CBM TEACHING PLATFORM

The integrated student and teacher learning solution for computational thinking

Now with CAIT
(Your Computational AI AssistanT)

computerbasedmath.org

Why adopt the CBM Teaching Platform?

PROBLEM-BASED TEACHING MODULES FOR ALL ABILITIES

Using a new curriculum, written from the ground up, teach your students to problem solve in modern contexts using industry-standard techniques and tools going beyond the competencies of the PISA 2025 framework for mathematics.

A UNIQUE COMPUTATIONAL THINKING ENVIRONMENT

Students create their own solutions within the modules, whilst using primers to learn new skills, concepts and tools as they solve the problems. All resources are written in Wolfram Notebooks, the world-leading computational software used by industries and universities.

OPEN-ENDED PROJECTS AND FURTHER ENRICHMENT OPPORTUNITIES

As well as optional research activities, each module has a supplementary project to allow students to demonstrate their newly learnt skills.

QUESTIONING AND CLASS COLLABORATION TOOLS

Teachers can remotely monitor responses and react to students' misconceptions in real time. Anonymous or named responses can be used as teaching points as the course progresses.

INSTRUCTOR AND STUDENT SUPPORT AT POINT OF NEED

Supporting teachers as they learn is as important as supporting the students. Modules are written with the inexperienced teacher in mind, giving them direction and helpful supplemental resources at the point where they need them, now with CAIT-integrated LLM support.

ASSESSMENT AND LEVELS OF CERTIFICATION OF ACHIEVEMENT

Students' progress can be tracked against the CBM outcomes. Certificates of achievement can be gained by sitting either a module test (Level 1) or by submitting project reports (Level 2).

Example activity from a module—teacher view

Activity introduction.

Activities are broken up into sections. Each modality follows one of the four problem-solving steps:

D Define A Abstract
C Compute I Interpret

Problems are set in real contexts that students can relate to. Students work on real solutions to real problems.

Tabs at the top of each modality offer teacher guidance.

PURPOSE
The aim of the modality.

STEPS
A step-by-step guide through the modality.

WHAT TO SAY
A list of probing questions to ask the students.

TECHNICAL MANUAL
Instructions for the tools; links to further material.

ANSWERS
Answers to the questions.

OUTCOMES
CBM outcomes for the modality.

BRAINSTORM
Teacher • Whole class • 10 minutes
Modality type, who leads the modality, group size, estimate of time needed.

Learners will…

- Gain computational thinking skills for further study and AI-age careers.
- Apply computation in all subjects—from life and social sciences to economics and business to traditionally mathematical subjects like physics and engineering.
- Be able to analyse data, interpret key findings and communicate effectively.
- Have confidence to approach real problems with a systematic process.
- Be motivated to learn through context-based problems.
- Be supported by an industry leader in computation.

Questions and answers about the CBM Teaching Platform

Q: Can you teach remotely using this platform?

A: Yes, the inbuilt class collaboration makes this ideal for remote delivery either in real time or asynchronously. Additional software (Zoom, Skype, Blackboard, etc.) is required for audio and video sharing.

Q: Can the materials be adapted or edited by teachers?

A: Yes. The text in the Wolfram Notebooks provided is editable. Interactive elements like questions or manipulatives can be deleted, but not edited. Teachers may add their own interactives—for example, those from the Wolfram Demonstrations Project site.

Q: Does every student need access to a computer?

A: For students receiving face-to-face teaching in classrooms, lessons can be run successfully with two students to one computer. Teachers and students must install Wolfram technology* and the CBM resources to get the best out of the computation power and collaborative tools.

Q: Do students need to know how to code before they start?

A: No. The modules provide introductory guidance on the use of simple code applicable to the problem in Wolfram Language. Teachers are provided with full solutions whenever necessary and also have access to the LLM assistant CAIT. Further guidance and courses on Wolfram Language can be found at Wolfram U.

Q: How much teacher training is required?

A: An introductory course covers three main areas:

1) The CBM approach and philosophy
2) Using the CBM Teaching Platform and Wolfram Language basics
3) Individual module orientation

This can be achieved in approximately four to six hours.

Q: What is the minimum hardware required?

A: CBM lessons require typed responses, so a keyboard and mouse on a desktop or laptop are required. Further specifications can be found wolfram.com/mathematica/system-requirements.html.

Q: Is the internet required?

A: Yes. The Teaching Platform runs in a browser, preferably Google Chrome.

Q: Is there technical support?

