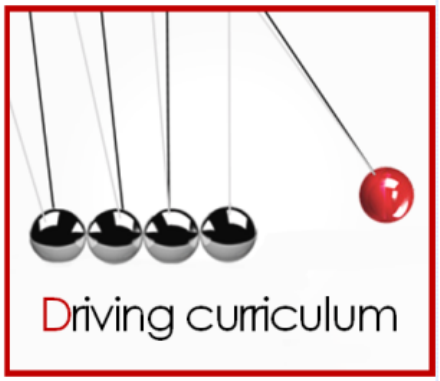
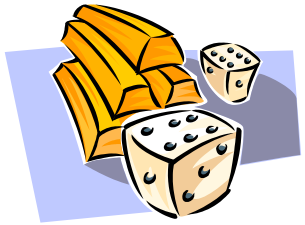




Programming

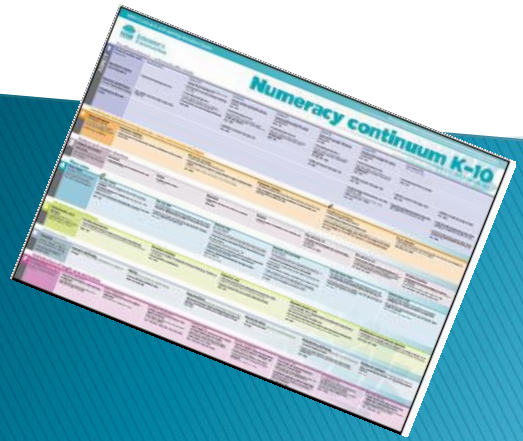
for

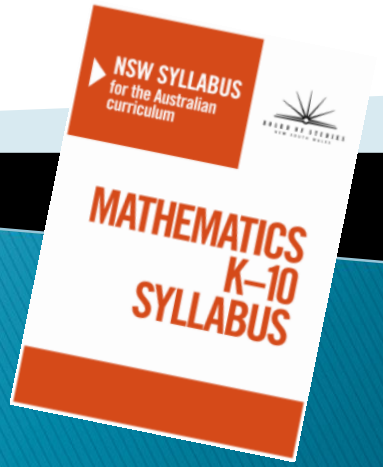
Engagement:

a

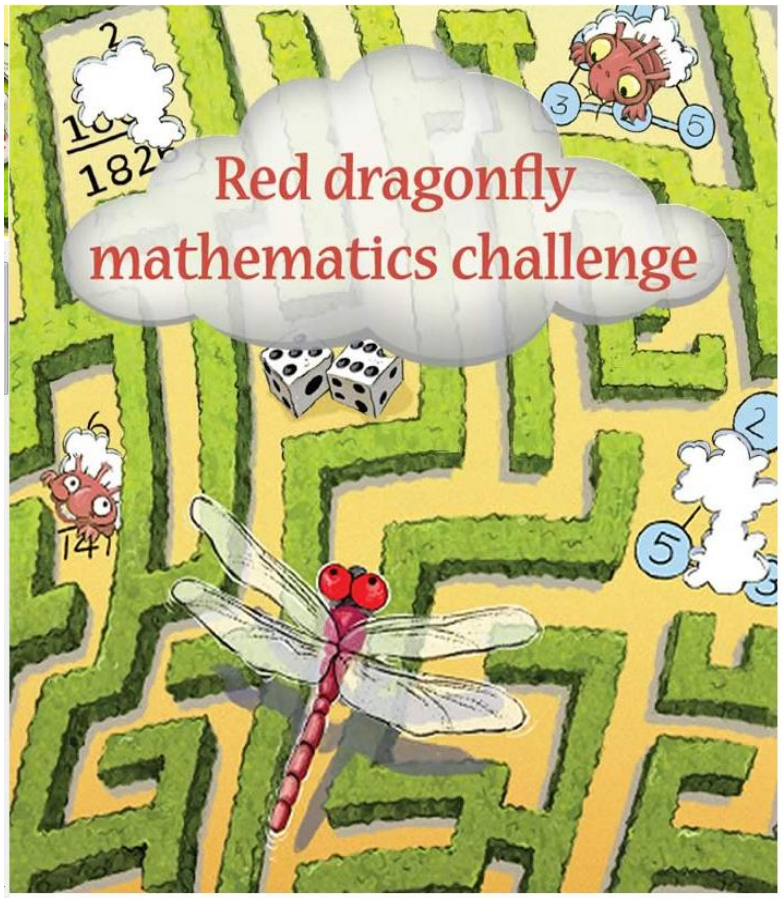
Working Mathematically Focus

Presented by Zdena Pethers






Warm-up
Activity



10 The numbers 1 to 10

Using the three digits 1, 2, 4 and the symbols +, –, x, ÷, (,), create calculations that will result in each of the number from 1 to 10.

Example: (1 + 2) x 4 = 12

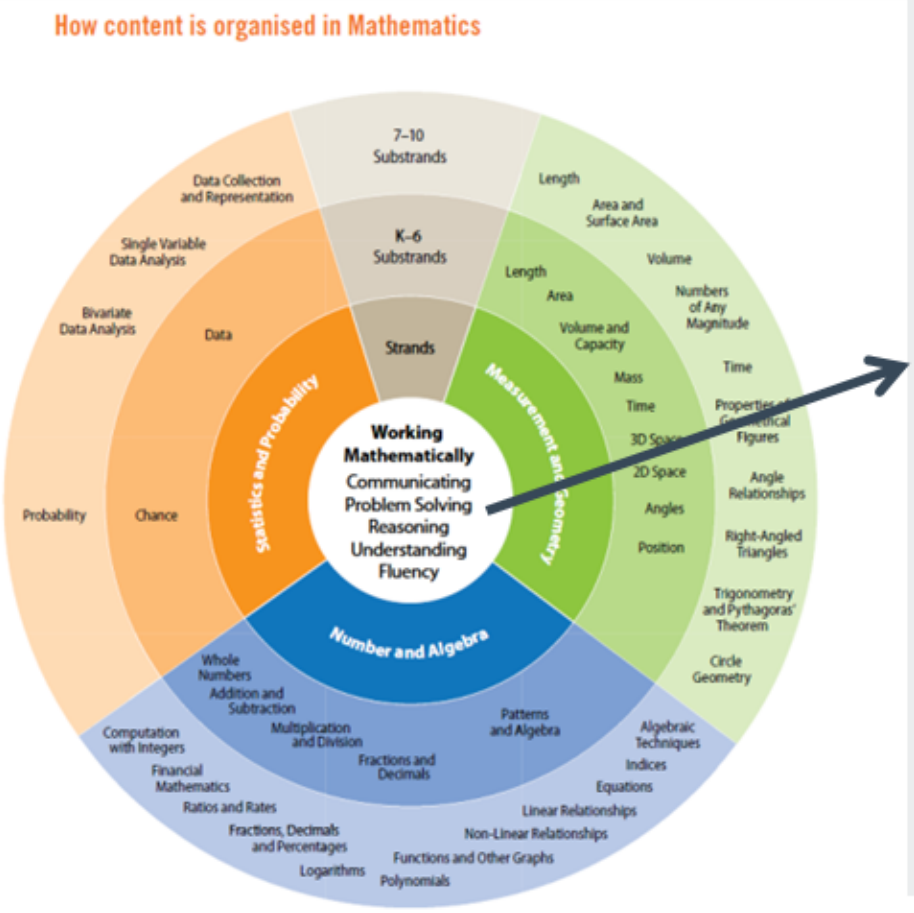
☐	☐	☐	=	1	☐	☐	☐	=	6
☐	☐	☐	=	2	☐	☐	☐	=	7
☐	☐	☐	=	3	☐	☐	☐	=	8
☐	☐	☐	=	4	☐	☐	☐	=	9
☐	☐	☐	=	5	☐	☐	☐	=	10

New syllabus – differences and implications:

Teaching for engagement and understanding!

