Module 1 Day 7

Collections, Part 1

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

Arrays Review

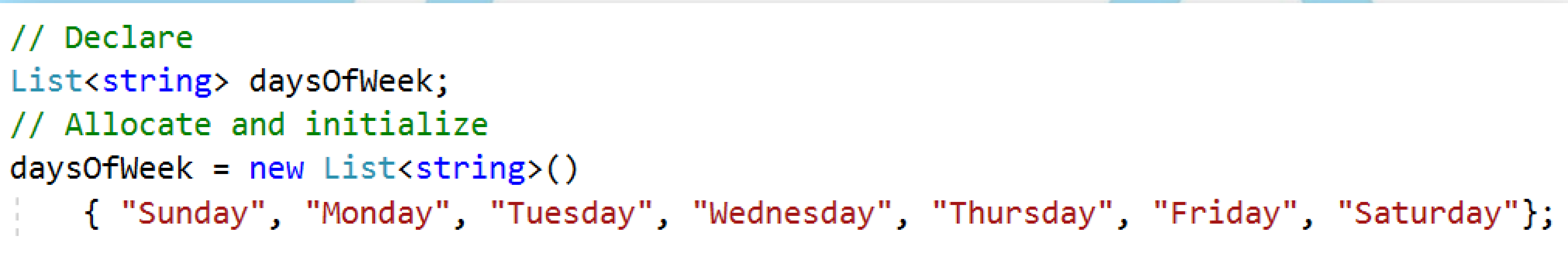
- A group of similarly typed items
- Elements are accessed by an integer index
- Fixed in size once created
- What would I need to do to add another element to an array?

Collection Classes

- Defined in the System.Collections.Generic namespace
  - A namespace is just an organization mechanism with a hierarchical naming structure
  - There are > 10,000 classes in the .NET framework
  - .NET Core Namespaces
- List: an Array on steroids
- Stack: a last-in, first-out collection
- Queue: a first-in, first-out collection
- … and many more, some of which we will cover tomorrow…
  - and some of which you will investigate on your own

List

- The collection most like an array
  - But it can shrink and grow!
- To create, like any other variable:
  - Declare, Allocate (Instantiate), Initialize



```
// Declare
List<string> daysOfWeek;
// Allocate and initialize
daysOfWeek = new List<string>()
    { "Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday"};
```

- <T> syntax is called a “generic”, and ANY type (T) can be placed there
- List<int>, List<double>, List<Car>
- You can even do a list of lists! (but we’ll spare you that)

Let’s Code

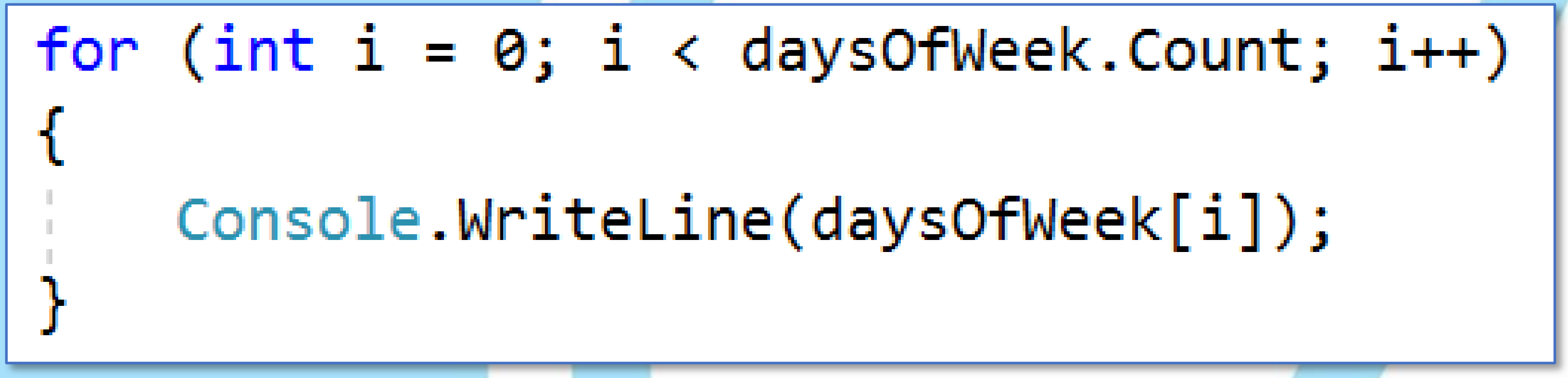
List Methods

- Access elements using listName[index] syntax, just like arrays
- Add elements
    - listName.Add(elementToAdd)
        - elementToAdd must be of the appropriate type
    - listName.Insert(index, elementToAdd)
    - listName.AddRange(elementsToAdd[])
- Remove elements
    - listName.Remove(elementToRemove)
        - Removes the first occurrence where (listElement == elementToRemove)
    - listName.RemoveAt(index)

