

Curriculum Development and Policy Implementation in K-12 Mathematics



THE UNIVERSITY OF
MELBOURNE

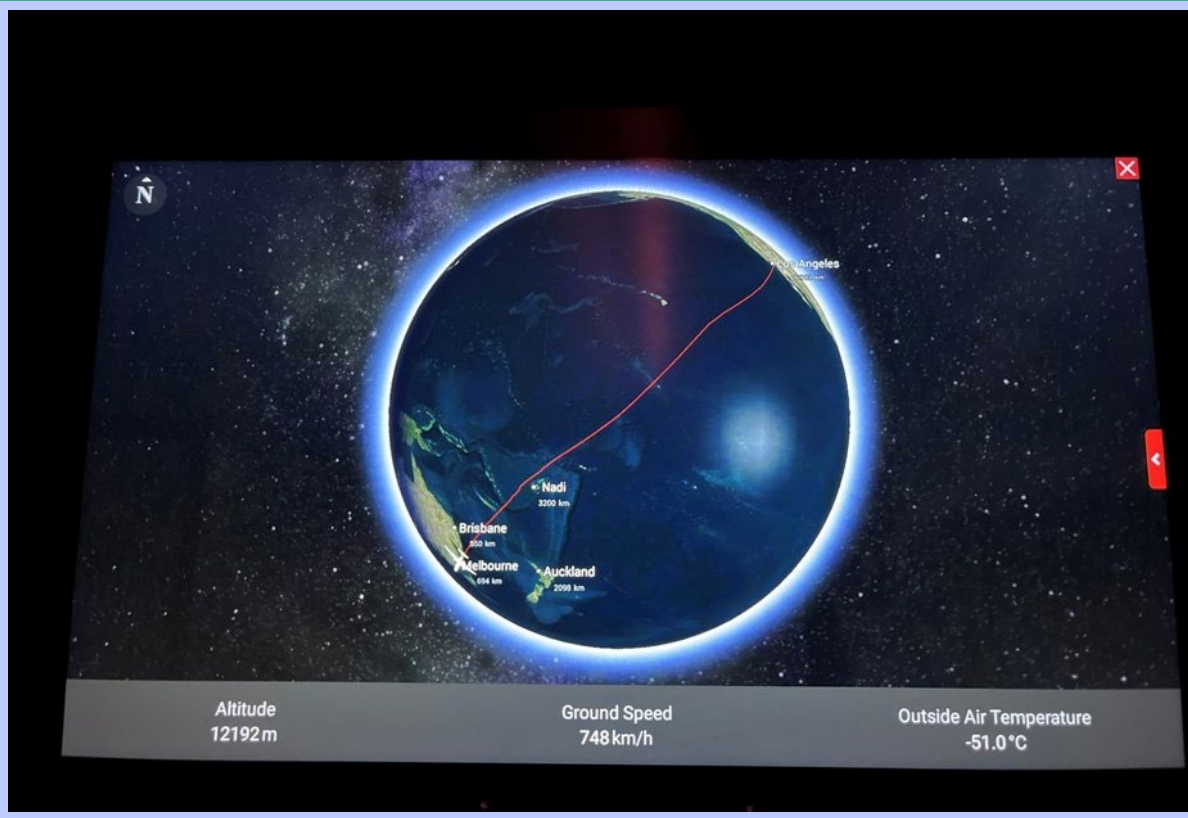
How Australia Enacts School Mathematics Curriculum and Education Policy

Justine Sakurai

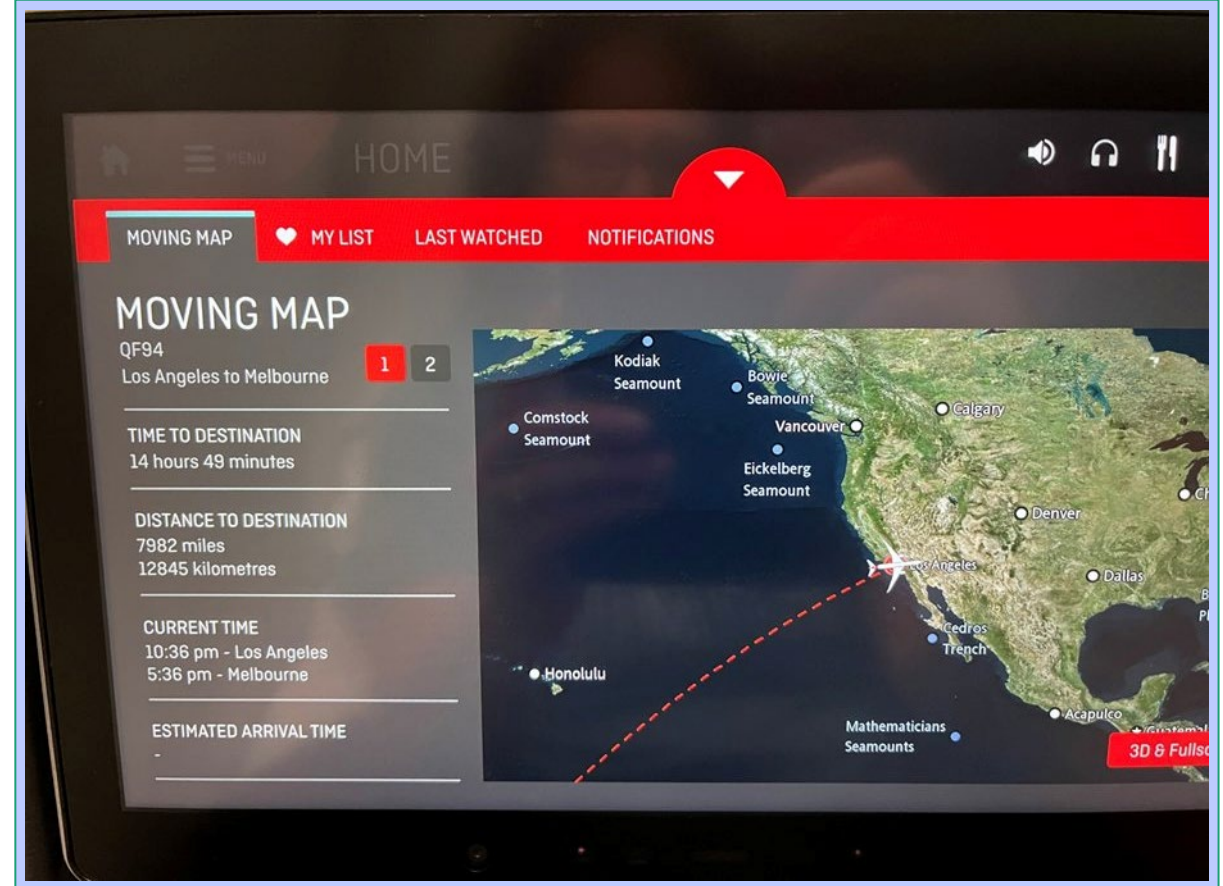
Faculty of Education, University of Melbourne

Australia

Bottom of the map: Top of the game



QF94 · Melbourne → Los Angeles · Altitude 12,192m · -51.0°C



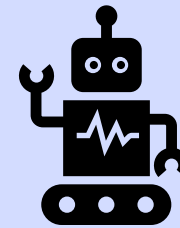
QF94 · Los Angeles → Melbourne · 12,845 km · 14 hrs 49 min

Why AI matters now

AI literacy is emerging as a defining competency of the 21st century (OECD, 2026)

