The ou-tma and ou-tma-sup Packages*

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Abstract

The ou-tma package provides macros and environments to assist in writing Tutor Marked Assessments (TMAs) for Open University courses. The companion file ou-tma-sup package provides a number of extra macros that may be useful for some modules.

Contents

*This document corresponds to ou-tma v1.21.2, dated 2025-10-28, and ou-tma-sup v0.12, dated 2025-10-28.

1 Introduction

The ou-tma package simplifies the creation of TMAs by providing an environment to encompass answers to questions commands to enumerate parts and subparts of those questions, and a set of macros facilitating mathematical entry based on the styles used by the Open University (OU).

2 Compiling and installing ou-tma

To compile the ou-tma package:

Enter ⇒ `pdflatex tma.ins`

To compile the ou-tma documentation:

Enter ⇒ `pdflatex ou-tma.dtx`

(several times)

Enter ⇒ `makeindex -s gglo.ist -o ou-tma.gls ou-tma.glo`

Enter ⇒ `makeindex -s gind.ist ou-tma`

Enter ⇒ `pdflatex ou-tma.dtx`

(several times)

The file `ou-tma.sty` should be placed in an appropriate location within the TEX directory structure. For example in a directory such as `tex/latex/tma`.

3 Usage

To use the ou-tma package, in its most basic form, it should be included in the preamble of your LATEX document:

```
\documentclass[a4paper,11pt]{article}
\usepackage{ou-tma}
⋮
\begin{document}
⋮
\end{document}
```

3.1 Options

A number of options are available to modify the results of using the ou-tma package. These should be included within the `\usepackage` declaration:

`\usepackage[`⟨*option,...*⟩`]{ou-tma}`

The following options are available:

`alph` (*Opt*) **`alph:`** (default) question numbering as 1(b)(iii);

`roman` (*Opt*) **`roman:`** varies question numbering to sequence used by M381 i.e. 1(ii)(c);

`cleveref` (*Opt*) **`cleveref:`** question numbering creates automatic referencing for use with cleveref package;

`pdfbookmark` (*Opt*) **`pdfbookmark:`** add PDF bookmarks for each question using hyperref package; and

`legacy` (*Opt*) **`legacy:`** enables old definitions of `\vec` and `\C` for backward compatibility.

3.2 Macros and environments

The ou-tma package provides several valuable macros and environments, most are documented here.

3.2.1 Document level commands

The document-level commands are intended for use within the document's preamble. They generally affect what appears on the title page and the headers/footers.

The most essential part of an assignment is to identify who it has been written by
\myname and what it has been written for. To this end, the `\myname` macro is used to specify your name: this should be your name as recorded with the University. As names are not unique, the OU allocates a Personal Identification Number (or PIN) as a
\mypin unique identifier for each student; this should be declared with the `\mypin` macro. It is formed by a letter, followed by seven digits—or six digits and a letter `X`. This is distinct from the OUCU, or OU Computer User identifier that is used to log in to the OU website. Once the personal identification has been done, the module being worked needs to be declared, the course code of your module should be given
\mycourse with the `\mycourse` macro and the number of the assignment using the `\mytma`
\mytma macro. Note that this is just the assignment number; there is no need to include the characters `TMA`. The final document level command is used if you wish to set a specific date that will be displayed on the compiled document title page; you may
\setdate use `\setdate`. This will override the default of using the compile date.

Example:

```
%    \myname{Anthony Neil Other}
%    \mypin{A1234567}
%    \mycourse{M101} % The original Maths introduction module
%    \mytma{02} % TMA02
%    \setdate{March 2025}
%
```

3.2.2 Question environment commands

These commands are the ones that, though few, comprise the bulk of the body of the TMA answer content of a paper.

`question` (*env.*) Within a TMA, each answer should be placeed in a `question` environment. The question number is printed across the left margin, preceded by the question string which defaults to 'Q' but may be redefined by use of the command
\setquestionstring `\setquestionstring[`⟨*alignment*⟩`]{`⟨*required question number introduction*⟩`}`. By setting *alignment* to '`l`' it is possible to left align the question string and number from the margin rather than into it, this is particularly useful for languages where the translation of 'Question' is long enough to disappear past the left hand edge of the page: the default is '`r`' for right aligned. The question number itself is automatically incremented unless one is specified in the optional parameter. Since

the question is presented as an environment, it may be convenient to place each question in a separate file to be included in the main paper.

\qpart Often questions are comprised of multiple parts, therefore, \qpart indicates the start of a question part. It will set the part identifier within the left-hand margin space. Normally, the parts are lettered as a, b, c... unless the option roman has been given to the ou-tma package when the parts are numbered as i, ii, iii... As with the actual questions, this is an auto-incrementing value unless an optional value is given. Note that the value should be numerical even if the parts are lettered or in Roman numerals. Each new question restarts the numbering at 1, which will be rendered as a or i as dictated by the options in effect.

\qsubpart There are frequent occasions that the parts of questions may be further divided into sub-parts; these may be declared using the \qsubpart macro. As with \qpart, this is set in the left margin and automatically incremented: an option to choose the sub-part number is also available. If a \qsubpart immediately follows a \qpart, both marginal markers will be set on the same line.

\qsubparte Infrequetly, there may arise the need for alternative questioning paths. This is most frequetly the case when there has been some form of practical that may not be feasible for all students to take part in. Under these circumstances questions get issued with tracking version, so there with be a question line '1' and a question line '2', to accomodate these the \qsubparte macro is made available. As with the standard \qsubpart macro, it may be followed by an optional number to restart the sequence, but it has, in addition, a required parameter to give the track number. *This is included in the ou-tma-sup package.*

Note that question is an environment to be used with the \begin ... \end structure, \qpart and \qsubpart are both macros that lay down titles in the margin and are designed to be used on a line on their own.

Example:

\begin{question}[⟨*question number*⟩]
⋮
\qpart[⟨*part number*⟩]
⋮
\qsubpart[⟨*sub-part number*⟩]
⋮
\qsubparte[⟨*sub-part number*⟩]{⟨*postfix track number*⟩}
⋮
\end{question}

3.2.3 Mathematical symbology

Various mathematical symbols and elements are defined for convenience, working from the normal suggested formats used within Open University courses. These

are mostly as proscribed by the various standards bodies too, for reference see "Quantities and units - Part 2: Mathematics" ISO 80000-2:2019*

These commands are created in such a manner that they will work correctly in both text and maths modes.

