receptors. Riggs, for example, discusses some of the parallels involved [2]. During the past two decades, a considerable effort has been spent on these linearisations so as to extract the most reliable parameters. Assuming now good fits, that is, only *random* errors, studies using simulated data have shown that the second plot appears to fit the best but yields, by far, the worst estimates of the parameters, meaning, for example, biased results, negative values and easily the largest standard deviations. The major reason is because the most error-prone datum (the smallest) is farthest from the origin and affects the regression the most, if, as is common, the data are not properly weighted. The other plots look worse when the smallest datum is in error but the estimates they provide are less biased (again, if unweighted regressions are done). The better of the other two plots seems to depend upon a combination of factors including the range and distribution of the data and the kind and level of the noise. Although the second plot has been shown, repeatedly, to be misleading, it remains the one most commonly used to display the data and to yield results [3].

The rectangular hyperbola is the only case we are aware of that can be linearised several distinct ways. This plethora of plotting possibilities provides us with a paradox. These plots allow us to check the fits and serve as a diagnostic when the fits are poor. If, however, such fit tests are passed, we are then confronted with choosing between the first and last plots so as to obtain the desired parameters with the smallest possible bias and spread.

References

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Obituary

Elizabeth M. Williams

In Autumn, 1914, shortly after the outbreak of the First World War, Elizabeth Williams accepted a temporary post at Nottingham High School for Boys, deputising for a master who had enlisted in the army. Almost seventy years later, she contributed new material to the third edition (1983) of her book with Hilary Shuard, *Primary mathematics today*. Few, if any, can have contributed to mathematics education for so long a period. But it was not only its duration which distinguished Elizabeth Williams' work. Its range, in terms of the levels, areas and geographical regions in which she was active, was truly remarkable. Here one can only hint at its richness, elsewhere (*A history of mathematics education in England*, Cambridge University Press, 1982, pp 169–204) I have given a fuller, but still far from complete, account.

Elizabeth entered university (Bedford College, London) in 1911 at the remarkably early age of 16 where her teachers included A. N. Whitehead. After a brief spell at Nottingham she returned to London for professional training with Percy Nunn as her mathematics tutor. Then followed six years of teaching in a girls' grammar school—but with some responsibility for mathematics teaching in the primary feeder school—before her marriage in 1922. In those days there was no place in state or endowed schools for married women, and this led her and her husband to establish their own 5–18 private school in North London. This 'little school' attracted the attention of Nunn and he helped her find a position in the early 1930s in the Department of Education at King's College, London. From then until her 'retirement' in 1958, she remained in teacher-training, moving from King's to Goldsmiths' before becoming the first Principal of the City of Leicester Teacher Training College, and then Principal of Whitelands College, London.

It was in 1958 that Elizabeth was awarded her CBE, in recognition, in particular, of the contribution she had made to the establishment of the new 3-year course for teacher training. (The then Minister of Education referred to her as 'the tigress', for Elizabeth's sweet face concealed a very strong will!) By that time, too, she had also played an outstanding part within the *Mathematical Association*. She was a member of the 'Primary' Committee established in 1938 and remained in it when that committee was reconstituted after the Second World War. Before the most influential *Primary report* was finally published in 1955, she had also chaired the committee which produced reports on *Mathematics in secondary modern schools* (Interim, 1949; Final, 1959). In 1958 she chaired the joint MA and ATCDE committee on *The supply and training of teachers of mathematics* (1963). She was for many years Secretary of the *Association* and in 1965–1966 our President.

And then there were the textbooks, the second *Primary report*, the programme committees for the Commonwealth Conference on Mathematics in Schools (Trinidad, 1968) and chairing that for the International Congress on Mathematics Education (Exeter, 1972), the many visits overseas including some months in 1956 planning teacher-training in Kenya, two years as Deputy Director of the School of Education in Ghana, and several journeys to the USA and Australia, ... The list goes on and on.

Elizabeth Williams' career is also of considerable interest because of how, in her words, 'it belongs to the transition from the Victorian era to contemporary practice'...; she was, for instance, the first married woman to play a number of important roles within education and so was a notable feminist pioneer. Her death severs many connections with the past, for it was always a joy to hear her speak of such personal influences on her as Whitehead, Adams, Nunn and Godfrey. Yet we can only rejoice that she was able to remain an active member of the mathematical community for so long. (She had me check that there would be access for wheelchairs at ICME 5 in

1984 at Adelaide, but was finally persuaded that the long journey would prove too taxing!) All who met and worked with her will remember her with enormous respect and affection. Her influence on mathematics education and on teacher education will be lasting.

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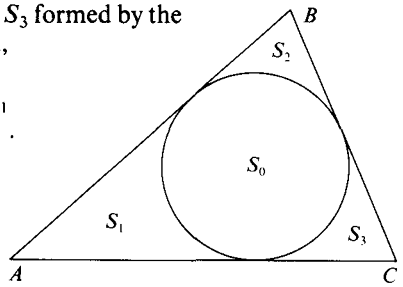
Problem corner

Solutions are invited to the following problems. They should be addressed to Graham Hoare at Dr Challoner's Grammar School, Chesham Road, Amersham, Bucks HP6 5HA, and arrive not later than 25 January please.

70.G Prove that the areas S_0, S_1, S_2 and S_3 formed by the incircle of a triangle ABC, as illustrated, satisfy the inequality

$$S_0 \geqslant \frac{9\pi}{3\sqrt{3}-\pi}\left[\frac{1}{S_1}+\frac{1}{S_2}+\frac{1}{S_3}\right]^{-1}.$$

Find all cases when the equality holds.



70.H Determine, giving a proof, for which real values of k the following inequality holds for all non-negative a and b.

$$\left(\frac{a+b}{2}\right)^k-(\sqrt{ab})^k \geqslant \left[\frac{a^{k/2}-b^{k/2}}{2^{k/2}}\right]^2.$$

These problems were submitted by Dmitry P. Mavlo, who writes from Moscow.

Solutions and comments on 70.C and 70.D (June 1986)

70.C Find a square of a rational number $\left(\text{other than } \left(\frac{5}{2}\right)^2\right)$ which remains the square of a rational number if it is increased or decreased by 6.

Answer. If $a^2-6b^2=c^2$ and $a^2+6b^2=d^2$, then the simplest solution after $a=5$ and $b=2$ is given by, $a=1201$, $b=140$, $c=1151$, $d=1249$, giving the rational number $a/b=1201/140$.

Given an integral solution a, b, c, d of the above equations then A, B, C, D given by $A=a^4+36b^4$, $B=2abcd$, $C=|a^4-12a^2b^2-36b^4|$ and $D=a^4+12a^2b^2-36b^4$, respectively, satisfy a relationship of the same kind. This iterative scheme, or its equivalent, given by a subset X of the set of successful solvers, was either quoted or derived from an identity of the form,

$$(m^2+n^2)^2 \pm 4mn(m^2-n^2)=(m^2-n^2 \pm 2mn)^2$$

The remainder, X', of solvers were content to find particular solutions by combining deductive and empirical methods.