Maharashtra Shikshan Samiti's

Maharashtra Mahavidyalaya, Nilanga

Department of Mathematics

SOP: Latex for Beginners-I

Class: B.Sc TY, Sem: V (2021-22)

Subject: SEC (Skill C)

Prepared by:

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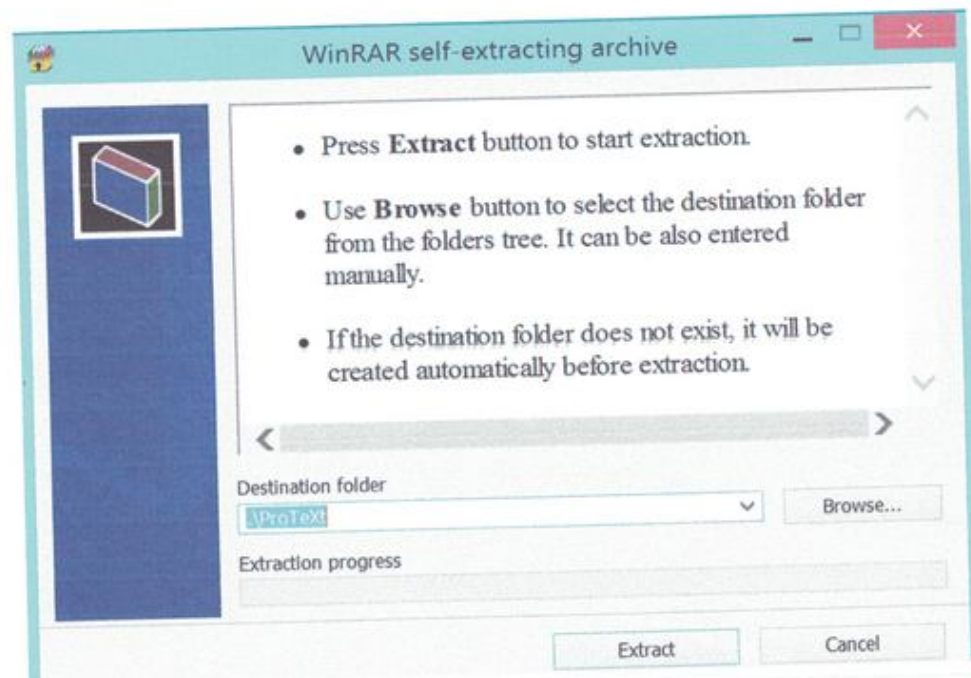
1. Latex Installation.

Prepare to set aside at least an hour of your time to install LaTeX. You should also be on campus or using a high-speed internet connection, since you will have to download a large file. You need to install two different parts, a LaTeX compiler (MiKTeX) and an editor (TeXstudio).

1. Visit http://mirror.ctan.org/systems/windows/protext/ and click on the **protext.exe** file to download it. This is the proTeXt installer, and it's quite large (~2.5 GB), so be prepared to wait a bit while it downloads. (Note: disregard the **Last modified** date; the latest version will be here at any given time.)

Index of /CTAN/systems/windows/protext/

Name:	Last Modified:	Size:	Type:
		-	Directory
../			
ProTeXt-3.1.9-121317.exe	2017-Dec-13 16:35:00	2.6G	application/octet-stream
protext.exe	2017-Dec-13 16:35:00	2.6G	application/octet-stream

2. Once the file has downloaded, double-click on **protext.exe**. If you see a security warning, click Run.

3. Extract the installation files to your desktop:
    1. In the file extracting window, set the destination folder to one called "protext" on your Desktop: click the **Browse** button. In the Browse for Folder window, click on **Desktop** and then click the **Make New Folder** button. Name the new folder **protext**, click on the new folder to select it, and then click **OK** to close the Browse for Folder window. Now click **Extract**. If a security window pops up, choose Yes, and then just wait, the extraction process will continue.

WinRAR self-extracting archive

- Press **Extract** button to start extraction.

- Use **Browse** button to select the destination folder from the folders tree. It can be also entered manually.

- If the destination folder does not exist, it will be created automatically before extraction.

Destination folder
\ProTeXt

Extraction progress

Extract   Cancel

Once the files have been extracted, the window will close.

4. Go to your desktop and then double-click on the **protext** folder to open it. Double-click on **Setup.exe** to begin the installation

5. In the proTeXt pop-up window, click the **Install** button next to MiKTeX.

    a. Answer yes to any security warnings, and then Read and accept the 'copying conditions' by checking the box, then click **Next**.

    b. Choose to install Basic MikTeX, then click **Next**.

    c. Accept the defaults on the next 2 screens by clicking **Next**.

    d. In the Settings, choose **Letter** as the preferred paper size. Make sure **'Ask Me First'** is chosen for the package installation option. Click **Next**.

    e. Click **Start** to begin the installation. When it is complete, click **Next** and then **Close**.

