

Newsletter No. 10
February 2001

La Multi Ani! Buon Anno! Happy New Year! Gott nytt år! Boldog uj evet! Godt nyttå! Gelukkig nieuw! Feliz ano nuevo! Srecna nova godina! Feliz ano novo! Hape Nuia Pau! I hope you get the message!

Well, we trust you're all relaxed and raring to go after the summer holidays. I thought we'd begin this newsletter by reminding you of what the NZ Maths Site is all about:

In it we take a problem solving approach to maths lessons. It's our basic philosophy of maths education and so all our material is based around a problem or an activity of some kind. We do that because we believe:

- it's more fun that way;
- it leads to better learning;
- it gives you a better idea of what maths is all about; and
- it's the way that research mathematicians do it.

Each month we have a newsletter to go with the web site. When you have registered for it the newsletter will be automatically emailed to you every month. In each issue we plan to have:

- information regarding the site and its development;
- specific comments about different problems and units;
- discussions on various aspects of the learning and teaching of mathematics;
- your general comments and queries;
- answers, comments and ideas from your students; and
- anything else that seems to be important to the teaching, learning and understanding of mathematics generally.

Your contributions are important and always valued. They don't necessarily have to do with the site itself. Anything to do with maths that concerns you - interests us and, we believe, would interest other teachers.

Looking back to the last issue in November, I'd better explain the Martin Gardner problem. The statement: 'When asked how old she was, she smiled and said cryptically, "The day before yesterday I was 22 but next year l'll be 25 "' makes sense only if she made it on 1 January and her birthday was 31 December. The reference to New Zealand war hero Curly Blyth related to the time frame of the problem which spanned three years. Curly Blyth's life spanned three centuries.
O.K. Let's get on .....

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## WHAT'S NEW ON THE NZMATHS SITE THIS MONTH?

Over the Christmas break we edited and then added the material written during our writers weekend in November. Listed below are these new additions:

## Problem Solving

| Counting Pills | Algebra | 4 |
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| Clockwise | 2 |
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| Red October | 4 |

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| :--- | :--- |
| Letter patterns | 2 |
| Building patterns constantly | 3 |
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## DIARY DATES - COMING EVENTS

## Computer Programming Courses for Canterbury Students

The Christchurch College of Computing (managed by Burnside High School) is offering 3 Computer Programming Courses for Canterbury Students (any age!) in term 1 of 2002, depending on the interest shown.

- Introduction to Quickbasic (for beginners) starts Saturday 9 February 2002
- Introduction to Visual Basic starts Saturday 9 February 2002
- Introduction to Jade starts Tuesday evenings 12 February 2002

For further details and entry form, look at website www.cosc.canterbury.ac.nz/~cces/ or www.ict.school.nz Entries close Monday 4 February 2002 (for Jade), Wednesday 6 February 2002 (for Quickbasic and Visual Basic)

Contact person: V Gough-Jones, Christchurch College of Computing, ph (03) 982 9822, fax (03) 982 9002; email admin@ict.school.nz

## MERGA 25

The annual conference of the Mathematics Education Research Group of Australasia (is scheduled for July 7-10, 2002 at Auckland University. The 2002 MERGA conference will provide opportunities for mathematics teachers, educators and curriculum developers to contribute and listen to research presentations and be actively involved in workshops, symposia and special interest groups developed around the conference theme of Mathematics Education in the South Pacific.
For further details look on the conference website:
www.math.auckland.ac.nz/MERGA25

## LESSON IDEA - DECIMALS

"The word 'lesson' came back to Pooh as one he had heard before somewhere. "There's a thing called Twy-stymes", he said, "Christopher Robin tried to teach it to me once, but it didn't."

## A.A. Milne

Have you noticed that some children never seem to fully grasp decimals? When you think about it, it's not surprising we have difficulties with them. The notation appeared quite late in the history of maths which suggests decimals involve a level of sophistication higher than mere counting and the four rules of arithmetic.

To bring some insight to decimals you might like to try the following activity with your class. Tell them you are going to play a game and they have to work out the game's rules. Tell the class that you will ask them to suggest any number between 1 and 10 and you will reply "yes" or "no". When you have answered they are to give you another number between 1 and 10 for a further response. This continues as long as necessary. What they have to do is to get only the 'yes' response which, of course, will tell them (and you) that they know the game's rules.

