THE MATHEMATICAL ASSOCIATION OF VICTORIA

THE COMMON DENOMINATOR 1/25

WILL 'WHAT WORKS' WORK?

INSIDE

Dr Carly Sawatzki, Deakin University and Dr Danielle Armour, The University of Queensland

IS THIS THE BEST WAY TO IMPROVE MATHEMATICS LEARNING FOR ALL?

The promise of a mathematics education that can support young people to overcome disadvantage is far from being met and the conditions for teaching and learning on the margins are increasingly untenable. In under-funded public schools, teachers and students are deprived of the resources they need to be successful and so struggle with unfilled teaching vacancies, out-of-field teaching assignments, and teacher absenteeism and attrition. Even well-resourced public schools have difficulties staffing programs that can help students who are identified as needing additional support (termed priority cohort students). In this article, we explore the political origins of recent instructional wars and mandates and the different perspectives on whether this is the best way to improve mathematics learning for all.

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FROM THE PRESIDENT

Kerryn Sandford

Welcome to 2025 and another year of mathematics learning and teaching. I am sure many of you have spent at least some of your holiday time preparing for the classes that you will be teaching this year or, perhaps, some of you have been preparing for how you will be supporting others with their classes. Either way, MAV is here to support you, whether through providing professional learning or leadership support or through provision of resources and ideas for learning tasks.

It was fantastic to see so many at our annual MAVCON event in December, it was abuzz with people connecting, learning, sharing their experiences and practice with each other. I took away many learnings that I hope to put into practice across 2025 and beyond. For me, the conference started with a keynote address featuring David Howes (Deputy Secretary, Schools and Regional Servies), Penny Addison, Michael McNeil and Rachael Whitney-Smith that investigated the challenges and opportunities within our system. David began the panel discussion with a summary of key statistics on how we are performing as a system in mathematics and was very clear that, according to the data, Victorian teachers are punching well above their weight in getting the best outcomes for their students. He referenced recent TIMSS results that showed that we, as a system, have improved on all areas assessed and particularly for our Year 4 students who were ranked higher than they've ever been in this latest round of testing. Year 8 results showed similar increases in attainment and, when compared to other OECD countries, Victoria's trend line is definitely 'bucking the trend' for numeracy in the right direction.

David was also quite scathing in his assessment of the way in which the media has been reporting on education in Victoria in recent times. Those of you who regularly read my column, will know that this topic is a key bug-bear of mine as well. He was clear that the actual story of Victoria's data is very different to the stories finding their way into major newspaper headlines and the blame being levelled at teachers, extremely disappointing given everything that they have been able to achieve despite lockdowns, remote learning, social media impacts and increasing behavioural complexities in both students and families.

One concern in the data is the impact that factors outside of student (or teacher) control have on performance. Whilst in Victoria, the impact of parental levels of education were held stable across recent testing periods. This impact is still present and demonstrates an issue of equity in our system. David also referenced the disparity in how girls perform compared with boys and noted that this is a wicked problem that we don't yet have an answer to.

Penny Addison (Department of Education) referenced some the key challenges being faced by the system at the moment focusing mostly on the workforce challenges and issues such as the proportion of out of field teachers across the system and especially in our remote and regional schools. She referred to some new initiatives being offered by the Department in 2025 including the launch of four new mathematics ambassador positions to help to build more aspiration around learning mathematics through working with family and community.

Michael and Rachael noted the challenges inherent in curriculum change and discussed the need for conversations around the purpose of mathematics education and to examine how this impacts on the decisions we make around how we teach and assess. The question was also raised as to how we convince students of the importance of mathematics and encourage more students to develop positive dispositions towards the discipline and to continue the study of mathematics into the senior years.

I attended many sessions focusing on various topics and techniques and even participated in a panel discussion, as principal of a secondary government school, discussing the many challenges that we face in mathematics. Overall, whilst challenges were identified, so too were possible solutions and ideas and I was left with no doubt that despite all that there is to be concerned about, the teachers and leaders of our schools will rise to meet the challenge and ensure that student needs are met.

Whatever challenges arise for you or whatever goals you have set for the new year, MAV will be there to support you.

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UPCOMING MAV EVENTS

For more information and to reserve your place at any of the events below, visit www.mav.vic.edu.au.

EVENT	DATE	YEARS	PRESENTERS
VCE Meet the Assessors	February	VCE	Various
SAC writing workshops	February	VCE	Various
VCE conference	14/2/25	VCE	Various
The rules and foundations of pseudocode (Part 1 of 3)	19/2/25 (Virtual)	VCE	Toan Huynh
Effective practices for teaching finance	21/2/25	7–10	Dr Jill Brown and Dr Carly Sawatzki
Analysing pseudocode (Part 2 of 3)	26/2/25 (Virtual)	VCE	Toan Huynh
VCE Regional conference (Shepparton)	28/2/25	VCE	Various
Designing and writing pseudocode (Part 3 of 3)	5/3/25 (Virtual)	VCE	Toan Huynh
Writing and testing pseudocode with Python for VCE Methods and Specialist Mathematics	12/3/25 (Virtual)	VCE	Toan Huynh
VCE Regional conference (Ballarat)	14/3/25	VCE	Various
MAV annual conference: Thriving in mathematics	4/12/25 5/12/25	All	Various

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WILL 'WHAT WORKS' WORK?

Dr Carly Sawatzki, Deakin University and Dr Danielle Armour, The University of Queensland

CONT. FROM PAGE 1.

THE FEATURES OF A WORLD-CLASS EDUCATION SYSTEM

Australia has two long-standing *Educational Goals for Young Australians* (Education Council, 2019) that are intended to unite governments, government bodies, school sectors, individual schools, and teachers in their work towards educating young people. The first goal is for an education system that promotes excellence and equity. The second goal is for all young Australians to become confident and creative, successful lifelong learners, and active and informed community members.

Australia's education system cannot be considered world-class, because it serves some students well and others far less so. In Australia, how young people progress and achieve at school varies by factors that are outside their control, such as where they live, their parents' education and employment, and their language and cultural background (De Bortoli et al. 2023). This is why the Organisation for Economic Cooperation and Development (OECD) describes Australia as being a low-equity country. In fact, we rank in the bottom third of OECD countries in providing equitable access to education.

The Australian Government's *Improving Outcomes for All* report (Department of Education, 2023) identifies seven priority areas for reform and the sort of things that Education Ministers can do to build a better and fairer education system. Stated priorities include to lift student outcomes and improve equity.

While everyone agrees that the situation is urgent, there is less agreement on what policy responses are appropriate.

YOU NEED TO KNOW ABOUT AERO

The Morrison government established the Australian Education Research Organisation (AERO) in 2020 in response to findings and recommendations made as part of the *Review to Achieve Educational Excellence in Australian Schools*, also known as the Gonski Review 2.0 (Commonwealth of Australia, 2018).

The establishment of AERO was one of 8 national policy initiatives in the 2019-2024 National School Reform Agreement.

On its website, www.edresearch.edu.au/about-us AERO describes a vision:

> for Australia to achieve excellence and equity in educational outcomes for all children and young people through effective use of evidence. In support of this vision, we:
>
> - generate high-quality evidence
> - present the evidence in ways that are relevant and accessible
> - encourage adoption and effective implementation of evidence in practice and policy.

Despite their reported remit, high-quality educational research studies involving Australian teachers and students across diverse educational settings are being ignored by AERO. This devalues the significant contributions that Australian scholars, including Aboriginal and Torres Strait Islander scholars, have made together with school communities to ensure the most expansive understanding of how teachers and students can interact to optimise student outcomes.

WHAT AERO WANTS: EQUALITY IN THE PROVISION OF TEACHING INSTRUCTION

AERO argues that the best way to lift student outcomes and improve equity is through a knowledge-rich curriculum that prioritises and explicitly outlines the subject knowledge and related skills that students should be taught and develop at each stage of their schooling. They say that the solution lies in providing all students with access to a common body of knowledge, including standardised lesson plans and slide stacks with sufficient scripting and worked examples to ensure consistent classroom delivery. The story goes that such resources, combined with explicit or direct instruction can minimise the impact of individual challenges and barriers to learning. This way of thinking is common in settler colonial countries like Australia.

