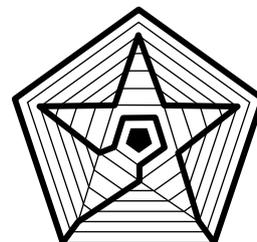


SHORT CIRCUIT

Newsletter of the Canberra Mathematical Association INC

VOLUME 12 NUMBER 8

AUGUST 2021



NEWS AND COMMENT

Many students and classes already produce interesting projects as part of their learning. Now, by submitting the best of them in the **Canberra Mathematics Talent Quest 2021**, ACT school students become eligible for consideration in the National Mathematics Talent Quest, which previously has not been an option. Full details are available on the [CMA website](#), including how and where to submit entries. The closing date is Friday, August 13.

CMA has had opportunities consider and to make submissions in two recent reviews of national education matters. First, on page 2 are some thoughts on the federal government's Quality Initial Teacher Education Review, and then, on page 5 readers can find comments assembled by the CMA committee for submission to

the Review of the Australian Curriculum: Mathematics.

In each case, what could be said in a submission was somewhat constrained either by the 'terms of reference' or by the strict categories under which comments could be submitted. Nevertheless, significant ideas were expressed, demonstrating among other things that CMA is taking its promotion and lobbying role seriously on behalf of its members and professional colleagues.

Comments from readers on these and related matters would be welcome.

Applications for the National Mathematics Summer School are due. If you have year 11 students who are strong in mathematics, please make sure they know about the NMSS. See page 3.

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Talent quest—p.3
CMA council 2021 – p. 4
Puzzle solutions—p. 6

Coming Events:

AAMT virtual conference 29-30 September. Theme: 'Future Proofing'

AGM: 10 November.

Wednesday Workshop:



MEMBERSHIP

Memberships run from 1 Jan to 31 Dec. each year. Membership forms can be accessed from the CMA website: <http://www.canberramaths.org.au>

Membership of CMA includes affiliation with the Australian Association of Mathematics Teachers and a subscription to one of two AAMT journals.

As a member, you are entitled to attractive rates for the CMA annual conference and CMA professional development events.

CMA members may attend conferences of the AAMT affiliates in other states, MAV, MANSW, etc. at member rates.

**CANBERRA
MATHEMATICAL
ASSOCIATION**

PUZZLES

1. **Billions factorised**

Large numbers with few divisors are hard to factorise without extra information. Two 5-digit numbers multiply to give 123,456,789. Find them.

2. **A fraction of a fraction**

A book you would like to purchase is available on the Epsilon website at a 30% discount and on the Omicron website at a 20% discount. If you buy it via the mobile app, Epsilon offers an additional 20% discount on the reduced price whereas the Omicron app offers an additional 30% discount. So, which app should you use to buy the book?

3. **Vice versa, again**

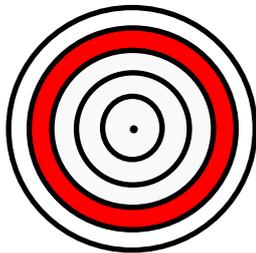
Which is greater, 17.5% of \$50 or 50% of \$17.50?

4. **Odd**

Is there an odd number that does not contain an 'e' in its English spelling?

5. **Bullseye**

In this archery target, is there more white area inside or outside the red region? The regions are meant to be made from concentric circles with radii increasing in steps of one unit.

6. **Unlikely story**

A student happened to notice that $\sqrt{3 \frac{3}{8}} = 3 \sqrt{\frac{3}{8}}$, and that $\sqrt{5 \frac{5}{24}} = 5 \sqrt{\frac{5}{24}}$, and supposed that it would always be true that $\sqrt{(x + x/y)} = x \sqrt{(x/y)}$. Is this correct? If not, under what circumstances does the rule work?

7. **Bermuda triangle**

The hypotenuse of a right triangle is 100 km and the altitude dropped onto it is 60 km. Find the area of the triangle.