Mathematics can position as a key entry point for AI use

- reasoning
- computational logic

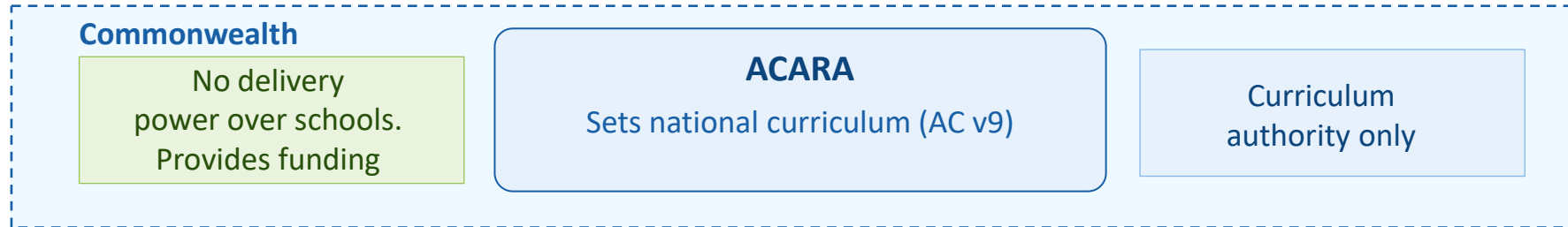


The equity issue - AI is not just for STEM-specialist students

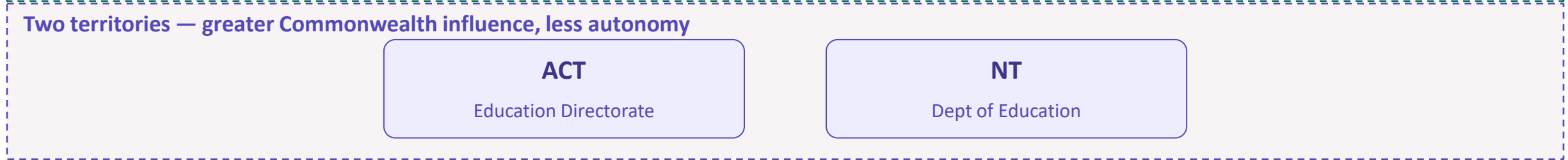
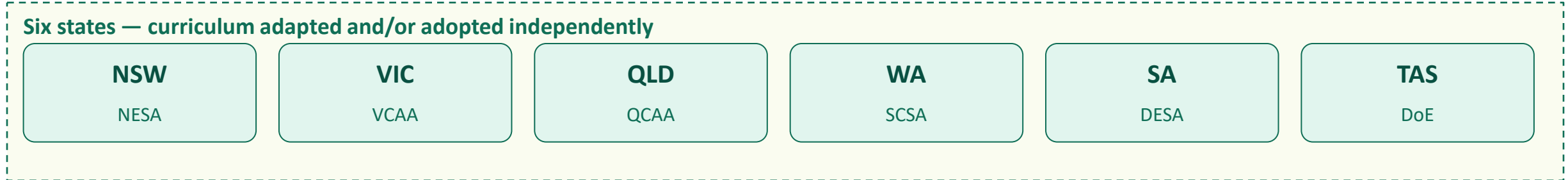
One question for Australia is
can a federated system move as one?



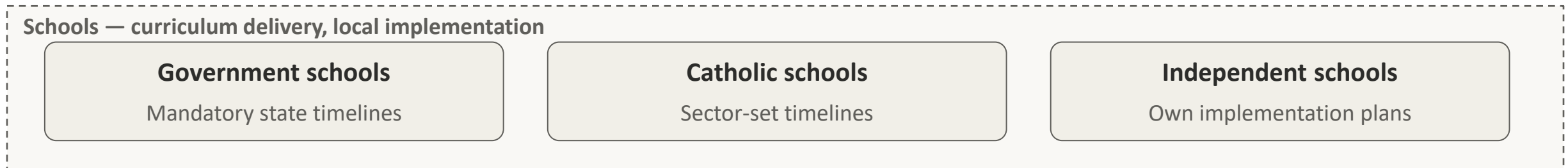
Australia's Federated Education System



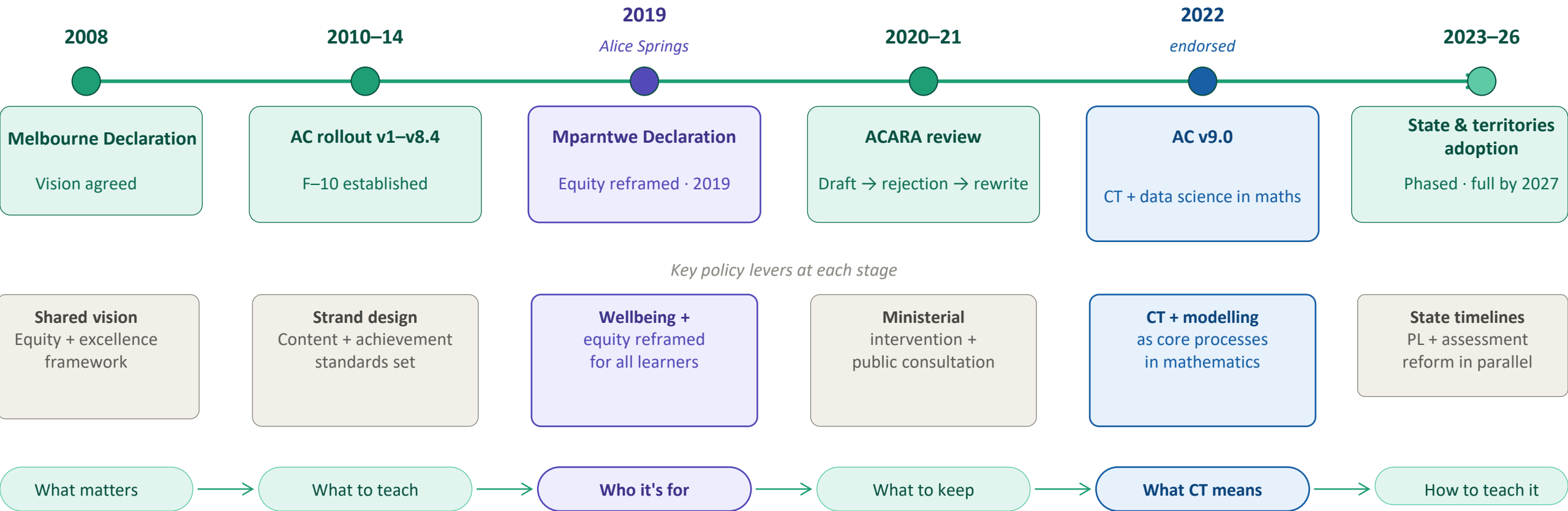
AC v9.0 — national standard endorsed April 2022



Each authority controls: teacher registration · assessment design · implementation timing



Policy Sequencing: How Reform Was Staged



Where Computational Thinking (CT) lives in Australian curriculum v.9.0



CT has four entry points in AC v9

Mathematics (KLA)

CT as a core mathematical process

Digital Technologies (KLA)

CT as subject content

Critical & Creative Thinking (GC)

CT as a reasoning practice

Digital Literacy (GC)