THE COUNTERPOINT: EQUALITY AND EQUITY ARE DISTINCT CONCEPTS

The alternative view is that teaching everyone the same way won't necessarily result in educational justice or reduce gaps in achievement – but giving school communities the time and space required to plan for and reflect on meaningful learning experiences can. In fact, the architects of the Australian Curriculum encourage professional educators to design learning experiences in ways that value teachers' professional knowledge, reflect local contexts, and take into account individual students' family, cultural, and community backgrounds (ACARA, 2024). This advice respects that Australian teachers must demonstrate Professional Standards in knowledge, practice and engagement to maintain registration to teach, and so can be relied upon to plan for and implement effective teaching and learning (AITSL, 2017). The Victorian Curriculum and Assessment Authority is responsible for high quality curriculum, assessment and reporting to enable learning for life in line with these national frameworks.

HOW CAN WE TEACH MATHEMATICS EFFECTIVELY?

Mathematics teaching and learning must be *lifeworthy* (Perkins, 2016). To achieve lifeworthiness, mathematics must be taught and learned through a variety of instructional approaches that resonate with the diverse lifeworlds and funds of knowledge (Moll et al., 1992) that young people bring to the classroom, as well as the diverse futures they wish to pursue.

Rather than one best way to teach and learn mathematics, there are a multitude of effective approaches. This range is reflected in Victoria's previous commitment to 10 High Impact Teaching Strategies, which teachers have worked hard to develop and refine. Note that in the United States, the National Council of Teachers of Mathematics identifies 7 effective teaching practices underpinned by meaningful and interactive mathematical discourse. An OECD analysis of teaching strategies that ensure instructional quality (Le Donné et al, 2016) identified that cognitive engagement and active learning strategies were more effective than explicit or direct instruction, which was the most prevalent mode of instruction, but the least related to mathematics performance. Associations were even weaker in disadvantaged school settings, suggesting the importance of nuanced and responsive pedagogies in these places.

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IMPROVED OUTCOMES FOR ALL RELIES ON LOCALLY RESPONSIVE CURRICULUM MAKING

Australian educational reform that is context-blind and requires all students to learn via instructional strategies that reflect a normalised, middle-class worldview and English language tradition is an example of colonising policy. This approach has failed generations of priority cohort students and will continue to do so.

The United Nations Declaration on the Rights of Indigenous Peoples emphasises that education is a fundamental human right and an endeavour that must be contextualised in ways that honour the unique identities, cultures, and contributions that young people bring to school (United Nations, 2007). Through local partnerships with Indigenous families and communities, Indigenous cultural knowledge can be integrated into everyday learning (Fricker et al. 2023). Further, the use of culturally appropriate resources can reduce the cultural, linguistic, and contextual barriers often associated with engaging Indigenous students in learning mathematics (Sarra & Ewing, 2014).

Consistent with these ideas, Australia's ten mathematics associations developed a commitment statement to make a systematic difference in mathematics education for Aboriginal and Torres Strait Islander learners. The commitment statement references the importance of culturally responsive practices, which have shown promising outcomes among marginalised student populations internationally. Morrison et al. (2016-2019) and Rigney et al. (2020) describe these practices as: providing high intellectual challenge; making strong connections to young people's lifeworlds; ensuring all young people feel positive about their own cultural identity; constructing opportunities for young people to share their learning in meaningful ways [including via multimodal literacies] within community; and modelling and inspiring a problem-solving, activist orientation.

CONCLUDING REMARKS

Leading Australian scholars are voicing serious concerns about AERO. These concerns include that the organisation is basing its directions on a narrow view of research evidence and what quality schooling can look like (van Bergen et al., 2024) and is not being held to high enough standards (Albrecht, 2024). Decades of mathematics education research exists to forewarn education authorities about the risks associated with instructional mandates (Brown, 2024; Brunker, 2024; Tytler, 2024).

Of course, we want all young people to be educated to achieve their potential and lead their best lives. Ultimately, the promise of templated lesson plans, slide stacks, and explicit or direct instruction seems not only wishful but will likely prove a costly mistake.

AUTHORS

Dr Carly Sawatzki is a non-Indigenous teacher educator and educational researcher in Deakin University's School of Education. She supports teachers of mathematics to teach differently, by helping them to connect students' classroom learning with their current and future lifeworlds.

Dr Danielle Armour is a proud Kamilaroi woman from northern NSW and Senior Lecturer in the University of Queensland's School of Education. Danielle's research area is in Aboriginal education. She has extensive experience working in partnership Elders and community members, including co-constructing curriculum and learning experiences.

WHAT CAN YOU DO TO KEEP LEARNING?

Uncover Emma Rowe and Sarah Langman's appraisal the politics behind the Australian Education Research Organisation (AERO) www.aeuvic.asn.au/professional-voice-1435

Find out more about the NCTM's 7 effective mathematics teaching practices www.nctm.org/Conferences-and-Professional-Development/Principles-to-Actions-Toolkit/Resources/7-EffectiveMathematicsTeachingPractices/

SELECTED REFERENCES

A copy of this article with a full, hyperliked reference list is available at https://redi.deakin.edu.au/news/is-this-the-best-way-to-improve-mathematics-learning-for-all/

Citations marked with * signal authorship by Aboriginal and Torres Strait Islander scholars.

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OUR APPROACH TO TEACHING

Donna McNeight, Numeracy Learning Specialist, Wendouree Primary School

As the Numeracy Learning Specialist at an inner regional primary school that has a high SFO we face many challenges. Our school's enrolments varies each year between 120 -140 with 10% classed as Indigenous and 15% that are EAL. As a government school we receive funding from the Student Resource Package that includes Equity Funding and Core Student Learning Allocation. There is also a high percentage of students that are funded through the Program for Students with a Disability.

Providing a supportive environment that enables our students to achieve success in their learning is essential but also challenging when there are outside influences that hinder this outcome. Providing support to our students that have experienced trauma, families are supported by our welfare system and students with learning difficulties is vital since these issues will affect a students' desire to learn.

As a leader with the specific focus of Numeracy, it was important that this was my focus. To gain success for the students it was important to first provide assistance to the teachers because they were the mathematical leaders in each classroom. This can be a challenge due to all teachers having their own positive or negative experiences as students which have followed them into adulthood. This is an area that can be addressed in university so that future maths teachers are not taking negative attitudes into their own classrooms. Achieving success in this is an ongoing focus as it can be affected by staff changes and the working level of the students in each class. Providing positive experiences in the teacher's professional development was essential as it was important that they take that enthusiasm into the classroom.

As a smaller school providing a mathematics intervention program is a goal that all schools should be provided support with. To enable students to achieve success and want to learn mathematics in high school we need to be able identify students that are vulnerable as early as possible. Identifying these students enables intervention to be provided in the early years of schooling which then reduces the chance of these students developing a negative attitude towards mathematics and falling through the cracks as they grow older.

Creating our Positive Approach to Mathematics Program has been a long process where as a school we have participated in a variety of programs. One funded program provided by the Victorian Government was the Primary Mathematics Specialist Program where professional development was provided to build the teacher's capacity as both a teacher and as a leader. To support the implementation of an intervention program we also have applied for grants. Being successful in one grant provided many mathematical opportunities for the students and teachers in a 12-month period but the difficulty then becomes sustaining the changes once the grant had finished.

Our approach to teaching mathematics is determined by our cohort and their life experiences because no one strategy suits our students. Our teachers determine the activities that are needed to provide a successful learning experience. Using the Victorian Curriculum to determine to focus, data is collected and then evaluated using the focus of 'where to next?' In planning meetings activities are decided that will meet students at their point of need. The teaching strategies that are used in the classroom are varied depending on the focus and the cohort in each classroom.

Our Foundation students are provided with a lot hands on exploration that enables talk and play because that was what was identified that our students needed. Our senior teachers use different strategies that could included explicit teaching, modelling and multiple exposures. No two mathematics lessons are the same as each lesson is adapted to meet the learning needs of the students.

Using this approach has been successful for us which has been reflected in our improved NAPLAN results over the last eight years and our positive student surveys. Building a positive learning environment for both our teachers and students has had a fabulous impact on both the students' attitude towards their learning and the teacher's confidence to support their students to achieve success.

