

Working Mathematically & the General Capabilities

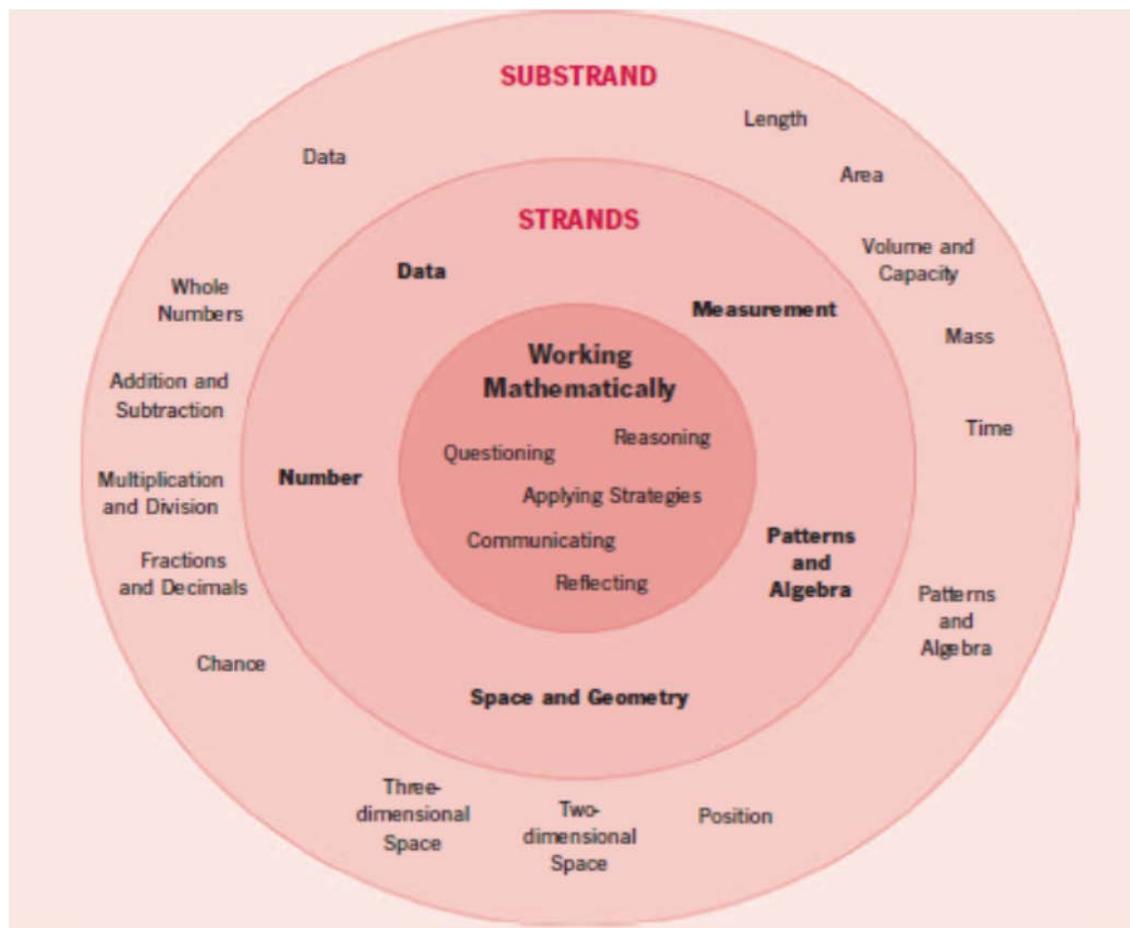
Adela King & Helen Paris
CCOS SDD Workshops
14th July 2014