\dd \e \ii **Differential operators** The general advise for most OU modules is to use an upright letter 'd' when specifying differential variables, thus `\dd` is provided to allow simple accomodation of this. Similarly, Euler's number and the imaginary unit representation of $\sqrt{-1}$ are both usually given upright letters of 'e', (`\e`), and 'i', (`\ii`), respectively.

Remember that it is always the exception that proves the rule: follow the the module guidebook for the course being completed.

Example 1: Differential

Code:

```
In display mode, compare \dd\ with $d$:
\[
\frac{\dd^2 y}{\dd x^2} + x\frac{\dd y}{\dd x} + y = 2\sin(x)\\
\]
and in line mode $\e^{\ii x} = \cos(x) + \ii\sin(x)$
```

Result:

In display mode, compare d with d:

$$\frac{\mathrm{d}^2 y}{\mathrm{d}x^2} + x\frac{\mathrm{d}y}{\mathrm{d}x} + y = 2\sin(x)$$

and in line mode $\mathrm{e}^{\mathrm{i}x} = \cos(x) + \mathrm{i}\sin(x)$

Number sets Standard 'black-board' fonts are used to indicate a number of frequently designated groups of numbers.

\N `\N:` $\mathbb{N}$ represents all natural numbers;

\Z `\Z:` $\mathbb{Z}$ represents all integers;

\Q `\Q:` $\mathbb{Q}$ represents all rational numbers;

\R `\R:` $\mathbb{R}$ represents all real numbers; and

\Complex `\Complex:` $\mathbb{C}$ represents all complex numbers.

*Available from British Standards Online as BS EN ISO-2:2019 (ISBN 978 0 539 23108 3), The European Standards Agency and The International Standard Organisetion. All are purchasable publications.

Example 2: Number sets

Code:

```
The relationship between number sets:
\begin{itemize}
\item \N\ (Natural numbers) $\subseteq \Z$ (Integers);
      every natural number is also an integer.
\item \Z\ (Integers) $\subseteq \Q$ (Rational numbers);
      every integer is also a rational number.
\item \Q\ (Rational numbers) $\subseteq \R$ (Real
      numbers); every rational number is also a real
      number.
\item \Complex\ (Complex numbers) $\supseteq \R$ (Real
      number); complex numbers include real numbers as
      a subset, since they can be represented by
      $a+\ii b$ where $a$ and $b$ are real numbers.
\end{itemize}
```

Result:

The relationship between number sets:

- $\mathbb{N}$ (Natural numbers) $\subseteq$ $\mathbb{Z}$ (Integers); every natural number is also an integer.
- $\mathbb{Z}$ (Integers) $\subseteq$ $\mathbb{Q}$ (Rational numbers); every integer is also a rational number.
- $\mathbb{Q}$ (Rational numbers) $\subseteq$ $\mathbb{R}$ (Real numbers); every rational number is also a real number.
- $\mathbb{C}$ (Complex numbers) $\supseteq$ $\mathbb{R}$ (Real number); complex numbers include real numbers as a subset, since they can be represented by $a + ib$ where a and b are real numbers.

`\vect` `\ve` **Vector notation** Two different vector representations are typically used on OU modules, there is the two, or more, letter with an over arrow version given with `\vect`; and the emboldened upright letter version `\ve`—the latter is commonly handwritten as an underlined letter.

Example 3: Vectors

Code:

```
Given a point $A$ at the co-ordinate $(6, 3)$ and a
point $B$ at the co-ordinate $(-4, 8)$, the vector
$\vect{AB}$ has a gradient of $\frac{8-3}{-4-6} =
\frac{5}{-10} = -\frac{1}{2}$
The standard unit vectors are \ve{i} and \ve{j}.
They are usually at right angles to each other.
```

Result:

Given a point A at the co-ordinate $(6, 3)$ and a point B at the co-ordinate $(-4, 8)$, the vector $\overrightarrow{AB}$ has a gradient of $\frac{8-3}{-4-6} = \frac{5}{-10} = -\frac{1}{2}$ The standard unit vectors are $\mathbf{i}$ and $\mathbf{j}$. They are usually at right angles to each other.

\st \nd \rd \nth **Ordinal indicators** The use of ordinal indicators is not specific to OU modules, but frequently is a useful element that is just inconvenient to produce.

So the standard four English ordinals are provided `\st`, `\nd`, `\rd`, and `\nth`, e.g. 1^{st}, 2^{nd}, 3^{rd}, and 4^{th}.

Note that the last ordinal is `\nth` not `\th`, the latter produces a thorn character, þ, and that only works if you have other than the default 7-bit font encoding (OT1).

Combinatoral notations There are two combinatoral forms that are commonly used in OU modules, the combination selecting r out of a total of n items where order does not matter, and the permutations of r out of n items were order matters.

\comb `\comb: {⟨n⟩}{⟨r⟩}`. This is equivelent to

$$^{n}C_{r} = \frac{n!}{r!(n-r)!}$$

\perm `\perm: {⟨n⟩}{⟨r⟩}`. This is equivalent to

$$^{n}P_{r} = \frac{n!}{(n-r)!}$$

Mathematical operators Additional mathematical operators are defined, again for convenience of entry.

\re `\re:` $\mapsto \operatorname{Re}$

\im `\im:` $\mapsto \operatorname{Im}$

\Log `\Log:` $\mapsto \operatorname{Log}$

\Arg `\Arg:` $\mapsto \operatorname{Arg}$

\Wnd `\Wnd:` $\mapsto \operatorname{Wnd}$

\Res `\Res:` $\mapsto \operatorname{Res}$

\Ker `\Ker:` $\mapsto \operatorname{Ker}$

\Orb `\Orb:` $\mapsto \operatorname{Orb}$

\Stab `\Stab:` $\mapsto \operatorname{Stab}$

\Fix `\Fix:` $\mapsto \operatorname{Fix}$

Derivatives There are three derivative forms defined specifically for speeding calculas entry and accuracy. One used the dx form and two use the partial, ∂x, form.

\deriv `\deriv: {⟨y⟩}{⟨x⟩}` $\mapsto \frac{\mathrm{d}y}{\mathrm{d}x}$

\pderiv `\pderiv: {⟨y⟩}{⟨x⟩}` $\mapsto \frac{\partial y}{\partial x}$

\psderiv `\psderiv: {⟨y⟩}{⟨x⟩}{⟨z⟩}` $\mapsto \frac{\partial^2 y}{\partial x \partial z}$

Additional symbols A couple of additional symbols are available for use in different modules, or purely for convenience.

