

# L<sup>A</sup>T<sub>E</sub>X practical

Clive Newstead

Wednesday 16th January 2019

By default, L<sup>A</sup>T<sub>E</sub>X is in ‘text mode’ which is used for inputting plain English text. Text mode is used for typing pretty much anything that isn’t mathematics. Single new lines are ignored by L<sup>A</sup>T<sub>E</sub>X.

Leaving a blank line starts a new paragraph. Avoid starting a new line using double backslash or the command.

To start a new section, use the section command:

## 1 Basic formatting

Text can be made **bold** or *italic* or underlined or monospace or sans-serif.

By default text is aligned to the left and justified.

It can be aligned to the centre.

It can also be aligned to the right.

## 2 Mathematics

Math mode is used to type mathematical symbols.

The simplest way of entering math mode is by typing a dollar sign. You can type another dollar sign to exit math mode. For example,  $a^2 + b^2 = c^2$ . This is not in math mode: a+b=c.

# All mathematical notation and variables should be typed using math mode!

Another way of entering math mode is using double dollar signs (and double dollar signs are used to exit again). For example

$$ab + bc + ca \leq \sqrt{a^2 + b^2 + c^2}$$

Using math mode, we can type:

- Logical operators:  $p \wedge q$ ,  $p \vee q$ ,  $p \Rightarrow q$  (not  $p \rightarrow q$ ),  $p \Leftrightarrow q$ ,  $\neg p$  (not  $\not p$ )
- Quantifiers:  $\forall x \in X$  and  $\exists x \in X$
- Number sets:  $\mathbb{N}$ ,  $\mathbb{Z}$

For example,

$$\forall a, b \in \mathbb{R}, a \leq b \Rightarrow \exists c \in \mathbb{R}, b = a + c^2$$

By default math mode ignores spaces:  $abcde$  but you can force spaces using various commands:  $abc\ d\ e\ f\ g$

You can also enter text mode from within math mode using the text command:

$$a^2 \geq 0 \text{ for all } a \in \mathbb{R}$$

Enumeration is handled automatically:

- (1) Variables
- (2) Quantifiers
- (3) Logical formulae
- (4) Apples
- (5) Oranges
- (6) Pomegranates
- (7) Guinea pigs

### 3 Aligned equations

Sometimes there are just too many = signs to keep track of. For example:

$$(n+1)!-(n-1)! = (n+1)n(n-1)!-(n-1)! = [(n+1)n-1](n-1)! = [n^2+n-1](n-1)! \neq -17 = 0-1-2-3-4-5-$$

We can remedy this using the `align*` environment.

$$\begin{array}{ll} (n+1)! - (n-1)! = (n+1)n(n-1)! - (n-1)! & \text{by definition of factorials} \\ = [(n+1)n-1](n-1)! & \text{collecting common factor} \\ = [n^2+n-1](n-1)! & \text{expanding} \end{array}$$

One last thing:  $x^{1000}$  is bad, but  $x^{1000}$  is good.