WALT

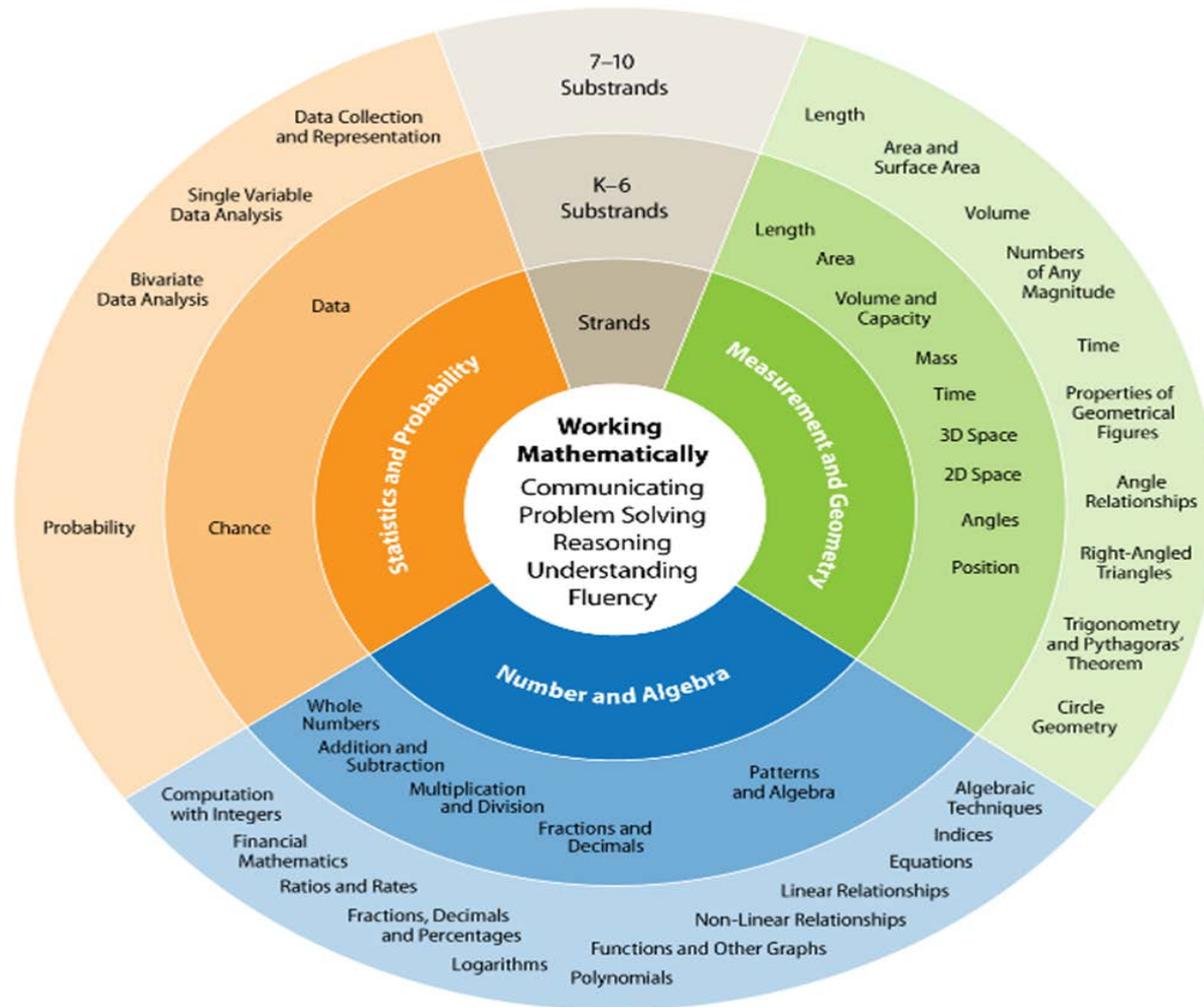
- **understand** the new Mathematics Syllabus
- **unpack** the five Working Mathematically proficiencies
- **understand** where the General Capabilities apply
- **identify** syllabus outcomes by participating in Maths tasks
- **'problem solve'** to **link** mathematical content when programming
- **enjoy** Mathematics

Mathematics Content

2002



Mathematics Content current



Learning Across the Curriculum

General Capabilities

- Critical and creative thinking 
- Ethical understanding 
- Information and communication technology capability 
- Intercultural understanding 
- Literacy 
- Numeracy 
- Personal and social capability 

Working Mathematically

- is central to all other strands
- needs to be embedded in all sub strands
- outcomes are listed **first** in every strand
- ▶ This icon on syllabus pages refers to an aspect of Working Mathematically
- The five WM proficiencies are now reflected in the outcomes and combined with the knowledge and skills content



