Maths in Schools
Professional Learning

# 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. 

CSER STEM PROFESSIONAL LEARNING The University of Adelaide | csermoocs.adelaide.edu.au

# Contents

# Introduction

Since 2013, the Computer Science Education Research (CSER)Group's Science, Technology, Engineering and Maths (STEM) Professional Learning Team at The University of Adelaide, based on Kaurna Country, has been supporting teachers with STEM curriculum implementation through the delivery of online courses, professional learning workshops and resources.

We built our professional learning program around community, collaboration, and openness. We see teachers as key to driving student engagement in STEM in the classroom. Our resources aim to upskill, inspire, empower, and support teachers, as individuals, to learn and to facilitate formal and informal professional learning in their schools, communities and across Australia. We believe that great things can be achieved by working openly together.

The team behind the Maths in Schools Professional Learning program are diverse and passionate educators. We are based across Australia and have come together with a wide skillset to bring you our online courses, professional learning workshops and resources in maths and numeracy.

This Professional learning guide is designed to support all educators - school leadership, classroom teachers, tertiary educators, and education providers to deliver professional learning using our suite of Maths in Schools online courses and PL-in-a-box program.

In this guide we cover key concepts, resources and professional learning session ideas that can provide a quick reference point for facilitators. Further, this guide provides advice and strategies for facilitating professional learning, to suit your community needs and purposes.

As a school or curriculum leader, teacher or professional learning facilitator, we would like to invite you to our CSER communities within our online courses. Our communities provide a place for you to connect, discuss and share professional learning ideas and resources with other educators that align with our courses.

Thank you for your interest in our professional learning guide and for championing maths professional learning! We look forward to working with you and empowering teachers to deliver quality learning and teaching in maths and implementation of the Australian Curriculum: Mathematics.

**Project Lead, Dr Rebecca Vivian**

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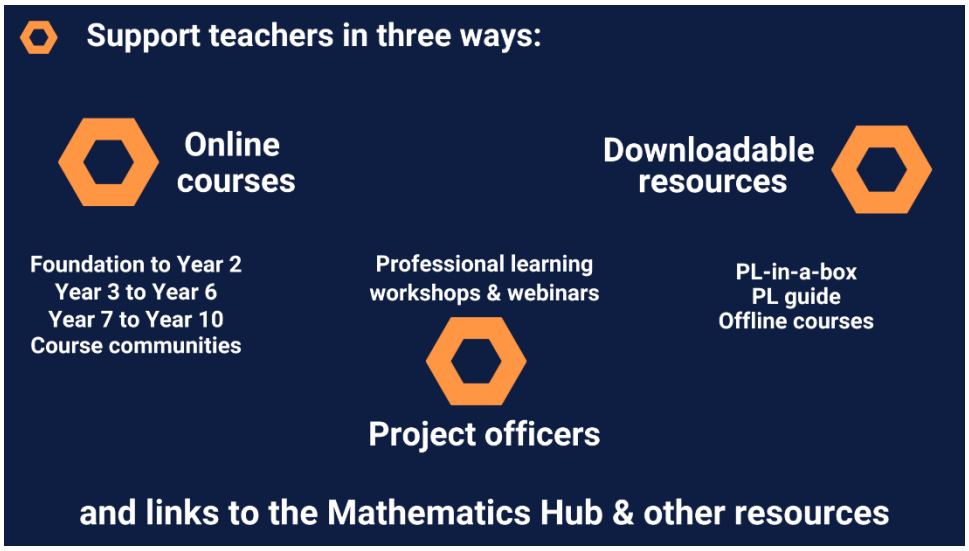
# Maths in Schools Professional Learning Program components

The Maths in Schools project is providing support for mathematics and numeracy teachers of Foundation to Year 10 students through the development and delivery of free online courses, face-to-face and/or virtual professional learning (PL) and provision of a repository of teaching and learning resources through an online Mathematics Hub (Maths Hub) and Numeracy Check.

