Multiple pythagorean number triples, by Albert Fässler. *American Mathematical Monthly* **98** 6 pp 505–517.

Fässler surveys a number of problems about Pythagorean number triples. Triples with common hypotenuse, common leg sum or difference, common area, common perimeter and common inradius are all considered. The distribution of such triples for small parameters is investigated and asymptotic formulas are developed.

Majorization and the birthday inequality, by M. Lawrence Clevenson and William Watkins. *Mathematics Magazine* **64** 3 pp 183–188.

In the well known Birthday problem, if there are k people in a room, the probability of at least two people having the same birthday is surprisingly high for quite small values of k. One might be worried, however, about the standard assumption that all birthdates are equally likely. In fact a non-uniform distribution of birthdates makes the probability of a match at least as high, a result known as the birthday inequality. This is not a new result, but the authors state:

"Our purpose is to strengthen the birthday inequality and to place it in its natural setting—the theory of majorization and Schur-convexity. . . . Our treatment is elementary."

The coupon collector's problem is given a similar treatment.

The Evolution of stochastic strategies in the prisoner's dilemma, by Martin Nowak and Karl Sigmund. *Acta Applicandae Mathematicae* **20** 3 pp 247–265.

I like to include something from a "heavyweight" journal, and this article is unusually accessible particularly in the initial sections. In a *reactive strategy* the decision in each round of a game depends on the behaviour of the opponent in the previous round. Nowak (a zoologist) and Sigmund consider such strategies as "tit for tat" and "contrite tit for tat", in the cases of the prisoner's dilemma and the "chicken" game.

STEVE ABBOTT

Farlingaye High School, Ransom Road, Woodbridge, Suffolk IP12 4JX

Correspondence

DEAR EDITOR,

I read the article written by Nigel Walkey and Gerald Goodall entitled "How many rugby balls can you fit in a minibus" with some interest. Certainly I agreed with the opening statements, but am I alone in thinking that those who suggest new style "watered down" A levels with the subsequent lowering of degree entrance requirements have got things the wrong way round?

Contrived mathematical investigations for GCSE do not need a fortnight of lessons and homeworks. The lesser able of the children in the selective school where I teach become bored after approximately three days—they would prefer to be taught.

May I have the temerity to suggest that those responsible for creating the gaps should be the ones to do the re-thinking. With no disrespect to Messrs Walkey and Goodall, ovoids to minibuses.

Yours sincerely,

R. P. SAWYER

Bexley Grammar School

DEAR EDITOR,

I wonder if I might be allowed a little space to comment on some of the arrangements being made for investigative work at Sixth Form level. I am very much in favour of such work, but there are dangers. One is that pupils spend a lot of time on a single project that does not have much mathematical significance, enterprises that are really no more than glorified Christmas puzzles. Another danger is the semi-compulsory nature of the tasks involved and imposed. One Examination Board is going to issue four tasks each year and every candidate will have to choose two of them. I enjoy mathematics as much as anyone can, but I look at the specimen tasks issued and my heart sinks with the prospect of boredom involved both for me and my pupils in such an arrangement. I doubt I am unusual in holding the view that many of the tasks being suggested (some in your pages) are really very dull and right out of the mainstream of mathematical development. When I was at school in the days of the unenlightened fifties, I was given Burnside and Panton's *The Theory of Equations* to read and told to take up some aspects of it I enjoyed and to explain and illustrate them. The work was a bit old-fashioned, even for those days, but it was a good solid piece of work and central to a wide area of mathematical thought. It really caught my imagination and I did a lot of work in this area and produced a little thesis that I am proud of even now. But even this project was suitable only for me. The wise mathematics master I was under selected other acceptable tasks for my classmates after talking with them to discover what they would enjoy. But perhaps the worst danger of all is the over-emphasis to be given to one or two specific tasks. These are the ones the Board is going to moderate! Inevitably these tasks are going to get far more time devoted to them than they are worth. How is it supposed to serve the mathematical needs of our pupils to highlight in this way a couple of set tasks (possibly of considerable boredom to many of the pupils involved and possibly also of little mathematical significance)? If the aim is to change the style of Sixth Form teaching to be investigative (and I am wholly in agreement with this intention) then please can we have a system in which unsuitable tasks are not made compulsory and unsuitable assessment arrangements are not imposed which by their nature (highlighting individual tasks) actually militate against the aim. You will see that I am coming out in favour of lots of Coursework of different kinds, plenty of choice, teachers to be trusted with their internal assessments, and merely random sampling by Boards to ensure maintenance of standards.

