

```

\documentclass{article}
\usepackage[utf8]{inputenc}
\title{table}
\begin{document}
\begin{center}
\begin{tabular}{c c c }
a & b & c \\
a & b & c \\
a & b & c \\
\end{tabular}
\end{center}
\end{document}

```

```

\documentclass{article}
\usepackage[utf8]{inputenc}
\title{table}
\begin{document}
\begin{center}
\begin{tabular}{|c|c|c|}
\hline
a & b & c \\
a & b & c \\
a & b & c \\
\hline
\end{tabular}
\end{center}
\end{document}

```

Example of multi-page tables in LaTeX is shown below:

```

\documentclass{article}
\usepackage[utf8]{inputenc}
\usepackage{longtable}
\begin{document}
\begin{longtable} [c] { | c | c | }
\hline
\multicolumn{2} { | c | }{Begin of Table}\\
\hline
Food & Names \\
\hline
\endfirsthead
\hline
\multicolumn{2} { | c | }{Continuation of Table}\ref{long}\\
\hline
Food & Names\\
\hline
\endhead
\hline
\endfoot
\hline
\multicolumn{2} { | c | }{End of Table}\\
\hline
\endlastfoot
Lots of lines & like this \\
Lots of lines & like this \\
Lots of lines & like this \\
Lots of lines & like this \\
\end{longtable}

```

```
\end{document}
```

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\begin{document}
\begin{tabular}{|p{3cm}|p{3cm}|p{3cm}|}
\hline
\multicolumn{3}{|c|}{Books}\\
\hline
Food name & Author & Publication \\
\hline
Book1 & Author1 & P1 \\
Book1 & Author2 & P2 \\
Book1 & Author3 & P3 \\
Book1 & Author4 & P4 \\
\hline
\end{tabular}
\end{document}
```

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\begin{document}
\begin{center}
\begin{tabular}{|c|c|c|c|}
\hline
c1 & c2 & c3 \\
\hline
\multirow{3}{4em}{a} & b & c \\
& a & b \\
& a & b \\
\hline
\end{tabular}
\end{center}
\end{document}
```

Output of the above code

#### 1.1.1.1.4 Captions, labels and references

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\begin{document}
\begin{table}[h!]
\centering
\begin{tabular}{||c|c|c|c|}
\hline
Col1 & Col2 & Col3 & Col4 \\
\hline \hline
1 & 2 & 3 & 4 \\
5 & 6 & 7 & 8 \\
9 & 10 & 11 & 12 \\
13 & 14 & 15 & 16 \\
17 & 18 & 19 & 20 \\
\hline
\end{tabular}
\end{table}
```

```

\caption{Table to test captions and labels}
\label {table:1}
\end{table}
\end{document}

```

Output of the above code

#### 1.1.1.1.5 Positioning a table

```

\documentclass{article}
\usepackage[utf8]{inputenc}
\begin{document}
\begin{table} [h!]
\centering
\begin{tabular}{| c c c c |}
\hline
C1 & C2 & C3 & C4 \\\ [0.5ex]
\hline
1 & 2 & 3 & 4 \\\
2 & 7 & 5 & 9 \\\
3 & 8 & 7 & 0 \\\
4 & 6 & 8 & 6 \\\
5 & 8 & 7 & 3 \\\ [1ex]
\hline
\end{tabular}
\end{table}

```

Output of the above code

#### 1.1.1.1.6 Colouring a table

```

\documentclass{article}
\usepackage[utf8]{inputenc}
\usepackage[table]{xcolor}
\setlength{\arrayulewidth}{1mm}
\setlength{\tabcolsep}{18pt}
\renewcommand{\arraystretch}{2.5}
\newcolumntype{s}{>\columncolor[HTML]{AAACED}} p{3cm}}
\arrayulecolor[HTML]{DB5800}
\begin{document}
\begin{tabular}{| s|p{3cm}|p{3cm}| }
\hline
Name & Author & Publication \\\
\hline
B1 & A1 & P1 \\\
\rowcolor{gray}
B2 & A2 & P2 \\\
B3 & A3 & P3 \\\
B4 & A4 & P4 \cellcolor [HTML]{AA0044} AND \\\
B5 & A5 & P5 \\\
\hline
\end{tabular}
\end{document}

```

Output of the code above

### 1.1.1.1.7 Line width and Cell padding

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\setlength{\arrayulewidth}{1mm}
\setlength{\tabcolsep}{18pt}
\renewcommand{\arraystretch}{1.5}
\begin{document}
\begin{tabular}{|p{3cm}|p{3cm}|p{3cm}|}
\hline
\multicolumn{3}{|c|}{Country List} \\
\hline
Name & Author & Publication \\
\hline
B1 & A1 & P1 \\
B1 & A1 & P1 \\
B1 & A1 & P1 \\
B1 & A1 & P1 \\
\hline
\end{tabular}
\end{document}
```

