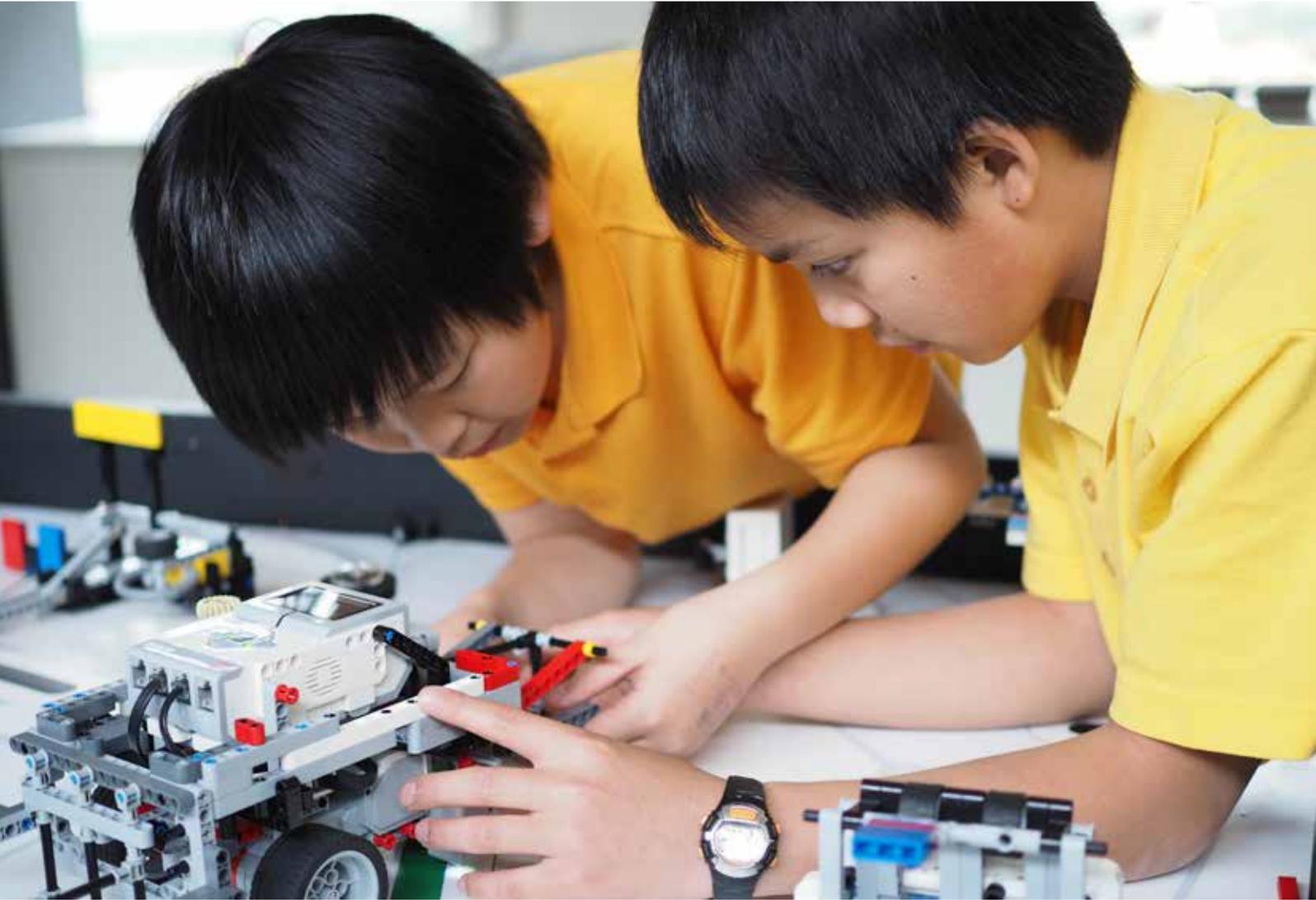


ROBOTICS BRINGS STEM TO LIFE



Students prepare their robot for the World Class Challenge in the FIRST Lego League competition.

INSIDE

4 Mathematics Active Schools:
Lego mastery

8 STEM week: Engaging
activities for students

12 Review:
24 Game

14 A life well lived:
Vale Ron Smith

Students from Wooranna Park Primary School competed in the FIRST Lego League (FLL) Asia Pacific Robotics Championships during July. It marked the culmination of almost 11 months of preparation. The tournament attracts over 250,000 students across the world. We had won the Victorian championships and placed seventh in the national championships so were invited to Sydney to compete against 50 teams from around the world.

FLL is an exciting and challenging competition where students complete four components to demonstrate their learning and skills in STEM subjects. The four components are: The robot game (build and program a robot to solve challenges based on a theme), a research project (our was T-ball and maths), technical judging (robot design and engineering) and core values (sharing knowledge and overcoming obstacles). Each year the competition has a theme based around a real world topic and is centred around a robot game where students build and program a Lego robot capable of solving a series of challenges autonomously.

Continued on page 6

FROM THE PRESIDENT

Jim Spithill - ACER

THE COMMON DENOMINATOR

The MAV's magazine published for its members.

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The first and simplest emotion which we discover in the human mind is curiosity.
- Edmund Burke

It is an innate curiosity that has brought our species to its present circumstances. It is curiosity that drives science, from Marie Curie wondering about radioactivity, to Einstein wondering about the implications of $e=mc^2$. It is curiosity that leads the young child to touch and taste things around them. It is the curiosity of children that is a teacher's best friend: we know that if we can engage their interest and challenge their understandings they will join us on the learning journey.

It is the curiosity of teachers that drives experimentation and change in classroom practice. It is curiosity that will bring so many to the 2015 MAV conference at La Trobe University in December, to have their good practice validated, their conventional practice perhaps challenged, and their research knowledge updated.

Research is formalised curiosity. It is poking and prying with a purpose.
- Zora Neale Hurston

After 30 years in Melbourne classrooms teaching mathematics at secondary level I have been fortunate in the last five years to work at ACER as a test developer. This has brought me into close contact with the research component of ACER's work. My impression from delivering PD around the country is that there is a growing awareness of the ways in which good research and timely data can empower teachers in their daily practice. Research in mathematics education takes many forms.

There is academic research whereby students are interviewed and observed, sometimes about very particular content topics such as representations of fractions, and other times in the more affective areas

of social interactions in the classroom and the differences in roles adopted in small group work.

The burgeoning field of educational neuroscience has the potential to transform our understanding of how learning occurs, and why some students have neurological barriers to learning, such as the way anxiety about mathematics closes down the pathways in the brain that process mathematics.¹

There is research in the form of dissemination of summaries of work in particular topics, curated and brought together in accessible form for busy people. The Council of Australian Governments, COAG, has funded ACER to contribute work such as this, and the Research Digests are housed at the Queensland College of Teachers Periodicals pages. There are mathematics-related papers on language in the mathematics classroom, on parent-teacher collaboration in the work of the school, and on big ideas in mathematics.²

At the local level there is the opportunity for action research within a cohort of a school whereby teachers work in teams to try new approaches, monitor their delivery and evaluate their outcomes. This is rewarding work and time well-spent, building a collegial approach.

Satisfaction of one's curiosity is one of the greatest sources of happiness in life.
- Linus Pauling

References

1. The Science of Learning Research Centre is leading this work in Australia <http://slrc.org.au>
2. Refer to <https://www.qct.edu.au/publications/periodicalpub.html> and scroll down to Research Digests

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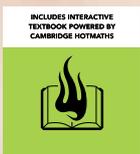
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LEGO MASTERY

Andrew Noordhoff - Year 3 teacher, Jells Park Primary School



In July seven teachers from my school headed to *Inside the Brick* for a Lego PD workshop. Jells Park Primary was recently accredited as a MAV Mathematics Active School (MAS), and this PD was an exclusive opportunity to network with other MAS so we could learn from each another.

