$ where $(10^p - {}^k C_1)$, $({}^k C_2 - 1)$ etc., are all p digit numbers and the gaps from left to right are filled in by $(9)_{n-p}$ and $(0)_{n-p}$ alternately, thus making it

$= (9)_{n-p} (10^p - {}^k C_1) (0)_{n-p} ({}^k C_2 - 1) (9)_{n-p} (10^p - {}^k C_3) (0)_{n-p} ({}^k C_4 - 1)$.

The last p digits being by ${}^k C_k$ or $(10^p - {}^k C_k)$ according as k is even or odd.

Proof.— $(9)_n^k = (10^n - 1)^k$
 $= 10^{nk} - {}^k C_1 \cdot 10^n (k-1) + {}^k C_2 \cdot 10^{n(k-2)} - {}^k C_3 \cdot 10^{n(k-3)} + \dots$
 $= [10^n - {}^k C_1] \cdot 10^{n(k-1)}$
 $+ [{}^k C_2 \cdot 10^n - {}^k C_3] \cdot 10^{n(k-2)} + \dots$
 $= [(9)_{n-p} 10^p + (10^p - {}^k C_1)] \cdot 10^{n(k-1)}$
 $+ [({}^k C_2 - 1) \cdot 10^n + (9)_{n-p} 10^p + (10^p - {}^k C_3)] \cdot 10^{n(k-2)} \dots$

since $10^n - 10^p = (9)_{n-p} \cdot 10^p$
 $= [(9)_{n-p} \cdot (10^p - {}^k C_1)] 10^{n(k-1)}$
 $+ [({}^k C_2 - 1) (9)_{n-p} (10^p - {}^k C_3)] 10^{n(k-2)} + \dots$
 since $(10^p - {}^k C_1)$ etc are p digit numbers.
 $= (9)_{n-p} (10^p - {}^k C_1) \cdot (0)_{n-p} ({}^k C_2 - 1) (9)_{n-p} (10^p - {}^k C_3) \dots$
 $= \dots (10^p - {}^k C_1) \dots ({}^k C_2 - 1) \dots (10^p - {}^k C_3) \dots ({}^k C_4 - 1) \dots$

where $(10^p - {}^k C_1)$, $({}^k C_2 - 1)$, etc., are p digit numbers; and the gaps are filled in with $(9)_{n-p}$ and $(0)_{n-p}$ alternately.

When $k \leq 5$, $p=1$ and so the problem is simple.

Ex. $-(9)_3^5 = -5-9-0-4-9$ to be filled in by $(9)_3$ and $(0)_3$ alternately = 999 5 000 9 999 0 000 4 9999.

We find that

$p=1$ if $k \leq 5$	$p=2$ if $6 \leq k \leq 8$
$p=3$ if $9 \leq k \leq 12$	$p=4$ if $13 \leq k \leq 15$
$p=5$ if $16 \leq k \leq 19$	$p=6$ if $20 \leq k \leq 22$.

Note.—Whatever be the value of $n (> p)$ to write down $(9)_n^k$, we have to calculate ${}^k C_1, {}^k C_2, \dots, {}^k C_k$ only.

Trivandrum, August 29, 1945. S. PARAMESWARAN.

* Bombay University Journal, March 1945.

THE EFFECT OF COLOUR ON THE VISUAL OBSERVATION OF LONG-PERIOD VARIABLE STARS

THE part played by colour in the errors involved in the visual observation of long-period variables was pointed out by Ford.¹ In order to verify the linear relationship between colour and mean deviation as derived by him, a study of twenty stars of varying colour was made utilising the same methods of analysis. The observational data were taken from the A.A.V.S.O. Reports in *Harvard Annals*, Vol. 107, Nos. 7 and 8, and Vol. 110, Nos. 1, 5, 6, 7 and 8. The deviations for each individual