Overview of syllabus: working mathematically

… ‘to become flexible and creative users of mathematics.’



Communicating
Problem Solving
Reasoning
Understanding
(transferable)
Fluency (efficient)

Referred to as five interrelated components

Often the components overlap

AC refers to them as ‘proficiency strands’

Important messages:

Most importantly –

change of focus in pedagogy:

Focus on working mathematically – make students think:

- Communication
- Problem solving
- Reasoning
- Understanding
- Fluency

Syllabus aim

- 'develop an increasingly sophisticated **understanding** of mathematical concepts and **fluency** with mathematical processes… to pose problems and reason…'
  - Increasingly sophisticated- needs a continuum to see the progress of development (WM outcomes)

Reasoning has an outcome as it develops in its level of sophistication

Reasoning in our mathematics syllabus

‘Students are reasoning mathematically when they explain their thinking…’

Mathematics K-10 syllabus

transfer learning from one context to another

compare and contrast related ideas

explain their thinking

Communication through **language** plays a large role in students' ability to reason, or more so, their ability to **explain** their reasons and thinking

These skills need to be:

- **planned for** during the lesson
- **taught** through teacher modelling
- **developed** through opportunities to talk.

Peter Gould says… *'convince yourself, convince a friend, convince an enemy'*

'Set tasks that require students to explain their thinking'

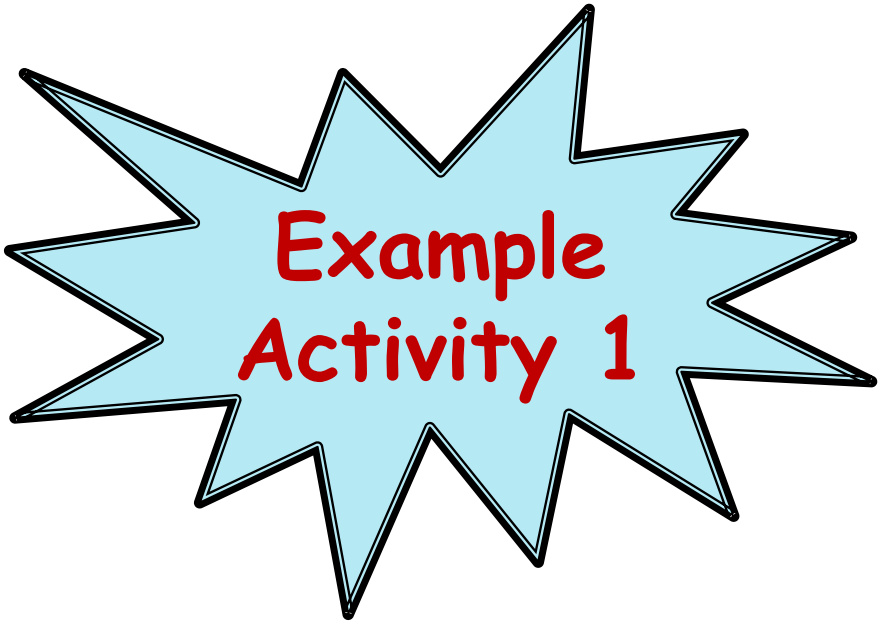
Prof Kaye Stacey

Think, pair, share

Cooperative learning

Reflection circle

Class Journal



Syllabus Outcome:
recognises and explains mathematical relationships using reasoning (MA4-3WM)

Agree or disagree, giving reasons:

A SQUARE IS A RECTANGLE

Reasoning in the new syllabus

S2	S3	S4	5.1.3	5.2.3	5.3.3
check the accuracy of a statement and explains the reasoning used	gives a valid reason for supporting one possible solution over another	recognises and explains mathematical relationships using reasoning	provides reasoning to support conclusions that are appropriate to the context	constructs arguments to prove and justify results	uses deductive reasoning in presenting arguments and formal proofs
MA2-3WM	MA3-3WM	MA4-3WM	MA5.1-3WM	MA5.2-3WM	MA5.3-3WM

