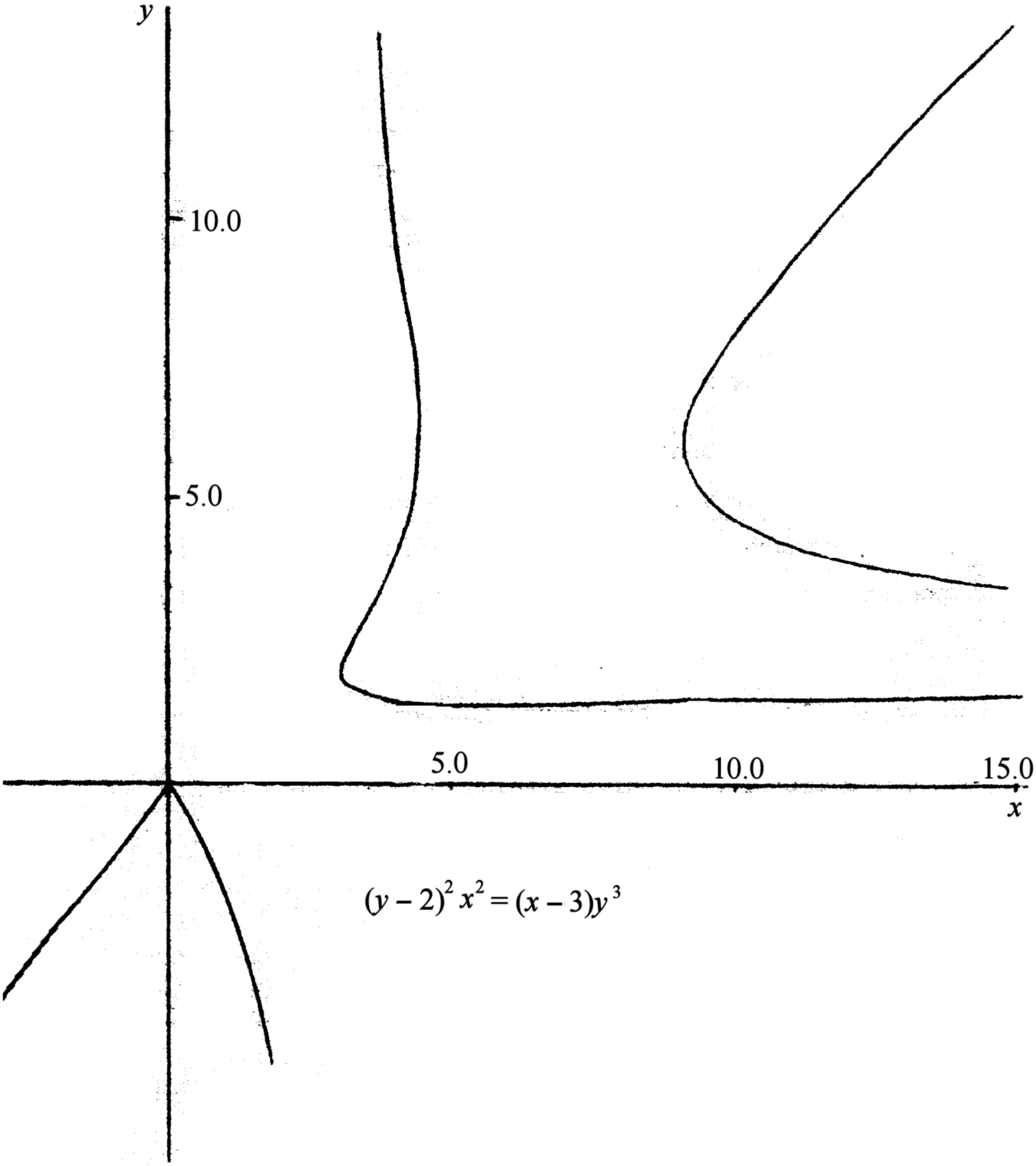
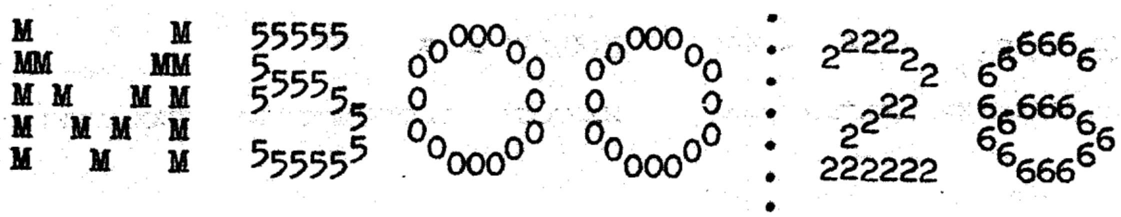

