LaTeX Workshop Demo Source

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```latex
\documentclass{article}

% Injects content from preamble.tex (mostly imports) here
\input{preamble}

\title{\LaTeX{} Workshop Demo (complete)}
\author{Jesse Wei}
\date{March 26, 2024}

\begin{document}

\maketitle

\tableofcontents
\newpage

\section{Introduction}

This is our \LaTeX{} workshop's complete demo (template
 ↪ \href{https://www.overleaf.com/read/tmgncmqywbdj#3f2451}{here}). Here are the
 ↪ associated
 ↪ \href{https://docs.google.com/presentation/d/1zO6tLPnshC0WfSBvqL2mZKDLLprnuQr2t1IMmsjBdlM/edit?usp=s
 ↪ This demo is heavily inspired by \cite{latex_vid_1} and \cite{latex_vid_2}.

\section{Math formatting}

Let's write some expressions involving the number $e$.

\subsection{Math mode (inline)}

$e\approx2.71828$

\subsection{Math mode (display)}

$$e\approx2.71828$$

\subsection{Expressions}

% fraction
$$(1+\frac{1}{n})^n$$

% left right
$$\left(1+\frac{1}{n}\right)^n$$
```

```
% subscript
$$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n$$

% sqrt and (optional) argument [n]
$$\lim_{n\to\infty}\frac{n}{\sqrt[n]{n!}}$$

% superscript, sum
$$\sum_{n=0}^{\infty}\frac{1}{n!}$$

% numbered equation with label
\begin{equation}
    \label{esum}
    \sum_{n=0}^{\infty}\frac{1}{n!}
\end{equation}

Since we labeled the above equation with \texttt{\textbackslash label\{esum\}}, we can refer to it with \texttt{\textbackslash ref}, like so: \ref{esum}.

%%%%%%%%%%%%%%%%%%
% Pause demo for 2 min to allow students to write their own.
% Or they can skip to exercise
%%%%%%%%%%%%%%%%%%

\subsection{Symbols}

Some lowercase symbols: $\alpha, \beta, \gamma, \sigma, \rho, \pi$

Uppercase symbols: $\Gamma, \Sigma, \Pi$

Symbols sometimes look different in inline and display mode even when the code is the same. For example,

$\sum_{i=0}^n$

$$\sum_{i=0}^n$$

$\prod_i$

$$\prod_i$$

\subsection{How to find symbol}

% Note: do not use " " (double quotation marks)
% Instead, use `` " (two grave symbols, then a quotation mark)
Is there a symbol that you don't know how to write in \LaTeX? You could try \href{https://detexify.kirelabs.org/classify.html}{Detexify} \footnote{Link made possible by \textbackslash usepackage\{hyperref\} in the preamble}, but I don't find it that great. Instead, I recommend googling (e.g., ``How to type alpha in LaTeX").

\subsection{Exercise}

\begin{exercise}{Expressions and symbols}{}
```

```latex
    Transcribe the following. If you don't know how to write a symbol in \LaTeX, search up how to write it. Once you're done, you can compare with \texttt{solutions/expressions.tex}.

    \input{solutions/expressions}
\end{exercise}

\begin{solution}{}{}
    \begin{enumerate}
        \item
        \item
        \item
        \item
        \item
    \end{enumerate}
\end{solution}

\section{Text formatting}

\subsection{Text}

\textbf{Bold}, \textit{Italicize}, \underline{underline}, footnote\footnote{This is a footnote}

\subsection{Lists}

\begin{enumerate}
    \item 1
    \item 2
    \item 3
\end{enumerate}

\begin{itemize}
    \item 4
    \item 5
    \item 6
\end{itemize}

If you forget the source code for these, you can click $\cdots >$ Bullet list or Numbered List in the Overleaf UI at the top.

\subsection{Figures}

Click $\cdots >$ Insert Figure $>$ From project files in the Overleaf UI to insert \texttt{img/latex.png}.

\begin{figure}[h]
    \centering
    \includegraphics[width=0.6\linewidth]{img/latex.png}
    \caption{\LaTeX{} logo}
    \label{latex_logo}
\end{figure}

```

```
If we label it with \texttt{\textbackslash label}, we can refer to it using \texttt{\textbackslash ref}, like so \ref{latex_logo}.

The figure will probably go somewhere unexpected (i.e., some location that isn't where you wrote \textbackslash begin\{figure\} because \LaTeX{} decides where it goes. For example, if there isn't enough space on the current page, then the figure will be placed on the next page. Try removing [h] from the above source code, and see where the figure goes.

