

MATHTRAK

<http://www.mathtrak.com.au>

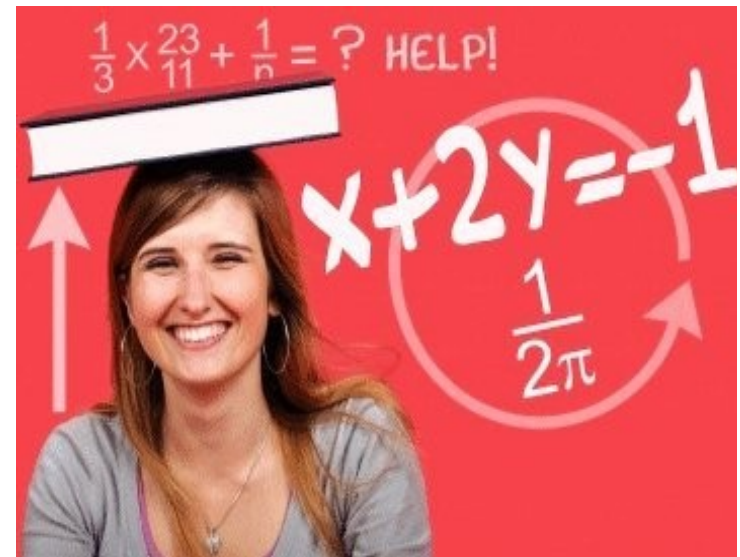
MATHTRAK is an online **Learning Management Tool** based on the **Australian National Mathematics Curriculum** that is designed to provide the classroom teacher with rich student data to inform decisions about student readiness and success with the school's own course in Mathematics. MATHTRAK is not designed to be a "teacher replacement tool" nor a replacement for regular instruction. MATHTRAK is not an add-on to regular instruction; schools design MATHTRAK courses to fit their Mathematics programme so that MATHTRAK becomes an integral phase in the learning process. MATHTRAK is the tool of choice for schools who value **evidence-based instructional design and delivery**.

MATHTRAK has identified over a **thousand essential skills** (called Key Concepts) in the National Mathematics Curriculum for Years 5 to Year 10. For each of these Key Concepts there is a unique **quiz question** that tests if the learner has mastered that Key Concept and an **interactive lesson** that illustrates the skills involved.

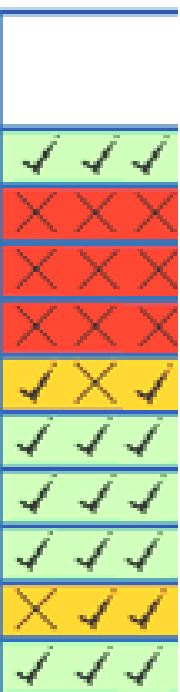
The quiz questions for most of the Key Concepts are **randomly generated** so the student rarely sees the exact same question. The learner can review the lesson and even take pre-requisite lessons before retrying the quiz questions. MATHTRAK keeps track of his/her progress as he/she views lessons and completes quiz questions.

In addition to helping the learner to develop mastery of the mathematical knowledge of the National Curriculum, MATHTRAK provides a comprehensive mathematical **problem solving tutorial** available to all students and a **fun game** to develop fluency with number skills.

Especially for teachers, MATHTRAK provides **Report Writer** that allows teachers to write targeted report comments that are easily pasted into a school's reporting software and **Survey Maker** which allows teachers to design class surveys and then provide graphical summary of student responses.



MATHTRAK – supporting teachers with World's Best Practice



MATHTRAK Administrator – easy site set up

With just the click of the mouse, the administrator creates courses by choosing the quiz questions that match the key concepts of the school's coursework. Tests for this course can then be created just as easily.

