

Whiteboard diagrams from the Course.

You can download this (as a PDF) and ‘zoom in’ to the diagrams.

Mark.

When does this loop end?

```
for(int loopCounter = 0; loopCounter < 10; loopCounter++)
{
    Console.Out.WriteLine("loopCounter is at: " + loopCounter);
    total = total + loopCounter;
}
Console.Out.WriteLine("Total of values is: " + total);
Console.Out.WriteLine("Average is: " + total / 10);
```

console.Out.WriteLine(\$"Total of values is: {total}");

What is going on here?

It is not a class

it contains related data and functionality

```
C# Example
public struct name
{
    string firstName;
    string middleName;
    string lastName;
    string suffix;
    public name(string first, string middle, string last, string suff)
    {
        firstName = first;
        middleName = middle;
        lastName = last;
        suffix = suff;
    }
    public string getFullName()
    {
        return firstName + " " + middleName + " " + lastName + " " + suffix;
    }
}
```

what is that? Constructor.

```
name Person1 = new name("Zoe", "ella", "wong", "Miss");
```

```
C# Example
public class Person
{
    public float _height;
    public float _weight;
    public string _ethnicity;
    public string _gender;
    public Person()
    {
        _height = 5.7F;
        _weight = 198.6F;
        _ethnicity = "Doesnt matter";
        _gender = "male";
    }
    public Person(float height, float weight, string ethnicity, string gender)
    {
        _height = height;
        _weight = weight;
        _ethnicity = ethnicity;
        _gender = gender;
    }
    public void Walk()
    {
    }
    public void Run()
    {
    }
    public void Eat()
    {
    }
    public void Sit()
    {
    }
    public void Speak()
    {
    }
}
```

"Blueprint for creating objects"

What is going on here?

Person p = new Person();

Person p2 = new person(180,45,"AI","NB");

method (function)

what are the differences between a struct and a class?

- structs are value types (They are stored in stack memory)
- classes are reference types (They are stored in heap memory)
- Capabilities to do with inheritance.

```
C# Example
public class Person
{
    public float _height;
    public float _weight;
    public string _ethnicity;
    public string _gender;
    public Person()
    {
        _height = 5.7F;
        _weight = 198.6F;
        _ethnicity = "Doesnt matter";
        _gender = "male";
    }
    public Person(float height, float weight, string ethnicity, string gender)
    {
        _height = height;
        _weight = weight;
        _ethnicity = ethnicity;
        _gender = gender;
    }
    public void Walk()
    {
    }
    public void Run()
    {
    }
    public void Eat()
    {
    }
    public void Sit()
    {
    }
    public void Speak()
    {
    }
}
```

What is going on here?

method (function)