Anticipation was high as many of us had fond memories of playing with Lego as kids and we were excited to see how we could incorporate this passion into the classroom in the future. After some short words and stories from MAV CEO Simon Pryor who described his brother stealing his Lego as a child, we began on some rotations.

Our first rotation was making a catapult and attempting to launch a ping pong ball as far as we could across the table. We raced off with some ideas and began testing our apparatuses. I found mine was somewhat successful and began making modifications to lengthen the lever to gain more distance.

In our group we continued to watch each other carefully, taking onboard ideas from

each other whilst trying to improve on our previous efforts.

We had a go at making some houses (micro scaling), bridges and watched a demonstration on using computer programming to operate a Lego robotic car. There was a host of excellent and engaging activities from the crew at *Inside the Brick*, which we have since taken back to our school. Since this Mathematics Active Schools event, we have purchased several Lego kits that have begun to be circulated around the school.

The Year 3/4's have borrowed some ideas from a Maths Talent Quest project I observed at this year's judging (judging is a great way to get some fantastic ideas!). We have created a little 2-3 week project that will have students becoming Master Lego Builders. They will be designing and making Lego houses in small groups. The students will then be looking at area, perimeter, money and shape. We were excited to be part of this event and look forward to future PD sessions from MAV!

Maths Active School accreditation is a great way to showcase your schools' effective mathematics teaching and learning programs. To be accredited, schools must complete an application that will be reviewed by the MAV's team of mathematical education consultants and the MAV Council.

For further information about Mathematics Active Schools go to www.mav.vic.edu.au/about-us/maths-active-schools.html or contact Ellen Corovic ecorovic@mav.vic.edu.au or 03 9380 2399.



Thanks to *Inside the Brick* for hosting this PD experience. To learn more visit www.insidethebrick.com.



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Members get 20% off all resources in the MAV's online shop. The shop is stocked with useful and informative resources suitable for all year levels, including trial exam papers, mathematical story books, teaching guides and hands-on resources.

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ROBOTICS BRINGS STEM TO LIFE

Shishir K, Suraya G, Sara K and Sandra T - students at Wooranna Park Primary School

Continued from page 1

In the 2014-15 season the theme was *World Class - Learning Unleashed* which is all about how students learn and will learn in the future. For the project we needed to look at 'How we can help someone learn something better?'. We chose to look at how maths and sports are taught and looked for a way to combine the two.

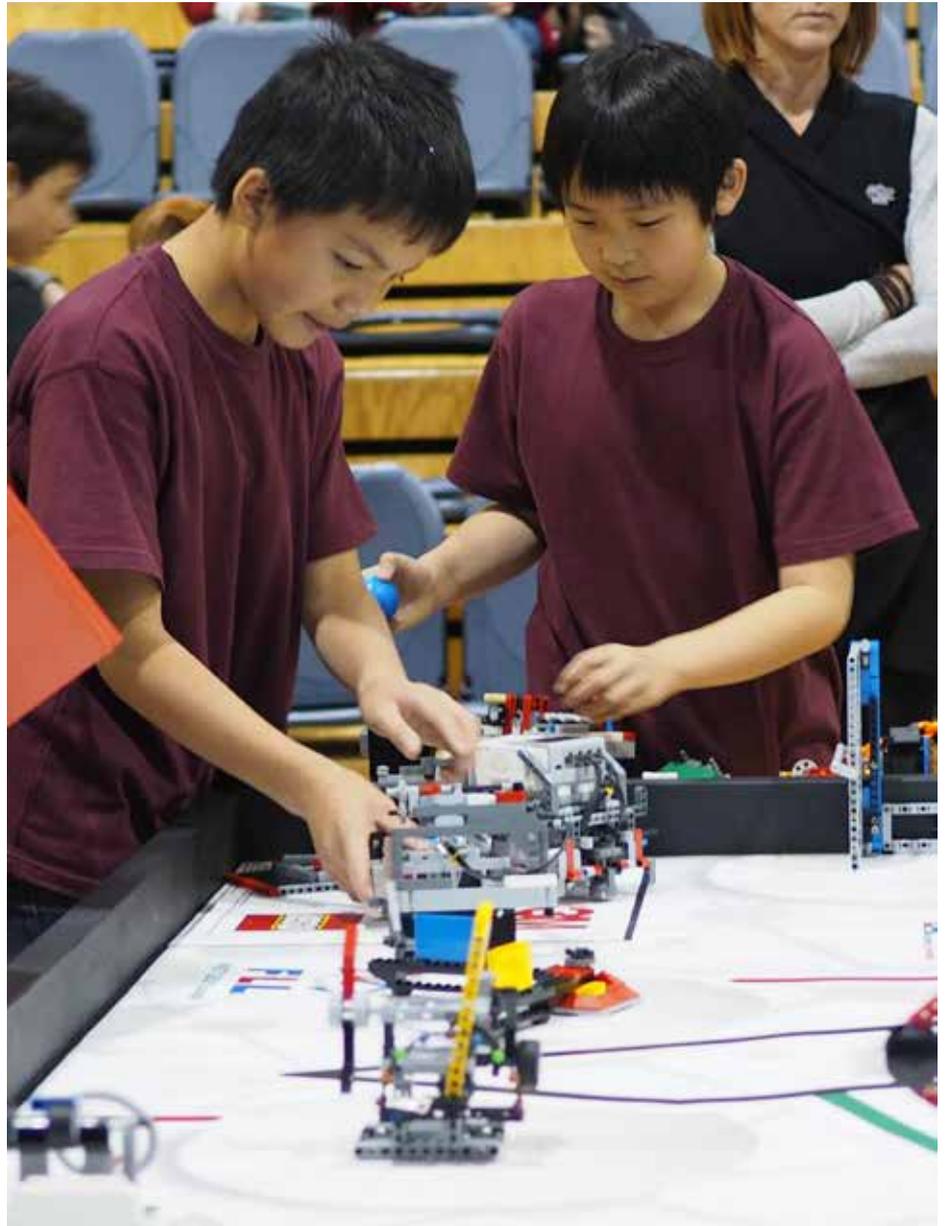
MATHS AND SPORT

We decided on maths and sport after talking to many of our classmates and finding there was a divide between the two subjects. Students usually identified as being good at maths or good at sport but rarely both. We also talked to teachers who told us about the crowded curriculum and how they struggled to teach everything they were expected to in the time they had available. Research into the Australian Curriculum showed that in physical education classes students were expected to apply critical and creative thinking to their movement and apply these strategies. Finally we noticed by observing professional sport how much the coaches and commentators relied on statistics when analysing the performance of the athletes.

T-BALL

We chose to focus on the sport of T-Ball for our project and looked at ways the students could improve the way they played. We talked about where the students should attempt to hit the ball to give them the greatest opportunity to make it safely to base. Then we devised a method for recording the result of each play (where the ball was hit and if the batter made it to base) and tested the game one afternoon with a group of Year 5 and 6 students. The result was a disaster, the students struggled to record the data in the table (which had over 20 options for each play). We had not taken into account runners on base getting out, the batter being caught or the inevitable fielding mistakes.

After heading back to the drawing board we changed the number of variables measured and made some assumptions based on the idea of a 'perfect game', where no player made mistakes. We also decided that the ultimate goal for T-Ball is to score runs, as a result the most advanced runner was the most important to keep safe on base even if



Competing at the Victorian tournament where we won the champions trophy.

this meant sacrificing the batter or another runner to get the most advanced runner home.

