

Newsletter No. 44
June 2005
I'm not quite going to avoid the subject of what's fashionable in mathematics education although I won't dwell on it. Mind you, I have seen formal exams come and go and come again, accreditation and all sorts of internal assessment. I've seen modules, which many teachers insisted was just another name for chapters, projects, development bands, unit standards and norm-based reference tests, to name just a few. Some are still with us. As to the relative merits of each, I make no comment although it does seem to me that many of the 'innovations' are simply attempts by each new generation of us to make our mark - and that's quite healthy, I suppose. Enough of that!

In attendance with new ideas, of course, comes new vocabulary. A buzz word of the past recently came to mind; lesson starters. Someone back-when had the thought that many of our lessons began with a fizz, didn't capture the class's interest from the outset which led to a general lack of interest and fall-off in pupil self-discipline, not to mention performance. The idea was to start each lesson with something that would grab pupils' attention - an excellent concept. I wonder if it has been absorbed by teachers, or to put it another way, has it been taken up by education colleges where teachers gain many of their pedagogical skills? I've no idea but since it is a fact that each lesson should start off with something to grab interest, while at the same time focus attention on the teacher, we've included a few ideas under the heading 'Lesson Starters' below.

Overheard in a classroom in which the lesson obviously did not begin with a starter!
Teacher: "Why do you think I'm teaching you maths?"
Pupil: "Maths? Gee, I must be in the wrong room - I thought it was French."

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## What's new on nzmaths.co.nz

## Numeracy Project

## Database

The updated version of the Numeracy Database is completed and open for the entry of 2005 data as of June 1. It can be found through the Numeracy section of the site or directly at:
www.nzmaths.co.nz/Numeracy/NumeracyDB2/
Please read the help file for information about how to use all the new features: www.nzmaths.co.nz/Numeracy/NumeracyDB2/help.aspx

## Uiui

The Uiui - the Māori version of the diagnostic interview - is now available online for teachers involved in Te Poutama Tau (or others who are interested).

## Lead Teacher Information

A collection of useful information for Numeracy Lead Teachers has been compiled and is available from the Numeracy section of the site or directly at:
www.nzmaths.co.nz/Numeracy/Lead Teacher/index.aspx

## Problem Solving Activities

Māori versions of the copymasters for virtually all of the problem solving activities are now available.

## Diary Dates

The annual conference of the Mathematics Education Research Group of Australasia, MERGA, is scheduled for July 7-19, 2005 in Melbourne. Put your search engine onto MERGA 28 for further details.

27-30 September. 2005: NZAMT Conference to be held at Christ's College, Christchurch. For more details check out www.nzamt9.org.nz/


ANZ Maths Week this year is the fourth week of Term 3, 15 to 19 August 2005, although activities and competitions start at the beginning of Term 3. Information about this year's activities will be available on the Maths Week site (www.mathsweek.org.nz) from 23 June, with the activities, games and competitions starting 25 July, Week 1, Term 3. Resources from previous years are available all year at: www.nzamt.org.nz
Some Maths Week activities are suitable for students even if schools chooses not to be involved, so please at least let all students know about Maths Week even if you do not intend to include it as part of your classroom program.
Maths Week is an initiative of the New Zealand Maths Teachers Association with support from the Ministry of Education and principal sponsor ANZ Bank. For more information please contact Ian Stevens at i.stevens@inspire.net.nz

## Some Lesson Starters

1. This one's called 'I'm thinking of a number'. The teacher, or later perhaps when the game is familiar, the pupil, has thought of a number and asks members of the class to write down what they think it is. The teacher then gives a clue that does not uniquely define the number. If the number previously chosen by a pupil satisfies the clue the pupil writes the same number down, if not $\mathrm{s} / \mathrm{he}$ writes down another number in line with the clue. The process is repeated until the number is uniquely defined and at least one pupil is sure $\mathrm{s} /$ he has it correct. When they are sure about their answer they may say so to the teacher/class.

