

# Maths in Schools

National teaching and learning resources to  
support Mathematics and Numeracy

# National Teaching and Learning Resources to support Mathematics and Numeracy

Celia Coffa  
Dr John West

MAV Dec 2024



## Acknowledgement of Country

We acknowledge the Traditional Custodians of Country and Place throughout Australia and the deep feelings of attachment and relationship of First Nations Peoples of Australia to Country and Place. We respect and value First Nations Peoples' connection to land, sea, sky and waters and their rich and enduring contributions to mathematics and numeracy.

# Maths in Schools

## Professional Learning



Maths in Schools  
Online F-2



Maths in Schools  
Online 3-6



Maths in Schools  
Online 7-10

### Artificial Intelligence

Primary and Secondary

Learn the fundamentals of AI including computer vision and natural language processing and how to include AI concepts in the classroom.

### Cyber security & awareness

Primary and Secondary

Build a deeper understanding of the challenges and risks of the digital age and how to model and teach students about proactive and informed cybersafe behaviours.

Free

Self paced

Curriculum aligned

Online

### Decoding Digital Technologies

Primary

Broaden knowledge of the content and core concepts in Digital Technologies curriculum including designing digital solutions and understanding data, digital systems, computational thinking and visual programming.

### Digital Technologies + X

Primary

Build confidence to integrate Digital Technologies with other learning areas, specifically English, Science (Sustainability) and Mathematics.



STEM PL

[csermoocs.adelaide.edu.au](https://csermoocs.adelaide.edu.au)

## Maths in Schools Professional Learning Guide

A guide to help educators use the Maths in Schools Professional learning program resources to facilitate free professional learning events in education environments.



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Maths in Schools: Teaching and Learning resources to support Mathematics is an initiative of, and funded by, the Australian Government Department of Education, Skills and Employment. Attribution: © 2021 Commonwealth of Australia, unless otherwise indicated. Creative Commons BY 4.0, unless otherwise indicated.

CSER STEM PROFESSIONAL LEARNING The University of Adelaide | [csermoots.adelaide.edu.au](http://csermoots.adelaide.edu.au)



# Professional Learning courses - Mathematics





## Online courses

For teachers of:

- Foundation to Year 2
- Year 3 to Year 6
- Year 7 to Year 10



## Project officers

Providing  
workshops & webinars



## Downloadable resources

- PL-in-a-Box
- PL Guide
- Offline courses

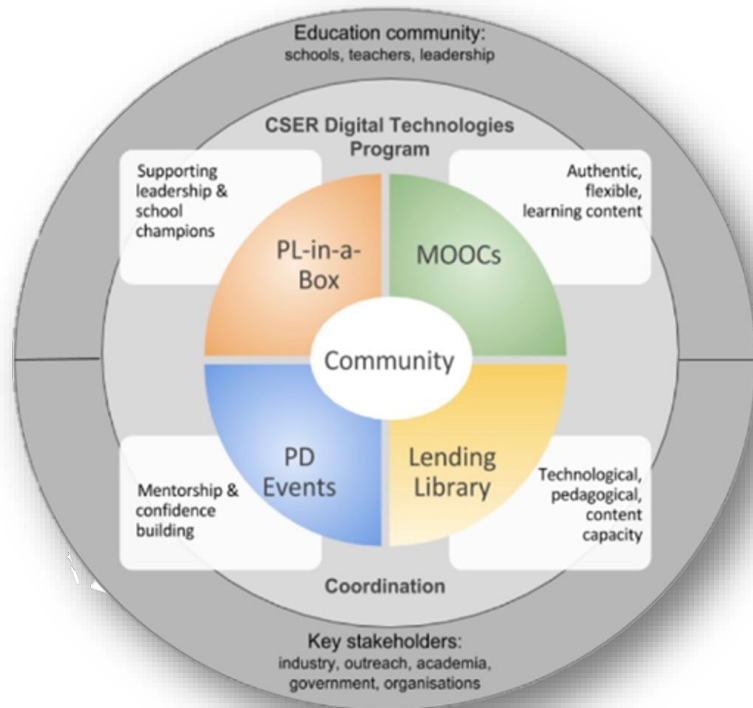


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 **Maths in Schools**  
Professional Learning