Working Mathematically

5 Proficiencies

- Communicating
- Problem Solving
- Reasoning
- **Understanding** no separate outcome
- **Fluency** no separate outcome



Communicating

- describing
- representing
- explaining

- mathematical situations, concepts, methods and solutions to problems

Communicating

Example

- Early Stage 1 **Two-Dimensional Space**

Describes mathematical situations using everyday language, actions, materials and informal recordings

MAe-1WM

MAe-15MG (content outcome)

- Students:

Draw closed two-dimensional shapes without tracing

- ▶ recognise and explain the importance of closing the shape when drawing a shape (Communicating, Reasoning)

Problem Solving

- More than just applying Mathematics to simple problems
- Communicate solutions effectively
- Plan their approaches carefully
- Apply strategies to seek solutions to rich and more elaborate tasks
- Evaluate and justify solutions

Problem Solving example

- Stage 3 **Multiplication and Division 1**

Selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations MA3-2WM
MA3-6NA (content outcome)

- Students:

Record the strategy used to solve multiplication word problems

- ▶ use selected words to describe each step of the solution process (Problem Solving, Reasoning)

Reasoning

- Higher-order thinking to connect specific facts to general principles
- Using algebra, logic, formal proof and justification
- Sophisticated capacity for logical thought and actions, such as analysing, proving, evaluating, explaining, inferring, justifying and generalising

Reasoning example

- **Stage 2 Data 2**

Checks the accuracy of a statement and explains the reasoning used MA2-3WM

MA2-18 SP (content outcome)

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- **Students:**

conduct a survey to collect categorical data

- ▶ after conducting a survey, discuss and determine possible improvements to the questions or recording sheet (Communicating, Reasoning)

Understanding

- More than just learning facts
- Deep understanding
- Connect related ideas
- Represent concepts in different ways
- Identify commonalities and differences
- Describe their thinking mathematically
- Applying metalanguage
- Interpreting mathematical information

Understanding example

- Stage 3 **Volume and Capacity 2** MA3-11MG
Calculates the volume of rectangular prisms
- use repeated addition to find the volume of rectangular prisms
- establish the relationship between the number of cubes in one layer, the number of layers, and the volume of a rectangular prism
- Requires an ***Understanding*** of: Whole Number, Addition, Multiplication, Three-Dimensional Space and Position

Fluency

- Is **not** about how fast you can recall times tables
- Carrying out procedures flexibly, accurately, efficiently and appropriately
- Recognise 'robust ways' of answering questions

Fluency example

- Stage 3 **Addition and Subtraction 2 MA3-5NA**
Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving addition and subtraction with whole numbers
 - ▶ select and apply appropriate mental and written strategies, with and without the use of digital technologies, to solve unfamiliar problems (Problem Solving)
- Requires **Fluency** to think flexibly and efficiently to choose appropriate strategies

