Classes

- A class is a data type whose variables are objects
  - Some pre-defined classes in C++ include int, char, ifstream
  - Of course, you can define your own classes too
- A class definition says two basic things
  - The kinds of values an object can hold
  - A description of the member functions

Example: class DayOfYear

- Decide on the values to represent
  - This example's values are dates such as July 4 using an integer for the number of the month
    - Member variable month is int (Jan = 1, Feb = 2, etc.)
    - Member variable day is int
- Decide on the member functions needed
  - Just one member function named output in the first version of this class

Simplest version of DayOfYear

```cpp
class DayOfYear {
public:
    void output();
    int month;
    int day;
};
void DayOfYear::output() {
    cout << "month = " << month << ", day = " << day << endl;
}
```

Notes about '::' and '.'

- '::' used with classes to identify a member
  - All parts public
  - Clients access month, day directly
- Also used with namespaces – identifies scope
- Called scope resolution operator
- '.' used with variables to identify object
  - DayOfYear birthday;
  - birthday.output( );
  - Object reference is passed to the method as an implicit parameter

What's wrong with DayOfYear?

- Most important: data are exposed to users
- Why is that a problem?
- Two major reasons:
  - No way to insure consistent object states – e.g. user could birthday.month = 74; // huh?
  - Developer can't change data names/meanings
    - e.g. can't change int to string for month, can't save Date instead of month, day, ...
- What's the solution (in C++)?

An access specifier: private

- Private members of a class can only be referenced within the definitions of member functions (and friends – later)
  - If the program tries to access a private member, the compiler gives an error message
- Private members can be data or functions
  - Should have public set methods to change data
  - Need public get methods to access the data
- Btw: default for class is private (public for struct)
Better class DayOfYear

class DayOfYear {
    public:
        void input();
        void output();
        void set(int new_month, int new_day);
        int get_month();
        int get_day();
    private:
        void check_date();
        int month;
        int day;
};