Newsletter No.7   **September 2001**

This month we have an article from Jan Wallace on the new qualifications scheme, the National Certificate of Education Achievement. Derek chips in with a book review on numeracy and t the Americans are thinking of as numeracy. Numeracy is obviously something that it is going to be a hot potato here for a while so it's nice to know that other countries are grappling with the same problem.

As usual we finish with the solution to last month's problem. I'm glad to say that we are getting solutions from more than one reader. In fact this month's winner is a school class. Congratulations to them. There must be other classes out there that can do these problems. Can we here from you too?

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WHAT'S NEW ON THE NZMATHS SITE THIS MONTH?

Number Component
1. Number Facts
   - Empty number lines (level 2).
   - More empty number lines (level 3).

2. Operating with Numbers
   - Arrays Hooray – a level 2 multiplication unit.

Site Statistics
The site statistics for the month of August are:

- Total sessions served: 19119 – This is how many users connected to the site this month.
- Total hits made on server: 772817 - this is the number of parts of a page downloaded.
- Total page view hits: 117931 - This is the total number of web pages viewed this month.

- Average page views per session: 6.17 – So on average each user looks at 6.17 pages.
- Average time spent per session: 331.51 seconds. So on average each user looks at the site for 5minutes and 31 seconds.

PERSONALITY OF THE MONTH

This month we feature Jan Wallace who will certainly be known to many people in the Auckland and Northland areas. She has contributed the article below on the NCEA.

Jan is an adviser with the Auckland Advisory Service, which is now called Team Solutions. Prior to that she was head of Maths at Papakura High School. Her interest in mathematics came from a really positive and enthusiastic maths teacher - Margaret Laidlawt.

Jan is married to a primary teacher and they have three adult sons. One of these is in New York, one has just returned from 3 years overseas and the youngest is currently on a safari through Africa. The first is an accountant specialising in taxation consultancy, the next an electrical engineer and the third a quantity surveyor, so all have chosen careers that use maths in some way. Jan had ten years out of teaching when the boys were small and during that time relieved at her husband's small rural school. For variety in life she developed maths and science activities for his class and then sent him off to do administration while she taught his class!

Jan has had a number of leadership roles related to maths teaching. She is a past president of both the Auckland and New Zealand Associations of Mathematics Teachers and has been heavily involved in assessment developments and professional development. Her goal as president of NZAMT was two-fold. Firstly she set about getting extension resources developed, especially for primary students. She could see from her husband's school how hard it was to meet the needs for all the ability groups and she felt this was a way in which we could provide ideas for teachers to extend their students. Secondly she initiated Maths Week across all levels of school.

In her spare time she enjoys spending time with the family (when they are in the same country) and going out for dinner and movies with her husband. They both enjoy travelling when the budget allows. They have a caravan at the beach which they enjoy in summer and make the most of their opportunities for swimming and relaxing. (But there is still a computer in the caravan so Jan can do the odd spot of work.) Both Jan and her husband are both involved in the Anglican Church where she is currently training for the ministry.

NCEA and All That, by Jan Wallace

NCEA stands for the National Certificate of Education Achievement and from 2002 this will replace the current examination system in the senior secondary school. There will no longer be a School Certificate examination in its current form. However there will still be an examination at the end of the year. For Mathematics it is probable that it will still be a 3-hour paper. In 2003 the same system will run for our Year 12 students and in 2004 for Year 13. From this you will see that in fact there will be more external examinations run by the New Zealand Qualifications Authority than there are in the current system. This

may be contrary to some of the publicity you may have read in the media in some parts of the country.

So why change? What is so different? The difference is in the way the examination is set up and marked and the place of schools' internal assessment. At the moment, the only internal assessments for qualifications in mathematics are in Year 12 for Sixth Form Certificate, where all subjects are totally internally assessed and at Year 13 where there is currently a Statistics project worth 20% of the Bursary mark.   Some other subjects also have internally assessed components at Year 11 for School Certificate.

With the introduction of Level 1 NCEA, the traditional Year 11 course in Mathematics will be divided into 9 'modules' called Achievement Standards. Six of these will be assessed in the external exam at the end of the year and the other 3 will be internally assessed. Each Achievement Standard has a number of credits associated with it. For example, the Achievement Standard Number has 3 credits while Algebra has 2 credits. A student will get all or none of the credits for each Achievement Standard depending on whether they achieve the standard or not. Altogether the 9 Standards have 24 credits. A student needs a total of 80 credits from all of their subjects for their NCEA at each Level but they do not need to get all of these credits in one year.