y
10.0
5.0
5.0
10.0
15.0
x
$(y-2)^2 x^2 = (x-3)y^3$



M500 is a student-operated and student-owned magazine for Open University mathematics students and staff. It is designed .to alleviate student academic isolation by providing a forum for public discussion of indrviduals' mathematical interests.

Articles and solutions are not necessarily correct, but invite criticism and comment.

MOUTHS is a list of names addresses and telephones, together with previous and present courses of voluntary members, by means of which private contacts may be made by any who wish to form telephone or correspondence selfhelp groups.

The views and mathematical abilities expressed in M500 are those of the authors concerned, and do not necessarily represent those of either the editor or the Open University.

The cover illustration this month is from Michael Gregory, who writes: "P Frost's Treatise on Curve Tracing gave me the idea for the curve on the cover. Some of us seem to require more symmetry smoothness and continuity for the enjoyment of a shape,"

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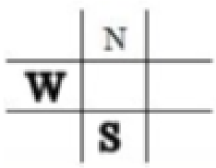
A N I N T R I G U I N G F R I E Z E - P A T T E R N

On a sheet of graph paper or the like, put in a configuration of ones as in the example below.

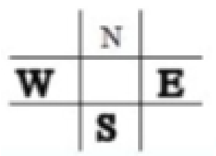
	1		1		1		1		1		1		1
		1											
			1										
		1											
	1												
1													
	1		1		1		1		1		1		1

In the top and bottom row, the ones are placed in every alternate square and we have, on the left, a sequence of diagonally placed ones joining the top row to the bottom.

Now fill in the pattern as follows:



becomes



where $E = \frac{N \times S + 1}{W}$.

If I have adequately described the procedure, the example above when completed should look like this.

	1		1		1		1		1		1		1
		1		2		5		1					
			1		9		4		1				
		1		4		7		3		1			
	1		3		3		5		2		1		
1		2		2		2		3		1			
	1		1		1		1		1		1		1

The amusing thing is that eventually the pattern terminates on the right with a sequence of diagonally placed ones joining the top row to the bottom. Now try one for yourself. If you make it too large you might find an electronic calculator handy!

David Asche, Staff Tutor E Anglia

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THE RULES OF THE GAME

In my first year with the Open University and now having completed over half of M100 including a visit to the computer facilities at Heading (I "creamed off" many megabuck spacecraft and got the star ship Enterprise hopelessly lost!) I would like to add to the discussion started by Richard Ahrens. I came into M100 (my second choice foundation course) having barely scraped through A-level ten years ago and having forgotten nearly all my school maths. The course and the subject came as a complete surprise to me but I was delighted to find the course so well prepared (apart from constant errors in assignment questions which even crept into the Summer School mock examination,) The course runs smoothly along and I have found no difficulty with either the English or the mathematics. What then are the difficulties? I would suggest the following:

1. Students with no mathematical aspirations taking M100 as second or third best and hence not enjoying the course. The only answer to this would be more foundation courses.

2. Students resuming studies after a long lapse who fail to get to grips with the course in the initial stages. The answer here is that more information should be given to prospective students about the form of the tuition at the pre-application stage - for instance the "Guide to the course" could be available at this time rather than when the studies begin.

3. Established mathematicians not being able to adapt to the new notation. Perhaps here the answer is that if they already know the mathematics of the course but in a different notation they should study some other subject.

As to the remake, all I would wish to see is in certain cases a greater detail in examples which too often seem to be manufactured with a particular element which bears no relation to assignment problems.

To those in difficulties I would just say stick with it and if the first unit on a particular topic does not make sense after the next two or three it will probably come clear.

