A Font Family Sampler

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To assist in producing greater font face variation in university dissertations and theses, this document illustrates font family selection with a LaTeX document preamble command

```
\usepackage{FAMILY}
```

where FAMILY is given in the subsection titles below.

Comparison of text fonts

Some of the families illustrated in this section include distinct mathematics faces, but for brevity, we show only prose. When a font family is not chosen, the LaTeX and Plain TeX default is the traditional *Computer Modern* family used to typeset the *Art of Computer Programming* books, and shown in the first subsection.

NB: The LuxiMono font has rather large characters: it is used here in 15% reduced size via these preamble commands:

```
\usepackage[T1]{fontenc} % only encoding available for LuxiMono
\usepackage[scaled=0.85]{luximono}
```

\usepackage{}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{ae}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{avantgarde}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{bookman}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{chancery}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{charter}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{comicneue}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{comfortaa}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus

neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{concrete}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{courier}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{DejaVuSans}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{DejaVuSansCondensed}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{DejaVuSerif}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{DejaVuSerifCondensed}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{fourier}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{helvet}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{kerkis}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{librebaskerville}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{librecaslon}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{lmodern}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{luximono}

```
Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non
maecenas, pariatur vitae congue laoreet semper, nulla adipiscing
cursus neque dolor dui, faucibus aliquam quis.  Lacus curae
fermentum, morbi vestibulum vel arcu sapien bibendum per.
```

\usepackage{mathpazo}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{mathptm}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{newcent}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{noto}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.
That sample was typeset with the default serifed roman fonts or {\rmfamily . . . } or \textrm{. . . }.
  The *Google Noto* free font family supplies thousands of Unicode characters in many scripts, with reasonable family resemblance across alphabetic scripts.

\usepackage{noto}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.
That sample was typeset with {\sffamily . . . } or \textsf{. . . }.

\usepackage{palatino}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{tgadventor}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{tgbonum}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{tgchorus}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{tgcursor}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{tgheros}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{tgpagella}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui,

faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{tgschola}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{tgtermes}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{times}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{universalis}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

\usepackage{utopia}

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio non maecenas, pariatur vitae congue laoreet semper, nulla adipiscing cursus neque dolor dui, faucibus aliquam quis. Lacus curae fermentum, morbi vestibulum vel arcu sapien bibendum per.

Comparison of fixed-width ('typewriter') fonts

To change the fixed-width font in a LaTeX document, issue the command

```
\renewcommand{\ttdefault}{ABBREV}
```

where ABBREV is the short name of a LaTeX font family. You can do that multiple times, as we do in this section, but normally, you should be consistent and use a single fixed-width font for your document.

The short names used here were found by searching numerous style files for the string \ttdefault. The subsection titles are the long font family names, and are *not* LaTeX package names.

In the examples, the first two lines of each verbatim display indicate column numbers. That is a useful one-time trick if you change \textwidth in your document, because you then know how long subsequent verbatim lines can be, and you can adjust them accordingly to avoid overfull boxes.

Notice the dramatic variations in text widths in the families shown below. For the common application of typesetting computer input and output in LaTeX verbatim displays, you may prefer a narrow font face to maximize the number of characters per line.

Notice also that the *Eco* family fixed-width font has *old-style* digits, where half the numerals descend below the baseline.

Some fixed-width font families offer variants in series (bold) and shape (italic and slanted), so each subsection ends with a table illustrating those variants.

