CURRICULUM, PEDAGOGY AND BEYOND









The proficiencies are key

Dr Em Thompson



Proficiencies and processes

Understanding Fluency Reasoning Problem solving

mathematical modelling algorithmic thinking

statistical investigation

probability simulations



Understanding

Mathematics provides opportunities for students to build and refine a robust **knowledge** of adaptable and transferable mathematical concepts, structures and procedures. Students make connections between related ideas, progressively draw on their reasoning skills to adapt and transfer understanding of familiar applications to unfamiliar contexts, and cultivate new ideas. They develop an understanding of the relationship between the 'why' and the 'how' of mathematics. Students build conceptual understanding and procedural fluency when they connect related ideas, represent concepts in different ways, identify commonalities and differences between aspects of content, describe their thinking mathematically and interpret mathematical information.

Fluency

Mathematics provides opportunities for students to develop, practise and consolidate skills; **choose appropriate procedures**; carry out procedures flexibly, accurately, efficiently and appropriately; and apply their recall of factual knowledge and understanding of concepts readily. Students are fluent when they connect their conceptual understanding to learned strategies and procedures, make reasonable estimates and calculate answers efficiently, and choose and use computational strategies efficiently; when they recognise robust or **multiple ways** of answering questions; when they choose appropriate representations and approximations; when they understand and regularly apply definitions, facts and theorems; and when they can manipulate mathematical objects, expressions, relations and equations to find solutions to problems.

Reasoning

Mathematics emphasises mathematical reasoning as central to thinking and working mathematically and as a critical component of proficiency in mathematics. Mathematical reasoning guides students in developing an increasingly sophisticated capacity for logical thought and actions, such as conjecturing, hypothesising, analysing, proving, experimenting, modelling, evaluating, explaining, inferring, justifying, refuting, abstracting and generalising. Students are reasoning mathematically when they explain their thinking, deduce and justify strategies used and conclusions reached, adapt the known to the unknown, transfer learning from one context to another, make inferences about data or the likelihood of events, and prove that something is true or false. They are reasoning when they compare and contrast related ideas, and reflect on and explain their choices.

Problem solving

Mathematics recognises the importance of providing students with meaningful opportunities to use mathematics to solve problems from **both abstract mathematical and real-world contexts**. Students engage in mathematical problem-solving when they are presented with a problem situation for which they do not immediately know the answer, and they work through a process of **planning**, choosing and applying strategies and heuristics to find a solution to the problem, reviewing and analysing their solution. Problems can be simple, where there is only one possible solution, or complicated, where the problem may have many valid approaches to develop solutions. Problem-solving is the ability of students to make choices, **interpret**, formulate, model and investigate problem situations mathematically, select and use technological functions and **communicate solutions** effectively. Students pose and solve problems when they use mathematics to **represent unfamiliar** or meaningful situations, design investigations and plan their approaches, make mathematical **decisions** as they draw on previously learnt concepts, skills, procedures and processes to solve problems, verify that their answers are reasonable, communicate solutions clearly and justify the reasonableness of their approaches.

Thoughts on 'Understanding'

- Definitions
- Axioms
- Conventions
- Results



Thoughts on 'Fluency'

Number facts are to maths as spelling is to poetry

Thoughts on 'Reasoning'

curiosity and creativity + clear and precise communication

logical thought The conjecturing
experimenting
abstracting
generalising
deduce and justify strategies
prove that something is true or false

The contrapositive:

If A is true, then B is true. *is the same as* If B is not true, then A is not true.

Thoughts on 'Problem solving'

- Isn't this ultimately the point?
- Productive struggle
- Both real-world and abstract mathematical contexts

A mathematically capable student

- Can access number facts without exerting excessive effort (not necessarily in their head)
- Can translate a problem into a mathematical framework
- Approaches problems creatively and with curiosity
- Uses sound logic

Engaging with the content descriptions...

The necessities

- Which of the skills do I want my students to take home and keep for life? (and what do these skills actually look like in that context?)
- Which of the skills need to be mastered to make future content accessible?

Beyond this...

• How can I use the content descriptions as inspiration for learning that prioritises the priorities?

... critically and creatively

Level 5 Content Descriptions	Level 6 Content Descriptions	Level 7 Content Descriptions
Space	Space	Space
connect objects to their nets and build objects from their nets using spatial and geometric reasoning (VC2M5SP01)	compare the parallel cross-sections of objects and recognise their relationships to right prisms (VC2M6SP01)	represent three-dimensional objects in 2 dimensions; discuss and reason about the advantages and disadvantages of different representations (VC2M7SP01)
construct a grid coordinate system that uses coordinates to locate positions within a space; use coordinates and directional language to describe position and movement (VC2M5SP02)	locate points in the 4 quadrants of the Cartesian plane; describe changes to the coordinates when a point is moved to a different position in the plane (VC2M6SP02)	classify triangles, quadrilaterals and other polygons according to their side and angle properties; identify and reason about relationships (VC2M7SP02)
describe and perform translations, reflections and rotations of shapes, using dynamic geometry software where appropriate; recognise what changes and what remains the same, and identify any symmetries	recognise and use combinations of transformations to create tessellations and other geometric patterns, using dynamic geometry software where appropriate (VC2M6SP03)	describe the effect of transformations of a set of points using coordinates in the Cartesian plane, including translations, reflections in an axis, and rotations about the origin (VC2M7SP03)
(VC210105FU3)		

design algorithms involving a sequence of steps and decisions that will sort and classify sets of shapes according to their attributes, and describe how the algorithms work (VC2M7SP04)





Event App

App Download Instructions

Step 1: Download the App 'Arinex One' from the App Store or Google Play



- Step 2: Enter Event Code: mav
- Step 3: Enter the email you registered with
- Step 4: Enter the Passcode you receive via email and click 'Verify'. Please be sure to check your Junk Mail for the email, or see the Registration Desk if you require further assistance.





Be in it to WIN!

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A02 - (Year 1 to Year 6) Supporting High Potential and Gifted Learners in Mathematics

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R∃ Speaker



Dr Chrissy Monteleone

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