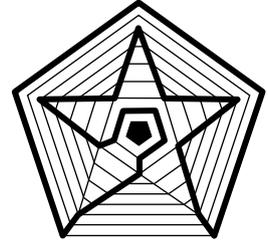


SHORT CIRCUIT

Newsletter of the Canberra Mathematical Association INC

VOLUME 12 NUMBER 10

OCTOBER 2021



NEWS AND COMMENT

Although stymied by the absence of a CMA conference, members and friends can still participate in our online workshop series.

We had a successful and enjoyable Zoom workshop with Kristen Triplet and the resolve team on Wednesday afternoon, 8 September. The Zoom format worked very well; in the end we had 11 participants.

Two more workshops are coming in October. On the 14th, Jono Adams takes the topic Spatial Reasoning and Mathematics; and on the 27th, Chris Wetherell will explain what he means by Letting the CAT out of the Bag. The workshops are free for CMA members and cost \$20 for non-member participants. See page 3 for the details.

If this newsletter is not too late and if you are quick, there is still time to register for the two-day AAMT virtual conference. Click this [link](#) for details.

The keynote speakers are Emeritus Professor Cheryl Praeger of the University of Western Australia, and Charlie Stripp who is the Director of The National Centre for Excellence in the Teaching of Mathematics (in the United Kingdom), and also CEO of Mathematics in Education and Industry, a UK national charity that works to improve mathe-

tics education.

The results of the inaugural Canberra Mathematics Talent Quest are out. See page 5.

It is not easy to know exactly how many participants there were in the CMTQ as there were interruptions caused by the lockdown, and in any case, schools would have submitted only their best work due to the number of entries permitted per school being restricted. CMA would like to acknowledge the work done in projects that were not submitted or not completed as well as the efforts represented in the submitted entries.

The total number of submissions for judging was 18. There were 4 individual, 9 small group and 5 class entries. There were no entries from years 11 and 12.

Eleven entries were submitted to the National Maths Talent Quest judging in Perth.

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CMA council 2021 – p. 4

Puzzle solutions—p. 7

Coming Events:

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

AGM: 10 November.

Wednesday Workshops:

14 October. See page 3.

27 October. See page 3.



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
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PUZZLES

1. Triangles constrained

(a) It is possible to construct a right-angled triangle with integer sides that are consecutive terms of an arithmetic sequence. The simplest example is the 3-4-5 triangle. What other possibilities are there?

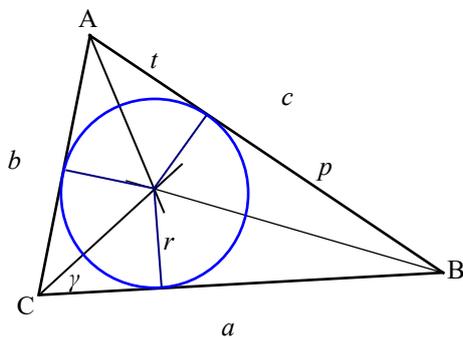
(b) It is also possible to have a right-angled triangle with sides that are consecutive terms in a geometric sequence: a, ar, ar^2 (Kepler). However, the common ratio r has to be a very special number. What is it? Is it possible for such a triangle to have integer sides?

2. Incircles

Every triangle has an incircle. Its centre, the incentre, is the point where the angle bisectors of the triangle intersect. (We refrain, for the moment, from asking you to prove that the three angle bisectors do intersect at a single point, and that that point is the incentre.)

There is a nice expression for the radius of the incircle when the sides are known. Can you find it?

You will need an angle but let's assume you have found it from the sides by trigonometry.



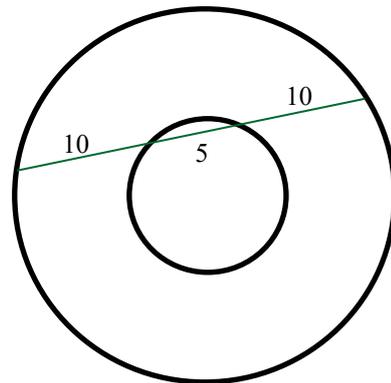
In the case of a right-angled triangle, the expression is particularly tidy. The angle in the diagram marked γ would be 45° , in that case.

3. Annual annulus

In Short circuit Vol. 11 No. 5 (2020) a puzzle question involved finding the area of an annulus given a chord that is tangent to the inner circle.

This time, we have a chord that passes through the inner circle and some lengths are given. We are not

told the radii of the inner and outer circles but is it still possible to find the area? The earlier puzzle may provide a clue.



TEACHING OUT-OF-FIELD

The 2021 **National Summit of Teaching Out-of-field** will be held online, 21-23 October 2021.