The Maths in Schools Professional Learning program is designed to help teachers and schools with the Australian Curriculum: Mathematics and includes the following core components:

- Online Courses and course community discussion forums
- Projects officers delivering webinars and workshops
- Downloadable resources (PL-in-a-Box packs, PL Guide and Offline courses).




## Online courses

The Maths in Schools Online courses are free professional learning courses, designed to support Australian teachers with implementing version 9.0 of the Australian Curriculum: Mathematics. The following courses will progressively be released throughout 2023:

- **Maths in Schools Online: F-2**
- **Maths in Schools Online: 3-6**
- **Maths in Schools Online: 7-10**

These courses provide teachers with background knowledge about concepts and topics in the curriculum, as well as practical examples that can be tried in the classroom. We bring together existing high-quality resources, our own developed resources as well as existing teacher ideas.

Our courses are self-paced and available anytime. This allows you to enrol and engage in professional learning or to host professional learning sessions using the courses when you need them. Teachers engage with online content (videos, lesson exemplars and text) and at the end of each unit, complete a module task that involves a reflective activity, sharing a resource, classroom activity or professional learning session idea to the associated community hive. Teachers receive a certificate of completion after finishing all module tasks.

Each course is based on a series of interconnected modules that you can work through at your own pace. Please start with the getting started module. You can return to this page by clicking on the 'Home' tab.


## Course aims

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

## Course modules

### *Getting started*

For those enrolling in the course for the first time, this is the place to start. The module begins with an introduction to the course and platform and then moves into an introduction of maths and numeracy and setting students (and teachers) up for success with positive mindsets. The sections in this module include:

- **Start of course survey** – pre and post course surveys help us to improve our courses for you.
- **Course how-to guide** – everything you need to know about navigating the course.
- **Mathematics & Numeracy** – an introduction to the broad ideas and concepts.
- **Positive mindsets in maths** – an introduction to why and how you can foster positive maths mindsets with students.
- **Module task:** Maths Mindsets – your first task in the course.

### *Practice and pedagogies*

In this module, we explore several approaches to guide the exploration of mathematical concepts and ideas that you can use in your teacher toolkit. This course allows you to dive deeper into areas you are less familiar with and discover resources for those you are already using in the classroom. The following topics are explored:

- **Overview** – Start here for an introduction to ideas, theories, and some key considerations, including targeted teaching, mathematical modelling and transference.
- **Universal Design for Learning (UDL)** – UDL provides a framework to help you design maths learning environments and experiences that are accessible and usable by all students from the outset.
- **Explicit teaching** – Explicit teaching has been identified as one of ten High Impact Teaching Strategies (HITS) and can be used to show students clearly what to do and how to do it. Our courses model the Concrete Representational Abstract (CRA) Model for explicit teaching.
- **Maths investigations** – This guided pedagogical approach allows students opportunities to transfer and apply their understanding of maths learning and concepts to solve real-world and authentic problems.
- **Culturally responsive maths pedagogy** – Learn about how to design a culturally responsive maths curriculum that connects to students' culturally diverse characteristics and perspectives in the classroom.
- **Module task:** Practice and pedagogies – your second task in the course.

### *Connections with community*

This module helps you understand the connection with maths in our daily lives as family members, community members and teachers. The following topics are explored:

- **Maths and Numeracy in our world** – Consider how to connect maths to local and local communities and ways to teach maths outside.
- **People in maths careers** – Explore mathematicians across time and current careers in maths – Who uses Maths?
- **The M in STEM** – Examine the thinking skills in STEM and examine STEM education programs from a mathematics perspective.
- **Rich contexts in maths** – Connect with ACARA's cross-curriculum priorities as rich contexts for maths. Take a deep dive into the Aboriginal and Torres Strait Islander Histories and Cultures cross-curriculum priority.
- **Maths professional communities** – Learn about which professional learning and teaching communities you can connect with to upskill in maths.
- **Module task:** Connection with community – your third task in the course.

### *Content in action modules*

The following modules unpack the six strands using a variety of the pedagogies and practices mentioned above. The strands are Number in Action, Algebra in Action, Measurement in Action, Space in Action, Probability in Action (introduced at Year 3), and Statistics in Action.