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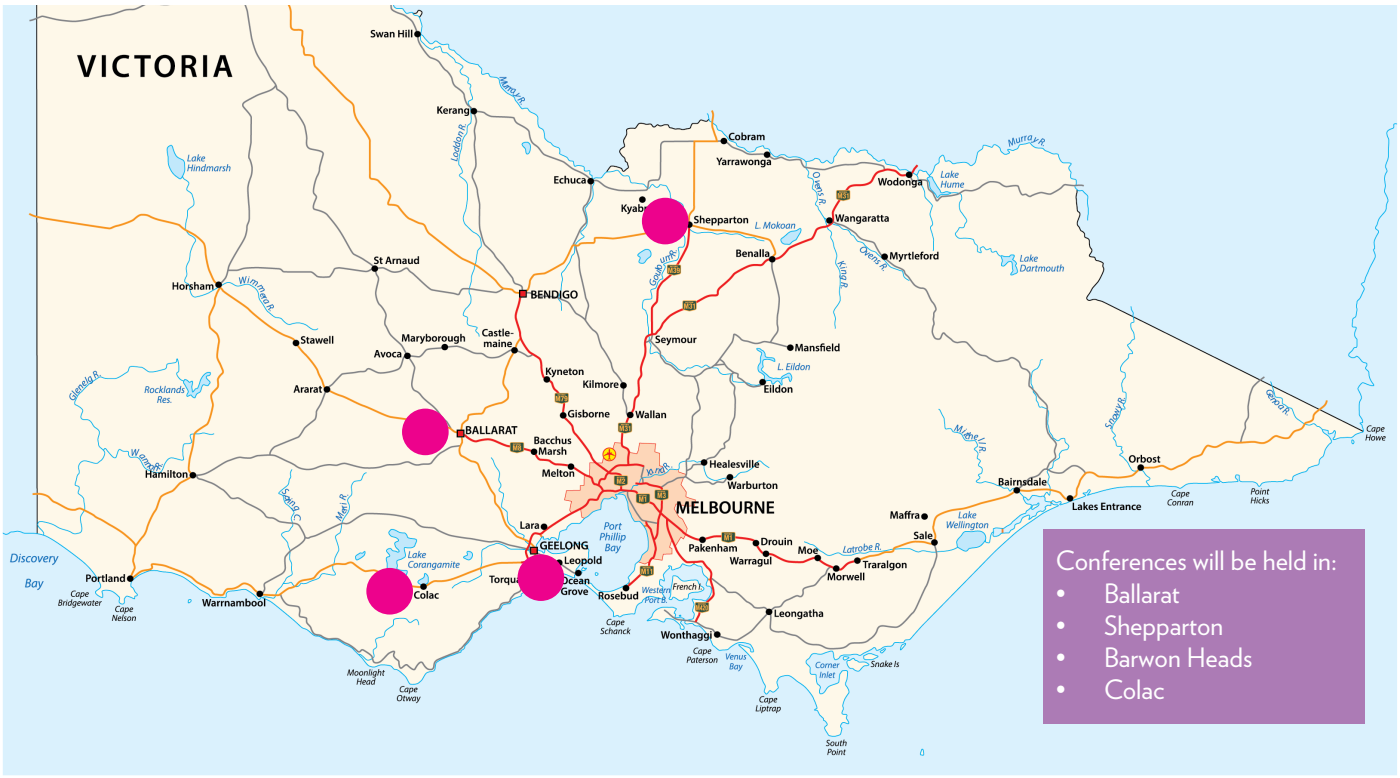
REGIONAL MATHEMATICS CONFERENCES



TRANSFORMING MATHEMATICS EDUCATION: STRATEGIES FOR EMPOWERMENT, ENGAGEMENT, AND EXCELLENCE

IMMERSIVE SESSIONS, INSPIRING CONTENT

- Connecting the Victorian Teaching and Learning Model to the teaching and learning of mathematics.
- Adapting to the Victorian Curriculum 2.0: Comprehensive guidance on the effective planning and assessment of mathematical modelling and statistical investigations.
- Challenging and supporting students in mathematics: effective use of manipulatives, representations, tasks, and resources.
- Explicit instruction, teaching and learning: understanding theory and pedagogies.
- Empowering students to develop their own problem-solving strategies: effective teaching techniques.
- Building student independence and motivation: fostering active learning and metacognitive skills.

WHERE AND WHEN

28 February 2025: Greater Shepparton Secondary College *(Primary, Secondary, VCE)*

14 March 2025: Ballarat Tech Centre *(Primary, Secondary, VCE)*

20 June 2025: Clifton Springs Primary School, Barwon Heads *(Primary, Secondary)*

5 September 2025: Colac Secondary College *(Primary, Secondary)*

Learn more about the 2025 regional mathematics conferences at: www.mav.vic.edu.au/conferences/regional

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ONE MINUTE WITH SHEENA WATT

I'M...

Sheena Watt, a Member of Parliament for the Northern Metropolitan Region of Victoria.

WHEN I WAS YOUNGER...

I dreamed of making a difference in my community.

MY CAREER HAS TAKEN ME ON QUITE A JOURNEY...

From working in public health to advocating for social justice and now to the halls and seats of our State Parliament.

I WAS INSPIRED TO RUN FOR PARLIAMENT...

To be a voice for those who often go unheard and to fight for equality and justice.

CONNECTED COMMUNITIES HAVE POWER TO...

Create positive change and support one another through challenges.

DIVERSITY BRINGS RICHNESS...

To our society, offering different perspectives and fostering innovation.

A STRONG EDUCATION SYSTEM...

Means every child has the opportunity to reach their full potential.

MY INDIGENOUS BACKGROUND...

I'm a proud Aboriginal woman and my Indigenous background shapes my perspective and drives my commitment to advocate for Indigenous rights.

BEING MATHEMATICALLY LITERATE...

Helps students develop critical thinking and problem-solving skills that are essential in everyday life.

GOVERNMENT TOUCHES PEOPLE'S LIVES...

In countless ways, from education to healthcare to infrastructure.

BEING A PART OF THE CHANGE IS EMPOWERING...

Because it allows me to contribute to a better future for all.

MY ADVICE TO YOUNG PEOPLE...

Is to stay curious, be persistent, and always believe in your ability to make a difference.

TEACHERS PLAY A BIG ROLE...

In shaping our future by inspiring and guiding the next generation.

I LIKE TO CHILL OUT WITH...

A good book and a cup of tea.

MY FAVOURITE SPORT IS...

AFL! I love the excitement and community spirit it brings. I especially love the mighty Blues!

MOST PEOPLE WOULDN'T REALISE THIS ABOUT ME...

I'm a huge fan of historical documentaries – especially those that shape my understanding of the world around us.

I SPEND A LOT OF TIME...

Working on initiatives to support and uplift my community.

I'D LINE UP FOR...

A ticket to Beyonce any day or Grand Final tickets if Carlton had a chance.

I'M READING...

Guwayu – For All Times, it's a fascinating look at Indigenous Australian history through poetry.

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AREA MAZE PUZZLES

Roger Walter

Before we begin, let us first consider how we develop the topic of area in the classroom. Initially, we look at calculating simple areas, for example, finding the area of a rectangle of length 8 cm and width 5 cm. The next step is to find the areas of more complicated shapes and also composite shapes. For the latter, students usually face problems where they need to calculate unknown sides, as in the shape below. If it helps, you may assume all lengths are in centimetres and areas in cm^2.

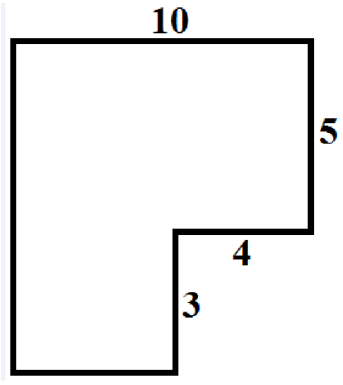

Figure 1.

To find the area of this shape, one must divide it into two rectangles, and then find the length with the question mark, as illustrated in Figure 2 (top right), showing that there is more than one way to do this. The third example, involving subtraction, is often very useful.

AREA MAZE PUZZLES

For students who have mastered these skills, including areas of shapes other than rectangles, a good next step could be to introduce them to area maze puzzles. Originally entitled Menseki Meiro, or Area Maze, this puzzle was invented by Japanese mathematician Naoki Iniba, a prolific inventor of all kinds of puzzles. All students need to know is the rule for finding the area of a rectangle. There is no need to form or solve equations and you should be able to solve them *without using fractions*.

The area mazes are a kind of reverse process to finding the areas of composite shapes, a bit like inverses. They vary from very easy to difficult.

