LaTeX Examples

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Contents

It is assumed the reader is viewing both the document `latexTemp.tex` and `latexTemp.pdf` simultaneously to become familiar with how to control the text. Also reviewing the accompanying presentation is highly recommended.

1 General

1.1 Header section

Often times this part of the LaTeX document can be ignored, with the exception of the `\title`, `\author`, and `\date`. Always update the title, author, and possibly also the date, otherwise comment out the `\maketitle` command. See the presentation slides for additional details.

1.2 Outline

The section and subsection commands are used to make the sections and headers. For example, "General" is a section, and "Header section" and "Outline" are subsections.

1.3 Paragraphs

A new paragraphs can be created simply by creating two blank lines between between the text. For instance, this paragraph is ended by hitting "enter" twice (see the .tex document)... This is not a new paragraph...

But this is a new paragraph. If an extra space is desired between paragraphs, use the double-backslash command and hit "enter" twice...

The PDF will now insert a space between the last paragraph and this one.

To make a particular paragraph have no indentation, use the command `\noindent`, as in this paragraph.

Generally, lots of extra spaces won't affect the output text in the PDF. A new page can be created using the command `\pagebreak`.

1.4 Spacing

Horizontal text can be inserted in text using the `\hspace{0.3cm}` command. The argument in the command can be changed, of course, to be larger or smaller, i.e. it can be 0.1cm, 2.5cm, 1.3in, etc. The command `\vspace{1.1cm}`

works in a similar way. LaTeX will accept specified lengths in `cm`, `mm`, `in`, among a few other options.

1.5 Text

Text can also be manipulated using commands. For example, use the command `\emph` to *emphasize* (italicize) text. *There are a few ways to italicize text.* {Braces} are often used to capture what the command acts on. Similar to italicizing, text can also be **bolded** in **multiple ways** or text can be colored. You can even create your own colors... this is "myRed". You can also `type like a typewriter`.

Using the shift-apostrophe key to get "double quotes" doesn't look very pretty in LaTeX. Instead, double the apostrophe up by the "1 key" for the "left quote and use the double quotes" for the right quote.

Text can also be made tiny, scriptsize, footnotesize, small, large, Large, LARGE, etc.

1.6 Macros

In general, the commands used in this section can be found using the **Macros**. For example, to get the font size that you want in TeXShop, go to Macros > Text Styles > size. Also, try out quotations (Macros > Insertions > quotation:

> This could be a very long quotation that you would not normally like to include in a paragraph. So instead you want it to stand alone and have a smaller width than a normal paragraph. This particular text was could easily be italicized using \em at the start of the quotation, if desired.

1.7 Lists

The three preceding subsections are...

- Spacing

- Text
- Macros

Lists use the `itemize` environment or, if you want things numbered, `enumerate`:

1. Spacing
2. Text
3. Macros

But the numbers should match the subsection names and there are options to do that, too...

1.4 Spacing

1.5 Text

1.6 Macros

1.8 Special characters

LaTeX code uses a lot of special characters, which means if you want to put these characters in your text, you must *escape* the characters from their usual purpose. For instance, each of the following commands requires a backslash to precede them to show up: #, $, {, }, &, %, _. \ and ∼ take a little more fussing. Greek letters and symbols will be introduced in Section 5.

1.9 verbatim

When you really need to put text out explicitly, use verbatim:

```
All this stuff looks just like it \emph{would} if
you looked in the LaTeX file. % and comments don't work in verbatim...
```

2 Tabbing

2.1 Basic tabbing

Text can be indented using the indent command:

        This is indented text.

More importantly, custom tabbing can be created. For example

First tab Second tab There is no extra space between tabs by default.
1 2 3 4
one three four

Cells can be blank, like in the 3rd row, 2nd column.

Using the command \hspace{0.2cm} to make a little more space...

First tab Second tab Now there is extra space between tabs.
1 2 3 4
one three four

2.2 Impromptu tabs

New tabs can also be created partway in...

