# Module 1 Day 9

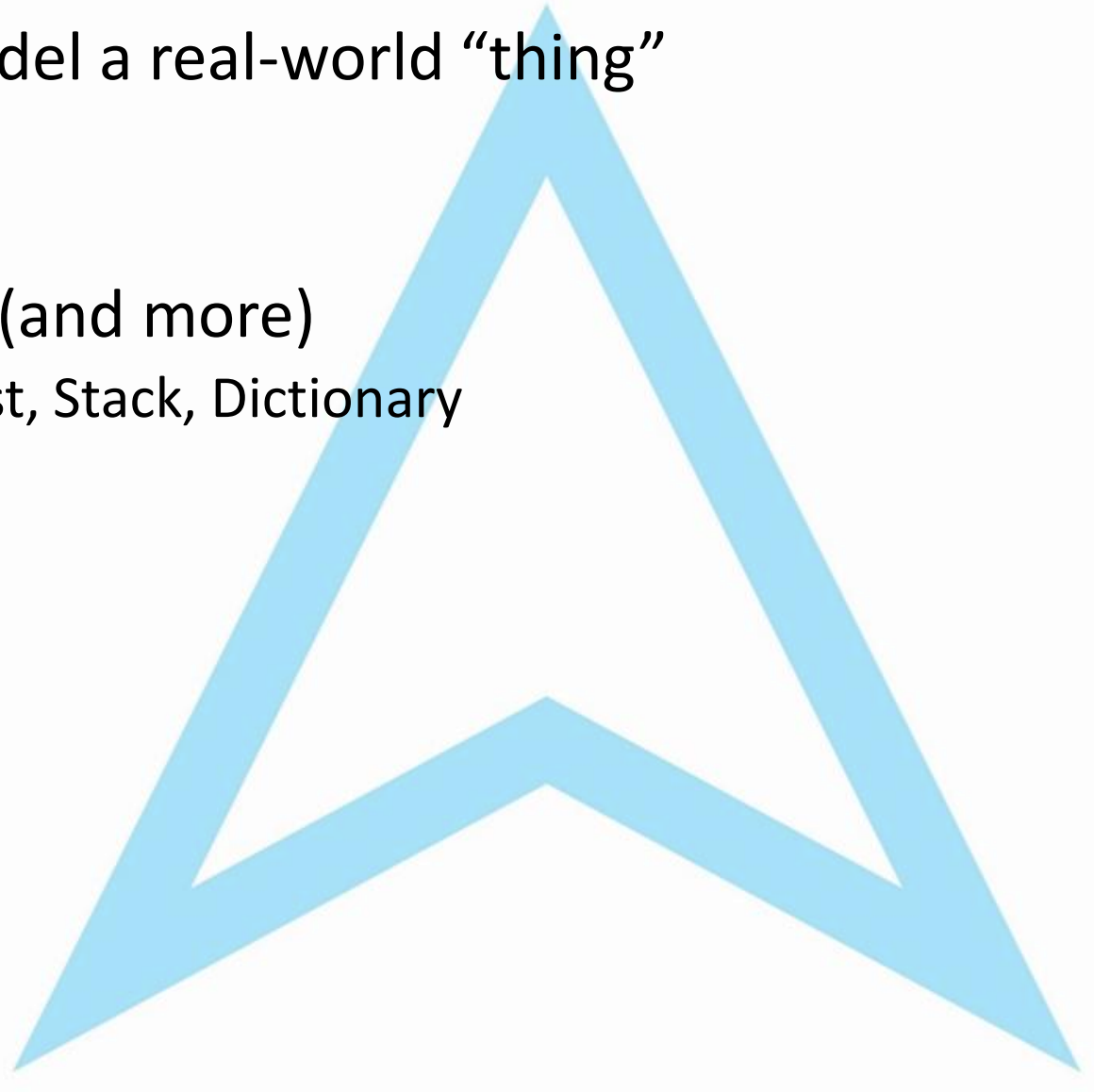
Introduction to Classes

# What makes an application?

- Program Data
  - ✓ Variables & .NET Data Types
  - ✓ Arrays
  - ✓ More Collections (list, dictionary, stack, queue)
  - ❖ Classes and objects (OOP)
- Program Logic
  - ✓ Statements and expressions
  - ✓ Conditional logic (if)
  - ✓ Repeating logic (for, foreach, do, while)
  - ✓ Methods (functions / procedures)
  - ❖ Classes and objects (OOP)
  - ❑ Frameworks (MVC)
- Input / Output
  - User
    - ✓ Console read / write
    - ❑ HTML / CSS
    - ❑ Front-end frameworks (HTML / CSS / JavaScript)
  - Storage
    - ❑ File I/O
    - ❑ Relational database
    - ❑ APIs