Let’s Code

Iterating a List using **for**

- The number of elements is called Count
- Since [index] works, we can iterate as usual



```
for (int i = 0; i < daysOfWeek.Count; i++)
{
    Console.WriteLine(daysOfWeek[i]);
}
```

Let’s
Code

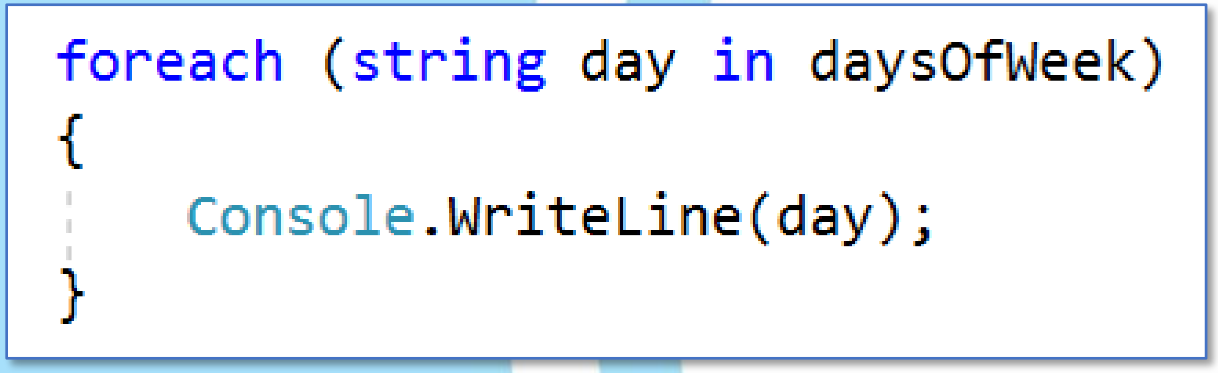
More List Methods

- Contains(element) – returns bool
- IndexOf(element) – returns int
- ToArray() – returns array
- Sort() – sorts the list in place
- Reverse() – reverses the list in place
- String.Join(separator, someList)

Let’s Code

Iterating a List using **foreach**

- Another way to loop through elements
- Incidentally, "foreach" can be used on arrays, too
- So, when to use "foreach" and when to use "for"?

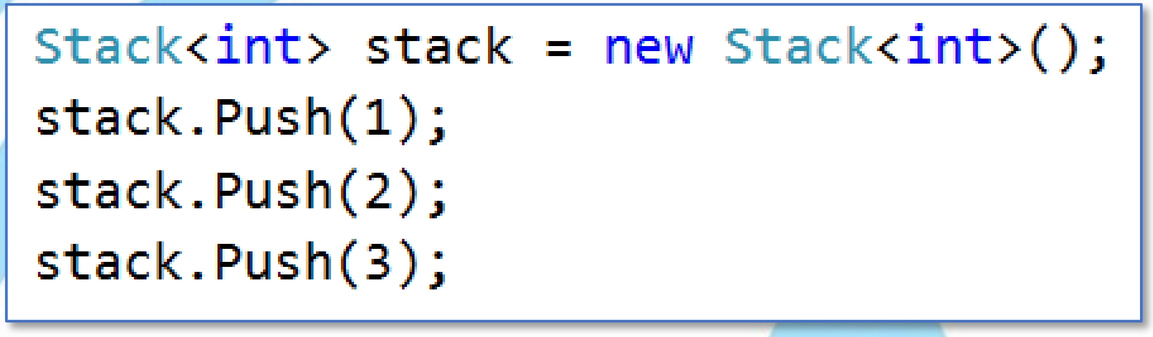


```
foreach (string day in daysOfWeek)
{
    Console.WriteLine(day);
}
```