First tab Second tab Now there is extra space between tabs.
1 2 3 4 4.5
one three fowhere does this start?

That didn't work out so well. Correcting using \hspace...

First tab Second tab Now there is extra space between tabs.

1 2 3 4 4.5
one three four where does this start?

2.3 Tabbing example

Tabbing is an interesting environment to play in. A more serious tabbing creation (it gets a bit messy in LaTeX)... note that \hspace can take a negative argument, otherwise components of this example would not be permitted.

Test Name	**Description**		**Total number of trials**
Fixed Size	Upon collection of the data,		$n_f(\alpha, \beta, \delta, \sigma^2)$
	if $\lvert Z_k \rvert \geq 1.96$	stop, reject H_0	
	otherwise	stop, DNR H_0.	
Pocock	After group $k = 1, ..., K-1$		$n_f R_P(K, \alpha, \beta)$
	if $\lvert Z_k \rvert \geq C_P(K, \alpha)$	stop, reject H_0	
	otherwise	continue testing,	
	after group K (the last group)		
	if $\lvert Z_K \rvert \geq C_P(K, \alpha)$	stop, reject H_0	
	otherwise	stop, DNR H_0.	

3 Tables

3.1 Basic tables

A basic table...

Left	Center	Right
1	2	3

To center a table, create a centered environment around the table:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.2852	0.8434	-0.34	0.7452
x	0.4192	0.1499	2.80	0.0266

Maybe you also want to add a vertical dividers (many more could be added, if desired)...

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.2852	0.8434	-0.34	0.7452
x	0.4192	0.1499	2.80	0.0266

Another table...

Left	Will be left-justified.	Right
1	If the text becomes long in a column, then use `\p{7.5cm}` or something of the equivalent instead of `l`, `c`, or `r` for alignment permits paragraphs to be written in the table in a nice format. This is also handy if you want careful control of your column widths.	3

3.2 Captions and referencing

Want captions on your table? Use a table environment. These are called floating tables... they "float" around your page if you don't control them carefully, and sometimes still do even if you try to control them.

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.2852	0.8434	-0.34	0.7452
x	0.4192	0.1499	2.80	0.0266

Table 1: This is a caption.

You can also *automatically* build in references to tables (and figures, as shown later). For instance, the table below is Table 2. If it's table number were to change, the table number would update automatically after compiling the .tex document twice.

Why twice? LaTeX reads its references in when it compiles (from one of those files that is produced when you compile... the ones we all ignore), however, the file it reads was made from the *previous* compile. Thus, if you only compile once, the file you are reading might not be up-to-date. (Got it?)

See `latexTemp.tex` for additional comments on references.

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.5758	1.4528	-0.40	0.7056
x	0.3775	0.1971	1.92	0.1039
z	1.4042	1.7357	0.81	0.4494

Table 2: Neither x nor z were found to be statistically significant.

3.3 `array` environment

As we'll see in Section 5, the `array` environment is very similar to the `tabular` environment, except that it is typically used for equations.

3.4 The R package, `xtable`

For R users who want to put R output into LaTeX, the package `xtable` is very useful:

```
> library(xtable) # to download the package, use install.packages('xtable')
> x <- 1:9
> z <- rnorm(9)
> y <- x/7 + z*2 + rnorm(9)
> xtable(summary(lm(y ~ x+z)))
[... a bunch of output that can be copied/pasted into LaTeX ...]
```

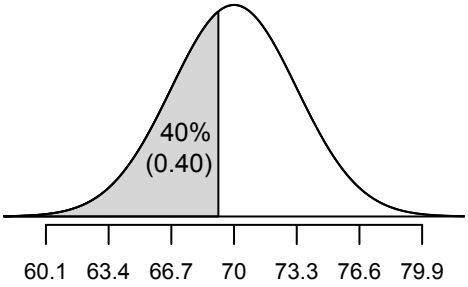
The resulting table, directly copied/pasted from R: This can also be used for matrices,

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.1563	0.6243	-0.25	0.8107
x	0.1094	0.1145	0.96	0.3760
z	2.6170	0.4308	6.08	0.0009

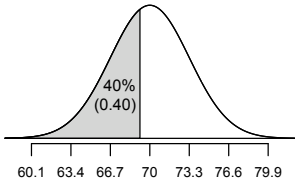
data frames, and some other R objects.

