Specifying Spaces, Lengths, and Boxes in \LaTeX

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Outline

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   - \texttt{hspace{}} and \texttt{hspace*{}}
   - Font Size and \texttt{hspace{}}
   - \texttt{hspace{}} and \texttt{stretch{}} , \texttt{hfill}
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This presentation covers \LaTeX\ spaces, lengths, and boxes as these elements apply to inline text structure of documents. These concepts apply to many areas of \LaTeX. For clarification, this presentation will not cover the application of spaces, lengths, and boxes as they apply to:

- equations
- graphics
- figures
- etc.
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The standard \hspace{\textit{length}} command will simply trigger a newline if it runs out of space:

\begin{itemize}
  \item One Two Three
  \item Four
\end{itemize}

But \hspace*{\textit{length}} will enforce the specified space (within a paragraph):

\begin{itemize}
  \item One Two Three
  \item Four
\end{itemize}

\textit{Note:} \hspace{} and \hspace*{} are equivalent at locations other than at the end of a line.
When using horizontal space together with text, it may make sense to make the space adjust its size relative to the size of the current font. This can be done by using the text-relative units em and ex:

\[
\text{big } y \quad \text{tin } y
\]
Horizontal Spacing Control
hspace{} and stretch{}, hfill

The command \stretch{length}, used in conjunction with the hspace{} command, generates a special “rubber space” in which all the remaining space on a line is filled up:

\[ x \hspace{\stretch{1}} x \]

The numeral argument does not have significance unless a succession of hspace\{\stretch{\}} commands are issued on the same line. In this case, the numerals represent respective proportions of all \stretch{} commands issued on the same line:

\[ a \hspace{\stretch{1}} b \hspace{\stretch{3}} c \]

If only an evenly proportional spacing is needed between elements on a line, use the \hfill command such as:

\[ pip \hfill pop \hfill bing \hfill plop \]
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Logically following from \hspace{} and \hspace*{} (\ldots), the commands \vspace{\texttt{length}} and \vspace*{\texttt{length}} operate not between lines \textit{within} a paragraph, but on the vertical space \textit{between} paragraphs themselves. These commands should normally be used between two empty lines. If the space should be preserved and spread across the bottom and top of successive pages, use the starred version of the command, \vspace*{}, instead of \vspace{}:

First paragraph: This produces \ldots \vspace{2ex}
Second Paragraph: No effect. (document only!!)

Third Paragraph: But now we have what we want.
The `\stretch{}` command can be used in conjunction with the `\vspace*{}`, and `\vspace{}` commands such as:

```
Hi! \vspace{stretch{1}} something \vspace{stretch{3}} else \pagebreak
```

...in order to define relative proportional vertical spacing on a page between structures similar to its use with the `\hspace{}` commands. Since an example would require an entire page top to bottom, one is not shown. Use your imagination.

If only an evenly proportional vertical spacing is needed between elements on a page, use the `\vfill` command similarly to usage of the `\hfill` command.
Vertical Spacing Control

Other vertical spacers

For custom spacing between lines within a paragraph, the ‘\[length\]’ command is the only way to go as in:

```
The next line is spaced 10pt below this one
Here it is.
```
```
The next line is spaced 10pt below this one \[10pt\]
Here it is.
```

The \texttt{\bigskip}, \texttt{\medskip}, and \texttt{\smallskip} commands can be used as alternative vertical line spacers within a paragraph if an exact spacing is not required.
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The underlying structure of \LaTeX\ basically typsets all letters, words, sentences, paragraphs, figures, tables, etc., into “boxes”. Multiple of these elements on a page are then further grouped into enclosing “boxes”. We can manipulate and emphasize these boxes in various ways.
The \texttt{\textbackslash parbox[\texttt{pos}]{\texttt{width}}\{\texttt{text}} \begin{minipage}\[\texttt{pos}]{\texttt{width}}\texttt{text} \end{minipage} commands can place a paragraph within a box. The ‘minipage’ method is more powerful as far as what you can do within a box. You can explore that on your own.

As an example:

\begin{itemize}
\item Here is a basic box around a paragraph. We have set a reasonable width relative to textwidth, and the text is centered vertically. Note that the ‘pos’ variable can be either ‘t’, ‘b’, or ‘c’ to designate vertical alignment.
\item \texttt{\parbox[c]{\textwidth}{
Here is a basic box around a paragraph. We have set a reasonable width relative to textwidth, and the text is centered vertically. Note that the ‘pos’ variable can be either ‘t’, ‘b’, or ‘c’ to designate vertical alignment.\}}
\end{itemize}
The \texttt{\makebox[width][pos]{text}} command is meant to operate on a single line with added horizontal control:

\begin{itemize}
  \item \texttt{\makebox[\textwidth][s] { A simple example. }}
\end{itemize}

Width is optional and specified as before, but ‘pos’ is either ’l’, ’r’, or ’s’ for horizontal flushleft, flushright, or spread, respectively.

The \texttt{\mbox{text}} command simply defines a box which will automatically set to the width of the specified text without additional options.
Boxes
\framebox{} and fbox

The \texttt{\framebox[width][pos]{text}} command is exactly the same as the \texttt{\makebox} command, except that it puts a frame around the outside of the box that it creates:

\begin{Verbatim}
\framebox[\textwidth][s] { A simple example. }
\end{Verbatim}

The \texttt{\fbox{text}} command is exactly the same as the \texttt{\mbox{text}} command, except that it puts a frame around the outside of the box that it creates.
An example combining the box structures explored so far is adapted from the “Not So Short …” document by Oetiker:

\makebox[.6\textwidth]{central} \par
\makebox[.6\textwidth][s]{spread} \par
\framebox[1.1\width]{Guess I'm framed now!} \par
\framebox[0.8\width][r]{Bummer, I am too wide} \par
\framebox[1cm][l]{never mind, so am I} 
Can you read this?

\begin{itemize}
  \item \texttt{parbox}\{\}
  \item \texttt{minipage}\{\}
  \item \texttt{makebox}\{\}
  \item \texttt{mbox}\{\}
  \item \texttt{framebox}\{\}
  \item \texttt{fbox}\{\}
\end{itemize}
The \raisebox{lift}[extend-above-baseline][extend-below-baseline]{text} command gives strange and wonderful vertical control to properties of a box. ‘lift’ is the distance the specified text will raise from the baseline of the current line. The other two optional parameters control the line spacing to other text above and below the current raisebox item.

An example is adapted from the “Not So Short …” document by Oetiker:

```
\frame {  
\parbox[c]{\textwidth} {  
\raisebox{-5pt}[0pt][0pt]{\Large\textbf{Aaaa\raisebox{-0.3ex}{a} \raisebox{-0.7ex}{aa} \raisebox{-1.2ex}{r} \raisebox{-2.2ex}{g} \raisebox{-4.5ex}{h}}}  
she shouted, but not even the next one in line noticed that something terrible had happened to her.
```
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Further Study On Your Own

There are several other \LaTeX\ spacing, length, and boxing commands which have not been covered in this presentation. Have at it:

- \addvspace{length} – extend the vertical space until it reaches length
- \hrulefill, \dotfill – fill out all available horizontal space with a line or with dots
- \rule{width}{thickness} – draw a line
- \newsavebox{boxname} – define the variable boxname to store a box
- \savebox{boxname}{text}, \sbox{boxname}{text} – save text into the variable boxname
- \usebox{boxname} – use material stored in box variable boxname
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Questions ??