SAMPLE PUZZLE

The composite shape in Figure 1 could be used to make an easy area maze puzzle,

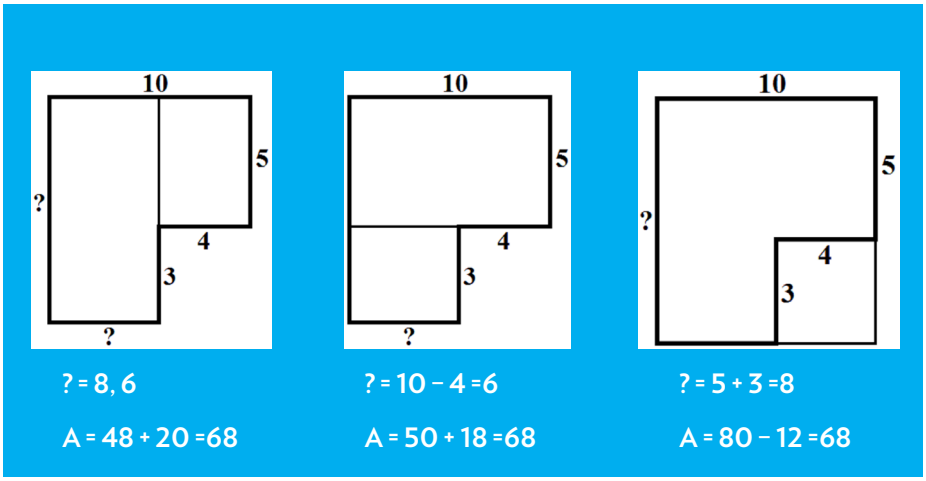

Figure 2.

as in the first shape below. I prefer to call them puzzles rather than problem solving, because puzzles are nearly always fun (in students' minds).

I recommend having a go at both puzzles without using fractions before reading on.

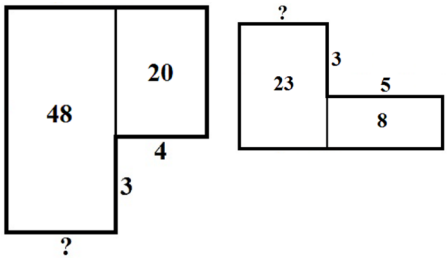

Figure 3.

SOLUTIONS

First puzzle: The short vertical side on the right must be 5 to make an area of 20. This means the left vertical side must be 5 + 3 = 8, and since the left area is 48, the side in question must be 6.

Second puzzle: The obvious method would be to find the short vertical side on the right, from which you can find the other vertical side and using the area of 23, the unknown side. However, this method relies on fractions. It is a good stretch for students to think – mathematically – how to solve the problem without using fractions. This needs lateral thinking, a good motivation for using area maze puzzles.

It's not too hard if you use another method for calculating area. First, 'complete the rectangle' (see Figure 4.), as in the subtraction method described earlier.

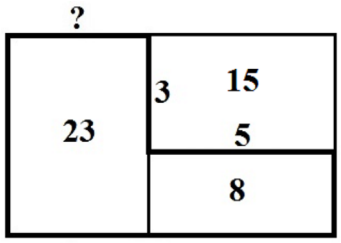

Figure 4.

The top right rectangle area is 3 × 5 = 15 meaning the right side area is 15 + 8 = 23. Since both left and right areas are the same and the heights are the same, the widths must also be identical, so the unknown side is 5.

When asked about area mazes by Alex Bellos, Naoki Inaba replied, reflecting my own thoughts, 'Calculating the areas of rectangles is not a new theme, so I myself didn't think I could make very interesting puzzles with it at first. Once I started making some Area Maze problems I hit upon some ideas about it one after another, and was able to make various problems – from easier ones to harder ones, and problems which need kind of inspiration to solve. Consequently, not only the children of the cram school but also many puzzle fans like it.'

MORE AREA PUZZLES

Here are some more to cut your teeth on. You can find plenty more in the references listed, or simply search the internet for 'area maze puzzles.'

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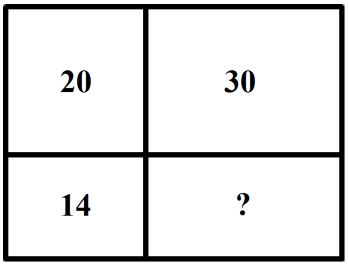
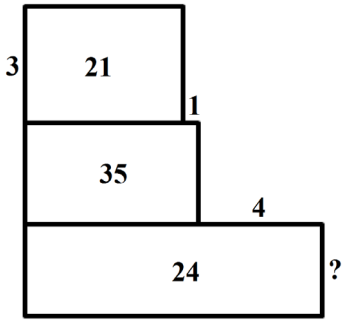
Puzzle 1

This one should be straightforward.



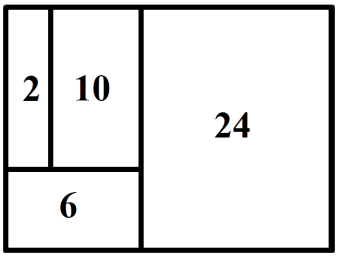
Puzzle 2

This one is also straightforward, but beware the red herring.



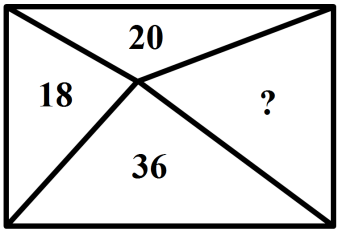
Puzzle 3

This one is not too difficult if you remember that all the sides must be integers.



Puzzle 4

This is one of my favourites and is a little different from the others. Three areas are given and you must find the fourth. Is it possible to find the lengths of the sides?



Naoki Iniba. Image by Naoki Iniba via The Guardian.

SOLUTIONS TO PUZZLES

Puzzle 1

Divide the shape vertically into five equal parts. The top left will consist of two parts of area 10 and the top right will have three parts of area 10. The bottom left will have two parts of area 7, so the bottom right will consist of three parts of area 7, an area of 21.

Puzzle 2

The length of the top rectangle must be 7.

Therefore the length of the bottom rectangle is 7 + 1 + 4 = 12.

The width of the bottom rectangle will be 24 ÷ 12 = 2

Note that the area of the middle rectangle is not needed, it is a red herring, or distractor!

Puzzle 3

The smallest rectangle must be 2 × 1 with the horizontal side 1, making the other rectangles 6 × 1, 5 × 2 and 3 × 8.

Puzzle 4

This can be difficult until you realise that the two middle triangles have the same base. Since the sum of their heights equals the width of the rectangle, their two areas, which total 56, add to half the rectangle area. The other two triangles make up the other half, so the missing area is 56 − 18 = 38.

I hope this gives you the idea. It is a very simple way to apply problem solving, and the puzzles can be chosen to differentiate students with varying skills.

FURTHER READING AND RESOURCES

www.theguardian.com/science/2015/aug/03/alex-belllos-monday-puzzle-question-area-maze-smarter-than-japanese-schoolchild

As an aside, I would recommend Alex Bellos to all educators, and his books, particularly *Alex's Adventures in Numberland* and *Alex through the Looking-Glass*.

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STIMULATING THINKING

Jessica Kurzman, Maths leader, St Patrick's Primary School

A picture sparks 1000 maths concepts! Use this picture as a prompt to stimulate thinking. If you have other ideas for investigations or lessons that could stem from the ideas here, add them to the conversation on our social channels. You can find us on Facebook and Instagram @maths.vic, LinkedIn @ maths-vic and on X, @maths_vic.

EARLY YEARS

- Each puzzle is made up of 7 shapes. Can you collect 7 items and put them in a pile? How many different piles of 7 can you make?
- I can see orange triangles. What shapes can you see? Can you draw them?
- Count and write the number of letters in the name of each animal. Which animal name has the most letters? Which animal name has the least number of letters? Do any have the same number of letters?
- How many animals are in the top 2 rows? Can you draw that number so it is quick to count? What might that number look like on a domino?
- Choose one of the puzzles, and point to the square in that puzzle. Can you find some other squares in the room you are in? What is different about each square? What is the same?
- If you saw these animals in real life, which one would be the largest? Smallest? Tallest? Shortest? Heaviest? Lightest? How do you know?
- Go outside and collect some sticks. Use these sticks to recreate as many shapes as you can spot in the puzzles. Try making both small and big versions of the shapes, but make sure they stay the same shape. Can you figure out why they're still the same shape even if they're different sizes?
- Play with a friend. Make a copy of the picture with all the puzzles for each person, to make a game board. Roll a dice. If you roll a 2, collect 2 counters (or pieces of pasta / pegs / matchsticks) and cover 2 animals on the board. Then, your friend rolls the dice and does the same (if they roll a 4, they put 4 counters on 4 animals on the board). Keep taking turns. The first person to cover all their pictures with counters is the winner.
- What are some shapes that are not in the puzzles? Draw them and say their names! Can you make them using matchsticks and blu-tack?

