CORRESPONDENCE.

ON THE NUMBER OF YEARS IN WHICH PREMIUMS AMOUNT TO TWICE THE TOTAL SUM PAID.

To the Editors of the Journal of the Institute of Actuaries.

DEAR SIRS,—I received a letter dated 3 October 1925 from Mr. W. R. Strong, F.I.A., of Melbourne, about this problem, and he quoted the following solution saying it is due to Professor Michell, of Melbourne University:

$$\frac{(1+i)^x-1}{i}(1+i)=2x$$

$$\therefore \qquad (1+i)^x=\frac{2xi}{1+i}+1$$

writing $\quad (1+i)^x=(1+i)^{\frac{1}{i}\times xi}=e^{xi}$ where i is very small

$$e^{xi}=\frac{2xi}{1+i}+1=2xi+1 \text{ nearly}$$

Now if we put $xi=1{\cdot}25$ the value of e^{xi} is found to be 3·4903, while the value of $2xi+1$ is 3·50.

When I was the official tutor for Part II I set this problem to one of the classes So far as my recollection goes I had some good solutions and the best of them was given by the late G. M. Reeve. I think his solution was like that given above, but unfortunately I kept no note of it, and my memory of what happened about eighteen years ago may be at fault.

Yours faithfully,

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[The approximate solution of the problem takes a somewhat simpler form for the continuous annuity. We then have (by the three-eighths rule)

$$2n=\bar{s}_{\overline{n}|}=\frac{n}{8}\{1+(1+i)^{\frac{n}{3}}\}^3 \text{ whence } (1+i)^{\frac{n}{3}}=\sqrt[3]{16}-1$$

and $\quad n\delta=3\log_e 1{\cdot}5198=1{\cdot}256.$]

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