Newsletter No. 19 **November 2002**

A friend came to stay with us recently. Perhaps anticipating unsavoury weather, he brought with him a quantity of food, two bottles of rather fine wine, a book and two ties.
For a while I was puzzled at the last of these but my friend wouldn't enlighten me until later when we'd enjoyed some of the food and a bottle of the wine. As we lounged convivially after the meal, he brought out the two ties and the book.

The 85 Ways to Tie a Tie by Thomas Fink and Yong Mao is a delightful history of the tie and the science and aesthetics of tie knots. The preface begins with a quote from a book published in 1828 called *The Art of Tying the Cravat*; 'No one accustomed to mixing with the higher classes of society will be at all inclined to dispute the advantages arising from a genteel appearance'. It then goes on to describe how wearing a cravat helps achieve this state of grace.

We quickly perused the chapters on history and an introduction to topology and got on to spending an uproarious evening trying out some of the 85 knots described in the book. We picked up some interesting titbits on the way. Did you know, for example, that Joseph Conrad favoured the Victoria knot, while Fred Astaire preferred the four-in-hand and Frank Sinatra the Windsor?

One interesting aspect for me was that like all new areas of study where mathematics is applied, a notation had to be developed. Fink and Mao devised an algebra with three elements; left L, right R and centre C for the positions in which the active end of the tie could be wrapped and two operations: under $\oplus$ (away from the shirt) and over $\otimes$ (towards the shirt). To complete a knot, the active end must be wrapped over the front, i.e., either $R\oplus L\otimes$ or $L\oplus R\otimes$, then underneath the centre $C\oplus$ and finally through the front loop just made (denoted by T but not considered a move). The theory provides 85 practical knots, only some of which have names. Beginning with the tie around your neck you then follow the notation. $L\otimes R\oplus L\otimes C\oplus T$, for example, describes the four-in-hand knot.

You might like to try a couple more.

The Kelvin knot: $L\oplus R\otimes L\oplus R\otimes C\oplus T$

The Victoria Knot: $L\otimes R\oplus L\otimes R\oplus L\otimes C\oplus T$

"Mathematics is the classification of all possible problems and the means appropriate to their solution."

W. W. Sawyer

This is our last edition for the palindromic year 2002. We trust you will take the well-earned opportunity for rest, relax in your special way and return to read us next year.

And may be we are the first to wish you a Merry Christmas this year.

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This month's recommended site

As you may have noticed we are trying to send you a new site each month that we think is pretty good and may be of help to you. This month we have Aunty Math. Before we get to it, I should say that we have reviewed about 100 maths sites this year. You'll find them listed in the links component of the nzmaths site.

Site title: Aunty Math

URL: http://www.dupagechildrensmuseum.org/aunty/index.html

Purpose of the site:
This site provides problem-solving challenges and information about problem solving strategies for students working at levels 1 and 2 of the NZ mathematics curriculum.

New Zealand context:
The challenges presented here could be used in small or large group teaching situations, or students could work independently to solve them. The *Learn How This Site Works* section contains a very useful list of strategies children could use to solve the problems and would be a useful classroom reference for both teachers and students. There is also a bank of previous problems which is a great reference.

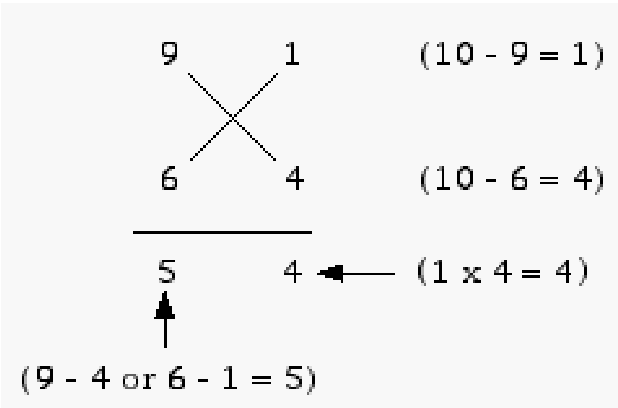
New and Different:

The problems are authentic, using meaningful contexts for the maths presented. The same characters are used in the stories given and children will begin to identify with these characters if the problems are solved regularly.
There is a facility for students to email Aunty Math to tell her their answers and this would be a great follow up activity. Aunty Math promises to post their solution on the site with a response from her if they include information about the strategy that they used.