Bera Mono

```
\renewcommand{\ttdefault}{fvm}
```

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.
```

```
Lorem ipsum dolor sit amet, aenean nulla tellus metus odio
non maecenas, pariatur vitae congue laoreet semper, nulla
adipiscing cursus neque dolor dui, faucibus aliquam quis.
```

Series and shape variants	
\bfseries	**http://www.math.utah.edu/**
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	***http://www.math.utah.edu/***

CMBright

```
\renewcommand{\ttdefault}{cmtl}
```

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.
```

```
Lorem ipsum dolor sit amet, aenean nulla tellus metus odio
non maecenas, pariatur vitae congue laoreet semper, nulla
adipiscing cursus neque dolor dui, faucibus aliquam quis.
```

Series and shape variants	
\bfseries	http://www.math.utah.edu/
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	http://www.math.utah.edu/

Computer Modern

\renewcommand{\ttdefault}{cmtt}

00000000011111111112222222222333333333344444444445555555555666666666677777777778
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio
non maecenas, pariatur vitae congue laoreet semper, nulla
adipiscing cursus neque dolor dui, faucibus aliquam quis.

Series and shape variants	
\bfseries	http://www.math.utah.edu/
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	http://www.math.utah.edu/

Courier

\renewcommand{\ttdefault}{pcr}

00000000011111111112222222222333333333344444444445555555555666666666677777777778
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio
non maecenas, pariatur vitae congue laoreet semper, nulla
adipiscing cursus neque dolor dui, faucibus aliquam quis.

Series and shape variants	
\bfseries	**http://www.math.utah.edu/**
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	***http://www.math.utah.edu/***

DejaVu Sans Mono

\renewcommand{\ttdefault}{DejaVuSansMono-TLF}

00000000011111111112222222222333333333344444444445555555555666666666677777777778
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.

```
Lorem ipsum dolor sit amet, aenean nulla tellus metus odio
non maecenas, pariatur vitae congue laoreet semper, nulla
adipiscing cursus neque dolor dui, faucibus aliquam quis.
```

To scale the font, put something like this in your document preamble:

```
\usepackage[scaled = 0.8]{DejaVuSansMono}
```

Series and shape variants	
\bfseries	**http://www.math.utah.edu/**
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	***http://www.math.utah.edu/***

Droid Sans Mono

`\renewcommand{\ttdefault}{fdm}`

```
000000000011111111112222222222333333333344444444445555555555666666666677777777778
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.
```

```
Lorem ipsum dolor sit amet, aenean nulla tellus metus odio
non maecenas, pariatur vitae congue laoreet semper, nulla
adipiscing cursus neque dolor dui, faucibus aliquam quis.
```

Series and shape variants	
\bfseries	http://www.math.utah.edu/
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	http://www.math.utah.edu/

Eco

`\renewcommand{\ttdefault}{cmott}`

```
000000000011111111112222222222333333333344444444445555555555666666666677777777778
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.
```

```
Lorem ipsum dolor sit amet, aenean nulla tellus metus odio
non maecenas, pariatur vitae congue laoreet semper, nulla
adipiscing cursus neque dolor dui, faucibus aliquam quis.
```

Series and shape variants	
\bfseries	http://www.math.utah.edu/
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	http://www.math.utah.edu/

Inconsolata

`\renewcommand{\ttdefault}{zi4}`

```
000000000011111111112222222222333333333344444444445555555555666666666677777777778
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.
```

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio
non maecenas, pariatur vitae congue laoreet semper, nulla
adipiscing cursus neque dolor dui, faucibus aliquam quis.

Series and shape variants	
\bfseries	**http://www.math.utah.edu/**
\itshape	http://www.math.utah.edu/
\slshape	http://www.math.utah.edu/
\bfseries \itshape	**http://www.math.utah.edu/**

Latin Modern

`\renewcommand{\ttdefault}{lmtt}`

```
000000000011111111112222222222333333333344444444445555555555666666666677777777778
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.
```

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio
non maecenas, pariatur vitae congue laoreet semper, nulla
adipiscing cursus neque dolor dui, faucibus aliquam quis.

Series and shape variants	
\bfseries	**http://www.math.utah.edu/**
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	***http://www.math.utah.edu/***

Libertine Mono

`\renewcommand{\ttdefault}{LinuxLibertineMonoT-TLF}`

```
000000000011111111112222222222333333333344444444445555555555666666666677777777
123456789.123456789.123456789.123456789.123456789.123456789.123456789.12345
```

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio
non maecenas, pariatur vitae congue laoreet semper, nulla
adipiscing cursus neque dolor dui, faucibus aliquam quis.

