QCM – A \LaTeX{} package for making Multiple Choices Questionnaires

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November 27, 2004

Abstract

QCM is a package for making multiple choices questionnaires (“QCM” is the corresponding French acronym) under \LaTeX{}. A special environment allows you to define questions and possible answers. You can specify which answers are correct and which are not. QCM not only formats the questions for you, but also generates a “form” (a grid that your students will have to fill in), and a “mask” (the same grid, only with correct answers properly checked in). You can then print the mask on a slide and correct the questionnaires more easily by superimposing the mask on top of students’ forms.

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1 Using QCM (attention users of version 1)

As of version 2.0, QCM comes both in style and class form. The style provides all the basic features: making questions, generating the form and the mask... You can use it with any class you want, which is useful when you want to incorporate multiple choice questions in a larger document (a full exam for instance).

If you want to make simple multiple choice questionnaires, with just a list of questions, you can alternately use the class which provides some basic formatting on top of the style itself.

2 The QCM Style

First of all, please note that QCM requires the packages \texttt{ifthen}, \texttt{calc} and \texttt{tabularx}. As of version 2.1, the \texttt{verbatim} package is also required. You don’t have to require these packages explicitly though. As long as \LaTeX{} is able to locate them, they will be used automatically.

In order to use the QCM style, say \texttt{\usepackage[(options)]{qcm}} in the preamble of your document. The available options are described along the text, where appropriate.

*This document describes QCM v2.1, class release date 2004/11/27, style release date 2004/11/27.
2.1 Creating Questions

Here’s a simple example demonstrating how to produce a new question:

\begin{question}{What is the color of Henri the Fourth’s white horse?}
\false black,
\true white,
\false yellow,
\false red.
\end{question}

The correct answer is white, because it’s in the question.

2.1.1 The question environment

The question environment allows you to insert questions into your document. It takes one mandatory argument which specifies the actual question’s text. The question will be displayed in a frame box, the size of the line.

The proposed answers are displayed below the question in a list fashion (the question environment is a list-based one). Instead of using \item however, use either \true or \false to insert a possible answer.

2.1.2 Question Numbers

The question environment is associated with a \LaTeX{} counter named question. This counter stores the number of the next (or current) question. It is initialized to 1, and automatically incremented at the end of question environments. You might want to use it to format question titles. For instance, you could decide that each question belongs to a subsection in the article class, and use something like this before each question: \subsection*{Question \thequestion}

2.2 The Form and the Mask

Based on the questions appearing in your document, QCM has the ability to generate a “form” (a grid that your students will have to fill in), and a “mask” (the same grid, only with correct answers properly checked in). This can make the correction process easier.

To generate a form and a mask, use the macros \makeform and \makemask.

QCM uses two auxiliary files to build them. These files have respectively an extension of frm and msk. If you use these macros, you will need two passes of \LaTeX{} in order to get a correctly formatted document.

2.3 Typesetting corrections

As of version 2.1, QCM comes with a “correction” mode which allows you to automatically typeset and distribute corrections to your students. These corrections are slightly modified versions of your questionnaire: each possible answer is prefixed with a small symbol (a visual clue) indicating whether the answer was correct or wrong. In addition, you can typeset explanations below each question.
To activate the correction mode, use the `correction` option. It is off by default.

To typeset explanations below the questions, use the `correction` environment (no argument). The contents of this environment is displayed only in `correction` mode. In normal mode, it is simply discarded.

In addition, note that QCM cancels the actions performed by `\makeform` and `\makemask` in `correction` mode. This is to avoid further edition of the source when typesetting a correction.

### 2.4 Important Note

Currently, QCM requires that you provide a constant number of proposed answers across all questions in your QCM. This is something natural when you want to build forms, but this might me too restrictive otherwise, I’m not sure, so it is possible that this restriction will be removed in future versions.

Currently, there is a built-in mechanism for checking that the number of proposed answers remains constant: when QCM encounters the first occurrence of the `question` environment, it remembers the number of proposed answers from there. Afterwards, any noticed difference in subsequent occurrences will generate an error. As a consequence, you never have to tell QCM explicitly what that number is.

### 2.5 Customizing the QCM style

#### 2.5.1 The question environment

- `\questionspace` is the amount of extra vertical space to put under the question, before the list of proposed answers. This is a \LaTeX length that defaults to 0pt.
- `\answerstitlefont` Before the list of possible answers, a short title is displayed (for English, it reads “Possible answers:”). The `\answerstitlefont` macro takes one mandatory argument which redefines the font to use for the answers title. By default, `\bfseries` is used.
- `\answernumberfont` Each proposed answer in the list is numbered automatically (and alphabetically). The `\answernumberfont` macro takes one mandatory argument which redefines the font to use for displaying the answer number. By default, `\bfseries` is used.

