

Newsletter 85: September 2009

## Introduction

You know that I like to start off with some reference to mathematicians, after all this is a site about mathematics and it's nice to know that mathematicians exist simply to produce more of it. Anyway my first hit was this.
"an 85 year old mathematician wearing a cherry blossom hat told me today i was either very brave or mad."

That's what you get for Googling " 85 year old mathematician." I must say I didn't follow up on that Twitter but you might like to. However, I did discover that Claudias Ptolomy was born in 85 AD.

But I want to now go on another track because I think that it might produce an interesting investigation that will give students lots of practice in number, factorisations especially, and at the same time get them to think a little. (Well, hopefully a lot.)

Below is a rectangle that is 85 square units in area. You can see there are 5 squares down the side and 17 squares along the top and $5 \times 17=85$.


There is nothing remarkable there. But there are only four rectangles that can be drawn with whole number sides that have area 85 . These are the $1 \times 85$ rectangle, the $5 \times 17$ rectangle, the $17 \times 5$ rectangle and the $85 \times 1$ rectangle. Now you may think that some of these are the same rectangle but I want to distinguish rectangles by both size and orientation. And notice that the first number in the size (the 5 in $5 \times 17$ ) is the vertical dimension and the second number is the horizontal one.

My question is, are there any numbers that turn up as the areas of rectangles in just four ways? So is there anything special about 85 ?

I suggest that your students start this off by experimenting. What can they say about the number of rectangles associated with all of the numbers from 1 to 12 ? This should first show that there is nothing unique about 85 but it should also make them think about what numbers can have $1,2,3,4,5, \ldots$ rectangles? Are there any patterns they can see? And I'll leave you with this problem.

Are there any numbers that have 85 rectangles? If there are what is the smallest such number? If there are not, why not?

I'd be happy to hear what students have to say in terms of answers, questions or comments. You can email me at derek@nzmaths.co.nz.

## Unpacking the Maths - Multiplication Fractions

In our last newsletter we were adding and subtracting fractions and now we look at multiplying fractions. The learning objects section of the nzmaths website has a learning object called Fractions of Fractions. This model uses area to help illustrate the concept of multiplying fractions. It is a model that you could use when teaching students about fractions.

The area model is used when multiplying whole numbers. The multiplication fact $5 \times 6$ can be shown on a five by six array.


Before we start with the fraction model let's be clear what multiplying fractions means. $1 / 4 \times 1 / 4$ can be read as one quarter of one quarter. Realising that " $x$ " is interpreted as "of" helps make sense of answers which are smaller than either factor.

On the area model $1 / 4 \times 1 / 4$ looks like this:


The area where the $1 / 4$ mark on one axis overlaps with the $1 / 4$ on the other axis is shown in green. The green area shaded is one of the 16 boxes in the 1 by 1 grid. This area has a value of $1 / 16$.

On the area model $2 / 4 \times 3 / 4$ looks like this:


Again we will shade from 0 to the $3 / 4$ mark on one axis and from 0 to the 2/4 mark on the other axis. The overlapping area (shown in green) covers 6 of the 16 squares in the 1 by 1 grid. This area has a value of $6 / 16$.

You will notice that $2 / 4 \times 3 / 4$ is the same area as $3 / 4$ $\times 2 / 4$ just as $5 \times 6$ and $6 \times 5$ both equal 30 .

Now let's use the area model to help make sense of a short cut. To find $2 / 4$ of $3 / 4$ we cut the one axis into quarters and the other axis also into quarters and this created 16 little squares within the 1 by 1 grid. To find $2 / 3$ of $2 / 4$ we could cut one axis into thirds and the other axis into quarters this would create 12 little squares in the 1 by 1 grid.

The pattern we notice is that denominators (bottom number) multiply together to give the denominator in the answer.