| Number and Algebra | | | | | | | |
|-------------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|--|-------------------------------|-------------------------------|
| | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Year 10A |
| Number and place value | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | | | |
| Fractions and decimals | view <input type="checkbox"/> | view <input type="checkbox"/> | | | | | |
| Real numbers | | | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | | view <input type="checkbox"/> |
| Money and financial mathematics | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | |
| Patterns and algebra | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> |
| Linear and non-linear relationships | | | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input checked="" type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> |

| Measurement and Geometry | | | | | | | |
|-----------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Year 10A |
| Using units of measurement | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> |
| Shape | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | | | | |
| Geometric reasoning | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> |
| Location and transformation | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | | | | |
| Pythagoras and trigonometry | | | | | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> |

| Statistics and Probability | | | | | | | |
|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Year 10A |
| Chance | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> |
| Data representation and interpretation | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> | view <input type="checkbox"/> |

| Strand - Number and algebra (Year 9) | | |
|--|-------------------------------|--|
| Sub-strand - Linear and non-linear relationships | View | View |
| ACMNA214 - Find the distance between two points located on a Cartesian plane using a range of strategies, including graphing software | view <input type="checkbox"/> | find the distance between two points on a number plane |
| ACMNA215 - Sketch linear graphs using the coordinates of two points | view <input type="checkbox"/> | draw graphs of straight lines that pass through the origin |
| | view <input type="checkbox"/> | draw graphs of straight lines that do not pass through the origin |
| | view <input type="checkbox"/> | Find co-ordinates that lie on a line |
| | view <input type="checkbox"/> | find the y-intercept of a line given the equation |
| | view <input type="checkbox"/> | find gradient given points or the equation in gradient/y-int form |
| | view <input type="checkbox"/> | find one coordinate on a line given the other |
| | view <input type="checkbox"/> | write the equation of a line given the gradient and y-intercept |
| | view <input type="checkbox"/> | convert equations of a line between general form and gradient/y-intercept form |
| | view <input type="checkbox"/> | find the gradient and y-intercept from the general equation of a line |
| | view <input type="checkbox"/> | find the intercepts from the equation of a line |
| | view <input type="checkbox"/> | write the equation of a line given the gradient and a point on the line |
| | view <input type="checkbox"/> | write the equation of a line given two points on the line |
| | view <input type="checkbox"/> | sketch horizontal and vertical lines from equation |
| ACMNA294 - Find the midpoint and gradient of a line segment (interval) on the Cartesian plane using a range of strategies, including graphing software | view <input type="checkbox"/> | find the gradient of the line between two points |
| | view <input type="checkbox"/> | find the midpoint of an interval on a number plane |
| ACMNA296 - Sketch simple non-linear relations with and without the use of digital technologies | view <input type="checkbox"/> | complete a table and graph for a non-linear equation |

The administrator adds/deletes teachers and classes

Following school registration, students are subscribed to MATHTRAK by the school. There is no delay caused by waiting for MATHTRAK to add the students from your list; the administrator and teachers can add/delete individual students, or whole classes automatically via a spreadsheet.

The administrator has at his/her fingertips an overview of each student's progress on key concepts of the course, fluency with number facts and the problem solving tutorial.

The administrator can write surveys using Survey Maker that seek opinions and feedback from students and view a graphical summary of their responses.

MATHTRAK Teacher – Rich data informing excellence in teaching

The teacher moves students to or from their classes and edits student details on MATHTRAK.

The teacher assigns the current course and tests to their class.

The teacher posts messages to the class outlining deadlines, revision plans etc.

The teacher monitors each student's progress on the key concepts of the course, fluency with number facts and progress with the problem solving tutorial.

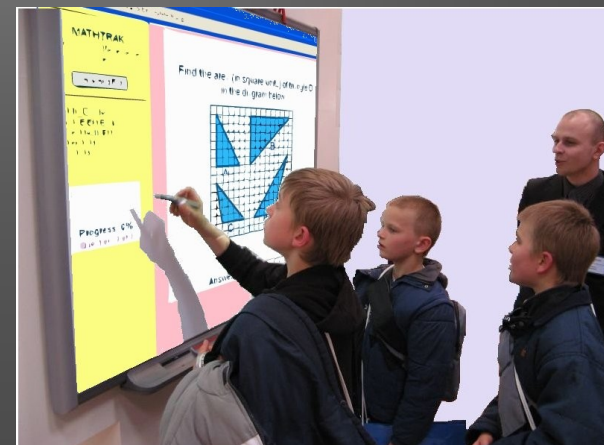
The teacher uses the results from MATHTRAK to modify classroom instruction.