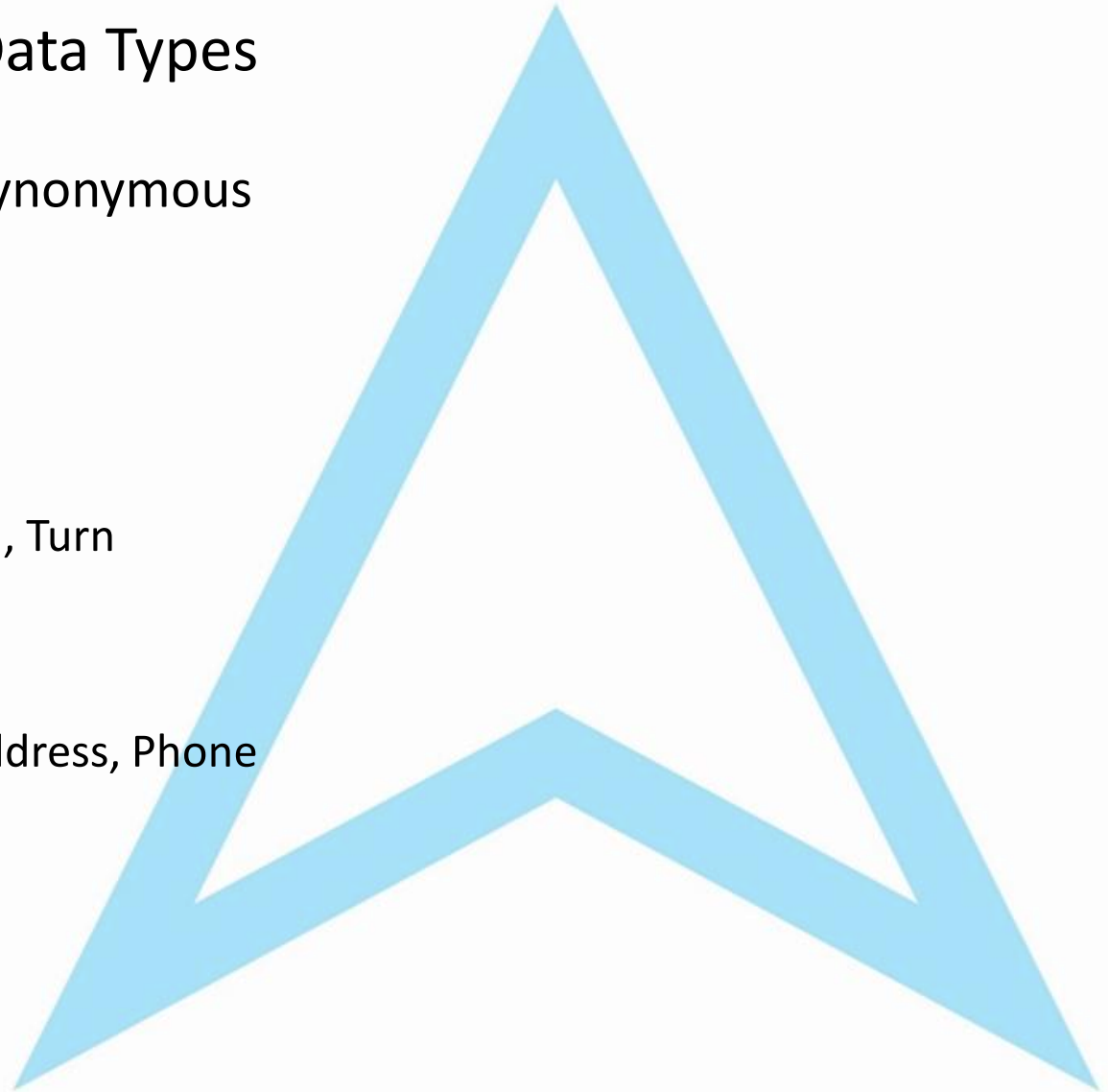
# Classes

- Combine Data and Behavior to model a real-world “thing”
  - Data: Variables / properties
  - Behavior: Methods
- So far, we have used these classes (and more)
  - int, double, string, Console, Array, List, Stack, Dictionary