INITIAL TEACHER EDUCATION

The federal government's Quality Initial Teacher Education Review was launched on 15 April, with the announcement of the Terms of Reference and an Expert Panel of Ms Lisa Paul AO PSM (Chair) (former Secretary of the Department of Education), Emeritus Professor Bill Loudon AM (former Dean of Education and Deputy Vice Chancellor, University of Western Australia), Mr Malcolm Elliott (President, Australian Primary Principals Association) and Mr Derek Scott (Principal, Haileybury and 2019 Australian School Principal of the Year).

There was a [discussion paper](#) and a call for submissions (with a deadline—midnight Sunday July 18). AAMT CEO Allan Duggan sought input from CMA for his submission written of behalf of AAMT. CMA's representative on the AAMT council, Sue Wilson, has written down some reflections after reading the discussion paper:

From reading the discussion paper I noted the issue of teacher attrition. I was concerned that there was a mention of attrition of pre-service teachers during their course, but little on the issue of the number of newly graduated teachers leaving in the first five years of teaching.

Estimates are highly variable - in 2007 it was estimated at 25%, but currently estimates range from 33-50%. This too is relevant to the issue of supply of teachers and attracting and retaining teachers in rural areas mentioned in the document.

What contributes to this? ...Initial Teacher Education? ...They don't feel prepared? See p. 20. The expectation is that newly graduated teachers will be 'classroom ready', when the majority of teachers don't find workloads manageable (p. 22)? Only 37% report having a mentor during the first 5 years (p. 22)?

The document quotes numbers in full-time employment (p. 13). However, is this permanent employment? What proportion of teachers are on contracts?

I was talking to a lady down the coast who said her son had been teaching for 12 years but hadn't had a permanent position, which impacted on his ability to buy a house. She claimed that it was common among teachers there.

The main emphasis of the review is attracting high performing students into teaching. Should the review also address the issue of retaining these students after they graduate and start teaching? What do you think?

It hardly needs to be said that the chosen Terms of Reference in a review can and do restrict the conclusions that may be reached and may themselves need to be challenged.

ZERO

A question that almost made it to the Puzzles section reads, 'Is zero an even number?'. There is a simple 'yes' or 'no' answer, of course, but the question has a deeper potential for the classroom.

'Zero' has a history worth imparting to students the details of which we leave to the reader's curiosity and research. Not so long ago, zero was not even a number, let alone an even number. The Roman system of numeration has no zero, for example.

To decide unequivocally that zero is even, a good definition of evenness is needed. Young mathematicians might be asked to design their own definitions. Then, quite possibly, a classroom discussion could ensue on the merits or failures of various proposals.

Would it be enough to claim that even numbers are those that are not odd? What, then, is an odd number? Are there numbers that are neither even nor odd? What objects are we including anyway when we use the word 'number'? Does splitting into equal parts enter the question? Or the possibility of forming pairs?

This apparently simple question about zero posits mathematics as being not in the first place about computational skills, important though they are, but fundamentally about clear thinking and logic within a matrix of human discourse.

CMA CONFERENCE 2021 POSTPONED

This year's CMA Conference scheduled to be held at ADFA on Saturday 7th August has been postponed because of the current uncertainty with the Sydney Covid crisis.

ADFA is understandably not allowing any visitors until the crisis is resolved.

The Council is considering a conference later in the year, in the fourth term and possibly in mid-October. It is also considering on-line presentations (in a hybrid model) and even a full on-line conference.

In the interim, we hope to offer workshops from potential conference speakers later this term.

ACER RESEARCH CONFERENCE

Online event—16 - 20 August

Conference theme:

'Excellent progress for every student'.

To register go to this [link](#).

As a foretaste, Teacher Magazine has published an interview with Professor Dianne Siemon of RMIT university, one of the four keynote speakers. Professor Siemon [discusses her topic](#) comparing year level curriculum with evidenced-based learning progressions.