4 Figures

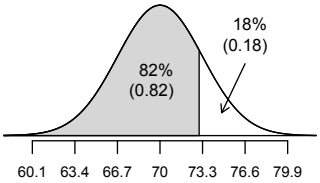
4.1 Basic figures



Basic figures are made using the `\includegraphics` command. The size can also be controlled via the optional `space` argument.



A figure can easily be centered in the same way a table was centered:



4.2 Captions and referencing

Like tables, figures can also be "floated" and have captions/labels. The Templates give a nicer means to work with graphics. See Figure 1. Note that the Float Figure template from LaTeX does not include the space option, which you would need to add.

4.3 Keeping organized

It is highly recommended that figures are organized into folders. This will keep the main folder from getting cluttered with lots of image files, like in Figure 2. Figure 3 shows a much better organization structure for the document figures.

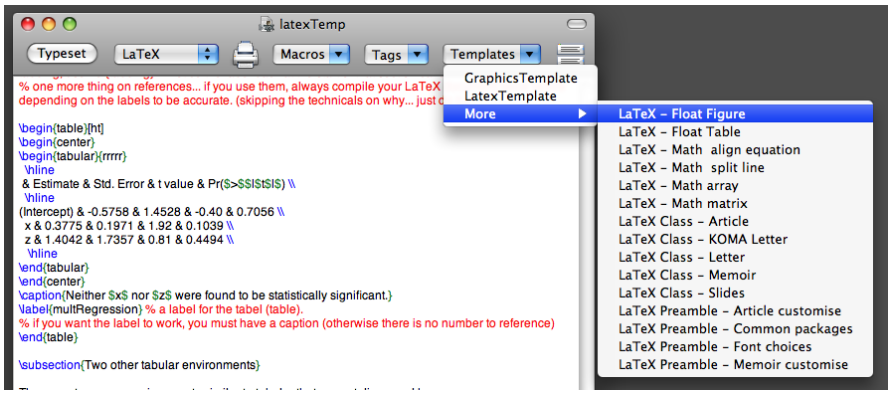


Figure 1: Where to find your figure template.

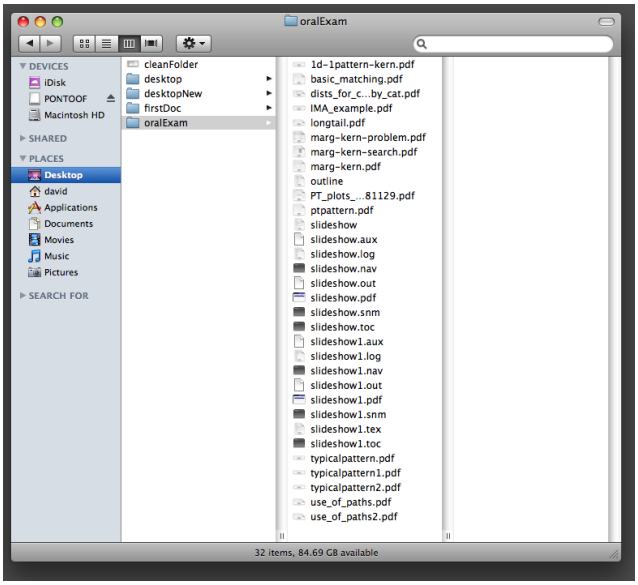


Figure 2: Don't do this. And name your files more carefully than this... "slideshow" is not specific.