FOUNDATION - YEAR 2

- How many triangles are used to make the fox? What do you notice about these triangles? What's the same about the triangles? And what's different?
- Each puzzle is made of 7 shapes. Is 7 an odd or an even number? Prove it.
- Sit back to back with another person. Select a shape from the puzzles and describe it to your partner, who cannot see it, while they attempt to draw it. If you're up for a challenge, try describing an entire animal for them to draw!
- How many different animals are shown? Draw that amount in a way that makes it easy to see the total without having to count every single number?
- Create a graph illustrating the number of letters in the names of the animals in the picture. What is the most common number of letters? Which are the least common number of letters?
- A group of friends had a puzzle party. They made 30 puzzles! They each made the same number of puzzles. How many friends do you think there were, and how many puzzles did they each make? How many different possibilities can you come up with? Prove each one is correct.
- Pick 2 animals from the puzzles and think about which one would be heavier. Represent your thinking using a picture of a balance scale.
- Add grid coordinates to the picture. Identify the locations of as many animals as you can using the grid coordinates. Next, give directions using the grid coordinates. For example, guide someone from the cat to the frog, but make a detour via the horse! Choose other animals and provide directions between them using the grid coordinates.
- What other animals could you create using the same puzzle pieces? Draw or create your designs.

YEARS 3 - 6

- What is the total number of puzzle pieces needed to make every animal in the picture? What is the most efficient way of working out the answer? What if I wanted to make 2 of every animal?
- It took Jerry 1 minute and 15 seconds to create each puzzle. How long would it take him to make 5 of the puzzles? What is the most number of puzzles could he create in 15 minutes?
- Tangram puzzle pieces are created by cutting a square into parts. If the original square the pieces came from was 100cm^2. What could be a reasonable estimate for the area of each of the 7 puzzle pieces? Convince someone your estimate is reasonable.
- A group of students completed a relay in which they had to complete each of the puzzles one after another. The team took 1 hour to complete all 16 puzzles. How long might it have taken them to complete each individual puzzle? No puzzle took more than 6 minutes to complete. How many combinations can you come up with?
- These puzzles use a variety of 2D shapes. What is the difference between a 2D shape and a 3D object? What 3D objects could be made using the shapes that are in these puzzles?
- A group of more than 100 people were asked which of the animals in the top row was their favourite. 50% chose whale, 25% chose elephant, 15% dog, and 10% cat. How many people did the survey, and how many chose each animal as their favourite?
- It costs $3.75 to buy 1 puzzle. How much would it cost to buy 20 puzzles? If there is a special offer where you buy 4, get 1 free, how much will you save if you buy 40 puzzles?
- In real life, the combined height of 3 of the animals is 1.53m. Which trio of animals do you think would that be and what would be the individual height of each animal? How many different combinations can you come up with?

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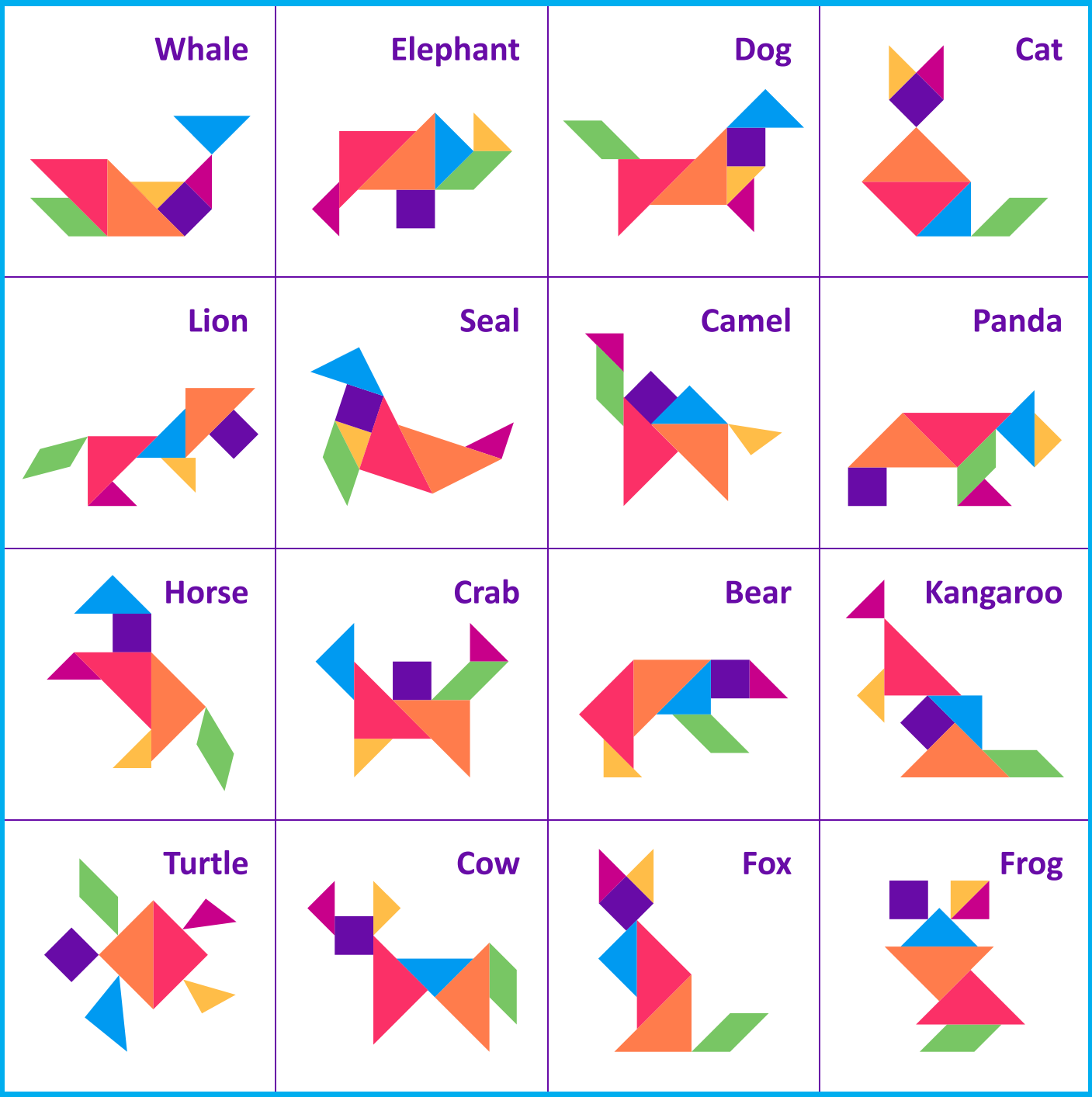

YEARS 7 AND ABOVE

- If the area of the square puzzle piece is 4cm^2, what is the total area of all of the puzzle pieces in one puzzle combined?
- What percentage of the total area of each puzzle is made up of triangles?
- The share price in a company that makes puzzles like those in the picture is currently $5.50 per share. It is predicted that the share price will grow by 10% each year. What will the share price be in 2032? In what year would the share price reach $1000?
- It takes 5 people 2 hours to complete all 16 puzzles. How many people would it take to complete the puzzles in 20 minutes? How long would it take if there were 15 people? 20 people? 3 people? 1 person?

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MAKING THE CONNECTIONS

Professor Caroline Cohrssen, School of Education, University of New England

MATHEMATICAL THINKING IN THE EARLY YEARS: MAKING THE CONNECTIONS

The Australian Curriculum for Mathematics sets out achievement standards for the Foundation Year (Austrailan Curriculum Assessment and Reporting Authority, 2023) that include, for example, connections being made between number names, numerals, position in the sequence of numbers – including zero to at least 20. Similarly, achievement standards are set out for algebra, measurement, space and statistics. Continuity of curriculum is an important way to 'create alignment and encourage coordination across stages of education (OECD, 2021, p. 35). Importantly, the Australian Curriculum Foundation Year level description states that learning builds on the Early Years Learning Framework (Australian Government Department of Education (AGDE), 2022) and the knowledge and capabilities that children bring to their learning when they enter school. This is important because children's learning begins from birth – long before they start school.

CHILDREN ENTER SCHOOL WITH MATHEMATICAL SKILLS

A systematic review of peer-reviewed research reported compelling evidence that children learn a wide range of mathematical skills before the age of four years (MacDonald & Murphy, 2021). Some children start school with knowledge and capabilities that far exceed the achievement standards described for the Foundation Year (Cohrssen & Pearn, 2019; Pollitt et al., 2015). Much of this mathematical thinking is shaped by opportunities to engage in meaningful learning experiences in the home environment such as cooking, playing with water, climbing and throwing – and even helping to measure a door to fix it (MacDonald & Lowrie, 2011).

