



# The Wilkie Way

## Newsletter September 2020

[www.wilkieway.co.nz](http://www.wilkieway.co.nz)

### Developing the Language of Mathematics

“Learning to communicate about and through mathematics is part of learning to become a mathematical problem solver and learning to think mathematically. Critical reflection may be developed by encouraging students to share ideas, to use their own words to explain their ideas, and to record their thinking in a variety of ways, for example, through words, symbols, diagrams, and models.”

Page 11 Mathematics in the New Zealand Curriculum (The previous national curriculum)

The numeracy project and the way mathematics was assessed took the focus off communicating mathematics through written recording and placed it firmly on mental strategies and only communicating orally. It was not intended that written communication of mathematics was no longer important. The NZCER book Teaching Primary School Mathematics & Statistics, Evidence based practice published in 2010 has a chapter titled “Using written recording to help children learn mathematics”. The current curriculum document puts even more emphasis on communicating through the number and algebra achievement objective, equations and expressions at each level, through the key competency language symbols and text and through the dedicated page in the document (Page 16) Language across all learning areas.

Many maths programmes and therefore teachers see language based activities as an introduction to mathematical activity rather than as central to it. People (teachers & parents) often think that maths isn't maths unless it includes numbers and equations. How often do I hear teachers saying “We are assessing maths not reading & writing.”

Students of mathematics- what ever their age - come to grasp new mathematical concepts in a series of language based stages.

#### Stage One: Student Language

This is the natural language a student uses to describe a concept in a familiar situation. This emphasises the requirement for meaningful contexts. All new learning is dependent on what a student already knows.

#### Stage Two: Materials Language

This is the language that clarifies the students vocabulary as they use materials (cubes, counters, place value blocks, rulers, scales or any 'concrete' apparatus.) At this stage teachers must be modelling the mathematical language spoken and written. Diagrams, pictures and videos are valuable for introducing and extending students language.

#### Stage Three: Mathematical Language

Making written recordings using mathematical words is the bridge between using materials and using symbols. This stage is often overlooked and students do not make the jump from using manipulatives to recording symbolically. This could be seen as a recording of the imaging stage. The students can now describe their understanding using more formal mathematical language.



At this stage teachers should be modelling symbolic language alongside the words. If this stage does not occur or is not given the time and emphasis it requires then for many students mathematics no longer makes sense. Students who require learning support with mathematics most often require language to symbol support which implies this stage is the weakest link in developing the language of mathematics.

## Stage Four: Symbolic Language

Students use mathematical symbols as a shorter way of recording their ideas and understanding.

Symbolic language occurs in a very limited way at level one. By the end of level one (year 2 for most students) the expectation is that students can read and write numbers to 100 and use symbols + - and = 'to represent a simple result unknown addition or subtraction situation. They should be able to write or tell a story to fit an addition or subtraction equation.

**Mathematics Moderation Task - Measurement Time**  
Level 3  
Name: Joshua Room: \_\_\_\_\_ Date: 9.9.16

How many times will you have brushed your teeth if you brush twice a day:  
For one week?  $2 \times 7 = 14$  a Week = 7 Days  $14 \div 2 = 7$  Days  
For the month of June  $2 \times 31 = 62$  June = 31 Days  $62 \div 2 = 31$  Days  
For a whole year? year = 365 Days  $365 \times 2 = 730$   $730 \div 2 = 365$

If it takes you 3 minutes to brush your teeth.  
How long do you spend brushing your teeth every week?  
Brush = 1 Day  $6 \times 7 = 42$  (42 mins in a week)  
How long would you spend brushing your teeth in the month of June?  
 $42 \text{ min} = 1 \text{ week}$  6 mins = 1 Day  $31 \text{ Days in June}$   $6 \times 31 = 186$   $186 \div 6 = 31$   
How long would you spend brushing your teeth in a year?  
 $6 \text{ mins} = 1 \text{ Day}$   $12 \text{ mins} = 1 \text{ week}$   $186 \text{ mins} = 1 \text{ June}$   
 $2 \times 365 = 730$   $6 \times 365 = 2190$   $730 \times 2 = 1460$   $2190 \div 6 = 365$

Working easily multiplicatively and kept all parts of the problem.

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## Achievement objectives for equations and expressions

Level 1: Communicate - using words, numbers and pictures

Level 2: Communicate - using words, diagrams [pictures], and symbols

Level 3: Record - using words, diagrams, and symbols, with an understanding of equality

Level 4: Form and solve simple linear equations



Much emphasis in mathematical assessment at primary school is put on recall of basic facts and having multiple ways to calculate an answer - just remember technology can actually do all of this for us.

Technology cannot turn student everyday language into mathematical symbols or turn symbols back into mathematics students understand.

If our goal is to create a numerate population - for all people to have the ability and inclination to use mathematics effectively - at home and work and in the community (*as written on the back of all the numeracy project books*) then consider where the emphasis needs to be in your mathematics programme.

How can you make language central to your mathematics programme?

1. Use story books as a way to develop a new topic or idea

See NZMaths (other resources) for a range of picture books and the stories within the series of Connected books

2. Writing is a natural way for students to communicate mathematically. Require students to use words in their recordings. Do not expect them to record a word problem only as an equation.

3. Minimise the use of completing symbolic worksheets except when consolidating use of symbolic language. Do not use symbolic worksheets because students can't read yet.

4. Stop basic fact testing as a measure of mathematical success.

A professional reading on **Learning to use symbols** has been added to the members area of the website under a new section in Teacher Professional Resources, Professional Readings.