6. In the proTeXt pop-up window, click the **Install** button next to **TeXstudio**

    a. Click through the installer, leaving all the defaults.

    b. Click **Finish** when the installer is complete.

7. You have now installed both LaTeX and the editor. You can now delete the downloaded protext.exe file as well as the protext folder on your desktop

2. Document Class

Document types available in the \documentclass command.

Document type	Description
article	For short documents and journal articles. Is the most commonly used.
report	For longer documents and dissertations.
book	Useful to write books
letter	For letters
slides	For slides, rarely used
beamer	Slides in the Beamer class format. See the beamer documentation for a better description

```
\documentclass{article}
\begin{document}
First document. This is a simple example, with no
extra parameters or packages included.
\end{document}
```

First document. This is a simple example, with no extra parameters or packages included.

3. Text Formatting

First example, bold, italics and underline:
Some of the **greatest** discoveries in <u>science</u> were made by ***accident***.

Example of italicized text:
Some of the greatest discoveries in science were made by *accident*.

Example of boldface text:
Some of the **greatest** discoveries in science were made by accident.

Example of underlined text:
Some of the greatest discoveries in <u>science</u> were made by accident.

Example of emphasized text in different contexts:
Some of the greatest *discoveries* in science were made by accident.
Some of the greatest discoveries in science were made by accident.
Some of the greatest *discoveries* in science were made by accident.

\documentclass{article}

\begin{document}

First example, bold, italics and underline:

Some of the \textbf{greatest} discoveries in \underline{science} were made by \textbf{\emph{accident}}.

\vspace{1.5cm}

Example of italicized text:

Some of the greatest discoveries in science were made by \emph{accident}.

\vspace{1.5cm}

Example of boldface text:

Some of the \textbf{greatest} discoveries in science were made by accident.

\vspace{1.5cm}

Example of underlined text:

Some of the greatest discoveries in \underline{science} were made by accident.

\vspace{1.5cm}

Example of emphasized text in different contexts:

Some of the greatest \emph{discoveries} in science were made by accident.

\textit{Some of the greatest \emph{discoveries} in science were made by accident.}

\textbf{Some of the greatest \emph{discoveries} in science were made by accident.}

\end{document}

Footnote

```
\documentclass{article}

\begin{document}

Future 5G cellular networks\footnote[1]{New Radio Cellular Networks}
are expected to support several-fold increase in data traffic and
number of devices\footnotemark , and provide a very low latency
and gigabit-rate data services.
\footnotetext{User Equipments}


\end{document}
```

Future 5G cellular networks[1] are expected to support several-fold increase in data traffic and number of devices[1], and provide a very low latency and gigabit-rate data services.

---

[1] New Radio Cellular Networks
[1] User Equipments

4. Math Mode and Graphics

(a) Mathematical Formulas

The well known Pythagorean theorem $x^2 + y^2 = z^2$ was proved to be invalid for other exponents. Meaning the next equation has no integer solutions:

$$x^n + y^n = z^n$$

\documentclass{article}

\begin{document}

The well known Pythagorean theorem \(x^2 + y^2 = z^2\) was

proved to be invalid for other exponents.

Meaning the next equation has no integer solutions:

\[x^n + y^n = z^n \]

\end{document}

(b) Exponemts and Subscripts

\[a_1^2 + a_2^2 = a_3^2 \]

$$a_1^2 + a_2^2 = a_3^2$$

\[x^{2 \alpha} - 1 = y_{ij} + y_{ij} \]

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

(c) Fractions

$$\frac{\sum\limits_{k=1}^{n} k^2}{5}$$

$$\frac{\sum_{k=1}^{n} k^2}{5}$$

Fractions can be used alongside the text, for example $\frac{1}{2}$, and in a mathematical display style like the one below:

$$\frac{1}{2}$$

The binomial coefficient is defined by the next expression:

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

\[

\frac{ \sum\limits_{k=1}^{n} k^2 }{ 5 }

\]

\[

\frac{ \sum_{k=1}^{n} k^2 }{ 5 }

\]

Fractions can be used alongside the text, for

example \(\frac{1}{2} \), and in a mathematical

display style like the one below:

\[\frac{1}{2}\]

The binomial coefficient is defined by the next expression:

\[

\binom{n}{k} = \frac{n!}{k!(n-k)!}

\]