Real-life experiences allow children to use mathematical language in context and support conceptual understanding (Ramani et al., 2015). Play and real-life experiences also provide opportunities for children to use mathematical argumentation and highlight adults' important role in facilitating back-and-forth conversations that consolidate and extend thinking, at times providing words for children's gestures (Hedge & Cohrssen, 2019; Nergård, 2023). Indeed, empowering families to recognise opportunities to support children's mathematical thinking in their diverse home environments should be a priority for all mathematics teachers (Eason et al., 2022) – whether early childhood, primary or secondary.

THE EARLY YEARS LEARNING FRAMEWORK FOR AUSTRALIA

The Early Years Learning Framework (EYLF; AGDE, 2022) references children's mathematical ideas, concepts, language and use of mathematical symbols, as well as mathematical discussions, arguments and the use of strategies and tools to organise and represent mathematical thinking. Play is the primary vehicle for learning in Australian early childhood education settings and this provides endless opportunities for children to demonstrate and rehearse mathematical knowledge and capabilities. The EYLF states:

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> It is essential that the mathematical ideas with which children interact are relevant and meaningful in the context of their current lives. Educators require a rich mathematical vocabulary to accurately describe and explain children's mathematical ideas and to support numeracy development. To build their numeracy, children explore powerful mathematic ideas in their world including spatial sense, geometric and algebraic reasoning, structure and pattern, number sense, data and probability, reasoning and measuring, along with drawing connections and argumentation. (AGDE, 2022, p. 57).

The framework defines mathematics and numeracy as 'broadly includes understandings about numbers, patterns, measurement, time, spatial awareness and chance, and data, as well as mathematical thinking, reasoning and counting' (AGDE, 2022, p. 67). The EYLF is intended to guide early childhood educators to support the learning of children aged from birth to five years.

As a framework that guides learning through play, the EYLF cannot describe and analyse every possible behaviour using a mathematics lens. For example, a toddler rolling a ball is experimenting with the properties of its shape, and when lying on the ground to look under furniture or crawling around a large object, is demonstrating spatial thinking (Franzén, 2015). Recognising mathematical thinking across the multiple strands of mathematics requires a strong understanding of learning progressions from birth to five years.

EARLY CHILDHOOD LEARNING TRAJECTORIES

Children develop and learn across multiple domains simultaneously and at their own pace. However, learning is cumulative: as new knowledge and skills are mastered, these form the platform on which subsequent knowledge and capabilities are progressively built.

The concept of mathematics learning progressions is well established (Alonzo et al., 2022; Clements & Sarama, 2021; Clements & Sarama, 2014; Cutting & Lowrie, 2023; Inchaustegui & Alsina, 2020). The Australian Education Research Organisation's Early Childhood Learning Trajectories (LTs; AERO, 2023a) offer a research-informed lens to strengthen early childhood educators' observations, assessment, planning and evaluation, that is, their application of the early years planning cycle described in the EYLF (AGDE. 2022). The LTs focus on five domains, one of which is Mathematical Thinking. The LT's user guide also maps out how mathematical thinking is relevant to each of EYLF learning outcomes (AERO, 2023b).

The Mathematical Thinking domain includes four sub-domains: patterns and predictions, shapes and spatial thinking, measurement and data, and quantity and counting. Within each sub-domain are three strands that describe the capabilities that change over time. By setting out what an educator may observe a child doing (indicators), educators are supported to take purposeful observations and to understand what behaviour may have preceded the observed behaviour and what may follow. For example, when learning to recognise and describe shapes and spaces in the world around them, infants use their bodies to explore shapes and spaces. Later, children begin to match shapes and may use simple words or gestures to describe them, as well as location and direction (like 'up'). The use of more precise language may follow. At the next progression point, the child may recognise and describe more complex attributes of shapes or explain relative positions (like 'on top of').

The LTs are intended to provide early childhood educators with a resource to support the assessment and planning cycle. For instance, an educator could refer to the Quantity and Counting sub-domain if a child is observed to say or sign some number words clearly, although not necessarily in the correct order. This would allow the educator to see where that observed behaviour is positioned along the trajectory. Noticing that saying or signing number words in the correct sequence up to 5 and then 10 would support planning for learning. This planning would include leveraging any opportunity during play or routines to rehearse the number word sequence: counting buttons on jumper, counting rocks on the edge of the sandpit, or counting cups in the home corner. It would also flag for the educator, that requiring a child to recite or sign the number words to 20 or beyond is too far. As this progression point is mastered, the following indicator suggests that children may recite number words back from 10. This would encourage the educator to leverage opportunities to model this during play and routines: 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, blast off!

Since children's learning is variable, their emerging understandings may follow differing paths: McMillan and colleagues (2024) argue persuasively that caution must be exercised when assessing preschool children's accurate use of the number word sequence when reciting or counting objects as the development of the number sequence in their sample of preschool children was not linear. Children may be able to count consecutive numbers accurately even after skipping a number, may be developing counting skills in or beyond the twenties while still developing accuracy with the 'teen' numbers between 10 and 20, and the assessment process itself needs consideration to ensure that it is relevant and meaningful to the child (Pollitt et al., 2015). These points reinforce the contribution of the LTs: they are a starting point to assist educators to be focused in their observations of children's capabilities and reflective in analysing their observations. They also provide teachers in the early years of school with a resource to access children's mathematical capabilities across multiple sub-domains and thus to differentiate teaching.

WHAT ABOUT ZERO?

Interestingly, the word 'zero' does not frequently appear in songs, rhymes or counting in early childhood programs. A recent study of preschool children's understanding of the concept of zero found that while some children were familiar with the shape of the numeral, others were not. Some children described zero as meaning nothing or the absence of something (Cohrssen et al., 2024). It was unclear in some instances whether some children were unfamiliar with the concept of zero or the word 'zero', suggesting that intentionally introducing both word and concept is important. This could be easily achieved as many rhymes and songs hint at the concept: '...Then there were no green speckled frogs,' and 'But none of the five little ducks came back'.

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MAKING THE CONNECTIONS (CONT.)

Professor Caroline Cohrssen, School of Education, University of New England

CONCLUSION

In summary, the AERO LTs support early childhood teachers' observations and purposeful planning for learning opportunities within play and daily routines in the context of an informal curriculum. They provide an opportunity for early childhood teachers to acquire, extend or deepen their own, and children's, mathematical vocabulary.

They are sparking professional conversations and supporting purposeful decision-making. They are also helpful to primary teachers, particularly as children transition from early childhood education settings into the formal school environment. They help primary teachers understand what children know already, as well as what knowledge and capabilities have formed the foundations for what children already know, when they start school.

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REBUILDING INTRINSIC MOTIVATION

Renee Ladner - Mathematics education consultant, MAV

REBUILDING INTRINSIC MOTIVATION IN YEAR 3 AND 4 STUDENTS: A REFLECTIVE JOURNEY

The start of a new school year brought with it a fresh cohort of students and a new level of teaching responsibility. The initial days were spent assessing students' literacy and mathematical competencies, followed by a week dedicated to building classroom norms and exploring how students engage with learning across various subjects.

Having taught many of these students during their early years in Foundation, I recalled their eagerness, curiosity, and persistence in learning. However, when I first introduced them to a mathematically challenging task — one that required collaboration, problem-solving, discussion and reflection — their initial enthusiasm seemed to have faded. It was disheartening to witness their diminished joy for mathematics. Instead of embracing the learning process, they were fixated on obtaining the correct answer quickly, seeking praise for accuracy, and applying rules where they did not belong.

The students appeared satisfied with rote learning — mimicking procedures, recalling facts, and prioritising speed. This raised a troubling question: did they define mathematical success by their ability to follow procedures rather than by their understanding? Was this their perception of what it meant to be 'good' at mathematics?

In *Self-Determination Theory* (Deci & Ryan, 1985), various forms of motivation are identified based on the underlying reasons or goals driving an action. The fundamental distinction is between intrinsic motivation, where actions are performed for the inherent enjoyment or interest they provide, and extrinsic motivation, where actions are driven by the pursuit of a specific outcome. When intrinsically motivated a person is moved to act for the fun or challenge entailed rather than because of external prods, pressures, or rewards.

Determined to shift their mindset, I continued to present problem-solving tasks with minimal instruction, encouraging productive struggle within their zone of proximal development. As the term progressed, a stark contrast emerged in their responses: while teacher-supported lessons received moderate engagement, guided inquiry-based tasks elicited far more enthusiasm, critical thinking and collaboration.

Intrigued by these observations, I conducted surveys to better understand the students' attitudes and preconceptions about mathematics. The data made it clear that a fundamental shift in classroom culture was necessary if students were to become numerate citizens capable of applying mathematical thinking in the real world. I identified several key areas of focus:

- Cultivating a growth mindset.
- Redefining my role and responsibilities as a teacher.
- Effective task design.
- Implementing a guided inquiry-based instructional model.