Teacher Reflection: Identifying outcomes

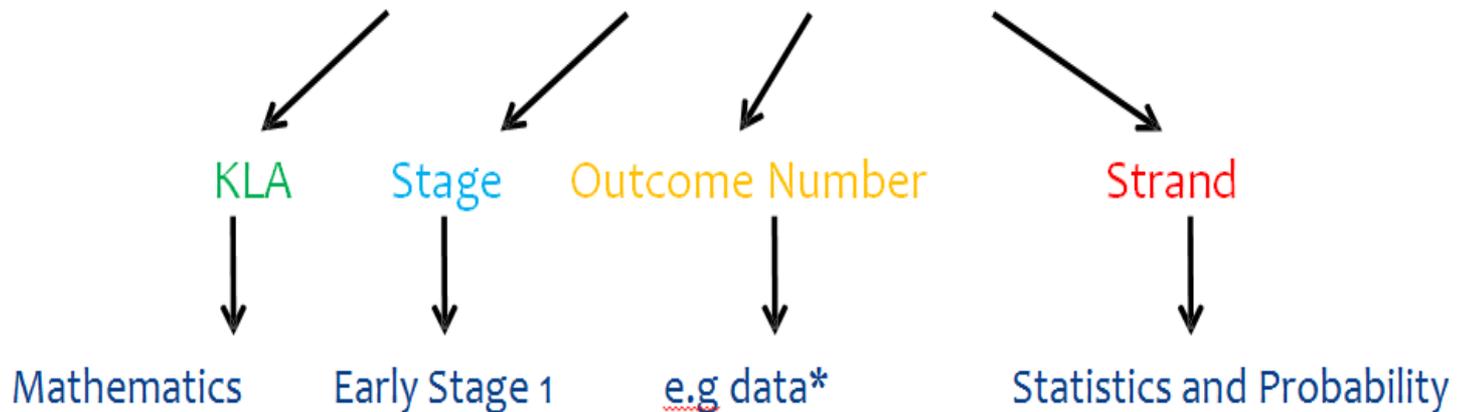
Identifying Maths Syllabus Outcomes

	Communicating "describe, represent and explain mathematical situations, concepts, methods and solutions to problems, using appropriate language, terminology, tables, diagram, graphs, symbols, notation and conventions"	Problem Solving "make choices, interpret, formulate, model and investigate problem situations, and communicate solutions effectively"	Reasoning "explain their thinking, deduce and justify strategies used and conclusions reached...and explain their choices"	Understanding "develop an understanding of the relationship between the 'why' and the 'how' of mathematics. They build understanding when they connect related ideas, represent concepts in different ways,.... describe their thinking mathematically, and interpret mathematical information"	Fluency "calculate answers efficiently, recognise robust ways of answering questions, choose appropriate methods", "recalling factual knowledge and concepts readily" and "recall skills to find solutions"
Number and Algebra					
Measurement and Geometry					
Statistics and Probability					

Reading the outcome codes

Example:

MAe-17SP



Task 1: What Number Am I?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



Task 1: What Number Am I?

