

# Lab 13

*3 December 2024*

In this lab you'll get a little bit more practice with various C++ features by writing a program that randomly shuffles names given to it in its input.

First, create a sample input file (to save yourself some typing later). Put at least three names in the file, one name per line. (You can end the filename with `.in`, but note that there will be no corresponding `.expect` due to the randomness!)

Then, start writing the program. In its `main` function, first, read in all the lines of input and print them to the screen as soon as you get them. (Practice: input loops; `getline`)

Test this much, and remember that you can redirect input to come from a file just as if you had typed the input by hand. That is, once you've compiled the program, you can run something like

```
./a.out < sampleNames.in
```

to use that file you created earlier as the input.

Now, edit the code to first read all the lines into an appropriate `vector`, then, print them back out from the vector. Compile it, run it, check it. (Practice: `vector`, `for`)

Next, write a function called `shuffle`, that takes a vector parameter and also returns a vector (which will have the same contents but in a different order). For now, though, declare two local variables called `contents` (which will get a copy of the parameter) and `result` (which will be empty), and return the `result`. Call this function from `main` and print out the values it's returning. Compile it, run it, check it. (Practice: writing functions, calling functions)

Now refine the function to, at first, return the reverse of its parameter, by implementing the following pseudocode:

```
while there are elements in contents,
    copy the last element of contents into result, and
    remove the last element of contents
```

Compile it, run it, check it. (Practice: using various ways to access and update **vectors**)

Next, refine the function further to get a random shuffle. Each time through the loop, first, swap a randomly-chosen element of **contents** with the last element of **contents**. Reminder: **swap** is built in to C++ and can be found in the `<utility>` header; **rand** gives a random integer from 0 up to a very large number and can be found in `<cstdlib>`. Compile it, run it, check it. (Practice: **swap**, random numbers)

Notice, by the way, that if you did that last bit right, it should rearrange the names somewhat, but probably rearranges them the *same* way each time you run the program. To fix that, make a call to **srand** right at the top of **main**, so that you get a different “seed” for the random number generator each time. A typical seed is **time(0)**, passed as the parameter of **srand** (and which is found in the `<ctime>` header). After you put that in, compile it and run it several times to show that you get a different shuffle each time.

That’s it! If you still have time before the end of lab, now’s a good time to pull up older labs that you’re still wondering about, to ask me questions about them and help prepare for the exam.