

## MAS115 PRESENTATION LAB 2

Last week we used the document class `article`, which is the basic L<sup>A</sup>T<sub>E</sub>X document class. This week we'll use `amsart`, which is the American Mathematical Society's version. This allows extra L<sup>A</sup>T<sub>E</sub>X commands and symbols among other things.

*If you need to look back at last week's sheet, you can find it on the MAS115 website.*

Open TeXworks. Start a new document with `\documentclass[11pt]{amsart}` at the top, adding the commands `\begin{document}` and `\end{document}`, as usual. Save your document in a folder on your U: drive as `week2.tex`, or similar.

*If the default text size in TeXworks is too small then you can make it bigger. Go to Edit, Preferences, then the Editor tab. Change the 8pt font size to something bigger on the top line. Click OK then restart TeXworks.*

Go to the School of Mathematics and Statistics website, click on Research, then Probability in the Research Groups box. Copy and paste the text from the probability research group into your document. Create your PDF document and check that everything is working so far.

*Problems? Check the last few lines of the log file which has appears at the bottom of TeXworks to see if there are clues as to what's gone wrong.*

Create a section title before the text you've pasted called 'Probability at the University of Sheffield'. Now, add the following to the *preamble* (that is, between the `\documentclass{...}` and `\begin{document}` commands).

```
\setlength{\parindent}{0cm}
\setlength{\parskip}{1ex}
```

Think about the following.

- (1) What changed when you entered the above commands? Do you prefer your document with or without them?
- (2) By changing the numbers, work out what each of the two commands does.
- (3) Try changing the 11pt command in the document class to something larger or smaller and see what happens. How far will it let you go?

Here you've used three different units of measurement: `cm` stands for *centimeters*, `pt` is for *point size* (the standard measurement for font sizes) and `1ex` is the height of the letter 'x' in whichever font is currently being used.

An easier way to change from indented paragraphs to line-breaks is to use the `parskip` package. Delete the two `\setlength` commands and replace them with `\usepackage{parskip}`. When you process the  $\LaTeX$  file, click OK if necessary to approve the installation of any packages and wait for your PDF to appear. This may take a little while the first time, and it's important not to interrupt it.

*Packages add extra functionality into  $\LaTeX$  documents, and we'll see them more in future weeks.*

Now do the following.

- (4) In your document, find the two journals published by the Applied Probability Trust and use the `\emph{...}` command to make them emphasised.
- (5) Put the name 'Applied Probability Trust' in single quotation marks, like 'this'.
- (6) Look very carefully at your output. Do the quotation marks both go the right way? If not, use the *backtick* symbol ``` found at the top-left of the keyboard.
- (7) Can you get get double quotation-marks to work, as in "this"?

Find the line that starts 'Research in probability includes:'. Break the line at this point, and type `\begin{itemize}`. At the end of the list of research topics type `\end{itemize}`. Now, before each research topic put `\item` and break the line afterwards so that it looks like

```
Research in probability includes:
\begin{itemize}
\item branching processes;
\item random walk;
\item ...
```

If you get an error, see if you can solve the problem by looking at the text in the log file.

Here, you've created an *itemize environment*. Environments always start with a `\begin` command and end with an `\end` command. We'll see more of them in future weeks. Change the `itemize` environment to `enumerate` instead, and look at the difference.

Create a *subsection* at the bottom of your page called 'Members'. Enter the sentence 'The probability group consists of the following academic staff.', then create an itemized list of the academic staff working in probability.

Try changing the `\subsection{...}` command to `\subsection*{...}`, and notice the difference.

## TYPESETTING PRACTICE

Now for something more fun. Try to typeset the following in a section called 'Typesetting practice' at the end of your document. To find some

symbols you'll need to use Google (e.g. 'latex real numbers symbol' or 'latex summation symbol'). Put your answers in an `enumerate` environment.

(1)  $x^2 + y^2$ ;  $x_i$ ;  $x_i^2 - y_i^2$ ;  $x_{i_m}$ ;  $x_i^m$ ;  $x^{2p}$ .

[Hint: the line begins  `$x^2+y^2$` ;  `$x_i$` ; and L<sup>A</sup>T<sub>E</sub>X uses curly brackets `{}` to bracket terms together.]