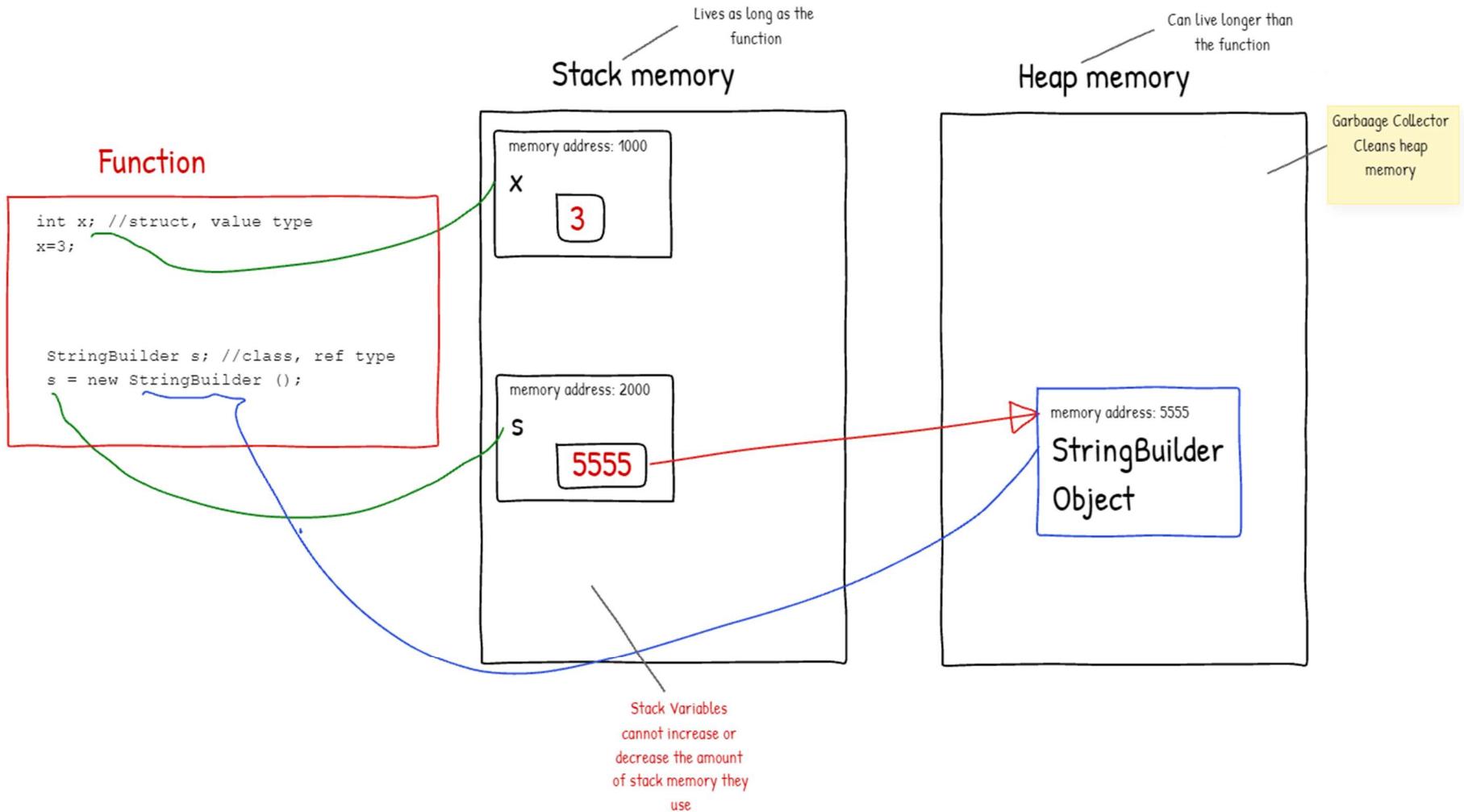
Person p = new Person();

Person p2 = new person(180,45,"AI","NB");

what are the differences between a struct and a class?

- structs are ~~value~~ types (They are stored in stack memory)
- classes are reference types (They are stored in heap memory)
- Capabilities to do with inheritance.

Value Type Vs Reference Type



What is *Polymorphism*?



When 2 or more objects have the same interface they can be used interchangeably.|

PolyMorphism in everyday life



What is going on here?

```
C# Example  
abstract class Person  
{  
    // public methods  
    public virtual void eat()  
    {  
        Console.WriteLine("slurping");  
    }  
    public void sleep()  
    {  
        Console.WriteLine("Snoring");  
    }  
    abstract public void move();  
}  
class Student : Person  
{  
    public override void move()  
    {  
        Console.WriteLine("Walking");  
    }  
    public override void eat()  
    {  
        Console.WriteLine("Chewing");  
    }  
}
```