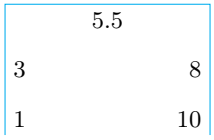
\rect **`\rect:`** `\rect`, $\square$, is defined particularly for the use of M208 people although others may find it useful.

\ld **`\ld:`** `\ld`, λ, is another useful definition for M208 student who may be taxed by the number of times they need to type, and then correct their spelling of, `\lambda`. The macro will work correctly in both text and maths mode. *This is an ou-tma-sup macro.*

\Pounds `\Pounds: {⟨value⟩}` `\Pounds` displays a Pound Sterling amount in the appropriate format with two decimal places (rounded as necessary). For example `\Pounds{2.56}` renders as £2.56. *This is an ou-tma-sup macro.*

Statistics devices A common device in statistics is the 'Five value statistic summary', it is communicated via a standardised graphic.

\FiveStats `[⟨n⟩]{⟨min⟩}{⟨max⟩}{⟨median⟩}{⟨Q1⟩}{⟨Q3⟩}` `\FiveStats` uses `TikZ` to draw the appropriate diagram. For example:
`\FiveStats[30]{1}{10}{5.5}{3}{8}` results in



The count of values, n, is optional. *This is part of the ou-tma-sup package.*

Legacy elements There are a couple of macros which become enabled when using the `legacy` option. These are now deprecated and may be removed from a future version. There are name clashes with standard LaTeX commands, so please be aware of this if used.

\C **`\C:`** is the original version of `\Complex`

\vec **`\vec:`** is the original version of `\vect`

4 Implementation of ou-tma

```
%% ou-tma.sty
%% Copyright 2025 G. I. Riley <geoffr@adaso.com>
%
% This work may be distributed and/or modified under the
% conditions of the LaTeX Project Public License, either version 1.3
% of this license or (at your option) any later version.
% The latest version of this license is in
%   http://www.latex-project.org/lppl.txt
% and version 1.3 or later is part of all distributions of LaTeX
% version 2005-12-01 or later.
```

```
%
% This work has the LPPL maintenance status 'maintained.'
%
% The Current Maintainer of this work is Geoff Riley.
%
%% This package may be freely used, especially by, but not limited to,
%% students, lecturers and staff of the Open University. It was created
%% by the efforts of many who are now or have been connected with the
%% Open University Students Association. No acknowledgement is
%% _required_ for using this package within the production of a _Tutor
%% Marked Assessment._
```

Adapted by Peter McFarlane from various sources. All errors of style or content are mine or subsequent contributors. Acknowledgements to Bob Margolis and Rob Lynas (from whom some macros are plagiarised). Further contributions from Steve Mayer and Tim Dale. Annotations, in part, and further modification by Geoff Riley.

Package Options

`\[alph]` (default) question numbering as 1(b)(iii)

`\[roman]` varies question numbering to sequence used by M381 i.e. 1(ii)(c)

`\[cleveref]` question numbering creates automatic referencing for use with cleveref package

`\[pdfbookmark]` add PDF bookmarks for each question using hyperref package

`\[legacy]` enables old definitions of `\vec` and `\C` for backward compatibility

To use a package option, place the option(s) before the package name:
`\usepackage[roman,cleveref]{ou-tma}`

Before getting into the main package, it is necessary to ensure that the LaTeX3 extensions are loaded. Most modern versions of the LaTeX core have this rolled in as standard, but as a belt and braces approach, inclusion here does no harm.

```
\RequirePackage{expl3} % LaTeX3 "experimental"
```

4.1 Package Initialisation

We are starting off using the `\ExplSyntaxOn` command to enable the LaTeX3 extensions before declaring a set of 'constants' that will be used by our package. Working with the established conventions the constants are declared as variables are named to reflect their ownership and function. These are all declared as 'token lists' so that they may, effectively, hold string elements. Make the underscore character a letter!

`g_tma_constant_name` (*Var*) `g_tma_constant_name:` holds the students personal name

`g_tma_constant_tma` (*Var*) `g_tma_constant_tma:` holds the number of the TMA being answered

g_tma_constant_course (*Var*)

g_tma_constant_course: holds the OU course code for the module being studied

g_tma_constant_pin (*Var*)

g_tma_constant_pin: holds the students personal identification number

g_tma_constant_thedate (*Var*)

g_tma_constant_thedate: holds the date to be printed on the front page of the TMA

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%
%% Package Initialization
% %%%%%%%%%%%%%%%%%%%%%%%%%%
\ExplSyntaxOn
\tl_new:N \g_tma_constant_name
\tl_new:N \g_tma_constant_tma
\tl_new:N \g_tma_constant_course
\tl_new:N \g_tma_constant_pin
\tl_new:N \g_tma_constant_thedate
```

These 'constants' are given initial generic values.

```
\tl_gset:Nn \g_tma_constant_name {name}
\tl_gset:Nn \g_tma_constant_tma {tma}
\tl_gset:Nn \g_tma_constant_course {course}
\tl_gset:Nn \g_tma_constant_pin {pin}
\tl_gset:Nn \g_tma_constant_thedate {the~date}
```

Then commands are provided to retrieve the values when required.

\name \name: returns the students name

\tma \tma: returns the working TMA number

\course \course: returns the OU course reference

\pin \pin: returns the students personal identification number

\thedate \thedate: returns the date to be printed on the title page of the TMA

```
\newcommand{\name}{\g_tma_constant_name}
\newcommand{\tma}{\g_tma_constant_tma}
\newcommand{\course}{\g_tma_constant_course}
\newcommand{\pin}{\g_tma_constant_pin}
\newcommand{\thedate}{\g_tma_constant_thedate}
```

Finally, macros are provided to set the values of the 'constants': these should only be used within the preamble. Use within the body of the text is unpredicable.

\myname \myname: {⟨*name*⟩} Set the students name

\mytma \mytma: {⟨*TMA number*⟩} Set the TMA number

\mycourse \mycourse: {⟨*course code*⟩} Set the OU course code for the module

\mypin **\mypin:** {⟨*pin*⟩} Set the students personal identification number

\setdate **\setdate:** {⟨*the date*⟩} Set the required date to display on the title page, default is the date of report generation

```
\NewDocumentCommand{\myname}{m}{%
 \tl_gset:Nn \g_tma_constant_name{#1}}
\NewDocumentCommand{\mytma}{m}{%
 \tl_gset:Nn \g_tma_constant_tma{#1}}
\NewDocumentCommand{\mycourse}{m}{%
 \tl_gset:Nn \g_tma_constant_course{#1}}
\NewDocumentCommand{\mypin}{m}{%
 \tl_gset:Nn \g_tma_constant_pin{#1}}
\NewDocumentCommand{\setdate}{m}{%
 \date{#1}\tl_gset:Nn \g_tma_constant_thedate{#1}}
```

That's the end of the LaTeX3 extensions requiring the extension switch, so it can be turned off.