Michael Masters

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I chanced to hear a play on the radio where a man was said to love his computer, which he called Digby. The one advance I've made this year over last in M100 is my improved relationship with Digby; by now it really is a love affair and I don't know how I'm going to survive through the long midsummer weeks without him. This improved relationship is not, however, due to M100 itself, but to the very interesting course PM951 (Post Experience). It's expensive, I'm afraid, but is an excellent, broad introduction to the subject of computing and computers and systems analysis. Practical sessions at the terminal go alongside Units on the other aspects. Obviously the actual computing will not reach the standard of M251 but it has enabled me to do the TMA on computing which I was wholly unable to attempt last year. Much of the computing is non-numerical (for those who reel at the sight of figures). It's a really good education in the subject; I much prefer PM951 to M100 and am learning much more from it because it concentrates on one branch of learning instead of flitting like a butterfly from subject to subject.

I have been interested in Richard Ahrens's and David Pedlow's articles in M500 on M100. I do not in the least agree with the latter that those who fall out are necessarily not suited to the course; they are simply not prepared for it. A book I have on elementary calculus says that students fail in the subject when the missing links in their understanding "are the basic operations of elementary algebra, geometry, and trigonometry." I have the feeling that, without the latter, it is pointless to study calculus. It must be remembered that the OU student is doing a very unusual thing in attempting to understand maths at foundation course level (which is necessarily abstract for otherwise it would be unsuitable by University standards) without a gradual and lengthy preparation via A-levels. Those who staff the maths departments at the OU and other Universities did not go straight to the conceptual level without first undergoing this more down-to-earth and numerical preparation. They will have studied for their O- and A-levels or equivalent, gradually undergoing a transition from the particular and numerical to the general and abstract.

The truly "open" M100 student (very much the minority of such students here) desperately need a preparatory course, and that one run by the OU staff, who fully understand what is needed. I have attended two short preparatory courses here run by other institutions which have helped not a whit. Courses run by correspondence colleges seem to me to concentrate too much on teaching what is actually in M100, which is better done by M100 itself, and not on what is needed, preparatory material for M100. I feel that really "open" students should be strongly advised to take a year-long preparatory course run by the University itself.

Vera Keates

THE AXIOM OF ARCHIMEDES

In M500 25, Percy Sillitto makes an interesting observation that the Archimedes' Axiom follows from Euclid's famous result about infinite primes. Let us have another look at Euclid's immortal poem:

THERE IS NO END TO PRIMES
Suppose not
Then there is the last one,
Call it q.
Look at $q! + 1$;
It has a unique prime factorisation.
But none of the primes divides $q! + 1$
For each, on division, leaves a remainder 1.
Ah! the prime factor of $q! + 1$, then, is greater than q—
q, the last prime!
Absurd!!
There is no end to primes.

Euclid.

Consider line 4 of the above poem. And ask the question - From what proposition does it follow that $q! + 1$ is a natural number, given that $q!$ is a natural number. The answer is simple. Euclid has assumed that if n is any natural number, so is $n + 1$. And this 'axiom of infinity' is one of the equivalent versions of the Axiom of Archimedes.

Datta Gumaste

149151157163167173179181

Is 'A Fine Romance' a song about two geometers? Jeremy Humphries

+++

OH!

No wonder they call it a circle, it's so round! Notice how the inside comes precisely to the line and not one whit further. And how the outside can't possibly get in. No corners is one of the principal things about a circle. An oval has no corners too but there are not nearly as no corners as a circle has. Circles are nice because we can go round in them. Hardly anybody ever goes round in squares. Every single place on the outside of a circle is the same distance from the centre as every other place. You can't say that about a parallelepiped.

Circles are often used to designate comments on TMAs and enough of them after some figure will show the national debt in round numbers.

There is nothing at present as round as a circle. But what with what science is accomplishing nowadays, doubtless there'll be something rounder before long. I think circles would be a lot less dull if they were oval.

Lytton Jarman

191193197199211223227229233

B O O K S

At the last day-school at Cambridge none of us knew how the Wronskian got its name. George F Sirmmons ("Differential equations with applications and historical notes", McGraw-Hill, 1972) tells us:

> Hoëné Wronski (1778-1853) was an impecunious Pole of erratic personality who spent most of his life in France. The Wronskian determinant was his sole contribution to mathematics. He was the only Polish mathematician of the nineteenth century whose name is remembered today, which is a little surprising in view of the many eminent men in this field whom Poland has given to the twentieth century.