CT as a functional skill

AC v9 embeds CT simultaneously in mathematics and as cross-curricular capability

Key Learning Areas

English

Mathematics

Science

HASS

Arts

Technologies

Health
& PE

Languages

General Capabilities · run across all learning areas

Literacy

Numeracy

**Critical &
Creative
Thinking**

**Digital
Literacy**

Personal
& Social

Ethical
Under-
standing

Intercultural
Under-
standing

Cross-Curriculum Priorities

Aboriginal & Torres Strait Islander
Histories & Cultures

Asia & Australia's
Engagement with Asia

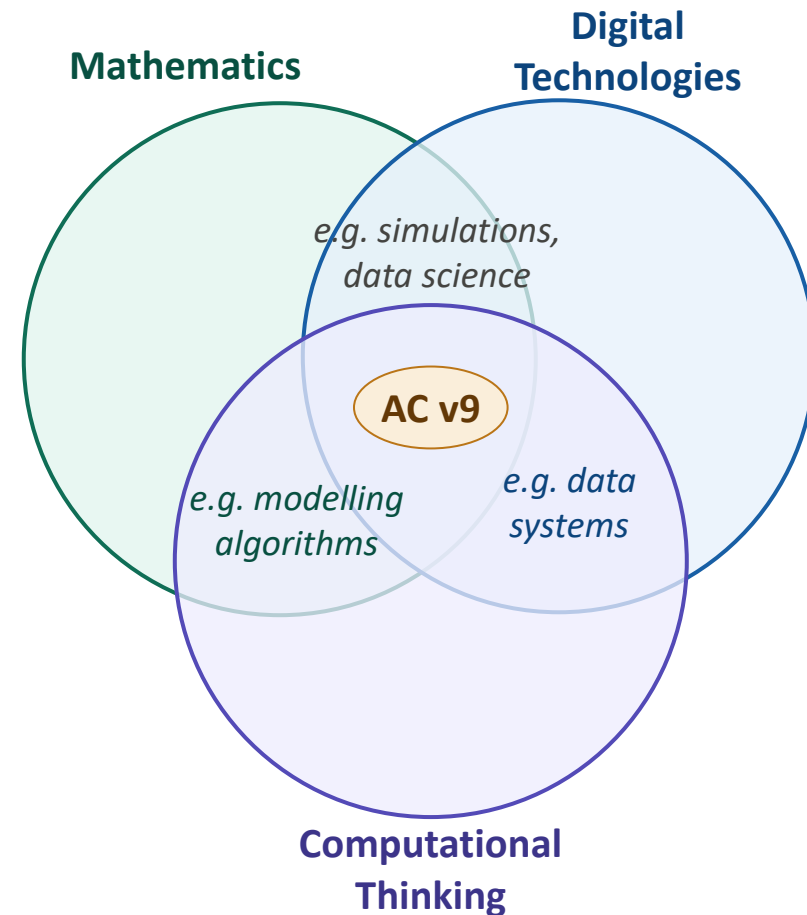
Sustainability

Highlights show where CT explicitly appears in AC v9

Architecture of Australian Curriculum v.9.0



- Key Learning Areas
- General Capabilities
- Cross-Curriculum Priorities
- Intersection of CT, Digital Technologies (DT), and Mathematics

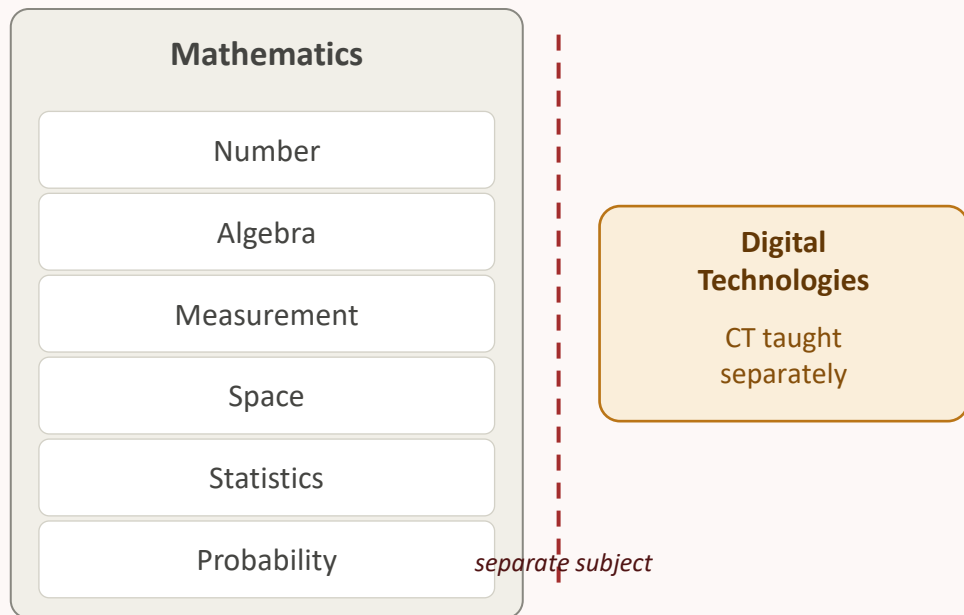


*In AC v8.4, CT belonged to Digital Technologies.
In AC v9, it belongs to Mathematics*

Embedded computational thinking (CT)