## Resources for Wilkie Way Members

Subscriptions purchased at the online store at [www.wilkieWAY.co.nz](http://www.wilkieWAY.co.nz)

Individual \$45 - paid via paypal

NZ School paid via invoice - complete form at online store

Up to 100 students \$150+GST

101 - 300 students \$250 + GST

300+ students \$350 +GST

Non NZ School \$400 - paid via paypal



The new website is up and running and is being well used - over 600 hits on the membership area in the month of August. Feedback has been positive with reporting of how much easier it is to navigate and find stuff, especially as student resources can appear under more than one heading. The video section has also been well received and making more short teaching videos with follow up activities is definitely on my to do list.

**New individual subscribers:** purchase the subscription from the online store and once you have paid the subscription via paypal, go straight to the members area and create an account. I receive a notification of the order, the payment and the account creation. I can then activate the account. I will send an email to say account activated then you are able to login to the members area.

*Just remember there could be a couple of hours between creating the account and it being activated, unless I am sitting at the computer when the notification arrives, then it is a matter of minutes.*

**New School Subscriptions:** Once the form has been completed and submitted, **individual teachers from within the school need to create their individual accounts.** An invoice will be sent to the school and individual teacher accounts created will be activated as for the individual subscribers without waiting for the invoice to be paid. Schools are trusted to pay their invoices and I understand this doesn't generally happen within a couple of days.

NZ schools can and all overseas schools must pay via paypal. Individual teachers from within a school must still create individual accounts.

Individual subscribers will receive an invoice for a resubscription at the beginning of the month it is due. You have until the end of the month to pay before your account is deactivated.

A school will receive their invoice the month it is due. if it is not paid in a reasonable time frame, or a school declines to resubscribe all teacher accounts from that school will be deactivated.

School subscriptions must have teacher accounts using their school email address. This email address will be used to send newsletters. If the email address is no longer valid then I assume the teacher has left the school and their account will be deactivated.

**Please take care when entering your email address - to date about 5% of addresses have been entered incorrectly. So far I have used my detective skills and managed to solve the typo mistakes.**

If you subscribe, create an account and do not get an account activated message then assume I haven't been able to solve a typo mistake.

New material and updated material will continue to be added to the site.

### **New Section: Teacher Professional Resources**

Professional Readings

- Learning to Use Symbols



# The Wilkie Way Teacher Challenge

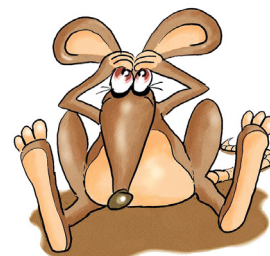


Using all of the digits from 0 to 9 just once each, create three 3 digit numbers that are in the ratio of 1:2:3



Here is one solution: 192 384 576

There are four solutions - can you find the other three?



Solutions next month

## Keeping an eye on NZ maths ([www.nzmaths.co.nz](http://www.nzmaths.co.nz))

### Supporting professional practice: Tracking progress and achievement

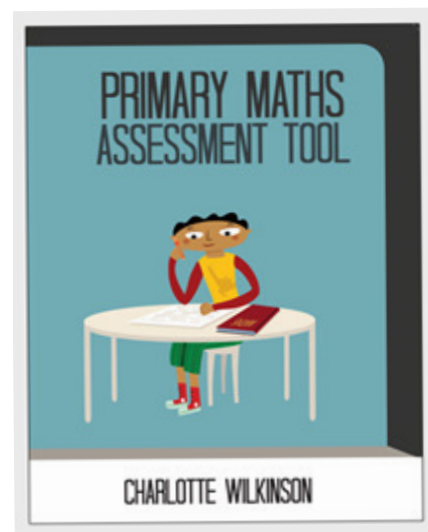
The focus has subtly changed from collecting stage numbers at particular points in the school year to describe student progress and achievement; **to planning opportunities to notice** what their students can do in their regular teaching and learning programmes.

“By observing students as they work in class, asking probing questions, listening to explanations, and looking at students’ workbooks, teachers can determine what students know and can do. They can use this information to improve the teaching and learning of mathematics and to make judgments about achievement.”

The given range of assessment tools do not include any tool a school devises or other tools not developed with MOE funding. This does not make these other tools invalid tools or the listed tools any better - schools have complete freedom to select or create whatever tools are useful to them as a teacher to improve the teaching and learning of mathematics and to report on student progress and achievement. The primary tool for any teacher should be observation, questioning and listening.

Other available tools for mathematics include

**PMAT - Primary Mathematics Assessment Tool** Focus of the tool is identifying early knowledge acquisition through to using knowledge for problem solving at levels 1 - 4. Includes contexts from other strands. Available from [www.edify.co.nz](http://www.edify.co.nz)



**Wilkie Way Assessment Screens:** Screening for key knowledge acquisition, gaps and next learning steps for levels 1, 2 3 and 4



### NZ Curriculum Mathematical Number Knowledge & Skills Screening Assessment Level 3 Even Year

Student Name	_____
Year Group	_____
Area of Mathematics	
Whole numbers	/20
Addition & Subtraction	/20 Uses range of additive strategies Yes / No
Multiplication & Division	/20 Uses simple multiplicative strategies Yes / No
Fractions	/20
Decimals & Percentages	/20
Total	/200
Comments:	

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- Counting (level 1)
- Place value (level 2 - 4)
- Addition & Subtraction (level 1 - 4)
- Multiplication & Division (levels 1 - 4)
- Fractions (levels 2 - 4)
- Decimals (level 3 - 4)

Teacher guides can be downloaded from members area of website. Discounted orders for 2021 will be available from term 4.