# Professional learning ecosystem



- Self paced
- Flexible use
- Community of practice

# Mathematics Hub

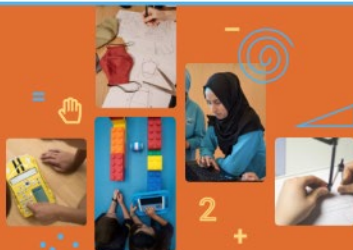
**Mathematics**  
Hub

Understanding Maths ▾ Plan, Teach and Assess ▾ Families ▾ Students ▾

Find great resources



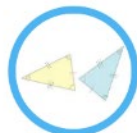
Explore up-to-date and engaging resources for teaching and learning mathematics at school or at home.



✓ **NumberCheck**  
Year 1

Use the Number Check to quickly and easily gauge the number knowledge of Year 1 students.

Explore →



**Planning tool**

Plan lessons using suggested teaching strategies, common misconceptions, suggested resources for teaching and assessment and more.

Explore →



**Maths in Schools**  
Professional Learning

Access free professional learning resources developed by the University of Adelaide.

Explore →



**Explicit Teaching in Maths**

Strengthen your explicit teaching strategies for primary school maths with these free online modules.

Explore →



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Professional Learning

**Explore →**

**Maths in Schools**  
Professional Learning

[www.mathematicshub.edu.au](http://www.mathematicshub.edu.au)



# Online courses (MOOCs)

3 courses to support teachers across Foundation – Year 10



Maths in Schools  
Online F-2



Maths in Schools  
Online 3-6



Maths in Schools  
Online 7-10

# Course aims

Our course has been designed with key aims in mind.

1. Build confidence and positive mindsets towards mathematics and numeracy.
2. Unpack key ideas and topics in mathematics and numeracy.
3. Showcase examples of classroom activities and assessments.
4. Highlight evidence-based maths pedagogy and research.
5. Address careers and real-world applications of mathematics.
6. Highlight opportunities for cross-curriculum integration.
7. Include strategies for inclusive learning and teaching.
8. Demonstrate maths connections to knowledge and cultures of First Nations Peoples of Australia.
9. Promote active learning and reflection in your professional practice.

# Course structure



The course consists of:

- 3 **core** modules (blue)
- 5 or 6 **strand** modules (orange)
- **community** hive (blue).

# V9.0 curriculum concepts introduced to the courses



## Identify | describe

Interpret a situation and **identify** a contextualised problem.

Describe the problem **mathematically**.

## Communicate

Share and explain the solution in terms of the **context**.



## Consider

**Consider and evaluate** - check the solution makes sense against the original context or scenario.

**Adapt** solution and apply changes if needed.

## Mathematical modelling

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## Apply | do

Apply appropriate **maths strategies** to create a solution.

Develop a **series of steps** to solve the problem **using maths**.

Model the solution - create a mathematical **representation** of the proposed **solution**. For example, equations, graphs, physical scale models.

## Plan



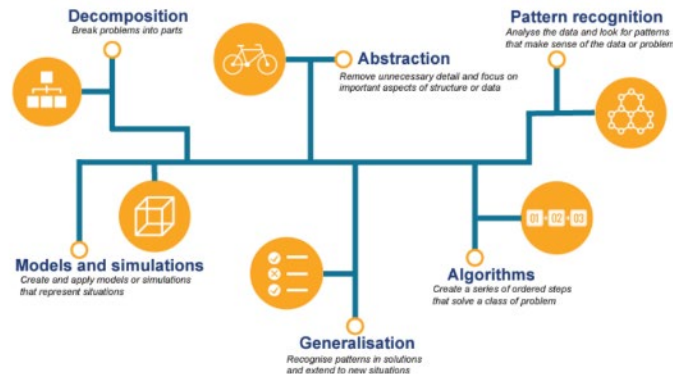
Break the problem into **smaller parts**.

Identify and formulate the **maths** required.



## Computational thinking

Computational thinking helps people to organise data logically by breaking down problems into parts; defining abstract concepts; and designing and using algorithms, patterns and models.



