

MAS115 Presentation Lab 2

Last week we used the document class `article`, which is the basic \LaTeX document class. This week we'll use `amsart`, which is the American Mathematical Society's version. This allows extra \LaTeX commands and symbols among other things.

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

Go to Overleaf and start a new project named 'MAS115 Week 2'. Delete the text in the left-hand pane and type `\documentclass[11pt]{amsart}` at the top, adding the commands `\begin{document}` and `\end{document}`.

If the default text size in the left-hand pane on Overleaf is too small then you can make it bigger. Go to Menu in the top-left, then scroll down and change the 12pt font size to something bigger.

Go to the School of Mathematics and Statistics website, click on the Research menu item, then Probability. Copy and paste the text from the probability research group into your document as far as the end of the section on the Applied Probability Trust. Create your PDF document and check that everything is working so far.

Problems? Look for red crosses in the margin on the input pane to see lines that Overleaf thinks are a problem. You can also look at the log file which you can view with the button just to the right of the `recompile` button.

Using the `\section` command as you did last week, 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. The `amsart` document class will only allow a restricted range of font-sizes in the output PDF. Try changing the `11pt` command in the document class to something larger or smaller and see what happens. Can you work out the allowable range? What happens if you go outside of it?

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 when asked to approve the installation of 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 double quotation-marks to work, as in "this"? (Hint: use backticks.)

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}` (Overleaf may try to help by automatically typing this, but you may have to move it to the right place). 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 ...
...
\end{itemize}
```

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.

Find the place where the members of the probability research group are listed, and make a *subsection* just above the list of names called 'Members'. After this subsection, 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. Finally, change the 'Past grants' and 'Applied Probability Trust' subheadings into subsections.

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^AT_EX 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 $\sqrt{\quad}$ and $\sqrt[3]{\quad}$.]

4.

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

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

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

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

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`.]
9. Search for Google on how to use `eqnarray*` to line up equals-signs, as in

$$\begin{aligned} f(x) &= x^x \\ &= (e^{\ln x})^x. \end{aligned}$$

If you get stuck with any of these, you can look at my attempt at the lab sheet, found on the course webpage.

If you finish all of the above, have a look at the excellent *Short Introduction to L^AT_EX* found at

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

(or use Google). Another very useful resource is the L^AT_EX 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. Don't copy and paste text from their website or Wikipedia, but use multiple sources to write a summary in your words as best you can.

(Usually when doing research like this, you would need to reference the source of any information you find. As we haven't covered referencing yet, you do not need to do it this time.)

2. Another bad solution

In response to a question, 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 in form $y = mx + c$

use coordinates from A thus

L is $y = mx + c$

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

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

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

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

Your job is to try and work out what question was asked, then write a much better solution using \LaTeX , correcting errors and improving the solution above as much as possible. Create a new section called 'Solution Re-write', with 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.

Save your PDF and upload it to Blackboard in the Homework section before next week's computer lab.