```
\ExplSyntaxOff
```

Set the `\title` and `\author` ready for use by the `\maketitle` macro at the start of the main document. They use the constants defined above so that changes are automatically reflected. They may be redefined by the user if required.

```
\title{\textbf{TMA: \course-\tma}}
\author{\textbf{\name\space\pin}}
```

In order to allow the question introduction string to be modified, a general LaTeX string is created along with a macro to set it.

\tma@questionalignment **\tma@questionalignment:** Holds the string alignment to the left margin, the default is 'r'. This is particularly useful for question strings that might otherwise extend beyond the left hand reach of the left hand page border.

\tma@questionstring **\tma@questionstring:** Hold the string to be printed before the question number, the default is 'Q'.

\setquestionstring **\setquestionstring:** [⟨*char*⟩]{⟨*string*⟩} Set the string to precede the question number

```
\NewDocumentCommand{\tma@questionalignment}{}{r}
\NewDocumentCommand{\tma@questionstring}{}{\relax}
\NewDocumentCommand{\setquestionstring}{O{r} m}{%
    \RenewDocumentCommand{\tma@questionalignment}{}{#1}%
    \RenewDocumentCommand{\tma@questionstring}{}{#2}%
}
```

Set the default date to 'today'.

```
\setdate{\today}
```

4.2 Package Loading

Here we load the useful packages that have proven their worth for OU students over the years. Many have properties that are utilised by the rest of the ou-tma package.

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Package Loading
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%

\RequirePackage{amsmath}
\RequirePackage{amssymb}
\RequirePackage{amsthm}
\RequirePackage{wasysym}
\RequirePackage{bm}
\RequirePackage{upgreek}
\RequirePackage{graphicx}
\RequirePackage{lastpage}
\RequirePackage{xifthen}
\RequirePackage{verbatim}
\RequirePackage{fancyhdr}
\RequirePackage{geometry}
\RequirePackage{calc}
\RequirePackage[UKenglish]{isodate} % use UK format for date
\cleanlookdateon % remove th,st, rd from date

```

4.3 Geometry Settings

An important part of TMA answering is providing a consistent output, to this end the following page geometry has been brought together as a compromise suitable for most modules.

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Geometry Settings
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%

\geometry{
  headheight=10mm,
  headsep=5mm,
  bottom=25mm,
  footskip=15mm,
  left=30mm,
  right=30mm,
  marginparwidth=0mm,
  marginparsep=0mm,
  includemp
}
```

4.4 Margin Notes

By default, no margin notes are assumed to be required, however, if one is wanted, the `\marginnotes` command will set up the side margin ready to accept notes using

`\marginnotes`

`\marginnote` the `\marginnote{`⟨*note*⟩`}` command.

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Margin Notes
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

\NewDocumentCommand{\marginnote}{m}{\marginpar{#1}}
\NewDocumentCommand{\marginnotes}{}{
  \geometry{
    marginparwidth=40mm,
    marginparsep=5mm,
    left=20mm,
    right=15mm
  }
}
```

4.5 Question Numbering

We set up three counters to keep track of the question number along with associated parts and subparts.

`question` (*Ctr*) `question:` Holds the current question number, when a new question is started this value is used unless one is provided, in either case the used value is incremented as saved back here. When used, the `\qpart` is automatically reset so that the first part will be part 1.

`qpart` (*Ctr*) `qpart:` Holds the current part number as a numeric value, as with the question number this may be overridden and is incremented after being used. When used, the `\qsubpart` is automatically reset so that the first subpart will be sub-part 1.

`qsubpart` (*Ctr*) `qsubpart:` Holds the current sub-part number as a numeric value, again, the value may be overridden and is incremented after being used.

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Question Numbering
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

\newcounter{question}
\newcounter{qpart}[question]
\newcounter{qsubpart}[qpart]
```

The question number is set to print as arabic digits,

```
\renewcommand{\thequestion}{\arabic{question}}
```

4.6 Option Handling

In order to handle the incoming options for the ou-tma package, we create a set of four new boolean tokens.

`tma@roman` (*bool*) **`tma@roman:`** False indicates 'alph' numbering, true indicates 'roman' numbering of parts and subpart.

`tma@usecleveref` (*bool*) **`tma@usecleveref:`** True indicates that the cleveref package is requested.

`tma@usepdfbookmark` (*bool*) **`tma@usepdfbookmark:`** True indicated that the pdfbookmark package is requested.

`tma@legacy` (*bool*) **`tma@legacy:`** True indicted that the commands `\Complex` and `\vect` will be redefined to the legacy commands `\C` and `\vec`.

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Option Handling
% %%%%%%%%%%%%%%%%%%%%%%%%%%%
% Define boolean flags
\newif\iftma@roman
\newif\iftma@usecleveref
\newif\iftma@usepdfbookmark
\newif\iftma@legacy

% Set default options
\tma@romanfalse          % Default numbering is 'alph'
\tma@usecleverefffalse   % Default is not to use cleveref
\tma@usepdfbookmarkfalse % Default is not to use pdfbookmark
\tma@legacyfalse         % Default is not to use legacy definitions
```

We now set up the default states and commands for the ou-tma package operation.

`\theqpart` **`\theqpart:`** returns the current question part number as either an alpha or roman index.

`\theqsubpart` **`\theqsubpart:`** returns the current question subpart number as either a roman or an alpha index.

`\tma@crefname` **`\tma@crefname:`** `{`⟨*label type*⟩`}{`⟨*singular name*⟩`}{`⟨*plural name*⟩`}` Declares a label with singular and plural spellings for the cleveref package.

`\tma@stepcounter` **`\tma@stepcounter:`** `{`⟨*counter name*⟩`}` Increments the named counter by one.