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AC  
Australian  
CURRICULUM


**Maths in Schools**  
Professional Learning


⋮ ▼ **Getting Started**


⋮  **Welcome**  
View

⋮  **Start of course survey**  
| Submit

⋮  **Course How-to guide**  
View


⋮  **Mathematics & Numeracy**  
View

⋮  **Positive mindsets in maths**  
View

⋮  **Module task: Maths mindsets**  
Contribute

**GETTING  
STARTED**

⋮ ▼ Practice & Pedagogies

⋮  **Introduction to practice and pedagogies module**  
View

⋮  **Practice & pedagogies**  
View

⋮  **Universal Design for Learning (UDL)**  
View

⋮  **Explicit teaching**  
View

⋮  **Maths investigations**  
View

⋮  **Culturally responsive mathematics pedagogy**  
View

⋮  **Module task: Practice and pedagogies**  
Contribute





# Pedagogical approaches

Universal Design for Learning (UDL)

Explicit teaching

F-2  
7-10 focus

High Impact Teaching Strategies (HITS)

3-6 focus

Maths investigations


Culturally responsive maths pedagogy

# Universal Design for Learning

The framework principles are based on the notion that learning brains are composed of three different networks: recognition, strategic, and affective. It aims to provide students with multiple means of engagement, representation, and action and expression.


Provide multiple means of  
**Engagement** →

Affective Networks  
The "WHY" of learning




Provide multiple means of  
**Representation** →

Recognition Networks  
The "WHAT" of learning



Provide multiple means of  
**Action & Expression** →

Strategic Networks  
The "HOW" of learning



- WHO -



**UDL GUIDELINES**

# Explicit teaching

Concrete, Representational (or Pictorial), Abstract (CRA)

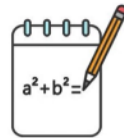
**Enactive representation (action-based)**  
**CONCRETE**



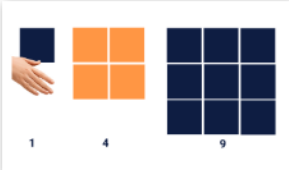
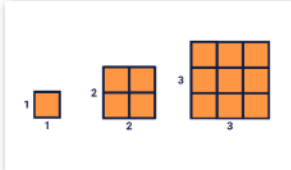

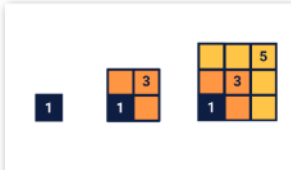
**Iconic representation (image-based)**  
**REPRESENTATIONAL**



**Symbolic representation (language-based)**  
**ABSTRACT**



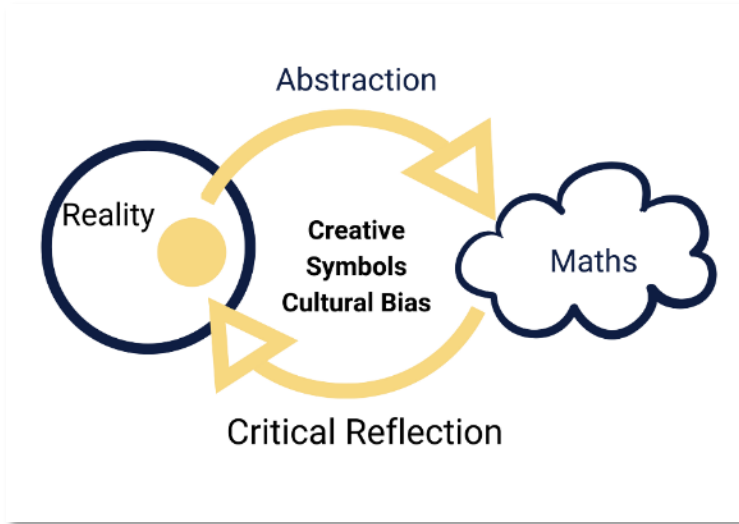
# CRA

Concrete	Representational	Abstract
Physical materials are used to model and make the maths concept visual and tactile.	Physical materials are replaced with representations such as graphics, images or drawings.	Mathematical concepts become symbolic, so numbers, notations and mathematical symbols are used.
Tiles are arranged to make increasing larger squares. Tiles can also be arranged to show the additive pattern between consecutive square numbers.	Tiles are replaced by drawing and labelling a grid.	Tiles and drawings are replaced by mathematical notation.
		$1 \times 1 = 1^2 = 1$ $\sqrt{1} = 1$ $2 \times 2 = 2^2 = 4$ $\sqrt{4} = 2$ $3 \times 3 = 3^2 = 9$ $\sqrt{9} = 3$
		$1$ $1 + 3 = 4$ $1 + 3 + 5 = 9$

Students are asked to describe the relationship between perfect square numbers and square roots. One method for achieving this could be using CRA. This may not be a linear process but will often occur simultaneously with students identifying the square numbers and then using abstract notation to calculate the square root.

