Foundations. Latex is the standard document typesetting system used for technical and scientific publications. In contrast to document preparation programs like Microsoft Word, where WYSIWYG (what you see is what you get), with Latex you type various commands into a .tex file using a Latex editor. These commands determine the visual presentation of your content. This .tex file is then compiled to produce a pdf.

A typical .tex file consists of two components: (i) the preamble (for specifying various settings) and (ii) the body of the document (for your content). The body of the document is contained between the lines:

```
\begin{document}
...
\end{document}
```

The simplest document you can produce is achieved by typing:

```
\documentclass{article}
\begin{document}
Lorem ipsum.
\end{document}
```

In the above example our preamble consists of the single line: `\documentclass{article}`. It is always necessary to tell Latex what document class to use. There are various classes you can investigate, but article is the most commonly used.

Sectioning. Within the body of our document we can break up our content according to the following hierarchy: section/subsection/subsubsection....To do this we write, for example,

```
\section{Section Title}
Lorem ipsum.
\subsection{Subsection Title}
Lorem ipsum.
\subsubsection{Subsubsection Title}
Lorem ipsum.
\section{Next Section Title}
etc.
```

Environments. An environment in Latex is a block of code that causes your content to be formatted differently. A small selection of examples of how environments can be used include:

(i) to change the text alignment,
(ii) to change the style of text i.e. bold/italic,
(iii) to display text in a list (like this),
(iv) to insert a table,
(v) to insert a picture,
(vi) to type mathematics.

Typically, we invoke an environment by typing:

```
\begin{environment type}
Lorem ipsum.
\end{environment type}
```

The Preamble. In order to facilitate easier customization of Latex people often bundle together various stylistic settings into packages. These packages can then be implemented with a single command in the preamble, instead of having to write out many lines of code. Packages can be written by anybody, and you typically download them off the internet if they are not included with the standard Latex setup. To utilize a package you insert the following into your preamble:

```
\usepackage{packagename}
```

For example, the American Mathematical Society created three packages which are very important for typesetting mathematics. You should always load these packages in your .tex files. You do this by typing:

```
\usepackage{amsthm}
\usepackage{amsmath}
\usepackage{amssymb}
```

Maths Mode. If we wish to type mathematics in our document, then we should invoke the maths mode environment. There are two possible ways of rendering the mathematics: (i) inline mathematics or (ii) display mathematics.

For inline maths we can type:
```
\begin{math}
x + 2 = 5
\end{math}
```
Alternatively, we can enclose the mathematics in dollar signs `$ x + 2 = 5 $`, or enclose it in the brackets `\( x + 2 = 5 \)`.

For display mathematics we can type:
```
\begin{displaymath}
x + 2 = 5
\end{displaymath}
```
Alternatively, we can enclose the mathematics in double dollar signs `$$ x + 2 = 5 $$`, or enclose it in the brackets `\[ x + 2 = 5 \]`.

With these different options available, you should be consistent in only using one type of notation. I recommend you use `\(\)` for inline maths and `\[\]` for display maths because it results in code which is easier to debug.

Mathematical Terminology. When typing mathematics we often wish to talk about definitions and theorems. Latex allows you to easily create specific corresponding environments so that your document has consistent notation. To do this we add the following to our preamble:
```
\newtheorem{theorem}{Theorem}
\newtheorem{definition}{Definition}
```
Then when writing a definition we type:
```
\begin{definition} Lorem ipsum.
\end{definition}
```
When writing a theorem we type:
```
\begin{theorem} Lorem ipsum.
\end{theorem}
\begin{proof} Lorem ipsum.
\end{proof}
```

Pictures. To include a picture in our document we add `\usepackage{graphicx}` to our document preamble. Then we include the following in our document body:
```
\includegraphics[scale=0.5]{imagefilename.jpg}
```
The parameter `scale=0.5` allows us to control the size of the image. We must also have the image file saved in the same folder as our .tex file.

Links. There is much more to Latex than we have developed here. Moreover, there is a wealth of information and many tutorials on Latex on the internet. If you have questions about how to customize it to suit your particular needs, then there is likely someone on the internet who has had the same questions and written about how to resolve them. In particular, there are often specific packages available for different purposes. Below we list several useful links.

(i) `http://artofproblemsolving.com/wiki/index.php?title=LaTeX` This website provides a good introductory tutorial to get you started typing mathematics in Latex.

(ii) `http://detexify.kirelabs.org/classify.html` It is difficult to remember the commands for all the different symbols which Latex can produce. This website attempts to recognize a symbol from a rough sketch, using machine learning, and suggests appropriate Latex commands accordingly.

(iii) `http://tug.ctan.org/info/symbols/comprehensive/symbols-a4.pdf` This is a complete list of all the symbols you can write in Latex. It's not practical to use this all that often, but you should know that it exists.