Module 1 Day 13

Abstract Classes

Little bits of Coolness

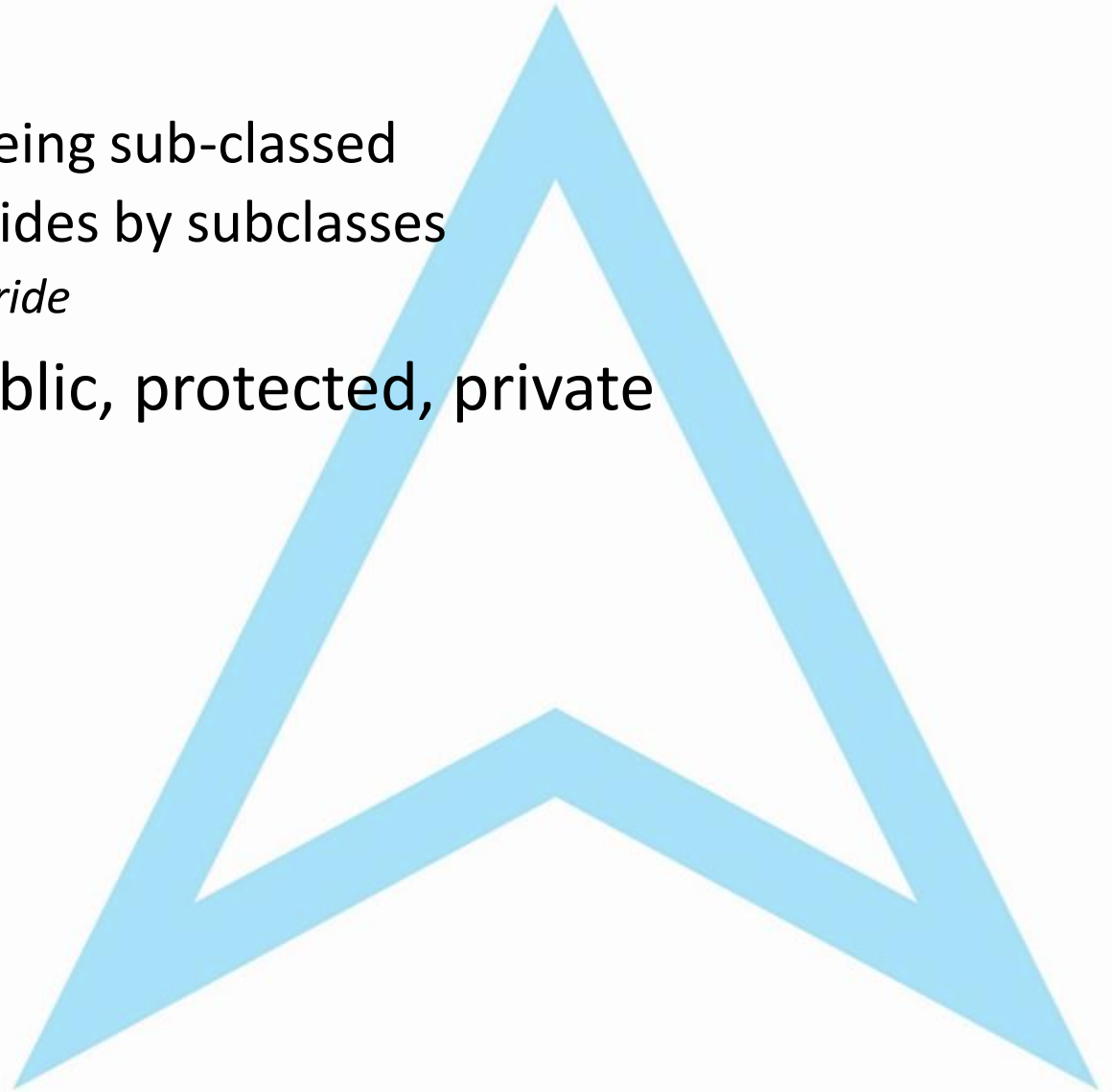
- Padding strings for alignment; justifying interpolated strings

  {<interpolationExpression>[,<alignment>][:<formatString>]}

  - https://docs.microsoft.com/en-us/dotnet/csharp/language-reference/tokens/interpolated
  - Format strings: https://docs.microsoft.com/en-us/dotnet/standard/base-types/formatting-types
- ToString() override

Communicating Design Intent

- Sealed
  - On a class, prevents the class from being sub-classed
  - On a method, prevents further overrides by subclasses
    - This would only be used alongside *override*
- Access modifiers – when to use public, protected, private
  - Easier to give than to take away



Abstract Methods and Classes

- Abstract Method
  - Superclass provides **no implementation**
  - Subclass **must** implement the method
- Abstract Class
  - A user cannot create an instance of this class
  - **Only subclasses** can be instantiated
    - Should it really be possible to create a new Shape3D?
    - What does a Shape3D look like?
    - Can we Draw it? Get its Area?
  - Some (or even all) of its methods **may** have implementation
  - The opposite of *abstract* is *concrete* in this context
- If a class has an abstract method, then it **must** be an abstract class

Classes, Abstract Classes, Interfaces, Oh My

Concrete Class	Abstract Class	Interface
Class Inheritance (max 1)	Class Inheritance (max 1)	Interface Implementation (many)
General → Specialized	General → Specialized	Functionality (can do)
Implementation code (all)	Implementation code (some)	No code, just a contract
May contain public, protected and private members	May contain public, protected and private members	Public members only
Can create an instance	**Cannot** create an instance	**Cannot** create an instance
Use when there is a specialization relationship (a true is-a), and the class represents a real-world thing that can exist (e.g., a Pig)	Use when there is a specialization relationship (a true is-a), but the class represents something that doesn't make sense to exist without being further defined (e.g., a Farm Animal)	Use when there is a need to make a class "behave like" or "can do" some additional functionality; when there is not a true "is-a" relationship.

Classes, Abstract Classes, Interfaces, Oh My

- Knowing what we know now, how would we design…
  - BankAccount
    - SavingsAccount
    - CheckingAccount
  - Shape2D
    - Circle
    - Rectangle
  - Clock
    - Grandfather Clock
    - Alarm Clock
      - Coffee Maker
    - Oven
    - Microwave