NMSS 2022

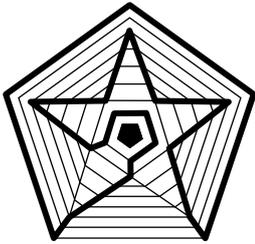
The National Mathematics Summer School is held in January each year for year 11 students who are about to begin year 12.

Attendance is by selection. Applicants typically have demonstrated a strong interest in and aptitude for mathematics. Teachers should encourage their more promising students to apply and will be asked to support their applications. The July 30 closing date for applications is likely to be extended.

Go to the [CMA](#) website or directly to the [National Mathematics Summer School](#) website for details.

AAMT VIRTUAL CONFERENCE

Future Proofing Australia's mathematical capacity 29 - 30 September—an event to engage and activate you in your profession, and deliver best practice mathematics teaching ideas and resources. [AAMT Members \\$135](#).



**NEWSLETTER OF THE CANBERRA
MATHEMATICAL ASSOCIATION
INC**

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We're on the Web!

<http://www.canberramaths.org.au/>

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ABOUT THE CMA

The Canberra Mathematical Association (Inc.) is the representative body of professional educators of mathematics in Canberra, Australia.

It was established by, among others, the late Professor Bernhard Neumann in 1963. It continues to run - as it began - purely on a volunteer basis.

Its aims include

- * the promotion of mathematical education to government through lobbying,
- * the development, application and dissemination of mathematical knowledge within Canberra through in-service opportunities, and
- * facilitating effective cooperation and collaboration between mathematics teachers and their colleagues in Canberra.

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CURRICULUM REVIEW: MATHEMATICS

These are the recommendations CMA has submitted to the Review of the Australian Curriculum: Mathematics.

1. Indigenous references and inclusion

We believe that the teachers that we represent would like to invest their goodwill in including Aboriginal and Torres Strait Islander culture and experience in their teaching practise. We value a sense of cultural responsibility.

In our particular context, living and working in the ACT, we directly implement the Australian Curriculum: Mathematics in classroom lessons and activities with no state government filter or support. Many teachers of non-indigenous background feel unqualified and hesitate to embrace the teaching of Aboriginal and Torres Strait Islander culture for fear of causing offence. We are concerned that this may result in some classes and schools not addressing this as a priority and as a consequence there will be no consistency between schools as to how this is taught.

We fully support the elaborations provided that include suggestions of how Aboriginal and Torres Strait Islander perspectives and experiences might be included in mathematics lessons, but we would appreciate some more detailed physical examples of how this might be done. Some suggestions would include:

- videos
- reference documents
- instructional advice for teachers of non-indigenous background

We are also conscious that the particular elaborations that refer to Aboriginal and Torres Strait Islander culture are listed last. We are concerned that this might imply that they have less value than the other elaborations.

There is some concern about the level of detail provided in the elaborations. Some elaborations are very specific whilst others are very vague and general. For example, AC9MFM01_E6 seems very general but AC9M1SP01_E5 is very specific to a particular cultural experience. While we appreciate this is a difficult balance to achieve, we would like to see a more consistent approach to the amount of detail provided in these elaborations.

2. Technology

We recognise the importance and influence of technology in education today. We would like to see a more explicit statement at the start of the curriculum document that elaborates on the application of

technology to mathematics education. In this statement it would be useful to include listed possible options that teachers could consider when implementing technology in a mathematics lesson.

We are also curious about the future role of *skuttle* in the support of the curriculum. We have made significant use of this resource over time and would like to see it continued and developed.

Any conversation about technology raises the question of equity of access. We would like some consideration made for schools where technology is not readily available, where technical support does not exist and the associated expenses of utilising technology cannot be supported by the available funds. This is a significant issue that needs to be addressed at a government level but we feel it needs to be acknowledged in this document.

