CPSC 418/MATH 318 LaTeX Practice Document

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1 Introduction

Welcome to LaTeX!

2 Lists

You can create many types of lists:

2.1 Itemized

- Itemize element 1
- Itemize element 2
- Itemize element 3

2.2 Numbered

1. Enumerate item 1 normally (indexed with numbers)
2. Enumerate item 2
3. Enumerate item 3

2.3 Indexed with symbols of your choice

Use this only if really needed; in general, it is better to just leave the numbering style up to LaTeX.

– Enumerate item 1 with a long dash

* Enumerate item 2 with an asterisk

Enumerate item 3 without a symbol

3 Tables

Here is a table, centered and with cell borders:

1	2	3
4	5	6

4 Math

Math mode inside text can be used by writing \$ . . . \$ This creates inline math symbols and expressions; for example v_{10}^2, v_2^2, v_3^2.

Use \[. . . \] to display math, which places an equation centered on its own line as below:

$$a \equiv c \pmod{20},$$

To give an equation a number, use the *equation* environment and give the equation a \label{}:

$$\binom{5}{2} = \frac{5(5-1)}{2} = 10. \tag{1}$$

To refer to Equation (1), use the \eqref{} command. Be sure to always label equations and reference them by their label.

The *align* environment allows formatting of equations that span multiple lines.

$$\begin{aligned} \sum_{\substack{i=0 \\ i \text{ is even}}}^{n} a_i &= \beta\alpha + \beta\alpha + \beta\alpha + \beta\alpha && (2) \\ &= 4(\beta\alpha) && (3) \\ &= \gamma \end{aligned}$$

Note how the last line is not numbered; this was done with \nonumber. The *align∗* environment also lines up multi-line equations in this way, but without numbers:

$$\begin{aligned} (x^2+xy+y^2)(x-y) &= (x^2+xy+y^2)x - (x^2+xy+y^2)y \\ &= (x^3+x^2y+xy^2) - (x^2y+xy^2+y^3) \\ &= x^3 - y^3. \end{aligned}$$

You may want to use blackboard font for sets of numbers such as $\mathbb{Z}$, $\mathbb{F}$, $\mathbb{R}$.

Many mathematical functions and notations, when preceded with a backslash, appear in the proper text mode (i.e. not in italics):

Correct	*Incorrect*
$\deg(f)$	$deg(f)$
$\sin(x)$	$sin(x)$
$\det(A)$	$det(A)$

A very common mistake is to *putsometextinmathmode*. As you can see, this is very hard to read and considered very bad form. So always use the \text{} command, like so:

$$a_i > 0 \text{ for all } i \in \mathbb{N}.$$

Some useful math symbols including the summation symbol can become quite large. You can adjust the size of brackets to make them look nicer:

$$(\sum_{i=1}^{n} a_i) \quad \text{vs.} \quad \left(\sum_{i=1}^{n} a_i\right)$$

Here is how you do arrays, with or without different types of brackets:

$$\begin{matrix} 1 & 2 \\ 3 & 4 \end{matrix} \qquad \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \qquad \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

You can also create simple matrices with the *bmatrix* (for square brackets) or *pmatrix* (for parentheses) environments:

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \qquad \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}.$$

Unnumbered Sections

Note that we just started an unnumbered section here. This is done with the \section* command. This works for subsections as well.

Finally, the \newpage command let's you start a new page, like this:

5 Practice tasks

1. Create an itemized list of all your classes this semester.

   - CPSC 418 *Introduction to Cryptography*
   - CPSC 413 *Design and Analysis of Algorithms I*
   - ...

2. Create a centered, bordered 4-column table with your courses this semester, containing the course number, course name, times and location:

Course number	*Course name*	*Lecture times*	*Lecture location*
MATH 318	Introduction to Cryptography	MWF 15:00-15:50	MFH 160
MATH 315	Algebra I	MWF 11:00-11:50	TRB 102
...			

3. Typeset the binomial theorem, displayed:

$$(x+y)^n = \sum_{i=0}^{n} \binom{n}{i} x^{n-i} y^i$$

4. Typeset the Riemann zeta function, displayed and aligned in two lines, with an equation number on the last line only:

$$\begin{aligned} \zeta(s) &= \sum_{n=1}^{\infty} \frac{1}{n^s} \\ &= \prod_{p} \frac{1}{1-p^{-s}} \end{aligned} \tag{4}$$

   Now reference it:

   Equation (4) shows the Riemann zeta function.

5. Type a matrix with dots:

$$A = (a_{ij})_{1 \le i,j \le n} = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix} \in \mathrm{Mat}_n(\mathbb{R}).$$

6. Use the assignment template to practice further. Have fun!