The second trip to the playing field proved more successful and students could record the data more easily in the tables. However, a new problem arose as even after an hour of play we could see the data was insufficient and skewed to one hitting zone (the initial hitting zones included, 1 - within the diamond, 2 - right field out of diamond, 3 - straight but out of diamond, 4 - left field out of diamond). This was largely due to the students not being skillful enough to consistently hit the ball further than the diamond.

For our third attempt we limited the zones to right, mid and left fields regardless of how far the ball was hit and this gave consistent results that we were capable of analysing.

Our analysis then focused on calculating the percentage likelihood of the most advanced runner safely making it to base which then told the batter where they should hit the ball to give the team the best chance of getting a runner home. We converted this analysis into a spreadsheet and took to the field one more time with a tablet and spreadsheet to record live data. As the game went on we found that batters could identify where the safest areas to hit the ball were and subsequently help the team to claim victory.

Having completed this we documented the sequence into a lesson plan that teachers could follow and mapped the lesson to AUSVELs to help them understand the benefits of the lesson. The lesson can be found at goo.gl/1gbCCz.

Doing FLL has been a great experience because it requires us to draw on a number of skill areas including programming, engineering, critical thinking, problem solving, mathematics and science. It has not been an easy journey to complete this task but by working as a team and talking through problems we have improved our self confidence and communication skills.

MTQ

Maths by inquiry was highlighted by outstanding investigations in this year's Maths Talent Quest. Over 61 schools entered with the majority being from Victoria. This year we were able to welcome entries from Western Australia and New Zealand. With 529 entries from across Prep to Year 10 the standard of investigation was extremely high. Students reflected a deep understanding of the inquiry process and applying their knowledge of mathematical concepts to their world.

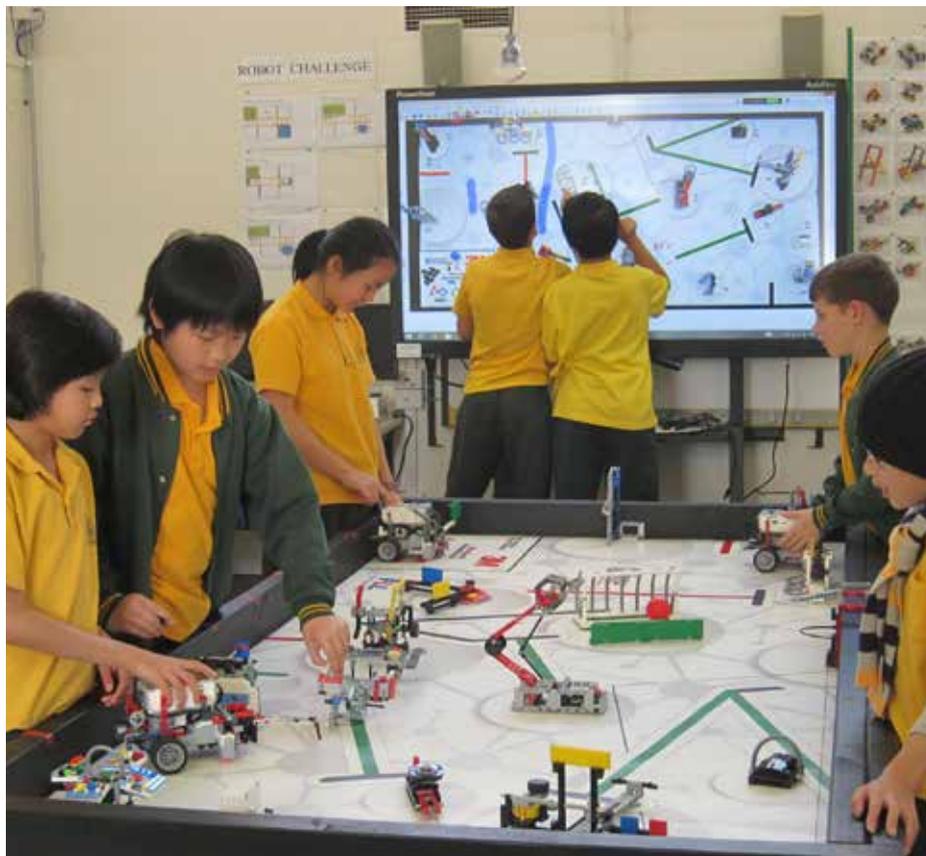
Investigations ranged from Minecraft to mapping, shopping to story telling and catapults to cooking. New technologies such as coding and blogs were presented in innovative inquiries.

Thank you to the teachers and volunteer pre-service teachers who took part in the judging process. This is an essential part of the MTQ and imperative to its ongoing success.

The MAV is very proud of the entries chosen for national MTQ judging, which took place at the end of term three. The national and state award ceremony will take place at La Trobe on Thursday 22 October.

WANT TO LEARN MORE ABOUT THE MATHS TALENT QUEST?

Register for the MTQ workshop at the 2015 MAV Conference or book a free PD at your school in Term 4 2015 or Term 1 2016. All Victorian, interstate and international enquiries are welcome, contact Jen Bowden jbowden@mav.vic.edu.au.



Students spend time learning about how they learn and planning their approach to the robot game, thinking about how they learn helps them to create engaging lessons for their peers.



Emotions run high at the national tournament held at Macquarie University.

STEM WEEK

Cathy Devlyn - Mathematics coordinator, Fintona Girls' School

If you check the inbox of any maths or science coordinator's email account over the past year you'll find it flooded with many STEM-related items. STEM is everywhere and it can be overwhelming sifting through the volume of material and making sense of what is relevant and meaningful and what is not. By now we all know what STEM stands for - but what does it really mean for schools?

WHY STEM?

The results are in. It's estimated that 60% of the 2020 workforce will require skills held by only 20% of the current workforce.

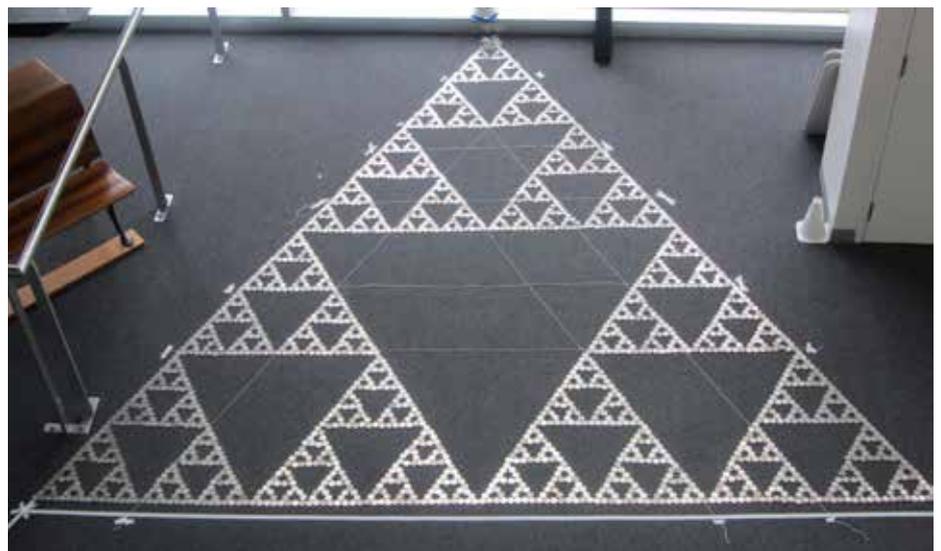
There's no doubt we agree that science and maths play an ever increasing part in our lives. We make important decisions about our health and that of our family, for example, choosing to vaccinate our children. We use smart phones to communicate and GPS in our cars to get from place to place. We regularly hear or read about climate change, genetically-modified food, space exploration, the use of DNA in forensic science, and new drugs to treat disease. And yet there is a general view that the level of scientific literacy and numeracy in the community is low.