Curriculum References
Mathematics, Levels: 1-2
Strand: Number and Algebra
Mathematical processes: Problem Solving and Developing Logic and Reasoning

A little bit of history

According to Robert Recorde (1510? - 1558), an Oxford University mathematician and teacher, one only needed to learn the multiplication tables as far as five by five. To multiply 9 by 6, for example, he suggested the following method:



So, 9 x 6 = 54. Try a few more examples and see that the method always works.

More on minus times minus

Chris Linsell is a lecturer at the Dunedin College of Education. It turns out that he had given a paper on ‘minus times minus’ at the MERGA (Maths Education Research Group of Australasia) conference earlier this year. Here is a précis of that paper.

Current approaches to teaching mathematics in New Zealand place emphasis on the use of meaningful contexts. One method of teaching multiplication of two negative numbers uses video. We rolled model cars along the ledge under the whiteboard, going both forwards and backwards. If a car was going forwards we wrote a plus sign on the board behind it, and if it was rolled backwards, a negative sign. The motion of the cars was recorded using a video camera. I then put the tape in a VCR and we watched it on a large television screen. I played the tape in both forwards and backwards directions and led a discussion of what we were seeing, whether the car was really going forwards or backwards and how this could be interpreted in terms of multiplication of integers. The discussion focussed on the apparent motion of the car on the video and how this related to actual motion in real life, and the direction and speed of motion of the video tape. Each time I asked whether the direction of the car's actual motion was positive or negative, whether the videotape was playing in a positive or negative direction, and whether the apparent motion of the car was in a positive or negative direction. Unfortunately this context of the car's motion on video met with limited success in promoting the understanding of multiplying negative numbers.

He also had this way of showing that minus times minus equals plus.

$$
\begin{aligned}
&(-1)\times(-1)\\
&\quad = (-1)\times(-1) + (0)\times(1)\\
&\quad = (-1)\times(-1) + (-1+1)\times(1)\\
&\quad = (-1)\times(-1) + (-1)\times(1) + (1)\times(1)\\
&\quad = (-1)\times(-1+1) + (1)\times(1)\\
&\quad = (-1)\times(0) + (1)\times(1)\\
&\quad = (1)\times(1)\\
&\quad = 1
\end{aligned}
$$

Staff Seminars

There wasn't actually a fanfare when we started staff seminars. I guess that we expected you to just notice automatically. But someone said that we should give them a bit of a plug, so here goes.

If you click the Info Centre cube on our Home page, you'll get a number of options including the newsletter and … staff seminars. The point is that we thought that you might like to have some inspiration for syndicate meetings or you might like to say something about maths in a staff meeting at some stage. So we have taken the opportunity to offer you a few things mathematical for just those occasions.

Staff seminars come with a mathematical background, an outline for the seminar, and material for overhead transparencies.

At the moment we have only three on the site (but several more have been written and should go on any time. These are entitled Snakes and Ladders, Lotto, and V-numbers. The first two are about some aspects of probability and the third is on problem solving.

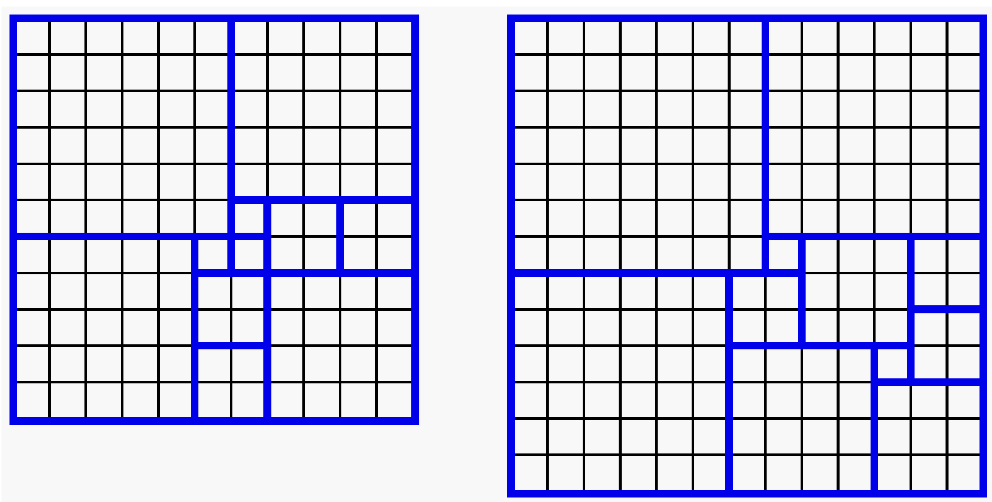
In the wings are seminars on the Bright Sparks puzzles that are currently being created. These are animated puzzles that have some mathematical depth. We hope that you and your students will enjoy playing with them. But you might like to tell the rest of the staff about them and you might like to help them to work with them. The Bright Sparks seminars will give you the mathematical background to the puzzles. They may help you to answer the awkward questions that students often have. Try Frogs now.