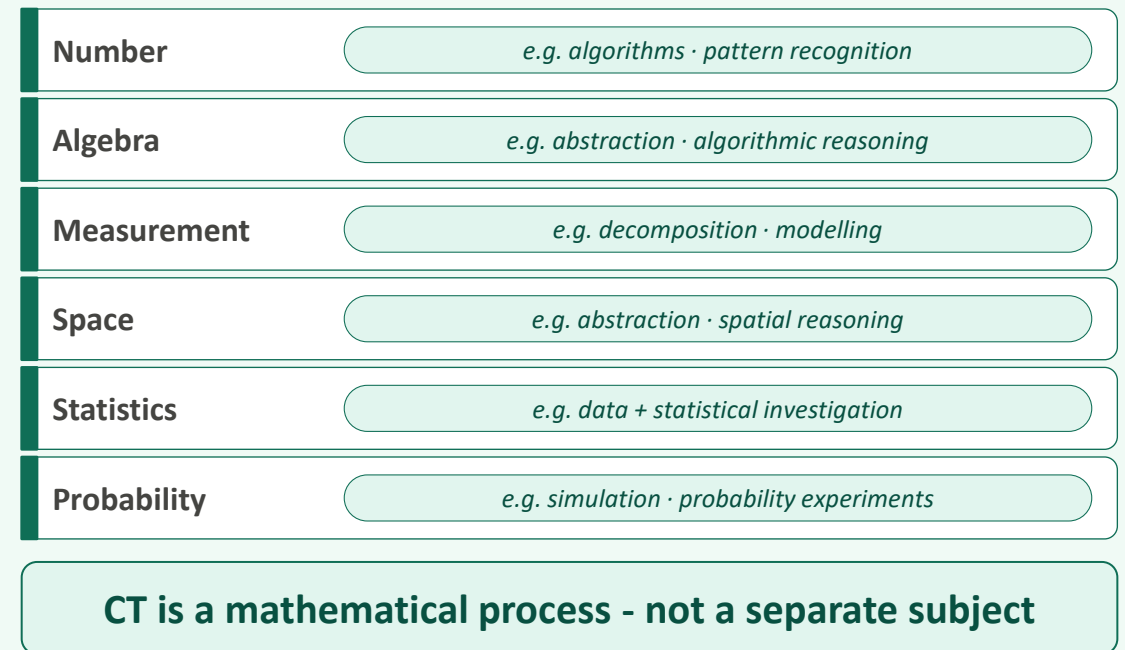


Old approach - CT beside mathematics



AC v9
→
structural
shift

AC v9 - CT embedded within mathematics

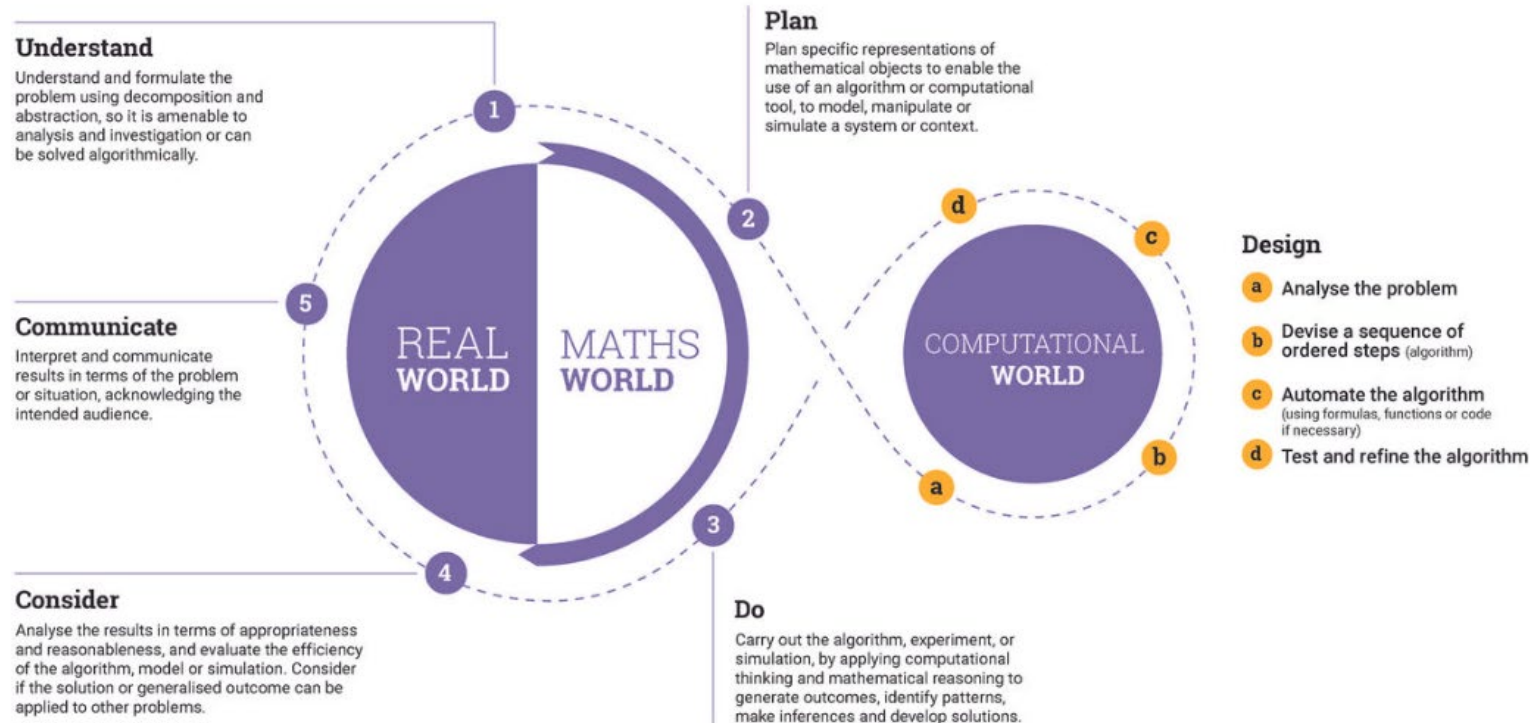


Computational Thinking in Mathematics



Computational Thinking process

Computational thinking process draws on a combination of decomposition, abstraction, pattern recognition, generalisation and the use of models, simulations or algorithms to formulate, investigate and communicate the results of inquiry or to solve classes of problems.



Computational Thinking Process

Step 1: Understand and Step 5: Communicate



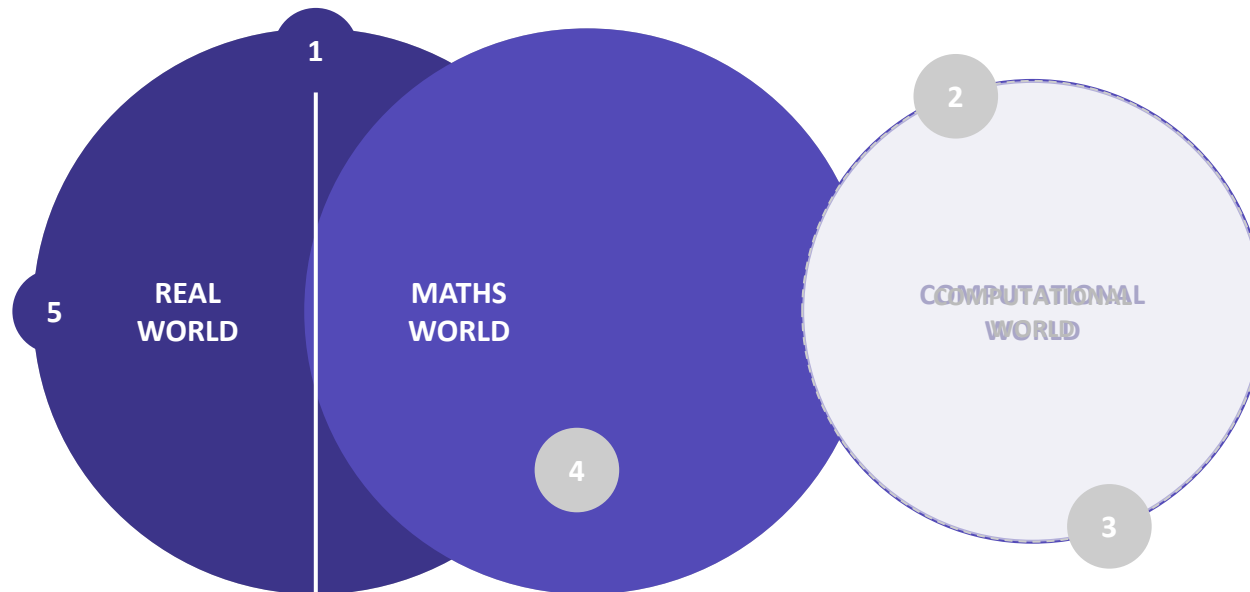
1 • Understand

Use decomposition and abstraction to formulate problem – to investigate or solve algorithmically.

5 • Communicate

Return results to the real-world context. Interpret findings for the intended audience — not just a mathematical answer.

Begins and ends in the real world—similar to mathematical modelling



Computational Thinking Process

Steps 2 & 3: Plan, Design and Do



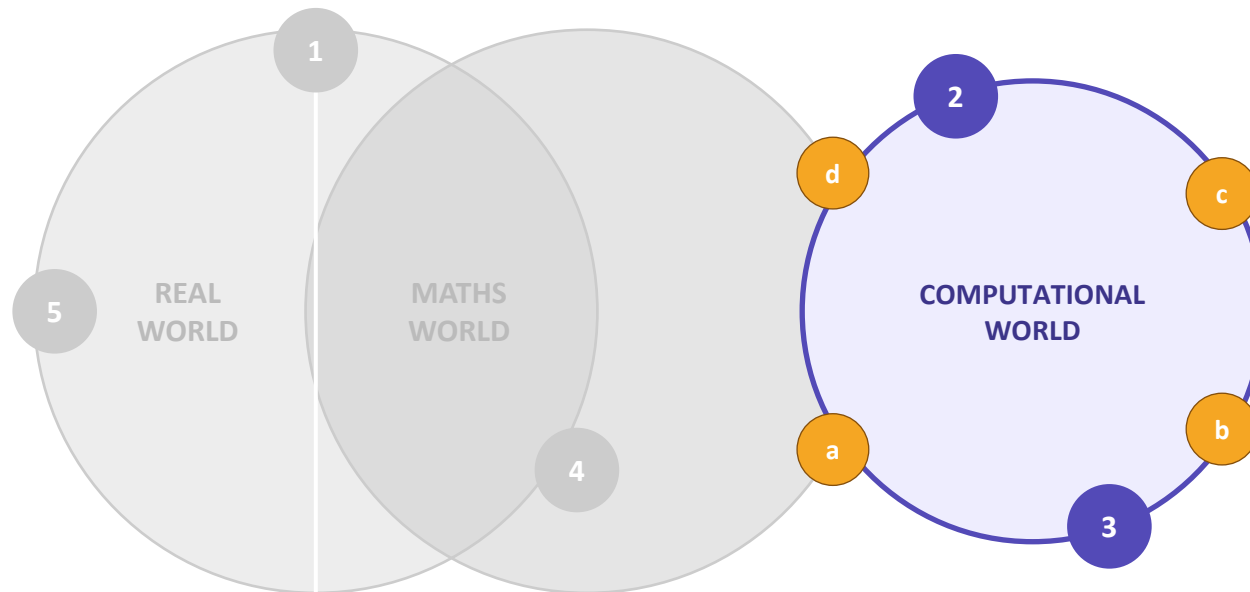
2 • Plan

Model the mathematical relationships to manipulate computationally.

3 • Do

Apply mathematical reasoning to generate outcomes, identify patterns and develop solutions.

mathematics is computational - algorithms run, patterns emerge



- a Analyse**
Identify constraints
- b Algorithm**
Devise steps to a solution
- c Automate**
Use formulas/ functions/code
- d Test**
Refine and iterate - check outputs

Computational Thinking Process

Step 4: Consider



Analyse results for appropriateness and reasonableness. Evaluate the efficiency of the algorithm, model or simulation. Ask: can this solution be generalised to other problems?

Is it reasonable?