The teacher can identify and mentor gifted students who have accepted the challenge of the Enrichment programme at MATHTRAK.

Parent-teacher interviews are greatly enhanced using the data that MATHTRAK provides on student progress, commitment and organisation.

The teacher assigns surveys and can view graphical summaries of student responses.

Using MATHTRAK's Report Writer teachers can write targeted report comments that are easily pasted into a school's reporting software.



The learner accesses MATHTRAK online (at school, home, anywhere with the appropriate technology) to:

- print out a copy of the coursework.
- complete tests.
- get immediate feedback on his/her performance on the tests.
- view and printout his/her progress on these tests.
- identify any strengths and weaknesses from these tests.
- obtain feedback about how to improve their test results.
- watch interactive lessons that teach step-by-step how to master each of the key concepts.
- practise and establish automaticity with essential number skills in a game environment.
- revise previously covered coursework.
- develop mathematical problem solving skills.
- continue with the mathematics course if away from school for a length of time (travel, sickness etc)



Rationale: Pretesting (using MATHTRAK) regularly identifies students (especially in the upper primary and lower secondary years) who appear to have considerable mastery of the content of the chapter before it is commenced. Research indicates that these students become disconnected from normal classroom instruction which is aimed at introducing and then consolidating knowledge that they have already mastered, to the point that they become bored and underachieve. Current Federal Government initiatives on Gifted and Talented Programmes (DEST Gifted Education Professional Development Package) recommend that schools can best cater for these students using a differentiated and compacted curriculum. MATHTRAK identifies such students (candidates) and provides a differentiated and compacted course that ensures that the student “touches base” with all required coursework and then in the remaining time in the course completes a structured Mathematics Independent Learning and Enrichment Programme (MILE) that is provided by MATHTRAK and the teacher.

What follows is one way in which such a programme can be designed and administered. The customisable resources referred to (profiles, certificates etc) are downloadable from MATHTRAK.

Stages in Enrichment:

1. Identification of likely candidates by pretesting using MATHTRAK (talented), and/or parent/teacher nomination (gifted but not yet talented?).

Anyone who achieves greater than 85% on the pretest can be invited to participate in MILE.

A permission letter can be sent home with each candidate outlining the MILE programme and inviting candidates and parents to sign the contract.

2. Compaction and Differentiation of curriculum for each candidate in MILE

MATHTRAK provides all students with a Work Register that outlines the required content from the text in the course.

MATHTRAK also provides a personalised Work Register (that compacts those key concepts that have been mastered) for any student who has achieved greater than 85% on the pretest.

3. Contracting the candidate.

Candidates can be provided with a Work Contract that outlines the conditions for their inclusion in MILE (such things as classroom etiquette, seeking help, keeping up with set revision, meeting deadlines, involvement in contests etc). This

MATHTRAK and the differentiated mathematics classroom

contract and other information can be kept by the candidate in a MILE folder, which acts as a journal of the candidate's engagement and progress.

4. Clustering the candidates (if possible) in the classroom.

If there is more than one candidate in a class they can be clustered at a convenient location in the class, preferably with access to at least one networked computer. It is recommended that the candidates always participate in the instruction phase of each lesson and return to MILE after completing the compacted work.

5. Monitoring of candidates within each class (teacher) and across the programme (coordinator)

The candidate's progress needs to be monitored to ensure that deadlines are met and that quality learning is happening. The programme works best with an Enrichment coordinator who designs and administers the programme in consultation with Mathematics staff. The classroom teacher is the mentor for their own cluster.

On acceptance to MILE, the candidate is provided with a Profile sheet for Stages 1 to 3, which indicates the required MILE coursework and the sequential tasks required for submission. As each task is submitted (with profile), the teacher reviews it and places a star (gold, silver or bronze) on the profile depending on the candidate's performance. Once a Stage has been completed, the candidate can be awarded (on Year Level Assembly) with a certificate and medal (gold, silver or bronze) depending on the stars awarded. The candidate may then undertake an investigative project negotiated with the teacher/coordinator.

