At Macquarie University the Mathematics Department has been developing\(^1\) a web-based system for producing quizzes which allow students to test their knowledge of mathematical ideas required in the courses that we teach. Currently these quizzes are used mainly at the most elementary level, for revision of the basic skills which the students should have acquired from mathematics courses at high school.

**Examples**

- **Basic Math Skills:** MATH130, examples
- **Discrete Math Quizzes, with answers:** MATH237

---

\(^1\)This project has received funding via a ‘Targeted Flagship Grant’ from the Center for Flexible Learning, Macquarie University, and the Division of Information and Communication Sciences, Macquarie University as well as an equipment grant from Apple Computer, Australia Pty Ltd, via the Apple Universities Consortium.
MATH130 Quizzes - DE1 2001

Assumed Knowledge Quizzes and Practice Quizzes

Quizzes require your web browser to have the Acrobat Reader software, version 4.0 or 4.05. **Version 5.0, does not support the quizzes**, so if you have installed this, then you should do the quizzes on campus (see below), rather than trying to reinstall an older version of Acrobat. Acrobat 4.05 can be downloaded for free from Adobe's site. Get the browser plug-in, and follow the instructions provided to install it.

**It is important to have the Acrobat Reader installed so that it runs inside the browser window.** If not, you may still be able to do the quiz, but your results will not be recorded - Acrobat needs the browser to do this. If a new window opens with the quiz in it, then Acrobat is not running inside your browser. Here are some instructions if you need them.

Note that this may require your computer to have a recent operating system; Win’95, Win’98, Windows NT (v.4) or later should be sufficient, or MacOS 7.6 or later for Macintosh systems. 16+ MByte RAM may be enough, but more is preferable.

You are required to complete the first three quizzes, getting full marks. You may try as many times as you like, the quiz will be different each time, and your results for each attempt will be recorded.

The Practice quizzes are not compulsory, but are recommended if you are having difficulty with the compulsory quizzes.

---

**Select a quiz.**

Enter your Student number, or other identifying string, then choose your quiz and hit the button:

**Student ID:** [ ]

**Name:** [ ]

**Compulsory Quizzes**
- [ ] Basic Skills Quiz 1
- [ ] Basic Skills Quiz 2
- [ ] Basic Skills Quiz 3

**Practice Quizzes**
- [ ] Fractions
- [ ] Manipulating Expressions
- [ ] Indices and Logarithms
- [ ] Geometry and Functions
The aim of the quizzes is not so much for assessment as for self-testing and practice of material covered previously in lectures or back at school.
The aim of the quizzes is not so much for assessment as for self-testing and practice of material covered previously in lectures or back at school. Why use quizzes?
The aim of the quizzes is not so much for assessment as for self-testing and practice of material covered previously in lectures or back at school. Why use quizzes?
For various practical reasons, related to the students …
Training not Testing

The aim of the quizzes is not so much for assessment as for self-testing and practice of material covered previously in lectures or back at school. Why use quizzes?
For various practical reasons, related to the students . . .

- wide range in ability and mathematical background;
The aim of the quizzes is not so much for assessment as for self-testing and practice of material covered previously in lectures or back at school. Why use quizzes?
For various practical reasons, related to the students …

- wide range in ability and mathematical background;
- not their main area of study, so need to identify holes in their mathematical knowledge;
The aim of the quizzes is not so much for assessment as for self-testing and practice of material covered previously in lectures or back at school. Why use quizzes?

For various practical reasons, related to the students …

- wide range in ability and mathematical background;
- not their main area of study, so need to identify holes in their mathematical knowledge;
- several years since last studied any mathematics;
The aim of the quizzes is not so much for assessment as for self-testing and practice of material covered previously in lectures or back at school. Why use quizzes?

For various practical reasons, related to the students . . .

- wide range in ability and mathematical background;
- not their main area of study, so need to identify holes in their mathematical knowledge;
- several years since last studied any mathematics;
- maybe only a refresher course may be needed;
The aim of the quizzes is not so much for assessment as for self-testing and practice of material covered previously in lectures or back at school. Why use quizzes?

For various practical reasons, related to the students . . .

- wide range in ability and mathematical background;
- not their main area of study, so need to identify holes in their mathematical knowledge;
- several years since last studied any mathematics;
- maybe only a refresher course may be needed;
- insufficient staff to help every student.
Training not Testing

The aim of the quizzes is not so much for assessment as for self-testing and practice of material covered previously in lectures or back at school. Why use quizzes?
For various practical reasons, related to the students …

- wide range in ability and mathematical background;
- not their main area of study, so need to identify holes in their mathematical knowledge;
- several years since last studied any mathematics;
- maybe only a refresher course may be needed;
- insufficient staff to help every student.

