User's Guide

LaTeX Template Guidance

1. The MIT Press LaTeX templates are available in three trim sizes at http://mitpress.mit.edu/content/guidelines-authors-preparing-manuscript-files-tex. Please check with your editor on the correct set of macros to download.
2. The template is designed using the MiKTeX 2.9 package. After installing MiKTeX 2.9 (http://miktex.org/2.9/setup), all style files will be automatically installed. The MIT Press template includes additional macros.
3. Our templates can also be used on the Mac (see instructions below).
4. The MIT Press template is designed to support numbered references. For more information on references, please see the Bibliography section later in this document.

Compilation procedure for both MAC and PC users

For each trim size, a complete set of macros is provided for the PC and the Mac:

Template-6x9-solution:

- **Mac_Compilation**
- **PC_Compilation**

Template-7x9-solution

- **Mac_Compilation**
- **PC_Compilation**

Template-8x9-solution

- **Mac_Compilation**
- **PC_Compilation**

PC USERS

1. Install MiKTeX 2.9 and any LaTeX-compatible editor (such as WinEdt, available at http://www.winedt.com).
2. Copy the supplied "**PC_Compilation**" folder to your PC.
3. Open the root files "Sample-6x9.tex" in WinEdt.
4. Start the compilation process using **PDFLatex**, available as a dropdown choice in the WinEdt toolbar.

   If you don't have the WinEdt editor installed, run the following command to compile:

   pdflatex Sample-6x9 (root file name)

   To view the output of the compiled file, run the following command:

   start Sample-6x9.pdf (root file name with extension .pdf)

5. These instructions are the same for the other two templates:
   a. **Template-7x9-solution**
   b. **Template-8x9-solution**

MAC USERS

1. Install MacTeX and a LaTeX editor (such as TeXShop, available at http://pages.uoregon.edu/koch/texshop/).
2. Copy the supplied "**MAC_Compilation**" folder to your machine.
3. Open the root file "Sample-6x9.tex" in TeXShop.
4. Start the compilation process using the LaTeX option.
5. These instructions are the same for the other two templates:
   a. **Template-7x9-solution**
   b. **Template-8x9-solution**

Basic Class File

Option used in class file

1. timesfont
2. dblspace

Use \documentclass[timesfont,dblspace]{MITPress-diacriTech-7x9}

You can use "timesfont" if you want to switch from the default Computer Modern

fonts to Times.

Important: If your manuscript is going to be printed for copyediting, use the "dblspace" command to double-space the lines of text. This command can be removed after copyediting is complete.

Front Matter

Use the command "\frontmatter" after "\begin{document}"

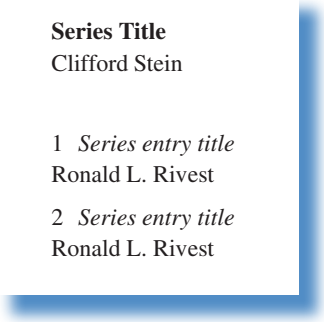
Half Title

```
\halftitle{Introduction to Algorithms}
```

Series page

```
\begin{seriespage}
\seriestitle{Series Title}                %for Series Title
\serieseditor{Clifford Stein}             %for Series Editor
\begin{seriesentry}
\item Series entry title                  %for Series Entry Title
\seriesauthor{Ronald L. Rivest}           %for Series Author
\item Series entry title                  %for Series Entry Title
\seriesauthor{Ronald L. Rivest}           %for Series Author
\end{seriesentry}
\end{seriespage}
```

Which produces:



Series Title
Clifford Stein

1 *Series entry title*
Ronald L. Rivest

2 *Series entry title*
Ronald L. Rivest

Book Title

\booktitle{Introduction to Algorithms}

Subtitle

\subtitle{Sub Title}

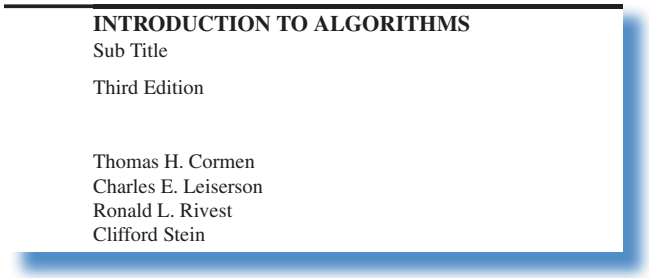
Edition

\edition{Third Edition}

Author/Editor

```
\edauthor{Thomas H. Cormen\\
          Charles E. Leiserson\\
          Ronald L. Rivest\\
          Clifford Stein
    }
```