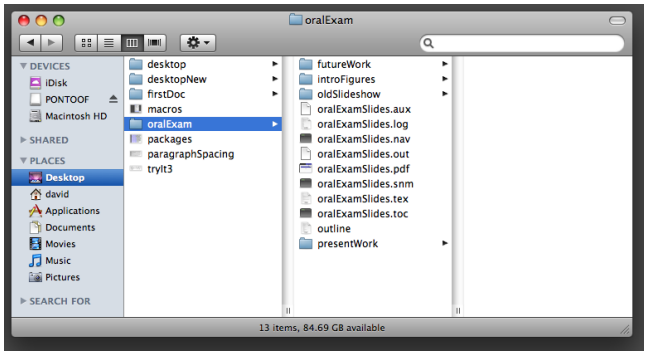


Figure 3: Organize your files more like this.

5 Math

5.1 Math in text

LaTeX makes it easy to add Greek letters like α, ζ, μ, etc. into text. In the same way, equations can be added easily as well: $y = x^3$, $\sum z^j$, $x_1 + \cdots + x_n$.

```
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$\mu$, etc. into text. In the same way, equations can be added
easily as well: $y=x^3$, $\sum z^j$, $x_1+\cdots+x_n$.
```

Greek letters and math expressions such as α, ζ, $y = \sqrt{x}\log(x)$ can be inserted easily using two dollar signs; it's just a matter of remembering what the commands are for each math expression or symbol. For example, α is created using `$\alpha$`. Based on how α was created, how would you think to create β?

The LaTeX and Matrix Panels have a large number of common symbols, letters, etc. and can be accessed by either `alt-command-[dash/underscore key]` or `alt-command-[+/= key]` in TeXShop or by navigating to them in the menu (see the "Window" menu in TeXShop). Some letters/symbols/etc that you can create...

$$\hbar\imath\ell\Re\Im\emptyset\infty\partial\nabla\triangle\forall\exists\nexists\top\bot\dagger\ddagger\sum\prod\int\oint\bigcap\cap\bigcup\cup\biguplus\bigoplus\bigotimes\bigodot\hat{a}\bar{a}\tilde{a}$$

$$\alpha\beta\gamma\delta\epsilon\varepsilon\zeta\eta\theta\iota\kappa\lambda\mu\nu\xi\pi\varpi\varrho\sigma\varsigma\tau\upsilon\phi\varphi\chi\psi\omega$$

The number of available symbols is enormous. If you want the symbol, it probably exists in LaTeX.

There are a huge number of ways to construct expressions...

$$\sqrt{2}, \quad \frac{5}{2+3} = 1, \quad \left(\frac{5}{2+3}\right), \quad 2^10 \neq 2^{10} = 1024, \quad x_1 = 3$$

$$\bar{x}, \quad 3 \geq x, \quad \lim_{x \to 0} \left(\frac{\sin(x)}{x}\right) \to 1, \quad \frac{\sin(x)}{x} \overset{x \to 0}{\to} 1$$

5.2 Equation environment and referencing

Equations can also be put on their own line using the equation environment:

$$A_{b_{ik}} = \sum_{l=1}^{k} \sum_{j=1}^{i} \gamma^{\alpha_{b_{jl}}} \tag{1}$$

Just like tables and figures, equations can also be referenced, such as Equation 1.

If you do not want a number assigned to your equation, use the `eqnarray*` environment:

$$A_{b_{ik}} = \sum_{l=1}^{k} \sum_{j=1}^{i} \gamma^{\alpha_{b_{jl}}}$$

One more example below in Equation 2...

$$\sum_{k=0}^{\infty} 0.5^k = \frac{1}{1-0.5} = 2 \tag{2}$$

5.3 Aligning

If there is a multiline equation, then use two amperstands (&) if any alignment is desired:

$$\begin{aligned} y &= (x-b)^2 + a \\ &= x^2 - 2bx + b^2 + a \end{aligned}$$

If you don't use this, the alignment is usually poor.