#### 2.5.2 The Form and the Mask

- `\headerfont` The `\headerfont` macro takes one mandatory argument which redefines the font to use for the headers (first line and first column) of the form and mask arrays. By default, `\bfseries` is used.
- `\X` In the mask, correct answers are checked in by filling the corresponding cell with an “X” character. If you want to change this, call the `\X` macro with one (mandatory) argument.

#### 2.5.3 The correction

- `\truesymbol` In correction mode, labels in front of answers are modified to give a visual clue about whether the answer was correct or wrong. By default, a cross and a small arrow are used. You can change these symbols by using the `\truesymbol` and
\falsesymbol macros. For instance, you could give a fancier look to your correction by using the \pifont package and issuing:

\trueSymbol{\ding{063}~}
\trueSymbol{\ding{067}~}

The appearance of the contents of the \correction environment can be adjusted by using the \correctionstyle macro. By default, \itshape is used.

2.5.4 Internationalization

QCM currently supports English, and French. You can select the language you want to use by using the corresponding option. The \french and \francais options are synonyms. If you want a finer grain on the language-dependent parts of QCM, the following macros are provided.

This macro takes one mandatory argument which lets you redefine the answers’ titles. For English, the answers title defaults to “Possible answers:”.

3 The QCM Class

The QCM class provides a wrapper around the style to allow you to format simple multiple choice questionnaires, with just a list of questions.

In order to use the QCM class, say \documentclass[\options]{qcm} at the beginning of your document. The available options are described along the text, where appropriate. Note that the underlying QCM style is loaded automatically.

3.1 Standard Class Features

3.2 Page Size and layout

The \a4paper, \a5paper, \b4paper, \letterpaper, \legalpaper, \executivepaper, \landscape, \oneside and \twoside options allow you to select the type of page format you want. By default, \letterpaper is used. The \landscape options switches the horizontal and vertical settings. I’m not sure why I propose this option. Nobody wants to write a QCM in landscape mode, right?

QCM also supports the standard \oneside and \twoside class options. By default, \oneside is used. In \twoside mode, odd and even pages have a different geometry and headings layout.

3.3 Font Size

The 10pt, 11pt and 12pt options let you choose the size of the default font you want to use. By default, 10pt is used.

3.4 Output Mode

In \draft mode, a black rule will be drawn at the end of overfull lines (as done by standard classes).
3.5 Page styles

QCM supports the standard \LaTeX{} page style mechanism. Available styles are \texttt{empty}, \texttt{plain}, \texttt{headings} and \texttt{myheadings}. These styles have their usual meaning, except that there are no sectioning commands in the QCM class. By default, the page style is \texttt{plain}. Also, note that the form and the mask have an empty page style, whatever the setting for the rest of the document.

3.6 Title

\texttt{\title} The \texttt{\title} macro takes one mandatory argument which defines a title for your questionnaire (repeated on the form and the mask). It can be used in the document's preamble only. The title will be centered on the page.

\texttt{\titlefont} The \texttt{\titlefont} macro takes one mandatory argument which redefines the font to use for the title. By default, \texttt{\LARGE\bfseries} is used.

\texttt{\titlespace} \texttt{\titlespace} is the amount of extra vertical space to put after the title. This is a \LaTeX{} length that defaults to \texttt{20pt}.

\texttt{\maketitle} If you have defined a title, make it appear by calling \texttt{\maketitle} after the beginning of your document. If you call \texttt{\maketitle} without having defined a title, an error will be generated.

3.7 Modifications to the question environment

The QCM class modifies the \texttt{question} environment so as to display a title before each question (something that you would probably do with a sectioning command in other classes). This title is displayed in a frame box, the size of a quarter of the line. For English, the default reads “Question n.\texttt{(X)}:”.

3.8 Modifications to \texttt{\makeform} and \texttt{\makemask}

The QCM class modifies \texttt{\makeform} and \texttt{\makemask} along the following lines: each grid is printed on a page of its own, and the document’s title is repeated on top of each. Also, the page style is set to \texttt{empty}.

3.9 Customizing the QCM class

3.9.1 The question titles

\texttt{\questiontitlefont} The \texttt{\questiontitlefont} macro takes one mandatory argument which redefines the font to use for each question title. By default, \texttt{\bfseries} is used.