Which produces:



Imprint

```
\MITimprint{The MIT Press\\
          Cambridge, Massachusetts\\
          London, England}
```

Copyright page

```
\begin{copyrightpage}
    text….
\end{copyrightpage}
```

Dedication page

\dedication{Dedication text}

Epigraph Page

\begin{epigraphpage}
text ….\source{Source text}
\end{epigraphpage}

Table of Contents

To generate a TOC, use:
\tableofcontents

List of Figures

To generate a List of Figures, use:
\listoffigures

List of Tables

To generate a List of Tables, use:
\listoftables

Contributors

\begin{contributors}
\name{Contributors Name}
\affil{Address}
\end{contributors}

Which produces:

Thomas H. Cormen
Professor and Chair, Department of Computer Science, Massachusetts Institute of Technology
Ronald L. Rivest
CSAIL, 32 Vassar Street, Room 32-G692, Cambridge MA 02139

Body Matter

At the start of the body matter, use the command "\mainmatter".

For Part

\part{Role of Algorithms}

Which produces:

For Chapter

\chapter{The Role of Algorithms in Computing}

Which produces:

For an Unnumbered Chapter

\chapter*{Chapter Head}

For Author

\author[Address Link no]{author name}
\author[1]{author name}

For Address

\affil[Author Link no]{Address}

Example

```
\author[1]{Thomas H. Cormen}
    \affil[1]{Professor and Chair, Department of Computer
    Science, Massachusetts Institute of Technology}
```

Which produces:

Thomas H. Cormen[1]

[1]*Professor and Chair, Department of Computer Science, Massachusetts Institute of Technology*

If an author and address are present in the file, write "\maketitle" at the end as in the following example:

```
\author[1]{ }
\affil[1]{ }
\maketitle
```

For Epigraph

```
\epigraph{Epigraph text}{Sentence}
```

For Abstract

```
\begin{abstract}
    Text…
\end{abstract}
```

Heading Levels

For A head

\Ahead{Ahead title}

For Head Level 1

\section{Head Level 1 Title}

For Unnumbered Head Level 1

\section*{Head Level 1 Title}

For Head Level 2

\subsection{Head Level 2 Title}

For Unnumbered Head Level 2

\subsection*{Head Level 2 Title}

For Head Level 3

\subsubsection{Head Level 3 Title}

For Unnumbered Head Level 3

\subsubsection*{Head Level 3 Title}

For Head Level 4

\paragraph{Head Level 4 Title}

For Unnumbered Head Level 4

\ paragraph *{Head Level 4 Title}

For Head Level 5

\subparagraph{Head Level 5 Title}

For Unnumbered Head Level 5

\ subparagraph *{Head Level 5 Title}

For Head Level 6

\subsubparagraph{Head Level 6 Title}

For Unnumbered Head Level 6

\ subsubparagraph *{Head Level 6 Title}

For List Head

\listhead{list Head}

Number Head 4 (math)

This heading should be used for the following elements: definitions, theorems, propositions, corollaries, lemmas, assumptions, and rules.

Definitions

```
\begin{definition}\label{def1}
    Text…
\end{definition}
```

If the definition has a title, use:

```
\begin{definition}[Title] \label{def1}
    Text….
\end{definition}
```

Example output:

DEFINITION 2.3 For any two functions $f(n)$ and $g(n)$, we have $f(n) = \Theta(g(n))$ if and only if $f(n) = O(g(n))$ and $f(n) = \Omega(g(n))$. As an example of the application of this theorem, our proof that $an^2 + bn + c = \Theta(n^2)$ for any constants a, b, and c, where $a > 0$, immediately implies that $an^2 + bn + c = \Omega(n^2)$ and $an^2 + bn + c = O(n^2)$.

Theorems

```
\begin{theorem}\label{thm1}
    Text…
\end{theorem}
```

Propositions

```
\begin{proposition}\label{prop1}
    Text…
\end{proposition}
```

Corollaries

```
\begin{corollary}\label{cor1}
    Text…
\end{corollary}
```

Lemmas

```
\begin{lemma}\label{lem1}
    Text…
\end{lemma}
```

Assumptions

```
\begin{assumption}\label{assum1}
    Text…
\end{assumption}
```

Rules

```
\begin{rules}\label{rul1}
    Text…
\end{rules}
```

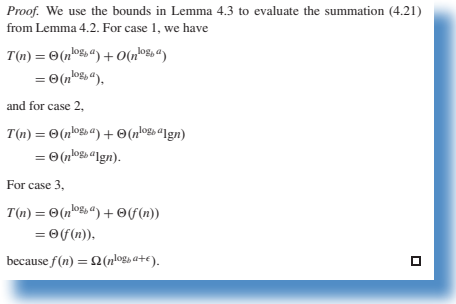
Number Head 5 (math)

This heading should be used for the following elements: proofs, examples, remarks, demonstrations, and solutions.

