Objectives

- In this session, you will learn to:
  - Use collections

What Is a Collection?

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- Collections store several objects rather than specific types.
- Collections size increase and decrease dynamically
- Use System.Object type to referenced items from a collection
- Microsoft .NET framework provides collection classes in System.Collections namespace

Using Collections

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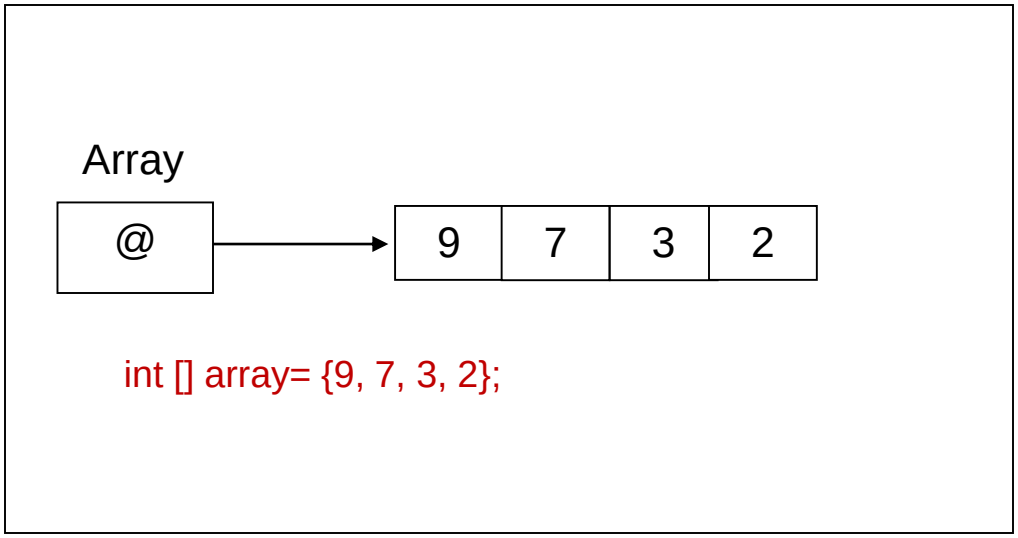
- The .NET Framework provides several classes that collect elements in specialized ways. Theses classes are known as collection classes, and are declared in the System.Collections namespace and sub-namespaces.
- The collection classes accept, hold, and return their elements as items.

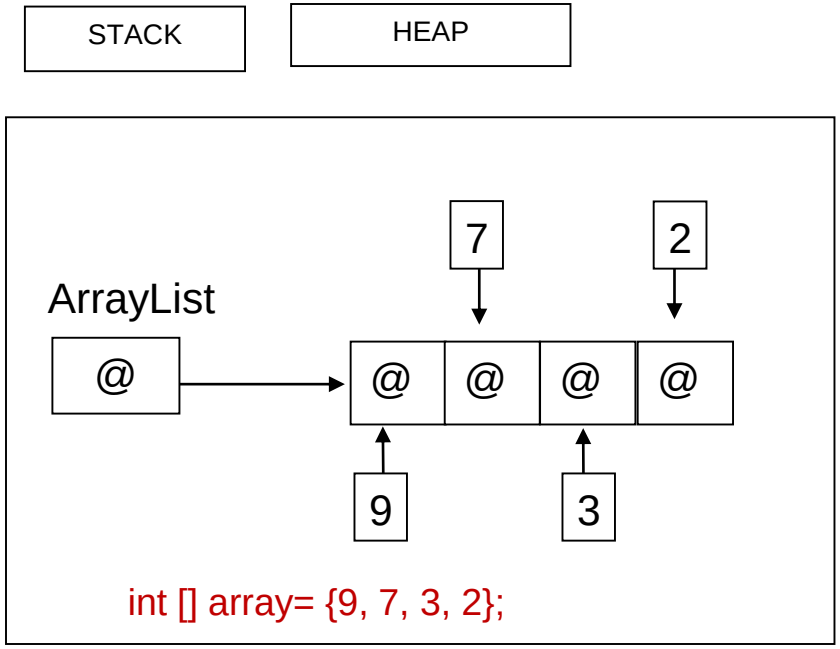
Using Collections (Contd.)

