

learning links

Helping Kids Learn

www.learninglinks.org.au

Information Sheet 32

Counting on Smarties

By Beth Southwell, Associate Professor in Mathematics Education at the University of Western Sydney*

Once upon a time I wrote an article about Smarties that arose from a four-year-old's birthday party.

His mother had made him a birthday cake and decorated it with Smarties. From this, young Nigel and I engaged in a vigorous mathematical conversation. He was a lively young fellow and remembers that he had four candles on his birthday cake and that it was cut into eight pieces – one for each of the people present.

Earlier in the day he had gone to the shops to buy his new shoes and had received other gifts. One of the gifts was a set of Mr Men books and his sister had him count them and pointed out that there was one for each of his years.

Nigel could count well. It was not just rote counting but rational counting because he could count using one to one correspondence. This process is an essential one for late success in counting to all levels and arithmetic operations such as addition, subtraction, multiplication and division.

When the birthday cake arrived, Nigel saw there were four candles and the numeral '4' marked out in Smarties.

After the candles had been blown out amongst much cheering and acclamation, Nigel explored more mathematics. Besides counting all the Smarties on the cake (there were many more than four), he counted the red ones, the green ones, the black ones,

the number of Smarties in the upright line, the number of Smarties in the other two lines, etc. and was obviously very sure of his colours.

We became more adventurous.

How can we share the Smarties so that everyone has one? If we take out all the purple ones how many others will be left?

Into how many pieces will we have to cut the cake so everyone will have a piece? What will the shape of each piece be like? What shape can we call the whole cake before we cut it up?

If Catherine has all the yellow ones and Sonia all the black ones, how many Smarties have gone? How many are left?

Can I exchange two red Smarties for a black one? Are there the same number of Smarties in each line? If Dominic gives his Smarties back to Nigel, how many will Nigel have then?

All these questions were asked of Nigel as part of the whole game using the birthday cake as the reference point. He hesitated over some and made what some people might call errors in others but was obviously delighted to hear the frequent "well done".

There are numerous questions one could ask in this type of situation.

Nigel would be able to keep going as long as he was enjoying the activity. Enjoyment is very important.

Admittedly, Nigel had an advantage over many other children because he had an older brother and two sisters who could continually encourage him even if his parents were not able to do so, which in Nigel's case, they were.

Another birthday present Nigel received was a set of construction blocks.

They were simple blocks of wood in different shapes. With these he began building structures and was therefore acquiring concepts of difference in shapes, some idea of dimension, relations, length and equality and very elementary ideas of balance, mass, volume and area. He also sorted or classified the different sizes and shapes of the blocks.

There are a great number of mathematical concepts that can be explored and discovered in this birthday situation.

In the simple activities listed above, Nigel has reinforced, developed or begun to develop the following mathematical concepts:

- counting,
- number names,
- the numeral "4",
- one-to-one correspondence,
- intuitive addition,
- straight lines,
- class inclusion,
- fractions,

Learning Links is a non-profit charity assisting children who have difficulty learning and their families.

We raise funds to help children from birth to 18 years by offering a range of services including the following.

Early Childhood Services for children from birth to six years.

- Early childhood intervention and support for very young children.
- An inclusive preschool for children with and without special needs.
- An assessment and consultancy service for families who are concerned about their young child's development.
- Specialist early childhood teaching and therapy.

School Age Services for children from Kindergarten to Year 12 who have low support needs.

- Comprehensive assessments.
- Small group tuition and therapy.
- Occupational and speech therapy programs combining specialist education services and therapy.
- Outreach programs.
- The Ronald McDonald Learning Program for seriously ill children and the Reading for Life Program for children falling behind in their reading.

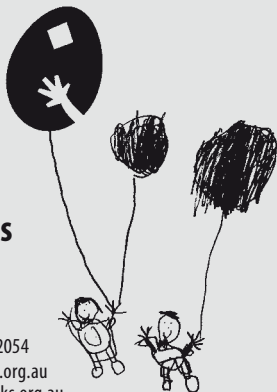
Family Services helping and supporting families and health professionals.

- Centre and home-based family counselling.
- Parenting Programs and groups for families.
- Case Management Services.

Professional Development for teachers and health professionals.

Presentations, workshops and advice on identifying and helping children with learning difficulties, learning disabilities and developmental delays.

Learning Links has branches in six Sydney locations at Peakhurst, Penshurst, Fairfield, Miller, Dee Why and Randwick. We also offer some services to children in country NSW, the ACT, Victoria and New Zealand. A complete list of branch locations and contact numbers is on the back cover.



Learning Links

Head Office

12-14 Pindari Road
Peakhurst NSW 2210
Tel: 9534 1710 Fax: 9584 2054
Email: mail@learninglinks.org.au
Website: www.learninglinks.org.au

Enquiries regarding this Information Sheet should be directed to Robyn Collins
Tel: (02) 9534 1710 Fax: (02) 9584 2054 Email: rcollins@learninglinks.org.au

© Learning Links 2006. The material in this publication cannot be reproduced without the written permission of Learning Links.

- intuitive division,
- equality,
- relationships,
- length,
- mass,
- finding patterns,
- classifying,
- volume,
- area,
- geometrical shapes,
- balance, and
- trading or exchanging.

There are other incidental concepts as well, including colour and aspects of language. The latter is extremely important. The concepts may at first be elementary or intuitive but they will lay a good foundation for later development of mathematical ideas in a more formal sense.

Attitudes to Mathematics

Mathematics tends to be something of a Cinderella subject in some schools and it is not uncommon to hear "don't worry about maths, I was never any good at it", or "maths is too hard".