We can sometimes resolve this with \texttt{\textbackslash begin\{figure\}[h]}. If that doesn't work, you may have to use \texttt{\textbackslash pagebreak} or other means.

\subsection{Tables}

Click Insert table at the top of the UI. Similar to figures, tables also may not go where you want without [h] or other means.

\begin{table}[h]
    \centering
    \begin{tabular}{ccc}
        1 & 2 & 3\\
        4 & 5 & 6\\
        7 & 8 & 9\\
    \end{tabular}
    \caption{No lines}
\end{table}

You can add lines:

\begin{table}[h]
    \centering
    \begin{tabular}{|c|c|c|}
        \hline
        1 & 2 & 3\\
        \hline
        4 & 5 & 6\\
        \hline
        7 & 8 & 9\\
        \hline
    \end{tabular}
    \caption{With lines}
\end{table}

\subsection{Code}

For inline code, it's good practice to use \texttt{\textbackslash texttt}, which is a monospace code-looking font. For example, \texttt{print("hello world")}.

For longer code listings, use the \texttt{listings} package. For example,

\begin{figure}[h]
    \centering
    \begin{lstlisting}[language=Python]
    def bogosort(l: list[int]):
```

```
        """Bogosorts list of integers"""
        while not sorted(l) == l:
            shuffle(l)
    \end{lstlisting}
\end{figure}

See \cite{overleaf_code} for more information.

\subsection{Bibliography}

We can add a bibliography using the package \texttt{biblatex} and a \texttt{.bib} file.

See the \texttt{biblatex} import in \texttt{preamble.tex}. Also see \texttt{refs.bib}. You can cite a source using \texttt{\textbackslash cite}, like so \cite{latex_vid_1} \cite{latex_vid_2}. Then, use \texttt{\textbackslash printbibliography} (at the bottom) to place the bibliography.

Note that if a source from the \texttt{.bib} file is not cited, it will not appear in the document.

See \cite{overleaf_bibliography} for more information.

\subsection{Comments}

Write a comment for your source code using \%.

For example, there's an unrendered comment here $\rightarrow$ % this is a comment and isn't rendered

\subsection{Escape characters}

However, if \% denotes a comment, how do we write \% in text? Use \textbackslash to escape the reserved character. And note that \textbackslash is also reserved, so to write \textbackslash, this source code uses \texttt{\textbackslash textbackslash}.

\subsection{Exercise}

\begin{exercise}{Escape characters}{}
    Transcribe the following. Once you're done, you can compare with \texttt{solutions/escape.tex}.

    \input{solutions/escape}

    3 should be done in math mode (for the sake of example), and use \texttt{\textbackslash text} to escape math mode.

\end{exercise}

\begin{solution}{}{}
    \begin{enumerate}
        \item
        \item
        \item
    \end{enumerate}
```

```
\end{solution}

\section{Define our own formatting}

\subsection{Environments}

When we use \texttt{\textbackslash begin} and \texttt{\textbackslash end}, we enter environments. We can actually define our own environments. For example, see the \texttt{\textbackslash newtheorem} definitions in \texttt{preamble.tex}.

\begin{theorem}
    There are no solutions to $a^n+b^n=c^n$ for positive integers $n > 2$.
\end{theorem}

\begin{proof}
    Left as an exercise to the reader.
\end{proof}

\begin{theorem}
    $\mathsf{P}=\mathsf{NP}$
\end{theorem}

\begin{proof}
    Left as an exercise to the reader.
\end{proof}

\begin{corollary}
    All of cryptography\footnote{except OTP} is broken.
\end{corollary}

\subsection{Macros}

Macros help us automate repetitive tasks.

For example, we normally write $\mathbb{R}$ with \texttt{\textbackslash mathbb\{R\}}. However, this is tedious to write every time. So, we can define a new command as a shortcut. For example, since we have \texttt{\textbackslash newcommand\{\textbackslash R\}\{\textbackslash mathbb\{R\}\}} in the preamble, we can simply write \texttt{\textbackslash R} to display $\R$.

As another example, suppose we want to implement a macro for column vectors. We can write a column vector using \texttt{bmatrix} (even inline). For example, $\begin{bmatrix}0\\1\end{bmatrix}$. However, this is a lot to type. So, check out the macro for \texttt{\textbackslash cv} in the preamble. Now, \texttt{\textbackslash cv\{0\}\{1\}} outputs $\cv{0}{1}$.

\newpage
\printbibliography

\end{document}
```