1 Administrivia

- First deliverable for Project 1 due today
- Project 1 meetings tomorrow during lab
- Problem set 1 grades out

2 Abstract Classes

An abstract class is a class that is declared abstract that can have zero or more abstract methods (methods without bodies). Abstract classes cannot be directly instantiated, but can be subclassed. They are useful for:

- Providing partial (base) implementations of a class
- Sharing code between subclasses
- Providing convenience implementations of an interface

3 Software Design Principles

The three main ideas behind good software design are:

- Modularity — Modules should exhibit a clean separation of concerns.
- Decoupling — Changes in one module should have minimal effect on other modules.
- Information Hiding — Design decisions that are likely to change should be segregated and hidden.

The more things depend on a class, the more abstract it should be; make it an interface, or an abstract class.

4 Testing

Testing is a good idea because it:

- Catches bugs early and can often save you from debugging code
- Forces you to clarify specifications
- Helps make you a fearless programmer
- Can be very satisfying (it feels good when that bar goes green)

To help you write tests, keep these in mind:

- Well-designed code should be easily testable
- Consider using mock objects to isolate components for testing
- Make sure to test edge cases (e.g. null, 0, "")
- If you find yourself writing a one-off test, make it a real unit test

5 Recommended Reading

Listing 1: Example of a skeleton abstract class

```java
public interface MyInputStream {
    int read();
    int read(byte[] buf);
}

public abstract class AbstractMyInputStream implements MyInputStream {
    abstract int read();
    public int read(byte[] buf) {
        int bytesRead = 0;
        while (bytesRead < buf.length) {
            int next = read();
            if (next == -1) break;
            buf[bytesRead++] = next;
        }
        return bytesRead;
    }
}
```

Figure 1: A partial module dependency diagram for a chat client