The Simmons is a very nice book, with a lot of biographical notes ranging from a few lines to many pages. Another book which I recommend is "Elementary Number Theory" by Underwood Dudley, W H Freeman & Co, 1969. Dudley says that the longest arithmetic progression known consisting entirely of primes has 12 terms:

$$30030n - 6887 \text{ for } n = 1, 2, ..., 12.$$

A problem based on one in Dudley's book appears on page 15.

Jeremy Humphries

239241251257263269271277281

S E L F – H E L P G R O U P S

I am a member of a M100 subset, which by now is very much $<$ its starry-eyed beginnings. In fact I sometimes feel that its limit ↷ just one as I listen to my councillor, seated in an element of the intersection of the set of seats and of the $\emptyset$ set of all occupied seats.

I have read, with interest and envy the articles on Self-Help groups. It has not been possible to form one here. Not only is the remainder on division of our group very small, but the idea does not seem to have appealed to my fellow students and being the only girl left, I do not feel I can do any more luring. After all I do have a husband and a series of ... *!*

Having reached a stage of depression, common, it seems from M500, to even some of my superior fellow mathematicians, I reached for the MOUTHS list and found the name and address etc of an M100 student, living within reasonable distance and I telephoned. We had a chat, which cheered me up and I invited my self to their tutorial and commiserating session, which was due two days later.

After some organisation and a long drive, going round in many $2\pi r$'s in Kingston I found and met this group, which even after a 50% drop out and a 'poor' turn out that evening, still counted about 12. I was overcome by the numbers, but I left for home feeling much encouraged. I was made very welcome and I am grateful to them. Unfortunately the distance will prevent me from going there too often.

Reading Pat Pammentor's letter (M500 25) I feel pleased that I have stuck it so far. If they have had feelings of giving up, had it not been for their group effort, I may still have a chance.

When this issue appears, Summerschool, on which I have pinned many of my hopes, will be a thing of the past and November 10th looming large. If there is another solitary soul who wants to join me somehow, I shall be delighted. It may still be useful although time is running out.

Let me end by saying that my sanity has been saved by M500/MOUTHS on several occasions, may it be that this was not through trying to solve the problems.

Miek Warden

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SERIAL NUMBERS

Who has the highest serial number? Mary Bibby must be one of the claimants, in this new competition. Her number is E039..., for Ml00, but living in Argyll must have helped there. Mrs D Barker is also in the running — A036... , Basingstoke, but of course the A-year had the greatest number of places available. One non-MOUTH in London is B029... for T100. J D Bosworth in Poole, Dorset is A041...; another non-MOUTH in Windsor is B05I... . Forces numbers seem very high — Alan Cohen with E047... in Lee-on-Solent is probably our highest MOUTHS candidate at a rough glance, but one would like to know of high numbers in more routine occupational classes — how high do the teachers go, for instance? How high do clerks in London go?

If you have a high number, not in the A-year, let's hear from you as a statistic. We will call anything greater than –027... a 'high' number eligible for this competition. Please state your region, occupation class, sex, courses &c *at the time you were accepted* .

If anyone is equally curious about low numbers, mine claims to be the winning MOUTH – A001..., sent in two days before the opening date for applicants in 1970. If anyone beats that I will concede the crown as graciously as possible!

Marion Stubbs

3495535595675733795855895 97

T H R E E   L I N E   W H I P

AM289 HISTORY OF MATHEMATICS will definitely be available (1)

in 1976 and I hope that all those who were disappointed (2)

in 1975 will re-apply for 1976. Graham Flegg. (3)

E S S A Y S I N M A T H S C O U R S E S

Like Peter Weir (M500 24) I favour the above and believe that an essay, under reasonable conditions, would be a help to both student and examiner.

The student who understands the material and has done well so far, but who ‘freezes’ in an exam, would be given a chance to ‘break the ice’.

The examiner could frame the subjects so that an essay showed a student’s understanding of the principles involved, as well as his ability to use the techniques.

For example, possible subjects for M231 might include

(i) What, if anything, is wrong with the use of the Leibnitz notation?

(ii) Explain the concept of a ‘limit’ in mathematics.

