CMSC 221 - Math, Pseudocode, and LaTeX

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For the following sections, the final product is shown in the pdf and how to generate the item is found in the tex file. Single best LaTeX resource: `https://en.wikibooks.org/wiki/LaTeX`. It is typically the top result when Google search contains "latex". Then, if you can't find the answer, ask Piazza and I will help steer you. I will likely add to this list throughout the semester as needed.

1 Math and Pseudocode

1.1 Math

Use the following recommendations for mathematics:

- All variables should be specified in math mode. Example x. Single data elements (doesn't matter the type) should be named with a lowercase letter. Example x, where x is an integer. Multiple data elements, i.e., sets (doesn't matter the data structure) should be named with a capital letter. Example X, where X is a set of real numbers.

- Use $\leftarrow$ (gets) for assignment. Example $x \leftarrow 0$. Use $=$ (equals) for equality comparison of single elements. Example $x = y$. Use $\equiv$ (equivalent) for equality comparison of sets. Example $X \equiv Y$.

- Use $\in$ (in) for stating an-element-of. Example $x \in X$ means that x is an element of (or in) the set X. Use $\subset$ or $\subseteq$ (subset or proper subset, respectively) for subset statements. Example $X \subseteq Y$ means that the set X is a proper subset of the set Y.

- Avoid "type" as much as possible. I mean you should not say "int $x = 0$;" but rather "$x \leftarrow 0$" without the type specified.

- Almost anything is allowed that you might imagine in math mode. Common ones you might want: Fractions $\frac{1}{2}$, Subscripts x_i, Superscripts x^2, and Summations $\sum_{i=0}^{n}$ or $\sum_{a \in A}$. Subscripts are used to name elements of series.

- Use propositional logic: $\neg$ is negation (not !), $\wedge$ is conjunction (and) (not &&), and $\vee$ is disjunction (or) (not ||).

- Website for other symbols: `http://web.ift.uib.no/Teori/KURS/WRK/TeX/symALL.html`

1.2 Pseudocode

Use the following recommendations for pseudocode:

- Define all input and output using \INPUT and \OUTPUT prior to the steps of the algorithm

- Comments can be added either with a \COMMENT on \STATE or as an optional parameter to loops and conditionals.

- Function calls to other algorithms, member functions of ADTs, etc should be in math mode but as a different font using {\mathtt} for example.

- Use \IF, \ELSIF, and \ELSE for if, else-if, and else, respectively.

- Use \FOR for for-loops and \FORALL for for-each-loops.

- Use \WHILE for while-loops and \REPEAT and \UNTIL for do-while-loops.

Examples for all of the recommendations:

Algorithm 1 Example

Input: Set X, Stack Y, positive integer n
Output: Tree T
  Step 1 {Comment on step}
  Y.pop() {Example function call of a variable}
  if $n = 0$ **then** {Comment on if}
    Step 2
  else if $n = 1$ **then**
    Step 3
  else
    Step 4
  for $i \leftarrow 0..n$ **do**
    Step 5
  for all $x \in X$ **do**
    Step 6
  while $\neg Y$.isEmpty() **do**
    Step 7
  repeat
    Step 7
  until $\neg Y$.isEmpty()
  return Return something

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2 LaTeX Features

2.1 Figures

There are a few ways to include figures in a tex document. However, note that not all image formats are treated equal. You can google how to include a specific image format, but the easiest to include in a document is eps (Enriched Post Script) format.

Basically you use the "figure" environment. Environments in LaTeX typically start with a \begin command and end with a \end command. Figure 1 shows an example of this.

Figure 1: Figure included in document

There is also a much fancier way of generating images. You can use the package tikz. I would give an example, but each thing you want to do with it requires a different example. So if you are interested I can give you more information.

2.2 Tables

Tables are fairly easy to manage. Use a tabular environment in LaTeX. There are many, many examples and small settings to get alignments the way you want. Ask if you can't figure something out. Simple example:

Centered text	Left Justified text	Right Justified text
Hey look	its	row two.

3 Citing references

Cite using the \cite command [1]. Then add the reference either using Bibtex or at the end of your text document using LaTeX's embedded citation system. Bibtex is much nicer but it is more difficult to setup.

References

[1] Leslie Lamport, *LaTeX: a document preparation system*, Addison Wesley, Massachusetts, 2nd edition, 1994.