CRA Approach applied in our F-2 and 7-10 courses

# Culturally responsive maths pedagogy



## Goompi Model

Prof Chris Matthews



## 8Ways

Department of Education NSW

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Professional Learning

# Goompi model



[Home](#) > [For schools](#) > [Teaching materials and methods](#)

## The Goompi model

The Goompi model can be used by teachers to connect maths ensures that students experience mathematics that is part of who they are.

### On this page

- ✓ [Teaching mathematics from a cultural perspective](#)
- ✓ [Exemplar Teaching linear equations using growing patterns](#)
- ✓ [Goompi model version of growing patterns](#)
- ✓ [Vignette](#)
- ✓ [Activity 3](#)

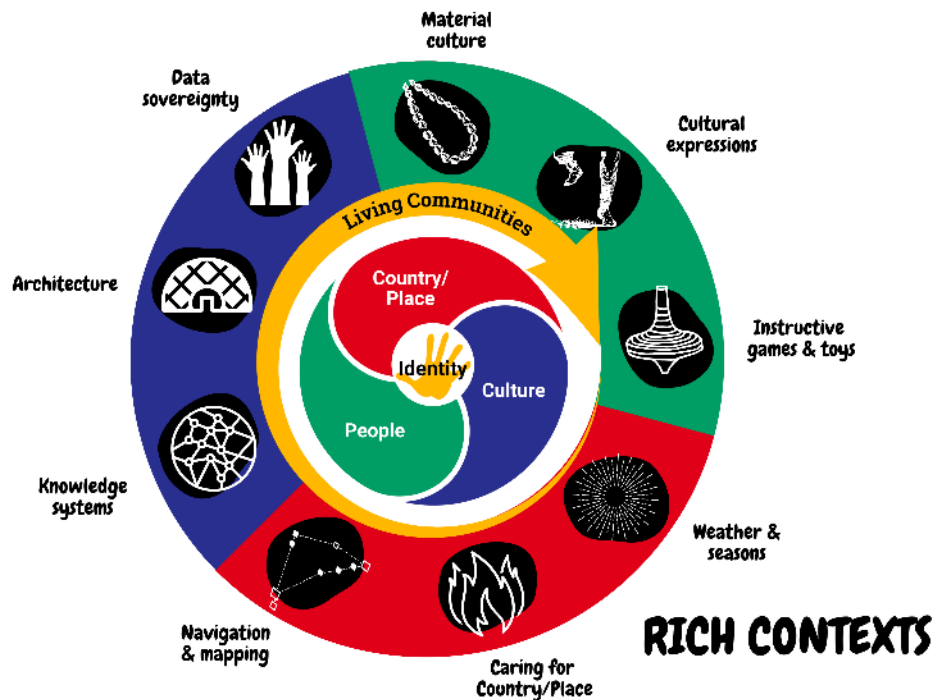


Prof Chris Matthews



# Cross Curriculum focus

## Aboriginal and Torres Strait Islander Histories and Cultures



# Rich contexts explored in courses



**F - 2**

- Weather & seasons
- Instructive games & toys
- Knowledge systems



**3 - 6**

- Navigation & Mapping
- Architecture
- Cultural expressions



**7 - 10**

- Material Culture
- Data Sovereignty
- Caring for Country/Place

# Maths investigations

## Water Management



4:2:1

four parts crushed rock : two parts sand : one part cement.

## Building Industry




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**Maths investigations** allow students to experience real-world applications of the thinking and understanding of maths within an authentic context. Teachers can use strategies to build more structure into the lessons to scaffold learners as needed or use maths investigations to follow explicit teaching of relevant maths concepts.