Yours sincerely,

CHRISTOPHER J. BRADLEY

Clifton College, 32 College Road, Clifton, Bristol BS8 3JH

DEAR EDITOR,

Mathematical Gazette, Note **74.50**

I was interested in Dr Jackson's contribution under the heading "What went wrong?" to the last edition of the *Gazette* in which he seeks a solution to:

$$1/\tan x = \cos x \quad \text{for } -180° < x < 180°. \tag{1}$$

Multiplying through by tan x,

$$1 = \tan x \cos x = \sin x \tag{2}$$

from which $x = 90°$, but the other solution, $x = -90°$, is not obtainable.

I think that the problem arises from the fact that equation (2) is not actually true for the whole interval $-180°$ to $180°$ since tan x is not defined for $x = \pm 90°$ where $\tan x = \pm\infty$. Equation (2) should read:

$$1 = \tan x \cos x = \sin x \quad \text{for } x \neq \pm 90°.$$

This equation has no roots, which is quite helpful in that it indicates that the only possible roots of the original equation (1) are $x = \pm 90°$. All that then remains is to try these two possibilities in equation (1) when it is found that they are, in fact, both roots.

Yours sincerely,

MICHAEL LONG

Farringtons School, Chislehurst

Thanks also to T. Jackman, B. Woodgate, W. B. Marcov, and A.R.G.B. for equally correct, though sometimes rather sterner, replies!

DEAR EDITOR,

In the March 1982 edition H. M. Finucan conjectured that all numbers that can be expressed as the sum of two squares in three or more ways were multiples of 5.

However if $N = c^2(2n^2 + 2mn + m^2)$ with $c^2 = a^2 + b^2$ then

$$N = c^2 n^2 + c^2(n+m)^2$$

$$= [(a+b)n + am]^2 + [(a-b)n - bm]^2$$

$$= [(a+b)n + bm]^2 + [(a-b)n + am]^2.$$

For example $N = 2873 = 13^2 + 52^2 = 32^2 + 43^2 = 8^2 + 53^2$, and there are plenty of such examples.

Yours sincerely,

SANTANU BANDYOPADHYAY

D-310 of R. P. Hall, Indian Institute of Technology, Kharagpur, India

Reviews

Logo and mathematics, by T. J. Fletcher, W. W. Milner and F. R. Mason. Pp 408. £9. 1990. ISBN 0-947747-19-2 (Keele Mathematical Education Publications)

The authors describe this book as a compendium of papers written at different times for different audiences. They aim to explore the relationship between mathematical ideas and their representation in Logo. Thus we find familiar ideas relating to turtle geometry and polygons, also explorations of trigonometry, Fibonacci numbers, determinants, complex numbers and many more. The important point about much of this work is that it has been developed by current practitioners and tried out in schools and colleges. The methods and procedures given are not considered to be the "best possible" but serve to show how maths can be carried out via Logo.

The book is not intended for beginners—it's for dipping into for new approaches to old problems. The procedures are written in BBC Logotron Logo though an appendix is included to allow the procedures to be adapted for the Archimedes and Nimbus.

The book is divided into four sections. Section A is the text of a lecture given by T. J. Fletcher entitled "LOGO: a catalyst for thinking". In it he explores Seymour Paperts belief that the strength of Logo lies in the way in which it makes children formalise their thought processes.

Sections B and C give an enormous amount of practical help about mathematical applications in the classroom. There are examples of worksheets to be copied or adapted including a set of 11 pupil sheets and teachers notes on "Sets via Logo". The scope for