A Local Guide for Using TEXmaker

The purpose of this document is to illustrate the editing program TEXmaker and LATEX. There are other editors available, but TEXmaker is illustrated because a port of this package is available under Windows, Mac, and Linux. This particular guide has been prepared in the Mathematics Department Lab using the machines there. Other versions of this package will operate in a slightly different way.

1 Beginning the document

To create a LATEX document first open the editor, start a file and enter the header. The exact commands necessary are described below.

Under the **Start** menu, locate **All Programs/Mathematics/TeX/texmaker**. Clicking on this will give you a window for editing. You need to create a new file by selecting **File/New**. The editor, TEXmaker, numbers lines automatically.[1]

You must name and save your file before continuing. Select **File/Save** and save your file to the `T:` drive. You will have to transfer your file to your USB drive later if you want to have it for future use. Under Windows, you do not need to insert the `.tex` suffix (under Windows). Just saving your file as say, `testing`, will work.

The first line of your file should be

```
\documentclass[10pt]{article}
```

The next lines should indicate any LATEXpackages you need and any additional header information. No such information is needed for this example. Now the document begins with

```
\begin{document}
```

The last line of your file, if you want to put it in now will be

```
\end{document}
```

For practice, you might enter the following lines and process the file.

```
\documentclass[10pt]{article}
\begin{document}
Hello World!
\end{document}
```

To process the file, select the icon with a `PDFLAT` on it (for PDFLATEX). To view the output, select the Acrobat reader icon (the red icon next to `PDFLAT`). If you have entered the information correctly, a window showing only

Hello World!

will appear. To revise this file, go back to the editor and change Hello to Goodbye. Then reprocess the file by selecting `PDFLAT`. Go back to the output window and press the R key (for refresh) to see the changes.

[1] Also, since LATEXis a typesetting tool, you do not need to insert line breaks. In fact, any line breaks you insert will be ignored.

2 Entering Text, part 1

In this example, an induction proof is illustrated. First, there is the statement of the problem.

> **Problem:** Show that, if n is a positive integer, then
>
> $$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

This is produced by the following lines.

```
\begin{quote}
\textbf{Problem:} Show that, if $n$ is a positive integer, then
\[ \sum_{i=1}^{n} i^2 =  \frac{n(n+1)(2n+1)}{6}\]
\end{quote}
```

The first and last lines, with `\begin{quote}` and `\end{\quote}`, cause the text between them to be indented. `\textbf{Problem:}` causes "Problem:" to be typeset in bold-faced print. `$n$` causes n to be typeset in italics (because it is a mathematical variable). By studying the line

```
\[ \sum_{i=1}^{n} i^2 =  \frac{n(n+1)(2n+1)}{6}\]
```

you should be able to figure out the LaTeX commands which cause the summation sign to be displayed, how the the upper and lower limits of the summation are indicated, how exponents are entered, and how fractions are specified. The entries `\[` and `\]` cause this equation to be centered on a line by itself.

3 Entering Text, part 2

The basis step of the induction would be entered with

```
\textbf{Proof:} The proof will be by induction.
Let $P(n)$ be the statement
\[ \sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}.\]

Since $\sum_{i=1}^1 i^2 = 1 = \frac{1\cdot2\cdot 3}{6}$, $P(1)$ is true.
```

which would produce

Proof: The proof will be by induction. Let $P(n)$ be the statement

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}.$$

Since $\sum_{i=1}^1 i^2 = 1 = \frac{1\cdot2\cdot 3}{6}$, $P(1)$ is true.

There are several things to observe here. First, when a summation is not displayed on a centered line, but in a line of text, the output is slightly different. Also, `\cdot` causes a centered dot to be displayed. There are very many different commands in TeX . Fortunately they are often easy to figure out. For example, the command for "centered dots" is `\cdots` and that for three "lower dots" is `\ldots`

4 Entering Text, part 3

Finally, comes the rest of the proof. This could be entered as follows.

```
Assume, by induction, that $P(k)$ is true for some $k > 0$.  Then,
by the associative law of addition and the inductive assumption,
\[\sum_{i=1}^{k+1} i^2 = \left(\sum_{i=1}^{k} i^2\right) + (k+1)^2
 = \frac{k(k+1)(2k+1)}{6} + (k+1)^2. \]
By finding a common denominator and simplifying,
\[ \frac{k(k+1)(2k+1)}{6} + (k+1)^2 = \frac{k(k+1)(2k+1)}{6}+
\frac{6(k+1)^2}{6} = \frac{(k+1)[(2k^2+k)+(6k+6)]}{6}\]
Since $(2k^2+k)+(6k+2) = 2k^2 + 7k + 6 = (k+2)(2k+3) = [(k+1)+1][2(k+1)+1]$,
we have that
\[ \frac{k(k+1)(2k+1)}{6} + (k+1)^2 = \frac{(k+1)[(k+1)+1][2(k+1)+1]}{6}.\]
That is, $P(k+1)$ is true.

Therefore, since $P(1)$ is true and for $k > 0$, the truth of $P(k)$ implies the
truth of $P(k+1)$, the Principle of Mathematical
Induction implies that $P(n)$ is true for all $n > 0$.
```

