Newsletter 81: March 2009

Introduction

Well, what do you think of this then? Perhaps you'd better not answer that question until you have read the rest of the newsletter. There are two new sections, the Classroom section and the Families section. The classroom section is designed to provide ideas for teachers to incorporate into their classroom programme. In this issue there is a brainstorm of maths activities based around the theme of Easter. The families section is designed to be copied and inserted into a school newsletter for families. This issue focuses on basic facts. We still have a section that explains a mathematical concept and a section with problem solving activities suitable for Years 1- 9. So, here we are in a new era and with a new style and everything.

I should also say that the newsletters from now on aren't going to be as frequent as they used to be. Instead of one a month from February to November inclusive we are now going for one in the first and last terms and two in the other two terms; so the next one should appear in early May.

Despite all the changes, this is still newsletter 81. Of course you all know that $81 = 9 \times 9 = 9^2 = 3^4$ and $8 + 1 = 9$. But there is a bit of an emphasis on fractions in this newsletter so maybe we should look at 1/81. What's interesting about this is that it is 0.012345679012345679012345679012... No, that isn't a misprint; there's no 8 there. If you really want to know 0.012345678901234567890123456789012... is equal to 13717421/111111111. So 1/81 is interesting because it isn't as interesting as 13717421/111111111 and 13717421/111111111 is interesting not only because its decimal form is 0.012345679012345679012345679012... but also because there are nine ones in its denominator.

Don't say I don't give you anything to talk about at parties.

Website updates

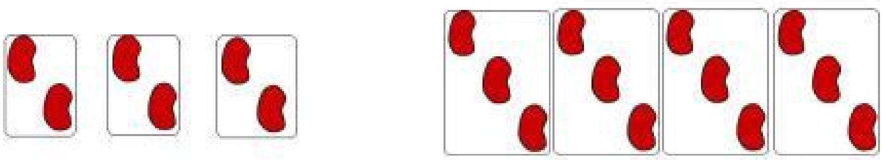
Tell us what you think of the new look of the website in our survey. There is a link to the survey available from the home page of the website.

We hope that not only have we improved the look of the site but that it is easier to navigate around. You may have noticed that resources have been reorganised particularly in the numeracy section, but we not deleted any of the resources. The new resource database and planning assistant are an exciting addition to the site. Teachers and educators will now find it much easier to use the site to search for resources and develop a teaching plan. Login and create your own maths planning site

Unpacking the Mathematics – Comparing Fractions

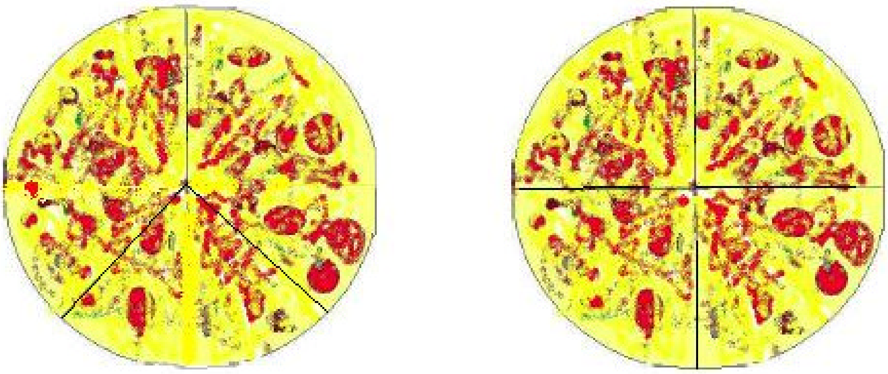
In the last newsletter I tried to underline the importance of the unit that was being used even when comparing whole numbers. For example, you don't know whether Fred, who is earning $50,000 or Sam, who is earning $40,000 earns the most. You don't, that is until you can be sure that they are both earning the same dollars. If Sam works in America and is being paid in US dollars, then right now he is getting a lot more than Fred, if Fred is being paid in NZ dollars.