I suggest that an essay of 20 – 30 minutes duration, i.e. 10% - 15% of the whole, with as wide a choice of subjects as possible. In fact, if a wide enough choice of titles is given, say a dozen possibles, then this question could be made compulsory.

Brian Woodgate

401409419421431433439443449

S E Q U E N C E S

I read with interest Hugh Mclntyre’s comments (M500 25) on my letter about sequences in M500 19. I agree that there is no question of finding ‘the rule’, only ‘a rule’. The central point about there not being any such thing as ‘the rule’ is that there cannot be any *a priori* justification for a rule. Choosing a rule only amounts to adopting a convention which we decide to follow. Fortunately most of us choose to follow the same conventions so that we can understand what other mathematicians are trying to tell us. Hence one should not talk of finding a rule as though it was lying about waiting to be discovered but rather of adopting an agreed convention.

However, Hugh Mclntyre still talks of justifying a rule by demonstrating that it generates the required bit of the sequence, but why do I need any justification at all? For this reason I do not agree that my last sequence: 1, 2, 4, 8, 18, 52, 206, 708, 6994 followed by 4996, 807, 602, 25, 81, 8, 4, 2, 1, ... fails as a solution. I could invent an arbitrary rule, namely ‘every sequence continues with 4996, 807, 602, 52, 18, 8, 4, 2, 1, ...’ This may look a silly rule, but it is a rule all the same. In fact the following are also rules (for which I written out the first few terms).

1) Continue every sequence with 3, A, 3, Z, 72, Q, ...

2) Continue every sequence with A, B, ±, /, 2, –10, V, ...

These rules do not depend on the original sequence in any way, but what is wrong with them? I think that ultimately I am free to choose any convention I like, however crazy it may seem.

If I may use one of the ideas of the philosopher Wittgen Stein we could say that we are guided through the agreed conventions of mathematics by a handrail. However you are free to let go of the handrail whenever you wish and go in any direction.

Tony Brooks

457461463467479487491499503

P I

π is nearly 3.2; so $\frac{\pi}{4}$ is nearly 0.8 = $\frac{4}{5}$, and this is nearly 4 arctan $\frac{1}{5}$. Let a = arctan $\frac{1}{5}$, $b = 4a - \frac{\pi}{4}$.

$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$. First let $A = B = a$ and then let $A = B = 2a$ to get

$\tan 2a = \frac{5}{12}$ and $\tan 4a = \frac{120}{119}$.

Then let $A = 4a$, $B = -\frac{\pi}{4}$ to obtain $\tan b = \frac{1}{239}$.

This yields the identity:

$$\pi = 16 \arctan \frac{1}{5} - 4 \arctan \frac{1}{239}.$$

John Machin (1706)

Und schreibt getrost; Im Anfang war die Tat. - Bohr.

MONGE'S SHUFFLE

Take a stack of cards and shuffle them in the following way: place the top card under the second, the third under both of them, the fourth on top, and so on. With a standard pack one ends up with the arrangement: 52, 50, 48, ..., 2, 1, 3, 5, ..., 47, 49, 51.

If there are $6k$+4 cards in the pack the shuffle leaves the position of the ($2k$ +2)th card invariant. With $10h$ + 2 cards the ($2h$ + l)th and the ($6h$ + 2)th cards change places. (In the standard pack of 52 cards these values are 18, 11 and 32.)

When there are $2p$ cards we can define a map that sends a card from its initial position x_0 to the position $f(x_0) = x_1$ as follows

$$f(x_0) \to \begin{cases} ½(2p + x_0 + 1),\ x_0 \text{ odd} \\ ½(2p - x_0 + 2),\ x_0 \text{ even} \end{cases}.$$

Shuffling the deck the mth time moves the card from position $f(x_{m-2})$ to the position $f(x_{m-1}) = x_m$, so $f^m(x_0) = x_m$.

According to Monge the following relation holds:

$$2^{m+1}x_m = (4p + 1)(2^{m-1} + (-1)^{m-1} \textstyle\sum_{i=0}^{m-2} 2^i) + (-1)^{m-1}\, 2x_0 + 2^m + (-1)^{m-1}.$$

If this were so then, since $\forall j\ f^j(18) = 18$ when $p = 26$ putting these values in should produce an identity. Also it should be possible to substitute x_0 for x_m in the equation to discover the number of shuffles (m) required to bring the pack back to its original order. Neither of these works, even knowing (by experiment) that $m = 12$.