These lines of input would produce the following:

Assume, by induction, that $P(k)$ is true for some $k > 0$. Then, by the associative law of addition and the inductive assumption,

$$\sum_{i=1}^{k+1} i^2 = \left(\sum_{i=1}^{k} i^2\right) + (k+1)^2 = \frac{k(k+1)(2k+1)}{6} + (k+1)^2.$$

By finding a common denominator and simplifying,

$$\frac{k(k+1)(2k+1)}{6} + (k+1)^2 = \frac{k(k+1)(2k+1)}{6}+\frac{6(k+1)^2}{6} = \frac{(k+1)[(2k^2+k)+(6k+6)]}{6}$$

Since $(2k^2+k)+(6k+2) = 2k^2 + 7k + 6 = (k+2)(2k+3) = [(k+1)+1][2(k+1)+1]$, we have that

$$\frac{k(k+1)(2k+1)}{6} + (k+1)^2 = \frac{(k+1)[(k+1)+1][2(k+1)+1]}{6}.$$

That is, $P(k+1)$ is true.

Therefore, since $P(1)$ is true and for $k > 0$, the truth of $P(k)$ implies the truth of $P(k+1)$, the Principle of Mathematical Induction implies that $P(n)$ is true for all $n > 0$. Q. E. D.

5 Using TEXmaker on a USB drive

If you use TEXmaker on a USB drive, you must work a little differently. First, insert your USB drive in a computer and go to that drive (you should be able to find it under **MyComputer:**) Next, go to the folder `USBTeX-0.9.8` on this drive. Then, execute the batch file `start` to make the necessary modifications to the registry of the computer. It takes a minute or so for these modifications to be made.

Next, execute the batch file `TexMaker` to start TEXmaker. You can now edit or create files in the usual way. However, do not click on file names to edit them — use **File/Open** under TEXmaker instead.

When you are finished, execute the batch file `stop` to restore the registry of the computer. This will also allow you to safely remove your USB drive.

6 Input File

```
\documentclass[10pt]{article}
\begin{document}
\begin{quote}
\textbf{Problem:} Show that, if $n$ is a positive integer, then
\[ \sum_{i=1}^{n} i^2 =  \frac{n(n+1)(2n+1)}{6}\]
\end{quote}

\textbf{Proof:
} The proof will be by induction.  Let $P(n)$ be the statement
\[ \sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}.\]

Since $\sum_{i=1}^1 i^2 = 1 = \frac{1\cdot2\cdot 3}{6}$, $P(1)$ is true.
Assume, by induction, that $P(k)$ is true for some $k > 0$.  Then,
by the associative law
of addition and the inductive assumption,
\[
\sum_{i=1}^{k+1} i^2 = \left(\sum_{i=1}^{k} i^2\right) + (k+1)^2
 = \frac{k(k+1)(2k+1)}{6} + (k+1)^2. \]
By finding a common denominator and simplifying,
\[ \frac{k(k+1)(2k+1)}{6} + (k+1)^2 = \frac{k(k+1)(2k+1)}{6}+
\frac{6(k+1)^2}{6} = \frac{(k+1)[(2k^2+k)+(6k+6)]}{6}\]
Since $(2k^2+k)+(6k+2) = 2k^2 + 7k + 6 = (k+2)(2k+3) = [(k+1)+1][2(k+1)+1]$,
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\[ \frac{k(k+1)(2k+1)}{6} + (k+1)^2 = \frac{(k+1)[(k+1)+1][2(k+1)+1]}{6}.\]
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truth of $P(k+1)$, the Principle of Mathematical
Induction implies that $P(n)$ is true for all $n > 0$. Q.E.D.
\end{document}
```

7 Output File

Problem: Show that, if n is a positive integer, then

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

Proof: The proof will be by induction. Let $P(n)$ be the statement

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}.$$

Since $\sum_{i=1}^{1} i^2 = 1 = \frac{1\cdot 2\cdot 3}{6}$, $P(1)$ is true. Assume, by induction, that $P(k)$ is true for some $k > 0$. Then, by the associative law of addition and the inductive assumption,

$$\sum_{i=1}^{k+1} i^2 = \left(\sum_{i=1}^{k} i^2\right) + (k+1)^2 = \frac{k(k+1)(2k+1)}{6} + (k+1)^2.$$

By finding a common denominator and simplifying,

$$\frac{k(k+1)(2k+1)}{6} + (k+1)^2 = \frac{k(k+1)(2k+1)}{6} + \frac{6(k+1)^2}{6} = \frac{(k+1)[(2k^2+k)+(6k+6)]}{6}$$

Since $(2k^2+k)+(6k+2) = 2k^2+7k+6 = (k+2)(2k+3) = [(k+1)+1][2(k+1)+1]$, we have that

$$\frac{k(k+1)(2k+1)}{6} + (k+1)^2 = \frac{(k+1)[(k+1)+1][2(k+1)+1]}{6}.$$

That is, $P(k+1)$ is true.

Therefore, since $P(1)$ is true and for $k > 0$, the truth of $P(k)$ implies the truth of $P(k+1)$, the Principle of Mathematical Induction implies that $P(n)$ is true for all $n > 0$. Q.E.D.