LETTERS TO THE EDITOR

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The Law of Divisibility.

MAY I briefly supplement my former letter by a few suggestions for the development of the above law?

(1) When δ (or a multiple) appears in N, it may be replaced by cyphers.

Thus if $\delta = 3$, for 235697 write 205007,
$= 7$, do. 200690 or 230090
$= 23$, do. 5007.

(2) Any member of the recurring period r_n may be represented by its negative complement which reaches its maximum at $\frac{1}{2}\delta$.

Thus if $\delta = 7$, period $= \pm 1, 3, 2$;
$= 11$, do. $= 1, -1$;
$= 37$, do. $= 1, 10, -11$;
$= 41$, do. $= 1, 10, 18, 16, -3$.

(3) If the final remainder be negative, its complement must be taken.

Thus if $\delta = 7, 17, 29, 41$,
and $R = -2, -14, -25, -32$,
true value $= 5, 3, 4, 9$.

(4) Final remainders may be found by repeated applications of the requisite formula.

Let $\delta = 41$,
$N = 3205175$ or 3000175
$N_1 = 5 + 70 + 18 + 30$
$= 123 = 3 + 20 + 18 = 41$,
Let $\delta = 37$,
$N = 87172$
$N_1 = 2 + 70 - 11 + 7 + 80$
$= 159 - 11 = 148 = 8 + 40 - 11 = 37$.
Let $\delta = 7$,
$N = 8638$
$N_1 = 8 + 9 + 12 - 8 = 21 = 1 + 6 = 7$.

(5) The group principle may be applied to $\delta = 99, 999, 9999$ &c., where $N_1 = a_2 + b_2 +$ &c.; $a_3 + b_3 +$ &c.; $a_4 + b_4 +$ &c. The first is a test for 11, the second for 37, the third for 101.

(6) Another method is the following:—

Let $N \div \delta + 1 = Q_1$ with remainder r_1,
$Q_1 \div \delta + 1 = Q_2$ do. r_2,
$Q_2 \div \delta + 1 = Q_3$ do. r_3,
&c. = &c.

$$\therefore N = (\delta + 1)Q_1 + r_1$$
$$= (\delta + 1)^2 Q_2 + (\delta + 1) r_2 + r_1$$
$$= (\delta + 1)^3 Q_3 + (\delta + 1)^2 r_3 + (\delta + 1) r_2 + r_1$$
$$= \&c.$$

Eliminating multiples of δ, we get, when $Q_n = 0$,

$$N_1 = r_{n-1} + r_{n-2} + \&c. + r_1.$$

If $\delta \pm a$ be used, we get

$$N_1 = a^{n-1} r_{n-1} \pm a^{n-2} r_{n-2} + \&c. \pm r_1.$$

Putting $a = 1, 2, 3$ we may deal with a wide series of primes, such as

19, 29, 59, 79, 89, 109 &c.
31, 41, 61, 71 &c.
23, 43, 53, 73, 83 &c.;

also with composites, as

119 for 17 and 7, 129 for 43 and 3,
159 for 53 and 3, 201 for 67 and 3,
301 for 43 and 7, 501 for 167 and 3, and so on.

As examples, let $\delta = 399 = 3 \times 7 \times 19$.

$$N = 8293177893$$

$\div 400^3$, $r_1 = 293$
$r_2 = 144$
$r_3 = 232$
$r_4 = 129$

400) 798 = 398
1

399 = 19 × 7 × 3.

Let $\delta = 299 = 13 \times 23$,
$N = 166371972$
$\div 300^4$, $r_1 + r_2 + r_3 + r_4 = 72 + 173 + 48 + 6 = 299$.
Let $\delta = 501 = 167 \times 3$
$N = 640550043$
$\div 500^4$, $5 - 62 + 100 - 43 = 0$.

From the foregoing I have derived many simple rules not requiring division. HENRY T. BURGESS.
Tarporley, West Norwood, November 4.

A Link in the Evolution of a Certain Form of Induction Coil.

AT a time when much interest is taken in the oscillatory electric discharge and its effects, it may not be out of place to mention that a link in the evolution of the Tesla coil is to be found in a paper by Dove (Royal Academy of Sciences, Berlin, October, 1844; *Electrical Magazine*, vol. ii. p. 67). It is as follows:—The external coatings of two Leyden jars were connected together by a wire spiral. This spiral was surrounded by a secondary insulated spiral. When the jars were so charged that a spark was produced on joining their internal coatings, electricity was induced in the secondary spiral. If to this arrangement of Dove, a cistern of insulating oil be added to contain the coils, and the jars, furnished with a spark gap, be charged from an induction coil, we have one of the combinations which has given such excellent results in the hands of Tesla. In 1831 Faraday ("Experimental Researches," vol. i. § 24) arranged an experiment to discover whether the electrical discharge of a Leyden jar would produce an induced current in his induction coil; he writes: "Attempts to obtain similar effects by the use of wires conveying ordinary electricity (*i.e.* from a jar) were doubtful in results."

The combination due to Dove, is probably the earliest instance of an apparatus in which electrical oscillation in one circuit set up a definite disturbance in a neighbouring coil.
Oxford, November 8. F. J. JERVIS-SMITH.

The Leonid Meteors.

I SHOULD be glad to receive accounts of any brilliant meteors that may be observed on the nights of November 13 and 14 next, for the purpose of computing their real paths in the air. The date and time of appearance of each object should be given, together with its apparent magnitude (compared with the moon, planets or brighter stars), observed course amongst the stars in R.A. and Declination, and estimated duration of flight. Though moonlight will be strong, many observers will be on the look-out for the vanguard of the Leonids, so that should any brilliant meteors appear, they are likely to be noticed at several different stations. W. F. DENNING.
51 Brynland Avenue, Bishopston, Bristol.

Insects and Colour.

THE following incident may throw some further light on the subject brought forward by your correspondent, Mr. J. Parkin, in his letter in your issue of November 4, on "A Bee's Movements in a Room." In the year 1893, the humming-bird hawk moth was particularly common here. On one or two occasions, driving out in a little trap, with a Shetland pony, whose head-gear was ornamented with pyramidal blue rosettes, one of these beautiful insects would fly straight at one of the rosettes, and hover over it for a few seconds, though the pony was going at a trot. It would seem that in this case the colour alone was the chief attraction; the odour being insignificant. But there are, I believe, numerous other instances of insects being attracted in the first instance by colour. I may add that these insects visited chiefly the *scarlet* geraniums in my garden.
ALFRED THORNLEY.
South Leverton Vicarage, Notts., November 5.

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