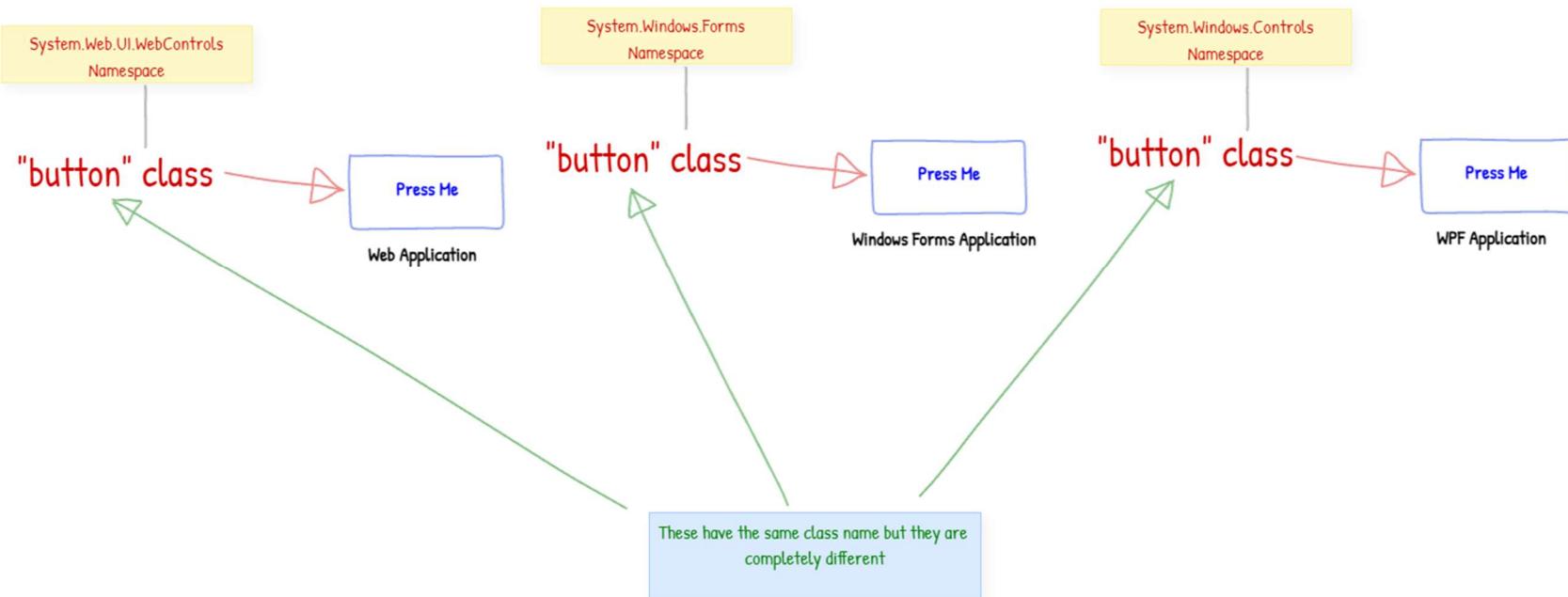
Derived classes can override this

Derived classes must override this

Student is a kind of Person

Student S = new Student();
S.eat();

"Namespaces" in the .net framework organise datatypes (classes, structures, etc) so that they are easy for us to find and they have a context. In this diagram you see there are multiple classes called "button". Namespaces distinguish between each of them.



Creating and Using Arrays

page 1-23,24

- C# supports:

- Single-dimensional arrays
- Multidimensional arrays
- Jagged arrays

Tell me anything you can remember about Arrays:

- Every element in the array has the same data type.
- Arrays cannot increase or decrease the number of elements.
- Arrays are objects, they are created in Heap memory.
- An array is a collection of elements that are logically related.
- Arrays are contiguous storage, therefore they are fast

- Creating an array

```
int[] arrayName = new int[10];
```

- Accessing data in an array:

- By index

```
int result = arrayName[2];
```

subscript (a.k.a. indexer)

- In a loop

```
for (int i = 0; i < arrayName.Length; i++)  
{  
    int result = arrayName[i];  
}
```

