

# 1 When to T<sub>E</sub>X your Problem Sets

Note that we do not suggest T<sub>E</sub>Xing every problem set. It is useful to T<sub>E</sub>Xwork that:

- Involves proof that has a lot of text.
- Homework that may need revising, changing order since problems may be hard.
- You can look at it later, in particular this is useful for problems that may be used by you in proving other things later.
- Sometimes, proofs involve some repetition, L<sup>A</sup>T<sub>E</sub>X would also be useful in this case.

On the other hand, you should bear in mind that typing computational work, such as integrals or row reductions takes a lot of time. This is usually more useful to do by hand. Moreover, when you start out using L<sup>A</sup>T<sub>E</sub>X for problem sets, it will be much slower than writing. However, with practice you will become more skilled and faster. Bottom line is, it is worth taking a moment to decide whether or not to do a particular assignment with L<sup>A</sup>T<sub>E</sub>X.

# 2 Fancyhdr

## Introduction

This is a L<sup>A</sup>T<sub>E</sub>X package that you need to import using the `\usepackage{fancyhdr}` command in the preamble (recall preamble is that part between `\documentclass` and `\begin{document}`). The first command we need is the `\pagestyle` command. This command takes a mandatory argument and also goes in the preamble. To get a `fancyhdr` we have to put in the `fancy` argument. The default is to just give you a line when you type this command just by itself. There are 8 things in the page that you are able to modify, in the part of the page that is not the main body.

LeftHeader	CenteredHeader	RightHeader
page body		
LeftFooter	CenteredFooter	RightFooter

Consider the following structure for a problem set:

Daniel Parker	Some Hard Math	Spring 2014
Dan's Homework		
Homework 1	1	Due Date

To get this, you use the following commands in your pre-ample:

```
\lhead{Daniel Parker} %%this is the left header
\chead{Some Hard Math} %%this is the centre header
\rhead{Spring 2014} %%this is the right header
\lfoot{Homework 1} %%this is the left footer
\rfoot{Due date} %%this is the right footer
```

The centre footer is default set to the page number, you can use the `\cfoot{*text here*}` command to change it or even leave the argument empty to leave this component empty. The rest of the commands are different in that they are left empty by default To get different outputs on odd and even pages for any of these commands, just type `\lhead[*even page output here*]{*odd page output here*}`

## Finer Details

For any of the header or footer elements you can put the page number in that place by using the `\thepage` command in the argument and the date by using the `\today` command.

Further, you may want to play around with the lines. Here is the command to change the width of the header and footer lines to zero (i.e. to make them go away):

```
\renewcommand{\headrulewidth}{0pt}
\renewcommand{\footrulewidth}{0pt}
```

Note that you can make the lines bigger and smaller as well.

So this, when used with the earlier commands would give you the following page style:

Daniel Parker	Some Hard Math	Spring 2014
Dan's Homework		
Homework 1	1	Due Date

To insert line breaks in any of these commands, simply use `\\` before the break.

## Changing Page Number Types

The `\pagenumbering` command defines the layout of the page number. It has a parameter from the following list:

- `arabic` arabic numerals
- `roman` lower case roman numerals
- `Roman` upper case roman numerals
- `alph` lower case letter
- `Alph` upper case letter

The `\pagenumbering{xxx}` defines the command `\thepage` to be the expansion of the page number in the given notation `xxx`. The `pagestyle` command then would include `\thepage` in the appropriate place. Additionally the `\pagenumbering` command resets the page number to 1. The `\pagestyle` and `\pagenumbering` apply to the page that is being constructed, so they should be used at a location where it is clear to what page they apply

## Empty Pages

```
\thispagestyle{plain}
```

after the `\begin{document}` and the `\maketitle` commands.

Alternatively, issue

```
\thispagestyle{empty}
```

if you do not want any headers or footers.

In fact the standard L<sup>A</sup>T<sub>E</sub>X classes have the command `\maketitle` defined in such a way that a `\thispagestyle{plain}` is automatically issued. So if you *do* want the fancy layout on a page containing `\maketitle` you must issue a `\thispagestyle{fancy}` after the `\maketitle`.

## Re-Sizing Margins

You may remember using the `fullpage` and the `geometry` packages.

To use headers and footers with `fullpage`, you need to put in the `[headings]` optional argument.

This shows up as:

```
\usepackage[headings]{fullpage}
```

`geometry`, on the other hand, just works. So you use:

```
\usepackage[margin=0.5cm]{geometry}
```

### 3 Custom Sectioning for Problem Numbers

As discussed about custom commands earlier, we can make a custom command to do nice problem numbering. The command for this is:

```
\newcommand{\problem}[1]{\subsection*{Problem #1:}}
```

To use it, you just type:

```
\problem[1]
```

### 4 Abstracts

If you're writing a thesis, you need an abstract. For this, just start the `abstract` environment and you're good to go. Here's what you do:

```
\begin{abstract}  
*abstract here*  
\end{abstract}
```

### 5 siunitx

For all your labs you'll need to use all of those SI units and make them look good. For this L<sup>A</sup>T<sub>E</sub>X has a package that typesets also SI units including the ones that are written with special symbols. This is how you import the package:

```
\usepackage{siunitx}
```

Here's a list of all that you can use in this package:

```
\ang[options]{angle}  
\num[options]{number}  
\si[options]{unit}  
\SI[options]{number}[pre-unit]{unit}  
\numlist[options]{numbers}  
\numrange[optionsi]{hnumbersi}{hnumber2i}  
\SIlist[optionsi]{hnumbersi}{huniti}  
\SIrange[options]{number1}{number2}{unit}  
\sisetup{options}  
\tablenum[options]{number}
```

An example of this is:  $1.345 \frac{\text{C}}{\text{mol}}$

Which is coded as:

```
\SI[per-mode=fraction]{1,345}{\coulomb\per\mole}
```

Note that the `\per` is to make the fraction form of the unit. You can learn in detail about this from the `ctan` documentation. Note that you don't usually need the options so if they look intimidating, don't stress. A simpler example is: 50 kg Typed as:

```
\SI{50}{\kilogram}
```