# Classes

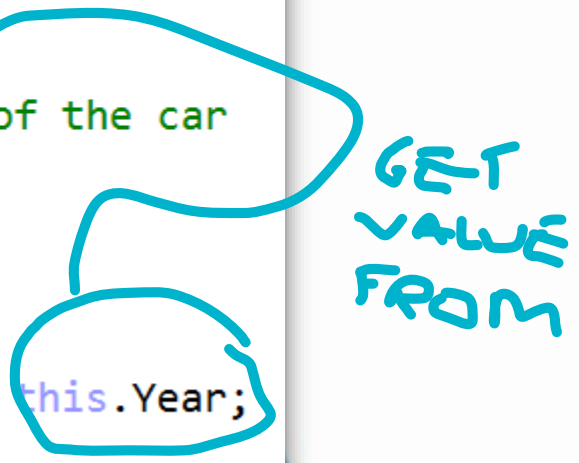
- Now we are going to write our own Data Types
  - These are called Classes in OO parlance
  - Remember that Classes and Types are synonymous
- e.g., Car
  - Data - describes it - adjectives
    - Make, model, color, Engine State, Gear
  - Behavior – what it can do - verbs
    - Start, Change Gear, Speed Up, Slow Down, Turn
- e.g., Contact
  - Data
    - First Name, Last Name, Birthday, Email Address, Phone
  - Behavior
    - Send Mail, Call, Text



# Classes - Properties

- Automatic Properties
- Derived Properties

```
// Type (class) to represent an automobile
public class Car
{
    public string Make { get; set; }
    public string Model { get; set; }
    public int Year { get; set; }
    // A derived property for the age of the car
    public int Age
    {
        get
        {
            return DateTime.Now.Year - this.Year;
        }
    }
```