`\tma@bookmark` **`\tma@bookmark:`** `[`⟨*level*⟩`]{`⟨*text*⟩`}{`⟨*name*⟩`}` The level is optional, numerical, the default is zero, the top level. The text is what will appear in the bookmark panel, and the name is what may be used as a reference to the location from other parts of the document.

`\tma@pageref` **`\tma@pageref:`** `{`⟨*name*⟩`}` returns the page number, if known, that contains the bookmark with the label name.

```
% Define commands with default values
\renewcommand{\theqpart}{\alph{qpart}}
\renewcommand{\theqsubpart}{\roman{qsubpart}}
\NewDocumentCommand{\tma@crefname}{mmm}{\relax}
\NewDocumentCommand{\tma@stepcounter}{m}{\stepcounter{#1}}
\NewDocumentCommand{\tma@bookmark}{O{0}mm}{\relax}
\NewDocumentCommand{\tma@pageref}{m}{\pageref{#1}}
```

Declare each of the valid options for the option processing system. In each case, the action is to set the appropriate boolean to true or false.

```
% Declare options
\DeclareOption{roman}{%
 \tma@romantrue%
}
\DeclareOption{alph}{%
 \tma@romanfalse%
}
\DeclareOption{cleveref}{%
 \tma@usecleverefttrue%
}
\DeclareOption{pdfbookmark}{%
 \tma@usepdfbookmarktrue%
}
\DeclareOption{legacy}{%
 \tma@legacytrue%
}
\DeclareOption*{%
 \PackageWarning{ou-tma}{Unknown option `\CurrentOption'}%
}
```

Go ahead, process those options!

```
% Process options
\ProcessOptions\relax
```

4.7 Debugging Options

A short section of code outputting to the log the state of the four main options that may be passed to the ou-tma package.

```
\typeout{***************** OPTION RESULTS **********}
\iftma@usepdfbookmark
\typeout{pdfbookmark is TRUE}
\else
\typeout{pdfbookmark is FALSE}
\fi
\iftma@roman
\typeout{roman is TRUE}
\else
\typeout{roman is FALSE}
\fi
\iftma@usecleveref
\typeout{cleveref is TRUE}
\else
\typeout{cleveref is FALSE}
\fi
\iftma@legacy
\typeout{legacy is TRUE}
\else
\typeout{legacy is FALSE}
```

```
\fi
\typeout{********** END OPTION RESULTS **********}
```

4.8 Package adjustments based on Options

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Set Up Package Based on Options
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%

% Set question numbering
\iftma@roman
\renewcommand{\theqpart}{\roman{qpart}}
\renewcommand{\theqsubpart}{\alph{qsubpart}}
\else
\renewcommand{\theqpart}{\alph{qpart}}
\renewcommand{\theqsubpart}{\roman{qsubpart}}
\fi
% Load hyperref if necessary
\iftma@usepdfbookmark
\AtBeginDocument{%
 \hypersetup{%
  colorlinks=true,%
  linkcolor=blue,%
  urlcolor=blue,%
  pdfstartview=FitH,%
  pdftitle={TMA~\tma}, %
  pdfauthor={\name~-~\pin}, %
  pdfkeywords={OUCU:~\pin, TMA~\tma}, %
  pdfsubject=\course%
 }%
}
\RequirePackage[pdfencoding=unicode,psdextra]{hyperref}
\fi

% Load cleveref if necessary
\iftma@usecleveref
% Ensure hyperref is loaded before cleveref
\@ifpackageloaded{hyperref}%
{}%
{\RequirePackage[pdfencoding=unicode,psdextra]{hyperref}}
\RequirePackage{cleveref}
% Redefine commands for cleveref
\RenewDocumentCommand{\tma@crefname}{mmm}{\crefname{#1}{#2}{#3}}
\RenewDocumentCommand{\tma@stepcounter}{m}{\refstepcounter{#1}}
\fi

% Redefine commands for pdfbookmark
\iftma@usepdfbookmark
\RenewDocumentCommand{\tma@pageref}{m}{\pageref*{#1}}
\RenewDocumentCommand{\tma@bookmark}{O{0} +m +m}{%
 \pdfbookmark[#1]{#2}{#3}%
}
\fi

\setquestionstring{Q}
```

4.9 Question Environment

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Question Environment
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% Set up cref names if cleveref is used
\iftma@usecleveref
\tma@crefname{question}{question}{questions}
\tma@crefname{qpart}{part}{parts}
\tma@crefname{qsubpart}{section}{sections}
\fi

```

Commands to introduce Questions, parts and subparts.

In each case, an optional argument allows a fixed starting 'number' to be included to override the defaul of using the next.

```
\NewDocumentEnvironment{question}{O{0}}{%
 \ifthenelse{#1>0}{\setcounter{question}{#1-1}}{\relax}%
 \tma@stepcounter{question}%
 \tma@bookmark{Question \thequestion}%
  {question\thequestion}%
 \makebox[0em][\tma@questionalignment]{\large{\tma@questionstring~\thequestion%
        \hspace{0.3em}}}\par%
}{%
 \par \vspace{3em}%
}

\NewDocumentCommand{\qpart}{O{0}}{%
 \ifthenelse{#1>0}{\setcounter{qpart}{#1-1}}{\relax}%
 \tma@stepcounter{qpart}%
 \tma@bookmark[1]{\thequestion.\theqpart}%
  {qpart.\thequestion.\theqpart}%
 \par%
 \makebox[0pt][r]{\large{(\theqpart)\hspace{1.5em} }}%
}

\NewDocumentCommand{\qsubpart}{O{0}}{%
 \ifthenelse{#1>0}{\setcounter{qsubpart}{#1-1}}{\relax}%
 \tma@stepcounter{qsubpart}%
 \tma@bookmark[2]{\thequestion.\theqpart.\theqsubpart}%
  {qsubpart.\thequestion.\theqpart.\theqsubpart}%
 \ifthenelse{\value{qsubpart}>1}%
 {\par}{}%
 \hspace{-2em}\makebox[2em][l]{\large{(\theqsubpart)}}%
}