6. Other Issues

Candidates sit the same assessment as the rest of the class and therefore should be included in any revision programme.

A candidate is not restricted to the Programme coursework in any one year. Once finished the MILE stage he/she may continue with an investigative project or even go on to the next stage.

It is a precondition of acceptance to the programme that the candidate is able to work independently in a self-regulated environment.

If a candidate demonstrates (disruptive behaviour, disengagement) that he/she is unable or unwilling to adhere to the set conditions in the contract, he/she may be removed from the programme and returned to regular instruction (after consultation with parents).

MATHTRAK – one school's approach

- All Junior Mathematics classes use MATHTRAK. The school adds each mathematics student and teacher to the secure MATHTRAK site.
- Classes with assigned teachers and courses are set up prior to the commencement of the teaching term. The first pretest (covering the whole term) is also designed for each course.
- Teachers assign the students to their MATHTRAK classes. The students then complete the **pretest**. Those (very few) students who do not have access to the internet outside school are allowed access to a school computer (in their own time) at some stage each week.
- From the pre-test any talented students are identified and an individually customised **compacted and differentiated** course (see above) is provided by MATHTRAK. Additionally, the results from MATHTRAK allow the teacher to see, in advance, which key concepts are going to cause students difficulty and to plan accordingly. Each lesson the teacher can 'touch base' with students who missed the key concepts in the pretest.
- If the results indicate that a student or students will struggle with this coursework a remedial group can be formed either in the class or (depending on number of students) as a separate class. These students can be given pre-tests designed to identify the prerequisite key concepts that need to be mastered before they can progress with the current course. The students are then given instruction on these specific key concepts.
- Each week students are given **revision tasks** to complete at MATHTRAK. The student is to attempt each completed key concept each week; usually by Tuesday (this gives those who have had technology problems at home a chance to complete that task at school on Monday). The weekly goal is to get each key concept green after three attempts to show that they have mastered the previously covered key concepts. By the end of term, before exams, all key concepts should be completed at least three times and green (scoring 100%). The students know that failure to complete the set tasks can result in an unfavourable comment about organisation, commitment, revision etc. on their report. Students can view interactive lessons on any key concepts that are causing concern. Each student's progress can be quickly monitored at MATHTRAK where the teacher can easily identify the number of attempts made (and views of lessons) for each key concept and the student's progressive success.
- Students know that success at MATHTRAK makes a significant contribution to their **assessment**. At the end of term, students sit a supervised online summative test at MATHTRAK based on a sample of the questions that they have been practising each week. They get immediate feedback for each question and get their final score before leaving the class (and the teacher does not need to mark any papers). The teacher can see, from the class' results, any key concepts that may need to be re-taught prior to the written exam.
- **Parents** use MATHTRAK to monitor their child's progress and to assist them with difficulties (supported by the lessons).
- MATHTRAK contributes detailed information to mid-term **parent-teacher interviews**. Each individual student's current progress can be shown to parents. Conversations become evidence-based and learner-focussed with MATHTRAK - at these interviews parents often discuss particular questions on MATHTRAK and how they helped their student to do them (or otherwise). With MATHTRAK many parents obtain a deeper understanding of their child's learning styles or difficulties making PT interviews much more informed and valuable.
- MATHTRAK is a very useful tool for **external tutors**, as it shows clearly what the required coursework is and shows the student's progress with the coursework - making for focussed tutoring sessions.
- During revision lessons prior to exams, MATHTRAK can **identify** those students having difficulty and the key concepts that may need revisiting. Teachers discuss each student's MATHTRAK progress in class throughout the course and certainly just prior to exams.
- Throughout the year students are encouraged to complete the appropriate year level set of the **Problem Solving tutorial**. The teacher can monitor each student's progress.
- Regularly throughout the year students play the **Invaders game** to ensure that they are fluent with their basic number facts. The teacher can monitor each student's progress.
- When required, teachers design a **survey** to gauge student perceptions about their progress. The teacher can monitor the class' response to assist with delivering effective instruction.
- At reporting time, the teacher can access MATHTRAK's **Report Writer tool** and the student progress data to write each student's report.