- Work in groups to select one number from the 100s board.
- Brainstorm everything known about the number.
- Brainstorm everything that the number is **NOT**.
- Identify clues as 'fat'/'skinny'.
- Group selects six clues.
- Swap clues with another group to find the number.

Teacher Reflection 1: Identifying outcomes

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Task 2: Who's tallest?

- Find the tallest person in your group.
- Use informal units to measure his or her height.
- Repeat the task using another unit of measurement.
- Compare your results with another group.
- Generalisations?

Teacher Reflection 2: Identifying outcomes

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Task 3: Odds & Evens

- Equipment: 2 dice, pencil, paper
- **Answer:** "an odd number"
- Task: Use the dice to explore possible questions to match this answer.
- Extension: What possible generalisations can you make?

Teacher Reflection 3: Identifying outcomes

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Task 4: 2D Challenge

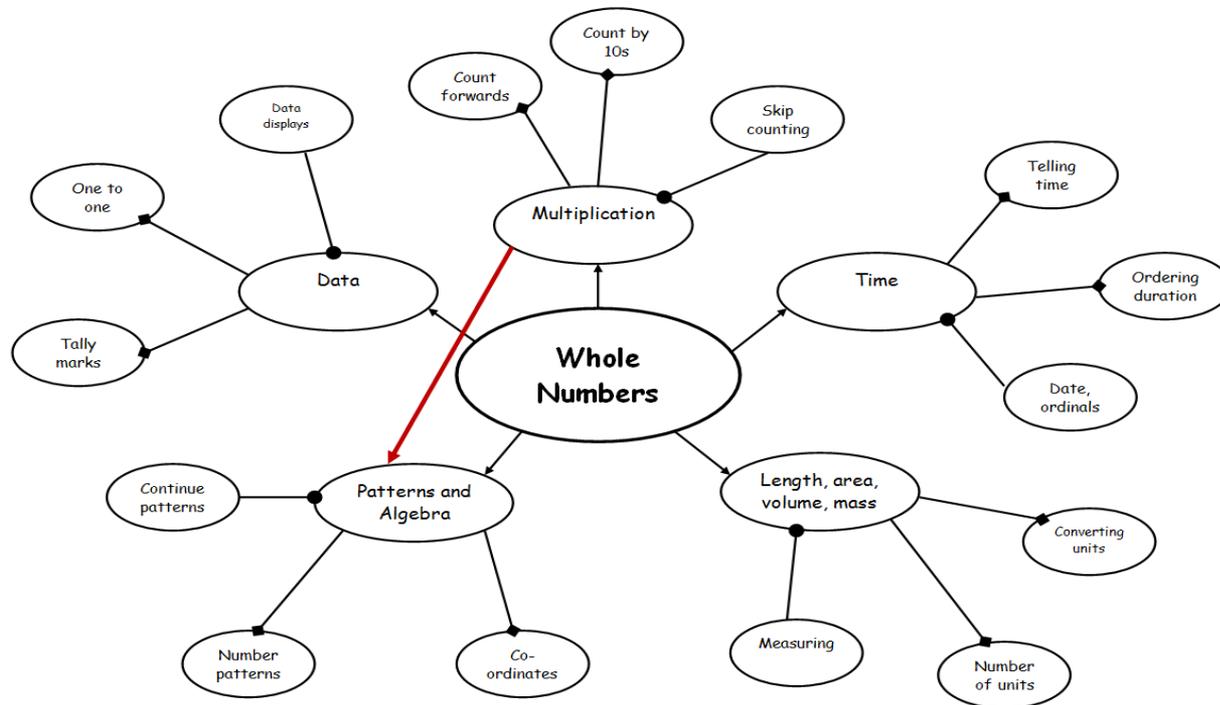
- Pattern Blocks and a barrier
- Work in pairs. Player 1 creates a 2D design that Player 2 cannot view .
- Player 1 uses mathematical language to describe their design.
- Player 2 listens and replicates the design.
- Compare results.