A: Yes, Wolfram Customer Service provides installation assistance by phone and email. CBM assistance is available through the CBM Teaching Platform's menu.

*Wolfram|Alpha Notebook Edition, Mathematica, Wolfram Player, Wolfram Desktop

Available modules (as of Q1 2024)

Teacher-led, fully supported learning resources

To commission new modules customised to your organisation's needs or find out about other services we offer, visit computationalthinking.org/services.

Data Science

Approx 70 hours

MODULES	THEMES	CBM LEVEL
Am I normal?	Collecting data and understanding expected norms	Beginner
How happy are people in my country?	Judging reliability of sources and measuring subjective data	Intermediate
How can I convince you?	Understanding unethical techniques that are used to present information	Intermediate
Can I trust a survey?	Sampling methods and identifying bias; fair and unfair questioning techniques	Intermediate
Does gender help with your maths score?	Sample size and comparison of datasets	Intermediate
Do I know what I don't know?	Reliability of models; making explicit assumptions	Intermediate
Should I insure my laptop?	Risk and methods to protect against unexpected loss	Intermediate
Cause or correlation?	Identifying dependent variables and understanding causation	Intermediate
Will it rain tomorrow?	Making predictions based upon data and chosen preconditions	Proficient
How many words do I know?	Making predictions and estimating their reliability	Proficient
Can I spot a cheat?	Understanding random events and their significance	Proficient
How tall is the tallest woman in your country?	Estimating population parameters based upon samples and their reliability	Proficient

Assorted STEM

Approx 60 hours

MODULES	THEMES	CBM LEVEL
That's random! Or is it?	Random behaviour and events	Beginner
How long will a hacker take to crack my password?	Multiplication, combinations and exponentiation	Beginner
Where's the plane?	Modelling possible locations and their probability	Intermediate
How do I design controls for my game?	Specification of location and mapping of controls	Intermediate
How can I create natural-looking shapes?	Modelling nature with iteration and recursion	Proficient
How fast could I cycle the race stage?	Power, energy and air resistance; creating personalised models that can be verified	Proficient
What will the population be in 50 years' time?	Fitting a model to data and extrapolating to the future	Proficient
How can I model a human population?	Building a model from individual agents	Advanced

The projects

Teacher-guided, open-ended problems for students to hone their computational thinking skills.

These contain information to get started, a solution framework based on the four-step process and a solution for teachers.

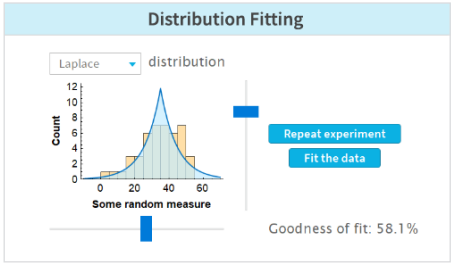
	PROJECTS	THEMES	CBM LEVEL
Architecture of Computation	Can I simulate a slot machine?	Generation of random outcomes, conditional events	Beginner
	Can I simulate a random walk?	Random movements using dimensions and angles	Intermediate
	Can I create a coastline?	Iteration and recursion to generate natural-looking images	Proficient
Data Science	What is normal intelligence?	Collecting data and understanding expected norms	Beginner
	Can I create a profanity filter?	Machine learning and text processing	Intermediate
	Is there evidence that referees are biased?	Significance and hypothesis testing	Proficient
Geometry	Can I create a spot-the-difference game?	Image processing, masking and infill	Intermediate
	Can I create a multi-view anamorphic sculpture?	Cross-sections and 3D views	Proficient
	How far will the shell travel?	Kinematics and modellings	Advanced
Information Theory	How many different teddy bears can you make?	Multiplication and counting problems	Beginner
	Can I create my own identifier system?	Combinatorics and exponentiation	Proficient
	Can I use an API?	Data handling and formatting queries	Proficient
Modelling	Can I create a fitness regimen?	Linear programming to optimise fitness	Intermediate
	What will the future elephant population be?	Model fitting and extrapolation	Proficient
	Can I model the spread of a virus?	SIR agent-based modelling	Advanced

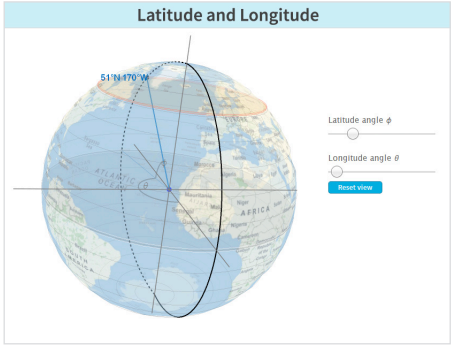
We have more than 50 teaching projects of varying difficulty to choose from. Find out more about the projects in the **Computer-Based Maths Teaching Platform** at computerbasedmath.org/inside-module.