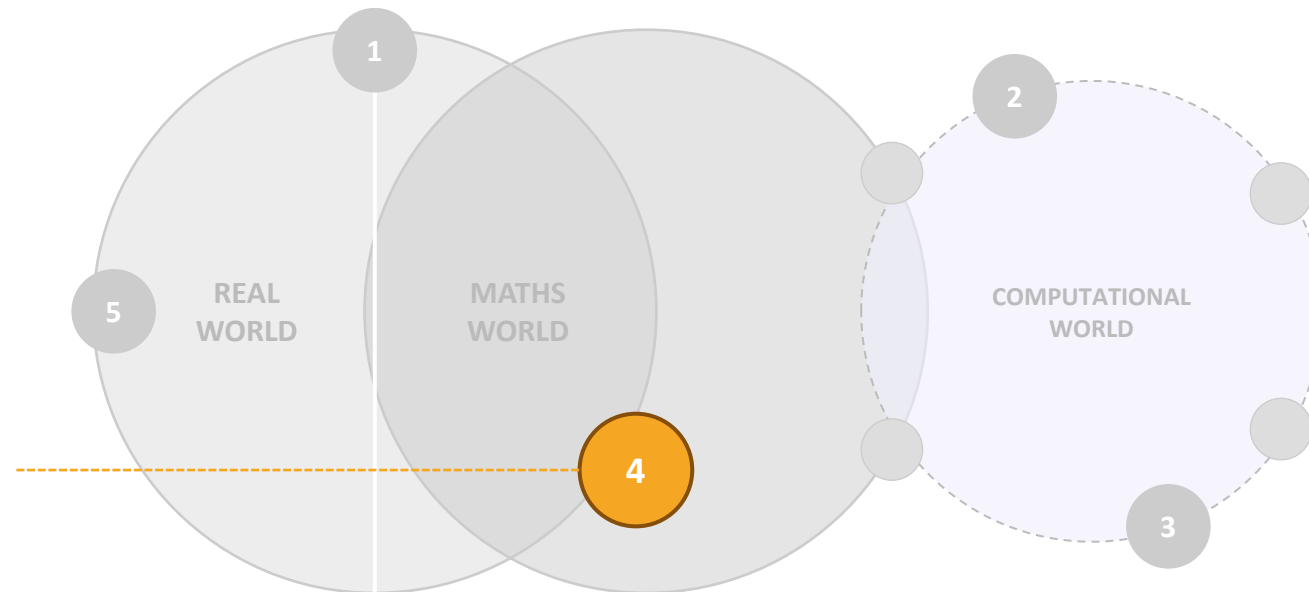
Sense-making in the real-world context

Is it efficient?

Is this the best algorithm, model, simulation

Can it generalise?

Can this solution apply beyond this problem?



- Links CT back to mathematical reasoning
- Develops mathematical judgement
- Critical for AI literacy - Evaluating model outputs

“Consider” turns computation into mathematical understanding

Mathematical Modelling is a Foundational Practice



Mathematical modelling process

Mathematical modelling is an essential dimension of the contemporary discipline of mathematics and is key to making informed decisions or predictions about natural and social phenomena. Students develop an understanding of mathematical modelling when they recognise, connect, and apply mathematical structures to gain insight into situations and solve real-world problems

AC v9 Mathematics: modelling elevated as a core process (alongside problem-solving, reasoning)

Understand

Identify and describe the problem situation, recognise any patterns and acknowledge any assumptions, constraints or ethical considerations

Plan

Formulate the problem mathematically, considering and choosing between alternative approaches, mathematical representations and tools

Do

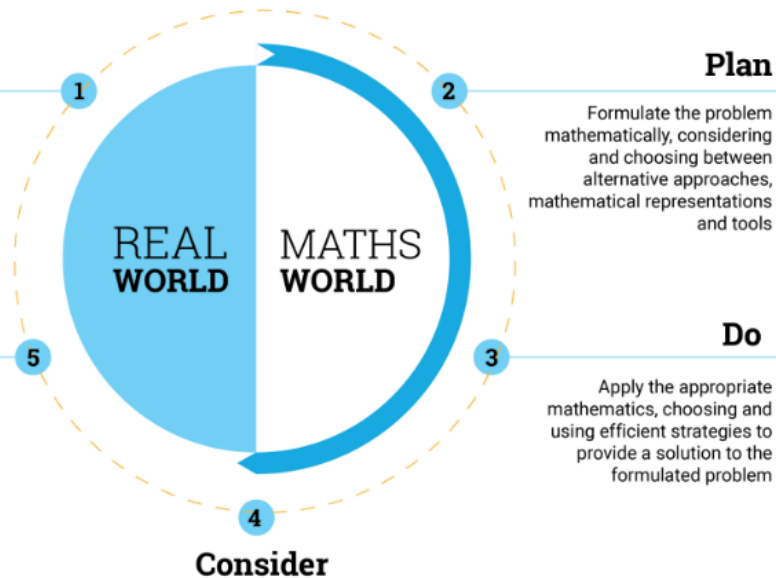
Apply the appropriate mathematics, choosing and using efficient strategies to provide a solution to the formulated problem

Communicate

Report the solutions within the context of the situation acknowledging the audience

Consider

Reflect on the results in terms of their reasonableness and whether they make sense in relation to the context. Evaluating the model used, including whether it achieves what was intended, and modify as appropriate.



Is Australia getting drier over time?
Let's use real BOM data!

Maths investigation — Yr 9

- Get BOM rainfall data
- Find the mean
- Plot anomaly
- Fit trend line
- Find the slope

-0.52 mm/yr

Predict 2030 rainfall
baseline + (slope × yrs)

Formulate Solve Evaluate Communicate

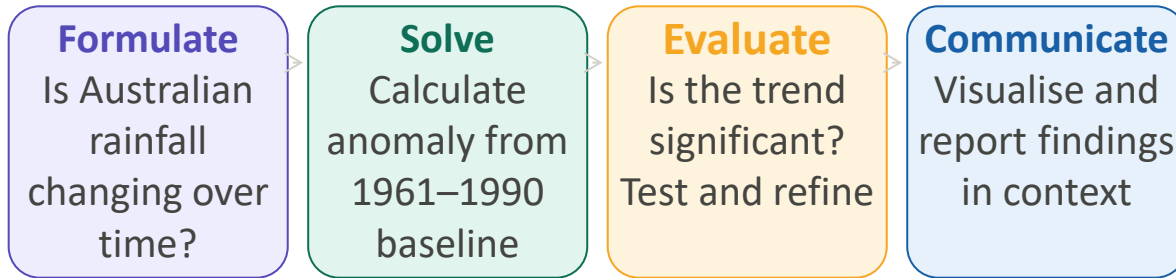
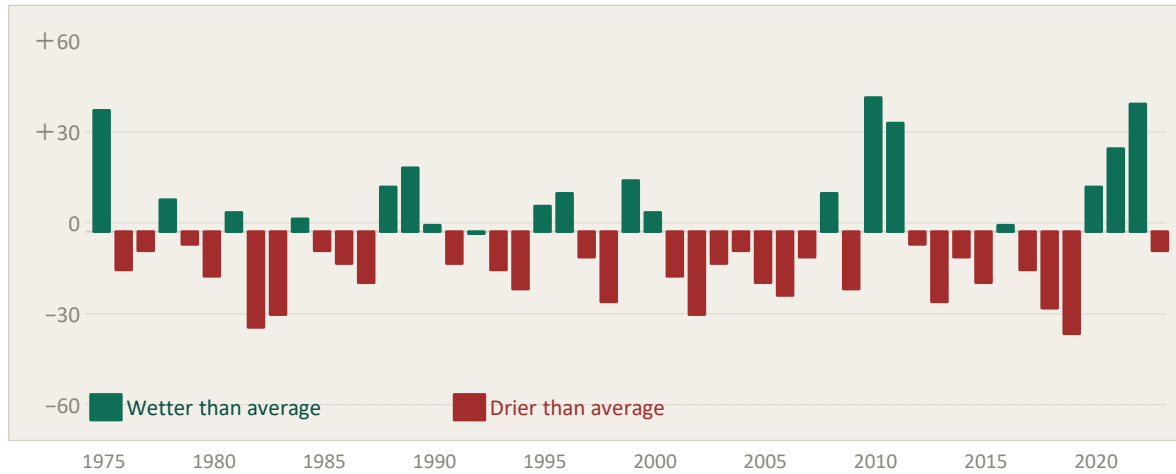
Data: Bureau of Meteorology · CC-BY 4.0 · bom.gov.au

Mathematical modelling meets data science



How a modelling cycle **formulate** → **solve** → **evaluate** → **communicate** maps to a real data investigation

Real-world data: Australian annual rainfall anomaly (BOM)



rainfall_investigation.xlsx — Excel

fx =AVERAGE (C2 :C64) - AVERAGE (\$C\$2 :\$C\$32)

Year	Rainfall (mm)	Anomaly (mm)	5yr avg
2019	430	-32	-18
2020	566	+14	-8
2021	618	+26	+5
2022	642	+40	+9
2023	516	-6	+13

