

Here the numbers whose logarithms are given are 71.524, and 70.524; and their difference being 1, the result therefore ought to be 0. Mr. F.'s process shows an error of 66 in the last two places, and mine shows an error of 52. It is quite possible that, in another trial the state of the errors might be reversed; but the truth is, the error in both cases arises from the nature of things. The data are insufficient when the numbers are nearly equal; and the insufficiency is indicated, *in both tables*, by the state of the differences, at the part in use, in the two series of which each table consists. In both tables the ratio of the differences at the part that here comes into operation is about 70 to 1; the less of the two being in the series that here forms the argument. Any error in the argument will consequently produce an error seventy times as great in the result.

I much fear it will be considered that I have attached undue importance to a very small affair. I therefore add no more as regards my personal concerns. Ere I close, however, I must enter my protest against a systematic abuse of the algebraic sign of equality practised by Mr. Filipowski. Thus (p. 202) we find—

$$\lambda a = 0.638783 = N.4.35240.$$

The recognized interpretation of the latter part of this expression is "0.638783 is equal to the number 4.35240," which of course is not true. If it *must be written as an equation*, the established form is

$$\lambda^{-1} 0.638783 = 4.35240.$$

I am, Sir,

Your most obedient servant,

London, 11th March, 1858.

P. GRAY.

FORMULÆ FOR APPROXIMATING TO THE EXPECTATION OF LIFE.

To the Editor of the Assurance Magazine.

SIR,—The publication of Mr. Willich's formula, expressing the expectation of life according to the Carlisle Table of Mortality, induces me to forward you the following memoranda, extracted from my Note Book, for insertion in your next Number, if you think them likely to be useful to your readers.

If the letter *a* signify any given age, the expectation of life at that age, according to the Northampton Tables, is, approximately, and from the age of 5 to 70, $\frac{86\frac{1}{2} - a}{2}$.

According to the Government Table for Male Lives,

$$(85 - a) \frac{3}{5}, \text{ or } 51 - \frac{3a}{5};$$

for Female Lives,

$$(86.4 - a) \frac{2}{3}, \text{ or } 57.6 - \frac{2a}{3}.$$

According to the Carlisle Table, from 7 years to 76,

$$57 - \frac{5a}{6} + \frac{a^2}{450}.$$

This is correct within half a year, excepting from the age 57 to 64, where the error is somewhat greater. It gives a value slightly higher than

the tables for ages below 15: at that age it is correct; from 15 to 52 an addition of half a year will rectify the result very nearly; and from 52 to 75 a deduction of a similar quantity will be sufficiently near. From 75 upwards the table is in excess of the formula by a rapidly increasing quantity, very nearly measured by $\frac{(a-72)^2}{90}$.

If the range of ages be divided into periods of fifteens, the following set of formulæ gives a closer approximation, for the Carlisle Table:—

	General Formula.	Correction.
For lives under 29 . . .	$(79-a)\frac{7}{10}$	$+\frac{29-a}{40}$
From 29 to 44 . . .	$(79-a)\frac{7}{10}$	$+\frac{a-29}{30}$
„ 44 to 59 . . .	$(79-a)\frac{7}{10}$	$+ \cdot 8$
„ 60 to 74 . . .	$(79-a)\frac{7}{10}$	$+\frac{a-55}{5}$

Or these four may be reduced to—

Under 29	$56\frac{1}{4} - \frac{3a}{4}$
From 29 to 44	$54\frac{1}{3} - \frac{2a}{3}$
„ 44 to 59	$56\cdot 1 - \frac{7a}{10}$
„ 59 to 74	$44\cdot 3 - \frac{a}{2}$

The formula for ages between 29 and 45, given just above, coincides with Mr. Willich's $\frac{2(81\frac{1}{2}-a)}{3}$, which, for want of correction in the early ages, differs by an amount increasing from $\cdot 3$ at the age of 28, to $1\cdot 24$ years at the age of 9 years; a difference twice as great as any which exists between the tabulated expectation and the expectation expressed by the formula $57 - \frac{5a}{6} + \frac{a^2}{450}$.

I am, Sir,

Your obedient servant,

WM. D. BIDEN.

9, Lansdowne Cottages, Lower Road, Islington,
March 12th, 1858.

ON THE METHOD OF TESTING THE SOLVENCY OF AN ASSURANCE COMPANY.

To the Editor of the Assurance Magazine.

SIR,—Mr. Younger and myself are so little likely to agree upon the first principles of the subject under discussion, that I feel some apology is due to you for resuming it. After the lengthened notice with which that gentleman has favoured me in your April Number, however, I must ask your indulgence for a brief reply to it.