We'd appreciate it if you could let us know if the staff seminars are useful. We'd also be happy to write some for you on a topic of your choice. Get in touch with Derek at derek@nzmaths.co.nz.

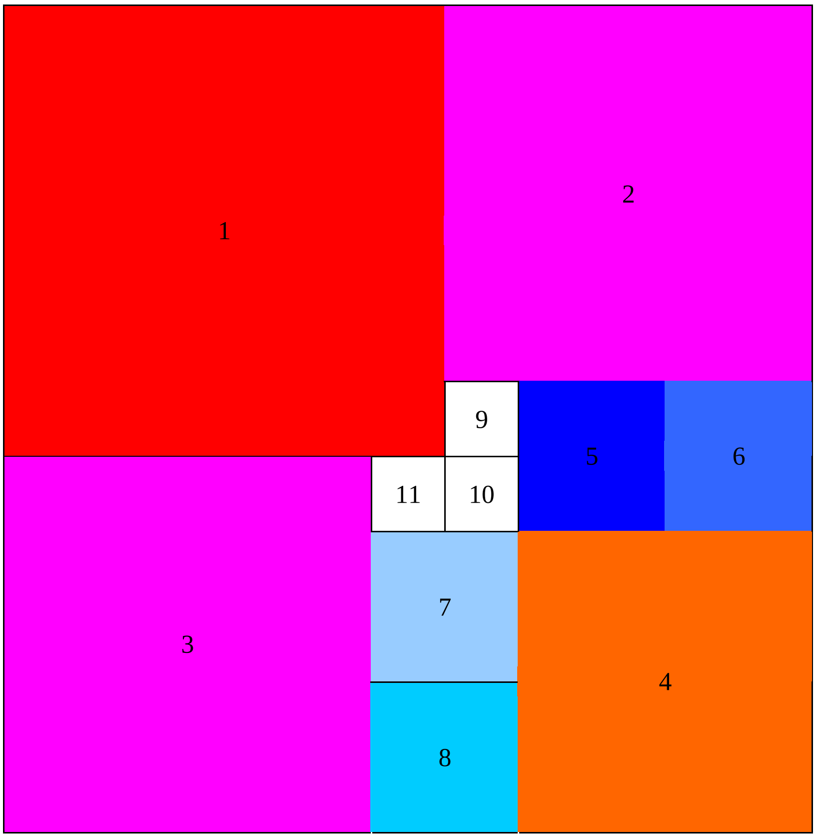
Solution to October's problem

You were asked to solve the problem of finding the minimum number of squares into which a square of side 11 units can be cut, then solve the problem for a square of side 13 units. The smaller squares must also have sides of length which are whole units.

Unfortunately there doesn't seem to be a general method for solving these dissection
problems. That means, of course, that there is a lot of trial and error but at the same time
you will be looking at symmetries, areas and lots of basic arithmetic, so there's plenty of maths content. Strangely enough the solution to both problems is the same, namely 11, as these two diagrams show.



The best answer that we received came from Kath Cherrie of Porirua. Her colourful answer for the 11 square is below. Congratulations Kath. A voucher is on its way.



This month's problem

Here's a two-way addition problem using the nine different positive digits 1 to 9. The numbers form a correct sum as they stand or if they are looked at turning your head 90°
anticlockwise.

$$
\begin{array}{rr|r}
 & 5\;8 & 3 \\
+ & 1\;4 & 6 \\
\hline
 & 7\;2 & 9 \\
 & + &
\end{array}
$$

The question is, are there any other such patterns using the digits 1 through 9?

Each month we give a petrol voucher to one of the correct entries. Please send your solutions to derek@nzmaths.co.nz and remember to include a postal address so we can send the voucher if you are the winner.