At Level 1, there will be internal assessments (done in school) for Statistics, where the students may possibly use computers or other tools to help with their analyses. They will be expected to carry out practical measuring in the Measurement internal assessment and in Geometry they may be asked to create a model or design. All of these may take the students longer to complete than is currently possible in School Certificate examination. So practical skills not previously possible to assess in a written exam, can now be included in internal activities.

Within each assessment activity there are questions addressing the different levels of credit, merit and excellence. Being standards-based assessment the student should know, before attempting the activity, what they need to show in order to achieve credit, merit or excellence. The assessor then has to check the student's work to see that they have provided such evidence.

During the first two terms this year Catherine Udy and I were contracted as co-National Facilitators to work with regional facilitators to train teachers. You are probably aware that all secondary schools have been closed for 1 day in term 1 and one day in term 2 to allow for this training to take place. This has also involved looking at material trialled with students and ensuring that we are ready to effectively implement the system in 2002.

NEWS FROM THE USA

Derek has been reading a new book from the States and we present a summary of his thoughts. It seems that there is a push towards numeracy all over the world.

I have just finished reading *"Mathematics for Democracy: The Case for Quantitative Literacy"* Lynn Arthur Steen (Ed), National Council on Education and the Disciplines, 2001. While we in New Zealand have been groping for a definition of Numeracy, the Americans have called it Quantitative Literacy and written a book about it!

The book is in two parts. The first presents "The Case for Quantitative Literacy". This has been prepared by a group of educators with impressive credentials and it spells out quite clearly what they mean by Quantitative Literacy and how it differs from mathematics. Basically Quantitative Literacy is the numeracy we were fumbling to define. The book makes the following points:

- Quantitative literacy is important for **all** citizens in the Twenty First Century;
- Quantitative literacy should be found in **all** subjects, not just mathematics;
- Quantitative literacy involves confidence in mathematics, a cultural appreciation of mathematics, the ability to interpret data, logical thinking, making decisions, mathematics in context, number sense, practical skills, and symbol sense;
- The above skills could be, but have not necessarily been, taught or learnt through mathematics courses; and
- To enable students to become quantitatively literate, teachers must encourage them to see and use mathematics in everything they do.

The second part of the book is a collection of comments on the first part by a variety of authors. Not surprisingly they are all sympathetic to the idea of quantitative literacy. However, they do add extra dimensions that make valuable reading. In one way or another they point out that

- Quantitative literacy is not the same as mathematics nor is it an alternative to mathematics; and
- Quantitative literacy requires a pedagogical approach that is not currently common in the USA (the need for "real" problems, the testing of hypotheses, and problem solving generally);

One of the authors (Schoenfeld) goes as far as to say that

- Quantitative literacy and mathematics should be thought of as overlapping;
- Every student should be enrolled in mathematics courses every year of high school; and
- Over the 4 years of high school mathematics, all students can and should become quantitatively literate.

It seems to me that this book is pointing us in the right direction. It does seem to me, however, that it will not be easy to produce a blueprint for quantitative literacy over the whole curriculum. But it is important to head in this direction.

NEWS FROM NEW ZEALAND

The recipients of this year's Teacher Fellows (a scheme that we advertised earlier in the year) were short listed in a meeting at the Royal Society a week or so ago. We hope to be able to announce the winners in next month's newsletter.

DIARY DATES

If you are in the Wellington region you may be interested in attending the following Professional Development Day.

Primary Mathematics Professional Development Day
Saturday 13 October 2001
Wellington College of Education

WMA's Primary Group is planning a series of workshops, with a focus on the Number strand. Registration from 8:30am will be followed at 9:00 by a plenary session. After a break for morning tea, your choice of workshops (each 50 minutes) will take you through to a light lunch, and then one further workshop. The day will conclude with everyone together for another plenary speaker, finishing at around 3:00pm. A charge of $20 will be made to cover costs; this can be paid on the day.

We would love to hear from practising primary teachers who would like to present a workshop on the day. Please contact either Di Drake or Linda Bonne at the College of Education on telephone number (04) 476-8699 or facsimile number (04) 476-079, email draked@wce.ac.nz or bonnel@wce.ac.nz.
Detailed programmes will be sent to schools in the wider Wellington region in the next few weeks. We look forward to seeing you there!

THE AUGUST SOLUTION

Last month we asked the following question: If all of the numbers 1, 2, 3, …, 10, 11, 12, … and so on were written in a line, what would be the 2001 digit. (For instance, the 12th digit is the first 1 in 11 – see in the solution below.)

The winning entry came from Room 3 Awapuni School, Gisborne. Here is their solution.

We had a few problems with this problem but our teacher helped us. This is what we did. We started by taking away 9 from 2001 because of the 1 digit numbers and that left 1992.