The summit intends to raise awareness of the practice of assigning teachers to teach in out-of-field contexts, and to explore the implications of this practice for policy, practice and research.

The intended outcomes of the Summit are to produce clear recommendations for policy, practice and research in relations to these themes. The summit will offer valued international and national stakeholders, industry partners and colleagues an opportunity to join conversations about the out-of-field teaching phenomenon.

You can find out more at the [website](#), where you can also register free of charge to participate. Please note, registration closes October 1.

FINGER COUNTING

Research participation opportunity!

Are you a Pre-school, Primary, Secondary or Special Education teacher who is currently teaching mathematics?

A Master of Education student from the University of Sydney is looking for teachers to complete a 15-minute online survey, with the possibility of a follow-up interview, about whether or not they use finger counting in teaching number concepts. Interested?

Survey link ([click here](#)).

The student, Karen Harricks, writes:

I will be able to send a short summary once the study is complete which can be shared as a follow up for those who participated and are interested in it. Thank you so much for your help with this! I really appreciate your support.

Kind regards,

Karen

kharricks@gmail.com

MAWA VIRTUAL CONFERENCE 2021

The Mathematical Association of Western Australia invites you to our first ever full virtual conference, to be held 29 November.

We are pleased to announce Tom Crawford as our keynote. Tom will be joining us live from the UK and is the face of the *Tom Rocks Maths* outreach program.

Our theme **Maths: Engaging Everyone Everywhere** encapsulates inclusion despite location.

The virtual conference aims to assist teachers from early childhood education, primary and secondary with their professional knowledge, practice, and engagement in mathematics education.

[Registrations](#) close 22 October. As a conference delegate you will have access to all virtual sessions for 12 months.

CMA WORKSHOPS

WORKSHOP 2 with Jono Adams on Spatial Reasoning and Mathematics, for teachers of years 6 to 10. Further details are on the CMA [website](#).

This workshop will run online. Please join Jono and the CMA team on Thursday 14th October (Team 4, week 2) from 4:00-5:30pm.

Register By email at canberramaths@gmail.com. Include your preferred email contact where you want the Zoom link to be sent.

WORKSHOP 3 with Chris Wetherell on Letting the CAT out of the Bag, targeting teachers of all levels. See the abstract on the CMA [website](#).

Join Chris and CMA online on Wednesday 27th October (Term 4, Week 4) from 4.00-5.30pm. Attend the workshop from the safety of your own space – all you need is pencil and paper.

Register by email at canberramaths@gmail.com Include your email contact so that we can send you the Zoom link.

We look forward to having you join us for these workshops.

AAMT VIRTUAL CONFERENCE

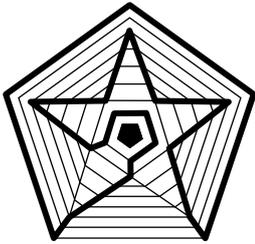
Future Proofing Australia's mathematical capacity 29 - 30 September—an event to engage and activate you in your profession, and deliver best practice mathematics teaching ideas and resources. [AAMT Members \\$135](#).

ACU MASTERCLASS SERIES

The Australian Catholic University—Mathematics Teaching and Learning Centre (MTLC) is offering, at modest cost, a series of masterclasses by webinar.

There are 12 webinars, running from September to December with various target audiences within the primary and junior secondary areas.

For details click this [link](#).



**NEWSLETTER OF THE CANBERRA
MATHEMATICAL ASSOCIATION
INC**

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We're on the Web!

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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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Short Circuit is edited by Paul Turner.

ISSN 2207-5755

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The Canberra Mathematics Talent Quest 2021a

Here are the winning and second-place entry results for the first Canberra Mathematics Talent Quest.

Thanks go to Andy Wardrop, the chief organiser of the event. Andy says there was not much between some of the entries.

Results of the national judging are not yet known but should be announced soon.

Thanks and 'Well done!' to the schools and to the students who submitted entries.

Results

1st Place (These entries were submitted to the National competition in Perth)

North Ainslie PS	Year 1 Small Group Alex, James and Marcel	<i>What is the chance of a cow dropping leather in Minecraft?</i>
North Ainslie PS	Year 3 Small Group Kobe and Anna	<i>Which senior class in our school brings the most fruit and vegetable in their lunchbox?</i>
Radford College	Year 4 Individual Lulu	<i>Building Plane Earth out of Lego.</i>
Radford College	Year 4 Class 4BF	<i>How many Kids Fit in our Classroom?</i>
North Ainslie PS	Year 5 Small Group Elliot, Maya and Zoe	<i>Penguins of Phillip Island.</i>
Arawang PS	Year 5 Class Year 5 Extension Group	<i>Maths on Mars.</i>
Arawang PS	Year 6 Class Year 6 Extension Group	<i>Double Trouble.</i>
Melrose HS	Year 8 Individual Isabella	<i>How much of my life have I spent in Mathematics?</i>
Melrose HS	Year 8 Small Group Ari, Denali and Samuel	<i>Simple Pendulums and their Length and Periods on Different Planets.</i>
Melrose HS	Year 10 Individual Will	<i>Gödel's Theorem.</i>
Melrose HS	Year 10 Small Group Rachel, Lea and Amelia	<i>Travelling the World with Bearings.</i>