\texttt{\questiontitlespace} \texttt{\questiontitlespace} is the amount of extra vertical space to put after the question title (and before the questions’ text). This is a \LaTeX{} length that defaults to \texttt{5pt}.

\texttt{\questionsepspace} In addition, questions are separated from each other by some vertical space. \texttt{\questionsepspace} is the amount of extra vertical space to put between each question block. This is a \LaTeX{} length that defaults to \texttt{20pt}.

3.9.2 Internationalization

\texttt{english} QCM currently supports English, and French. You can select the language you want to use by using the corresponding option. The \texttt{french} and \texttt{francais} options
are synonyms. If you want a finer grain on the language-dependent parts of QCM, the following macros are provided.

This macro takes one mandatory argument which lets you redefine the questions’ titles. For English, the question title defaults to “Question N.\thequestion:”.

4 AUC-TEX support

AUC-TEX is a powerful major mode for editing \TeX{} documents in Emacs or XEmacs. In particular, it provides automatic completion of macro names once they are known. QCM supports AUC-TEX by providing a style file named qcm.el which contains AUC-TEX definitions for the relevant macros. This file should be installed to a location where AUC-TEX can find it (usually in a subdirectory of your \TeX{} styles directory). Please refer to the AUC-TEX documentation for more information on this.

For people already knowing AUC-TEX: note that the AUC-TEX command \LaTeX-insert-item (usually bound to M-Ret) inserts \false by default in a QCM, since it replaces \item. If you want to insert a \true, use a prefix.

5 Style Code

```latex
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{qcm}[2004/11/27 v2.1]
\PackageWarning{}{Multiple Choice Questionnaire style for \LaTeX{}2e}
\RequirePackage{ifthen}
\RequirePackage{calc}
\RequirePackage{verbatim}
\RequirePackage{tabularx}

5.1 The Form and Mask

Here are the customization parameters:
\def\@headerfont{\bfseries}
\newcommand\headerfont[1]{\gdef\@headerfont{#1}}
\def\@X{X}
\newcommand\X[1]{\gdef\@X{#1}}
\renewcommand\X[1]{\gdef\@X{#1}}
\renewcommand\tabularxcolumn[1]{m{#1}}
\newcommand\makeform@nocorrection{\addtocontents{frm}{\protect\end{tabularx}}
\newcommand\makeform@nocorrection{%
\newcommand\makeform@nocorrection{%
\addtocontents{frm}{\protect\end{tabularx}}
```

6
5.2 The question Environment

Here are the customization parameters:

\newlength\questionspace
\setlength\questionspace{0pt}
\newcommand\answerstitle[1]{\gdef\@answerstitle{#1}}
\def\@answerstitlefont{\bfseries}
\newcommand\answerstitlefont[1]{\gdef\@answerstitlefont{#1}}
\def\@answernumberfont{\bfseries}
\newcommand\answernumberfont[1]{\gdef\@answernumberfont{#1}}

The question counter starts at one, and is incremented at the end of each question.
\newcounter{question}\stepcounter{question}
\newcounter{@choice}

The macro \@initorcheck is called at the end of each question. After the first one, it initializes the number of proposed answers (this must be constant across all questions). This is used to build the form and mask arrays description lines, and initialize the auxiliary files. Afterwards, it redefines itself so that subsequent calls will just check that the number of answers remains the same across all questions.
\def\@initorcheck{%
\xdef\@choices{\the@choice}%
\setcounter{@choice}{1}%
\gdef\@arraydesc{|Q||}%
\gdef\@headerline{}%
\whiledo{\not{\value{@choice}=@choices}}{{
\xdef\@arraydesc{\@arraydesc D|}
\def\@appendheader{\g@addto@macro@\headerline}
\@appendheader{&\protect\@headerfont}
\edef\@the@choice{\alph{@choice}}
\expandafter\@appendheader\@the@choice
\stepcounter{@choice}}%
\addtocontents{frm}{%
\protect\begin{tabularx}{\protect\linewidth}{\@arraydesc}
\protect\hline
\@headerline\protect\hline\protect\hline}%
\addtocontents{msk}{%
}}

\@starttoc{frm}}
\newcommand\makeform@correction{%
\addtocontents{frm}{\protect\end{tabularx}}}
\newcommand\makemask@nocorrection{%
\addtocontents{msk}{\protect\end{tabularx}}}
\newcommand\makemask@correction{%
\addtocontents{msk}{\protect\end{tabularx}}}
\@starttoc{msk}
A minipage environment is used in order to prevent page breaks in the middle of a question.