Proofs

\begin{proof}
    Text…
\end{proof}

Proof output:



Proof. We use the bounds in Lemma 4.3 to evaluate the summation (4.21) from Lemma 4.2. For case 1, we have

$$T(n) = \Theta(n^{\log_b a}) + O(n^{\log_b a}) = \Theta(n^{\log_b a}),$$

and for case 2,

$$T(n) = \Theta(n^{\log_b a}) + \Theta(n^{\log_b a} \lg n) = \Theta(n^{\log_b a} \lg n).$$

For case 3,

$$T(n) = \Theta(n^{\log_b a}) + \Theta(f(n)) = \Theta(f(n)),$$

because $f(n) = \Omega(n^{\log_b a + \epsilon})$. □

Examples

\begin{examples}
    Text…
\end{examples}

Remarks

\begin{remark}
    Text…
\end{remark}

Demonstrations

\begin{demonstrations}
    Text…
\end{demonstrations}

Solutions

\begin{solution}
    Text…
\end{solution}

Lists

Numbered Lists

```
\begin{enumerate}
    \item  text…
    \item  text…
\end{enumerate}
```

For lists with double-digit items, use:

```
\begin{enumerate}[10.]
    \item  text…
    \item  text…
\end{enumerate}
```

For lists with triple-digit items, use:

```
\begin{enumerate}[100.]
    \item  text…
    \item  text…
\end{enumerate}
```

Example output:

1. They have many candidate solutions, the overwhelming majority of which do not solve the problem at hand. Finding one that does, or one that is "best," can present quite a challenge.
2. They have practical applications. Of the problems in the above list, finding the shortest path provides the easiest examples. A transportation firm, such as a trucking or railroad company, has a financial interest in finding shortest paths through a road or rail network because taking shorter paths results in

Numbered Sublists

```
\begin{enumerate}[a.]
    \item  text…
    \item  text…
\end{enumerate}
```

Numbered Sub-sublists

```
\begin{enumerate}[iii.]
    \item  text…
    \item  text…
\end{enumerate}
```

Example output:

2. They have practical applications. Of the problems in the above list, finding the shortest path provides the easiest examples. A transportation firm, such as a trucking or railroad company, has a financial interest in finding shortest paths through a road or rail network because taking shorter paths results in lower labor and fuel costs. Or a routing node on the Internet may need to find the shortest path through the network in order to route a message quickly. Or a person wishing to drive from New York to Boston may want to find driving directions from an appropriate Web site, or she may use her GPS while driving.

    a. No black-heights in the tree have changed.

    b. No red nodes have been made adjacent. Because y takes z's place in the tree, along with z's color, we cannot have two adjacent red nodes at y's new position in the tree. In addition, if y was not z's right child, then y's original right child x replaces y in the tree. If y is red, then x must be black, and so replacing y by x cannot cause two red nodes to become adjacent.

    c. Since y could not have been the root if it was red, the root remains black.

        i. Otherwise, $u = 2^{2^k}$ for some integer $k \geq 1$, so that $u \geq 4$. In addition to the universe size u, the data structure *pro to-vEB* (u) contains the following attributes, illustrated.

Bullet Lists

```
\begin{itemize}
    \item text…
    \item text…
\end{itemize}
```

Bullet Sublists

Same as Bullet Lists.

Example output:

- The Human Genome Project has made great progress toward the goals of identifying all the 100,000 genes in human DNA, determining the sequences of the 3 billion chemical base pairs that make up human DNA, storing this information in databases, and developing tools for data analysis.
  - Each of these steps requires sophisticated algorithms. Although the solutions to the various problems involved are beyond the scope of this book, many methods to solve these biological problems use ideas from several of the chapters in this book, thereby enabling scientists to accomplish tasks while using resources efficiently.
  - The savings are in time, both human and machine, and in money, as more information can be extracted from laboratory techniques.
- The Internet enables people all around the world to quickly access and retrieve large amounts of information. With the aid of clever algorithms, sites on the Internet are able to manage and manipulate this large volume of data. Examples of problems that make essential use of algorithms include finding good routes on which the data will travel.