Activate Wir
Go to Settings to

The 'Ternary' operator in C#. (? :)

```
namespace ConsoleApp2
{
    class Program
    {
        static void Main(string[] args)
        {
            Console.WriteLine($"The largest integer is {int.MaxValue}");
            Console.WriteLine($"The largest long is {long.MaxValue}");
            Console.WriteLine($"The largest float is {float.MaxValue}");
            Console.WriteLine($"The largest double is {double.MaxValue}");
            Console.WriteLine($"The largest decimal is {decimal.MaxValue}");

            Console.WriteLine(DateTime.Now.Hour>12?"It's afternoon":"It's Morning");
            Console.ReadLine();
        }
    }
}
```

return this if true

evaluate

return this if false|

The diagram illustrates the execution flow of the ternary operator in the provided C# code. A red line starts at the condition `DateTime.Now.Hour > 12`, branches into two paths: one leading to the string "It's afternoon" and another to "It's Morning". The path to "It's afternoon" is labeled "return this if true". The path to "It's Morning" is labeled "return this if false|". Below the code, the word "evaluate" is written under the condition, indicating where the expression is evaluated.

Passing arguments when starting an application

The screenshot shows the Microsoft Visual Studio IDE interface. The top menu bar includes File, Edit, View, Project, Build, Debug, Team, Tools, Test, Analyze, Window, and Help. The toolbar below has icons for file operations like Open, Save, and Print, along with other development tools. The title bar says "ConsoleApp1 - Microsoft Visual Studio". The main code editor window displays "Program.cs" with the following C# code:

```
1
2
3     using System;
4
5     namespace ConsoleApp1
6     {
7         class Program
8         {
9             static void Main(string[] args)
10            {
11                Console.WriteLine($"Hello {args[0]}");
12                Console.ReadKey();
13            }
14        }
15    }
```

The output window at the bottom shows a command prompt window titled "Command Prompt - C:\junk\ConsoleApp1\ConsoleApp1\bin\Debug\ConsoleApp1.exe". The command entered is "Zoe". The output shows the application's response: "Microsoft Windows [Version 10.0.16299.15]" followed by "(c) 2017 Microsoft Corporation. All rights reserved." Then it prints "Hello Zoe". The word "Zoe" is highlighted with a red box.

Output window content:

```
Microsoft Windows [Version 10.0.16299.15]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\Users\Admin>c:\junk\ConsoleApp1\ConsoleApp1\bin\Debug\ConsoleApp1.exe "Zoe"
Hello Zoe
```

Be careful with the datatypes you choose.

The screenshot shows a Microsoft Visual Studio interface. The top menu bar includes File, Edit, View, Project, Build, Debug, Team, Tools, Test, Analyze, Window, Help, and Full Screen. The title bar shows "Program.cs" and "ConsoleApp2.Program". The code editor displays the following C# code:

```
7  namespace ConsoleApp2
8  {
9      class Program
10     {
11         static void Main(string[] args)
12         {
13             Console.WriteLine($"The largest integer is {int.MaxValue}");
14             Console.WriteLine($"The largest long is {long.MaxValue}");
15             Console.WriteLine($"The largest double is {double.MaxValue}");
16             Console.WriteLine($"The largest decimal is {decimal.MaxValue}");
17
18             Console.ReadLine();
19         }
20     }
21 }
22
```

A red annotation with a wavy line points from the line "Console.WriteLine(\$"The largest decimal is {decimal.MaxValue}");" to the text "Do not use this for financial." A second red annotation with a wavy line points from the line "Console.WriteLine(\$"The largest double is {double.MaxValue}");" to the text "Use this for financial".

The bottom window shows the console output of the application:

```
C:\junk\ConsoleApp2\ConsoleApp2\bin\Debug\ConsoleApp2.exe
The largest integer is 2147483647
The largest long is 9223372036854775807
The largest double is 1.79769313486232E+308
The largest decimal is 79228162514264337593543950335
```