## Example: Clues <br> Pupil's response

It's a whole number 100
It's less than $100 \quad 85$
It's odd 85
It's prime 83
It's 1 more than a multiple of $10 \quad 31$
It's 4 less than a multiple of $5 \quad 31$
It's more than $70 \quad 71$
Quickfire oral work like this at the beginning of a lesson immediately gets pupils on task and practises correct use of vocabulary and mental arithmetic at the same time.
2. This is an excellent starter to practice algebra skills. The teacher enters the classroom and without any preamble launches into statements like:
"Think of a number, double and add 10 "
or, "Think of a number, subtract it from 8 and double your answer so far."
or, $\quad$ Think of a number, multiply it by itself, and subtract 5
and so on.
I usually give them in batches of ten and occasionally mark them to measure progress in understanding the concepts. The class will already know that specific numbers should not have been chosen at the outset as this is an exercise in algebra. Appropriate answers for the statements given above are: $2 \mathrm{n}+10$, $2(8-n)$ and $n^{2}-5$.
3. The teacher enters the classroom and immediately begins to tell a story using a recognised pattern of speech. For example, "Good morning people, once upon a time ...". For this particular story algebraic skills are being exercised but as an alternative a purely arithmetical version may be used. A story might begin ...
"Once upon a time the dragon slayer Vossa decided to go hunting dragons. She gathered up her gear and set off. After travelling k kilometres she suddenly realised that she'd
forgotten her favourite stun gun and traipsed back home for it. How far has Vossa travelled so far? She then set off again. How far had Vossa travelled by the time she was back to where she first turned back?"

While the story continues pupils jot down their answers to the questions. Every five, perhaps, the story stops and the answers are read out.
"At this point Vossa decided to stop for a cup of tea. It took her an hour to unpack and $x$ minutes to boil the kettle and make the tea. How much time did she spend on these tasks altogether, in minutes?"

The answers so far are, of course; $2 \mathrm{k}, 3 \mathrm{k}$ and $60+\mathrm{x}$. Teachers can pitch the story at a mathematical level to suit or slightly extend the class and the plot made up as $\mathrm{s} / \mathrm{he}$ goes along. In my experience stories like these are very popular with classes and very effective in consolidating algebraic skills, particularly in setting up simple formulae which can be a pupil's weak spot. This starter can also be successfully used as a break in a lesson, something to provide a natural division when tasks are to be changed, or just for a break in routine.

These have been just three lesson starters. If you have some of your own and feel able to share them with us we would love to hear from you.

## Here's to a bit of history

If you want a bit of history to add spice to your lessons or to keep your students entertained or to entertain yourself, here are a couple of web sites that you might like to visit. We'll dip into them from time to time and extract what takes our fancy. Let us know if it takes your fancy too.

The first site this month is the "Earliest Known Uses of Some of the Words of Mathematics". It's URL is http://members.aol.com/jeff570/a.html. Well that's not quite true. The ' $a$ ' towards the end signifies that you'll land on the page that has things starting with ' A '. Here are a couple of entries that were chosen because they are words that most of us know about. Things like Abelian Groups might not be so well known but they are there too. So when did 'addition' get into the language? What about 'algorithm'?

ADDITION. Fibonacci used the Latin additio, although he also used compositio and collectio for this operation. Fibonacci, of course wasn't English so he can be forgiven for using strange words. Apparently the word 'Addition' was first found in English in about 1300 in the following passage:

Here tells (th)at (th)er ben .7. spices or partes of (th)is craft. The first is called addicion, (th)e secunde is called subtraccion. The thyrd is called
duplacion. The 4. is called dimydicion. The 5. is called multiplicacion. The 6. is called diuision. The 7. is called extraccion of (th)e rote.

The citation is from "The crafte of nombrynge" (ca. 1300), one of the earliest manuscripts in the English language that refers to mathematics. The transcription was carried out by Robert Steele (1860-1944), and it was first privately printed in 1894 by the Early English Text Society (London). It was later included in "The Earliest arithmetics in English", a sourcebook edited by Robert Steele, and published for the same Society, in 1922.

ALGORITHM is derived from the much older word algorism, and was "influenced by the Greek word arithmos (number)". However, some scholars believe it was not so influenced. (There you go. You can never trust scholars.)

In 1503 in Margarita philosophica Gregor Reisch used the headings Algorithmus de minutijs vulgaribus, Algorithmus de minutijs physicalibus, and Algorithmus cum denarijs piectilibus: seu calcularis. Under these headings are rules for handling fractions, astronomical fractions, and rules for computing on the reckoning board.

You need to read on to learn more about the English use of the word.
The second site we want to recommend is http://turnbull.mcs.st-and.ac.uk/~history/. (You can get there by typing in 'Mactutor' in your search engine.) This is a very comprehensive collection of things mathematically historical that is produced by members of St Andrew's University, Scotland.

Apart from giving you histories of all the famous mathematicians as well as many that we're sure that most people haven't heard of, it talks about mathematics in various cultures, and provides articles on different topics such as mathematical astronomy.

Now generally we don't get to hear too much about female mathematicians but you can find out about the best of these by looking up the index of female mathematicians. There is also an index of famous curves and you can see which mathematicians were born and died on this day (whichever day that is).