3. Skills

Apart from a general reference in the key considerations to fluency, there is little specific conversation about the place of skills in mathematics. The presentation of the curriculum document suggests that the six Key Strands stand separate from each other. This denies one of the significant strengths of mathematics, in that there is considerable connection between different strands, elements and concepts in this subject. In exploring these connections between different areas and topics of mathematics, many opportunities are revealed for rich learning. Without these connections being elaborated or expanded upon, there is a temptation for teachers to teach skills in isolation. This does not lead to deep understanding of the relationships in mathematics between mathematical processes.

We would propose that specific reference is made throughout the curriculum document to opportunities for students to explore connections across strands, for example between multiplication, area, length and data. In this specific example we could easily explore ideas from four of the six strands in one lesson, develop fluency in the use and application of skills related to these concepts and produce a deeper level of understanding.

4. Achievement Standards

We note that the achievement standards are much longer than they used to be. It is good that they are brought in context but there is significantly more information and content specified. Many schools use the achievement standards for reporting purposes. They are used as a reference point for student performance and the observed change in length and content will have an impact on assessment and reporting at a classroom level. There is potential for

Continued from page 5

this to lead to bad teaching, where teachers conduct tasks and activities simply for the purpose of ticking off a statement from the achievement standards. While this is not a new problem, the increase in the size of the achievement standard will potentially make this problem worse.

We recommend that a statement is included for schools that specifically relates to assessment and reporting that clarifies the use of the achievement standards for this purpose and empowers teachers to teach purposefully rather than to achieve a checklist of completed tasks.

We suggest that the Achievement Standards should include some less concrete values: *creativity, communication, reasoning, argument, strategic thinking, and modelling*. The justification for this is that these are things learners do to activate their mathematical knowledge. If such things are not assessed they will not be valued, yet they are arguably the key outcomes of a mathematics education.

5. Minimum Standards and Opportunities for Extension

It is noted that in the previous version of the Australian curriculum learning outcomes were expressed as a minimum standard for that year group. In the revised version, this seems to be expressed with statements included in the outcomes to a standard of 'at least' or 'such as'. While a focus on minimum standards is useful, there appears to be some ambiguity about the potential for extension work for students who have completed the minimum standard.

As professionals, we do not believe in lockstep progression. We do not believe that one chronological year equates to 12 months of academic learning. We do not believe that all eight-year-olds for example are ready for the same learning. Differentiation is essential within any class group since children operate at different levels of ability and readiness.

Our recommendation is that specific advice be given in this curriculum document relating to extension for students who have achieved a minimum standard for the year. If the intention is that students progress to the next year level of mathematics work whenever they complete their current year requirements, then this needs to be stated explicitly. If the intention is that students be provided with broader extension opportunities that do not involve work from a more advanced year group, then this needs to be explained.

Clarification about how to handle extension work needs to be provided in clear terms so that there is consistency across all schools.

Closely related to this point is the question of remediation. If students do not complete the minimum standards for the year group within a 12-month period, is it the expectation that they do not progress to the next year level until these requirements are met? This needs to be clarified.

6. Language Used Within the Revised Document

The language used within the revised document appears to be more technical and sophisticated than in the previous version of the curriculum. This language is mathematically correct and clear in intent but is it accessible to all teachers? This is a significant issue given the number of out-of-field teachers involved in teaching high school mathematics. If they fail to understand the meaning of the mathematical vocabulary used in the document, they will not be able to implement it effectively.

Our recommendation is that either the language used within the document is simplified and presented in a less technical format or that there is provision for unfamiliar terms to be explained and clarified. There may be the possibility of providing digital links to a glossary of terms that will enable teachers to fully appreciate the terms being used.

MATHS TRUST MoU

The Australian Mathematics Trust (AMT) has proposed a memorandum of understanding with CMA. This would formalise the cooperative relationship that has always existed between the two organisations. In particular, the memorandum would aim

- to form an effective partnership that leverages of each organisation's strengths;
- to promote the importance of mathematics and mathematical problem solving to teachers, students and the wider community;
- and to establish a closer working relationship that will enable both parties to approach strategic opportunities and risks more collaboratively.