Teacher Reflection 4: Identifying outcomes

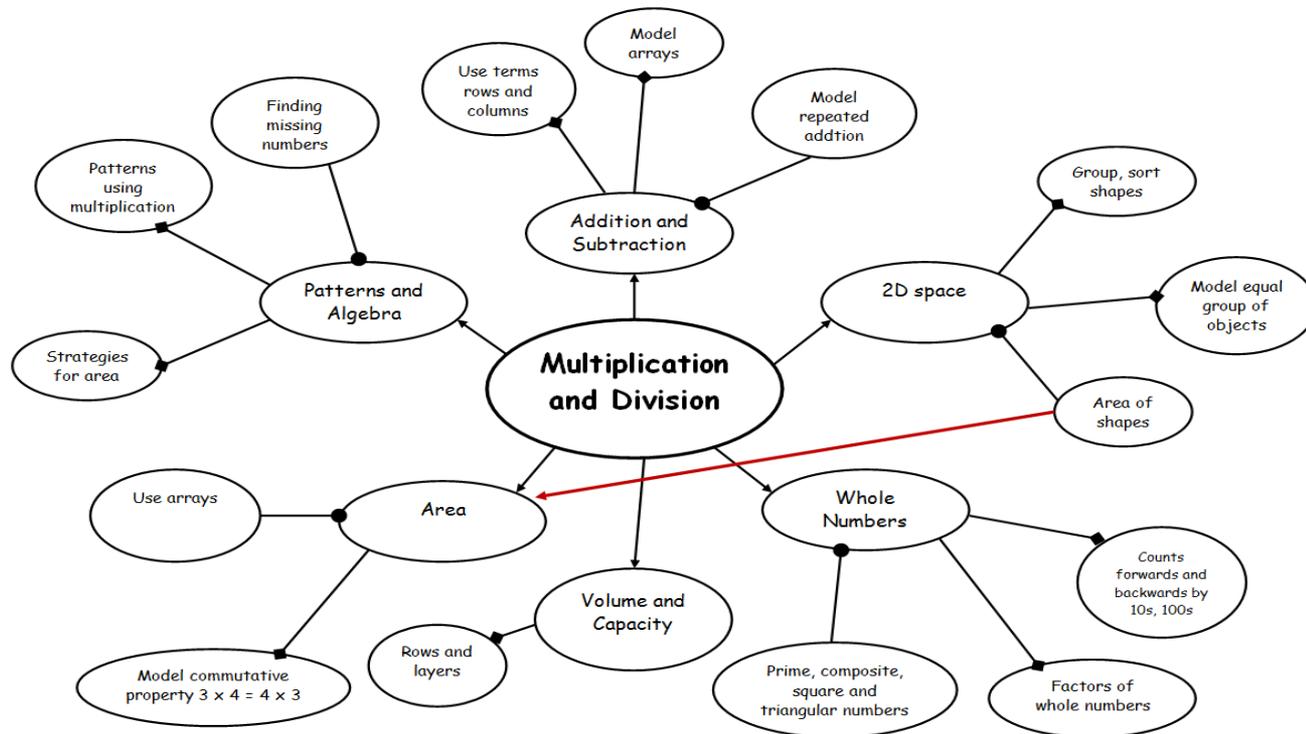
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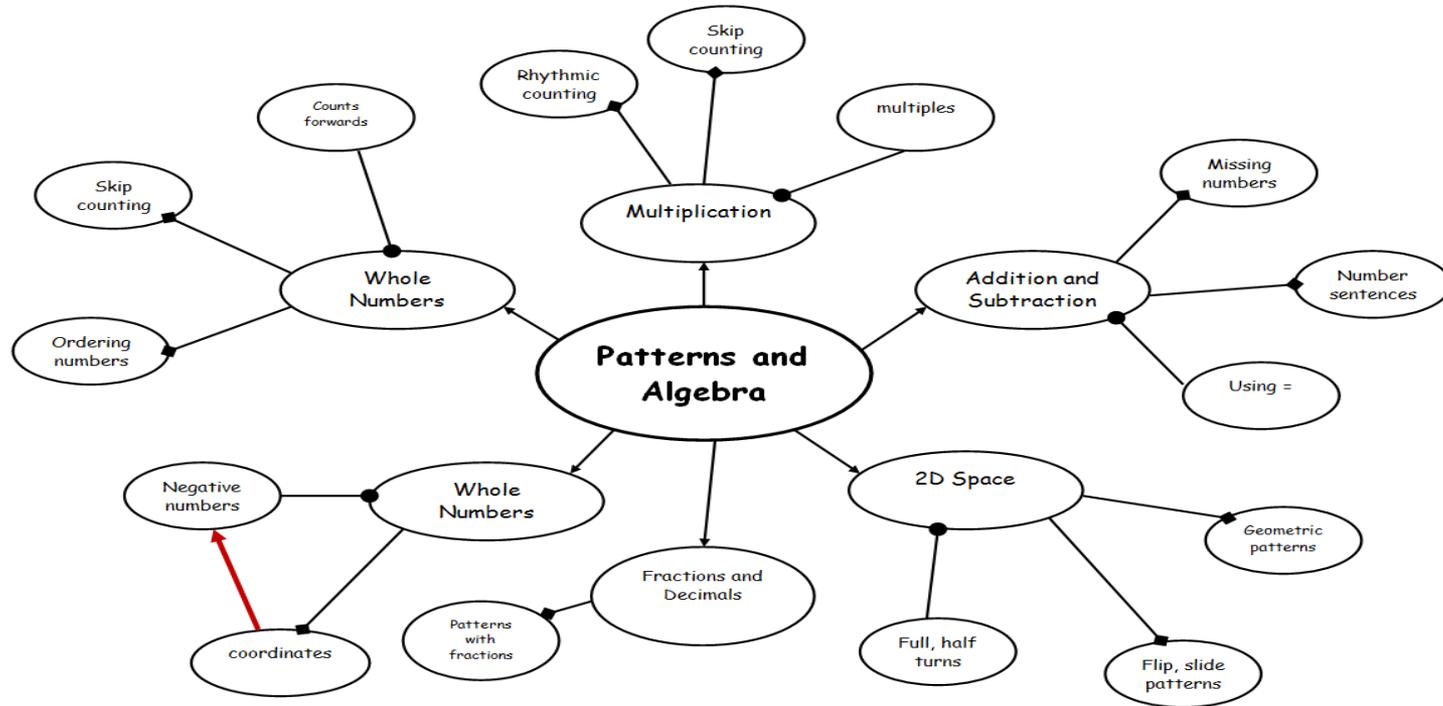
Programming Links