An understanding of science and maths and how they work is essential for the community to make informed choices on issues that have a scientific basis.

Education in STEM is the key to broadening and deepening the community's grasp of what STEM is saying and doing about the complex challenges facing society.

For schools, along with content, we need curricula that encourage curiosity, reflection, critical thinking and develop scientific method. STEM is about promoting an awareness of science and maths related careers and career opportunities and ensuring the development of relevant skills necessary to participate in STEM careers of the future.

Motivated and excited by the current focus on STEM we decided to organise a STEM week at Fintona. Months of planning and preparation came together under the framework of a joint initiative from the science and mathematics faculties.



The week saw students across many year levels given the opportunity to participate in a wide range of engaging and thought-provoking activities.

Robogals, a group of Monash female robotics engineers, started the week with a workshop for the Year 7 students. Who would have thought a robot could dance to One Direction?

The Years 5/6 students were treated to a Fintona Maths trail produced by the Year 9 students using iPads and QR codes. A lovely cross-age activity and it was great to hear the level of mathematics being discussed. Tuesday arrived and the Year 8's ventured into the city to look at the mathematics

of the architecture of Swanston Street on the Mathematical Association of Victoria's maths trail (<http://madebymaths.mav.vic.edu.au>).

A super day was topped off with a visit to explore outer-space in spectacular 3D at the Centre for Astrophysics at Swinburne University. *Paper Planes*, the movie, kept the younger students entertained during lunchtimes and gave them plenty of ideas and inspiration for Fintona's paper plane Contest. The Engineering Link Group, (TELG), brought in working engineers from industry and the armed forces to work with the Years 9/10 girls on Thursday in a variety of workshops aimed at highlighting the diversity of careers in engineering.



Parachutes were designed and tested to cushion the flight of an egg from a second floor balcony (many survived - see above!) and exacting calculations were pondered in producing the right gear ratio to ensure the mechanical car completed the time trial with precision. On Friday, the senior levels came together to hear from four guest speakers in the STEM mini conference.

Fintona was host to four leading Australian scientists and mathematicians, Drs Graham Mitchell, Jee Hyun Kim and Norman Do together with Associate Prof James McCaw. They each presented on their fascinating areas of science and mathematics and stimulated interest and enthusiasm in their varied and unique fields.

Dr Graham Mitchell, a veterinary science graduate and gold medallist at the University of Sydney, spoke of the importance of science in an ever-changing world. His discoveries, while at The Walter and Eliza Hall Institute, were fundamental in the global development of tools to control parasitic diseases. As well as holding many roles including Director of the Royal Melbourne Zoological gardens, he is an advisor to the government on innovation and technology.

Dr Jee Hyun Kim has been involved in researching the how our responses during infancy and childhood are critical in subsequent drug use and the development of anxiety disorders. She is also the chair of the Australian -New Zealand Bee challenge which aims to foster the development of an interest in science careers amongst school leavers. She shared her personal perspective of her journey through science and gave some intriguing highlights of her work at the Florey Institute.



Associate Professor James McCaw uses mathematics and science to build models that simulate the transmission of diseases such as influenza. His work through the Department of Mathematics and Statistics and the Centre for Epidemiology and Biostatistics at the University of Melbourne enables the development of new strategies for controlling the spread of transmissible diseases. James' work on the mathematical modelling of infectious diseases is of great importance to many other public health practitioners.

Dr Norman Do researches mathematical patterns and their application to diverse mathematical problems and theoretical models of the universe. Hence his research leads to a deeper understanding of the laws of nature. His hope is that his research will facilitate future scientific advances. Dr Do is also involved in many community outreach programs, including an involvement with the Australian Mathematics Trust and writing for the Australian Mathematics competitions. Jointly he initiated the Monash maths academy for motivated students.

The audience was privileged to be part of a very special morning of presentations. Staff and students of Fintona, teachers and students from a number of other schools and invited parents were enchanted and enthused by the courage and wisdom of the fine young scientists. The presentations served to break down many of the stereotypes of what scientists and mathematicians do.

The speakers each focussed on actual examples, exposing what working in fields of the science and maths mean and how they are relevant to society.

STEM week also allowed the chance to reflect on the wonderful opportunities provided by a science/maths education at Fintona and presented a unique opportunity to give back to the community. Fintona girls were generous in their donation of twenty cent coins. We raised over 2187 coins, enough to produce a dazzling piece of maths art in the form of a Sierpinski triangle. The money raised will go to the organisation Big Brother-Big Sister, a group that sets up mentoring programs for disadvantaged and at risk students.

STEM week at Fintona delivered all that it promised. Many students were challenged and inspired and, most importantly, finished the week wanting more. Teaching maths and science is much more than the cramming in a busy curriculum, worrying about NAPLAN/VCE results and debating the tensions between skills-driven courses versus open-ended investigative learning. It's about ensuring we fuel and promote the right passion in our teachers; that our teachers are knowledgeable and energised to educate and invigorate the STEM learners of tomorrow.

The MAV will be releasing an updated *Made By Maths* version of our app in time for the conference in December.

This will include fine tuning what we have already created and updating programming to cater for the latest iOS and Android software.

In addition, the MAV will also release two new walks for the app at the conference. One walk, aimed at junior secondary, will be a guided mathematical walk around La Trobe University - Bundoora Campus. The second walk is aimed at upper primary school. This walk can be completed on any school grounds.

If you are planning on attending the MAV conference, it may be a great chance to trial the La Trobe walk!

For more information contact Ellen Corovic ecorovic@mavvic.edu.au.

MATHEMATICS GAMES DAYS 2015

Throughout Term 3 the MAV supported schools in hosting Statewide Mathematical Games Days.

Games Days were held for Years 4-VCE. Schools sent teams of four students to an event. The MAV thanks all host schools and coordinators:

Lowther Hall - Jacqueline Berkeley, Penleigh and Essendon Grammar - Peter Maher, Lumen Christi Primary School, Point Cook - Mark Gleeson, Genezzano College Kew - Ferruccio Servello, Wesley College Elsternwick - Colin Shnier, Overnewton College - Sue Ellis, Penleigh and Essendon Grammar - Joanna Carasavidis, Williamstown High School - Lauren Withers, Mount Scopus Memorial College - Allason McNamara, Camberwell Grammar School. - Robyn Crockett and Antoinette Emenyeonu

At each event students are posed with a booklet of problems across all Australian Curriculum content strands: number and algebra, measurement and geometry and statistics and probability. The problems range from those at the students expected level to those beyond the expected level of students.

The various Games Day activities provide students opportunities for initiative taking, decision making, communicating their processes and findings, and working both independently and collaboratively.

The problems also take into account the Australian Curriculum proficiency strands understanding, fluency, problem solving and reasoning with a key focus on problem solving and reasoning.

Students have with the opportunity to demonstrate and develop their ability to interpret and formulate problem situations, and communicate solutions effectively. Many problems are unfamiliar to students so they need to apply their knowledge of existing strategies to seek solutions.

The problems student are faced with require a capacity for logical thought such as analysing, evaluating, explaining, justifying and generalising.

The Mathematical Games Day offers students the opportunity to demonstrate other general capabilities as stated in the Australian Curriculum namely critical and creative thinking and personal and social capability.

The problem solving and relay component of the day require teamwork. By working as a team students develop their capability in critical and creative thinking as they evaluate the information provided, clarify aspects of the problem amongst their team members.