The quizzes can be used by students to identify for themselves where they are weak and may need to seek the extra help that can be provided.
When a student requests a quiz,
When a student requests a quiz, the identity is first validated; if authorized, a quiz is sent to the student’s browser.
When a student requests a quiz, the identity is first validated; if authorized, a quiz is sent to the student’s browser. A record is kept of all request details.
When a student requests a quiz, the identity is first validated; if authorized, a quiz is sent to the student’s browser. A record is kept of all request details.

After completing the quiz,
When a student requests a quiz, the identity is first validated; if authorized, a quiz is sent to the student’s browser. A record is kept of all request details.

After completing the quiz, submitted results are recorded in the student’s log and in the overall quiz log.
When a student requests a quiz, the identity is first validated; if authorized, a quiz is sent to the student’s browser. A record is kept of all request details.

After completing the quiz, submitted results are recorded in the student’s log and in the overall quiz log. A personalized message concerning the student’s progress is returned as FDF data.
When a student requests a quiz, the identity is first validated; if authorized, a quiz is sent to the student’s browser. A record is kept of all request details.

After completing the quiz, submitted results are recorded in the student’s log and in the overall quiz log. A personalized message concerning the student’s progress is returned as FDF data. This appears in a form field at the end of the PDF quiz document.
Sending a quiz to the student's browser
Student's browser + Acrobat

Student completes quiz (PDF and JavaScript)

Result submitted (URL-encoded)

Check if this version is already submitted

Yes

Record result in main log

Personalized result message (FDF)

Personalized warning message (FDF)

Request log

No

Record result in student's individual log

Recording results from a quiz
Each Quiz can be Different

An element of randomness can be used in the generation of a quiz document.
An element of randomness can be used in the generation of a quiz document.

- A student may attempt the ‘same’ quiz many times; each will be slightly different.
Each Quiz can be Different

An element of randomness can be used in the generation of a quiz document.

◦ A student may attempt the ‘same’ quiz many times; each will be slightly different.
◦ This is used to alter numerical aspects for each quiz instance.
An element of randomness can be used in the generation of a quiz document.

- A student may attempt the ‘same’ quiz many times; each will be slightly different.
- This is used to alter numerical aspects for each quiz instance.
- One way uses the *Mathematica*\(^2\) software [11] to generate the exact contents of each question and its worked solution.
An element of randomness can be used in the generation of a quiz document.

- A student may attempt the ‘same’ quiz many times; each will be slightly different.
- This is used to alter numerical aspects for each quiz instance.
- One way uses the Mathematica\textsuperscript{2} software \cite{11} to generate the exact contents of each question and its worked solution.
- Randomness applies to order of answer choices.

\textsuperscript{2}Mathematica is a trademark of Wolfram Research Limited.\cite{11}
Each Quiz can be Different

An element of randomness can be used in the generation of a quiz document.

- A student may attempt the ‘same’ quiz many times; each will be slightly different.
- This is used to alter numerical aspects for each quiz instance.
- One way uses the *Mathematica*\(^2\) software [11] to generate the exact contents of each question and its worked solution.
- Randomness applies to order of answer choices.
- Repeat the same quiz as many times as necessary, to achieve a 100% score.

\(^2\) *Mathematica* is a trademark of Wolfram Research Limited.[11]
An element of randomness can be used in the generation of a quiz document.

- A student may attempt the ‘same’ quiz many times; each will be slightly different.
- This is used to alter numerical aspects for each quiz instance.
- One way uses the Mathematica\textsuperscript{2} software [11] to generate the exact contents of each question and its worked solution.
- Randomness applies to order of answer choices.
- Repeat the same quiz as many times as necessary, to achieve a 100% score.
- Students cannot ‘cheat’ by presuming, for example, that the correct answer to question 5 will always be ‘b’.

\textsuperscript{2}Mathematica is a trademark of Wolfram Research Limited.[11]
Student log-file pages are also accessible from the staff/instructor interface page.

This page allows access to:
Evaluating Student Progress

Student log-file pages are also accessible from the staff/instructor interface page.

This page allows access to:

- **log-files for the available quizzes**;
Student log-file pages are also accessible from the staff/instructor interface page.

This page allows access to:

- log-files for the available quizzes;
- log-files for individual students;
Evaluating Student Progress

Student log-file pages are also accessible from the staff/instructor interface page.