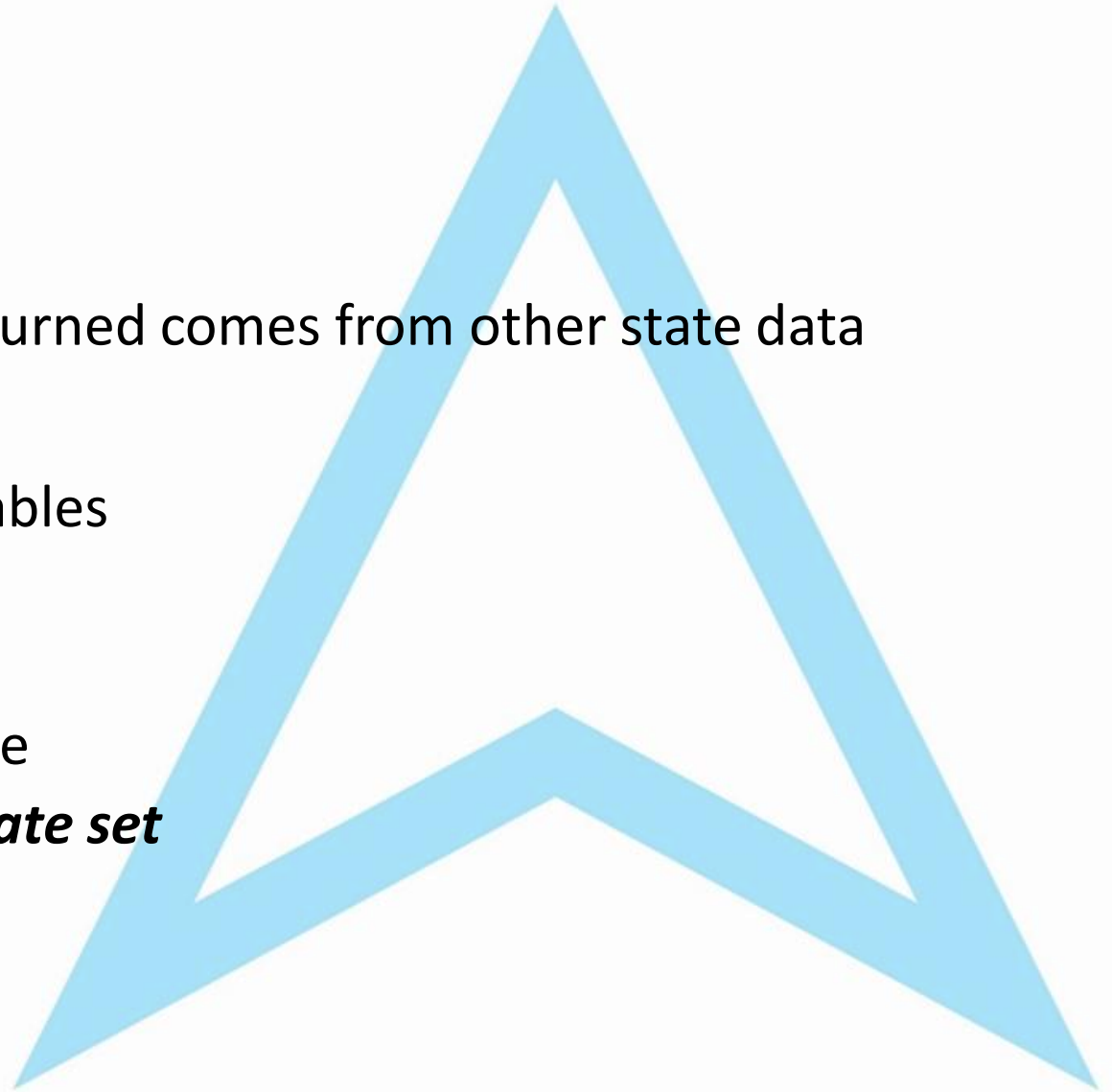
# Classes - Properties

- Properties “backed by” a private variable

```
private string gear;
public string Gear
{
    get
    {
        return this.gear;
    }
    set
    {
        // Check to make sure the gear can be set, based on where it is now...
        // Then, set it...
        this.gear = value;
    }
}
```

# Classes - Properties

- Automatic Properties
  - { get; set; }
- Derived properties
  - “getter” with no setter; the value returned comes from other state data
- Access modifiers
  - For class and for properties and variables
  - *private* and *public* (for now)
  - Users of the object can “see” public
  - Only the class itself can access private
  - We can have a ***public get*** with a ***private set***



# Classes - Methods

- Methods provide “behavior”. We’ve written lots of these.
- The **this** keyword allows access to the data held by *this instance* of the class

```
// Public can see the speed, but cannot set it directly
public int Speed { get; private set; }

// Accelerate 1 mph
public int Accelerate()
{
    // Check if car is in gear, then set speed
    this.Speed++;
    return this.Speed;
}
```

# Classes - Constructors

- Special method that is invoked as the object is being instantiated
- Same name as the class, and NO return type
- Can accept parameters
- If you don’t define one, a “default constructor” exists automatically

```
// Constructor for a Car
public Car(int year, string make, string model)
{
    this.Year = year;
    this.Make = make;
    this.Model = model;
    this.gear = "P";
}
```

# Method Overloading

- Change behavior of a method based on how it is called
- Define another method:
  - With the **same name**
  - With a **different set of parameters**, as defined by their data type and order
    - Differing by *parameter name only* will not make it different

```
// Accelerate 1 mph
public int Accelerate()
{
    return Accelerate(1);
}

// Accelerate a certain number of mph. Can be + or -.
public int Accelerate(int amount)
{
    // check if car is in gear, then set speed
    this.Speed += amount;
    return this.Speed;
}
```

# Method Overloading

A method overloaded MUST have the same name, plus:

- Overloaded methods MUST change the argument list
- Overloaded methods CAN change the return type
- Overloaded methods CAN change the access modifier