\begin{question}
    Each line in the form and mask arrays is stored in the macros \@formanswerline
    and \@maskanswerline. They are initialized here, updated progressively by each call to \true or \false, ...
    \xdef\@formanswerline{\@questionheader}\%
    \xdef\@maskanswerline{\@questionheader}\%
    \fbox{\parbox[c]{\linewidth}{#1}}\vspace{\questionspace}\par
    \begin{list}{\@answernumberfont\alph{@choice}.~}{\usecounter{@choice}}\%
    \end{question}

...and added to the form and mask auxiliary files here:

\addtocontents{frm}{\@formanswerline\protect\hline\protect\hline}%
\addtocontents{msk}{\@maskanswerline\protect\hline\protect\hline}%
\end{minipage}%
\stepcounter{question}
5.3 The correction environment

Here, we only define the visible version of the correction environment. The other one is provided by verbatim’s comment environment.

\def\@correctionstyle{\itshape}
\newcommand\correctionstyle[1]{\gdef\@correctionstyle{#1}}
\newenvironment{@correction}{\@correctionstyle}{}

5.4 Internationalization

\DeclareOption{english}{% 
  \def\@questionheader{Question n.\thequestion} 
  \answerstitle{Possible answers:}}
\DeclareOption{french}{% 
  \def\@questionheader{Question n$^o$~\thequestion} 
  \answerstitle{Réponses possibles~:}}
\DeclareOption{francais}{% 
  \ExecuteOptions{french}}
\ExecuteOptions{english,nocorrection}
\ProcessOptions

5.5 Options Processing

Note that we don’t use \let but \def to implement the correct behavior of \makeform and \makemask. This is because when using the class, the underlying macros might be redefined, so we want to use their latest definition.

\DeclareOption{nocorrection}{% 
  \let\@true\@true@nocorrection 
  \let\@false\@false@nocorrection 
  \let\correction\comment 
  \let\endcorrection\endcomment 
  \def\makeform{\makeform@nocorrection} 
  \def\makemask{\makemask@nocorrection}}
\DeclareOption{correction}{% 
  \let\@true\@true@correction 
  \let\@false\@false@correction 
  \let\correction\@correction 
  \let\endcorrection\end@correction 
  \def\makeform{\makeform@correction} 
  \def\makemask{\makemask@correction}}
\ExecuteOptions{english,nocorrection}
\ProcessOptions

6 Class Code

\NeedsTeXFormat{LaTeX2e}
\ProvidesClass{qcm}[2004/11/27 v2.1]

Multiple Choice Questionnaire class for LaTeX2e]
\RequirePackage{qcm}[2004/11/09]

6.1 The Title

\def\@titlefont{\LARGE\bfseries}
\newcommand\titlefont[1]{\gdef\@titlefont{#1}}
\@onlypreamble\titlefont
\newlength\titlespace
\setlength\titlespace{20pt}
\@onlypreamble\title
\maketitle
informs QCM that the title should be repeated on the form and mask pages by defining \maketitle.
\def\@make@title{\begin{center}\@titlefont\@title\end{center}\vspace\titlespace}
\let\@maketitle\empty
\newcommand\maketitle{\@make@title\let\@maketitle\@make@title}

6.2 The Form and Mask

The qcm style \makeform and \makemask macros are saved and wrapped into new ones that first repeat the document’s title on a new page. The page style is also set to empty.

For a reason I don’t recall anymore, \addtocontents fails to write anything in the auxiliary files when nothing has been written on the page yet. To cope with this problem, we restate the title first.
\let\old@makeform@nocorrection\makeform@nocorrection
\def\makeform@nocorrection{%
\newpage
\@maketitle
\thispagestyle{empty}
\old@makeform@nocorrection}
\let\old@makemask@nocorrection\makemask@nocorrection
\def\makemask@nocorrection{%
\newpage
\@makemask\@maketitle
\thispagestyle{empty}
\old@makemask@nocorrection}

6.3 The question Environment

\newcommand\questiontitle[1]{\gdef\@questiontitle{#1}}
The real space used is \@questionsepspace. It is initially set to 0 to prevent extra space from appearing before the first question. It is redefined to the real value at the end of the question environment.

The qcm style question environment is saved and wrapped into a new one that outputs a question title.

6.4 Language Processing

6.5 Standard Class Processing
Well, I think that’s it. Enjoy using QCM!