CULTIVATING A GROWTH MINDSET

A significant portion of our classroom discussions centered around cultivating a growth mindset, particularly in the context of mathematics. We explored what it means to embrace learning as a continuous process, emphasising that intelligence and capability in mathematics can grow with effort and persistence. We used reflective statements to foster a classroom culture that celebrated learning, collaboration, and mutual support.

REDEFINING MY ROLE AND RESPONSIBILITIES AS A TEACHER

Inspired by the work of Jo Boaler (2017), I committed to creating a mathematics classroom where students:

- Develop an inquiry-based relationship with mathematical concepts and skills.
- Share and discuss their thinking with peers.
- Explore multiple strategies for solving problems.
- Engage in tasks that offer low entry points but high ceilings for challenge, ensuring that all students are consistently engaged at their appropriate level.

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- Make meaningful connections across mathematical concepts.
- Receive assessment, feedback, and praise that emphasise growth over correctness.

I envisioned a classroom where students would internalise the following beliefs:

- Everyone has the potential to succeed in mathematics.
- Problems can be solved in multiple ways.
- Mistakes are valuable opportunities for learning and connection-building.

By making connections and solving problems, they can apply mathematics to the real world, ultimately becoming numerate.

EFFECTIVE TASK DESIGN

During this period, I was fortunate to study under Peter Sullivan at Monash University, who modelled the design and implementation of challenging mathematical tasks. Experimenting with these tasks revealed just how much prior knowledge the students already possessed and how readily they could make connections between mathematical concepts. This was especially true for students who were initially hesitant to engage. After only two lessons focused on challenging tasks, I observed a profound shift: students were deep in problem-solving, reasoning, justifying their approaches, collaborating with peers and enthusiastically sharing their findings. The change in intrinsic motivation was remarkable.

IMPLEMENTING A GUIDED INQUIRY-BASED INSTRUCTIONAL MODEL

Explicitly teaching students how to approach a task at the outset often hindered their ability to engage in productive struggle, make connections and feel challenged. To address this, I shifted my instructional model from a traditional whole-part-whole approach to a more dynamic launch-explore-summarise framework. This model encouraged students to think, explore, and collaborate before I provided explicit instruction as needed, based on the challenges they encountered during exploration. This approach empowered student voice and agency, allowing even reluctant students to contribute and often present their thinking in ways that more confident students had not considered.

INSTEAD OF...	TRY THINKING...
I am not good at this	What am I missing?
I give up	I'll try a different strategy
I got the answer, easily	Have I thought of other possibilities?
This is good enough	Is this really my best work?
I cannot make this any better	I can always improve
This is too hard	This may take some time
I made a mistake	I learn from mistakes
I just cannot do this	I am going to train my brain to find a way
I'll never be that smart	I will learn to do this my own way
Plan A didn't work	There is always plan B, C or D!
My friend can always do it	I can learn from and with them

Table 1.

KEY TAKEAWAYS

Over the course of the semester, these strategies underscored the importance of fostering a safe, challenging and motivating learning environment in the Year 3 and 4 classroom.

The following principles became clear:

- Intrinsic motivation is a critical driver of success in mathematics.
- Student voice and agency are essential components of effective mathematics instruction.
- All students, regardless of their current level, benefit from being consistently challenged.

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ADDING ZING TO YOUR LESSONS

Bernard Kerrins - St Francis of the Fields Primary School, Strathfieldsaye

Figure 1. Solving the wanted number - you can feel the concentration in the room!

Have you ever arrived at school thinking 'How will I get through today?'

After more than 20 years teaching, I took on coaching and leadership roles for 9 years which took me out of the classroom. During this time I began to question whether or not I'd be able to take on a classroom role again, but after a year as a Co-Principal I realised that the classroom was where I really wanted to be. Two years doing CRT and a position at a rural school reignited my love of teaching and I took on a class at St Francis of the Fields Primary School in 2021. Great kids and a great team helped me to get my mojo back. 6 months into the role, I had to take a year off due to my wife becoming sick and subsequently passing in 2022. I was as flat as a tack upon my return and needed ways to ignite my passion again, and this was done by making concerted efforts to make my maths lessons as enjoyable and engaging as I could.

By adopting a *maths without maths* approach I have been able to help my class become more enthused about maths as the pressure to perform has been removed.

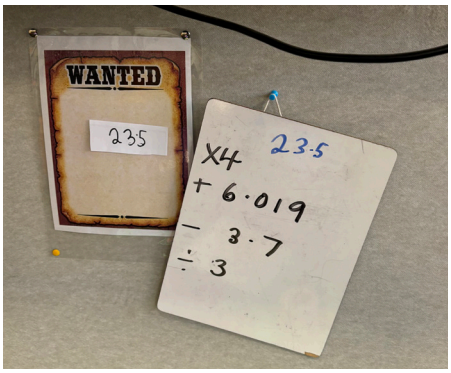
WHAT IS MATHS WITHOUT MATHS?

I look for 'hooks' to engage my students - things they can relate to. This involves reality TV shows like *The Block*, where we spend a few weeks designing house plans then constructing a 3D model of our houses. Messy? Yes! Engagement? Totally! This year we had kids coming in early to work on their models before school, and even asking if they could take them out at recess and lunch!

MORNING MATHS

When the students come in I might be shuffling some cards or rattling some dice and they'll ask 'What are you playing?' and pretty soon they'll join in. These games enable communication on a very relaxed level and also provide valuable insights into strategies used by the kids in a totally non-threatening manner. It's not uncommon for kids from other classes to come and join in too. It's a very subtle way to work on specific skills that I see some students need.

OUR WANTED NUMBER



Each day a random number is selected by one student and during the course of the day they add instructions of what to do with that number. At the end of the day we go through the answers, where the emphasis is on participation rather than correct answers. We often analyse one in particular or discuss why we got a answer. This activity has resulted in so much more engagement as the students own it and drive it.

As the year has progressed they have taken it upon themselves to gradually increase

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Figure 2. Bridge the Gap Graph. The smaller part at the top of each column is 'The Gap'.

the complexity and number ranges - for example, by using fractions and decimals.

DEVELOPING NUMBER FACTS

Perhaps our greatest success has been the way that we focus on developing our number facts. I keep telling my students 'If you can get these under control your maths will be so much easier'. At the start of the year we began 20 questions each day and we discuss strategies to use as we do them, for example: write down the question, turn around facts, doubles, near doubles etc.

We keep a score of how many the class got correct, and look at how many more are needed for a perfect score. We call this 'The Gap' and our focus is to always 'Bridge The Gap'

Foolishly I let my class talk me into promising them a party whenever a perfect score occurs, and this has happened a few times. There is no naming of scores - only I get to see the results from each student.

GRAPHING AND RECORDING DATA

The one activity that has taught my students so much about graphing and recording data is observing me yawning.

I'm a shocking yawner - whenever I read I yawn repeatedly! Every time I yawn, one of the kids will add to a tally mark on the board, and whenever the tally gets to 10 they fine me $1. This adds up over the term and our deal is that I must spend the fine money on a class party. Last term cost me $43!

You can see the tally marks on the left in Figure 3.

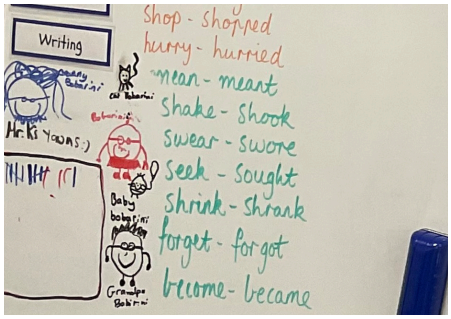

Figure 3. The yawn tally.

QUIET OBSERVATIONS

We graph the daily temperature of Bendigo and London. Nothing gets said about it, I just let the class raise comments whenever they feel like it. The spin-off has been that when we came to do graphing, very little instruction was required as the class had seen it happening daily.

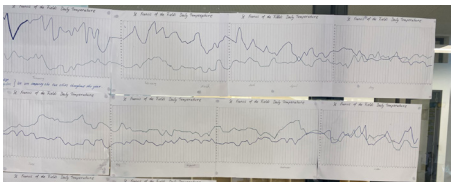

Figure 4. Graphs comparing the daily temperature of Bendigo and London.

These activities have been embraced by students and have kept me motivated - the student involvement is infectious.

Did I get 100% engagement? No. Did I get *more* engagement? Yes! And as I moved into my retirement at the end of 2024, had I gotten my mojo back? Definitely!