During the relay one elected runner from the team collects the problem. The team works together to solve it. The student who reaches a solution is required to explain their thinking to the team members and once agreed, present this to the team runner. The runner then runs to either the front of the room and presents their solution. If the solution is incorrect the students have up to two additional attempts on the problem, before being asked to forfeit this problem and collect the next. This offers the team the opportunity to look for different possibilities and consider alternatives as they proceed to solve the problems.

Many of the Games Days activities require students to demonstrate skills in areas that have been identified as essential not only in school but in their future beyond school, such as thinking critically and creatively and behaviours and dispositions such as reasoning, logic, resourcefulness, time management and working effectively in teams.

Games Days attract students from across the state and they offer an ideal situation for fostering interschool relationships.

Most importantly, students are presented with the opportunity to experience the enjoyment of mathematics out of their usual school setting. Games Days provide an environment that is intellectually challenging and competitive - and fun!

All hosts said that their Games Day was a success. It is a real joy for maths teachers to observe students talking maths in an atmosphere of concentration and excitement.

2015 RESULTS

YEAR 4

Host: Lowther Hall Anglican Grammar School
Winner: Lowther Hall Anglican Grammar School - 1
Second: Valkstone Primary School - 1
Third: St Michael's Grammar School - 1

YEAR 5

Host: Penleigh and Essendon Grammar
Winner: Methodist Ladies' College
Second: Penleigh and Essendon Grammar
Third: Brighton Grammar School

YEAR 6

Host: Lumen Christi Primary School
Winner: Lumen Christi Team 1
Second: Lumen Christi Team 2
Third: Gilson College Taylors Hill campus

YEAR 7

Host: Wesley College Elsternwick
Winner: Scotch College
Second: Heatherton Christian College
Third: Mount Scopus

YEAR 7

Host: Overnewton
Winner: Ruston Girls College
Second: MLC
Third: Overnewton College Taylors campus

YEAR 8

Host: Penleigh and Essendon Grammar
Winner: Camberwell Grammar
Second: Parade College
Third: Glen Waverley SC

YEAR 9

Host: Williamstown High
Winner: Melbourne High A
Equal second: Penleigh and Essendon Grammar A and Glen Waverley SC B

YEAR 10

Host: Mt Scopus
Winner: Penleigh and Essendon Grammar
Second: Melbourne High School
Third: Scotch College

YEAR 11 AND 12

Host: Camberwell Grammar
Winner: Melbourne High
Second: Camberwell Grammar School
Third: Melbourne High

This year the MAV together with Federation University held a Year 8 – 9 Maths Challenge day at the University's Churchill campus for students in the Gippsland region.

The results, after a first ever 3-way tie and hence a further challenging problem for the three teams in the decider, were:

YEAR 8/9

Host: Federation University Gippsland
Winner: Mirboo North SC – Minus Ones
Second and third: St Paul's Anglican Grammar



PEGS - Year 5

A CHALLENGING DECIDER QUESTION

Tricky Trains: An express train leaves Bradtown for Central City at the same time as a stopping train leaves Central City for Bradtown. The express train travels at a steady 130km/h, while the slow train travels at 100km/h but stops every 50km for 10 mins. The two towns are 300km apart, which train is further from Bradtown when they meet?

The solution will be published in the Term 1 2016 edition of *Common Denominator*.

The MAV is seeking to expand the games days into other regional areas for 2016.

If you are interested in hosting or having the MAV host a regional day please contact either Jen Bowden, jbowden@mav.vic.edu.au or Helen Haralambous, hharalambous@mav.vic.edu.au or telephone 03 9380 2399.



Overnewton - Year 7



Wesley College - Year 7



Federation University Gippsland - Year 8/9



Williamstown High School - Year 9



Mt Scopus - Year 10



Camberwell Grammar - VCE

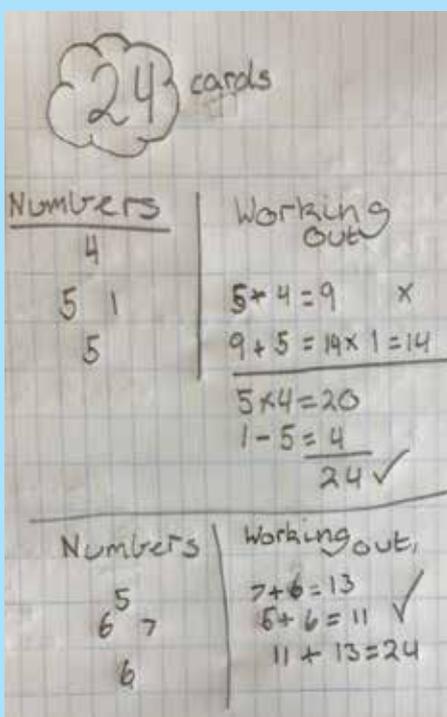


Lumen Christi Primary School - Year 6

RESOURCE REVIEW

24 GAME SINGLE DIGITS 123 DOT

Rachael Waites - Year 5/6 teacher, Derrimut Primary School



As educators we are faced with the difficulty of searching for activities that allow students to tune into mathematics effectively, without being too time consuming or complicated. Tuning in activities must be engaging enough to encourage students to be active participants in their learning and skill development. Well, you can search no more; here is a game that is guaranteed to engage and tune all your students into mathematics.

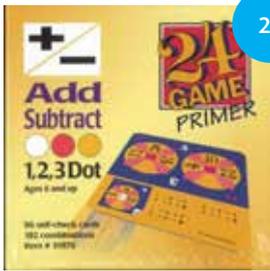
This *24 Game* is a card game that requires students to use all four operations to reach a target of 24 from the four numbers presented on each card.

Students choose any combination of addition, subtraction, multiplication and division, using all four numbers on the card once and once only. Sound easy? Think again. This game has ways to challenge the sharpest of minds and also enables students to enter the game at their own level.

We play this game frequently in our learning community with our 5/6 students as a tuning in activity to numeracy lessons. As it is accessible to all learning abilities, all students can actively participate in pairs, small groups, as a class or simply on their own. The game brings out so much mathematical language and really has the students hooked right from the very beginning.

Some of our students felt driven to take numbers home to think of ways they could make 24 using all the operations. It really has extended their learning beyond the classroom and brought out a new level of confidence, even our most reluctant numeracy learners are motivated to play.

So, when you're looking for your next tuning in activity or a practical way to apply the operations, look no further than the *24 Game*. Try it out yourself!



**ADD/SUBTRACT
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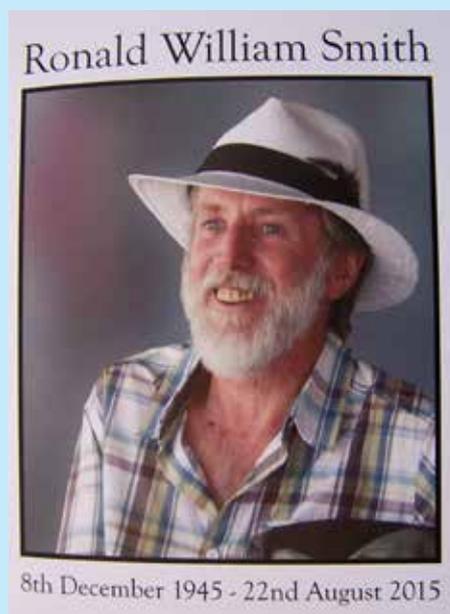
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VALE RON SMITH

John Gough



Sad news for MAV members: Ron Smith died on 22 August 2015, in hospital, following lung surgery. Although the operation had initially seemed to be successful, he then developed pneumonia, and died in his sleep.