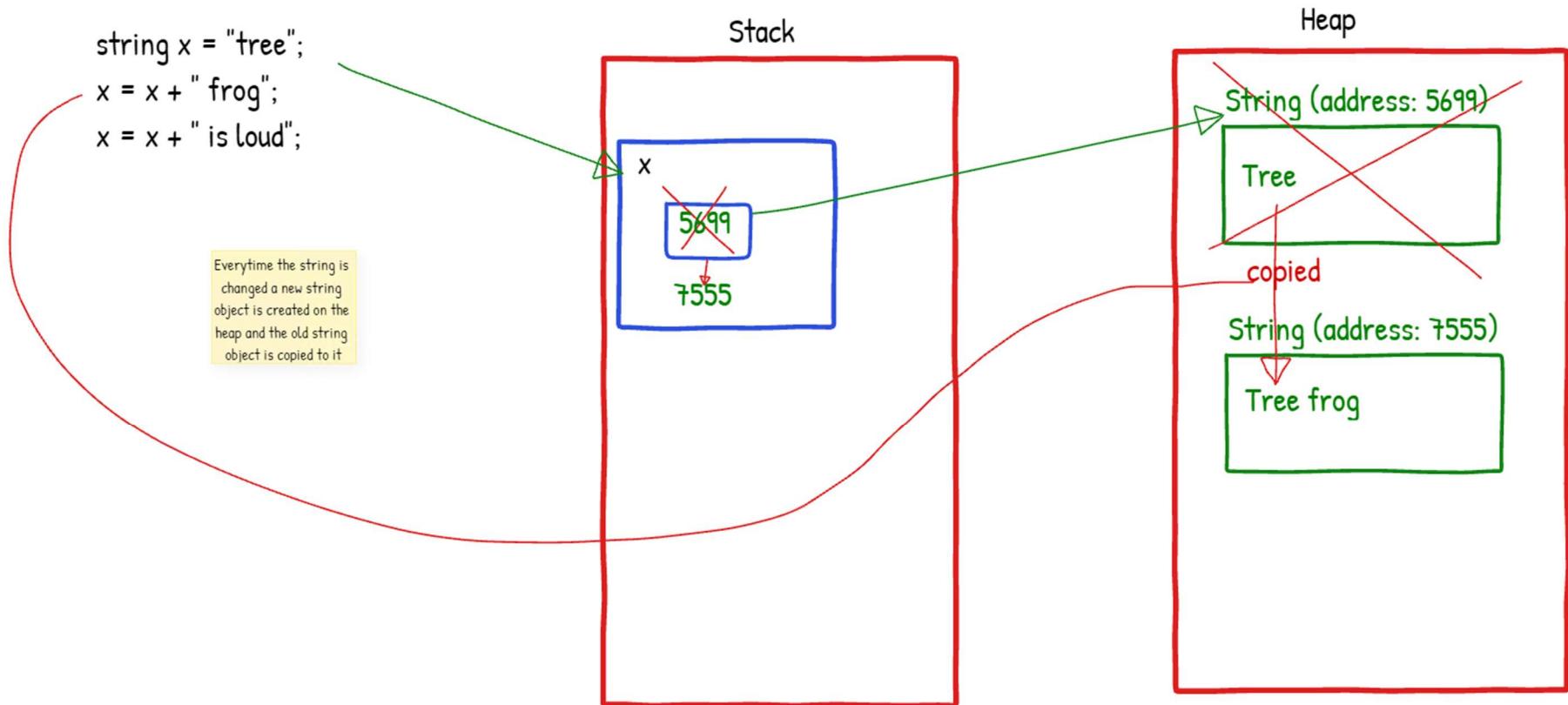
The Output window shows:

```
121 %
Output
Show output from: 'ConsoleApp2.exe'
'ConsoleApp2.exe'
```

The Error List window shows:

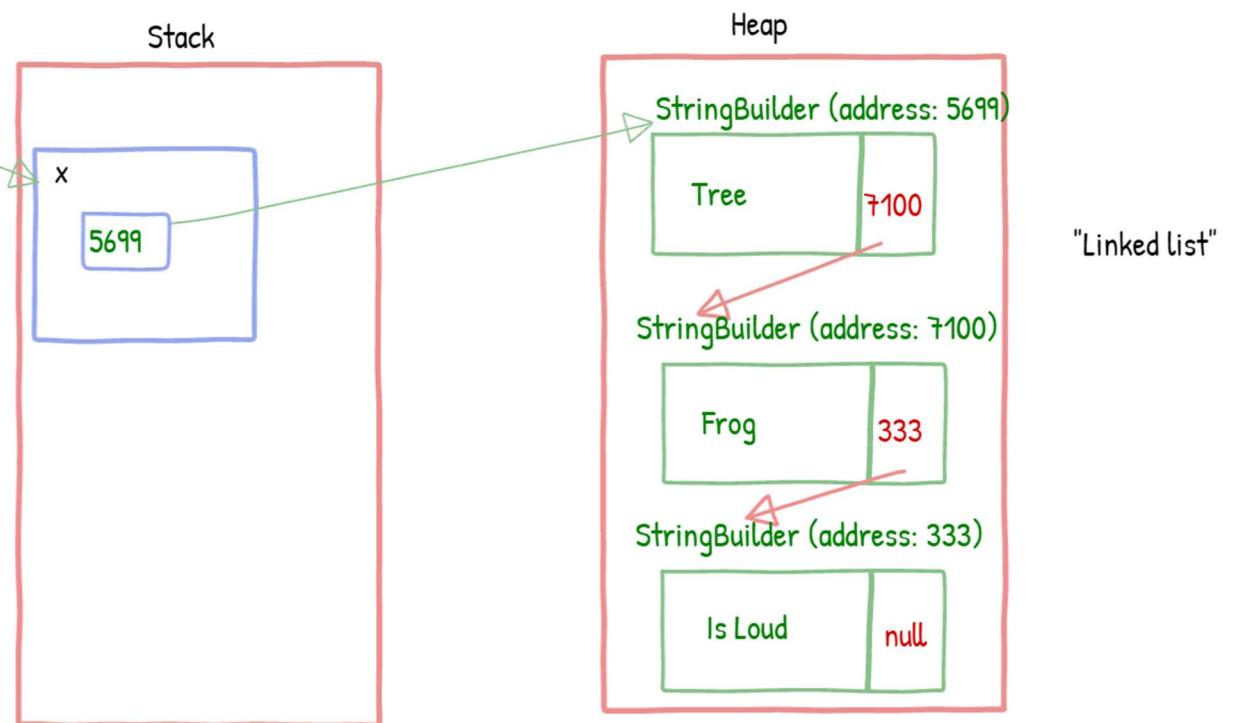
```
Skipped loading symbols. Module is
```

Many changes to a string can result in slowing down your application and the device it is running on. In this case whenever a string is changed in code a new string object must be created and the old string contents copied to it; why? Because strings are arrays, and arrays cannot change in size. All this copying palaver slows things down.



If you are making many changes to a string then use the string builder class. See how it adds a new object each time for the next part of the string and a pointer is updated to indicate where the new object is?

```
StringBuilder x = new StringBuilder();
x.add("Tree");
x.add(" frog");
x.add(" is loud");
```



Creating Methods

- Methods comprise two elements:
 - Method specification (**return type**, **name**, **parameters**)
 - Method body
- Use the **ref** keyword to pass parameter references

```
void StartService(int upTime, bool shutdownAutomatically)
{
    // Perform some processing here.
}
```

"named parameters". In this case I wanted to pass a value for **d** but not for **c**

```
Program.cs* 00b-OptionalParameters _00b_OptionalParameters.Program Main(string[] args)
7  namespace _00b_OptionalParameters
8  {
9      class Program
10     {
11         static void Main(string[] args)
12         {
13             Console.WriteLine(AddThem(44, 55, 77, 88));
14             Console.WriteLine(AddThem(44, 55, 77));
15             Console.WriteLine(AddThem(44, 55));
16             Console.WriteLine(AddThem(44, 55, d:6)); // Argument d is highlighted with a red box
17
18             Console.ReadLine();
19
20         }
21
22         static int AddThem(int a, int b, int c=0, int d=0)
23         {
24             return a + b + c + d;
25         }
26     }
27 }
28 }
29 }
```