The same thing is true for fractions. A third can definitely be smaller than a quarter in certain circumstances. For instance, a third of six jelly beans is 2 jellybeans but a quarter of 12 jellybeans is 3 jellybeans.



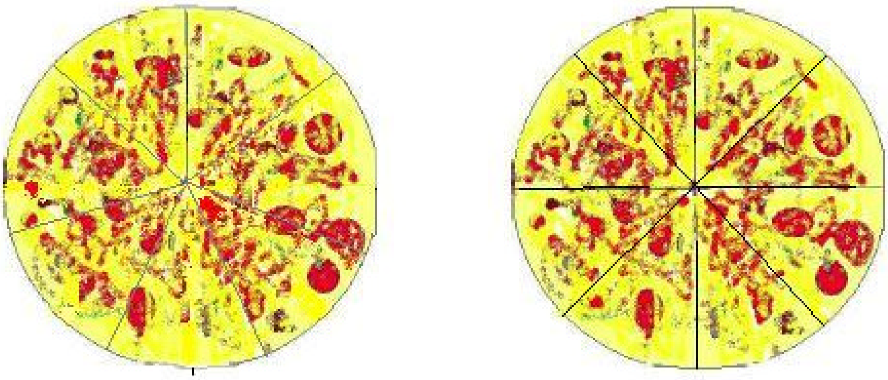
So I want to now assume from now on that the unit or whole that we are talking about for the rest of this article is the same. If I talk about dollars they will be in the same currency; if I talk about jellybeans there will be the same number; if I talk about pizzas, the pizzas will all be the same size (none of this medium and large nonsense!)

OK so let's look at thirds and quarters with respect to pizzas. Just to make sure we're all on the same page, a third of a pizza is one of the pieces that we get by cutting it up into three ***equal*** pieces. Similarly, a quarter of a pizza is one of the pieces that we get by cutting it up into four ***equal*** pieces.



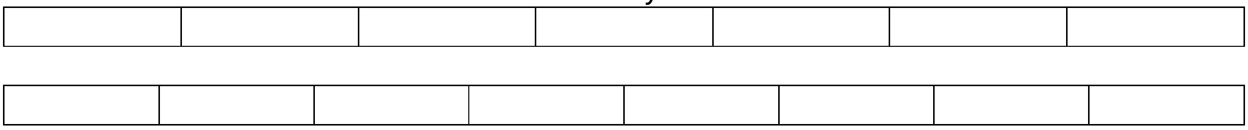
You can clearly see from the diagram that, if you like pizzas, then you would prefer to get a third of a pizza rather than a quarter of a pizza. You just get more that way. So if you have to share a pizza between friends you would hope that you only had ***two*** other friends to share the pizza and not ***three*** other friends. It's not that you are greedy mind. But having more friends can have obvious disadvantages.

But pizzas can be a problem if we have a reasonable number of people wanting to share. Have a look at the diagram below. Can you tell by just looking whether a seventh is bigger or smaller than an eighth? You can certainly reason it out though. If you shared the pizza equally between eight people you would expect that they would get less each than if you shared it between seven people. And the pizza-type picture gets worse if you are trying to show the difference between a ninety-ninth compared with a fifty-secondth.



And even jellybeans aren't too reliable if you are a young 7 year old who gets lost counting biggish numbers. I have in mind that you might want to find a seventh and an eighth of 56 jellybeans. Why don't you try it? There is strong evidence to tell us that there are a lot of people out there in the real world aren't good at counting to, say 76. My evidence is that Australians had to count to this many in ordering the candidates for the national elections once. So many votes were invalidly cast because of errors in counting that they decided to change the system!

So what other model can we use? Well we could try a linear model like the one below.



But even here it’s beginning to be a bit dicey of you use a free hand diagram. But anything involving more pieces can only be done accurately if the children can measure lengths accurately. The same thing can be said for a number line which is also a good tool to use.