These and other statements indicate that the speakers are approaching mathematics from a limited background and have not experienced the joy and wonder of mathematics as a subject.

It need not be a difficult subject if the proper groundwork has been laid and the fundamental concepts grasped by very young children. It is, in fact, possible to enjoy mathematics and if we enjoy it, we tend to have greater success in doing mathematics.

The enjoyment of mathematics can be initiated around such activities as the birthday cake or some similar experience.

Basic Mathematical Concepts

Many children acquire one-to-one correspondence and counting skills fairly naturally through simple activities in the home.

One of the first things children are asked to do after learning to say "mum" and "dad" and their own name, is to rote count to ten.

Rote counting is the process of saying the number names in order without knowing what they represent. This is the only rote process that children should experience and is not to be confused with drill.

All drill is not rote learning. It is rote learning only when the learner has no understanding of what is being remembered.

After getting the number names in the correct sequence, the next step is to learn what they represent and be able to count them rationally.

This process of rational counting is enhanced as through copying their parents or teacher, (children) associate the number name with the appropriate set of objects, e.g.



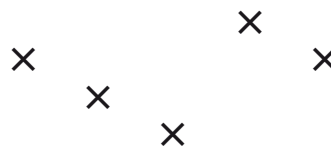
To underline the above ideas, children who say the number names in order without referring to anything else are rote counting, i.e. without meaning.

When, however, they count a group of objects by placing a finger on each item as they say the number name or using some other method of designating individual objects, they are counting rationally.

For rational counting, one-to-one correspondence is essential.

Another concept that is necessary for rational counting is the idea that the number of objects in a group does not change when their configuration is altered.

For example, there are five objects in the group below.



When they are rearranged in a row, there are still five objects.



To recognise this consistently is a very big development for children. Until this concept is acquired, the children will find it difficult to successfully add, subtract, multiply or divide.

Another critical concept for success in mathematics is place value.

Again children can gain intuitive notions about place value through games, and, in particular, trading games in which the children are asked to exchange numbers of objects for one other object or vice versa.



Using Smarties again, five red Smarties might be exchanged for a green one. This is the basis of our decimal number system in which we exchange 10 ones for one ten, 10 tens for one hundred, etc. It is also the basis of our money system and our metric system of measurement.

How Children Learn

Here are some important principles to note.

1. Children are keen to explore their world and make sense of it. Extending what they know, looking for patterns, drawing conclusions are all part of this.
2. Children learn in a variety of ways. This has been particularly recognised since the work on multiple intelligences has developed. Children's learning is often haphazard and without direction but nevertheless it is real. "Errors" usually make "sense" to children, e.g. saying "twenty ten" for "30" indicates a search for a pattern.
3. Children acquire many mathematical ideas without adult or peer intervention. They cannot always realise this and do not express them as adults might, but, nevertheless, the concepts are being formed.

The theory of constructivism emphasises the fact that children develop their ideas as a result of their experiences and build on what they have already constructed, sometimes finding it necessary to expand or change in some way their previously constructed knowledge.

Principles for Teaching and Learning

At the risk of saying the obvious, I have developed a list of principles we can all follow.

1. Provide a rich environment of books, toys, bottle tops, saucepan lids, wall charts, etc. The environment can provide the basic materials through which the Nigel's and Naomi's of the world can commence their mathematical journey. Bottle tops or shells can be sorted and counted. Leaves can start children thinking about symmetry; stones or popsticks can be used to tally a score. These are only effective if the interest of the children can be aroused. Games and other personal occasions are an ideal way of arousing that interest and giving enjoyment.

2. Take advantage of incidental opportunities to reinforce and teach counting skills.
3. Link any incidental learning experience with language skills. Help children to talk informally about their mathematical experiences.

Conclusion

Returning to Nigel, my conjecture is that, even if he forgets the birthday cake and even forgets that I was there for his fourth birthday, he will have benefited from the attention and love he received both mathematically and personally.

Happy birthday, four-year olds!

* Reprinted with the kind permission of Beth Southwell, Square One and the Primary Association for Mathematics.

Printed in Square One, Vol 14, No. 2, August 2004.

learning links

www.learninglinks.org.au

Early Childhood Services

– all enquiries to Head Office

School Age Services

– contact your local branch

Family Services

– contact your local branch

All other enquiries

– Head Office

Head Office

12-14 Pindari Road
Peakhurst NSW 2210
Telephone: (02) 9534 1710
Preschool: (02) 9533 3283
Facsimile: (02) 9584 2054
Email: mail@learninglinks.org.au

Northern Suburbs Branch

2 Alfred Road
PO Box 634
Brookvale NSW 2100
Telephone: (02) 9907 4222
Facsimile: (02) 9907 4244
Email: nsb@learninglinks.org.au

Western Suburbs Branch

Unit 7/9 William Street
PO Box 1026
Fairfield NSW 1860 (2165)
Telephone: (02) 9754 2377
Facsimile: (02) 9755 9422
Email: wsb@learninglinks.org.au

Southern Suburbs Branch

10 Railway Parade
Penshurst NSW 2222
Telephone: (02) 9580 4888
Facsimile: (02) 9580 4788
Email: ssb@learninglinks.org.au

South West Sydney Branch

88 Shropshire Street
PO Box 42
Miller NSW 2168
Telephone: (02) 8783 7111
Facsimile: (02) 8783 7222
Email: sws@learninglinks.org.au

Eastern Suburbs Branch

1/20 Silver Street
Randwick NSW 2032
Telephone: (02) 9398 5188
Facsimile: (02) 9326 5364
Email: esb@learninglinks.org.au