Problem Solving Strategies

- uses objects
- acting it out
- trial and error
- drawing a diagram
- working backwards
- looking for patterns
- using a table
- making a model or list
- simplifying the problem

Make an organised list

Creating a list is normally used when there is a greater amount of information available. It requires the information to be set out in a more systematic fashion so that the probable solutions can be clearly seen. Students need to follow a procedure or sequence to ensure all possibilities are listed and to prevent repetition.

E.g. How many different combinations can you make using the numbers 1 2 3 4

1234	2134	3124	4123
1243	2143	3142	4132
1324	2314	3214	4213
1342	2341	3241	4231
1423	2413	3412	4312
1432	2431	3421	4321

Some descriptions come from "Problem Solving" by Sharon Shapiro Blake Education

Table to observe strategies in file pod

Signs in file pod

Blake Education

Recording problem solving

Link to Newman's prompts

1. Read the question to me
2. What is the question asking you to find out?
3. What method could you use to get the answer?
4. Try doing it and as you are doing it tell me what you are thinking?
5. Now write down your answer

Reading

Comprehension

Transformation

Process

Encoding

http://www.curriculumsupport.education.nsw.gov.au/primary/mathematics/numeracy/newman/index.htm

prove that something is true or false

When you take any two- digit number, add its digits and then take away that number, the answer is always a multiple of 9.

47 – 11 = 36

Prove why this is true.

The maths itself (the addition and subtraction skills) are not that difficult (Stage 1). Even providing other examples to justify this isn't too hard (Stage 2). But proving **why** this is true, always true, is much more difficult (Stage 3 and beyond). That's mathematical reasoning.

This works for 3-, 4-, 5- digit… numbers as well

Explain why without using algebraic formulas.

Question Stems

How do you know...

What happens when...

Is there another way...

Is it possible...

What pattern can you see...

How did you work it out?...

What do you notice when...

Does it always work...

Why does it work?

Can you explain how...

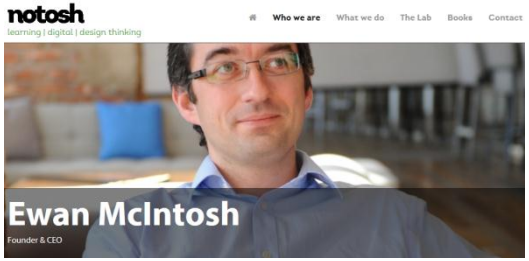
In file pod

Thinking cubes- create your own

Doc in file pod

Problem finders….

Food for thought



Watch Ewan McIntosh's TEDxLondon talk: The Problem Finders (8 minutes)

http://notosh.com/who-we-are/ewan-mcintosh/

http://edu.blogs.com/

Final comments

How much of the learning 'work' are you doing as a teacher compared to your students?

Do we need to present all content in the same way? E.g. Flipping the classroom

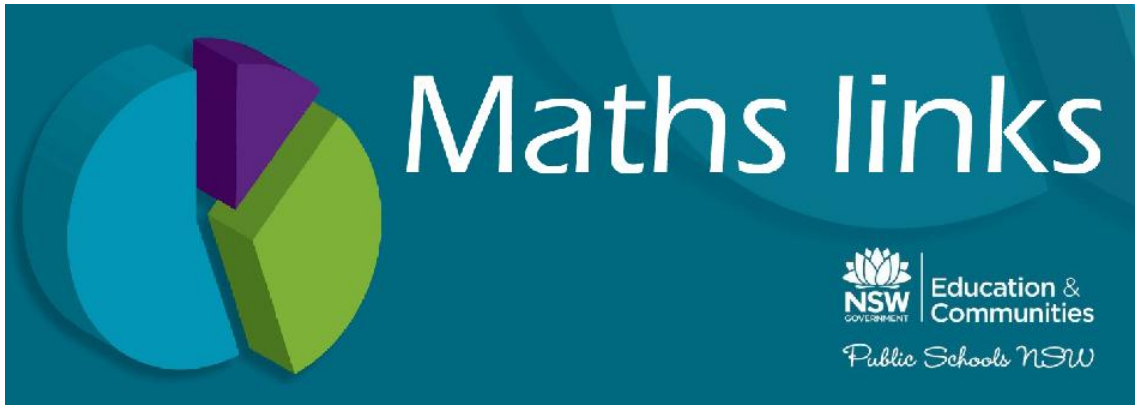
Students are excellent problem – finders!

