ALFRED LODGE.

Alfred Lodge became a member of the A.I.G.T. in 1888, was Honorary Treasurer from 1891 to 1896, and first President of the Mathematical Association in 1897-1898. Until recently he was constant in his attendance at meetings of the Council; we shall not easily forget his keen interest in all the activities of the Association or the charm of his kindly manner. His first contribution to the *Gazette* appeared in No. 1; his last in No. 239.

After a distinguished career at Oxford, including a Fereday Fellowship at St. John's College, Lodge was from 1884 to 1904 Professor of Pure Mathematics at the Royal Indian Engineering College, Coopers Hill, and then for fifteen years mathematical master at Charterhouse. A former Charterhouse colleague, Mr. C. O. Tuckey, contributes the following inspiring account of mathematical thought continued in the closing years of a long life.

I wonder whether there are friends of Alfred Lodge who would be interested to read of his mathematical activities a month or so before his death, and whether the younger readers will care to know that mathematics can be a keen interest and a solace to a bereaved and lonely old man in his 84th year.

Lodge was my colleague for fifteen years in mathematical specialist teaching at Charterhouse, and after his retirement we corresponded regularly on all sorts of mathematical questions. When I say regularly, he was much more regular than I was; he always answered my letters promptly, which is more than could be said for me. I believe he also corresponded similarly with various other friends.

But to his recent activities, this summer he was interested in theory of numbers. For the problem " To show that N^{10} is either $41n$, $41n \pm 1$, or $41n \pm 9$ " he sent me this solution.

" By Fermat, if N is prime to 41, N^{40} is of form $41n+1$;

$$\therefore\ (N^{20}-1)(N^{20}+1) \text{ is } M(41), \text{ i.e. } N^{20}=41n\pm 1;$$

$$\therefore\ N^{10} \text{ is such that its square is } 41n\pm 1.$$

If $N^{10}=41n\pm 1$, its square is $41n+1$, and in no other case.

If $N^{10}=41n\pm 9$, its square is $41n+81$, i.e. of form $41n-1$.

All I had to do was to take all the squares from 1 to 20 inclusive, divide them by 41, and see which gave the required remainder -1. I found that 9^2 did it. When these squares are divided by 41 all the remainders are different up to 20^2, after that they repeat backwards, since r^2 and $(41-r)^2$ leave same remainder.

So the solution is unique; 9^2 is the only chance.

Hence N^{10} is $41n$, or $41n\pm 1$ or $41n\pm 9$.

This makes N^{20} of form $41n$, $41n+1$, $41n-1$,

and N^{40} of form $41n$ or $41n+1$."

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This October, *à propos* of something of mine on Mass and Weight in the *Gazette* :

" For beginners I am convinced that Newton's second law is best given as $P/W = f/g$, i.e. accelerations are proportional to the forces acting on a given body, actually or potentially. The equality $P/W = f/g =$ constant for a given body is more abstruse in its ideas and should be delayed a bit. $W/g = M$ is chiefly a matter of *quality*. W and g are both vertical vectors ; M is a scalar quite directionless. Important but too advanced for youngsters : that is one reason for delaying a dissertation on M."

This November we discussed the problem : " By how many routes can a King on an empty chessboard go from his usual starting square to a square on the opposite side of the board? " We neither of us reached a formula capable of extension to a board of n^2 squares, but this is what he sent me about a month before his death.

" On an unrestricted board the numbers of routes to the various squares are the coefficients in $(x^{-1} + 1 + x)^n$

The actual board showing the losses in red [printed in italics] :

				1					
			1	1	1				
		1	2	3	2	1			
	1	3	6	7	6	3	1		
1	4	10	16	19	16	10	4	1	
1 5	14 1	30	45	51	45	30	15	5	*1*
1 6 21	44 6	89 1	126	141	126	90	50	20 1	*6 1*
1 7 28 77	133 28	259 7	356 1	393	357	266	160 1	70 7	*28 7 1*

We lose

$$x^7 + 7x^6 + 28x^5 + 77x^4 + 28x^3 + 7x^2 + x + x^{-3} + 7x^{-4} + 28x^{-5} + 7x^{-6} + x^{-7}.$$

The total is $3^7 - 149 - 44 = 1994$."

May all members of the Association, whether the problems with which they are concerned are more abstruse than these or less so, find like Alfred Lodge that their interest in them never falters.

C. O. TUCKEY.

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