Series and shape variants	
\bfseries	**http://www.math.utah.edu/**
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	***http://www.math.utah.edu/***

LuxiMono

\renewcommand{\ttdefault}{ul9}

This sample was produced with the package option \texttt{scaled = 0.85}:

00000000001111111111122222222222333333333334444444444455555555555666666666667777777777 8
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio
non maecenas, pariatur vitae congue laoreet semper, nulla
adipiscing cursus neque dolor dui, faucibus aliquam quis.

To scale the font, put something like this in your document preamble:

\usepackage[scaled = 0.8]{LuxiMono}

Series and shape variants	
\bfseries	**http://www.math.utah.edu/**
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	***http://www.math.utah.edu/***

New TXTT

\renewcommand{\ttdefault}{ntxtt}

00000000001111111111122222222222333333333334444444444455555555555666666666667777777777 8
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.

Lorem ipsum dolor sit amet, aenean nulla
tellus metus odio non maecenas, \ldots.

Series and shape variants	
\bfseries	**http://www.math.utah.edu/**
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	***http://www.math.utah.edu/***

NotoMono

\renewcommand{\ttdefault}{NotoMono-TLF}

This sample was produced with the package option \texttt{scaled = 0.85}:

00000000001111111111222222222233333333334444444444555555555566666666667777777778
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.

Lorem ipsum dolor sit amet, aenean nulla
tellus metus odio non maecenas, \ldots.

To scale the font, put something like this in your document preamble:

\usepackage[scaled = 0.8]{noto}

Series and shape variants	
\bfseries	http://www.math.utah.edu/
\itshape	http://www.math.utah.edu/
\slshape	http://www.math.utah.edu/
\bfseries \itshape	http://www.math.utah.edu/

TEX Gyre Cursor

\renewcommand{\ttdefault}{qcr}

00000000001111111111222222222233333333334444444444555555555566666666667777777777 8
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.

Lorem ipsum dolor sit amet, aenean nulla tellus metus odio
non maecenas, pariatur vitae congue laoreet semper, nulla
adipiscing cursus neque dolor dui, faucibus aliquam quis.

Series and shape variants	
\bfseries	**http://www.math.utah.edu/**
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	***http://www.math.utah.edu/***

TXTT

\renewcommand{\ttdefault}{txtt}

00000000001111111111222222222233333333334444444444555555555566666666667777777778
123456789.123456789.123456789.123456789.123456789.123456789.123456789.123456789.

Lorem ipsum dolor sit amet, aenean nulla
tellus metus odio non maecenas, \ldots.

Series and shape variants	
\bfseries	**http://www.math.utah.edu/**
\itshape	*http://www.math.utah.edu/*
\slshape	*http://www.math.utah.edu/*
\bfseries \itshape	***http://www.math.utah.edu/***

Scaling fonts

A few fixed-width font families allow the font to be scaled uniformly by a package declaration in the document preamble like \usepackage[scaled = 0.8]{*font-package-name}*, as noted in earlier subsections. That is helpful when the default monospaced character height differs from that of the prevailing prose font, which, except for TEX's own font families of *Computer Modern* and *Concrete,* and the commercial *Lucida* fonts, is likely to be of a completely different design.

Regrettably, it does not seem to be possible to precisely control font scaling within a single document with standard LATEX commands, other than by selection of the usual LATEX size-changing commands: \footnotesize, \tiny, \scriptsize, \small, \normalsize, \large, \Large, \LARGE, \huge, and \Huge, and their corresponding environments like \begin{footnotesize} ... \end{footnotesize}.