(2)  $\frac{1}{y}$ ;  $\frac{x^2}{x+y}$ ;

$$\frac{\frac{1}{x} + \frac{1}{y}}{\frac{1}{x+y}}.$$

[Hint: the first one is  `$\frac{1}{y}$` .]

(3)  $\sqrt{x+y}+7$ ;  $\sqrt[3]{7}$ ;  $\sqrt[n]{1 + \sqrt{1+x}}$ . [Hint: use `\sqrt{}` and `\sqrt[3]{}`.]

(4)

$$\int_0^\infty e^{-x^2} dx = 2\pi; \quad \sum_{i=1}^n i = \frac{1}{2}n(n+1).$$

(5)  $\sin^2 x + \cos^2 x = 1$ ;

$$\Gamma(x) \equiv \lim_{x \rightarrow 0} \prod_{v=0}^{n-1} \frac{n! n^{x-1}}{x+v}.$$

(6)  $(2^{2^2} - 1)^2$ ;  $\left\{ \alpha + (\sqrt{\beta} + \gamma^2)^2 \right\}$ .

[Hint: for the correct sized brackets use `\left(...\right)`, and for a curly bracket use `\{.`]

(7)  $f : \mathbb{R} \setminus \{-\frac{d}{c}\} \rightarrow \mathbb{R}, x \mapsto \frac{ax+b}{cx+d}$ .

(8)  $\sum_{i=1}^n i^2 = \frac{1}{6}n(n+1)(2n+1)$  for  $n = 1, 2, 3, \dots$

[Hint: try using `\ldots`.]

If you finish all of the above, have a look at the excellent *Short Introduction to L<sup>A</sup>T<sub>E</sub>X* found at

<http://www.ctan.org/tex-archive/info/lshort/english/lshort.pdf>

(or use Google). Another very useful resource is the L<sup>A</sup>T<sub>E</sub>X Wikibook, which lives at

<http://en.wikibooks.org/wiki/LaTeX>

## HOMEWORK

Create a document with the title ‘MAS115: Homework 2’ and your name as author, using ‘amsart’ document class, 11pt font and the ‘parskip’ package.

**1. Understanding SoMaS’s Research Areas.**

- (1) Go to the research section of the School of Mathematics and Statistics website and use the information to create an itemized list of the research areas of the school. Call this section ‘Mathematics and Statistics at the University of Sheffield’, and write an introductory sentence for the list.
- (2) Look for your personal tutor on the School of Mathematics and Statistics webpage, or find their own homepage. Find out which areas of research they are interested in. Find at least two sources of information on the web which explain their research area, and use them to write a brief summary in your own words of what it is you think they do in a new subsection called “(name)’s Research Interests”.

You only need to write a paragraph or two, and you don’t need to thoroughly understand their work to do this. Don’t copy and paste text from their website or Wikipedia, but use different sources to write an overview. If there’s time, you could ask your tutor at the end of your MAS110 tutorial to give you a quick summary of their work.

**2. Another Bad Homework.** Create a new section called ‘Solution Rewrite’ and re-write the badly written solution below, correcting any errors and improving it as much as possible. This section should have two subsections, ‘Question’ and ‘Solution’. Your solution will probably be short, but should include more words than the badly written one below.

- Use full sentences, with full stops.
- Write in paragraphs and don’t overdo the display-math.
- Print out your PDF and hand it in at next week’s computer lab.

In response to the question

A line  $L$  passes through the points  $A = (8, 1)$  and  $B = (2, 3)$ .

Find the equation of  $L$ .

a student handed in the following. (This is a genuine answer given in a recent exam.)

$$m = \text{gradient} = \frac{3-1}{2-8} = -\frac{2}{6} = -\frac{1}{3}$$

$$L \text{ in form } y = mx + c$$

use coordinates from  $A$  thus

$$L \text{ is } y = mx + c$$

$$L \text{ is } 1 = -\frac{1}{3}8 + c$$

$$\frac{y-x}{m} = c$$

$$c = \frac{1-8}{-\frac{1}{3}} \iff c = 21$$

thus the equation of  $L$  is  $y = -\frac{x}{3} + 21$