While working as a primary school teacher, Ron became an MAV Council member in 1977 and was the Editor of an MAV publication called *Murmur*, from March 1978 to September 1981, 36 issues altogether.

Later, Ron and Suzanne Peterson (1944 – 2009: see Ron's 'Obituary' *Prime Number*, vol. 24, no. 3, p 14, 2009), a friend and teacher-training colleague, were co-editors of *Prime Number* from 1992 (vol. 7 no. 1), until 1996, vol. 11, no. 4). This new, but vigorous MAV publication for primary teachers replaced an earlier MAV magazine known as *Set Two* which appeared from 1975 to 1985.

For many years, *Digit 1* was an insert leaflet in *Prime Number*, in which Ron had a regular column based on a cartoon-like character known as 'Mr. Digit' – with a lively Roger Hargreaves-like *Mr. Men* story and activities based on the adventures and questions about 'shaped Mr. Digit (who looked a little like Ron) and his numerous Number friends. Ron edited *Digit 1* until the end of 1996.

Ron and Suzanne later wrote a set of three books for classroom teachers, and parents, *Maths in the Making 1, 2, and 3*:

Creative Activities Using Everyday Resources (2006).

Ron also wrote several books of his own, some published by Curriculum Corporation and others self-published.

Apart from editorial activities, and many journal articles, Ron was well-known as a regular workshop and conference presenter, conference organiser, and mathematics education consultant. He was an outstanding teacher-trainer for more than 20 years!

Born several months after the end of World War II, Ron grew up in Burwood, an eastern Melbourne suburb. He attended Bennetswood Primary School, and then Burwood High School, and then in 1966 completed his TPTC (Trained Primary Teachers' Certificate) at Burwood Primary Teachers' College (which decades later became part of Deakin University).

Ron was one of the clever TPTC graduates offered the opportunity to complete a BA. at Monash University (where Ron met Shirley, teacher-in-training and wife-to-be), while enduring several more years of a half-pay studentship. (The bonded teacher-training studentships provided at that time by the Victorian Education Department were, however clumsy, a major investment by the government in the nation's education and economy! Modern USA style HECS fees seem a poor and often punitive alternative.)

Once Ron began teaching, his studies soon continued into a BEd. (Monash) in 1976, followed by MEd. Studies (Monash) in 1990, and eventually a PhD (Monash) in 2002: *Professional Development Organisation and Primary Mathematics Teachers: Exploring Connections With Beliefs and Practice*, an interesting investigation of individual attitudes and responses to the longer term impacts of a short term Professional Development program. (He was supervised by Gilah Leder, Alan Bishop, and his final main supervisor was Barbara Clarke.)

(The thesis is available as a free PDF download from Monash University: available via: <http://arrow.monash.edu.au/hdl/1959.1/8624>)

From 1986, working at Victoria College (which later merged with Deakin University), Ron was a highly respected academic, admired by his students, colleagues, and a wide community of school teachers and mathematics educators.

For many years, Ron (along with Suzanne Peterson and other colleagues) was part of a vigorous co-curricular teaching team at Deakin University. The team worked in the innovative school-based pre-service undergraduate program known as SLAM (Science, Literacy and Mathematics) that integrated university-teaching, curriculum areas, and active classroom experiences. Student-teachers would attend an actual primary school instead of the university campus. During the school day they would have university lessons, as well as observing teachers in the classroom, working with individual school students, and small groups of students, all of this leading to taking lessons with the whole class.

I remember Ron at the Burwood campus, wearing an open collar shirt, with a narrow leather thong around his neck, and a tiny brass silhouette model of a Supermarine 'Spitfire'. His late father had made it, while working in World War II as a machinist. (How will we remember Ron now?)

After retirement, Ron wrote and published further articles and books on mathematics education, including *Certain Number: Teaching Number Through Chance and Data Activities* (CD-ROM, Mathematical Association of Victoria, reviewed in *Prime Number*, vol. 28, no. 1, p 18, 2013).

A major achievement was writing a full history of one of the primary schools where he taught: *The School on the Small Plateau: The History of the Garfield North State School No. 3849*, self published by Ron's Perfect Number Consultancy, in 2014.

This is the history of the Garfield North State School from its beginning in 1914 to its current use as a special needs school camp.

When he became a degree graduated teacher, Ron was appointed headteacher at Garfield North from 1970 to the end of 1972.

Ron's history includes stories of people connected to the school, such as head teachers, students, district inspectors, and school committee members, and also some wider history of families and Garfield North. Garfield was originally known as Cannibal Creek, but changed to its present name in 1887. See www.historyvictoria.org.au/shop/school-on-the-small-plateau-the-the-history-of-the-garfield-north-state-school-no-3849-by-ron-smith.

Ron explained to me that the school building at Garfield North 'had been on two other sites in the Garfield district covering about 30 years. I don't know how it was moved - probably in parts on a wagon pulled by oxen(?). The original Koo Wee Rup school - the same type of 1880s portable was moved from Yallock to Koo Wee Rup, and then to Island Road, and is now back at Koo Wee Rup. When it was moved across the swamp to Island Road it was pulled by horses on a sled - but that would have been on very flat wet ground. They did achieve amazing things in those times.'

Similarly it takes an amazing and dedicated historian to find these amazing facts! Ron spent a day a week for a year going into the State Library, reading 60 year's-worth of the Bunyip and Garfield Express.

In Ron's first year at the Garfield North school the teachers had to write their own version of the history of the school. At that time, five or six of his paragraphs were published in a book about Garfield North. After this, Ron kept his notes, telling himself this was something he would finish off when he retired. And he did!

Recently, in his retirement, Ron was active in his local branch of U3A, teaching interesting features of mathematics (at a school level), and running a monthly Nature Club meeting. (Nature studies used to be a primary school subject in the 1950s, before science replaced it, along with health. The Gould League of Bird Lovers also featured regularly in the primary school experience. Ron absorbed a great deal from his school days! He was also a keen gardener, and a staunch environmentalist, active in many conservationist groups.)

Following his father's musical interests, Ron used to play saxophone in several dance bands (earning enough to buy his first

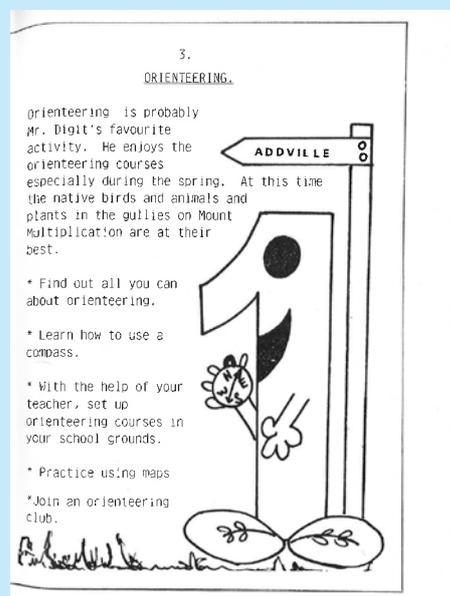
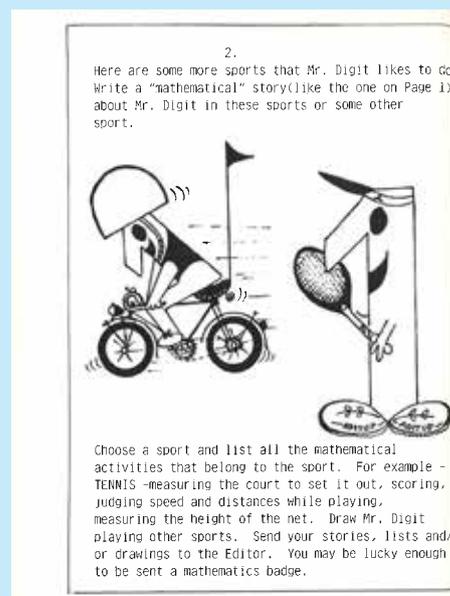
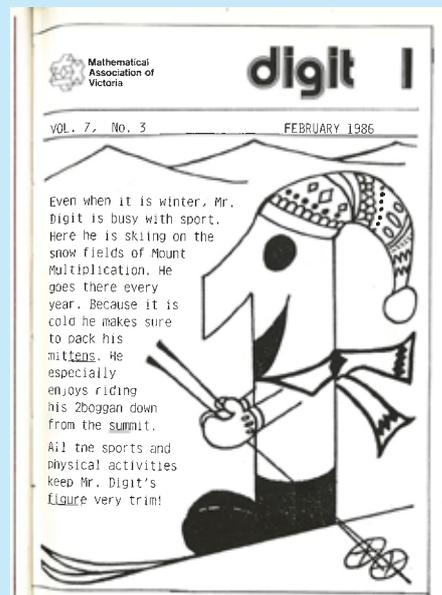
car!), and later played with a classical group called CLASAX (Clarinet and Sax Society). About a dozen people in this group played up to six different-sized saxophones. Ron found these bands musically and socially very rewarding, and he strongly encouraged his sons to learn to play instruments.

