Notes for exam question authors

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The full documentation for the `exam-n` document class is in the file `exam-n.pdf`, but some of this is quite detailed, and addressed to the exams convener, who has to assemble the overall exam. This document is a compact account of how to use the exams class as a question author.

You can find updated versions of the `exam-n` document class, and the complete documentation, at `http://purl.org/nxg/dist/exam-n`.

Template

```
\documentclass[compose,siunitx]{exam-n}
\begin{document}
\begin{question}{20} \author{Frieda Bloggs}
\shout{Dummy question}
\part Show that, under the action of gravity alone, the scale size
of the Universe varies according to
\[
\ddot{R}=-\frac{4\pi G \rho_0}{3R^2}.
\]
Is $\ddot{R}=\Diffl*[2]{R}{t} > \SI{10}{\astronomicalunit. s^{-2}}$?
\partmarks*{4}
\begin{solution}
This can be solved by remembering the answer.
\end{solution}

\part Explain the nature of being.
\partmarks{16}
\begin{solution}
Om.
\end{solution}
\end{question}
\end{document}
```

Notice first that this is a standalone document – you can LaTeX it to produce a formatted exam paper, as long as you include the `[compose]` option in the document class line. This complete document can later be given to the exams convener, who can input it unchanged into the master file which pulls the various questions together. It follows from that that you should be hesitant about putting anything into the preamble other than `\usepackage` commands, and you should consult with the exams convener to ensure that such packages go into the master file, too. It's probably a safe bet that the 'graphicx' package will be included in the master file. If you want to include a `\newcommand`, or anything like that, it can be placed inside the `{question}` environment. For other customisations, negotiate with the exams convener.

The `{question}` environment contains (surprise) a question, broken into parts (a, b, c, ...) by `\part` commands, and with the distribution of marks within the question being indicated by `\partmarks{`*n*`}`; the class will check that the marks in `\partmarks` do add up to the question goal given as an argument in `\begin{question}{`*markgoal*`}`. Within the question there can be one or more `{solution}` environments, which are not displayed in the final version (obviously), but which do appear in draft modes. You'll most typically have a `\partmarks` macro and a `{solution}` environment for each `\part`, but they don't have to match up, and you can have the entire solution at the end if you prefer.

The `\partmarks` command will most typically go at the end of a paragraph, but it may also appear inside an equation (that is, in `\[...\]`; don't use `$$...$$`), inside one or other amsmath display environments, or in a list or other environment. If it appears inside an environment, the indicator will appear at the *end* of the environment, independent of where in the environment the command was typed (which implies that you can't have more than one inside an environment).

The starred version is similar, but budges its indicator upwards a little, and is a heuristic alternative which is useful in some cases *after* a list or display, or after a numbered equation, if the placement of the indicator is otherwise inaesthetic (if the style of the part-marks indicators happens to be such that the indicator may be mistaken for an equation number, then it would be wise to use either `\partmarks` or `\partmarks*` after the equation, instead). If you use `\partmarks*` within a display, you might be confronted by an error message, talking about `\eqno` in maths mode, which is even more incomprehensible than most LaTeX messages.

Note that `\partmarks` ends a paragraph (`\partmarks*` doesn't): this is probably good style, but if you insist on mid-paragraph marks, then a following `\noindent` will be useful. It's helpful to use `\partmarks` inside a `{solution}` to indicate the distribution of marks – this doesn't mess up the mark-totalling calculation.

You may optionally give a question number as an argument to the `{question}` environment: `\begin{question}[n]{`*markgoal*`}`. In `[compose]` mode, this simply sets the question number, but in the other modes, when the question file is included in a master file, this checks that the given number *n* is what would be assigned automatically, to help detect missing or out-of-order questions. If the question identifier is not

a number, such as 'D1', then you can provide that identifier here also, but in this case you must also set `\QuestionNumberChecksOff` in the question preamble.

The `\partmarks` command has an optional argument which indicates the category of the question, thus 'bookwork', 'unseen', and so on. If this is present – for example `\partmarks[bookwork]{5}` – then the category is included in the marks indicator. As you might hope, the `\partmarks*` command can take this optional argument also: `\partmarks*[bookwork]{5}`. This extra text will typically be only one or two words long, but if the text is much longer than that, it will be turned into a footnote.