I wonder if anyone can spot the error.

Eddie Kent

Is Wittgen related to Ep, Gert and Ein (whom nobody understands)?

L E T T E R S

Many thanks for the copy of M500. As usual I am cottoning on to a good thing late in the day.

I read with surprise that student numbers for M202 are small. As far as I am concerned it was the most enjoyable and interesting course I have so far taken - I should certainly encourage anyone thinking about it to take it.

Looking forward to future copies of M500.

Jackie Inglis.

Enclosed is a small contribution ($0 \leq x \leq n$) towards a typewriter ribbon so that you will continue to enliven the morning post. It has been a relief to sense the occasional pale voiced non mathematical student rising from your pages, the knowledge of there being other innumerates is worth the subscription alone. I would be interested to know if many - and how many is many indeed - of the D stream on MTD241 could not see the wood for the subscripts.

Congratulations on M500 presentation - the achievement of interesting variety with typescript and a few colours is refreshing - even if we can't do the problems the pictures are good.

Moke.

Publisher's note - Coloured paper costs about 30p more per ream than white, but weighs 70gm per cm^2 against 71gm per cm^2 for white. You get coloured only when weight more important than cost! Aesthetics does not enter into it.

R E P E A T   R E Q U E S T

Whenever writing to Marion Stubbs please put Name and MOUTHS No. on *every sheet*. When referring to problems please quote *problem number and title*. If not, I have to look it up but you have it in front of you already and could help in this way. Please do not sign things with a squiggle of initials, in a corner - the average daily post at 176 consists of cheques, requests, solutions, letters all mixed up to be sorted into files. I simply do not have the time to sort out who “ JBC” or whatever might be and write it in before filing. Please do what you can - it is appreciated. - MS.

OBITUARY

Professor Lancelot Hogben, F.R.S., the popular author of *Mathematics for the Million*, died on August 22, aged 79.

He was the son of a fundamentalist preacher which might explain why he took up scientific humanism. As the first of the county scholarship boys at Cambridge he developed a social resentment which lasted throughout his life and caused him to feel, as he wrote in the introduction to *Science for the Citizen*, that he had a “sheer genius for making enemies”. On the other hand H G Wells spent years asking “What have I done to offend Lancelot?”

Hogben emerged from Trinity, where he was Senior Scholar and Prizeman, as an experimental biologist. He spent some of WW–I in prison as a conscientious objector. Then in 1919 be began lecturing in Zoology at Imperial College and campaigning for the Labour Party. After that he went to Edinburgh to lecture in experimental physiology for two years then to McGill as assistant professor of Zoology. Prom 1927–30 while he had the Chair of Zoology at Cape Town he campaigned on behalf of the Coloureds.

At this point the LSE created a Chair of Social Biology for him. A member of his social science group, Enid Charles, became his first wife. He became an F.R.S. in 1936 at the age of 41 mainly for his laboratory work which included the Hogben test for pregnancy. And the following year he became Regius Professor of Natural History at the University of Aberdeen.

After another row he resigned in 1941 to become Mason Professor of Zoology at Birmingham but was unable to occupy this Chair because he was a colonel at the War Office. In this job he discovered medical statistics. To avoid another fight Birmingham created for him a Chair in this subject which he held from 1947–1961.

After the war he invented a new language, “interglossa”, and wrote a series of simplified books: *Signs of Civilisation*, *Mathematics in the Making* and others, and many articles; much of this was widely translated. His marriage to the demographer Enid Charles, with whom he had two sons and two daughters, ended in divorce in 1957 when he married Sarah Jane Evans. She died last year.

Publications included *Nature and Nurture* 1933, *Mathematics for the Million* (written as “one who had been frightened by mathematics at school” while in hospital) 1936, *Science for the Citizen* 1938, *Dangerous Thoughts* 1939, &c, and many contributions to the scientific journals.

++++++++

S O L U T I O N S

24.1 FOUR FOURS. $19 = 4/{\cdot}4 + 4/{\cdot}\dot{4}$. Bill Shannon.

24.2 QUADRATIC COEFFICIENTS

$ax^2 + bx + c$ has 2 roots in (0, 1). Show $a \geq 5$ and find an example with $a = 5$.