```

4.10 Mathematical commands

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Mathematical Commands
```

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Differential Operators
\NewDocumentCommand{\dd}{}{\ensuremath{\mathop{}\!\mathrm{d}}}
\NewDocumentCommand{\e}{}{\ensuremath{\mathrm{e}}}
\NewDocumentCommand{\ii}{}{\ensuremath{\mathrm{i}}}

%% Number Sets
\NewDocumentCommand{\N}{}{\ensuremath{\mathbb{N}}}
\NewDocumentCommand{\Z}{}{\ensuremath{\mathbb{Z}}}
\NewDocumentCommand{\Q}{}{\ensuremath{\mathbb{Q}}}
\NewDocumentCommand{\R}{}{\ensuremath{\mathbb{R}}}
\NewDocumentCommand{\Complex}{}{%
 \ensuremath{\mathbb{C}}} % Changed from \C to \Complex
\NewDocumentCommand{\Rr}{}{\ensuremath{\mathcal{R}}}

%% Vector Notation
\NewDocumentCommand{\vect}{m}{%
 \ensuremath{\overrightarrow{#1}}} % Changed from \vec to \vect
\NewDocumentCommand{\ve}{m}{\ensuremath{\textbf{#1}}}

%% Ordinal Indicators
\NewDocumentCommand{\st}{}{\textsuperscript{st}}
\NewDocumentCommand{\nd}{}{\textsuperscript{nd}}
\NewDocumentCommand{\rd}{}{\textsuperscript{rd}}
\NewDocumentCommand{\nth}{}{\textsuperscript{th}}

%% Additional Symbols
\NewDocumentCommand{\rect}{}{\ensuremath{\sqsubset\!\!\sqsupset}}

%% Combinatorial Notations
\NewDocumentCommand{\comb}{mm}{\ensuremath{{}^{#1}C_{#2}}}

\NewDocumentCommand{\perm}{mm}{\ensuremath{{}^{#1}\!P_{#2}}}

%% Mathematical Operators
\DeclareMathOperator{\re}{Re}
\DeclareMathOperator{\im}{Im}
\DeclareMathOperator{\Log}{Log}
\DeclareMathOperator{\Arg}{Arg}
\DeclareMathOperator{\Wnd}{Wnd}
\DeclareMathOperator{\Res}{Res}
\DeclareMathOperator{\Ker}{Ker}
\DeclareMathOperator{\Orb}{Orb}
\DeclareMathOperator{\Stab}{Stab}
\DeclareMathOperator{\Fix}{Fix}

%% Derivatives
\NewDocumentCommand{\deriv}{mm}{%
 \frac{\dd{}#1}{\dd{}#2}}
\NewDocumentCommand{\pderiv}{mm}{%
 \frac{\partial #1}{\partial #2}}
\NewDocumentCommand{\psderiv}{mmm}{%
 \frac{\partial^2 #1}{\partial #2 \partial #3}}

% Legacy Definitions
```

```
\iftma@legacy
% Redefine \vec to old definition
\RenewDocumentCommand{\vec}{m}{\ensuremath{\overrightarrow{#1}}}
% Redefine \C to old definition
\ProvideDocumentCommand{\C}{}{\ensuremath{\mathbb{C}}}
\RenewDocumentCommand{\C}{}{\ensuremath{\mathbb{C}}}
\fi

```

4.11 Theorem Environment

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Theorem Environment
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

\newtheorem{lemma}{Lemma}
\newtheorem{theorem}{Theorem}
% Define \blacksmiley without loading wasysym
\ProvideDocumentCommand{\blacksmiley}{}{%
 \ensuremath{\unicode{263B}}} % Unicode for blacksmiley emoji
\RenewDocumentCommand{\qedsymbol}{}{\blacksmiley}

```

4.12 Miscellaneous Settings

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Miscellaneous Settings
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

\RenewDocumentCommand{\thefootnote}{}{\fnsymbol{footnote}}
\numberwithin{equation}{question}
\setlength{\parindent}{0pt}
\setlength{\parskip}{2ex plus 0.3ex minus 0.2ex}

```

4.13 Header and Footer Settings

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Header and Footer Settings
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

\pagestyle{fancy}
\fancyhf{} % Clear all headers and footers
\fancyhead[L]{\textrm{\name\ \pin}}
\fancyhead[C]{\textrm{\course\ TMA-\tma}}
\fancyhead[R]{\textrm{Page \thepage\ of \tma@pageref{LastPage}}}
\RenewDocumentCommand{\headrulewidth}{}{0pt} % Remove header rule

% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% End of Package ou-tma
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%\endinput
```

5 Implementation of ou-tma-sup

```
%% ou-tma-sup.sty
%% Copyright 2025 G. I. Riley <geoffr@adaso.com>
%% This package may be freely used, especially by, but not limited to,
%% students, lecturers and staff of the Open University. It was created
%% by the efforts of many who are now or have been connected with the
%% Open University Students Association. No acknowledgement is
%% _required_ for using this package within the production of a _Tutor
%% Marked Assessment._
```

This is the OU TMA supplementary file. It's purpose is to contain commands that are less commonly used, probably used by only one or two modules; and for experimental commands that may be included for testing by a wider audience but may be deemed unnecessary in the long run.

```
% \RequirePackage{expl3} % Automatically loaded with the \ProvidesExplPackage
\RequirePackage{ou-tma} % main ou-tma package
\ExplSyntaxOn
% ------------------------------------------------------------------------------
% README / Package Summary
% ------------------------------------------------------------------------------
% This package provides macros for formatting numeric approximations, probability
% expressions, monetary values, and statistical diagrams, using expl3 and siunitx.
% It is intended for typesetting mathematics and statistics answers in OU TMAs.
%
% ----------------------
% Main formatting commands
% ----------------------
% \tmadp[<options>]{<value(s)>}[<unit>]  % Round to <n> decimal places
% \tmasf[<options>]{<value(s)>}[<unit>]  % Round to <n> significant figures
%
% <value(s)> should be either:
%   - {x, n}           for one value to n dp/sf
%   - {x, y, n}        for a range from x to y to n dp/sf
%
% Optional [<options>] may include:
%   style=bracket      % for bracketed range: (x, y)
%   style=to (default) % for range using 'x to y'
%
% ----------------------
% Other useful commands
% ----------------------
% \prob{event}              % Formats P(event) in upright font
% \Pounds{amount}           % Formats amount in £ with two dp, e.g. £3.45
% \FiveStats[<n>]{min}{max}{med}{Q1}{Q3}
%     Draws a 5-number summary diagram using TikZ.
%     Optional argument: n = sample size (e.g. \FiveStats[30]{1}{10}{5.5}{3}{8})
% ------------------------------------------------------------------------------
%% Package Initialisation
\ExplSyntaxOff
\RequirePackage{amsmath}
\RequirePackage{ifthen}