(d) Sums

```
$$
\sum\limits_{k=1}^{n} k^2
$$
```

$$\sum_{k=1}^{n} k^2$$

(e) Integrals and Limits

`$$\int$$`

$$\int$$

`$\int_{a}^b f(x)dx$`

$$\int_a^b f(x)dx$$

`$$\iint$$`

$$\iint$$

`$$\int_{a}^b\int_{c}^d f(x,y)dxdy$$`

$$\int_a^b \int_c^d f(x,y)dxdy$$

`$$\iiint$$`

$$\iiint$$

`$$\oint$$`

$$\oint$$

`$$\lim_{x \to +\infty} f(x)$$`

$$\lim_{x \to +\infty} f(x)$$

`$$\lim_{x \to \alpha} f(x)$$`

$$\lim_{x \to \alpha} f(x)$$

`$$\inf_{x > s}f(x)$$`

$$\inf_{x>s} f(x)$$

`$$\sup_{x \in \mathbb{R}}f(x)$$`

$$\sup_{x\in R} f(x)$$

(f) Roots

\[\sqrt{a}=b \qquad \text{iff} \quad b^2=a \]

$$\sqrt{a} = b \qquad \text{iff} \quad b^2 = a$$

$\sqrt[\leftroot{10} \uproot{5} n]{b}$

$$\sqrt[n]{b} \quad a^{(1/p)} \text{ as } \sqrt[p]{a}$$

$a^{(1/p)}$ as $\sqrt[p]{a}$

(g) Text in math display

$$\text{Let } x = \text{Countries participated in the marathon.}$$

$\text{Let } x=\text{Countries participated in the marathon}. $

(h) Operators

Symbol	LaTeX	Comment	Symbol	LaTeX	Comment	Symbol	LaTeX	Comment	Symbol	LaTeX	Comment
$\pm$	\pm	plus or minus	$\cap$	\cap	set intersection	$\diamond$	\diamond		$\oplus$	\oplus	
$\mp$	\mp	minus or plus	$\cup$	\cup	set union	$\triangle$	\bigtriangleup		$\ominus$	\ominus	
$\times$	\times	multiplied by	$\uplus$	\uplus	multiset addition	$\triangledown$	\bigtriangledown		$\otimes$	\otimes	
$\div$	\div	divided by	$\sqcap$	\sqcap		$\triangleleft$	\triangleleft		$\oslash$	\oslash	
$\ast$	\ast	asterisk	$\sqcup$	\sqcup		$\triangleright$	\triangleright		$\odot$	\odot	
$\star$	\star		$\vee$	\vee		$\bigcirc$	\bigcirc		$\circ$	\circ	
$\dagger$	\dagger		$\wedge$	\wedge		$\bullet$	\bullet		$\setminus$	\setminus	set difference
$\ddagger$	\ddagger		$\cdot$	\cdot		$\wr$	\wr		$\amalg$	\amalg	

(i)Relations

Symbol	LaTeX	Comment	Symbol	LaTeX	Comment
$<$	<	is less than	$>$	>	is greater than
$\nless$	\nless	is not less than	$\ngtr$	\ngtr	is not greater than
$\leq$	\leq	is less than or equal to	$\geq$	\geq	is greater than or equal to
$\leqslant$	\leqslant	is less than or equal to	$\geqslant$	\geqslant	is greater than or equal to
$\nleq$	\nleq	is neither less than nor equal to	$\ngeq$	\ngeq	is neither greater than nor equal to
$\nleqslant$	\nleqslant	is neither less than nor equal to	$\ngeqslant$	\ngeqslant	is neither greater than nor equal to
$\prec$	\prec	precedes	$\succ$	\succ	succeeds
$\nprec$	\nprec	doesn't precede	$\nsucc$	\nsucc	doesn't succeed
$\preceq$	\preceq	precedes or equals	$\succeq$	\succeq	succeeds or equals
$\npreceq$	\npreceq	neither precedes nor equals	$\nsucceq$	\nsucceq	neither succeeds nor equals
$\ll$	\ll		$\gg$	\gg	
$\lll$	\lll		$\ggg$	\ggg	
$\subset$	\subset	is a proper subset of	$\supset$	\supset	is a proper superset of
$\not\subset$	\not\subset	is not a proper subset of	$\not\supset$	\not\supset	is not a proper superset of
$\subseteq$	\subseteq	is a subset of	$\supseteq$	\supseteq	is a superset of
$\nsubseteq$	\nsubseteq	is not a subset of	$\nsupseteq$	\nsupseteq	is not a superset of
$\sqsubset$	\sqsubset		$\sqsupset$	\sqsupset	
$\sqsubseteq$	\sqsubseteq		$\sqsupseteq$	\sqsupseteq	