Put $f(x) = ax^2 + bx + c = (x - n)(x - m) = 0$ so $\frac{c}{a} = mn > 0$ and $\frac{b}{a} = -(n + m) < 0$.

Two roots $\Rightarrow b^2 > 4ac$. $a, b, c \in \mathbb{Z}^+ \Rightarrow b^2 \geq 4ac + 1$. (1)

$f(1) = a + b + c > 0 \Rightarrow a > -b - c$ or $a \geq -b - c + 1$;

$a + c - 1 \geq |b|$ since $b < 0$.

Thus (from 1): $(a + c - 1)^2 \geq |b|^2 = b^2 \geq 4ac + 1$ or

$a^2 \geq 2a + 2c + 2ac - c^2 = g(c)$. (2)

$\frac{dg}{dc} = 2 + 2a - 2c$. Thus $g(a + 1) = a^2 + 4a + 1$ is max g and since $n, m < 1$, $nm = \frac{c}{a} < 1$, hence $c < a$.

But $c > 0$. $\therefore$ min $g = g(1) = 4a + 1$.

From (2) $a^2 \geq 4a + 1 \Rightarrow a \geq 4 + \frac{1}{a}$ since $a > 0$. $\therefore$ $a \geq 5$.

Now $a + c > b > \sqrt{4ac}$; put $a = 5$, $c = 1$, then $6 > |b| > \sqrt{20}$

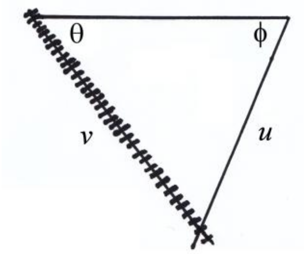
$\therefore$ $|b| = 5$; $b = -5$, and the quadratic is $5x^2 - 5x + 1 = 0$.

Dennis Hendley.

25.1 TRAIN CATCHING

In what direction should a man walk to try and catch a train due west of him and running between south and east?

South. Since he must set a course to maximise u/v in the diagram, which involves putting $\phi = 90^\circ$.



$$\frac{u}{v} = \frac{\sin\phi}{\sin\theta}$$

Steve Murphy.

Marjorie Brew obtains the same result by an intuitive argument so it must be true but I shall retain a healthy scepticism and avoid deserts. – EK.

25.3 FOOLPROOF SYSTEM

Initial fortune m. Each stake $\frac{1}{n}$ of current fortune. Probability 1/2. q wins, q losses. Final fortune?

$m(1 + \frac{1}{n})^q(1-\frac{1}{n})^q = m(1 - \frac{1}{n^2})^q < m$. Steve Murphy.

25.4 INSTANT ADDITION Find the sum of a Fibonacci sequence of 10 terms.

Multiply the 7th term by eleven. For generators x, y the sum is $55x + 88y$; the seventh term is $5x + 8y$. Jeremy Humphries, Marjorie Brew.

25.5 THE INHERITORS

Each heir receives £a more than his predecessor and $1/n$ of the remainder; each gets the same amount.

Let £x be the heritage, £y the portion of each heir.

The first receives £$a + \frac{x-a}{n}$; the second £$\left(2a + \frac{1}{n}\left(x - \left(a + \frac{x-a}{n}\right) - 2a\right)\right)$.

Equating these gives $x = a(n-1)^2$ so that $y = a(n-1)$. The number of heirs, $\frac{x}{y}$, is $n - 1$. Michael Masters.

25.2 We have no solution to show as yet. Datta Gumaste sent one and wrote to say it was wrong and would we please not mention it, so we won't. Dorothy Craggs seems to have done it, but her solution is too long for M500—running to 3½ pages. In a note accompanying it she writes

> "I'd like to know whether Roger Webster has a solution (so would we - Ed) as I suspect that none may exist – the proof would appear to depend on there being an infinity of primes of the form $6k + 1$. I have found a reference to a very neat proof that there is an infinity of primes of the form $6k + 5$, but it makes no reference to primes of the form $6k + 1$ or $6k + 3$, which suggests that no proof is known in these cases."

See Problem 26.2.

P R O B L E M S

26.1 FOUR FOURS II. Bill Shannon.

Find an expression using only the figure 4 four times, plus any mathematical symbols, which will equal 71.

