Homework 8

Due: 1 April 2025

Problem 8.1   — theoretical

Consider the language S specified by the following BNF grammar.

$$
\begin{aligned}
S &\rightarrow P\ S \\
S &\rightarrow N\ P \\
S &\rightarrow N \\
P &\rightarrow @\ N \\
P &\rightarrow \#\ N \\
P &\rightarrow N\ * \\
N &\rightarrow N\ N \\
N &\rightarrow a|b|c|d
\end{aligned}
$$

Show derivations for each of the following "sentences" in the language, or explain why it's not part of the language:

a. a b a @ c

b. a c * d

c. # a b c *

d. a c * # d

Problem 8.2   — practical

Write a program in C$^\sharp$ that gets a number from the command line and, starting with that number, prints lines of the form

```
42 bottles of beer on the wall!
41 bottles of beer on the wall!
```

and so on until it gets to `1 bottle` and then no bottles.

The one-bottle line should print correctly (i.e. using singular "bottle"). Both zero and one should work correctly as the initial count. If the user runs the program without a command line argument, the program should print a polite error and exit, rather than crashing.

Problem 8.3

Write a program in C$^\sharp$ that reads in lines from standard input, where each line contains space-separated integers, e.g.

```
23 5 42 -12 7
```

The output should have the same number of lines, and should give the minimum and maximum number on each line of input, e.g.

```
Min: -12  Max: 42
```

Every input line will contain at least one number, but might contain only one number. You can assume that the input is valid, i.e. there's no floats or alphabetic characters to mess things up. You should use `foreach` at least once, and you should write a method `MaxMin` to iterate through and compute both a maximum and a minimum.

Hand in the file(s) containing the C$^\sharp$ code using the handin script:

```
handin cmsc208 hwk8 myfile.cs
```

Collaboration policy: **For Problem 8.1:** group work! If you work with other people on this homework, you can just hand in one copy and put all your names on top. There will be a revision cycle for this. **For Problems 8.2–8.3:** collaborative. You each have to hand in your own version of the assignment, but you can talk to other people about the problems. Mention in a comment who you worked with. (Still no copying, though.)