Symbol	LaTeX	Comment
$=$	=	is equal to
$\doteq$	\doteq	
$\equiv$	\equiv	is equivalent to
$\approx$	\approx	is approximately
$\cong$	\cong	is congruent to
$\simeq$	\simeq	is similar or equal to
$\sim$	\sim	is similar to
$\propto$	\propto	is proportional to
$\neq$ or $\ne$	\neq or \ne	is not equal to

(j) Negated Symbols

Symbol	LaTeX	Comment	Symbol	LaTeX	Comment
$\neq$ or $\neq$	\neq or \ne	is not equal to	$\notin$	\notin	is not member of
$\nless$	\nless	is not less than	$\ngtr$	\ngtr	is not greater than
$\nleq$	\nleq	is not less than or equal to	$\ngeq$	\ngeq	is not greater than or equal to
$\nleqslant$	\nleqslant		$\ngeqslant$	\ngeqslant	
$\nleqq$	\nleqq		$\ngeqq$	\ngeqq	
$\lneq$	\lneq		$\gneq$	\gneq	
$\lneqq$	\lneqq		$\gneqq$	\gneqq	
$\lvertneqq$	\lvertneqq		$\gvertneqq$	\gvertneqq	
$\lnsim$	\lnsim		$\gnsim$	\gnsim	
$\lnapprox$	\lnapprox		$\gnapprox$	\gnapprox	
$\nprec$	\nprec	does not precede	$\nsucc$	\nsucc	does not succeed
$\npreceq$	\npreceq	neither precedes nor equals	$\nsucceq$	\nsucceq	neither succedes nor equals
$\precneqq$	\precneqq		$\succneqq$	\succneqq	
$\precnsim$	\precnsim		$\succnsim$	\succnsim	

(k) Mathematical equations and their labeling and referring

\documentclass[paper=a4,12pt]{article}

\usepackage{amsmath}

\begin{document}

\begin{equation}

$$E = 1 - \dfrac{\sum\limits_{i=1}^{n}(O_i - P_i)^2}{\sum\limits_{i=1}^{n}(O_i - \bar{O})^2} \tag{1}$$

E=1-   \dfrac{\sum\limits_{i=1}^{n}(O_{i}-P_{i})^{2}}{\sum\limits_{i=1}^{n}(O_{i}-\bar{O})^{2}}

\end{equation}

\end{document}

(l) Greek letters

Symbol	LATEX	Symbol	LATEX
A and α	\Alpha and \alpha	N and ν	\Nu and \nu
B and β	\Beta and \beta	Ξ and ξ	\Xi and \xi
Γ and γ	\Gamma and \gamma	O and o	\Omicron and \omicron
Δ and δ	\Delta and \delta	Π, π and ϖ	\Pi, \pi and \varpi
E, ϵ and ε	\Epsilon, \epsilon and \varepsilon	P, ρ and ϱ	\Rho, \rho and \varrho
Z and ζ	\Zeta and \zeta	Σ, σ and ς	\Sigma, \sigma and \varsigma
H and η	\Eta and \eta	T and τ	\Tau and \tau
Θ, θ and ϑ	\Theta, \theta and \vartheta	Υ and υ	\Upsilon and \upsilon
I and ι	\Iota and \iota	Φ, ϕ, and φ	\Phi, \phi and \varphi
K, κ and $\varkappa$	\Kappa, \kappa and \varkappa	X and χ	\Chi and \chi
Λ and λ	\Lambda and \lambda	Ψ and ψ	\Psi and \psi
M and μ	\Mu and \mu	Ω and ω	\Omega and \omega

(m) Working with image

```
\documentclass{article}
\usepackage{graphicx}
\graphicspath{ {./images/} }

\begin{document}
\listoffigures
```

The universe is immense and it seems to be homogeneous, in a large scale, everywhere we look at.
`\includegraphics{MM image.jpg}`

`\includegraphics[scale=1.5]{MM logo.jpg}`

```
\includegraphics[width=5cm,
height=4cm]{MM logo.jpg}
```

`\includegraphics[scale=1.2, angle=45]{MM logo.jpg}`

```
\begin{figure}[t]
\includegraphics[width=8cm]{MM
logo.jpg}
\centering
\end{figure}
\begin{figure}[h]
\caption{MM Logo}
\centering
```

```
\includegraphics[width=0.5\textwidth]{M
M logo.jpg}
\end{figure}
```

```
\begin{figure}[h]
  \centering

\includegraphics[width=0.25\textwidth]{
MM logo.jpg}


\end{document}
```

```
  \caption{MM Logo}
  \label{logo}
\end{figure}
```
As you can see in the figure \ref{logo}, the

Principal
Maharashtra Mahavidyalaya
Nilanga-413521 Dist.Latur