☰ ▼ **Connections with community**

☰  **Introduction to connections with community module**

☰  **Maths and Numeracy in our world**  
View

☰  **People in maths careers**  
View

☰  **The M in STEM education**  
View

☰  **Rich contexts in maths**  
View

☰  **Maths professional communities**

☰  **Module task: Connection with community**  
Contribute



## Content in Action Modules



Choose your own  
adventure

Pick at least  
2 strands

### ▼ Number in action

- What is Number?
- Number guide
- Number challenges
- Scaffolding knowledge - Number
- Maths investigations - Number



# Community hive

## Search by strand

Find lesson ideas, digital tools, storybooks, and more for each of the strands.

Q Number

Q Measurement

Q Algebra

Q Space

Q Statistics

Q Probability

## Search by Topic

Browse ideas for maths in any of the following topics or share ideas and resources.

Q Mindsets

Q Maths connections

Q Families

Q Careers

Q Pedagogies





# Course completion

## Module tasks and requirements

Please find a table below with course activities and those that are identified as required to be completed for a certificate and those that are optional.

Module	Items	Requirement
Getting started	<ul style="list-style-type: none"><li>Start of course survey</li><li>View all sections</li><li>Module task 1</li></ul>	Required for certificate
Practice & pedagogies	<ul style="list-style-type: none"><li>View all sections</li><li>Module task 2</li></ul>	Required for certificate
Connection with community	<ul style="list-style-type: none"><li>View all sections</li><li>Module task 3</li></ul>	Required for certificate
Content in action	<ul style="list-style-type: none"><li>View 2 strands of choice (Number, Algebra, Measurement, Space, Statistics or Probability)</li><li>Content in action - Intentions &amp; needs</li></ul>	Required for certificate
End of course survey	<ul style="list-style-type: none"><li>Complete end of course survey</li></ul>	Required for certificate
Content in action	View more than 2 strands	Optional (self-identified hours)
All modules	Reading Further information/Additional activities	Optional (self-identified hours)

**Certificate of completion  
12 hours of professional  
learning.**

# Multiple complementary elements

 Support teachers in three ways:



**Online  
courses**

Foundation to Year 2  
Year 3 to Year 6  
Year 7 to Year 10  
Course communities

**Downloadable  
resources**



PL-in-a-box  
PL guide  
Offline courses



**Project officers**

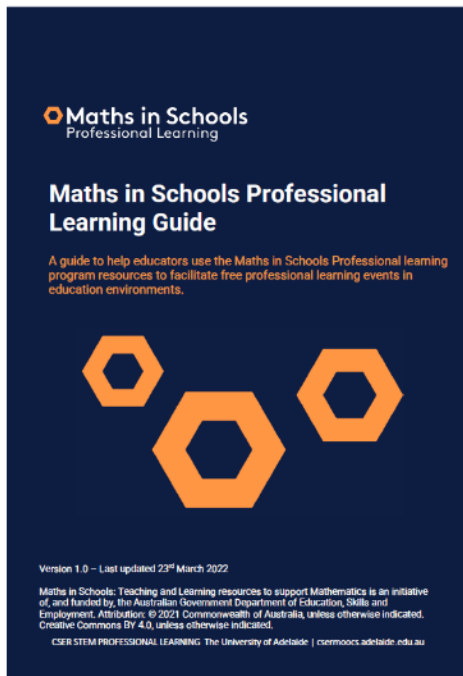
**and links to the Mathematics Hub & other resources**



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# Professional learning resources



## Downloadable resources



PL-in-a-box  
PL guide  
Offline courses



# Articles, podcasts, webinars...



## Articles

Articles are published monthly on a range of topics relevant to Australian teachers of levels Foundation to Year 10 teaching mathematics.

[Read →](#)



## Podcasts

The Maths in Schools podcast series is a conversation with maths education specialists, practitioners, and researchers to discuss key considerations and strategies to plan and deliver effective maths programs across Australia.

[Listen →](#)



## Webinars


Maths in Schools presents webinars on a wide range of mathematics education topics. Register to attend or listen to past webinars.

