C++ fundamentals

Part 2

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Libraries

- Standard ANSI C library (e.g. `cmath`)
- C++ libraries (e.g. `iostream`)
- Standard Template Library (e.g. `vector`)
- Third-party libraries

I/O streams

Standard streams

`iostream` declares the standard streams:

`cin`	Standard input (keyboard)
`cout`	Standard output (screen)
`cerr`	Standard error (screen)

→ `cin` is an `istream`

→ `cout` and `cerr` are `ostream`s

File streams

`fstream` declares…

- `ifstream` to read from files
- `ofstream` to write to files

File input

Steps

1. Construct an `istream`
2. Connect it to a file
3. Read from it using `<<`
4. Disconnect the file

File input

```
#include <fstream>

ifstream input;
input.open(filename, mode);

// Alternatively:
ifstream input(filename, mode);

// ...

input.close()
```

File output

Steps

1. Construct an `ostream`
2. Connect it to a file
3. Write to it using `>>`
4. Disconnect the file

File output

```
#include <fstream>

ofstream output;
output.open(filename, mode);

// Alternatively:
ofstream output(filename, mode);

output.close()
```

Strings and vectors

Strings

- C represents strings as arrays of **char**s
- In C++, `string` models character sequences
- It also provides functions such as `length()`

```
1  #include <string>
2
3  string s("Test");
4  cout << s.length() << endl;
```

Vectors

- `vector` represents dynamically-sized vectors
- It provides functions to add and remove elements

```
1  #include <vector>
2
3  vector<int> v(10);
4  cout << v.length() << endl;
```

Useful third-party libraries

Boost

- A large collection of general-purpose libraries
- Many have been incorporated in the C++ standard over the years

Libraries for scientific computing

- ALGLIB
- Armadillo
- Blaze
- Dlib
- Eigen
- NAG
- …