Let's continue to find the pattern for the numerators (top number). Let's shade in the area we are interested in. So for our example $2 / 3$ of $2 / 4$ we shade from 0 to the $2 / 4$ mark on one axis and 0 to the $2 / 3$ on the other axis and find the overlapping area is 4 squares. Notice that $2 \times 2=4$ so again the rule is to multiply the numerators (top numbers) together to give the numerator in the answer.


We hope now you will have a better understanding of multiplying fractions and that you are able to use this model to improve your students' understandings of fraction multiplication.

You can access the Fractions of Fractions Learning Object at this link:
http://www2.nzmaths.co.nz/LearningObjects/fractions/index.html

## Problem Solving

## Years 1-3

Mum is making a patchwork quilt. The border has this pattern.


1. What fraction is dark blue?
2. What fraction is green-blue?
3. What fraction is light blue?

Draw your own pattern using a rectangle. Colour half red, a quarter green and a quarter blue.

In the tropical fish aquarium a quarter of the fish are blue, half are red, the other 5 are orange.
4. What fraction of the fish are orange?

Draw the fish in the aquarium.
5. How many fish are there?
6. How many are blue and how many are red?

## Years 4-6

The 24 biscuits on the oven tray are arranged in 6 rows with the same number in each row. The ginger bread cutter was used to make 2 rows and the round cutter was used to make the other rows.

1. What fraction of the biscuits are gingerbread men?
2. Half the gingerbread men have 3 silver balls each as buttons.

How many silver balls have been used?

3. 4 biscuits are burnt. What fraction is that of the batch of biscuits?
4. If half the baking mixture made the gingerbread men and half made the round biscuits, what would be bigger, a gingerbread man or a round biscuit?

Mum says you can't just eat biscuits! In the fruit bowl there are 18 pieces of fruit, two thirds of the pieces are apples and oranges. But there are twice as many oranges as there are apples.
5. How many oranges and how many apples are there?

A school survey found that $4 / 5$ of the 100 senior children like playing in the adventure playground and $3 / 4$ of the 120 junior children like playing in the adventure playground.
6. Do a greater proportion of senior or junior children like the adventure playground. Show your answer is true using a diagram.
7. How many senior children like playing in the adventure playground?
8. How many of all the children playing in the adventure playground?

## Years 7-9

There are 60 passengers on the bus. A third of the passengers get off at the shopping mall stop and half of them say thanks.

1. How many people thank the driver?

As the remaining passengers get off the driver notices that a quarter of them thank him for the ride.
1b. What fraction of the bus passengers thank the driver?

The rug measured $11 / 2$ by 2 metres. The coffee table covered a third of the rug.
2. What is the area of the part of the rug not covered by the table?

Josie has 5 identical presents to wrap. She has $11 / 2$ metres of ribbon. She wants to cut it into 5 equal lengths.
3. How could she work out one fifth of $11 / 2$ metres? How long will each ribbon be?

Josie has a roll of wrapping paper 60 cm by 3 metres. The roll is just enough to wrap the 5 presents. The first piece she cuts is 50 cm by 70 cm , Josie thinks there will be enough left - is there? Why does Josie think there is enough?

## Answers to Problem Solving

## Answers

Years 1-3

1. $1 / 2$
2. 1/4
3. $1 / 8$
4. $1 / 4$. $1-1 / 2-1 / 4=1 / 4$.
5. 20 fish. If a quarter is 5 , then a whole is 20 .
6. 5 blue fish. 10 red fish.

Years 4-6

1. $2 / 6$ or $1 / 3$
2. 12. 
1. $4 / 24$ or $1 / 6$.
2. Gingerbread man
3. 8 oranges, 4 apples.
4. Senior children. $4 / 5$ is greater than $3 / 4$

5. 80
6. $170(80+90)$

Years 7-9

1. 10. 

1b. 1/3
2. 2 m .
3. Change to units to centimetres: $1 / 5$ of 150 cm . Or solve in parts: $1 / 5$ of 1 metre is 20 cm so $1 / 5$ of $1 / 2$ a metre is 10 cm together that's 30 cm . Other methods are possible. 30 cm
4. No. Josie has used a little less than $1 / 5$ of the area but she can't get 5 pieces sized 50 cm by 70 cm from the roll.