[Watch →](#)

# Webinars



[Home](#) / [Understanding Maths](#) / [Professional learning](#) / [Articles, podcasts, webinars](#) / [Webinars](#)

 **Teaching mathematics through stories**

Sue Carter  
CSER STEM Team

Teaching Maths through Picture Books - Primary years (4 September 2023)

Presented by Sue Carter

[See more →](#)

 **Maths investigations Primary**

Dr John West

Maths Investigations - for the Primary Years (29 August 2023)

Presented by Dr John West, University of Adelaide

[See more →](#)

 **The benefits of using problem pictures in maths education**

Rebekah O'Keeffe

The benefit of Problem Pictures in Maths education (17 August 2023)

Presented by Rebekah O'Keeffe, University of Adelaide

[See more →](#)

 **Maths in Schools PL webinar series**

Connecting culture with maths: *Culture*

Dr Caty Morris

Aboriginal and Torres Strait Islander Mathematics Alliance (ATSIIMA) & CSER Maths in Schools Team

This session has been funded by the Australian Government Department of Education under the Maths in Schools Project

Connecting Culture with Maths - webinar series Part 1 (8 November 2023)

Presented by Dr Caty Morris

[See more →](#)



[Expand All](#)

Decoding Digital Technologies [Primary] - Available



Digital Technologies + X (Primary) - Available



Cyber Security & Awareness - V 9.0 - Available



Teaching AI in the Classroom - Available now!



Maths in Schools - Available





# Algebra challenge – 7-10

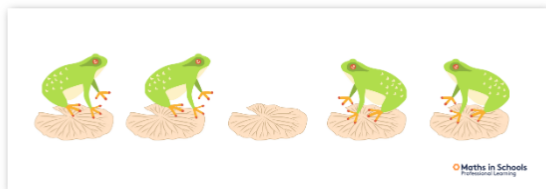
This activity is represented in different formats such as "Jumping Frogs" [NRICH Frogs activity](#). This activity requires players to swap two items (coins, cups, counters) at each end of a simple board that has one free space between the objects. Players can move objects by **sliding** into an adjacent free space or **jumping** over an object into a free space.

The challenge lies in the modelling being systematic and recording solutions (writing an algorithm or series of steps) to be compared to find the minimum number of moves needed. Recording methods can include:

- numbering
- drawing pathways
- using arrows
- using colour.

The Algebra lies in the pattern formed in the data for solving successive problems with increasing numbers of objects at each end. For example, once the students have data for 1, 2 and 3 objects, teachers can challenge them to predict the number of moves for 4 and 5 objects, leading them to look for a pattern. The pattern forms a quadratic relationship  $n \times (n + 2)$

Frogs	1	2	3	4	5	$n$
Moves	3	8	15	24	35	$n(n + 2)$



**Level 6**

**Number** ^

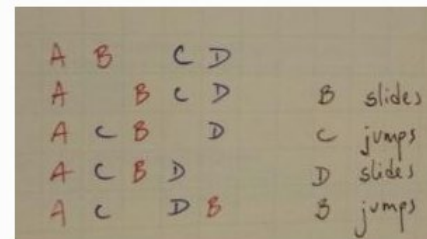
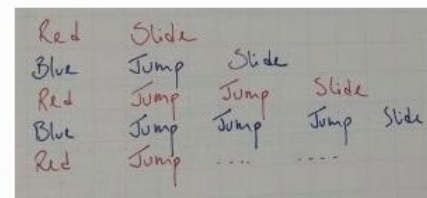
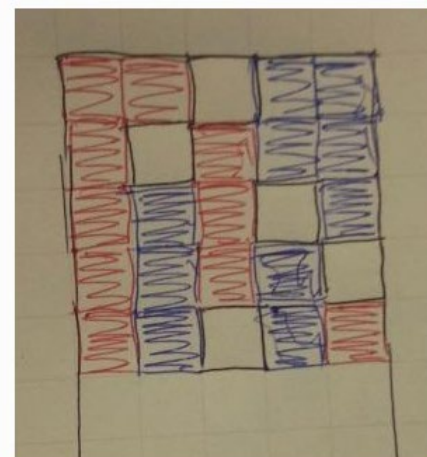
**Algebra** v

Students learn to:

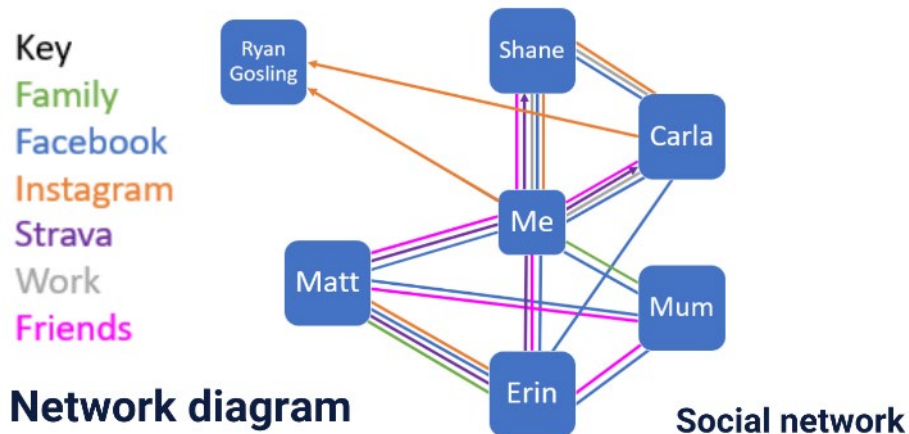
recognise and use rules that generate visually growing patterns and number patterns involving rational numbers  
 VC2M6A01  
[ELABORATIONS](#) COPY

find unknown values in numerical equations involving brackets and combinations of arithmetic operations, using the properties of numbers and operations  
 VC2M6A02  
[ELABORATIONS](#) COPY

design and use algorithms involving a sequence of steps and decisions that use rules to generate sets of numbers; identify, interpret and explain emerging patterns  
 VC2M6A03  
[ELABORATIONS](#) COPY



# Networks – Space investigation - Year 10

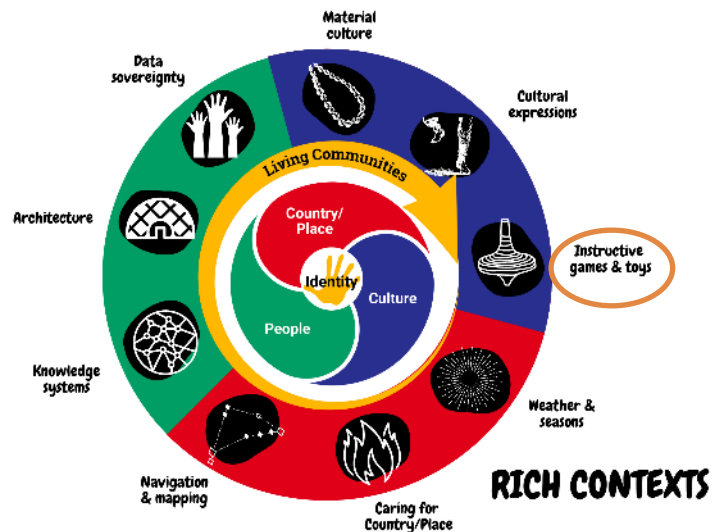
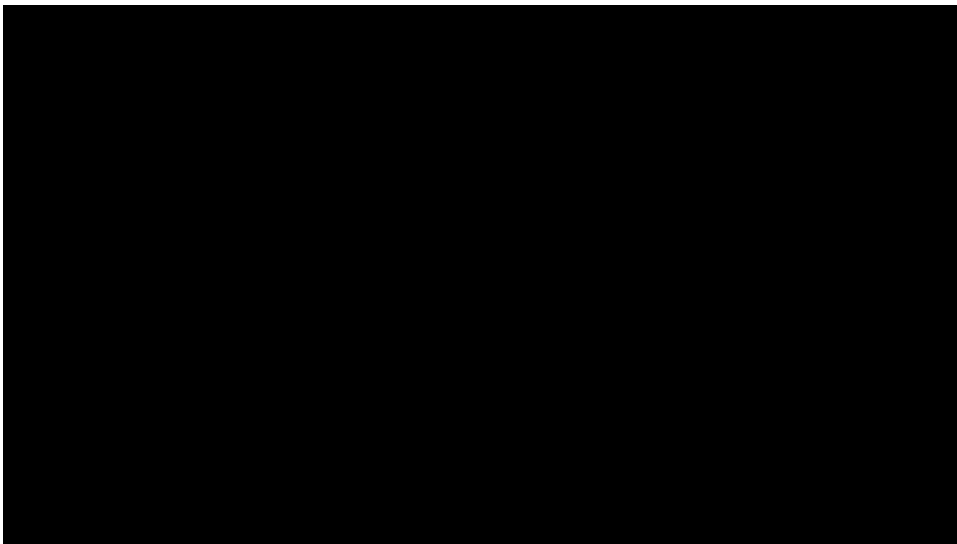
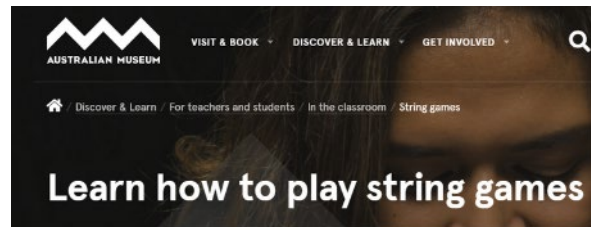