Output of the above code

### 1.1.1.2 Inserting Figures in Latex

#### 1.1.1.2.1 Overview

This section will give an overview of floats and figures. It will cover importing external graphics and positioning. It will also cover sub-figures and captions.

#### 1.1.1.2.2 Floats

| Specifier | Action  |
|-----------|---|
| H         | Place exactly at spot in source text                              |
| h         | Place approximately at spot in source test                        |
| t         | Place at top of page  |
| b         | Place at bottom of page   |
| p         | Place on page for floats only                                     |
| !         | Override internal LaTeX parameters for determining float position |

```
\documentclass{article}
\usepackage{float}
\begin{document}
\begin{figure}[H]
%figure content goes here
%Can be:
%graphic
%table
%tikz drawing
%etc.
```

```
\end{figure}
\end{document}
```

Note: The **float** package is not necessary if you wish to let LaTeX place the figure for you.

### 1.1.1.2.3 Graphics

```
\documentclass{article}
\usepackage{float}
\usepackage{graphicx}
\begin{document}
\begin{figure}[H]
\centering
\includegraphics[scale=1.5]{atom.png}
\end{figure}
\end{document}
```

### 1.1.1.2.4 Captions

```
\documentclass{article}
\usepackage{float}
\usepackage{graphicx}
\begin{document}
\begin{figure}[H]
\centering
\includegraphics[scale=1.5]{atom.png}
\caption{This is an atom}
\end{figure}
\end{document}
```

### 1.1.1.2.5 Subfigures

```
\documentclass{article}
\usepackage{float}
\usepackage{graphicx}
\usepackage{caption}
\usepackage{subcaption}
\begin{document}
\begin{figure}[H]
\centering
\begin{subfigure}{.3\textwidth}
\includegraphics[width=\textwidth]{atom.png}
\caption{Atom 1}
\end{subfigure}
%%%%
\begin{subfigure}{.3\textwidth}
\includegraphics[width=\textwidth]{atom.png}
\caption{Atom 2}
\end{subfigure}
%%%%
\begin{subfigure}{.3\textwidth}
\includegraphics[width=\textwidth]{atom.png}
```

```

        \caption{Atom 3}
    \end{subfigure}
    \caption{Atoms are fun!}
\end{figure}
\end{document}

```

### 1.1.1.3 List of figures / tables

```

\begin{document}

...

\begin{figure}

\caption{Dummy figure}

\end{figure}

\begin{table}

\caption{Dummy table}

\end{table}

...

\begin{appendix}

\listoffigures

\listoftables

\end{appendix}

\end{document}

```

## 2.1

### 1. Arithmetic Operations:

```

\documentclass{article}

\usepackage[utf8]{inputenc}

\usepackage{amsmath}

\begin{document}

\begin{equation} \label{eqn}

E = {mc^2}

\end{equation}

\end{document}

```

```
\end{equation}
```

The equation \ref{eqn} states mass equivalence relationship.

```
\end{document}
```

### 1.1.1.3 Aligning Equations

```
\documentclass{article}
```

```
\usepackage[utf8]{inputenc}
```

```
\usepackage{amsmath}
```

```
\begin{document}
```

```
\begin{equation} \label{eq1}
```

```
\begin{split}
```

```
A & = \frac{\pi r^2}{2} \setminus
```

```
& = \frac{1}{2} \pi r^2
```

```
\end{split}
```

```
\end{equation}
```

```
\end{document}
```

Output of the code above

### 1.1.1.4 Displaying long equations

```
\documentclass{article}
```

```
\usepackage[utf8]{inputenc}
```

```
\usepackage{amsmath}
```

```
\begin{document}
```

```
\begin{multline*}
```

```

p(x) = x^8+x^7+x^6+x^5\\
- x^4 - x^3 - x^2 - x
\end{multline*}
\end{document}