One common exam or test question type is a multiple-choice question. This is indicated by a `\begin{mcq}` environment, which contains a textual question followed by a sequence of possible answers indicated by `\item`, including precisely one correct answer, indicated by `\answer` (this is of course formatted identically to the others, unless the `[showsolutions]` option is present). Before you can use the `{mcq}` environment, you must call `\multiplechoiceanswers{`*n*`}` to indicate how many options are required in each question. It's OK to have a `{solution}` within an `{mcq}` environment, perhaps to provide commentary on or explanation of the correct answer.

You can include a `{questiondata}` environment at (typically) the end of the question: this is intended for extra equations or constants which are useful for the examinee.

The `{figure}` and `{table}` environments act differently from the way they usually act in LaTeX: *'floats' don't float.* In each case, the content is forced to be always 'here', and in addition is also tied to the text which follows it, so that a page break will not occur immediately after a figure or table. There are *no* figure or float options permitted in this class's 'floating' environments (that is, option `[h]` is neither necessary nor permissible). If you need to tune the page breaking, then you should use `\goodbreak`, `\vspace` or, in extremis, `\newpage`. The `\caption{`*text*`}` command works as usual; the figure and table numbering sequences continue through the solutions, if they're shown, but this isn't expected to be a problem.

There is neither a `{figure*}` nor a `{table*}` environment, because this is a single-column class. Use the no-option unstarred versions instead.

Hints

Figures can be included with `\includegraphics` as usual, as long as the graphicx package has been included at the top of the master file. If you want to include complete pages from a PDF (most typically containing a scanned handwritten model answer), then you can do so by including the pdfpages package at the top of the file, and then `\includepdf[pages={-}]{`*filename*`}` inside a `{solution}` environment. The `pages={-}` option means that all pages from the file are inserted; you may wish to use `scale=0.8` to shrink the PDF; the option `pagecommand={\thispagestyle{fancy}}` will cause the other class apparatus, such as page numbers and headers, to be superimposed on the included pages. See the documentation of the pdfpages package for more information.

If you use `\label` within a `{question}` environment, that label will, as you might expect, refer to the question number.

Include marginal notes with `\comment{`*remark*`}` – these show up in drafting modes (`[draft]` and `[compose]`), but not in the final version. The `\author{`*name*`}` command is just a type of comment. If you need to make more noise, then `\shout{`*remark*`}` inserts a highlighted *remark* in the flow of text (so it can be used anywhere) and includes the remark in a prominent list of exclamations at the end of the document. Note that `\shout` text *appears in the `[final]` version*: it is to draw attention to problems (for example `\shout{`*solution wrong!*`}`) which must be resolved before the exam is presented to students.

At the bottom of each page, you see a faint identification code, such as 'QM/123-456'. This consists of an exam identifier, extracted from the exam preamble, plus a code which changes each time LaTeX is run, but which is otherwise meaningless. This helps you avoid collation accidents, and to distinguish between slightly different versions of the printed document.

Various convenience commands

Macro `\vec{`*v*`}` is redefined to give bold-font vectors rather than vectors with arrows, which is the (weird) LaTeX default – thus $\mathbf{v}$ rather than $\vec{v}$. This is intended to work for bold greek as well as roman, but it does so reliably only for the `[mtpro2]` and `[stix2]` options.

Macros `\dd` and `\ddd`: `\dd` is a roman d, as used for differentials; `\ddd` is the same with a preceding thinspace, as used within integrals; for example

```
\int f(x)\ddd x = \int f(x)\,\dd x
```
$$= \int f(x)\,\mathrm{d}x$$

You can typeset derivatives neatly:

`\Diffl{a}{b}`	$\dfrac{\mathrm{d}a}{\mathrm{d}b}$
`\Diffl[2]{a}{b}`	$\dfrac{\mathrm{d}^2a}{\mathrm{d}b^2}$
`\Diffl*{a}{b}`	$\mathrm{d}a/\mathrm{d}b$
`\Diffl*[2]{a}{b}`	$\mathrm{d}^2a/\mathrm{d}b^2$

The unstarred versions are for displayed equations, the starred ones for inline maths. There is analogous support for partial derivatives with `\Partial{`*a*`}{`*b*`}`.

