Chapter 6: I/O and Streams

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File I/O

- Thus far, we have either printed to the screen or gotten input directly from the user
- What if we could read data from files and save data to files?
- This would enable us to save information beyond the current program execution and use the data later

File I/O

- Your program *reads* from a file when it takes input from a file
- Your program *writes* to a file when it sends information to a file
- This chapter examines *streams* to accomplish I/O

Streams

- Streams will serve as our first introduction to objects
- A **stream** is a flow of characters
  - If the flow is into your program, the stream is called an **input stream**
  - If the flow is out of your program, the stream is called an **output stream**

Streams

- The data in the stream can come from a file or from a keyboard - the stream does not care
- `cin` and `cout` are both special stream *objects* included from the `iostream` header

Streams

- Suppose your program defines an input stream `in_stream` that comes from a file (this does not show how to create `in_stream`):

```
1  int some_number;
2  instream >> some_number
```

- This **int** is filled with a number from this file.

Streams

- We can also use output streams in a similar fashion:

```
1  out_stream <<  some_number << endl;
```

- This will output the value stored in some_number to the file.
    - This effectively saves some_number to the file

Streams

- Input streams are created with:

```
1  ifstream in_stream
```

- Output streams are created with:

```
1  ofstream out_stream;
```

- Both types are provided by fstream, which can be included with #include <fstream>

Streams

- Important functions:
    - open() - opens a file
    - close() - close a file
- See documentation at
    - http://www.cplusplus.com/reference/fstream/ifstream/
    - http://www.cplusplus.com/reference/fstream/ofstream/

Example: `simple_io.cpp`

```
1  // Reads three numbers from the file infile.dat, sums the numbers, and
       writes
2  // the sum to the file outfile.dat. (A better version of this program
       will be
3  // given in Display 6.2.)
4
5  #include <fstream>
6
7  int main()
```

```
 8  {
 9    using namespace std;
10
11    ifstream in_stream;
12    ofstream out_stream;
13
14    in_stream.open("infile.dat");
15    out_stream.open("outfile.dat");
16
17    int first, second, third;
18    in_stream >> first >> second >> third;
19    out_stream << "The sum of the first 3\n"
20               << "numbers in infile.dat\n"
21               << "is " << (first + second + third) << endl;
22
23    in_stream.close();
24    out_stream.close();
25
26    return 0;
27  }
```