Course participants can pick two content strands to focus on for completion of the course certificate, however you are welcome to complete all of the content in action module strands or revisit the course at a later time to focus on a new strand. Each Module has the following elements:

- **Introduction** – introduction to the strand including video, curriculum summaries, everyday maths links, careers with maths.
- **Guide** – unpacks maths language and ideas relevant to the strand.
- **Puzzles (F-2), Problem pictures (3-6) or Challenges (7-10)** – depending on the course you choose, each will provide puzzles, problem pictures or challenges linked to the strand.
- **Scaffolding knowledge** – activity ideas developed using the Concrete, Representational, Abstract (CRA) pedagogical approach in the F-2 and 7-10 courses. In 3-6 High Impact Teaching Strategies (HITS) has been used.
- **Maths investigations** – activity ideas that engage students in applying their maths learning to rich real-world problem-solving tasks.

## Community hive

Our courses are built around a core online community of teachers, sharing resources for mathematics and numeracy teaching and learning. The community hive can be used to build networks, to ask questions, to find and connect with other educators in the state, territory or across Australia, to find resources, inspiration, and ideas, and to share ideas and experiences on the topics covered in the modules. The community hive is where you will post your course module tasks.

## Course completion requirements

You can receive a certificate of completion for 12 professional learning hours upon course completion. We have set some course tasks that provide opportunities for teachers to demonstrate their knowledge and understandings to put key learnings into practice. These tasks apply to classroom teachers, pre-service teachers, or other professions with an education role.

For each module task, we have provided up to three options to choose from. This allows for flexibility and for you to select the tasks that best align with your professional role, interests, and needs.

You will find information about how to access the certificate of completion in the course 'Getting started' module.

**The following table explains the course activities and identifies which modules are required to be completed for a certificate and those that are optional.**

| Module | Items | Requirement |
|---|---|---|
| Getting started | • Complete start of course survey<br>• View all sections<br>• Module task 1 | Required for certificate |
| Practice & pedagogies | • View all sections<br>• Module task 2 | Required for certificate |
| Module: Connection with community | • View all sections<br>• Module task 3 | Required for certificate |
| Content in action | • View 2 strands of choice (Number, Algebra, Measurement, Space, Statistics or Probability)<br>• Survey: Content in action - Intentions & needs | Required for certificate |
| End of course survey | • Complete end of course survey | 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) |

# PL-in-a-box

## What is PL-in-a-box?

PL-in-a-box supports the professional learning delivery of the Maths in Schools online courses with ready-made slide packs aligned to each course. The packs were inspired by our Digital Technologies education program, where we found pre-service lecturers, school or jurisdiction leaders wanted to champion our online courses in their school with a group of teachers in a more interactive and collaborative format.


These slide sets are designed to make this process easy for you and allow you to deliver free professional learning workshops with a group of teachers based around the courses. The Maths in Schools PL-in-a-Box are provided under Creative Commons Attribution licensing, which means that you can freely use these for education purposes.

## How can I use PL-in-a-box materials?

The Maths in Schools PL-in-a-box supports the delivery of the online course content in face-to-face, blended or online professional learning sessions by a lead facilitator. Each pack is directly aligned to the course and includes speaker notes and suggested interactive activities for your session.

Each PL-in-a-box provides content suitable for a 1-3 hour workshop. You can adapt the length of the session to suit your needs.

## How can I get started?

To get started, register for the online course of your choosing, and download the PL-in-a-box packs you need from the course homepage. A Maths in Schools PL-in-a-box pack is available for each of our three courses (F-2, 3-6 and 7-10) covering the key course modules:

- **Getting started** – Begin the course and start unpacking Mathematics and Numeracy, mindsets and classroom strategies.
- **Practice and pedagogies** – Dive into how we teach maths and explore teaching practices with classroom examples.
- **Connections with community** – See where maths fits into our world by considering community, teaching outside, rich contexts, careers and STEM education.
- **Content in action modules** – Choose to download 2 strand packs as a focus for staff completion, including: Number, Algebra, Measurement, Space, Statistics and Probability.