Unnumbered Lists

```
\begin{unlist}
    \item Text…
    \item Text…
\end{unlist}
```

Descriptive Lists

```
\begin{descriptive}
    \item \head{Head text}
    \item \head{Head text}
\end{descriptive}
```

Example output:

1. ***Input*** A sequence of n numbers $\{a_1, a_2, \ldots, a_n\}$.
2. ***Output*** A permutation (reordering) $\{a'_1, a'_2, \ldots, a'_n\}$ of the input sequence such that $a'_1 \leq a'_2 \geq \cdots \leq a'_n$.
3. ***Divide*** Divide the n-element sequence to be sorted into two subsequences of $n/2$ elements each.

Figures

Figure

```
\begin{figure}[tb]
    \includegraphics{images-name}
    \caption{ caption text\label{fig1}}
\end{figure}
```

Meaning of [tb]

t – top placement

b – bottom placement

Landscape Figure

```
\begin{sidewaysfigure}
    \includegraphics{image-1}
    \caption{ caption text\label{fig1}}
\end{sidewaysfigure}
```

Tables

For tables, use the processtable{caption here}{tabular here}{table footnote} tag:

```
\begin{table}[!t]
    \processtable{caption text\label{time-use}}
    {
    \begin{tabular*}{26pc}{@{\extracolsep{\fill}}lcc@{}}
\Toprule
    & \multicolumn{1}{c}{Employed} & {Unemployed} \\
\Midrule
    {Sleep} &  496 &  555 \\
    {Personal care and eating} & 110 & 197 \\
    {Home production, shopping, care of others} & 158 & 254 \\
    {Leisure, travel, sports, and socializing} &  320 & 442\\
    {Work} &  325 & 210 \\
    {Job search} & 321 & 323 \\
\Botrule
    \end{tabular*}}
    {Note: This is where authors provide additional information about the data, including whatever notes are needed.}
    \end{table}
```

Which produces:

Table 2.1

Average Minutes Per Day by Activity and Employment Status in the United States in 2003–2006.

	Employed	Unemployed
Sleep	496	555
Personal care and eating	110	197
Home production, shopping, care of others	158	254
Leisure, travel, sports, and socializing	320	442
Work	325	210
Job search	321	323

Note: This is where authors provide additional information about the data, including whatever notes are needed.

Landscape Table

```
\begin{sidewaystable}
\processtable{caption text here}{
    \begin{tabular}{ll}
        \Toprule
        Head & Head\\
        \Midrule
        1 & 2\\
        3 & 4\\
    \Botrule
    \end{tabular}
}{footnote text here}
\end{sidewaystable}
```

Unnumbered Table

```
\begin{table}[!h]
\unprocesstable{}{
    \begin{tabular}{llllll}
        \Toprule
            Stubhead & \( df \) & \( f \) & \( \eta \) & \( p \) \\
        \Midrule
            &    \multicolumn{4}{c}{Spanning text}    \\
            Row 1   & 1     & 0.67  & 0.55  & 0.41  \\
            Row 2   & 2     & 0.02  & 0.01  & 0.39  \\
            Row 3   & 3     & 0.15  & 0.33  & 0.34  \\
            Row 4   & 4     & 1.00  & 0.76  & 0.54  \\
        \Botrule
    \end{tabular}}{}
\end{table}
```

Box

Box Head

For a box number and title, use:

```
\boxhead{Common Functions}
```

Which produces:

Box 1
Common Functions

Box

```
\begin{mdframed}
    Text….
\end{mdframed}
```

Extract inside Box

```
\begin{extract}
    Text…
\end{extract}
```

Heading Levels within a Box

Use the same commands given for "Heading levels" to create head levels within a box.

Program Coding

```
\begin{lstlisting}[language=C]
void initializeMyStruct( myStruct* ms ) {
    static int modulo3 = 0
        if (modulo3 == 2) {
        modulo3 = 0;
        if (checkDay('tue')) {
        ms->a = 1;
        }
        } else {
        modulo3++;
        ms->a = 0;
        }
        }
\end{lstlisting}
```

Which produces:

```
void initializeMyStruct( myStruct* ms ) {
   static int modulo3 = 0;
   if (modulo3 == 2) {
       modulo3 = 0;
       if (checkDay('tue')) {
           ms->a = 1;
       }
   } else {
       modulo3++;
       ms->a = 0;
   }
}
```