One can achieve arbitrary dynamic font sizing by descending to low-level TEX font commands, such as with the input

```
{\font \dyntt = ul9r8t at  7pt \dyntt  7pt text},
{\font \dyntt = ul9r8t at  8pt \dyntt  8pt text},
{\font \dyntt = ul9r8t at  9pt \dyntt  9pt text},
{\font \dyntt = ul9r8t at 10pt \dyntt 10pt text},
{\font \dyntt = ul9r8t at 11pt \dyntt 11pt text}, and
{\font \dyntt = ul9r8t at 12pt \dyntt 12pt text}
```

that produces 7pt text, 8pt text, 9pt text, 10pt text, 11pt text, and 12pt text.

Proportional scaling is generally preferred to absolute font sizing, because it behaves as expected when the overall document font size is changed in the leading \documentclass command. You can scale fonts proportionally with input

```
{\font \dyntt = ul9r8t scaled  700 \dyntt  70\%-scaled text},
{\font \dyntt = ul9r8t scaled  800 \dyntt  80\%-scaled text},
{\font \dyntt = ul9r8t scaled  900 \dyntt  90\%-scaled text},
{\font \dyntt = ul9r8t scaled 1000 \dyntt 100\%-scaled text},
{\font \dyntt = ul9r8t scaled 1100 \dyntt 110\%-scaled text},
and
{\font \dyntt = ul9r8t scaled 1200 \dyntt 120\%-scaled text}
```

to produce 70%-scaled text, 80%-scaled text, 90%-scaled text, 100%-scaled text, 110%-scaled text, and 120%-scaled text.

Clearly, such input is tedious to write, and hard to keep consistent throughout a large document. One solution is a private macro that is defined in the document preamble, or better, a private style file:

```
\newcommand{\mytt}[2]
{% Usage: \mytt{scale-in-0-to-1}{text}
    {%
        \dimen0 = 1000sp
        \dimen0 = #1\dimen0
        \count0 = \dimen0
        \font \dyntt = ul9r8t scaled \count0
        \dyntt #2%
    }%
}
```

It is later used with input

```
\mytt{0.7}{ 70\%-scaled text},
\mytt{0.8}{ 80\%-scaled text},
\mytt{0.9}{ 90\%-scaled text},
\mytt{1.0}{100\%-scaled text},
\mytt{1.1}{110\%-scaled text}, and
\mytt{1.2}{120\%-scaled text}
```

to produce 70%-scaled text, 80%-scaled text, 90%-scaled text, 100%-scaled text, 110%-scaled text, and 120%-scaled text.

Low-level font definitions with raw TeX code are not affected by standard LaTeX size-changing commands: compare

```
{\tiny \texttt{tiny typewriter text}}
```

to produce tiny typewriter text with

```
{\tiny \mytt{1.0}{tiny (whoops!)\ typewriter text}}
```

to typeset tiny (whoops!) typewriter text.

Despite our cautions about not conforming to LaTeX size-changing commands, in documents that need to show a lot of computer input and output, our private macro is nevertheless a useful tool to squeeze long verbatim lines into the document line width, without having to introduce possibly-confusing line wrapping.

Font color and style

It is easy to get colored text into a document using these preamble declarations

```
\usepackage[pdftex]{color}
\usepackage{rgb}
```

to define a number of LaTeX macros, and color names.

The rgb package is a Utah addition that provides LaTeX definitions of all of the named colors supplied by the X11 Window System on desktop Unix(-like) systems.

You can see X11's roughly 800 color definitions in the system-dependent files /usr/openwin/lib/X11/rgb.txt and /usr/share/X11/rgb.txt, or view them interactively in a terminal window like this:

```
% showrgb | less
199  21 133          medium violet red
176 196 222          light steel blue
102 139 139          paleturquoise4
159 121 238          mediumpurple2
...
 61  61  61          gray24
255 255 255          white
  0 205 205          cyan3
  0   0   0          black
```

For use in LaTeX, X11 color names are downcased, and embedded spaces are removed, so the first output line corresponds to the LaTeX color mediumvioletred, which the rgb package defines like this:

```
\definecolor{mediumvioletred}{rgb}{0.780,0.082,0.522}
    % #c71585 199 21 133 MediumVioletRed
```

