# SHORT CIRCUIT

## NEWS AND COMMENT

It is on!

The CMA conference this year is scheduled for August 13 at the Australian Defence Force Academy. (See page 6.)

CMA council is relieved to be able to make this announcement after a period of uncertainty and negotiation. Members and friends will undoubtedly welcome the news that the conference is back in 2022, providing an opportunity for professional development, the sharing of ideas, networking with associates, and more, all in a supportive atmosphere.

———————

Results from last year's Canberra Mathematics Talent Quest together with information about this year's event are on page three. Students from K to 12 can participate. The closing date for submissions is still some months away but projects can be undertaken at any time that suits your students.

**Coming Events:**

2022 CMA conference ADFA August 13.

**Wednesday Workshops:**

Check for notices sent separately.

## → 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.

# Change – one of life's constants
## CMA Annual Conference 2022

# Australian Defence Force Academy
## Saturday 13th August 2022    9am-5pm

# CANBERRA MATHEMATICAL ASSOCIATION

# PUZZLES

**1.    Tik Tok**

There are 100 people in a room and exactly 99% of them are tiktokers. How many of the tiktokers must leave the room to bring the percentage of tiktokers in the room down to exactly 98% ?

**2.    Packed squares**

In the diagram, three unit squares are packed in the semicircle. Can you discover the radius of the circle?

This is a problem posed by Colin McAlister (UK) who has been investigating packings of various shapes into circles and semicircles experimentally using the application GeoGebra.
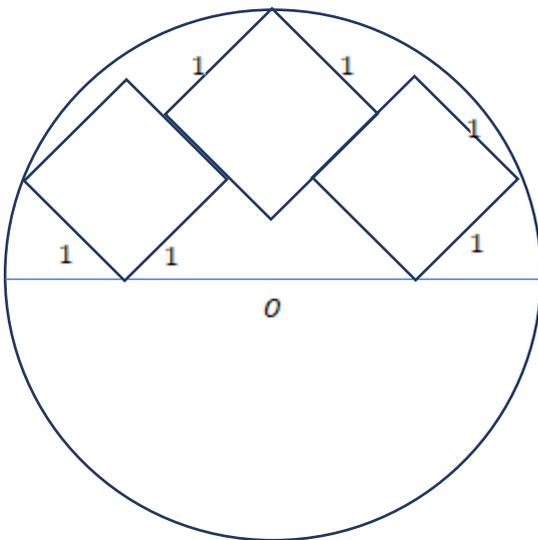


How might one demonstrate that this configuration represents the smallest semicircle into which three unit squares can be packed?

**3.    Algebra**

It is usually true that the expressions

$$a^{(b^c)} \text{ and } (a^b)^c$$

are different.

Can you find values of *a, b* and *c* such that the expressions evaluate to the same number, and is there a general condition that makes this possible?

# MY FAVOURITE LESSONS

**Double Trouble.  (Suitable for primary school through to year 12)**

I used this theme to investigate number patterns with a year 6 group.  They prepared a project which won its category in the Canberra Maths Talent Quest last year. It was subsequently submitted to the National Mathematics Talent Quest which was judged in Perth and it won the trophy for its category.

I saw an ABC television tourist promotion for Kalgoorlie.  A colourful local was interviewed and he described the main street of the old mining town which had 14 pubs.  He said that locals would have a $50 bet with tourists that they couldn't drink 1 tsp of beer in the first pub, 2tsp in the second, 4tsp in the third, 8tsp in the fourth and so on, completing all 14 pubs. ...Seems easy enough.

The students completed the doubling calculations to discover the surprising result.  They found containers holding the approximate volume for each pub and took photos of themselves trying to drink it (easy at the beginning!). They then changed the story to a school setting and lemonade stands and submitted the project, winning the year 6 class section.

I have presented this problem to higher level classes in years 11 and 12 when studying geometric progressions and the sum of geometric progressions. They have been equally captivated by the problem and surprised at the result. It's good fun.

Heather Wardrop

# THE CANBERRA MATHEMATICS TALENT QUEST 2022

## 2021 result

The National Mathematics Talent Quest (NMTQ) has provided a venue to showcase the creative thinking skills of students in Australia for many years. To be eligible to enter the national quest a project has to win its category in a similar quest at the state level. Students throughout the ACT have put considerable time and effort into mathematics assignments and projects yet they did not have a mechanism where they could get local or national recognition and encouragement for their work. The executive of CMA decided that we should launch the Canberra Mathematics Talent Quest in 2021 so that we could participate in the national competition and highlight the abundance of local talent.

All entries that were submitted for ACT judging were of a very high standard and eleven entries won their category and were sent to Perth for national judging. Of these entries, two were outstanding and won their category:. They were:

Year 1 Small Group      North Ainslie Primary School (Alex, James and Marcel)

***What is the Chance of a Cow Dropping Leather in Minecraft?***

Year 6 Class                Arawang Primary School (Maths Extension Class)

***Double Trouble***

These are the first winners we have had in the National Mathematics Talent Quest. We hope to have many more winners at the local and national level in 2022.