When two methods have the same name but a different number of parameters and/or different parameter types they are said to be **overloaded**. Can you work out why we have this concept?

```
1  using System;
2  using System.Collections.Generic;
3  using System.Linq;
4  using System.Text;
5  using System.Threading.Tasks;
6
7  namespace _00a_OverloadedMethods
8  {
9      class Program
10     {
11         static void Main(string[] args)
12         {
13             Console.WriteLine($"The cube of 4 is " + Cube(4));
14             Console.WriteLine($"The cube of 5 is " + Cube("5"));
15             Console.ReadLine();
16         }
17
18         static int Cube(int x)
19         {
20             return x * x * x;
21         }
22
23         static int Cube(string x)
24         {
25             int z = Convert.ToInt32(x);
26             return z * z * z;
27         }
28     }
29 }
30 }
31 }
```

An example of an OUT parameter

```
{  
    public MainWindow()  
    {  
        InitializeComponent();  
    }  
  
    private void btn_Click(object sender, RoutedEventArgs e)  
    {  
        int num;  
        if (int.TryParse(textBox1.Text, out num))  
        {  
            lblResult.Content = $"The square of {num} is {(num * num)}";  
        }  
        else  
        {  
            lblResult.Content = "Try a number!";  
        }  
    }  
}
```

if the value in TextBox1.Text is an integer then TryParse will return true and num will contain the integer.|

Another example of an OUT parameter. The GetFiles function returns the number of files and the OUT parameter called *fileNames* will contain an array with all the file names.

```
static void Main(string[] args)
{
    ArrayList x;

    int filecount=GetFiles(@"C:\Windows\system32", out x);

    Console.WriteLine($"The number of files in C:\\Windows\\system32 is {filecount}. Press enter to see them all.");
    Console.ReadLine();

    foreach (var item in x)
    {
        Console.WriteLine(item);
    }

    Console.WriteLine("OK. Done. Press enter to finish");

    Console.ReadLine();
}

static int GetFiles(string path, out ArrayList fileNames)
{
    int fileCount = 0;
    fileNames = new ArrayList();
    foreach (var item in Directory.GetFiles(path))
    {
        fileCount++;
        fileNames.Add(item);
    } ≤ 1ms elapsed

    return fileCount;
}
```

Activate !
C - + - C - + -

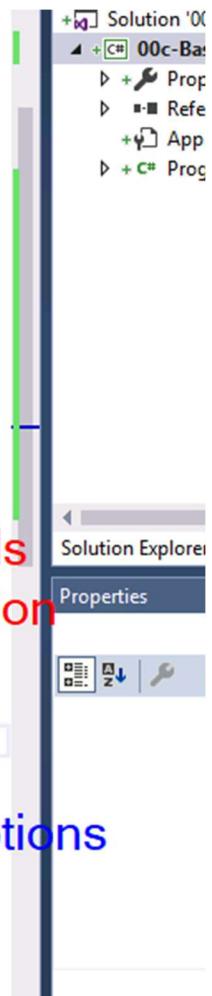
This example shows the basics of implementing exception handling

```
class Program
{
    static void Main(string[] args)
    {
        try
        {
            int x = 3;
            x = x / x;
            File.WriteAllText(@"c:\temp\result.txt", $"the result is {x}");
        }
        catch (DivideByZeroException ex)
        {
            Console.WriteLine("Sadly. the application failed because of a number. It will now close");
            Console.WriteLine("Message:" + ex.Message);
            Console.WriteLine("Stack trace:" + ex.StackTrace);
        }
        catch (UnauthorizedAccessException ex)
        {
            Console.WriteLine("The application is trying to write out to a file, but you don't have access");
            Console.WriteLine("details:" + ex.Message);
        }
        finally
        {
            Console.WriteLine("\n\nPress enter to end");
            Console.ReadLine();
        }
    }
}
```

this variable points to an exception object

can access details about the exception

best practice is to catch exceptions that you expect



One Situation you want to avoid is when your application gets an exception and you can't get around it and you don't inform the user that something has gone wrong. The application might continue in a state where the data is corrupt for example.

```
static int Divide(int top, int bottom)
{
    try
    {
        return top / bottom;
    }
    catch (Exception)
    {
    }
}
```

This is bad coding.
It swallows the exception.
I.e. the user might not realise something has gone wrong.