CMA is in discussion with AMT about this initiative and its ramifications.

NEW REGIONAL EDUCATION NETWORK

The Capital Region Schools Network (CRSN), ‘uniting education stakeholders across all sectors’, was officially launched on Tuesday 20th July. The member organisations are: ACT Education Directorate, Association of Independent Schools, Australian Catholic University, Catholic Education – Archdiocese of Canberra & Goulburn, NSW Department of Education, Teacher Quality Institute, University of Canberra.

The Network has a range of possible foci, including although not limited to: creating a bridge between teacher education institutions and the teaching profession; collaborative research possibilities; the promotion and sharing of good practice and initiatives; and public presentations and events.

The keynote speaker at the launch was Dr Jenny Donovan, CEO **Australian Education Research Organisation (AERO)** on ‘Evidence-based Practice’. The remit of AERO (<https://edresearch.edu.au/>) is to generate high-quality evidence, make high-quality evidence accessible and enhance the use of evidence in Australian education.

In support, AERO has produced four *Tried and Tested* evidence guides for classroom teachers. These guides aim to support teachers' ongoing professional development by summarising key practices that can rapidly improve learning outcomes for students in Australian classrooms.

AERO

The Australian Education Research Organisation, mentioned above, is a government owned body that joins the suite that includes ACARA, AITSL and ESA. Its purpose is to be an arms length research body providing expert input to government

SEEN ON TWITTER

So I'm not getting a vaccine next week - was feeling weird about why I'd been selected ahead of others so rang GP to check. Turns out they had my height as 6.2 cm rather than 6 ft 2, giving me a BMI of 28,000.

PUZZLE SOLUTIONS from [Vol 12 No 7](#)

1. Transposed digits

$53n - 35n = 540$. So, $n = 30$. Austin's result must have been 1590.

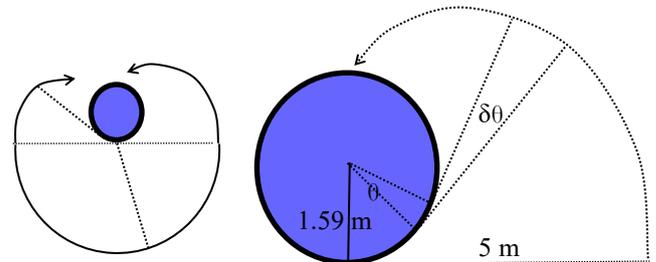
2. Fair game

A coin with diameter y tossed onto a square grid with sides x will fail to touch a gridline if the centre of the coin is inside a square with side $x - y$ centred within a grid square. So, the probability of winning is the ratio of areas $(x - y)^2/x^2$. For a fair game this quantity is $1/2$. So, after expanding, we have $(y/x)^2 - 2y/x + 1/2 = 0$.

On solving the quadratic, and remembering that $y < x$, we find $y/x = 1 - 1/\sqrt{2}$. Approximately 0.29.

3. Goat

The semi-circular portion of the region the goat can reach is just $1/2 \times \pi \times 5^2 \approx 39.27 \text{ m}^2$.



The portions where the tether is wrapping around the tank are clearly less than this, so we can expect a total area more than 39 m^2 and less than 79 m^2 . It is possible to construct a careful drawing on grid paper and then count the grid squares that are within the region to get an estimate of the area. Calculus works too.

Note that the 5 m tether wraps almost exactly half way around the tank, so that the reachable regions each side of the tank do not overlap.

The region shown in the diagram is approximated by the sum of many narrow sectors. Each of them has area $1/2 (5 - 1.59 \theta)^2 \delta\theta$ where the angle θ subtended at the centre of the tank by the points of tangency of the tether ranges from 0 to π . By integration we obtain the value 13.1 m^2 . Then, adding up the pieces, we get just over 65 m^2 .