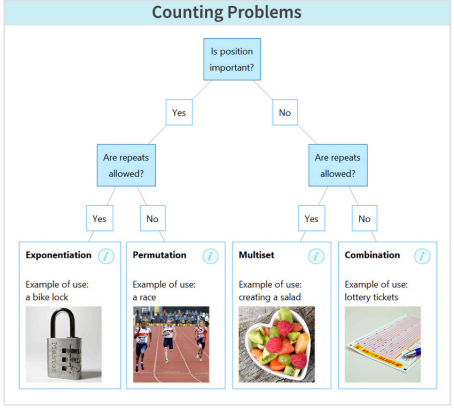
The primers

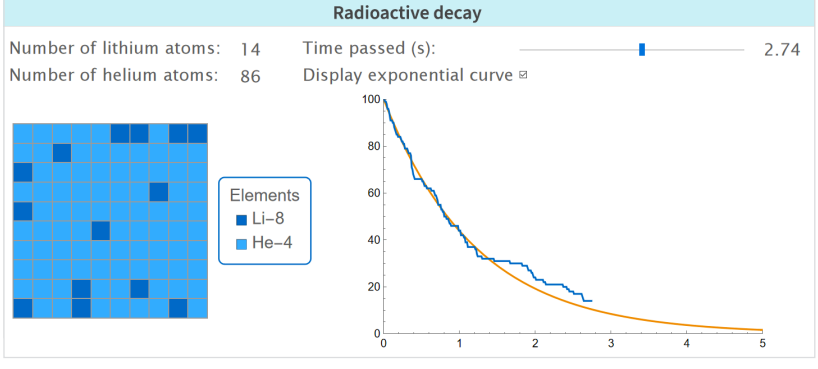
Non-contextual introductory information about a concept and its associated tools.

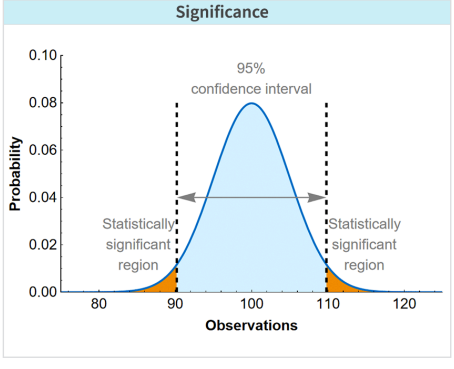
Causality
Combinations
Combinatorics
Conditional probability
Confidence interval
Correlation coefficient
Data
Dependence and independence
Distribution fitting
Empirical distribution
Estimation error
Expected value
Exponentiation
Hypothesis test
Insurance
Mathematical model
Model fitting
Multisets
Parameter estimation
Permutations
Population and sample
Probabilistic model
Probability
Probability distribution
Random
Risk
Sample space
Sampling bias
Significance
Statistic of distribution
Utility function
2D coordinate systems
3D coordinate systems
Angles in a right-angled triangle
Code controls
Data density
Dimensions of space
Function transformations
Latitude and longitude
Loci operations
Mapping
Monte Carlo simulations
Orientation
Similar triangles
Specification
Speed
Agent-based model
Coding associations
Coding function definitions
Energy conservation
Work and power
Recursion and iteration
Fractal dimensions
Exponential change











What technology is implementing CBM?

WOLFRAM COMPUTATIONAL PLATFORM + **LLM-ASSISTED LEARNING**

Wolfram Research are pioneers in deploying LLM technology and computation for teaching and learning. CBM resources are built upon Wolfram Technology, utilising the ease and convenience of notebooks to enable learners of all abilities to access the power of modern computation. Directly linked to the knowledge of Wolfram|Alpha and capabilities of LLMs, CBM resources provide a unique creative environment for learners to become computationally literate.

Moreover, these technologies are widely used in higher education, industry and governement around the world, so by learning them students will gain an extra, marketable skill. But the CBM philosophy is not dependent on any one technology base—including Wolfram's.

See full reasons at: computerbasedmath.org/technology

CBM is keen to gain support for this fundamental maths education shift that's so vital to your community and others. If you can help, whether by lending support, contributing ideas or sponsoring, or you just want to find out more, go to computerbasedmaths.org or contact us at info@computerbasedmath.org