```

### 1.1.1.5 Aligning several equations

```

\documentclass{article}
\usepackage[utf8]{inputenc}
\usepackage{amsmath}
\begin{document}
\begin{align*}
a+b & \& a-b & \& (a+b)(a-b)\\
x+y & \& x-y & \& (x+y)(x-y)\\
p+q & \& p-q & \& (p+q)(p-q)
\end{align*}
\end{document}

```

### 1.1.1.6 Grouping and Centering Equations

```

.
\documentclass{article}
\usepackage[utf8]{inputenc}
\usepackage{amsmath}
\begin{document}
\begin{gather*}
(a+b)=a^2+b^2+2ab \\
(a-b)=a^2+b^2-2ab
\end{gather*}

```



```
\end{gather*}
```

```
\end{document}
```

### 1.1.1.7 Parenthesis or Brackets

```
\documentclass{article}
```

```
\usepackage[utf8]{inputenc}
```

```
\usepackage{amsmath}
```

```
\begin{document}
```

```
\[
```

```
\left \{
```

```
\begin{tabular}{ccc}
```

```
1 & 5 & 8 \\\
```

```
0 & 2 & 4 \\\
```

```
3 & 3 & -8
```

```
\end{tabular}
```

```
\right \}
```

```
\]
```

```
\end{document}
```

### 1.1.1.8 Operators

```
\documentclass{article}
```

```
\usepackage[utf8]{inputenc}
```

```
\usepackage{amsmath}
```

```
\begin{document}
```

```
\[
```

```
\sin^2(a)+\cos^2(a) = 1
```

```
\]
```

```
\end{document}
```

Output of the code above

```
\documentclass{article}

\usepackage[utf8]{inputenc}

\usepackage{amsmath}

\begin{document}

\[

\lim_{h \rightarrow 0} \frac{f(x+h)-f(x)}{h}

\]
```

This operator changes when used alongside

text `\( \lim_{x \rightarrow h} (x-h) \)`.

```
\end{document}
```

### 1.1.1.9 Subscripts and superscripts

The use of superscripts and subscripts is very common in mathematical expressions involving exponents, indexes, and in some special operators. This article explains how to write superscripts and subscripts in simple expressions, integrals, summations, et cetera.

#### 1.1.1.10 Introduction

Definite integrals are some of the most common mathematical expressions, let's see an example:

$$\int_0^1 x^2 + y^2 \, dx$$

In LATEX, subscripts and superscripts are written using the symbols `^` and `_`, in this case the  $x$  and  $y$  exponents were written using these codes. The codes can also be used in some types of mathematical symbols, in the integral included in the example the `_` is used to set the lower bound and the `^` for the upper bound. The command `\limits` changes the way the limits are displayed in the integral, if not present the limits would be next to the integral symbol instead of being on top and bottom.

#### 1.1.1.11 More detailed examples

The symbols `_` and `^` can also be combined in the same expression, for example:

$$a_{21}+a_{22}=a_{23}^{12}+a_{22}^{22}=a_{32}^{22}$$

If the expression contains long superscripts or subscripts, these need to be collected in braces, as LATEX normally applies the mathematical commands ^ and \_ only to the following character:

$$x_{2\alpha-1}^{ij}+y_{ij}^{2\alpha-1}=x_{2\alpha-1}^{ij}+y_{ij}^{2\alpha-1}$$

Subscripts and superscripts can be nested and combined in various ways. When nesting subscripts/superscripts, however, remember that each command must refer to a single element; this can be a single letter or number, as in the examples above, or a more complex mathematical expression collected in braces or brackets. For example:

$$(a_n)_{r+s}=a_{nr+ns}^{(r+s)}=a_{nr+ns}^{r+s}$$

### 1.1.1.12 Operators using subscripts and superscripts

Some mathematical operators may require subscripts and superscripts. The most frequent cases are those of the integral \int and the summation (\sum) operators, whose bounds are typeset precisely with subscripts and superscripts.

$$\sum_{i=1}^{\infty} \frac{1}{n^s}$$

$$= \prod_p \frac{1}{1 - p^{-s}}$$