More recently, when lung problems made blowing a saxophone too difficult, Ron continued his musical interests playing in a recorder consort in his local University of the Third Age (U3A). (All Burwood Teachers' College student-teachers learned to play recorder, under the inspirational instruction of Frank Higgins, a lecturer for many years at the Burwood campus. Obviously, in Ron's case, these lessons stuck for life!)

While working at Deakin University (Burwood), Ron arranged his workload so he could finish his second semester's teaching in time to participate in the Great Victoria Bike Ride. He successfully completed these epic journeys several times, and long riverside bike riding tours with Shirley in Europe, and other major Australian rides.

After retiring he continued his serious interest in recreational cycling, and recently added Tai-Chi, for fitness, joining in with a local Chinese group. Ron became an avid bird watcher, and went on several bird watching trips around Australia and the wider world. He also enjoyed taking long overseas trips and other travels with his wife, Shirley, and spending time with his two sons and their young children. Ron was an ideal grandfather, with many games and activities - once even organising a do-it-yourself teddy bear making project at home, which naturally then needed a further teddy bear clothing sewing project, followed by taking the well dressed teddy bears on a miniature steam train ride! Ron was constantly stimulating his children and grandchildren to think, mathematically, creatively and musically. And they had lots of fun!

The family's newspaper notice of Ron's sudden death summed it up beautifully: 'A life well lived!' But, so suddenly and sadly, far too short! He will be greatly missed and long remembered!





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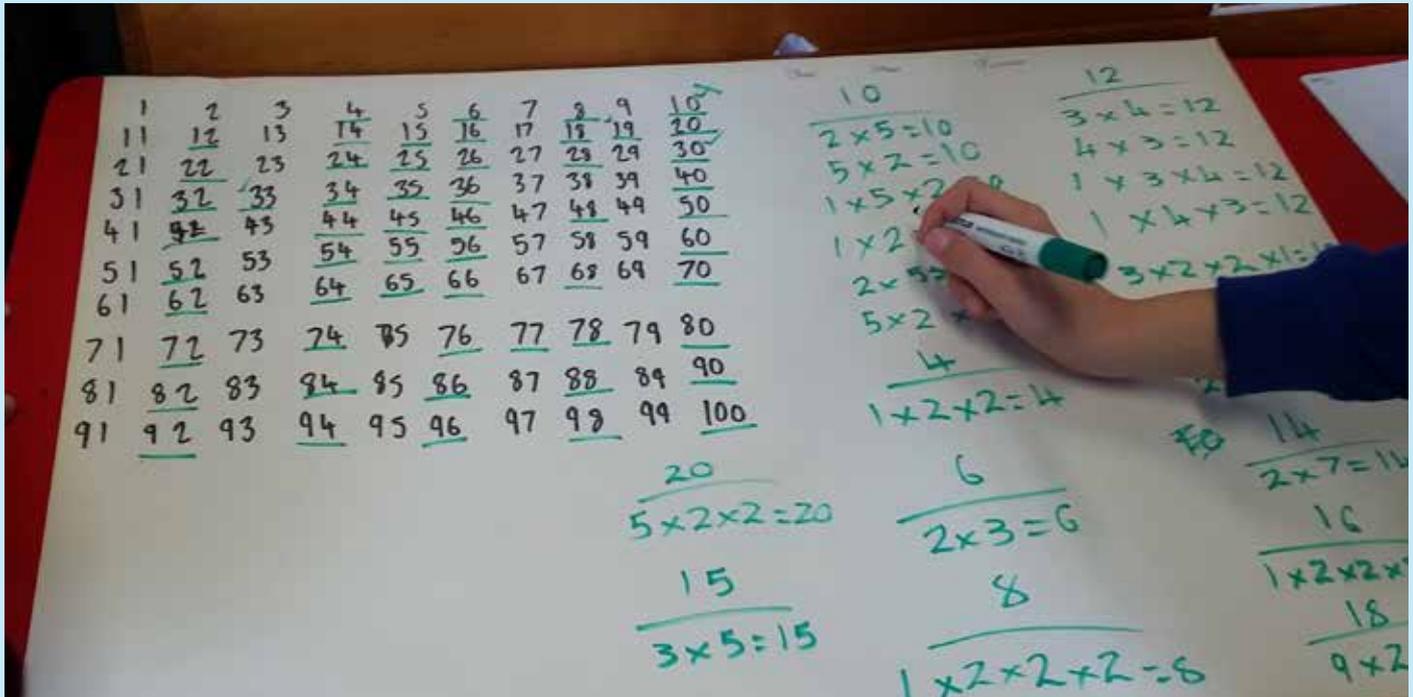
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*INSPIRED BY AUSTRALIAN TEACHERS
FOR AUSTRALIAN STUDENTS*

REVIEW: MATHS 300

Conal Reilly - Numeracy and e-learning leader (Year 3 - 6), St Christopher's Primary School



At St Christopher's, the success of our learning and teaching in mathematics has been supported through the use of high quality, engaging activities that allow our students to apply their knowledge, skills and understandings in a range of unfamiliar and challenging scenarios.

Our students have achieved excellent levels of relative growth in their 2015 NAPLAN results in mathematics from Year 3 to Year 5, which highlights their ability to understand and apply their skills to solve problems in a range of topics and contexts.

Maths300 is one of the 'go to' resources that we use within our team planning process to teach to the identified needs of our children. As a resource, the lessons are clear, well sequenced and often only require readily available resources and manipulatives.

Maths300 puts at the fingertips of all our teachers an accessible bank of lessons and ideas that cover the range of content areas within the Australian Curriculum in ways that clearly support the application and development of the proficiency strands, in particular problem solving and reasoning.

The activities are rich and layered, importantly providing entry points for most students to begin working independently

whilst also providing sufficient challenge and depth for more capable students to go beyond.

Maths300 lessons can often be used over a sequence of lessons and therefore provide the opportunity to consolidate and apply concepts that may have been explicitly taught earlier in a planned unit.

Notes, scaffolds and suggestions are included within lessons that can provide springboards to other areas, as well as touchstones to guide the direction of the activities.