\RequirePackage{siunitx}
```

```
\sisetup{per-mode = symbol}
\sisetup{uncertainty-mode = separate}

\RequirePackage{tikz}
\RequirePackage{pgfplots}
\pgfplotsset{compat=1.18}
\usepgfplotslibrary[units]
\usetikzlibrary{angles,
    quotes,
    calc,
    arrows.meta,
    positioning,
    decorations.markings}

```

5.1 TikZ styles for solid and hollow dots

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% TikZ styles for solid and hollow dots
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% Create TiKZ styles for solid and hollow dots: used to mark included and excluded points
\tikzset{
 soliddot/.style={only marks, mark=*, mark size=2pt, color=black},
 hollowdot/.style={only marks, mark=o, mark size=2pt, color=black, fill=white, line width
}

```

5.2 Question subpart with extention

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Question subpart with extention
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% Make a question subpart with an extension, eg: Q1.a.i-1
% Usage:
%  \qsubparte[n]{ext}
%  where n is an optional value to reset the counter, a decimal value,
%          omitted or zero continues the previous count.
%    and ext is the required extension string.
\NewDocumentCommand{\qsubparte}{O{0}m}{
    {
        \iftma@roman
            \renewcommand{\theqsubpart}{\alph{qsubpart}-#2}
        \else
            \renewcommand{\theqsubpart}{\roman{qsubpart}-#2}
        \fi
        \qsubpart[#1]
    }
}

```

`\tmadp [`⟨*options*⟩`]{`⟨*values*⟩`}[`⟨*units*⟩`]`

`\tmasf` `[`⟨*options*⟩`]{`⟨*values*⟩`}[`⟨*units*⟩`]`

Each of these macros follow the same format, they produce automatically rendered n decimal places or significant figures, and can optionally display ranges and units thereof. The values should be a comma separated list of two or three numbers, the last specifying the appropriate digit count. If two values are given then they represent a real number followed by the digit count; and if three values are given, then they represent a range of two real numbers followed by the digit count.

Zero padding is applied where needed, so:
`\tmadp(5.5,3)` correctly returns 5.500 (to 3 dp); and
`\tmadp[style=bracket]{2.25,7.25,2}[\gram]` returns (2.25 g, 7.25 g) (to 2 dp)

5.3 Macros to render appropriate decimal places and significant figures

```
% ################################
%% Decimal places and significant figures
% ################################

\ExplSyntaxOn

\tl_if_exist:NF \l__tma_style_tl { \tl_new:N \l__tma_style_tl }
\tl_if_exist:NF \l__tma_label_style_tl { \tl_new:N \l__tma_label_style_tl }

\keys_define:nn { tma }
{
    style .choice:,
    style / to      .code:n = { \tl_set:Nn \l__tma_style_tl { to } },
    style / bracket .code:n = { \tl_set:Nn \l__tma_style_tl { bracket } },
    style           .initial:n = to,

    labels .choice:,
    labels / words  .code:n = { \tl_set:Nn \l__tma_label_style_tl { words } },
    labels / long   .code:n = { \tl_set:Nn \l__tma_label_style_tl { long } },
    labels / abbr   .code:n = { \tl_set:Nn \l__tma_label_style_tl { abbr } },
    labels / short  .code:n = { \tl_set:Nn \l__tma_label_style_tl { abbr } },
    labels / dp-sf  .code:n = { \tl_set:Nn \l__tma_label_style_tl { abbr } },
    labels          .initial:n = abbr,
}

%% Public commands
% Parameters for \tmadp and \tmasf:
%  #1: keyval options like [style=bracket]
%  #2: data (e.g. 1.2, 3.4, 2)
%  #3: optional unit
%  #4: mode (dp or sf)
\NewDocumentCommand{\tmadp}{O{}mO{}}{ \tma_format:nnnn {#1}{#2}{#3}{dp} }
\NewDocumentCommand{\tmasf}{O{}mO{}}{ \tma_format:nnnn {#1}{#2}{#3}{sf} }

% Entry point: parse style and data
\cs_new_protected:Nn \tma_format:nnnn
{
    \keys_set:nn { tma } {#1}
    \tma_parse:nnn {#2}{#3}{#4}
```

```
}

% Parse 2- or 3-item list
\cs_new_protected:Nn \tma_parse:nnn
{
    \clist_set:Nn \l_tmpa_clist {#1}
    \int_case:nnF { \clist_count:N \l_tmpa_clist }
    {
        {2}{
            \tma_format_single:nnnn
            { \clist_item:Nn \l_tmpa_clist {1} }
            { \clist_item:Nn \l_tmpa_clist {2} }
            {#2} % unit
            {#3} % mode
        }
        {3}{
            \tma_format_range:nnnnn
            { \clist_item:Nn \l_tmpa_clist {1} }
            { \clist_item:Nn \l_tmpa_clist {2} }
            { \clist_item:Nn \l_tmpa_clist {3} }
            {#2} % unit
            {#3} % mode
        }
    }
    { \textbf{Error: expected 2 or 3 comma-separated values.} }
}

% Single number (optional unit)
\cs_new_protected:Nn \tma_format_single:nnnn
{
    \tma_with_rounding:nnn {#4}{#2}
    {
        \tl_if_blank:nTF {#3}
        { \num{#1} }
        { \qty{#1}{#3} }
        \text{~(to~#2~\tma_mode_label:nn {#4}{\l__tma_label_style_tl})}
    }
}

% Range (optional unit) with style switch
\cs_new_protected:Nn \tma_format_range:nnnnn
{
    % no unit
    \tl_if_blank:nTF {#4}
    {
        \tl_if_eq:NnTF \l__tma_style_tl { bracket }
        { \tma_output_bracketed_range:nnnnn {#1}{#2}{#3}{#4}{#5} }
        {
            \tma_with_rounding:nnn {#5}{#3}
            { \num{#1}\text{~to~}\num{#2} }
        }
    }
    { % with unit
        \tl_if_eq:NnTF \l__tma_style_tl { bracket }
        { \tma_output_bracketed_range:nnnnn {#1}{#2}{#3}{#4}{#5} }
        {
```

```
            \tma_with_rounding:nnn {#5}{#3}
            { \SIrange{#1}{#2}{#4} }
        }
    }
}