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REVVING UP THE CLASSROOM

Annabel Dorey - Head of Education, The Huddle

As F1 fever hits Melbourne once again this March, The Huddle's GOAL! Motorsport Australia series is ready and waiting in pole position to generate classroom excitement. Developed in collaboration with MAV and the team at Motorsport Australia, GOAL! Motorsport is the latest series of six curriculum-linked lessons that enhance numeracy and STEM learning through the power of sport.

GOAL! Motorsport lessons were designed by teachers, informed by the Victorian Curriculum, follow a simple lesson structure, and have assessable links to VC Levels 5 – 8. They're ready to plug and play!

Each lesson is paired with a video featuring a real Australian Motorsport star – from drivers to engineers and team managers, students are exposed to a variety of career opportunities they may not have known existed in the intersection between maths and motorsport.

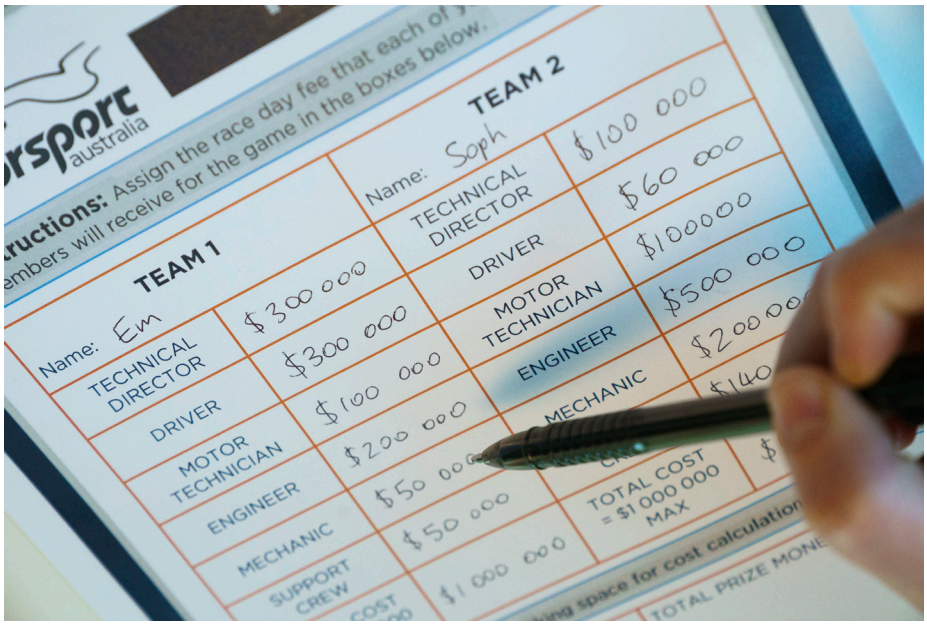
The lessons are hands-on and practical, with different outcomes from the VC 2.0 highlighted in each one.

A Chance at Victory is one of these lessons, with a focus on chance and probability in a gamified real-world context – but, without the gambling.

The main activity for students to explore is a card game, based (with permission) on Dr Paul Swan's RowCo. In the game, students have a chance at victory if they assign the right value to the cards with a higher likelihood of turning up in the spread.

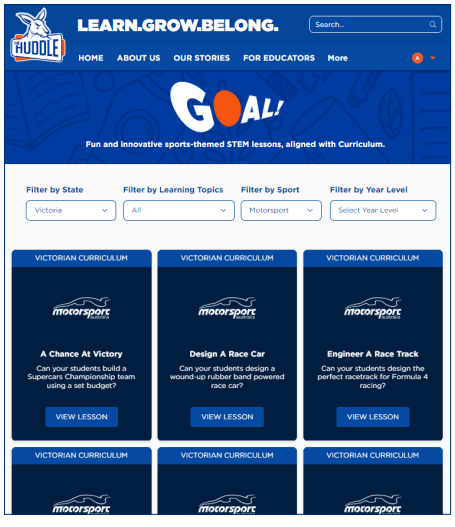
Students must assign a monetary value to each role in a Supercars racing team, then 'race' their opponent to collect as much revenue as they can, by selecting cards from either rows or columns. The catch: will students assign a high value to the singular driver card, or outsmart the system and assign more value to their five potential support crew cards?

When playing the game, students are working together to understand the rules, think critically and strategically, and see firsthand the importance of considering probability in a chance game. Peers can be heard throughout the classroom offering tactical help, even to their opponent, as they collaborate to play and try to win.



Teachers have reported that they loved watching their students' critical thinking skills improve in real time during the process of playing *A Chance at Victory*, and when students played it again, tough probability concepts they hadn't quite grasped before seemed to sink right in!

A Chance at Victory and five other GOAL! Motorsport Australia lessons, and even more sport-themed numeracy and STEM lessons can be found on The Huddle's website for free download: www.thehuddle.org.au/goal.



Numeracy and STEM lessons are available on The Huddle's website.

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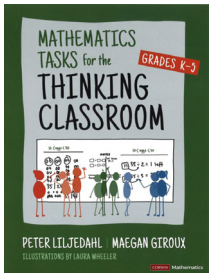


MATHEMATICS TASKS FOR THE THINKING CLASSROOM

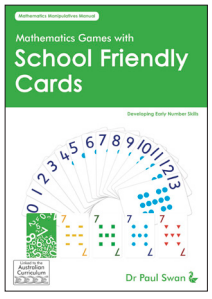
K–5

Practical and proven maths tasks to maximise student thinking and learning. This book delves deeper into the implementation of the 14 practices from the *Building Thinking Classrooms* framework by updating the practices with the newest research, and focusing on the practice through the lens of rich maths tasks that address specific mathematical learning outcomes or standards. Across the 20 non-curricular tasks and 30 curricular tasks used as models, this book:

- Helps you choose tasks to fit your particular maths standards, goals, and the competencies you want your students to build.
- Walks you through all the steps and scripts to launch, facilitate, and consolidate each task.
- Shares examples of possible student solutions along with hints you might offer to help their thinking along.
- Offers tasks for consolidation, example notes to my future forgetful self, and mild, medium, and spicy check-your-understanding questions for every thin sliced sequences of curricular tasks.

This book will help teachers, and specialists transform traditional math classrooms into dynamic and thought-provoking learning spaces.

$76 (MEMBER)
$95 (NON MEMBER)

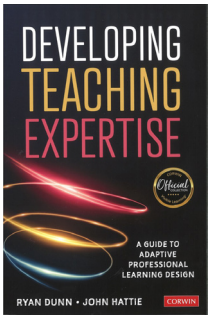


SCHOOL FRIENDLY PLAYING CARDS (INDIVIDUAL PACK)

K–6

School friendly cards are just playing cards but without any of the links to gambling and are sold as an individual packet. There are no picture cards - just numbers 0 to 13. There are no suits, just shapes configured in standard subitising patterns and four different colours. You can play all of the traditional cards games like snap, fish and more using these simple, easy to use cards.

$4.30 (MEMBER)
$5.40 (NON MEMBER)



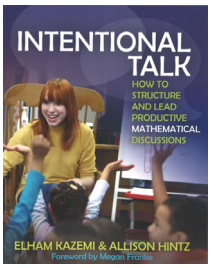
DEVELOPING TEACHING EXPERTISE

F–VCE

Do your teachers have the expertise to produce the best outcomes in every context? Do they confidently and intentionally inquire, adapt, and change based on student needs? This book offers a deep exploration into cultivating a culture of design thinking – a proactive process where teachers work through iterative design cycles and understand how to make what works best work.

- Explore how specific design and leadership approaches can form a framework for leading teacher professional learning.
- Learn to navigate through complex educational environments.
- Learn from illustrative action items, vignettes, and real-life examples and results.

$51 (MEMBER)
$63.75 (NON MEMBER)



INTENTIONAL TALK

F–VCE

Maths teachers know the first step to meaningful mathematics discussions is to ask students to share how they solved a problem and make their thinking visible; however, knowing where to go next can be a daunting task. This book provides teachers with a framework for planning and facilitating purposeful maths talks that move group discussions to the next level while achieving a mathematical goal.

The authors provide a window into how teachers lead discussions and make important pedagogical decisions. By creating equitable opportunities to share ideas, teachers can orient students to one another while enforcing that all students are sense makers and their ideas are valued. They examine students' roles as both listeners and talkers, offering numerous strategies for improving student participation. *Intentional Talk* includes a collection of lesson planning templates in the appendix to help teachers apply the right structure to discussions in their own classrooms.

$48.10 (MEMBER)
$60.10 (NON MEMBER)

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