

# CSE 235 Homework Template\*

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**Problem:** (Levitin 2.1.1) For each of the following algorithms, indicate (i) a natural size matrix for its inputs; (ii) its basic operation; (iii) whether the basic operation count can be different for inputs of the same size.

- a. Computing the sum of  $n$  numbers

*Answer:*

- i.  $n$
- ii. addition of two numbers
- iii. no

- b. Computing  $n!$

*Answer:*

- i.  $\lceil \log n \rceil$
- ii. Multiplication of two integers
- iii. no

- c. Finding the largest element in a list of  $n$  numbers

*Answer:*

- i.  $n$
- ii. Comparison of two numbers
- iii. Nothing else.

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\*This document was created by Chris Bourke [1].

**Problem:** Prove that  $\frac{n(n^2)}{2} \in \Omega(n)$

*Answer:* We have the following theorem from Levitin, page 57:

**Theorem 1.** Let  $f(n)$  and  $g(n)$  be two monotonically increasing functions, then

$$\lim_{n \rightarrow \infty} \frac{f(n)}{g(n)} = \begin{cases} 0 & \Rightarrow f(n) \in \mathcal{O}(g(n)) \\ c & \Rightarrow f(n) \in \Theta(g(n)) \\ \infty & \Rightarrow f(n) \in \Omega(g(n)) \end{cases}$$

We set up our limit appropriately:

$$\lim_{n \rightarrow \infty} \frac{\frac{n(n-1)}{2}}{n} = n - 1 = \infty$$

Therefore, by Theorem 1,  $\frac{n(n^2)}{2} \in \Omega(n)$

Here is a mathematical expression:  $(a + b)_{n_i}^{2k} \frac{3x}{7y}$ . Note that it is written in line, in the text.

The following mathematical expression is displayed on a new line, centered, but it is not assigned a number:

$$(a + b)_{n_i}^{2k} \frac{3x}{7y}$$

The equation (1) has a number and a label, which can be referenced in the text.

$$(a + b)_{n_i}^{2k} \frac{3x}{7y} \tag{1}$$

The set of equations below are listed as an array. Only two are numbered.

$$(a + b)^2 = a^2 + b^2 + 2ab \tag{2}$$

$$(a + b)^2 = a^2 + b^2 + 2ab \tag{3}$$

$$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3 \tag{4}$$

**Problem:** Draw the graph  $K_5$ .

*Answer:*  $K_4$  is shown in Figure 1

**Problem:** Define the semantics of the logical connective  $\wedge$  in Propositional logic.

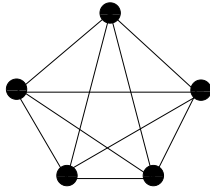


Figure 1: A complete graph with 5 nodes.

Table 1: Definition of the logical connective  $\wedge$ .

a	b	$a \wedge b$
0	0	0
0	1	0
1	0	0
1	1	1

*Answer:* Given two logical propositions  $a$  and  $b$ , the semantics of  $\wedge$  is defined in Table 1:

**Problem:** Give an algorithm to compute the sum of  $n$  integers stored in an array  $\mathcal{A}$ .

*Answer:* The following algorithm computes the sum:

```

SUMMATION( $\mathcal{A}[0 \dots n - 1]$ )
INPUT: an integer array  $\mathcal{A}$ 
OUTPUT: the summation  $\sum_{i=0}^{n-1} \mathcal{A}[i]$ 
  sum = 0
  for  $i = 0 \dots (n - 1)$ 
    sum = sum +  $\mathcal{A}[i]$ 
  return sum

```

## Compiling Your Document

Now that our document is finished, we need to compile it. If you are on CSE or any other system that has  $\text{\LaTeX}$  installed, then you compile this document from the command line as follows: `latex hw_example.tex`

$\text{\LaTeX}$  will do its thing and report any errors that you may have, otherwise it will successfully compile in to a dvi file named `hw_example.dvi`. At this point you

have several options. You can convert the dvi file into a pdf file or a postscript file by using either `dvipdf` or `dvips` respectively. Another alternative is to use `pdflatex` instead of `latex`, which automatically outputs a pdf file rather than a dvi file.

If you have labels like our label, `\label{theorem:asymptotics}`, you will need to run `latex` or `pdflatex` 2 or three times to compile the proper references.

## Additional Tools

You can use a program called `ispell` from the command prompt to spell check your document. Conveniently, `ispell` ignores  $\LaTeX$  markup!

If you are just getting used to the linux environment, one of the best text editors for  $\LaTeX$  besides emacs and xemacs is nedit. This text editor recognizes  $\LaTeX$  markup uses font and color offsets to help you out.

## Additional Resources

The main source for  $\LaTeX$  resources is the *TeX Users Group*: <http://www.tug.org> in particular, check out their page for beginners, *Getting Started With  $\LaTeX$*  at <http://www.tug.org/begin>.

One of the best tutorials is the *Not So Short Introduction to  $\LaTeX$  2e* which can be found at <http://www.ctan.org/tex-archive/info/lshort/english/lshort.pdf>

Good Luck on your  $\LaTeX$ ing

## References

- [1] Chris Bourke. Using LaTeX to Typeset Your Homework Example. 2004.