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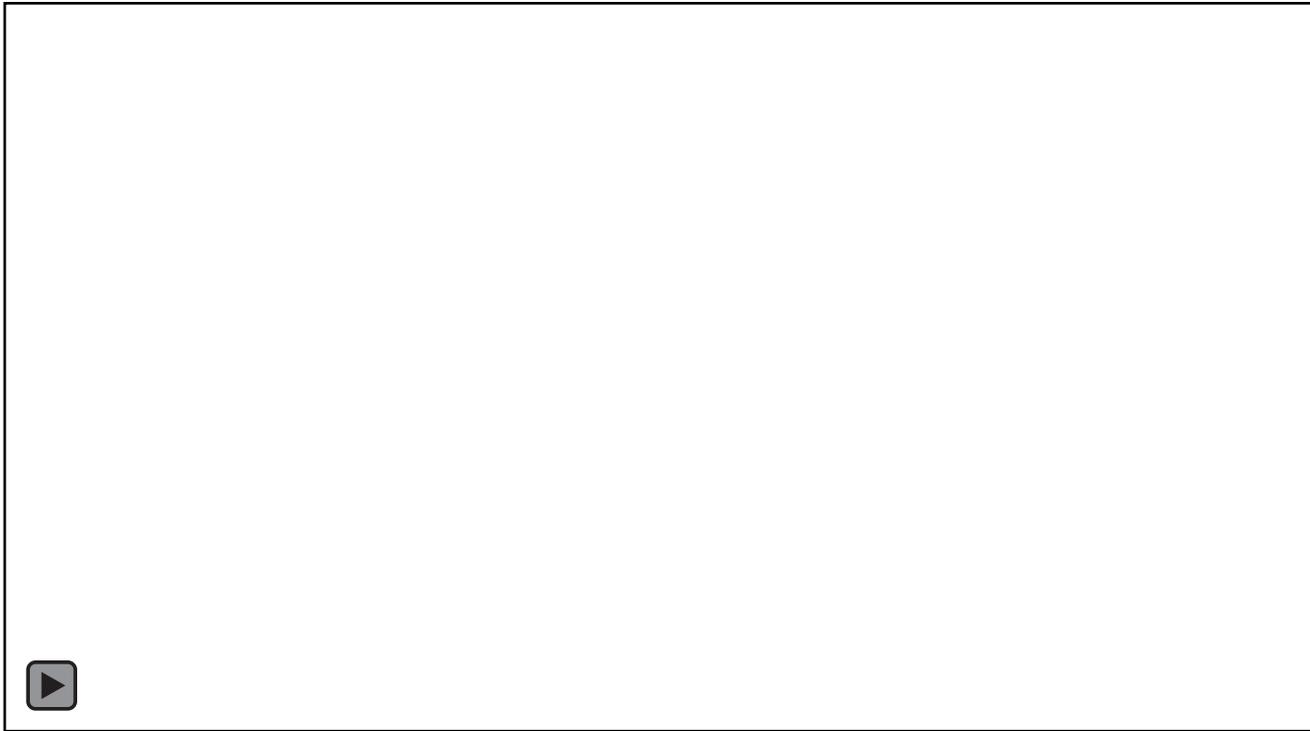
Real Life Relevance