5.4 Arrays

Arrays are easily constructed using the Matrix Panel:

$$\begin{pmatrix} \sigma_1^2 & \sigma_{1,2} & \sigma_{1,3} \\ \sigma_{2,1} & \sigma_2^2 & \sigma_{2,3} \\ \sigma_{3,1} & \sigma_{3,2} & \sigma_3^2 \end{pmatrix}$$

Array construction is essentally identical to tables, except now it is easy to insert mathematics.

5.5 Some benefits of the package `amsmath`

The package `amsmath` is not in the LaTeX template, however, it can be very handy. If you have a longer equation and only want a number for one line, then use `\notag`:

$$\begin{aligned} &Cov\left(\left(\bar{X}_A^{(k_1)} - \bar{X}_B^{(k_1)}\right)\sqrt{I_{k_1}}, \left(\bar{X}_A^{(k_2)} - \bar{X}_B^{(k_2)}\right)\sqrt{I_{k_2}}\right) \\ &= Cov\left(\bar{X}_A^{(k_1)} - \bar{X}_B^{(k_1)}, \bar{X}_A^{(k_2)} - \bar{X}_B^{(k_2)}\right)\sqrt{I_{k_1} I_{k_2}} \\ &= Cov\left(\bar{X}_A^{(k_1)} - \bar{X}_B^{(k_1)}, \bar{X}_A^{(k_2)} - \bar{X}_B^{(k_2)}\right)\sqrt{I_{k_1} I_{k_2}} \end{aligned} \tag{3}$$

The package `amsmath` is required to use this command. This package is also required if text is added to an equation using `\text`:

$$\bar{x} = \sum_{i=1}^{n} x_i \quad \text{and} \quad \hat{\sigma} = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

Another example of `eqnarray`* with `\text`:

$$\text{estimated time} = \frac{\text{distance of travel}}{\text{speed of the car}} + \text{any delays}$$

6 Practice

Create a new document and produce the 3 items below. Be sure to update the `\title` and `\author` in your new document.

6.1 Try it #1

Make the output shown in Figure 4 using the `tabular` environment.

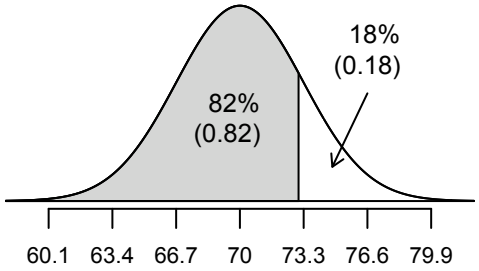
	$\bar{x}$	$\hat{\sigma}$	n
S_1	6.5	1.3	17
S_2	12.2	1.4	25

Figure 4: Try it #1.

6.2 Try it #2

Make the following image 0.8 inches tall, center it, add a caption, and add a reference. Write a sentence referencing the figure (using `\ref`) as well and compile your LaTeX document

twice so the reference works. (If you use the Float Figure Template be sure to add the height option... alternatively, you might use an earlier LaTeX example as a template.)



6.3 Try it #3

Produce the equation in Figure 5 using the `eqnarray`* environment.

$$\sum_{i=0}^{n} p^i = \frac{1 - p^{n-1}}{1 - p}$$

Figure 5: Try it #3.

7 Bibliography stuff

A point pattern is described as a realization of a point process (Daley and Vere-Jones, 2003), and several one-dimensional distance functions for point patterns are described in Victor and Purpura (1997).

References

Daley DJ and Vere-Jones D (2003). *An Introduction to the Theory of Point Processes, Volume 1: Elementary Theory and Methods*. Springer–Verlag, New York.

Victor J and Purpura K (1997). Metric-space analysis of spike trains: theory, algorithms and application. *Journal of Neuroscience Methods*, 8:127–164.