\documentclass[a4paper,12pt]{article}

\usepackage{amsmath}

\begin{document}

\title{How to write Mathematical equations in the Latex Document}

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\date{Feb 28, 2024}

\maketitle

\tableofcontents

\begin{abstract}

In this practical we implement the mathematical Equations in the Latex Document. For that

we need to use the package "amsmath". In this we can see how to write equations inside a

line or separately and also how to use divisions, parts and other formats also.

\end{abstract}

\section{Equations inside line and Sepearately}

For writting the formula inside a line we use dollar symbol and the equation starts with a dollar and ends with a dollar. If we would like to write it separately we use

begin equation method. This can be done as follows:

Inside a line $E = mc^2$ .

\begin{equation}

E = mc^2

\end{equation}

\section{Splitting Equations using begin split}

We use the equation environment to wrap our equation or we can use equation if we want it to be numbered. The environment split is used inside an equation environment to split the equation into smaller pieces which will be aligned accordingly.

\begin{equation}

\begin{split}

f(x) &= \frac{x^2}{x^2+1} \\

& \frac{\pi r^2}{2}

\end{split}

\end{equation}

\section{Multiline equations}

The equations that utilise more than one line use multiline environment. We use a double backslash to set the point where equation has to be broken. The first line is aligned to the left and the second line is aligned to the right. We use \* to determine whether the equation has to be numbered or not.

\begin{multline}

f(a) = x^3+5x^2+6x+9 \\

-p\theta^2+2p\theta-4\sin^2\theta

\end{multline}

\section{Integration, Summation and limit}

Integration\\

\begin{equation}

\int\_{0}^{\infty} \frac{\sinh^2x}{\sin^2x}dx

\end{equation}

\begin{equation}

\int\_{1}^{10}\log\frac{x^2}{1+x^2}dx

\end{equation}

Summation \\

\begin{equation}

\sum\_{n=0}^{\infty} \cos8\theta

\end{equation}

limit \\

\begin{equation}

\lim\_{n\rightarrow\infty}\tan^2\alpha

\end{equation}

\end{document}

creating a table

\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}

\hline

\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}

creating multiple page tables

\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}\\

\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}

combining rows and columns

\documentclass{article}

\usepackage[utf8]{inputenc}

\begin{document}

\begin{tabular} { | p {3 cm} | p {3 cm} | p {3 cm} | }

\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}

captions and lables

\documentclass{article}

\usepackage[utf8]{inputenc}

\begin{document}

\begin{table} [h!]

\centering

\begin{tabular}{ || c c c c || }

\hline

Col1 & Col2 & Col3 & Col4 \\ [0.5 ex]

\hline \hline

1 & 2 & 3 & 4 \\

5 & 6 & 7 & 8 \\

9 & 10 & 11 & 12 \\

13 & 14 & 15 & 16 \\

17 & 18 & 19 & 20 \\ [1ex]

\hline

\end{tabular}

\caption{Table to test captions and labels}

\label {table:1}

\end{table}

\end{document}

coloring the table

\documentclass{article}

\usepackage[utf8]{inputenc}

\usepackage[table]{xcolor}

\setlength{\arrayrulewidth}{1mm}

\setlength{\tabcolsep}{18pt}

\renewcommand{\arraystretch}{2.5}

\newcolumntype{s}{>{\columncolor[HTML]{AAACED}} p{3cm}}

\arrayrulecolor[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}

adding image

\documentclass{article}

\usepackage{float}

\usepackage{graphicx}

\begin{document}

\begin{figure}[H]

\centering

\includegraphics[scale=1.5]{atom.png}

\end{figure}

\end{document}