How to use the `theorem` environment

In your preamble (that is, between the `\documentclass` command and `\begin{document}`; this is in `main.tex` in the paper template), put a line like

```
\newtheorem{thm}{Theorem}
```

for each theorem-like structure you want to define (Lemma, Conjecture, Proposition, and Definition are other common ones). Here `Theorem` is the printed name of the structure, and I shall use `\begin{thm}` and `\end{thm}` around the theorem. For example:

```
\begin{thm}
Herding cats is hard.
\end{thm}
```

Theorem 1. *Herding cats is hard.*

LaTeX automatically numbers theorems consecutively, so my next one will be Theorem 2. Don't type the theorem numbers directly into your paper, but use `\label` and `\ref`, just as you do with numbered figures and tables. For example:

```
\begin{thm}[Cain, 2002]\label{mattstemperflaring}
Herding Rickoids is harder.
\end{thm}
That was Theorem~\ref{mattstemperflaring}.
```

Theorem 2 (Cain, 2002). *Herding Rickoids is harder.*

That was Theorem 2.

The tilde (~) produces a nonbreaking space (you wouldn't want a page break between "Theorem" and "2"). Note in the above example that the `\begin{thm}` command has an optional argument: you can put a theorem's traditional name, date, discoverer, or the like in square brackets after the `\begin{thm}`, and it will be typeset in parentheses as part of the theorem's heading.

By default, each theorem environment will have its instances numbered independently, so you can have both a Theorem 1 and a Lemma 1, for instance. Because you may disapprove of this, the `\newtheorem` command lets you specify that the new environment should use an existing theorem environment's counter instead of its own independent counter: if, having already defined the `thm` environment, I say

```
\newtheorem{lem}[thm]{Lemma}
```

in the preamble, then my lemmata will be numbered using the same counter as my theorems. Thus, when I now say

```
\begin{lem}[\emph{Watership Down}]
We have $5=\infty$.
\end{lem}
```

Lemma 3 (*Watership Down*). *We have* $5 = \infty$.

I get Lemma 3. Without the `[thm]` above, I'd have a Lemma 1 instead.

A theorem environment's numbering normally counts 1, 2, 3, ... without regard to the sectioning of the paper. You might instead want your theorems numbered independently within each section, so that the second theorem in section 3 shall be called Theorem 3.2. For this you would say

```
\newtheorem{prop}{Proposition}[section]
```

(note that the optional argument appears in a different position here than in the previous example).

So far I've said how to state a theorem, but not how to prove it. If you are using the `amsthm` package (say `\usepackage{amsthm}` in the preamble), you can wrap your proof in the `proof` environment.

On the next page is an example document showing how to use these features of the `\newtheorem` command.

```
\documentclass{article}
\usepackage{amsthm}
\newtheorem{theorem}{Theorem}[section]
\newtheorem{lemma}[theorem]{Lemma}
\newtheorem{conj}[theorem]{Conjecture}
\begin{document}

\begin{theorem}[Wolfenstein, 1572]
People have fun with beer.
\end{theorem}

\begin{lemma}[Ventura, 1992]
Guys have fun in cathouses.
\end{lemma}

\section{Moo}

\begin{theorem}[Lu, 2000]
God is bovine.
\end{theorem}

\begin{conj}[Mihelich, 2002]
Yuran Lu is insane.
\end{conj}
\begin{proof}
(Heuristic.) Yuran moos a lot and thinks God is a cow.  'Nuff said.
\end{proof}

\end{document}
```

Theorem 0.1 (Wolfenstein, 1572). *People have fun with beer.*

Lemma 0.2 (Ventura, 1992). *Guys have fun in cathouses.*

1 Moo

Theorem 1.1 (Lu, 2000). *God is bovine.*

Conjecture 1.2 (Mihelich, 2002). *Yuran Lu is insane.*

Proof. (Heuristic.) Yuran moos a lot and thinks God is a cow. 'Nuff said. □