Real Life Relevance

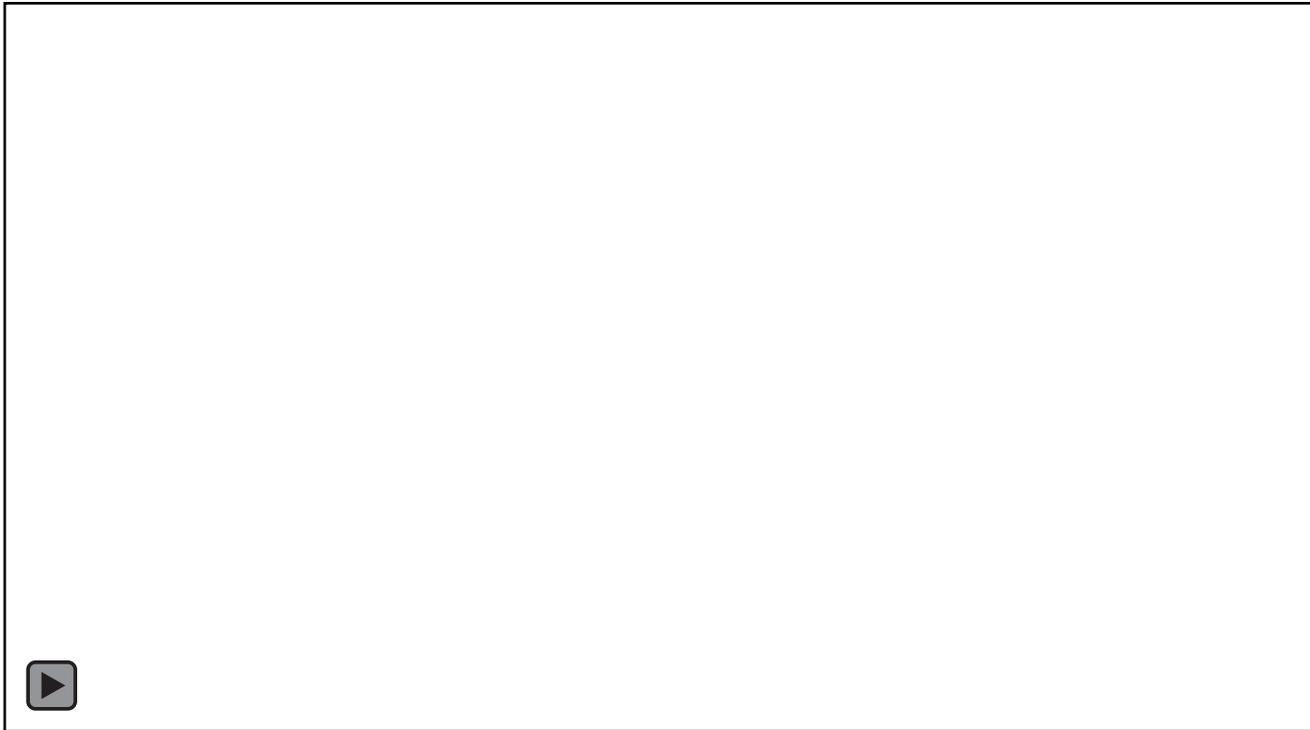


Enjoyment



Sheldon's Favourite Number Big Bang Theory

Reflecting on Maths



Miss USA - Should 'Math' be taught in schools?

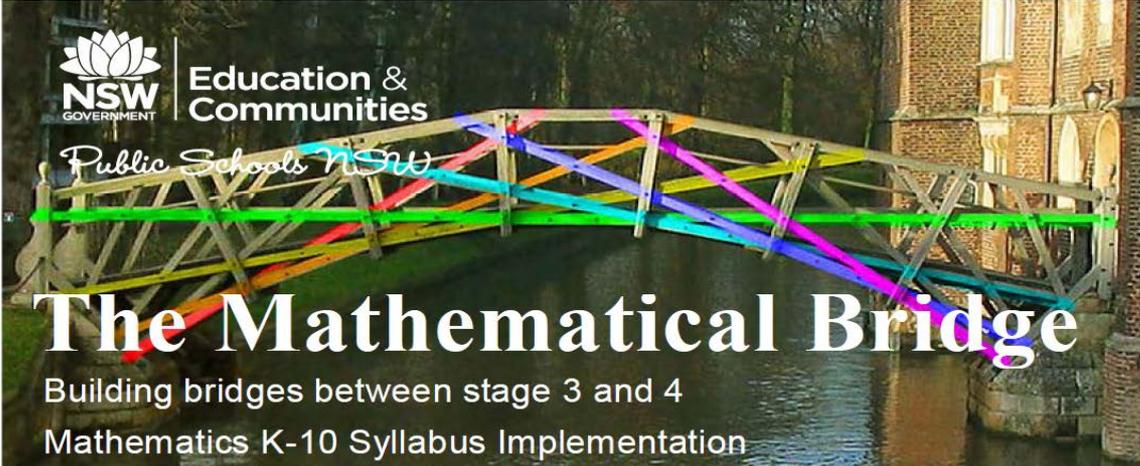
Resources



top drawer teachers

resources for teachers of mathematics

Home	Fractions	Geometric reasoning	Mental computation	Patterns	Reasoning	Statistics
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NSW GOVERNMENT
Education & Communities
Public Schools NSW

The Mathematical Bridge

Building bridges between stage 3 and 4
Mathematics K-10 Syllabus Implementation

ISSUE 1 | FEBRUARY
Mathematical bridge
tangents CC.3.0 by Cmglee

Syllabus content

Pedagogy

Teaching ideas



We would like to acknowledge:

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