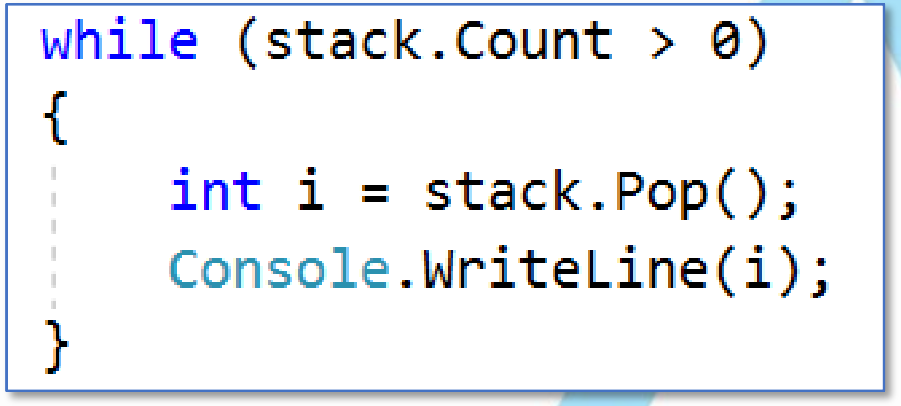
Let’s
Code

Stack

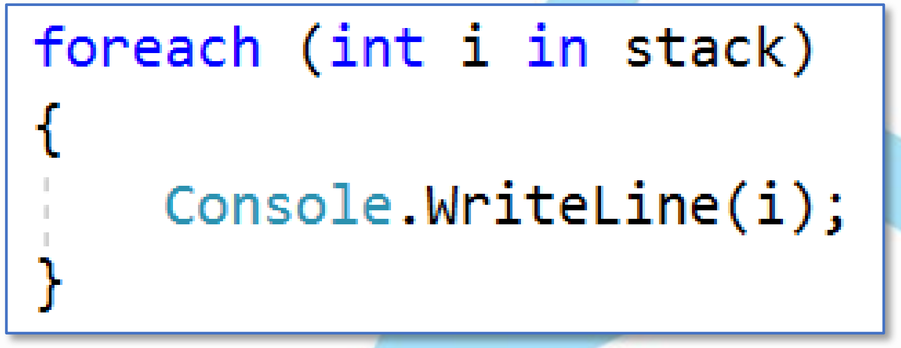
- Last-in, First-out
- Methods
  - Push
  - Pop
  - Peek
- Foreach
- NO index access!
- NO initializer



```
Stack<int> stack = new Stack<int>();
stack.Push(1);
stack.Push(2);
stack.Push(3);
```



```
while (stack.Count > 0)
{
    int i = stack.Pop();
    Console.WriteLine(i);
}
```

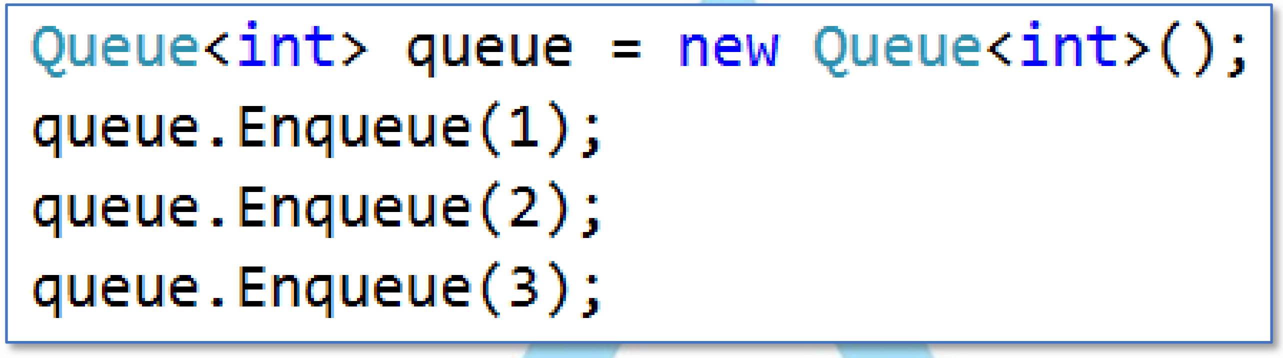


```
foreach (int i in stack)
{
    Console.WriteLine(i);
}
```

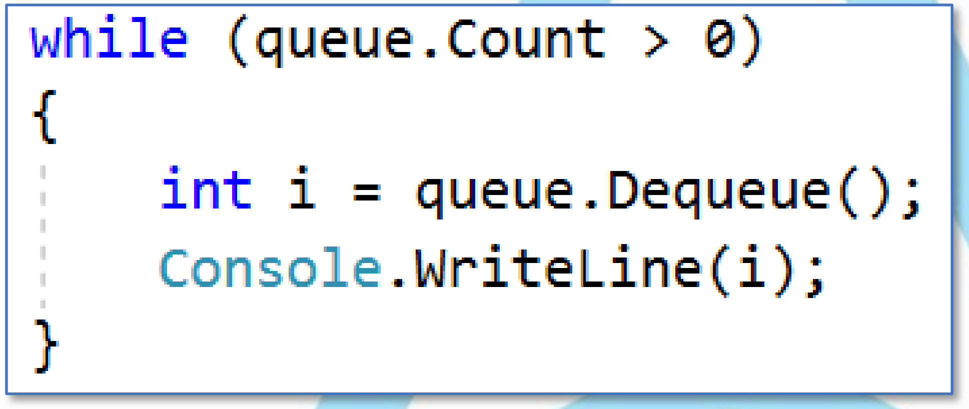
Driveway parking, Undo, Browser Back

Queue

- First-in, First-out
- Methods
  - Enqueue
  - Dequeue
  - Peek
- Foreach
- NO index access!
- NO initializer



```
Queue<int> queue = new Queue<int>();
queue.Enqueue(1);
queue.Enqueue(2);
queue.Enqueue(3);
```



```
while (queue.Count > 0)
{
    int i = queue.Dequeue();
    Console.WriteLine(i);
}
```

Store checkout, Print queue