Dialogue

```
\begin{dialogue}
    \speak{Vladimir} Where are all these corpses from?
    \speak{Estragon} These skeletons.
    \speak{Vladimir} A charnel-house!  A charnel-house!
    \speak{Estragon} I'm in hell!
    \speak{Vladimir} Where were you?
    \speak{Estragon} They're coming there too!
    \speak{Vladimir}  We're surrounded! makes a rush  towards
back.
                Imbecile!  There's no way out there.
                There!  Not a soul in sight!  Off you go!  Quick!
\end{dialogue}
```

Which produces:

Vladimir Whare are all these corpses from?
Estragon These skeletons.
Vladimir A charnel-house! A charnel-house!
Estragon I'm in hell!
Vladimir Where were you?
Estragon They're coming there too!
Vladimir We're surrounded! makes a rush towards back. Imbecile! There's no way out there. There! Not a soul in sight! Off you go! Quick!

Exercises

Exercises should be placed in a separate, unnumbered chapter. Use the command \backmatter before "\begin{exercises}".

```
\backmatter
\begin{exercises}
    \begin{enumerate}
        \item Text…
        \item Text…
    \end{enumerate}
    Text…
\end{exercises}
```

All heading levels in exercises are same as regular heading levels.

Appendix

```
\begin{appendices}
\chapter{Summations}
    Text….
\end{appendices}
```

To create headings within an appendix, use the regular heading commands.

Bibliography

\begin{thebibliography}{11}

\bibitem{1} Milton Abramowitz and Irene A. Stegun, editors. Handbook \ of Mathematical Functions. Dover, 1965.

\bibitem{2} G. M. Adel fson-Vel fski.. and E. M. Landis. An algorithm for the organization of information. Soviet Mathematics Doklady, (5):1259.1263, 1962.

\end{thebibliography}

Which produces:

Bibliography

[1] Milton Abramowitz and Irene A. Stegun, editors. Handbook of Mathematical Functions. Dover, 1965.

[2] G. M. Adelfson-Velfski.. and E. M. Landis. An algorithm for the organization of information. Soviet Mathematics Doklady, 3(5):1259.1263, 1962.

Sample Coding for Crosslink

```
the algorithm. The most important of these is Shell's sort, introduced by D. L. Shell, which uses
insertion sort on periodic subsequences of the input to produce a faster sorting algorithm in \cite{1}.


\item Not all authors define the asymptotic notations in the same way, although the
various definitions agree in most common situations. Some of the alternative definitions encompass
functions that are not asymptotically nonnegative \cite{2}, as long as their absolute values are
appropriately bounded.


\item Equation (3.20) is due to Robbins [297]. Other properties of elementary mathematical
functions can be found in any good mathematical reference, such as Abramowitz and Stegun [1] or Zwillinger
[362], or in a calculus book, such as \cite{4} or \cite{3}. Knuth [209] and Graham, Knuth, and Patashnik
[152] contain a wealth of material on discrete mathematics as used in computer science.
```

Which produces:

Shell, which uses insertion sort on periodic subsequences of the input to produce a faster sorting algorithm in [1].

4. Not all authors define the asymptotic notations in the same way, although the various definitions agree in most common situations. Some of the alternative definitions encompass functions that are not asymptotically nonnegative [2], as long as their absolute values are appropriately bounded.
5. Equation (3.20) is due to Robbins [297]. Other properties of elementary mathematical functions can be found in any good mathematical reference, such as Abramowitz and Stegun [1] or Zwillinger [362], or in a calculus book, such as [4] or [3]. Knuth [209] and Graham, Knuth, and Patashnik [152] contain a wealth of material on discrete mathematics as used in computer science.

Index

To generate an index:

1. Before \begin{document}, use:

   \usepackage{makeidx}

   \makeindex
2. Enter \index{term} or \index{term!subterm} or index{term!subterm!subterm}

Be careful! There must be no spaces before or after the '!' or your subterms will not alphabetize correctly.

3. Run LaTeX, producing *filename*.idx.
4. Type 'makeindx *filename*' at the command line to produce *filename*.ind.

The index file, *filename*.ind can be edited if necessary.

5. To insert the generated index within your files, use:

   \printindex

   \documentclass{book}

   \usepackage{makeidx}

   \makeindex

   \begin{document}

   Borden's symbol, Elsie the cow, is a Jersey, a kind of

   cow characterized by a caramel colored coat and

   large dark eyes.\index{Cows}\index{Cows!Jersey}\
   index{Cows!Jersey!Brown eyed}...

   \printindex

   \end{document}