The sharp-prefixed value in the comment is the hexadecimal equivalent that could be used in place of a named color in a command-line color option, such as these equivalent commands:

```
% xterm -bg 'medium violet red' -fg white     &
% xterm -bg '#c71585'           -fg '#ffffff' &
```

Knowing the hexadecimal values makes it easy to produce families of windows with slightly varying shades of color, such as these examples that use three-character hexadecimal colors differing by one digit in each primary color:

```
% xterm -bg '#4d8' &
% xterm -bg '#5e9' &
% xterm -bg '#6fa' &
```

The X11 color names have varied over time, so if you find a color name in showrgb output on your system that is not in the rgb package, scale its integer red, green, and blue values from the range [0,255] to the range [0,1] to provide a new definition like this:

```
\definecolor{teal}{rgb}{0, 0, 0.502} % #008080 0 128 128 teal
```

As described in Appendix C.14.3 of the *LaTeX User Guide and Reference Manual*, the `color` package provides macros for coloring foreground and background of typeset material. For example, `\textcolor{red}{red text}` produces red text, and `\textcolor{blue}{\bf bold blue text}` produces **bold blue text**.

You can also supply background colors with

```
\colorbox{skyblue}{black on skyblue}
```

to get black on skyblue , or embellish that further with

```
\fcolorbox{red}{skyblue}{red-bordered black-on-skyblue text}
```

to typeset red-bordered black-on-skyblue text .

The text color inside the box can be changed as well, with input `\colorbox{teal}{\textcolor{yellow}{yellow on teal}}` to typeset yellow on teal .

Boxing interferes with linebreaking, because color boxes are unbreakable horizontal material. You need to use them judiciously, and you may have to rewrite prose containing color boxes to help TeX's line breaking.

However, what if you want to color all verbatim text? You cannot include such text as an argument to other macros, so you have to dig into LaTeX internal to find how the verbatim font is selected, and then insert a suitable color command. The standard file `latex.ltx` that defines the core of LaTeX contains the one-line definition

```
\def\verbatim@font{\normalfont\ttfamily}
```

that sets the font for the `verbatim` environment, as well as for the `\verb` macro. Because it contains an at-sign, you need to redefine it in a private style file, where such characters are permitted in macro names.

Here is a reasonable set of definitions that allow you to dynamically change the default `verbatim` font color and style:

```
%%% Internal macros
\def \verbatim@style {}     % default value
\def \verbatim@color {blue} % default value
\def \verbatim@font  {\normalfont \color{\verbatim@color}
                     \ttfamily \verbatim@style}
%%% Public macros for GLOBAL color and style changes:
\def \verbatimcolor #1{\def \verbatim@color {#1}}
\def \verbatimstyle #1{\def \verbatim@style {#1}}
```

You can then temporarily change colors inside a braced group with

```
{%
    \verbatimcolor{red}     \verb=red=,
    \verbatimcolor{blue}    \verb=blue=, and
    \verbatimcolor{hotpink} \verb=hotpink=
}
```

to typeset red, blue, and hotpink verbatim text.

You can also change styles, if the fixed-width font family permits, with

```
{%
    \verbatimstyle{\bfseries} \verb=bold=,
    \verbatimstyle{\itshape}  \verb=italic=, and
    \verbatimstyle{\slshape}  \verb=slanted=
}
```

to typeset **bold**, *italic*, and *slanted* verbatim text.

Finally, you can combine color and style with input

```
{%
    \definecolor    {utahred} {rgb} {0.8, 0, 0}%
    \verbatimstyle {\bfseries \itshape}%
    \verbatimcolor {utahred}%
    \verb=Utah red bold italic=%
}
```

to typeset ***Utah red bold italic*** verbatim text.

Dark colors on light backgrounds generally work best.

Remember that color reproduction fidelity varies across output devices, and color perception by humans is often affected by culture, and by retinal differences. Notably, up to 6% of human males have difficulty distinguishing red and green: both may look similar to shades of brown. If the three color names in the preceding sentence look similar to you, then you may have a degree of red–green perception difficulty.