When using the PL-in-a-box pack, we encourage facilitators to have the online course open as a reference point. You can also encourage teachers to register for the course and complete their course tasks following your workshop so that they are working toward their certificate of completion.

## Professional learning delivery

We have a team of project officers who will run national and state/territory professional learning events and conferences across Australia. Follow the Maths in Schools social media channels and visit the Maths in Schools Professional Learning Page on the Maths Hub for upcoming events. Our Maths in Schools project officers will be able to provide on-the-ground support for teachers and jurisdiction leadership, and help you navigate your way through the Maths in Schools Professional Learning program courses and resources.

As a professional learning facilitator, you can either work with the project officer, use the project officer for remote support, or simply notify the project officer of your intention to host professional learning within your school or community.

The Maths in Schools project officers will be able to provide support for teachers, and help you navigate your way through the Australian Curriculum: Mathematics. Project officers can help promote:

- motivation and engagement with Mathematics as a key aspect of Australia's future;
- an overview of the Maths in Schools professional learning resources;
- enrolment in the Maths in Schools Online courses; and
- facilitated professional learning sessions structured around the learning resources.

If you would like to request support from a project officer, please visit the Maths in Schools Professional Learning Page on the Maths Hub.

## Webinars and workshop topics

The Maths in Schools project team has developed a suite of professional learning sessions covering various topics such as careers with maths, growth mindsets in maths, assessment in maths, culturally responsive maths pedagogy and more. Each session is approximately 1-2 hours in duration. The sessions are interconnected and together form a suite of professional learning in maths, directly linked to the content of the online courses, providing teachers with access to continued learning and resources after the session.


These sessions will run as national webinars but they can also be run on-demand by project officers for schools and professional learning communities. Sessions can be conducted weekly, fortnightly, monthly, or as required. They can be conducted as part of staff meetings, curriculum area meetings or Professional Learning community meetings. Sessions can be conducted face-to-face, online or using a blended approach.

Keep an eye out on our social media channels on Twitter and Facebook for information on when dates and information about our national webinars.

To organise a workshop session with your school or community please visit the Maths in Schools Professional Learning Page on the Maths Hub.

# Key ideas and terminology

## Mathematics and Numeracy

Mathematics is the study and science of numbers, shapes and space, patterns and relationships, and data. The Australian Curriculum describes the mathematics to be taught at each of the year level bands and includes the following strands:

- Number
- Algebra
- Measurement
- Space
- Probability (introduced in Year 3)
- Statistics

In Version 9.0 of the Australian Curriculum: Mathematics, mathematical proficiencies have been embedded into the content descriptions across all strands to ensure students are provided opportunities to develop fluency, mathematical reasoning and problem-solving skills.

Numeracy is the understanding and the use of mathematics in practice. This includes applying mathematical skills, knowledge and behaviours across a variety of situations and in real-world contexts. This view of numeracy recognises that very few situations in life are purely mathematical, as students will draw on skills from a range of learning areas when investigating contexts, problems and suggesting solutions. Students become numerate when they learn how to apply mathematical knowledge, skills and behaviours across learning areas and various contexts in purposeful ways. As students progress through school, they develop their mathematical capabilities to solve various problems, communicate their ideas, and make informed decisions. Environments that support this view of learning encourage students to explore mathematics in creative ways to develop their skills to think and work mathematically. Throughout the various online courses, the Numeracy capability content has been embedded in tasks to enrich learning.

There are ways teachers can support students' numeracy development, for example:

- investigating real-world problems
- starting with the real world and having students identify the maths
- making the maths explicit
- applying the maths back into the real-world context and within STEM learning.

Both numeracy and maths are important together, as these skills and knowledge overlap, have their place, and are complementary.