## Website Links

## National Standards for Literacy and Numeracy

The main themes from the consultation process on the National Standards are available on the Themes of Consultation page. For more information on the National Standards visit the Ministry of Education National Standards page.

## nzmaths updates

## Resource Database Update

We have added the Figure it Out Answers and Teachers' Notes to the Resource Database. You can now search for Figure it Out activities by level, strand and achievement objects, just as you can search for units of work, problem solving activities and numeracy activities.

## Early Childhood Education

A new section of the site has been developed to support early childhood educators to use opportunities that arise in everyday interactions with children to foster the development of mathematical thinking. You can find the material from the link on the front page of the site.

## Links section

The links section of the website provides links to other websites that we think will be useful to teachers. We are looking for suggestions of websites we can add to our Links section. The websites must be free sites and contain no advertisements (including Google Ads). Please email the web address to andrew@nzmaths.co.nz.

## Resources for the Resource Database

We are looking for submissions of resources to be added to the Resource Database. If you have a numeracy activity that you have designed and would like to share then you can do this by clicking to downloading the template from http://www.nzmaths.co.nz/sites/default/files/images/template.doc and completing all the sections. Email your completed activity to andrew@nzmaths.co.nz.

## Site Development Survey

We have developed a survey to collect ideas to help inform the future development of the nzmaths website. The survey can be found from the link on the front page of the website or at http://www2.nzmaths.co.nz/nzmaths7.htm.

## Families

In some ways encouraging children with their maths is a bit like getting them to eat vegetables. Most successful strategies include working at their level (let's face it carrots and peas are a good start), making it fun and sometimes we just sneak it in in ways they hardly even notice. Here is a list of ways that can be used to sneak maths into the day.

## Fun and Games

Lots of board games involve counting, money and chances. Use 2 dice and add the numbers together.

Play shops, build structures with boxes, explore origami.
Games designed with a maths focus can be found in the Families section of the nzmaths website.
At home
Digital and analogue clocks: reading time, timing events, setting the timer

Reading timetables: television or bus timetables, family rosters
Cooking: measuring quantities, reading scales, finding half measures, reading recipes, finding fractions with areas like pizza or sets like biscuits

Counting items: utensils while drying dishes, clothes pegs, skip count eggs in cartons or multiplication of biscuit arrays on an oven tray

There are lots of children's books that involve counting and other maths activities.

## Out and About

Look for shapes and patterns in the environment, e.g. street signs shapes, reflections

Counting: objects, count forward on way up steps and backwards on way down, notice the letterbox number pattern

Directions: follow left and right directions, reading maps at malls, reading street maps
Estimating: time to do things, objects e.g. number of sheep in paddock, or cars in carpark
Supermarket: comparing prices by weight
Shops: working out prices, handling money

Working out parking meter money and time, value of concession deals

Planning family activities

## Classroom section

Maths and Literacy
There are lots of ways to make maths fun and exciting for your students. Using picture books with primary aged students can be one way to make mathematical concepts accessible and fun for children. On the links section of the nzmaths website we recommend a page from the Christchurch City Library that reviews picture books that have a mathematical theme. The link is http://www.christchurchcitylibraries.com/Learning/MathsinPictures/. If don't live in Christchurch can use the list to browse your own city or school library for books. Follow up activities can include students writing their own pages for a parallel book or extending an idea or problem in the book.

Incidental teaching
Mathematics is not limited to the "maths lesson" so if you can highlight the maths you find in other curriculum areas you can show students how their learning is connected. This connectedness of learning heightens the sense of usefulness and enriches the learning experience. Incidental teaching does not need to be planned, or assessed! It's just about looking for ways to show maths exists in their world - displaying and interpreting data, looking at patterns, measuring, dealing with numbers.