% Core: locally apply siunitx rounding then typeset #3
%   #1 = mode code dp/sf/off, #2 = precision, #3 = content
\cs_new_protected:Nn \tma_with_rounding:nnn
{
    \group_begin:
    \exp_args:Nx \sisetup
    { round-mode=\tma_mode_map:n {#1}, round-precision=\int_eval:n {#2} }
    #3
    \group_end:
}

% Bracketed style output; handles math/text mode parens
\cs_new_protected:Nn \tma_output_bracketed_range:nnnnn
{
    \tma_with_rounding:nnn {#5}{#3}
    {
        \mode_if_math:TF
        {
            ( \qty{#1}{#4},~\qty{#2}{#4} )
            \text{~(to~#3~\tma_mode_label:nn {#5}{\l__tma_label_style_tl})}
        }
        {
            \text{(}\qty{#1}{#4},~\qty{#2}{#4}\text{)}
            \text{~(to~#3~\tma_mode_label:nn {#5}{\l__tma_label_style_tl})}
        }
    }
}

% Mapping + label text
\cs_new:Npn \tma_mode_map:n #1
{
    \str_case:nnF {#1}
    { {dp}{places} {sf}{figures} {off}{off} }
    { places }
}

\cs_new:Npn \tma_mode_label:nn #1#2
{
    \str_case:nnF {#2}
    {
        {words}{ \tma_label_words:n {#1} }
        {long} { \tma_label_long:n  {#1} }
        {abbr} { \tma_label_abbr:n  {#1} }
    }
    { \tma_label_abbr:n {#1} }
}

\cs_new:Npn \tma_label_words:n #1
{
    \str_case:nnF {#1} { {dp}{places} {sf}{figures} {off}{off} } {places}
```

```
}

\cs_new:Npn \tma_label_long:n #1
{
    \str_case:nnF {#1}
    { {dp}{decimal~places} {sf}{significant~figures} {off}{off} }
    { decimal~places }
}

\cs_new:Npn \tma_label_abbr:n #1
{
    \str_case:nnF {#1} { {dp}{dp} {sf}{sf} {off}{off} } { dp }
}

\ExplSyntaxOff


```

5.4 Pound Sterling printing

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Pound Sterling value
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

\NewDocumentCommand{\Pounds}{m}{%
    \pounds\,\num[round-precision=2,round-mode=places,round-integer-to-decimal]{#1}%
}

```

5.5 Five value statistics summary

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Five value statistical summary diagram
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% Print the five stats 'square' with the provided values
% Arguments: #1 (Optional) number of samples
%            #2 Extreme minimum value
%            #3 Extreme Maximum value
%            #4 Mean average
%            #5 Seccond quartile value
%            #6 Fourth quartile value
\NewDocumentCommand{\FiveStats}{o mmmmm}{%
    \begingroup
    \tikzset{
        every node/.style   = {font=\footnotesize,inner sep=0pt},
        number/.style       = {text depth=0pt},      % tidy baselines
    }
    %--- global layout knobs you might like to tweak --------
    \def\Pad   {3pt}        % white-space between numbers and walls
    \def\XGap  {25mm}       % distance between the L & R interior columns
    \def\Row   {1.7em}      % vertical separation between rows
    %------------------------------------------------------------

```

```
    \begin{tikzpicture}[baseline=(med.base)]
        % reference x-coordinates for the two interior columns
        \coordinate (IL) at (0,0);          % interior-left column
        \coordinate (IR) at (\XGap,0);      % interior-right column

        %---------------- Numbers -----------------
        \node[number] (med)  at ($ (IL)!0.5!(IR) $) {#4};

        \node[number,anchor=west] (q1)  at ($(IL)+(0,-\Row)$)       {#5};
        \node[number,anchor=west] (min) at ($(IL)+(0,-2*\Row)$)     {#2};

        \node[number,anchor=east] (q3)  at ($(IR)+(0,-\Row)$)       {#6};
        \node[number,anchor=east] (max) at ($(IR)+(0,-2*\Row)$)     {#3};

        \IfNoValueF{#1}{
            % sample size
            \node[number,anchor=east] (n) at ($(IL)+(-2*\Pad,-\Row)$) {$n = #1$};
        }

        %---------------- Frame --------------------
        \coordinate (TL) at ($(q1.west |- med.north)  + (-\Pad,\Pad)$);
        \coordinate (TR) at ($(q3.east |- med.north)  + ( \Pad,\Pad)$);
        \coordinate (BL) at ($(q1.west |- min.south) + (-\Pad,-\Pad)$);
        \coordinate (BR) at ($(q3.east |- min.south) + ( \Pad,-\Pad)$);

        % draw: top, right, and left edges
        \draw[cyan, line width=.4pt] (BL) -- (TL) -- (TR) -- (BR);
    \end{tikzpicture}%
    \endgroup
}

\ExplSyntaxOn

```

5.6 Probability expression

\prob ***Maths Mode only.*** `\prob{`⟨*text*⟩`}` typesets a probability statement. It allows the use of `\and`, `\or`, `\bar` and `\not` within the definition so that expressions like `$\prob{(Journey A \or Journey B) \and Bus}$` may be set:
$P\left((\text{Journey A} \ \textit{or}\ \text{Journey B}) \ \textit{and}\ \text{Bus}\right)$.

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Probabilty expression
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% Main \prob command
\NewDocumentCommand{\prob}{m}
{
    \prob_prob:n { #1 }
}

% Internal implementation with local keyword overrides
\cs_new_protected:Nn \prob_prob:n
{
    P\left(
```

```
    \group_begin:
    % Locally redefine LaTeX primitives - safely!
    \cs_set_eq:NN \oldand \and
    \cs_set_eq:NN \oldor \or
    \cs_set_eq:NN \oldbar \bar
    \cs_set_eq:NN \oldnot \not

    \cs_set:Npn \and { \;\textit{and}\; }
    \cs_set:Npn \or  { \;\textit{or}\; }
    \cs_set:Npn \bar { \mid }
    \cs_set:Npn \not { \textit{not}\; }

    \text{#1}
    \group_end:
    \right)
}

\ExplSyntaxOff
```

5.7 Extra macros

```
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% Extra macros
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\NewDocumentCommand{\pflag}{}{\ensuremath{[+]}}
\NewDocumentCommand{\nflag}{}{\ensuremath{[-]}}
\NewDocumentCommand{\ld}{}{\ensuremath{\lambda}}

% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% End of Package ou-tma-sup
% %%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%\endinput
```

Change History

Index

Numbers written in italic refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in roman refer to the code lines where the entry is used.