Trend analysis

D2:	=AVERAGE (C2 :C6)	→ 5-year rolling average
E1:	=LINEST (C2 :C64 ,A2 :A64)	→ Slope: -0.52 mm/yr
E2:	=CORREL (A2 :A64 ,C2 :C64)	→ r = -0.31 (p < 0.05)
F1:	=FORECAST (2030 ,C2 :C64 ,A2 :A64)	→ Projected -28 mm by 2030

Excel, Computer Algebra System (CAS) such as Ti-Nspire... make the modelling cycle computational - students see the mathematics working on real data

Data science in the Australian Curriculum



Statistics strand

Data types

Categorical, discrete, continuous

Distributions

Shape, spread, skewness

Variation

Why data varies; signal vs noise

Sampling

Random, systematic, stratified

Inference

Drawing conclusions from samples

Visualisation

Choosing the right display

Year-level progression

Yr F – 2

Collect and sort data
Simple displays (lists, pictographs)

Yr 3 – 4

Bar charts, tables
Interpret data displays

Yr 5 – 6

Dot plots, stem-and-leaf
Mean, median, mode, range

Yr 7 – 8

Histograms, box plots
Compare data distributions

Yr 9 – 10

Bivariate data, scatter plots
Statistical inference, sampling

Years 9–10: Data Science Skills unit

Introduces data science as a process: acquire, store, analyse and visualise data from surveys, sensors and online repositories. Builds on Years 7–8 database and spreadsheet skills.

AC9TDI10P01

Acquire, store and validate data using spreadsheets and databases

AC9TDI10P02

Analyse and visualise data to draw conclusions and predict trends

AC9TDI10P03

Model and query relational data structures

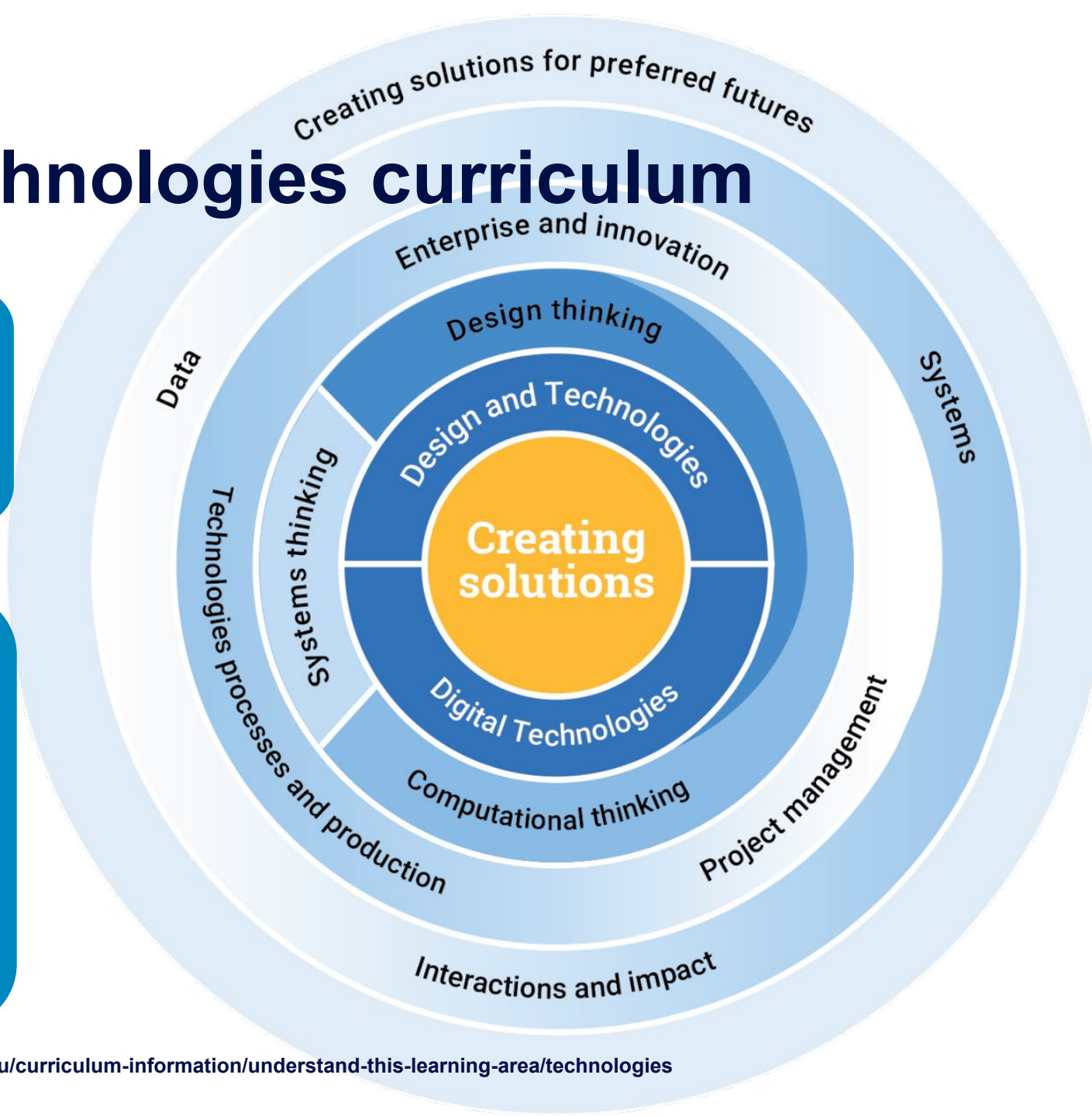
AC9TDI10P14

Apply Australian Privacy Principles to data systems

Links to Mathematics

- Statistics: distributions, sampling, inference
- Probability: simulation and prediction with data
- Critical & Creative Thinking: data reasoning
- Cross-curriculum: Digital Literacy capability

Digital technologies curriculum



1. Computational thinking - shared explicitly between Digital Technologies and Mathematics

2. Statistics strand - Digital Technologies directly underpins the AC v9 Mathematics Statistics strand through data acquisition, interpretation and representation.

3. Algorithmic thinking - Digital Technologies introduces algorithmic thinking

4. Mathematical literacy with real world connections - applies number, geometry, scale, proportion, measurement and statistical reasoning in authentic design and production contexts

AI in Mathematics in Australian curriculum

australiancurriculum.edu.au/curriculum-information/understand-this-curriculum-connection/artificial-intelligence



Mathematics is the foundation of AI

"Mathematics v9 provides the knowledge and skills that underpin AI — and the ways of reasoning that AI mimics."

— ACARA Curriculum Connection: AI (2023)

Statistics Distributions, inference, sampling

Probability Prediction, uncertainty, bias

Algebra Functions, variables, generalisation

Measurement Scale, error, normalisation

Space Geometry, spatial reasoning

Curriculum (standards)

Yr F – 6

- Investigate AI accuracy using %
- Statistical investigations
- Pattern recognition and CT

Yr 7 – 8

- How AI makes sampling decisions
- Synthetic data distributions
- Probability simulations using AI
- Mitigate bias in AI sampling

Yr 9 – 10

- Generative AI to explore functions
- Bivariate data - AI forecasting
- Identify bias in machine learning

E.g. Is the AI model accurate?

Year 5–6 · Statistics · Mathematics Hub

- 1 Design a statistical investigation
- 2 Test a rock-paper-scissors AI model
- 3 Collect accuracy data using %
- 4 Evaluate if model matches theory?

CT in Maths that AI uses:

Pattern recognition

Abstraction

Algorithms

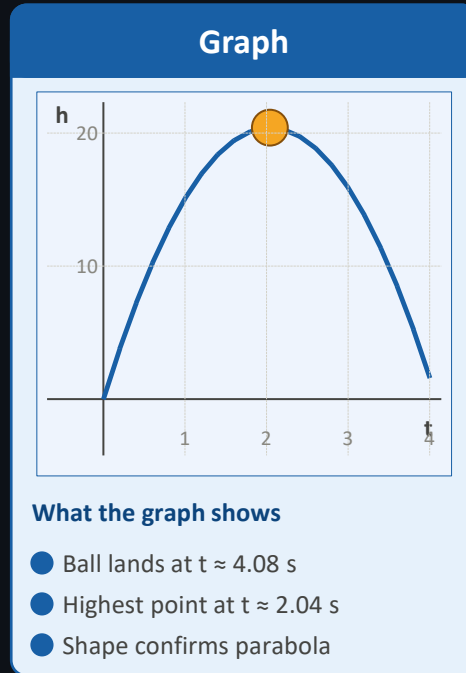
Generalisation

The mathematical knowledge is already in AC v9 — the question is whether to name it explicitly as AI.

