Programming Languages and Tools: Programming with C++ CS:3210:0003

Lecture/Lab #12

Classes vs Structs

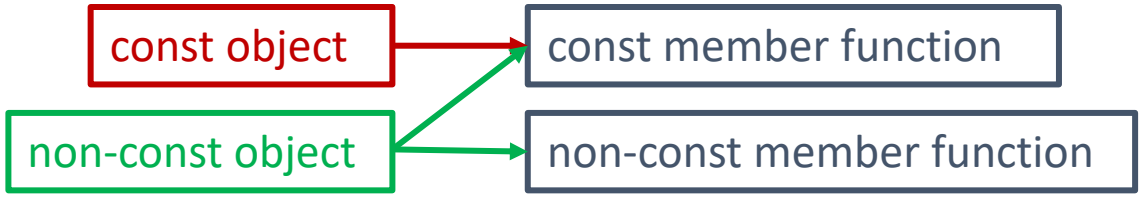
- In C, structs have limited capability.
- Classes were added to C++ to extend this capability,
  - However, most of the extended capability was also given to structs
- Often, classes and structs are interchangeable
- Convention dictates when to use one over the other.
- We'll look at features that are common to both classes and structs and point out differentiating features when they arise
- Class types refer to both

Member Functions

- Class types can have their own functions - member functions
- Must be declared inside the class, can be defined inside/outside
- Remember, definitions implicitly contain declarations
- Member functions can be called using the dot (.) operator on an object
- The object on which the member function is called is an implicit argument to the function

Const Member Functions

- Member functions can be made const to guarantee that
  1. they won't modify object
  2. call non-const member functions



- Syntax:
  `returnType funcName (args) const`
- If your member function isn't going to modify object (member variables), make it const
- If your object isn't going to be changed and you have made your member functions const, call it by const reference

Member Access

- Access level of member determines who can access it:
  1. public: can be accessed by anyone (in scope)
  2. private: can only be accessed by other members of same class/struct
  3. protected: concerned with inheritance
- Illegal access leads to compilation error
- Use access specifiers to make access level explicit:
  `public:`, `private:`, `protected:`

Struct	Class
Members public by default	Members private by default

Access Functions

- Public functions used to access/change private variables
- Getters/accessors return values of private variables
- Setters/mutators set values of private variables
- For Fraction class:
  - Getters: `int getNum() const`, `int getDen() const`
  - Setter: `setFrac(int num, int den)`
- Getters should be read-only: return by value or const reference

Best Practices

- Start names of member variables with `m_` (especially private)
- Leave all members of structs public (default)
  - This allows us to initialize using aggregate list, ex: `Fraction y {5, 3};`
- No member variables of classes should be public
  - Public member functions can provide access to private members

C++ Program for Tennis Scoring

- Input: string of 0s/1s from a text file,
  - 1 if Player 1 wins the point, 2 if player 2 wins.
- Output: simulate a single game

- Scoring Rules:
  - Winning a point increments your score through range 0, 15, 30, 40, Game with the following exception
  - If score is 40-40, player needs to win 2 points in a row. First one takes your score to Advantage and the next one to Game
    Losing at Advantage brings you back to 40-40

Examples

P1	P2
0	0
15	0
30	0
40	0
W	0

Examples

P1	P2
0	0
15	0
30	0
40	0
W	0

P1	P2
0	0
15	0
15	**15**
15	**30**
30	30
40	30
40	**40**
A	40
40	**40**
40	**A**
40	**W**

Task 1

Set up input from external file: one line string of 0s/1s from a text file, Points.txt

Input from file and print the line on to the screen

Task 2

Fix a data structure for points. Possibilities: 0, 15, 30, 40, A, W

Define a print function for it, and test it from main()

Task 3

Use a class Score to keep track of the score of the game

Define getter and accessor members for Score

Task 4

Put it all together to simulate the game from the points in the text file