This page allows access to:

- log-files for the available quizzes;
- log-files for individual students;
- statistical information for a whole class of students;
Evaluating Student Progress

Student log-file pages are also accessible from the staff/instructor interface page.

This page allows access to:

- log-files for the available quizzes;
- log-files for individual students;
- statistical information for a whole class of students;
- as formatted HTML tables or raw text form.
Student logs

When a student requests a quiz, the request is recorded in a number of log files, including one for that student. When the student completes the quiz and submits the result, this is also recorded in these logs.

Sometimes things go wrong with the connection, the browser or acrobat, and the results don't come back to the server. In this case only the request can be recorded, but no results.

You can look at a student's individual results, in a nice table or as a raw log file. You can also look at a nice table of collated results for the class, showing which students have attempted the quizzes, which ones they have got full marks for and the number of attempts for each quiz.

Other logs you might want to look at for maintenance purposes, or just for sticky-beaking, include the logs for each quiz, the bad logins (from unauthorized users) and the main activity log (big!!)

---

**Student logs**

Student number: [enter student number]

- Student's quiz results
- Student's full log file

---

**Class logs**

- Class summary - successes, attempts, download attempts, average tries etc
- Class results - each student's success and number of attempts
- Downloads - lists all students who have downloaded a quiz

- MATH130Fran27340
- MATH130Fran7257
- MATH130practice1
- MATH130practice2
- MATH130practice3
- MATH130practice4
- MATH130quiz1
- MATH130quiz2
- MATH130quiz3
Viewing quiz logs and student logs

Script for viewing logs (PERL)
Directory structure of MacQTEX quiz system
All management aspects of the MacQTEX quiz system are handled from the staff/instructor interface page. This page provides access to allow the following tasks:

- design a new Quiz
- edit/modify an existing Quiz
- recover already used Quiz instances
- view student log-files
- make a login page for student access
- general house-keeping duties
Overview of MacQTEX quiz building system
Also accessible from the staff/instructor interface page is the interface for creating new quizzes.
Designing a Quiz

Also accessible from the staff/instructor interface page is the interface for creating new quizzes.

- choose up to 12 questions for a quiz;
Designing a Quiz

Also accessible from the staff/instructor interface page is the interface for creating new quizzes.

- choose up to 12 questions for a quiz;
- from 14 areas of basic mathematics;
Designing a Quiz

Also accessible from the staff/instructor interface page is the interface for creating new quizzes.

- choose up to 12 questions for a quiz;
- from 14 areas of basic mathematics;
- up to 6 types of question in each area;
Also accessible from the staff/instructor interface page is the interface for creating new quizzes.

- choose up to 12 questions for a quiz;
- from 14 areas of basic mathematics;
- up to 6 types of question in each area;
- use pop-ups and text-fields to make choices;
Designing a Quiz

Also accessible from the staff/instructor interface page is the interface for creating new quizzes.

- choose up to 12 questions for a quiz;
- from 14 areas of basic mathematics;
- up to 6 types of question in each area;
- use pop-ups and text-fields to make choices;
- can choose all questions from the same area;
Designing a Quiz

Also accessible from the staff/instructor interface page is the interface for creating new quizzes.

- choose up to 12 questions for a quiz;
- from 14 areas of basic mathematics;
- up to 6 types of question in each area;
- use pop-ups and text-fields to make choices;
- can choose all questions from the same area;

This is only the first step in the process of creating quiz instances to be available for student use. All the files resulting from these choices may be edited.
Staff Login

Choose a task
- Make a new quiz
- Edit an existing quiz
- Recreate a used quiz
- Create login page
- View student logs
- Clean up directories

Look at these
- Question catalogue
- Sample student login

Choose a task

Choose the questions
- A standard quiz

<table>
<thead>
<tr>
<th>Question</th>
<th>Topic</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>absolute value</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>equation solving</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>factorization</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>fractions</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>functions</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>geometry</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>indices</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>inequalities</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>lines</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>logs</td>
<td>1</td>
</tr>
</tbody>
</table>
Quiz creating script (PERL)

Create quiz directories

Mathematica file

Construct LATEX sources

Select Mathematica sources

Mathematica file

Link to question sources (LATEX)

Create quiz directories

Copy quiz directories

Move logs

Copy

Hand edit LATEX sources

If new or changed

Bad questions

Error message (HTML)

Generate 50 quizzes

Wrong

Display sample quiz (PDF)

OK

Names of existing quizzes

Invalid

Warning message (HTML)

New

Edit and reset logs

Copy

Quiz title, topic file name

New? Edit?