2nd Place

Chapman PS	Year 4 Class Monday Maths Group	<i>The Scribe's Tomb Wall</i>
North Ainslie PS	Year 5 Small Group Eloise and Tamara	<i>Cost of our New Oval</i>
Melrose HS	Year 8 Individual Sourisa	<i>Analysing the Use of Mathematics in The Martian</i>
Calwell HS	Year 8 Small Group Isaac, Sally, Sara and Tashi	<i>Weather Wonderings</i>
Melrose HS	Year 10 Small Group Jiaqui, Samuel and Adrian	<i>The Infinite Hotel</i>

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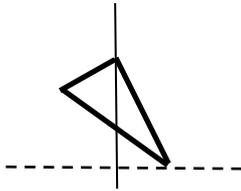
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PUZZLE SOLUTION from [Vol 12 No 9](#)

Physics speaks maths—an investigation

The investigation illustrates the need for physical theory to be consistent with what is implied by the relevant mathematics.

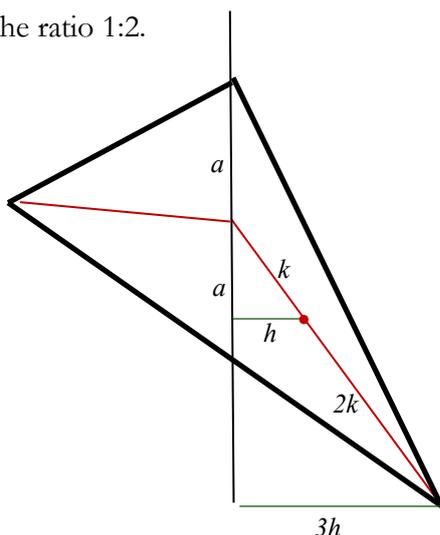


It is a physical observation that a triangular lamina suspended at a vertex hangs so that the midpoint of the side opposite lies vertically below the point of suspension. Geometrically, the vertical line is a median.

On the other hand, it is a mathematical observation that the triangles formed on either side of the median have equal areas. Thus, the physical lamina is divided into two parts with equal mass. This does not by itself explain the observed balance since, by analogy with a see-saw, the ‘centres’ of mass of the two parts would need to be equidistant from the vertical line.

However, the physicist suspects that the central point defined by the intersection of the medians (the *centroid*) coincides with the centre of mass of the triangular lamina, and so wishes to check whether this theory is consistent with the geometrical facts.

It is known that the centroid always divides a median in the ratio 1:2.

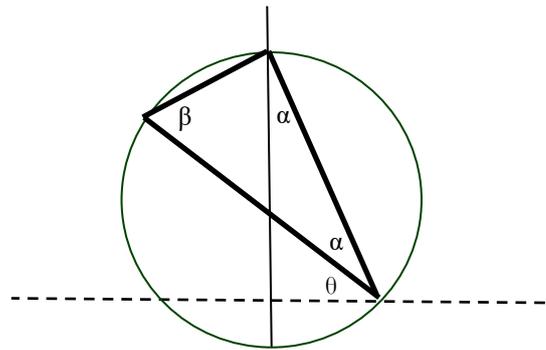


In the diagram, half of the triangular lamina is labelled. The vertical median of the whole triangle has length $2a$. A median of the right-hand half triangle has been drawn, with length $3k$.

We deduce that if the area of the half triangle is $A = 3ba$, then $b = A/3a$, where b is the perpendicular distance between the centroid and the vertical median.

The left-hand half triangle has the same area A , and the distance a is common to both sides. So, the distance of the left-hand centroid from the vertical median must again be $A/3a$. The centroids are indeed equidistant from the vertical line, so the physicist’s theory is at least consistent with the mathematical prediction.

In the case of a right-triangle suspended at the 90° vertex, the two half-triangles formed by the vertical median are isosceles.



In this case, $\theta + 2\alpha = 90^\circ$ and $\beta + \alpha = 90^\circ$. So, the angle between the lower edge and the horizontal is $\theta = \beta - \alpha$.