But here there is the rule of thumb that everyone uses but gets mixed up and that is the biggest number rule for fractions. How do I know whether which of a ninety-ninth and a fifty-second is bigger? I think a little. If I was dividing my mythical (or is it mystical) pizza into 99 pieces to share among a party of 99, would they get more or less than the party of 52? Clearly the more people the less they get. So the bigger the number that I’m distributing among the smaller the pieces. The bigger the dividing part the smaller the fraction. So if I write the amount that each of the 99 people get as 1/99 and the amount that each of the 52 people get as 1/52, then 1/52 is biggest. And 1/32 is bigger than 1/43.

The bottom number is called the denominator and the top number is the numerator. If we hold the numerator at 1 for a moment, the bigger the denominator the smaller the fraction.

But that’s the problem. What if the numerator is so unfriendly enough to be something other than 1? What happens with 2/13 and 2/7. Which is the smallest of these two?

Are fortunately they both have the same numerator – 2! So think about 1/13 and 1/7. The rule kicks in to tell us that 1/13 is smaller than 1/7 because 13 is bigger than 7. But the 2 just tells us that we have 2 lots of 1/13 and 2 lots of 1/7. So if 1/13 is smaller than 1/7, then 2/13 is smaller than 2/7.

That means that we should have no problem at all comparing 3/7 and 3/11 or 4/7 and 4/5. First go to the respective ‘one over’ fractions and compare them. Then the same holds for the ‘two over’ three over’ four over’ or whatever over’ provided that the ‘whatever’ is the same in both cases.

But life was never meant to be easy. Which is bigger, 3/7 or 2/3? No matter what anyone will tell you, there is no ‘bigger rule’ that we can apply here. Write in with your rules and I’ll discuss them next time. I know that 3 and 7 are bigger than 2 and 3 respectively, but that doesn’t count for anything.

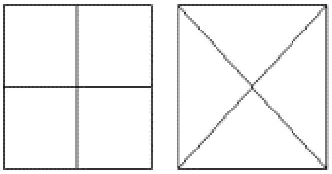
So what do we do? If we are doing this on native wit, find a reference point. Where does a half fit in the grand scheme of things? Going back to your pizza you should be able to see that 2/3 is bigger than 1/2. But what about 3/7? Is that smaller or larger than 1/2? How can we tell?

I’ve already raved on for far too long. I’ll take this up again next newsletter.

Problem Solving

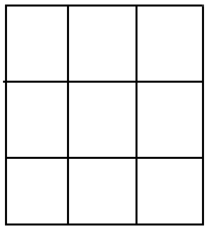
Years 1-3

1. Mum makes sandwiches for Alex and Beth for their school lunches. Alex likes his bread cut into four small square sandwiches and Beth prefers hers in four triangles.



Are Beth's sandwiches bigger than Alex's, smaller than Alex's or the same size? Who gets the most crust on each of their sandwiches?

2. Carol has a square chocolate bar that is made with 9 small square pieces. So there are 3 pieces on each side.



Carol wants to share her chocolate equally with her friends Dot and Eric. How many small pieces will each of the three friends get? She also wants them to have a whole piece of chocolate each? In how many different ways can the chocolate be broken up into three whole pieces with the same number of small squares?

Years 4-6

1. Hal has 24 chocolates. It's a wet day and he's at home with his dad, sister and grandma. Ivy lives down the road. She also has 24 chocolates and is home with her mum and brothers. Hal and Ivy share equally their chocolates with their family. Who gets the most chocolates and how many more does the person with the biggest share get?

2. Hal's dad and grandma say that it is okay for Hal and his sister to have twice as many chocolates as they get. If Hal and his sister get the same amount and dad and grandma get the same amount, how many chocolates does Hal get?

Years 7- 9

If you go back to the introduction you'll see that this is the 81st newsletter. Now it is only written that because that's the way we count. The Romans would have written it as LXXXI because they used L for 50, X for 10 and I for 1.