Human color perception is also affected by viewing distance and ambient lighting. Prepare a lecture slide with black, blue, and red text on a light background, and then view it from different places in the classroom: you will likely find it hard to distinguish the text colors at long distances, unless the font is large and bold.

Dangerous digits

In most font designs, decimal digits have equal widths, and thus, line up neatly in LaTeX array and tabular displays. However, there *are* fonts where digits vary in width, and when that is the case, numerical displays may look quite peculiar. Pay attention to that point if you explore the font world more widely than we do in this document!

In font families that include a repertoire of mathematical characters, the text and math digits are usually identical, but that is not always the case. When they are not, you need to be particularly careful in marking your input. Here is an example:

```
A magician pulled $27$ rabbits out of a hat in 1933,
which is mathematically interesting, because $27 = 3^3$.
```

Digits that form a word, such as a calendar year, are *text* digits, whereas digits that count something are better treated as *math* digits.

The *Chicago Manual of Style* (16th edition, 2010) says on page 464 in its section *Numerals versus Words*:

> In nontechnical contents, Chicago advises spelling out whole numbers from zero through one hundred and certain round multiples of those numbers.
> …
> Many publications, including those in scientific or journalistic contexts, follow the simple rule of spelling out only single-digit numbers and using numerals for all others.

Thus, the CMS recommends writing text like this:

```
The Senator owns seventeen houses, three condos, and
two forest cabins.
```

There are exceptions, and it later suggests favoring consistency over the rule when several numbers are used in the same sentence, paragraph, or series of paragraphs:

```
A 12th Century Italian farmer named Bonacci had 0 fish,
1 dog, 1 rabbit, 2 cows, 3 cats, 5 goats, 8 sheep, and
13 chickens.  His son later became quite famous for that
peculiar number sequence.
```

Confusing characters

The character shapes for several European-language letters and digits are subject to confusion, notably for the uppercase letters **O**, **Ø**, and **Q** and the digit **0**, and the letters lowercase **l**, uppercase **I**, and the digit **1**.

TeX does not even supply separate macros for Greek letters who shapes are normally identical to corresponding Latin letters, such as uppercase alpha, beta, epsilon, and omicron, and lowercase omicron.

Look carefully at the fixed-width font samples earlier in this document to see how well, or poorly, the fonts distinguish the problem glyphs. Some typewriter fonts have a right-leaning stroke through the digit **0**, like *Inconsolata*'s

0, but that looks too much like the penultimate letters of the Danish and Norwegian alphabets, **Ø** and **ø**. The left-leaning stroke in the zero in the *TXTT* fonts `0`, and the dotted-zero `0` of *Bera Mono* and *DejaVu Sans Mono* remove the Scandinavian ambiguity.

The glyph shape distinctions may not matter much for a novel, where context generally removes ambiguities. However, in scientific writing, clear differences in character shapes are essential, and you need to choose your prose, mathematical, and typewriter fonts carefully.

In mathematics text, you should probably never use the lowercase letter **l**; instead, write `\ell` for ℓ. Similarly, avoid the letter **O** unless it is suitably distinguished: in TeX math mode and LaTeX mathematical environments, write `{\cal O}(n)` for $\mathcal{O}(n)$, `\mathcal{O}(n)` for $\mathcal{O}(n)$, `\mathit{O}(n)` for $O(n)$, `\mathsf{O}(n)` for $\mathsf{O}(n)$, or `\mathfrak{O}(n)` for $\mathfrak{O}(n)$.

When such material appears repeatedly, encapsulate it in a private macro that tells what it is, not what it looks like, with input

```
\newcommand {\Order} {\mathcal{O}}
...
\emph{\textbf{Warning}: Gaussian elimination on $n \times n$ matrices
      takes $\Order(n^3)$ operations.}
```

to get ***Warning****: Gaussian elimination on* $n \times n$ *matrices takes* $\mathcal{O}(n^3)$ *operations.*