Reset logs?

Edit copy?

Question choices

Validate user

Invalid

Login

HTML form

Designing or editing a quiz
Generating new quizzes
To facilitate managing the quiz system other available options are:
To facilitate managing the quiz system other available options are:

- recreate an old quiz instance from its numerical identifier;
Other Features

To facilitate managing the quiz system other available options are:

- **recreate an old quiz instance from its numerical identifier;** instructor may recover the exact questions that confronted a student who is seeking further help.
To facilitate managing the quiz system other available options are:

- **recreate an old quiz instance from its numerical identifier;** instructor may recover the exact questions that confronted a student who is seeking further help.

- **existing quizzes may be edited for:**
To facilitate managing the quiz system other available options are:

- **recreate an old quiz instance from its numerical identifier;** instructor may recover the exact questions that confronted a student who is seeking further help.

- **existing quizzes may be edited for:** titles, instructions, page-layout, fix errors, change order of questions or answers, etc.
Other Features

To facilitate managing the quiz system other available options are:

- **recreate an old quiz instance from its numerical identifier;** instructor may recover the exact questions that confronted a student who is seeking further help.
- **existing quizzes may be edited for:** titles, instructions, page-layout, fix errors, change order of questions or answers, etc.
- **automatically designs a student log-in page;**
To facilitate managing the quiz system other available options are:

- **recreate an old quiz instance from its numerical identifier;** instructor may recover the exact questions that confronted a student who is seeking further help.

- **existing quizzes may be edited for:** titles, instructions, page-layout, fix errors, change order of questions or answers, etc.

- **automatically designs a student log-in page;**

- **reset log-files and counters, to reuse the same quiz;**
Other Features

To facilitate managing the quiz system other available options are:

- **recreate an old quiz instance from its numerical identifier;** instructor may recover the exact questions that confronted a student who is seeking further help.

- **existing quizzes may be edited for:** titles, instructions, page-layout, fix errors, change order of questions or answers, etc.

- **automatically designs a student log-in page;**

- **reset log-files and counters, to reuse the same quiz;**

- **archive or remove old log-files;**
Other Features

To facilitate managing the quiz system other available options are:

- **recreate an old quiz instance from its numerical identifier;** instructor may recover the exact questions that confronted a student who is seeking further help.
- **existing quizzes may be edited for:** titles, instructions, page-layout, fix errors, change order of questions or answers, etc.

- automatically designs a student log-in page;
- reset log-files and counters, to reuse the same quiz;
- archive or remove old log-files;
- remove unwanted archives.
Recreate a used quiz

Script for rebuilding used quiz (PERL)

Display form (HTML)

Student ID

Name of quiz

Version number (random seed)

Check student downloaded this version

Generate quiz (PDF)

Display quiz
Making the student login page

Script for writing student login page (PERL)

Display form (HTML)

Compulsory?

Practice?

Order for quizzes

Name of quiz on page

Heading text

Intro text

Extra text

File name

Hand edit, store in local directory

Login page (HTML + JavaScript)

Page template (HTML + JavaScript)
House-keeping tasks

Display form (HTML) → Validate user → OK → Log choices

Delete old logs
Remove old log archives
Delete entire quiz directory
Remove all quiz files
Archive logs
Copy logs
Remove quiz files
Reset logs
Reset logs and quiz counters
Delete obsolete quizzes
Delete obsolete quizzes with lower numbers
Number of last quiz used


[6] Hàn, Thê Thành; pdf-TEX, free software for generating documents in PDF format, based on the \TeX\ typesetting system. Available for all computing platforms; see http://www.tug.org/applications/pdftex/.

[7] Lamport, Leslie; \LaTeX, a Document Preparation System. This is free software available for all computing platforms. Consult the \TeX\ User’s Group (TUG) website, at http://www.tug.org/.


[9] Story, Donald; exerquiz & Acro\TeX, packages for including special effects in PDF documents, using \TeX\ and \LaTeX. Dept. of Mathematics and Computer Science, University of Akron. Software available online from http://www.math.uakron.edu/~dpstory/webeq.html.

Overview of the system

- **Student Interaction**
  - Sending a quiz to the student’s browser
  - Recording results from a quiz
  - Viewing quiz logs and student logs

- **Quiz Management**
  - Overview of the MacQTEX system
  - Directory structure of the MacQTEX system

- **Designing a Quiz**
  - Designing or editing a quiz
  - Generating new quizzes

- **Other Features**
  - Recreate a used quiz
  - Making the student login page
  - House-keeping tasks