You should generally type units, and numbers with units, using the siunitx package (use the `[siunitx]` `\documentclass` option).

However this package currently also supports a basic `\units` command, described here. This macro is very likely to be removed in a future version of this package. Macros `\units{`*expr*`}`, `\units*{`*expr*`}`: These typeset physical units in an upright shape, with tilde or dot acting as a separator between units. Since this is typeset in maths mode, all other spacing is ignored. For example, `$v=10\units{m.\mu s^{-1}}$` gives $v = 10\,\mathrm{m}\,\mu\mathrm{s}^{-1}$. The unstarred version includes some leading space; the starred version can be used when referring to the unit by itself, where it is not qualifying a number (eg labelling an axis with units `$B/\units*T$`, or B/T).

The command `\e` sets an upright 'e': `$\e^{i\pi} + 1 = 0$` produces $\mathrm{e}^{i\pi} + 1 = 0$. Other shortcuts may be available in customisations of this class.[1]

Note: π is set as an italic pi character, matching the LaTeX default. Since it's (usually) used as the circular constant, it should more properly be set upright, and you can get that using the `[uprightpi]` option. This option also defines a `\italicpi` command, for completeness. This option is at present implemented only for the `[mtpro2]` and `[stix2]` options.

Extra: Creating complete exams

As a question author, you are typically only concerned with one or two single questions, and that is why this brief guide concentrates exclusively on the `[compose]` mode. But you might be interested to see how your text appears in the final exam. A template master file is below. For more detail, see the complete documentation in `exam-n.pdf`.

```
\documentclass[siunitx]{exam-n}

\exambanner{Examination for the degree of Master of Examinations}
\universitycoursecode{EX-666}
\schoolcoursecode{Exams001}
\coursetitle{Advanced setting of exams}
\degreedescriptions{Examinations 3}

\examdate{2012 December 25}
\examtime{12:00 -- 23:00}
\rubric{Be creative, but not vindictive}

\numquestions{1}

\begin{document}
\maketitle

```

[1] The package used to support an `\au` macro, for astronomical unit, and `\lambdabar` for Compton wavelength, but these have since been removed. The former is available via siunitx.

```
\includequestion{template-question}

\end{document}
```

The `exam-n` class currently supports a sample class option `[myclass]`. This automatically includes a suitable constants sheet in the formatted paper.

On the following pages, you can see the result of LaTeXing the sample file on p.**??**, and of processing the master file above. As you can see, the `[compose]` mode by default shows solutions, and collects the `\shout{`*text*`}` remarks to the end. In the `[final]` mode (which is the default mode), solutions disappear, but the shouted-out alerts remain, just to make sure no-one can miss them.

SHOWING SOLUTIONS

Author: Frieda Bloggs

1 Dummy question

(a) Show that, under the action of gravity alone, the scale size of the Universe varies according to

$$\ddot{R} = -\frac{4\pi G\rho_0}{3R^2}.$$

[4]

Is $\ddot{R} = \mathrm{d}^2R/\mathrm{d}t^2 > 10\,\mathrm{au\,s^{-2}}$?

Solution: This can be solved by remembering the answer.

(b) Explain the nature of being. [16]

Solution: Om.

[**Total: 20 OK**]

NOTE: Dummy question

no logo available

2012 December 25
12:00 – 23:00

EXAMINATION FOR THE DEGREE OF MASTER OF EXAMINATIONS

Examinations 3

Exams001

[EX-666]

Advanced setting of exams

Be creative, but not vindictive

Answer each question in a separate booklet

Candidates are reminded that devices able to store or display text or images may not be used in examinations without prior arrangement.

Approximate marks are indicated in brackets as a guide for candidates.

1 Dummy question

(a) Show that, under the action of gravity alone, the scale size of the Universe varies according to

$$\ddot{R} = -\frac{4\pi G\rho_0}{3R^2}.$$

[4]

Is $\ddot{R} = \mathrm{d}^2R/\mathrm{d}t^2 > 10\,\mathrm{au\,s^{-2}}$?

(b) Explain the nature of being. **[16]**

[Total: 20]

End of Paper

NOTE: Dummy question