Going back to female mathematicians, you might be surprised to see that Florence Nightingale is listed there. But the fact that she was interested in maths, or maybe statistics, turned out to be very important. I'll pass over the details of her early life, though you might want to know why her sister was called Parthenope. In that case, why was Florence called Florence? Suffice to say that Florence pleaded with her parents to let her study maths - how about that? Her parents finally gave in to her demands in much the same way that they gave in to her wishes to be a nurse. Maybe this is not surprising as

During the mid-nineteenth century nursing was not considered a suitable profession for a well-educated woman. Nurses of the time were lacking in
training and they also had the reputation of being coarse, ignorant women, given to promiscuity and drunkenness.

With the advent of the Crimea war she was invited to oversee the introduction of nurses to military hospitals. The conditions in the hospitals were so bad that injured soldiers were 7 times more likely to die from disease in hospital, than on the battlefield.

But her statistical ideas were put to good use to improve conditions for the wounded. She was able to show that sanitary methods reduced mortality and in a few months had dropped the death rate from $60 \%$ to $2.2 \%$. You might be interested in seeing her Polar Area Diagram that she used to graphically represent her data on mortality rates. This data showed that if things hadn't changed the entire British force would have been wiped out by typhus and cholera alone.

Because of this work and similar work back home in Britain in military hospitals she became the first woman to be elected as a Fellow of the Royal Statistical Society.

Although she became bedridden due to an illness contracted in the Crimea, she still campaigned to improve health standards.

If you are ever in Waterloo Place in London (we think this might run into Pall Mall), you'll see a monument erected in her honour.

## Solution to May's problem

The numbers $a, b, c, d, \ldots$ in the cells of square $S_{1}$ are all either +1 or -1 . From $S_{1}$ a new square $S_{2}$ is formed (as shown) where each number in $S_{1}$ is replaced by the product of the numbers in neighbouring cells (neighbouring cells have edges in common).


| bd | ace | bf |
| :---: | :---: | :---: |
| aeg | bdfh | cei |
| dh | egi | fh |

What happens if the process is repeated indefinitely?

If you continue the process another step you will find, for example, that the entry in the top left cell is the product aaceeg, or to put it another way, $a^{2} \mathrm{ce}^{2} g$. Since each of $a, b, c$, etc. is +1 or -1 , their square is +1 and hence the number in the top left cell becomes ce. If the procedure is repeated you will soon discover, after a few steps, that every cell in the square becomes 1 .

Derek Smith of Lower Hutt got that answer but went on to ask a further interesting question. "But the question is, what is the largest number of times the operation has to be repeated before all the entries are ones?" In other words, no matter what the values in $\mathrm{S}_{1}$ are, after how many turns can be sure that you have got all ones? You might like to think about that the next time you have run out of books to read.

## This Month's Problem

Here you are asked to do some arithmetic with all the ten different digits 0 to 9 . What five-digit number when divided by another five-digit number (each of the ten digits being different) gives the answer nine. Oh, by the way, did I mention that the first number is odd?

So, place the ten different digits from 0 to 9 in the boxes shown. Remember that fivedigit numbers don't begin with a zero and that the numerator is an odd number.


If you feel mentally athletic I might mention that if the restriction that the numerator is odd is removed, there are two more solutions. You might like to have a go at finding them too. However, we will give a book voucher for one of the correct entries to the first part of the problem. Please send your solutions to derek@nzmaths.co.nz and remember to include a postal address so we know where to send the voucher if you are the winner.

## This Month's Junior Problem

Last month we ran our first Junior Problem. This is a monthly problem competition for students up to Year 8. We're giving a $\$ 20$ book voucher to the best correct solution sent in to the problem below. And we mean solution; we won't accept just a 'yes' or 'no' or number answer. That is, we need some explanation of how the answer was obtained.

The question was: Amal has two bottles. One can hold 300 ml and the other 500 ml . Can she measure out exactly 100 ml ? If not, why not? If she can, what is the smallest number of times she used the 300 ml bottle?

We had several entries but we'd like to see more so we'd appreciate it if teachers could spread the word to their students. Our first winner is Joanna Ng from Epsom Normal Primary School. Her answer is:

Step1: Fill the 300 ml container \& empty into the 500 ml container.
Step2: Fill the 300 ml container again \& pour into the 500 ml container until it's full $/$ reach 500 ml mark. The remaining water in the 300 ml container is 100 ml .

This month's question is as follows.
The Otahoehoe Post Office has only 40c and 50c stamps. Prunella wants to send a packet that is going to cost her $\$ 4.50$. In how many different ways can she make up this amount of postage just using the stamps available?

Remember that you will need to show how to make each possible combination and you have to say why there are no other answers.

Please send your answers to derek@nzmaths.co.nz.