A typical first suggestion would be 8 which would elicit a "yes". Then someone in the class might try the number 6 to which you would respond "no". At this stage I should tell you the rules of the game and there's only one - it is that the numbers they give after each "yes" response should have one further decimal digit than the number before. For example; $3,4.6,5.88,9.234, \ldots$ would get a sequence of "yeses" while $3,4,4.6,5.8$, $5.88,9.234, \ldots$. would get "yes", "no", "yes", "no", "yes", "yes". So when the students give a correct response you answer "yes', otherwise it's a "no".

Even older students find this game very difficult. It's as though for them only whole numbers exist. After their first response to your, "Give me a number between one and ten", they will persist in trying all the other whole numbers between 1 and 10, some more than once (getting a "no" each time), then try outside the range 1 to 10 (eliciting another "no" of course). It takes quite a long time before someone suggests a number which is not whole and if the first person tries a fraction rather than the decimal the game sometimes never ends, i.e. the class never fully understands the rules, at least, not without some prompting from you.

When the class has got the hang of the game you might introduce an additional rule. For instance, you might only accept numbers that use the digit " 5 ". That would force students to give you $5,5.5,5.55$, etc. You might get them to think up other additional rules.

Are we surprised that even some of us 'growed ups' find decimals difficult? Perhaps we shouldn't be, after all the system is contrived. It didn't arise naturally from a need to understand our world but as something designed to unify a plethora of different systems of units and to simplify the processes of arithmetic.

## sOLUTION TO NOVEMBER'S PROBLEM

You were presented with the following alphametic in which letters of the alphabet in an addition problem were to be replaced by numerical digits, each different letter standing for a unique digit and the arithmetic holding true.

HAPPY +
HAPPY
HAPPY
DAYS
AHEAD
The winner of our $\$ 50$ prize was 10 year old Kane Raharuhi from Broadgreen Intermediate School, Nelson. Very well done Kane, don't spend all the prize money at once! The problem was given to Kane's class by trainee teacher Andy Johnstone. Kane's class teacher Neil Seagar sent us the information. Thanks guys. It's good to see teachers out there doing that extra bit to stimulate their pupils.

Well, to solve the problem requires a certain amount of trial and error but it's not random trial and error. For example, since there is no digit carried in the left-hand position of the answer, H must be 1,2 or 3 . Almost immediately it can be seen that H cannot be 3 and a little experimentation shows it must be 2 .

The problem then becomes,

> 2APPY 2APPY 2APPY DAYS

It is now clear that A must be $6,7,8$ or 9 but 6 and 7 are immediately disqualified because the second column on the left would then be at least $6+6+6+\mathrm{D}$ which means at least 2 would be carried over in to the left hand column. That in turn means that A would then be at least 8 - a contradiction. By such arguments A turns out to be 9 and the problem becomes,

2 9PPY
2 9PPY
2 9PPY
DAYS
9 2E9D
The next step is to show that $\mathrm{D}=3$ and use thoughtful 'trial and error' for the remaining digits. By this time, of course, the number of digits to trial is much reduced and the task simpler. The solution to the problem is,

29661
29661
29661
3910
92893

## PROBLEM OF THE MONTH

To help understand electrical componentry, electrical networks are often drawn. Similarly, underground maps are provided to help find our way about large cities and to investigate our ancestors, family trees are drawn. All these diagrams have something in common. They consist of points (electrical components, stations, people) and show how they are interconnected. The length and angle of the lines is not important.

Mathematician Denes Konig made the first systematic study of such patterns giving them the generic name 'graphs'. What has graph theory got to do with the following problem you may ask? Well, you might find a graph diagram helps you understand it, especially as it seems we are given too little information to solve the problem.

My wife and I recently attended a party at which there were four other married couples. Various handshakes took place. Of course, no-one shook hands with himself (or herself) or with his (or her) partner and no-one shook hands with the same person more than once.

After all the handshakes were over I asked each person, including my wife, how many hands he (or she) had shaken. To my surprise each gave a different answer. How many hands did my wife shake?