We then took 180 away from 1992 because we got that many digits for numbers with 2 digits. We got that by counting the digits between 10 and 19, 20 and 29 and so on then multiplying by 2 because each number has 2 digits. (They are down to 1812 now.)

Between 100 and 199 there are 100 numbers and each of these has 3 digits so we took off digits in lots of 300's: 1812-300 = 1512; 1512-300 = 1212; 1212-300 = 912; 912-300 = 612; 612-300 = 312; 312-300 = 12. So we counted and the 12th digit was a 1. We thought that was the answer but then we realised that the 12th digit we needed should have been counted from the 3 digit numbers not the one digit numbers. So instead of subtracting from 2001 we added up from 1 so we got 9 + 180 + 300 + 300 + 300 + 300 + 300 + 300 = 1989; then we needed 12 more. To work out what number we were up to we counted 100 numbers for every 300 digits so by 1989 we were up to

number 699 the 9 in the ones column. Then we wrote down the next 12 digits 700701702703 and we got the digit 3.

So the answer is 3.

Congratulations Room 3 Awapuni!

PROBLEM OF THE MONTH

Here's one that's a bit like last month's. There are 9 x 8 x 7 x 6 x 5 x 4 x 3 x 2 x 1 = 362880 9 –digit numbers that use each of the digits 1 to 9 once each. You can see this because there are 9 choices for the first digit and after that there are only 8 choices for the second digit, and so on. If all of these 9-digit numbers are written out in order starting with the number 123456789, what is the 2001th number?

Once again we will give a $50 petrol voucher to (i) anyone who sends us a solution to this month's problem (we'll choose one at random if we have a deluge) or (ii) anyone who sends us a problem that we can use here next month.
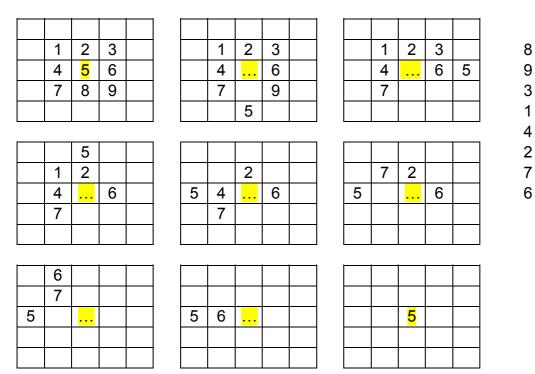
More on July's problem

Place 9 coins in a 3 by 3 array somewhere in the middle of a chessboard. A coin can 'take' another coin by jumping over that coin and landing on an empty square. Show that in a sequence of 8 'takes', all the coins except one can be removed. Is it possible for the last coin to end up on its original square? (More than one coin needs to be moved.)

Cathy Walker and her class used a spreadsheet to solve the problem. She says "I have attached a spreadsheet with the solution to this month's problem as I thought this was easier than trying to explain in writing. We (the kids and I) found quite a few ways to leave 1 coin and found this way where the no. 5 coin starts and finishes in the middle. We found the easiest way to keep track of where and what we'd moved was to make a picture up on the computer and then use undo and redo to keep track of our moves."

Here is a copy of their spreadsheet result.

Grid 1:

1	2	3	
4	5	6	
7	8	9	

Grid 2:

1	2	3	
4	…	6	
7		9	
	5		

Grid 3:

1	2	3		
4	…	6	5	
7				

Grid 4:

	5		
1	2		
4	…	6	
7			

Grid 5:

		2		
5	4	…	6	
	7			

Grid 6:

	7	2		
5		…	6	

Grid 7:

	6		
	7		
5		…	

Grid 8:

5	6	…		

Grid 9:

		5		

8
9
3
1
4
2
7
6

We also mentioned the 52 by 52 problem as a follow up. Place 2704 coins in a 52 by 52 array somewhere in the middle of a chessboard. (Of course, it has to be a pretty big chessboard!) A coin can 'take' another coin by jumping over that coin and landing on an empty square. Show that in a sequence of 2703 'takes', all the coins except one can be removed and the last coin can end up on its original square.

We've had no solutions to this but there's a neat way of 'shaving off' a layer 2 coins wide. So you can remove layer after layer until you have a 2 by 52 array. This can then be reduced to a single coin on its original square. Let us know if you can follow this prescription or if you can find another way to do the problem.

MATHS WEEK

Well Maths Week has come and gone. We'd like to hear from you about what things you did at your school. What things worked? What didn't work? What might you do differently next year. Please email us.

All the best for your teaching.
Let us know if there is any way that we can help you.

Gill, Derek and Joe.