The cricket ball at the Melbourne Cricket Ground (MCG)



A real-world parabola — three representations that reveal the same mathematical story



Table

t (s)	h (m)	Event
0	0	Ball released
1	15.1	Rising fast
2	20.4	★ Max height
2.04	20.4	Vertex (peak)
3	15.3	Falling
4	1.6	Near ground
4.08	0	Ball lands

Equation

Standard form
 $h(t) = -4.9t^2 + 20t$
 $a = -4.9$ (gravity)
 $b = 20$ (initial velocity)

Factored form
 $h(t) = t(-4.9t + 20)$
 Roots: $t = 0$ and $t = 20/4.9 \approx 4.08$ s

Vertex form
 $h(t) = -4.9(t - 2.04)^2 + 20.4$
 Peak: 20.4 m at $t = 2.04$ s

"A cricket ball is bowled at the MCG. It follows the path $h(t) = -4.9t^2 + 20t$. Show me the graph, a table of values and the equation in all three forms. What does each tell me about the ball?"

Symmetry: $h(1) \approx h(3)$, $h(0) = h(4.08) = 0$ Each form highlights different features —
 Vertex row stands out as the maximum AI instantly switches between all three

📎 How AI tells me it can help students see the connections

Graph → Table

'Why is the table symmetric?' AI: it mirrors the parabola's axis

Table → Equation

'Show me the vertex row' AI: links $t=2.04$ across both

Equation → Graph

'Change a to -9.8 , what happens?' AI: re-draws and re-explains

All three → Real life

'What does this mean for the bowler?' AI: connects to context

Assessment Design Can Drive Integration



Mathematical Modelling Cycle

What ACARA says

AC v9 requires mathematical modelling from Year 3 onwards. The cycle [formulate, solve, evaluate, communicate] is also the assessment vehicle.

- 1 Formulate** Define the real-world problem
- 2 Solve** Apply mathematics and AI tools to generate outputs or predictions
- 3 Evaluate** Test the AI model: is the output reasonable?...
- 4 Communicate** Report findings in context
- 5 Generalise** Does the model work for other problems? What are its limitations?

Year 9 example

Can bone length be used to estimate height?

Collect data, build a linear model in Excel/TI-Nspire, test it against AI predictions of forensic height estimation, and evaluate which method is more reliable.

Statistical Investigation Cycle

What ACARA says

AC v9 Statistics: AI systems use bivariate data to forecast and make predictions. The statistical investigation cycle also as assessment tool.

- 1 Pose** Formulate a statistical question about an AI model's predictions
- 2 Collect** Gather data: AI outputs, sensors, surveys ...
- 3 Analyse** Visualise, calculate statistics, identify patterns
- 4 Interpret** Draw conclusions: AI accuracy, bias & limitations

AC (Yr 9–10): *"Acquire and analyse bivariate data: recognise how AI systems use bivariate data to forecast or make predictions based on association"*

Year 10 example

Is the AI model accurate? - BOM rainfall predictions

Compare BOM AI rainfall predictions against actual data across regions, investigate prediction accuracy using statistics, and identify which factors make prediction harder.

How this is enacted in the state of Victoria

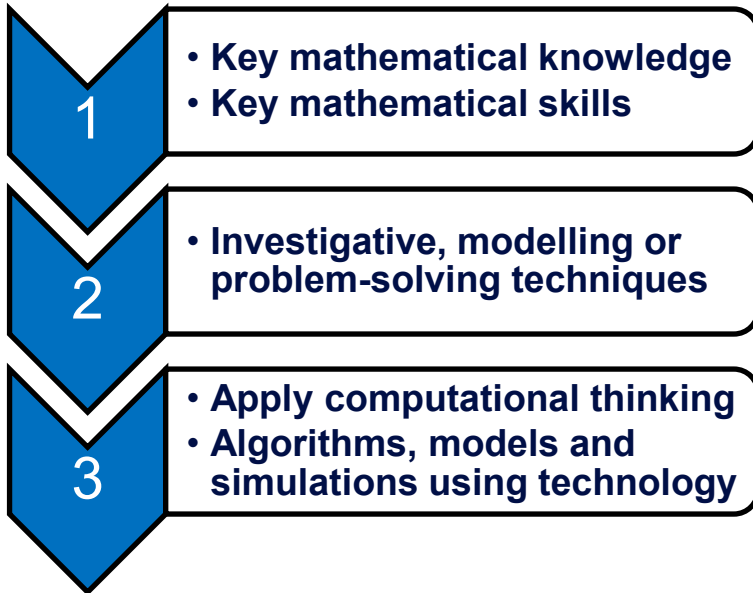


How this is enacted in the state of Victoria



Final two years of school =
Victorian Certificate of Education
(VCE)

Assessment



Years F (K) to 12
Victorian curriculum
Based on Australian curriculum

Embedded throughout. E.g.

- Use mathematical modelling to solve (practical) problems involving...
- Plan and conduct statistical investigations involving
- Run simulations using digital tools...
- design and implement simple algorithms using pseudocode or other general purpose programming language

Handheld Computer Algebra
Systems (CAS)

Introduced

- CAS 2010
- Algorithmic thinking in 2015
- Pseudocode and flowcharts 2024
- Data Science in Statistics 2024
- CT in Vocational strand 2023



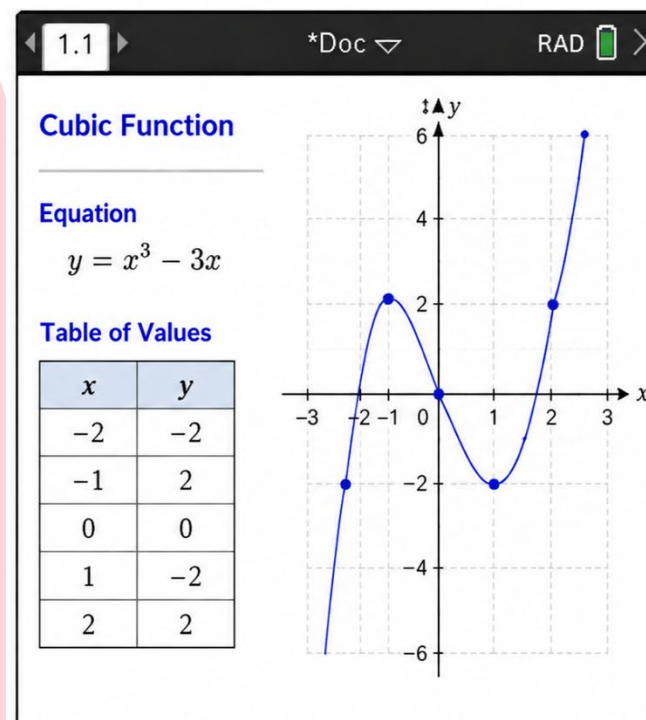
Victorian Certificate of Education (VCE) CAS active CT

<https://www.vcaa.vic.edu.au/curriculum/vce-curriculum/vce-study-designs/vce-study-designs>

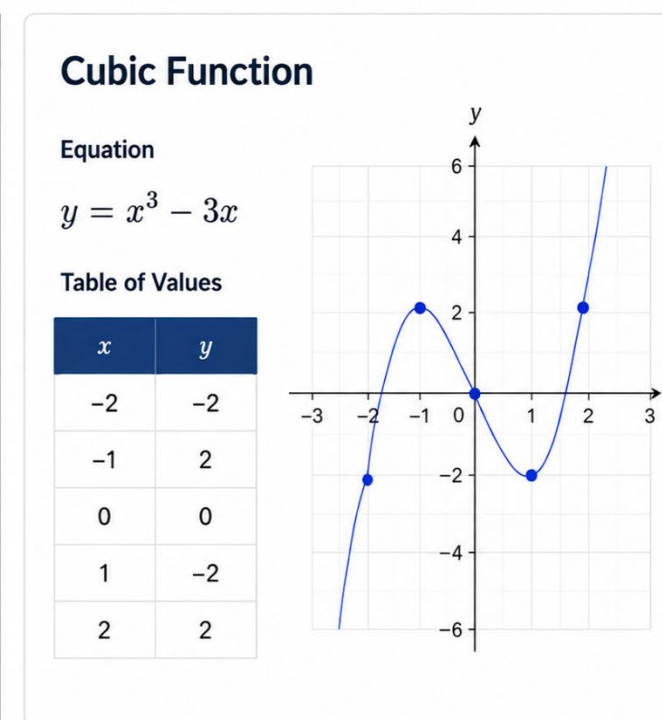


Outcome 3 of VCE mathematics: Apply computational thinking and use numerical, graphical, symbolic and statistical functionalities of technology to develop mathematical ideas, produce results and carry out analysis in situations requiring investigative, modelling or problem-solving techniques or approaches.