VC2M10SP02

Mathematics | Space | Level 10

... investigating how a social **network**, intranet, local area **network** (LAN), electrical wiring or wireless **network** of a home can be represented as a **network** diagram to specify relationships; for example, using **network** diagrams to ...

# String games



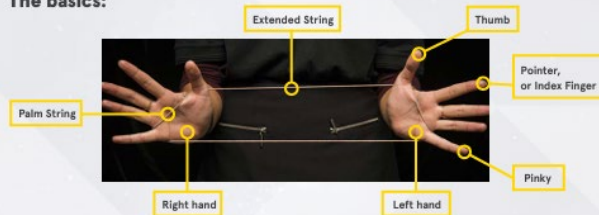
## kamai (string games)

**kardra** (yam), Yandruwandha language from Innamincka Country (region of north-east South Australia)



Many Aboriginal groups traditionally made patterns or designs on the hands with a loop of string 'kamai' was among the names applied to string figures in north Queensland, 'meeroo-meeroo' in one area of Western Australia and 'wame' is the word used for string figures in the Torres Strait.

### The basics:



### Lets play!



**Step 1:**  
Hook thumbs into string loop - extend



**Step 2:**  
Hook pinky fingers under far string - extend



**Step 3:**  
Drop the right-hand string



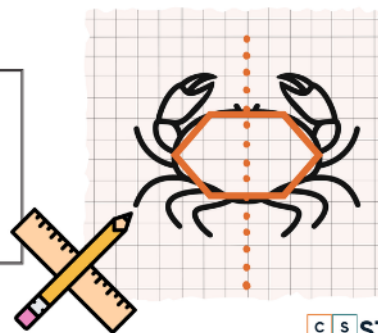
**Step 4:**  
Using your right hand pull left palm string and then drop



**Step 5:**  
Pull left palm string one more time and drop again



**Step 6:**  
Thread your right hand through the loop so that it is around your wrist and both palms are facing each other



C S STEM PL  
E R csmrmoocs.adelaide.edu.au

```

1  rt 90
2
3  pen orange
4
5  #body
6
7  for 1..2
8  fd 50
9  rt 60
10 fd 50
11 rt 60
12 fd 50
13 rt 60
14 fd 50
15
16 #claws
17

```

# Reflections



## **What am I doing?**

- What would you like to introduce into your classroom?
- How could this course influence your practice?

## **What are we doing as a team?**

- How can you incorporate new practices into your team mathematics planning?

## **What are we doing as a whole school?**

- How could you influence other teachers and share what you know about mathematics?

# Where to from here?



1. Register
2. Colleagues
3. Leadership
4. School

# Keep in touch

Follow the CSERSTEM PL team on social media



#CSERSTEMPL  
#CSERMООCS



or go to  [csermooos.adelaide.edu.au](https://csermooos.adelaide.edu.au)

# Event App



## App Download Instructions

Step 1: Download the App 'Arinex One' from the App Store or Google Play



App Store



Google Play

Step 2: Enter Event Code: **mav**

Step 3: Enter the email you registered with

Step 4: Enter the Passcode you receive via email and click 'Verify'. Please be sure to check your Junk Mail for the email, or see the Registration Desk if you require further assistance.



Be in it to WIN!



**A02 - (Year 1 to Year 6) Supporting  
High Potential and Gifted Learners in  
Mathematics**

Pedagogy



Add to Favourite



Complete the Survey



Description



Speaker



**Dr Chrissy Monteleone**  
ACU

 [mathsinschools@adelaide.edu.au](mailto:mathsinschools@adelaide.edu.au)

 [mathshub.edu.au/MathsInSchoolsPL](http://mathshub.edu.au/MathsInSchoolsPL)



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