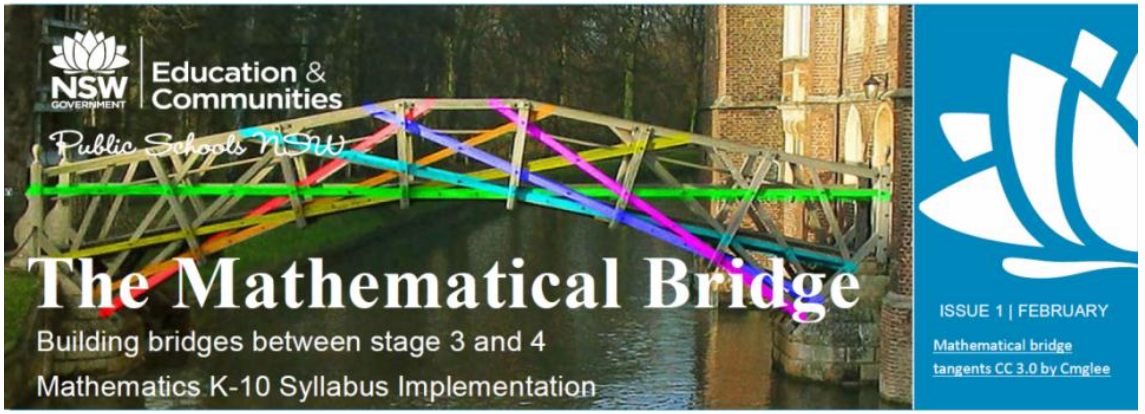
E-Newsletters

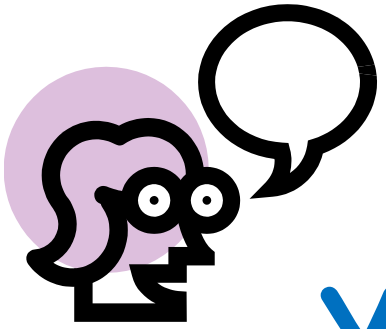
Curriculum networks
Subscribe here

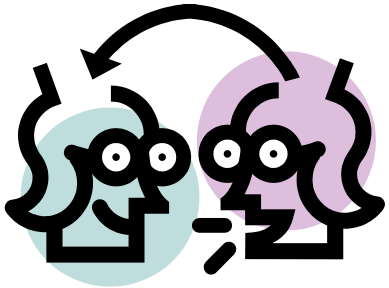
http://www.surveymonkey.com/s/ELPSE_subscription

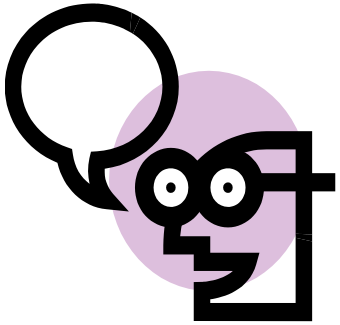
1. Maths links K-12 (mathematics and numeracy)
2. The Mathematical Bridge (Stage 3-4)











Your comments & questions

Acknowledgement:

Peter Gould PhD
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Primary Mathematics Australian Curriculum Advisor

Nagla Jebeile
Secondary Mathematics Australian Curriculum Advisor

Thank you!
All the best with your programming for 2015