- the role of computational thinking (abstraction, decomposition, pattern and algorithm) in problem-solving, and its application to mathematical investigation
- exact and approximate specification of mathematical information produced by use of technology
- the similarities and differences between formal mathematical expressions and their representation by technology
- the purpose and effect of sequencing, decision-making and repetition statements on relevant functionalities of technology, and their role in the design of algorithms and simulations
- the appropriate functionality of technology for a variety of mathematical contexts



TI-Nspire Screen



AI/ChatGPT Screen

Sense-making of mathematics using AI

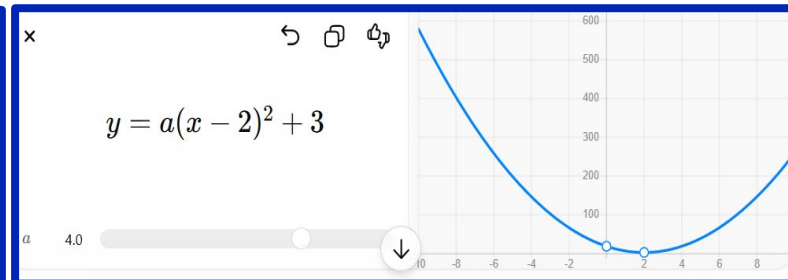
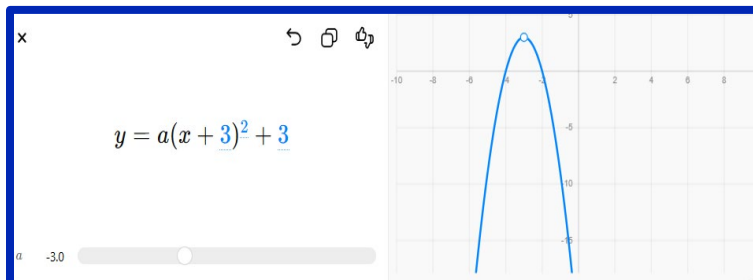


E.g., for a function $f(x)=a(x+3)^2+3$, $x \in \mathbb{R}$, show how changing a affects a cubic function.
(Year 11-12)



AI can be an interactive explanatory partner:

- animate transformations in real time.
- explain *why* the graph changes
- generate tables of values automatically.
- compare multiple functions simultaneously.
- create student prompts or investigations.
- respond to natural language.



Australian “Federated States” Approaches to AI in School Curriculum (as of May 2026)



Jurisdiction	AI position	Key initiative/focus
Victoria	Curriculum-led; computational thinking focus	Algorithmics, Digital Technologies, AI literacy
New South Wales	System-wide generative AI deployment	NSWEduChat for Years 5–12
South Australia	Operational AI integration in schools	EdChat statewide rollout
Queensland	Governance and ethical AI emphasis	Responsible AI and future-focused learning
Western Australia	Cautious, risk-managed adoption	Teacher guidance and privacy focus
Tasmania	Incremental professional learning approach	AI Aware teacher capability program
ACT	Exploratory and ethics-oriented	School-level pilots and guidance
Northern Territory	Early-stage and equity-focused	Digital capability and access priorities
National (ACARA)	Framework and curriculum alignment	Australian Framework for Generative AI



Key Takeaways from Australia



Curriculum + policy

1 CT belongs inside mathematics

Embed algorithmic reasoning and modelling as core mathematical processes.

2 Sequenced policy reform works

Lock in the curriculum vision before debating classroom delivery.

3 Equity is the test

Every curriculum innovation must be measured against its impact on the most marginalised learners first.

Curriculum + pedagogy

4 Data science is now in mathematics

Statistics strand + Years 9–10 Data Science Skills subject = a powerful dual entry point.

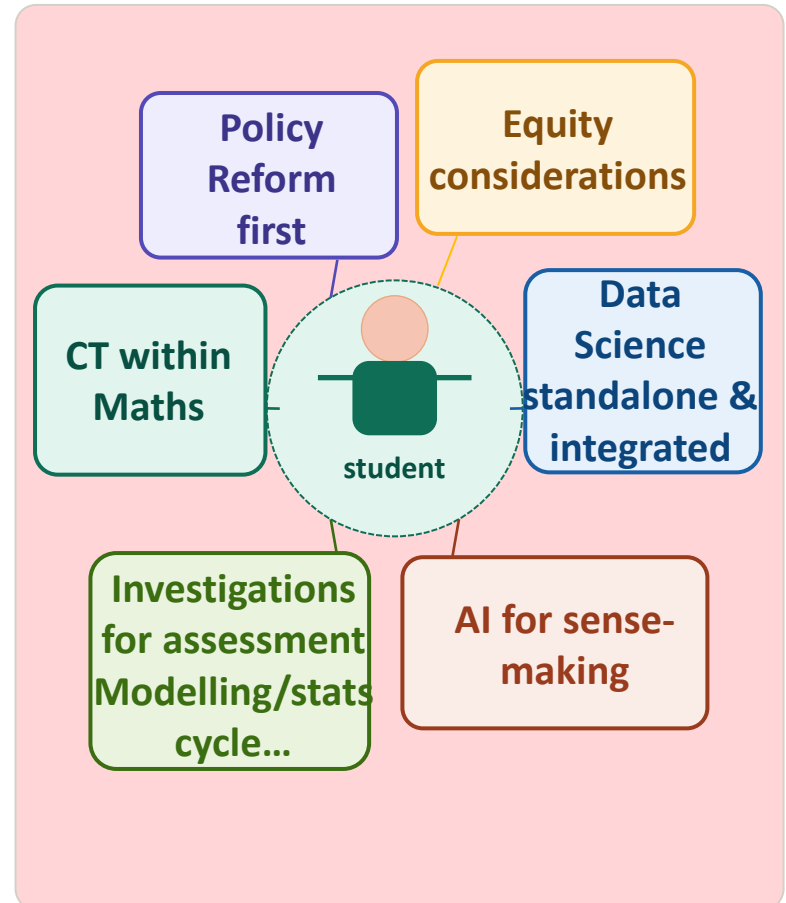
5 AI supports mathematical sense-making

AI tools help students move between representations and connect concepts building mathematical understanding.

6 Assessment captures the full cycle

Modelling + statistical investigation tasks assess reasoning, computational process and communication.

Six connected ideas





[www.linkedin.com
/in/justine-
sakurai-
52b9a2257](https://www.linkedin.com/in/justine-sakurai-52b9a2257)



[https://acara.edu.au
/curriculum](https://acara.edu.au/curriculum)

Questions and thank you

Contact me at:

j.sakurai@unimelb.edu.au





THE UNIVERSITY OF
MELBOURNE

(c) The University of Melbourne 2026

This material is protected by copyright. Unless indicated otherwise, the University of Melbourne owns the copyright subsisting in the work. Other than for the purposes permitted under the Copyright Act 1968, you are prohibited from downloading, republishing, retransmitting, reproducing or otherwise using any of the materials included in the work as standalone files. Sharing University teaching materials with third-parties, including uploading lecture notes, slides or recordings to websites constitutes academic misconduct and may be subject to penalties. For more information: [Academic Integrity at the University of Melbourne](#)

Requests and enquiries concerning reproduction and rights should be addressed to the University Copyright Office, The University of Melbourne: copyright-office@unimelb.edu.au

The University of Melbourne (Australian University)
PRV12150/CRICOS 00116K