A full list of award winners for 2021 is on the CMA webpage.

## 2022 quest

The entries for the Canberra Mathematics Talent Quest must be submitted by **Friday 19th August 2022.** Teachers may wish to get an early start on their entries.

Students are able to participate in the quest in one of three categories:

Submit an **individual** entry

Be part of a **small group** (up to 6 students)

Be part of a **whole class** entry (7 or more students)

All students from Kindergarten to Year 12 in the ACT are eligible to submit an entry.

**Any topic that involves a mathematical investigation is acceptable.** It can be something that the student found interesting or something the class is given as a task. The projects or assignments can be presented in any format including;

Essays, scripts, stories, poems, diaries, illustrated texts, newspaper format or any other form of writing

Posters

Videos

Models – static or interactive

Coding

Power point presentations

Spreadsheets or databases

To be eligible for entry to the National Mathematics Talent Quest the submission must be in electronic form.

**Further details, including the judging rubrics and links to sites giving examples of student entries in previous years, are on the [CMA webpage.](#)**
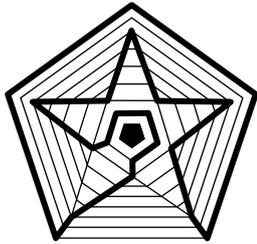
**NEWSLETTER OF THE CANBERRA MATHEMATICAL ASSOCIATION INC**

PO Box 3572
Weston ACT 2611
Australia

E-mail: canberramaths@gmail.com

We're on the Web!
http://www.canberramaths.org.au/

## 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.

## THE 2022 CMA COMMITTEE

| | | |
|---|---|---|
| President | Aruna Williams | Erindale College |
| Vice Presidents | Bruce Ferrington | Radford College |
| | Paul Kruger | Marist College |
| Secretary | Valerie Barker | |
| Treasurer | Jane Crawford | Brindabella Christian College |
| Membership Sec. | Paul Turner | |
| Councillors | Peter McIntyre | University of NSW Canberra |
| | Theresa Shellshear | Australian Catholic University |
| | Heather Wardrop | |
| | Andrew Wardrop | |
| | Sue Wilson | |
| | Yuka Saponaro | |
| | Jo McKenzie | ACT Education Directorate |
| | Joe Williams | |

Theresa Shellshear is CMA's COACTEA representative.

Sue Wilson is CMA's AAMT representative.

Joe Wilson is the website manager.

Short Circuit is edited by Paul Turner.

**Find us on Facebook**

http://www.facebook.com/pages/Canberra-Mathematical-Association/110629419011275

# CAREERS AND MATHEMATICS

This article, from Frances Moore, includes links to the website http://onthejob.education .

**Beekeeper**

Mathematics is in every job - we all know that but do our students? . Detailed information about the Beekeeper & the Bee Broker can be found here.

**Context and relevance**: *As we approach the year 2050 it is estimated that the world's population will reach 9.7 billion people. Although this seems a long way away, it is within students' lifetime. Because of this expected population increase we need to be smart about how we use resources today, to make sure they are available in abundance in future years. Bees pollinate a whopping TWO THIRDS of our food production.* (Source: Cool Australia.org).

─────────────

**Activities for the Classroom:**

To complete these activities, students need to follow the link in the heading above to the webpage for the details. Here is a summary of the activities:

**Activity 1: Building a Warre Hive: What's the Cost? Middle Secondary**

This activity involves the costing of building a particular hive – the Warre hive and the associated costs of having a beehive at the school. Involving the Technology Teachers.

**Activity 2: Bees and Hexagons**

An activity for **Middle Secondary** studying Geometry. Students are challenged to investigate the geometrically appealing shape of honeycombs and present their findings. Teachers will need to direct students to the appropriate resources for their mathematical level.

**Activity 3: Fires and Beekeeping: What are the implications? Secondary**

An activity for students studying Ecology and Mathematics. While the main emphasis is the ecology of fires and beekeeping – there is a small element of mathematics involved.

**Activity 4: Let's do the mathematics for the Almond Industry and the Bee Brokers!**
**Middle Secondary**

This lesson explores the impact of the relatively new Almond industry in Australia and the role of Bee Brokers to deliver bees and beehives to the almond growers in different States on time for pollination.

─────────────

**Life on the Job – Cedar & Stu Anderson – Australian Inventors of the Honey Flow.**

This father and son team have revolutionised the harvesting of honey all around the world. You need to click the link and get your students to read the page to complete the following two activities.