26.2 TOP PRIMES. Dorothy Craggs (35).

Show there is no highest prime of the form

a) $6k + 5$
b) $6k + 1$
c) $6k + 3$.

In the cases b and c a construction of the greatest prime in the category will suffice.

26.5 A BORING TEASER. B Dowding (Maths Counsellor).

A cylindrical hole is drilled through the centre of a solid sphere. The hole is six inches long. What volume of material remains?

Mr Dowding says this problem came from an ancient *Scientific American*. It can be solved using calculus taking up about one side of a sheet of A4 but there is another, shorter solution. This is the one we would like please. Not more than four lines!

26.4 THE PIG. Jeremy Humphries.

A problem in Dudley (see page 6) asks

> A man sold n cows for n dollars each. With the proceeds he bought an odd number of sheep for 10 dollars each and a pig for less than 10 dollars. How much did the pig cost?

This is so simple that we will not set it but we will ask, can you prove the answer?

26.5 COMMUTERS. Bob Margolis (Staff)

Given a set S and a closed binary operation on S denoted by o.

Define a relation R on S by

$$x\ R\ y \Leftrightarrow x \circ y = y \circ x.$$

Problem How do the properties of R depend on those of o? e.g. under what conditions on o is R an equivalence relation? If o is associative does this tell you anything about R? Does S being finite make any difference? etc. Results known - essentially none!

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EDITORIAL

Marion said nobody noticed who edited M500/25. It was me - Eddie Kent. Which does not make this an Eddie-torial as has been suggested.

Through a typing error I stupidly put a wrong address for Marion Stubbs last month. Would anyone who was fooled please alter their head.

Also, as I should have mentioned last time as a rider to the usual information on the inside of the cover: anything unsigned is the sole responsibility of the editor who will be happy to enter into contraversy.

Does anyone want M500 printed as it were professionally? More to the point, does anyone want to print it? And if so who is prepared to pay for it, and how much? Maybe we could have people's views on this - and other aspects of M500 such as format, contents, etc. All of which leads up to the recurring plea: contributions are urgently required. There are 300 odd (?) readers so if they write 200+ words each we are out of trouble.

By the way, I am sorry to have abandoned "lettering" in this issue but if you look at 25 you must agree it's not my line.

EK

OPUS

We have a collection of miniloaders, following the distribution of the OPUS pages from M500 to all TM221 students in offprint form. The winner for sheer elegance is one by Ernie Poggio - 23 locations. It uses RETURN and a stack without ever using JMPSB. Clever stuff. John Owen revised Ernie's and reduced it to 19 locations, which surely cannot be beaten. However, according to my experiments, John's 19-address loader cannot be moved easily, if at all, whereas Ernie's is completely mobile and fits anywhere in OPUS without much alteration. So John wins on brevity, Ernie on elegance.

Meanwhile, Arthur Towning sent along programs for generating random numbers (simulating a dice game) and an 8-bit chain code generator (apparently old hat to T100 types), while Roger Bridgman provided a Fruit Machine program designed to keep his children quiet. The Fruit Machine + Ernie's High Address Version Miniloader completely fills OPUS, which is maybe a record in the short history of OPUS?

But all of these came too late for sensible publication in M500. OPUSes have to be returned next week. If there is a demand from MOUTHS who will do TM221 in future years, I will maybe put all these programs on stencils for distribution to those who ask for it. Let me know?

Marion Stubbs.

156/373.253.252.252.252.274.314.314.314.071.373.061.373.321.214.340.050.171; 002/007; 003/Main Program address; 005/156.163.163 P to 164 and RUN.
= Ernie Poggio's High Address Loader. Load your program direct from the keyboard. Errors? Reset 003, Pto 164, RUN.

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A LETTER FROM THE FIRST ‘F-YEAR’ MOUTH

Having just been accepted by the OU to do M100 next year, I am suddenly aware of the twenty-odd years of math-less desert behind me and the fearsome mountains ahead. No doubt there are plenty of old hands among you to whom M100 is a fond memory of easier times, but I would welcome comments from those who are still in the throes, particularly anyone with no previous background except an old School Cert.

So, no comfort or reassurance please, but constructive advice - either in M500 or direct to me at home or office.

Joyce Moore F0290059