## Mathematical processes

Mathematical processes are how students apply mathematical skills, knowledge, and concepts in the classroom. There are many different mathematical processes used in the classroom:

- **Additive thinking –** the ability to flexibly manipulate numbers and use appropriate additive computational strategies for different purposes.
- **Multiplicative thinking –** the capability to work flexibly with the concepts, strategies, and representations of multiplication (and division) across a wide range of contexts.
- **Proportional reasoning –** the process of thinking about relationships, identifying and describing what is being compared with something else in multiplicative terms.
- **Spatial reasoning –** the ability to think about objects in three dimensions and reason about the object with limited information.
- **Statistical investigations –** the use of critical thinking and analytical skills used to make decisions about how to collect, present, display and interpret data.
- **Mathematical modelling –** the process of using mathematics to make decisions, predict outcomes and understand relationships that exist in authentic real-world scenarios by mathematising a situation, recognising, connecting, and applying mathematical structures and using mathematical approaches to manipulate, analyse, generalise, interpret and communicate within the context of the modelling situation.
- **Computational thinking –** this has various components, including decomposition, abstraction, pattern recognition, modelling and simulation, algorithms, and evaluation. Computational thinking provides the strategic basis for inquiry, modelling and problem solving in mathematics and other fields.

# Mathematics Hub

The Mathematics Hub developed by Education Services Australia (ESA) is an online repository of teaching and learning resources for mathematics and numeracy education to support the Australian Curriculum: Mathematics and the Numeracy general capability. The Mathematics Hub will support teachers, school leaders, families (parents and carers) and students.

The Mathematics Hub will provide:

- quality-assured and evidence-based learning resources that support teachers and students to develop their mathematics and numeracy knowledge, skills and understanding from Foundation to Year 10
- resources aligned to Version 9.0Australian Curriculum: Mathematics to support teachers, school leaders, students, parents and carers
- resources that support cohorts underrepresented in STEM domains, including girls and women, rural and remote communities, and First Nations Australian students
- an online Year 1 Number Check and formative assessment tools and resources for teachers
- new resources designed to address identified gaps in coverage of the Australian Curriculum: Mathematics.

Visit the Mathematics Hub by going to [www.mathematicshub.edu.au](http://www.mathematicshub.edu.au)

# Australian maths education organisations

Below we provide a quick reference point to key Australian maths associations and organisations.

Each state and territory of Australia has a professional Maths Association, with the overarching **Australian Association of Mathematics Teachers (AAMT)**. The different maths associations provide professional learning opportunities, resources, advice, and support. www.aamt.edu.au

**Aboriginal and Torres Strait Islander Mathematics Alliance (ATSIMA)**

(ATSIMA) is an Indigenous-led charity whose vision is that all Aboriginal and Torres Strait Islander students will be successful in mathematics. ATSIMA is creating new ways of teaching and learning by connecting mathematics to mathematics to Aboriginal and Torres Strait Islander histories, cultures and languages. By transforming mathematics education for Indigenous students, all students benefit. www.atsima.com

**Australian Maths Trust**

The Australian Maths Trust is a not-for-profit organisation run by passionate volunteers. Their vision is 'to develop a nation of creative problem solvers, and we believe that enjoying the challenge of maths is the most effective way to get students there.' AMT run competitions and programs to help students to become better problem solvers. www.amt.edu.au

**Mathematics Education Research Group of Australasia**

MERGA exists to provide forums for raising important issues in mathematics education and sharing research findings that speak to how these issues might be effectively addressed. www.merga.net.au

**Australian Mathematical Sciences Institute (AMSI)**

**AMSI** is Australia's only national voice and champion for mathematics and statistics. A not-for-profit, the Institute works with schools, universities, industry, government and the community to help shape policy and skill Australia for the future. AMSI provide resources such as 'Careers in Maths', the 'Maths Talk' podcast and more. www.amsi.org.au

# Contact us

**Maths in Schools Professional Learning Program**

## Mailing address

CSER STEM Professional Learning Team

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## Web

Visit our CSER STEM Professional Learning page via csermoocs.adelaide.edu.au

Visit us on the Maths Hub via mathshub.edu.au/mathsinschoolsPL

## Socials

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