**Activity 5: Connect Three: Honey Bees**.
**Primary Middle Secondary**

This activity encourages creativity and critical thinking skills. Only one activity out of nine is based on Mathematics where the students are to view a video about the Waggle Dance and create an infographic explaining the mathematics in the video. The other eight activities are based on the Flow Hive, Bees, Honey, Venn Diagram on the roles, creating a Tik-Tok on how Honey Flow works.

**Activity 6: The Way of the Waggle Dance**
**Primary Middle**

Students are to use the Cornell Note-taking Method to analyse the bees dance and share their findings with another pair. They are to then play *The Way of the Waggle Dance* game created by Arizona State University and describe the mathematics involved in the game.

**Careers & Mathematics can be found at** this link.

**Contact Information**

If you are investigating a job or person in that job, please contact me Frances Moore – I would be happy to hear from you.

Frances.Moore@onthejob.education

Mob 0410 540 608

## CMA CONFERENCE

The Canberra Mathematical Association conference is on in 2022.

Save the date:
  August 13
  at the Australian Defence Force Academy, Campbell

Theme:
  **Change: One of Life's Constants**

The keynote speakers will be announced soon.

Proposals for workshop presentations will be welcome. Registration information will be available shortly.
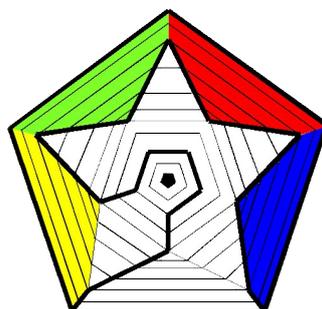
### 1. Another constant
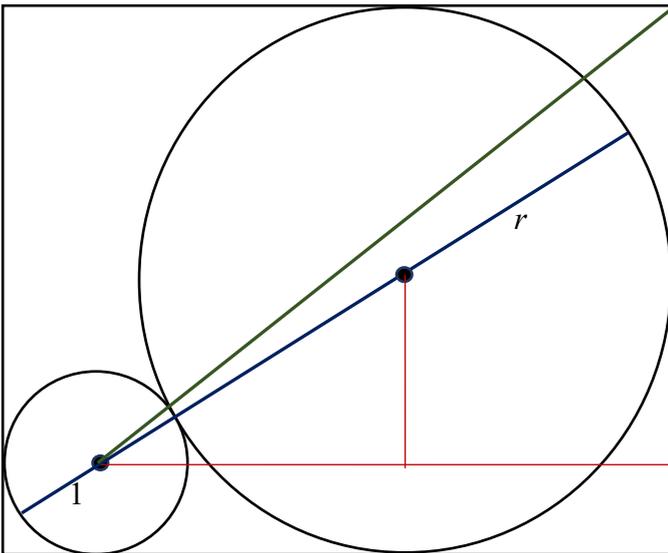


Two mutually tangential circles are contained within the rectangle. The small circle, radius 1, is tangent to two sides of the rectangle, and the large circle, radius $r$, is tangent to three of the sides. The distance from the centre of the small circle to the opposite corner of the rectangle is equal to the sum of the diameters of the two circles.

By Pythagoras we deduce, after some simplification, that the horizontal distance between the centres is $2\sqrt{r}$. So, the distance from the centre of the small circle to the upper right hand corner is $\sqrt{(2r + r)^2 + (2r - 1)^2}$. But this is required to be the same as the sum of the two diameters. Hence, $2(1 + r) = \sqrt{(2r + r)^2 + (2r - 1)^2}$. This is equivalent to the equation $r^2 + 4r\sqrt{r} - 8r - 3 = 0$, which can be solved by a numerical method to give $r = 2.6389\ldots$ .

The construction fixes the shape of the rectangle. Its sides are $2r$ and $1 + 2\sqrt{r} + r$, with $r$ determined.

### 2. Another face of geometry

From a square piece of paper, a net for a cube can be cut in various ways. We could have something like:
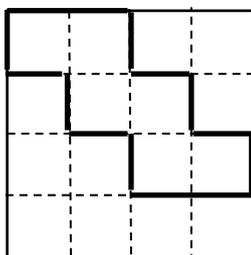


This folds into a cube but uses only 3/8 of the area of the square. We think the best alternative is:
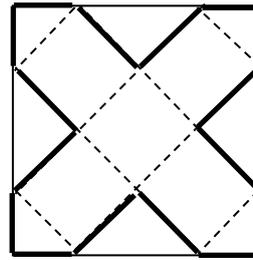


This uses 3/4 of the square.

### FINANCIAL LITERACY

The Australian Taxation Office (ATO) has launched an all-new **Tax, Super + You** website. It contains free resources that help improve financial literacy, teach the value of tax and super, and prepare secondary students for the workforce.

The new website (taxsuperandyou.gov.au) includes hundreds of high-quality resources designed by teachers, for teachers. The resources are mapped to the Australian and state curriculums and involve real-world concepts. All content is available in online and printable formats once a user has registered for free.

For more information on Tax, Super + You go to taxsuperandyou.gov.au