- The elements of an array are of value types.
- The array of int variables holds the int values directly, as shown in the following figure.



Using Collections (Contd.)

- The element type of a collection class is an object, which is a reference type.
- The action which automatically converts the value type to the reference type, is known as boxing.
- The following figure shows the process of boxing.



Using Collections (Contd.)

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- The following table shows the various classes of the System.Collection namespace.

Class	Description	Use	Example
`ArrayList`	*Represents the ordered collection of an object that can be individually indexed*	*Is used when you want to access elements by using an index. In almost every situation, an* `ArrayList` *is a good alternative to an array.*	*Items can be inserted or removed at any position in a mailbox.*
`Queue`	*Represents a first-in, first-out collection of object*	*Use queue when you need first-in, first-out access.* *A queue is often used to hold elements that are discarded immediately after use, such as information in a buffer.*	*Waiting in a queue for booking a ticket. You join the end of the queue and leave the beginning of the queue.* *Requests coming over a network are queued and then discarded after they are processed.*
`Stack`	*Represents a simple last-in, first-out collection of objects*	*Use a stack when you need last-in, first out access. A stack is often used to hold items during calculations.*	*A pile of plates, in a cupboard, where you place the plates on top, and also remove them from the top.*

Using Collections (Contd.)

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Class	Description	Use	Example
`Hashtable`	*Uses a key to access the elements in the collection*	*Use a hash table when you must access elements by using an index and you can identify a useful index value.*	*You can access book titles by their ISBN numbers.*

Using Collections (Contd.)

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- When you want to access the elements of an array through its index value, you can use an ArrayList class .
- The following table describes the use of various methods of an ArrayList class.

Method	Use
`Add`	Adds an object to the end of the `ArrayList`
`Remove`	Removes the element at the first occurrence of a specific object from the `ArrayList`
`Clear`	Removes all the elements from the `ArrayList`
`Insert`	Inserts an element into the `ArrayList` at the specified index
`TrimToSize`	Sets the capacity to the actual number of elements in the `ArrayList`
`Sort`	Sorts the elements in the `ArrayList`
`Reverse`	Reverses the element in the `ArrayList`

Iterating Through a Collection

- Use foreach loop to display every item in a collection.
- To use a foreach loop, the collection needs to have an enumerator.

```
foreach(<type> <control_variable> in <collection>)
{
   <foreach_statement_body>
}
```

What Are Generic Types?

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- Generics introduce to the .NET Framework the concept of type parameters, which make it possible to design classes and methods that defer the specification of one or more types until the class or method is declared and instantiated by client code.
- Use generic types to maximize code reuse, type safety.
- The most common use of generics is to create collection classes.
- The .NET Framework class library contains several new generic collection classes in the System.Collections.Generic namespace.

To define Type parameters use angle brackets after the class name

public class List<T>

public class Stack<T>

Compiling Generic Types and Type Safety

List<T> Generic class can be used several times with different type parameters

```
List<int> studentScores = new List<int>();
studentScores.Add(40);
studentScores.Add(50);
int score=studentScores[0];
```

OR

```
List<string> userNames = new List<string>();
userNames.Add(“Tom");
userNames.Add("John");
string name = names[0];
```

The compiler generates a strongly typed equivalent of the generic class, effectively generating the following method:

```
public void Add(List<string> item)
```

Generic Method

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```
static void Swap<T>(ref T lhs, ref T rhs)
{
    T temp;
    temp = lhs;
    lhs = rhs;
    rhs = temp;
}
```

```
public static void TestSwap()
{
    int a = 1;
    int b = 2;

    Swap<int>(ref a, ref b);
    System.Console.WriteLine(a + " " + b);
}
```

Summary

- In this session, you learned that:
  - The .NET Framework provides the `Collection` classes in the `System` namespace.
  - Elements in a collection are of the object type.
  - An `ArrayList` is an alternative of using an array and allows easy manipulation of values in an array.

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Thank You