Recently, Year 5 teacher Lizzy Andrews used the *Licorice Factory* activity with her class as a learning experience for children to explore for themselves the concept of prime numbers whilst also reinforcing number facts, multiples, factors and consolidating their multiplicative thinking.

After setting the engaging scenario of a *Licorice Factory* where everything is going fine until one day a machine breaks down, children are then set the challenge of identifying a creative solutions to this unfamiliar problem.

Once solutions are found, the complexity of the task increases with several other machines breaking down and then finally

children are asked to identify which machines the factory could actually do without in the event of further machine malfunction.

The children were instantly engaged with the challenge posed in the scenario and there was a real buzz as the children were keen to get into the task.

There were numerous 'a-ha' moments throughout the lesson as children realised and were able to articulate why certain machines were either crucial or necessary to the factory process (check out the *Licorice Factory* lesson for yourself for greater detail) Lizzy explained that she had decided to withhold the learning intention from children in this particular lesson as she believed this would provide for a more powerful and meaningful sharing session for children.

The children themselves used vocabulary including prime numbers, factors and multiples when sharing, explained how they overcame challenges as well as posing further questions.

Article continues on page 19.



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**TEXAS
INSTRUMENTS**



Children framed reflections in terms of what they had learned within the session:

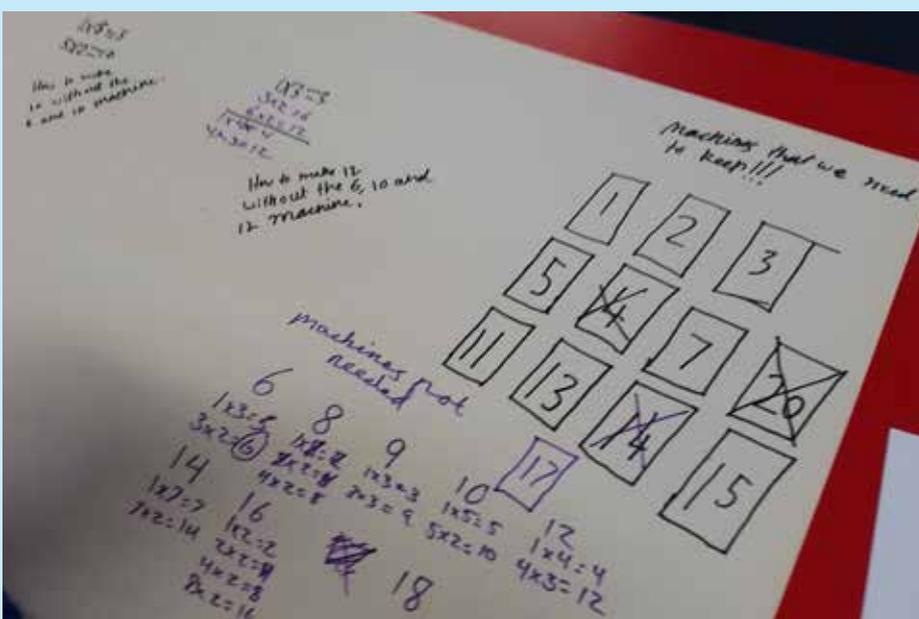
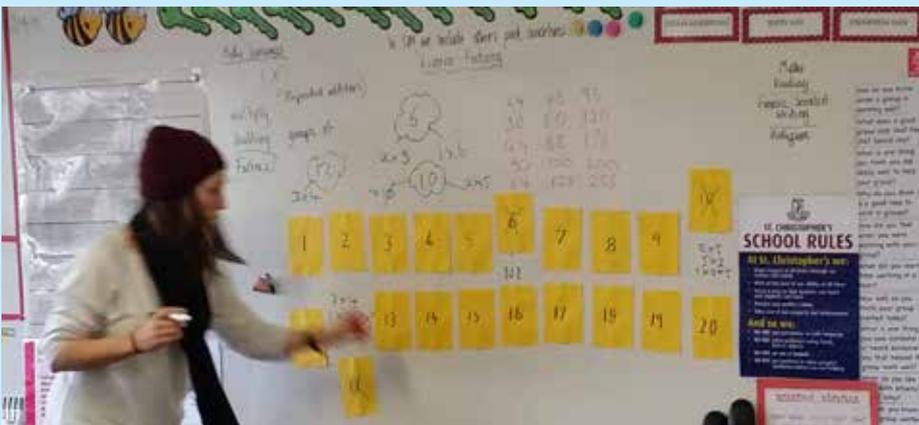
I now know how to solve problems with prime numbers. I know which numbers to keep and which ones you need to get rid of because they have common factors.
- Stephanie

Do we need the 1 machine? We are always given 1 to start with anyway...
- Imogen and Luca

We now know that you can make most numbers using different factors. You can even use 3 or 4 numbers to make some.
- Michael and Tahlia

We now know that prime numbers are the most needed machines in the factory because there is only one way you can make them.
- Ethan, Jordan and Jessica

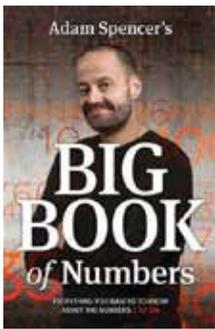
I now know the importance of prime numbers, and how to work out what they are.
- Luke



If you're looking for a resource that will provide your children and staff with a range of engaging, challenging and meaningful lessons to enhance the learning and teaching of mathematics, then Maths300 is definitely a resource you should be utilising in your school. www.maths300.com.au.

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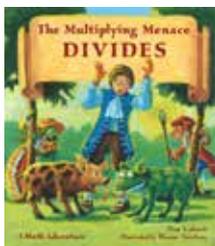
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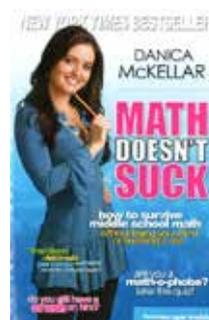
THE MULTIPLYING MENACE DIVIDES

3-6

A ribbiting maths adventure! After being banished to the Abyss of Zero in *Multiplying Menace: The Revenge Of Rumpelstiltskin*, Rumpelstiltskin is back, and he's stirring up more trouble than ever. Together with his sidekick, a witch named Matilda, Rumpelstiltskin plots his revenge on Peter and uses his magical powers to divide the kingdom into frogs. Peter and his dog, Zero, must locate the Great Multiplier and find a solution that will break the Great Divide before Rumpelstiltskin has a chance to combine the two mighty math sticks. Can Peter once again save the kingdom in time, or will it meet a green and warty fate?

Young readers will fall in love with this maths adventure and learn all about dividing by whole numbers and fractions, as well as division rules for equations involving zero. Beautifully rendered illustrations will grab readers' attention as they learn basic math skills in a fun and inventive way.

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MATH DOESN'T SUCK

6-10

From a well-known actress, math genius and popular contestant on *Dancing With The Stars* a groundbreaking guide to mathematics for middle school girls, their parents, and educators. Research continues to prove that it is in middle school when maths scores begin to drop especially for girls in large part due to the relentless social conditioning that tells girls they 'can't do' maths, and that maths is 'uncool'. Young girls today need strong female role models to embrace the idea that it's okay to be smart.

It's Danica McKellar's mission to be this role model, and demonstrate that maths doesn't suck. In this fun and accessible guide, McKellar gives girls and their parents the tools they need to master the math concepts that confuse most, including fractions, percentages, pre-algebra, and more. The book features hip, real-world examples, step-by-step instruction, and engaging stories of Danica's own childhood struggles in maths (and stardom). Borrowing from the style of today's teen magazines, it includes a maths horoscope section, personality quizzes, and real-life testimonials revealing why math is easier and cooler than readers think.

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