But in octal, 81 is written as 121. What's this octal business then? Well we use the decimal (based on the number 10) system so 81 is actually 8 x 10 + 1. Something like 4,528 is short for 4 x 1000 + 5 x 100 + 2 x 10 + 8 = $4 \times 10^3 + 5 \times 10^2 + 2 \times 10 + 8$.

Now the octal system is based on the number 8 (just imagine that you didn't have a thumb on each hand). And 121 = 1 x 82 = 1 x 64 + 2 x 8 + 1 = 64 + 16 + 1 = 81.

To show that 121 is in octal and not decimal we write $(121)_8$.

Now binary (base 2) is another way of writing numbers. So $(1001101)_2$ is equal to $1 \times 2^6 + 0 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2 + 1$ = 1 x 64 + 1 x 8 + 1 x 4 + 1 = 77 in base 10.

So here are the problems.

What is $(345)_8$ in the decimal system?

What is 81 in the binary system? That is written as a sum of multiples of powers of 2?

Classroom section

Website Links

In the links section we recommend a website called Maths at Home. This site contains ten activities that "build math into the things most families already do - ordinary routines such as figuring out ways to save money, to share fairly, or to get somewhere on time". You may like to use this site in your maths programme or promote it to your parents/caregivers in a school newsletter.

With the Easter holidays approaching you may wish to use some of these ideas to develop a mini cross-strand maths unit.

Strand	AO	Activity
Number and Algebra	Number Strategies (Levels 1 & 2 AO1)	Counting activities using Easter theme (buns, eggs, chicks, bunnies etc). Skip counting using multipacks, or arrays on baking trays.
Number and Algebra	Number Strategies (Levels 3 & 4)	Adapting measurements for different quantities of buns or biscuits. Calculating percentages of ingredients in baking.
Number and Algebra	Number Strategies AO1 (Levels 3 & 4)	Work out the best buy of Easter buns or eggs by working out cost per item in a multipack.
Number and Algebra	Number Strategies and knowledge (Level 4 AO4)	Work out best buys of different sized Easter eggs by weight.
Measurement and Geometry	Measurement AO1 (Levels 1- 4)	Measuring ingredients for a Hot Cross bun or Easter biscuit recipe.
Measurement and Geometry	Shape AO2 (Levels 3)	Draw nets for Easter egg boxes.
Measurement and Geometry	Position and Orientation (Levels 1-4)	Follow and give instructions for an Easter egg hunt. (Level 1). Follow and draw maps for an Easter egg hunt. (Levels 2 – 4)
Measurement and Geometry	Transformation (Levels 1-4)	Show translations, reflections, rotations in Easter card designs.
Statistics	Statistical investigations (Levels 1-4)	Survey, communicate and make conclusions about Easter holiday activities.
Statistics	Statistical literacy (Levels 1-4)	Interpret results of classmates' surveys and conclusions from Easter holiday activities survey.
Statistics	Probability (Levels 1-4)	Find the chance of selecting different coloured Easter egg wrappers from a multipack.

Families

If you are new to the nzmaths website you will find there is a section particularly designed for parents and caregivers. There is a link on the homepage menu to the Families section. Here you will find information, advise and activities to do with your children.

How can I help my child learn their basic facts?

Basic facts are the addition facts and subtraction facts up to 9 + 9 = 18, and multiplication and division facts up to 10 x 10 = 100. It is important that children know these facts so they are able to develop their mental strategies for solving problems.

Find out from the class teacher what basic facts would be appropriate for your child to be working on. Learning basic facts is easier when children have an understanding of the operation they are working, for example understanding that multiplication is the same as repeated addition: 4 + 4 + 4 = 3 groups of 4 or 3 x 4.

Learning the basic facts takes some time so don't rush through the learning but make sure each fact is consolidated. As well as some rote learning, games and activities are an effective and fun way to learn the basic facts. The website has some games and activities designed for parents/caregivers to help children with their basic facts. Look in the Families section, under Activities to do at Home, and choose activities from the Number Facts section.