Realise

Sometimes you want to throw exceptions in your code because you have a situation where an application shouldn't continue. In this case an invoice is being raised with a negative amount; that's not allowed.

```
static void Main(string[] args)
{
    try
    {
        string invoice;
        invoice = ConstructInvoice(3, -6);
        Console.WriteLine(invoice);
    }
    catch (ApplicationException ex)
    {
        Console.WriteLine(ex.Message);
    }
    Console.ReadLine();
}

static string ConstructInvoice(decimal qty, decimal price)
{
    decimal invoiceTotal = qty * price;

    //Check the invoice total
    if (invoiceTotal <= 0)
        throw new ApplicationException("Invoice total is invalid. Must be >= 0");

    return $"invoice: Total Amount {invoiceTotal:C}";
}
```

here we are checking the invoice for validity

It's not valid, so pass an exception back to the caller

This is an example of using a constructor with a Struct.

```
class Program
{
    static void Main(string[] args)
    {
        Coffee c1 = new Coffee();
        c1.BeanType = "Aribica";

        Coffee c2 = new Coffee();
        c2.BeanType = "Kenyan";

        Coffee c3 = new Coffee("PNG");
    }
}

struct Coffee
{
    public Coffee(string bType)
    {
        ≤ 1ms elapsed
        BeanType = bType;
    }

    public string BeanType;
}
```



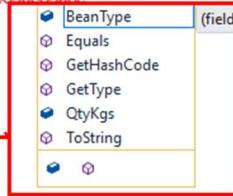
Private fields are not visible outside a struct or class

```
Coffee c4 = new Coffee("Brazil");

Console.WriteLine($"{c3.BeanType} has a quantity of {c3.QtyKgs}, strength is: {c3._strength}");

Console.ReadLine();
}

struct Coffee
{
    public Coffee(string bType, int qty, int strength)
    {
        BeanType = bType;
        QtyKgs = qty;
        _strength = strength;
    }
    public Coffee(string bType)
    {
        BeanType = bType;
        QtyKgs = 0;
        _strength = 0;
    }
    public string BeanType;
    public int QtyKgs;
    private int _strength;
}
```



The code demonstrates a struct named Coffee. It contains three public properties: BeanType (string), QtyKgs (int), and _strength (private int). The _strength field is highlighted with a red box. A tooltip for the BeanType field is shown, listing its declaration in the Coffee struct, its type (string), and its methods: Equals, GetHashCode, GetType, QtyKgs, and ToString.

not visible because it's private

This is an example of protecting a private field by using a Property.

```
22
23
24     c3.Strength = 12; // Line 24 highlighted with a red box
25     Console.WriteLine($"{c3.BeanType} has a quantity of {c3.QtyKgs}, strength is: {c3.Strength}");
26
27     Console.ReadLine();
28 }
29
30
31 struct Coffee
32 {
33     public Coffee(string bType, int qty, int strength)
34     {
35         BeanType = bType;
36         QtyKgs = qty;
37         _strength = strength; // Line 37 highlighted with a red circle
38     }
39     public Coffee(string bType)
40     {
41         BeanType = bType;
42         QtyKgs = 0;
43         _strength = 0;
44     }
45     public string BeanType;
46     public int QtyKgs;
47     private int _strength;
48     public int Strength
49     {
50         get { return _strength; }
51         set
52         {
53             _strength = value; // Line 53 highlighted with a red box
54         }
55     }
}
```

The reason you'd define an indexer is to make it easier for other people who use your class or struct. Indexers are special methods that use a *subscript* to set or get data. The method name for an indexer is always *this*.

- Use the **this** keyword to declare an indexer
- Use **get** and **set** accessors to provide access to the collection

```
public int this[int index]
{
    get { return this.beverages[index]; }
    set { this.beverages[index] = value; }
}
```

- Use the instance name to interact with the indexer

```
Menu myMenu = new Menu();
string firstDrink = myMenu[0];
```

From your notes. A simple arraylist.

```
// Create a new ArrayList object.  
ArrayList al = new ArrayList();  
// Add values to the ArrayList collection.  
0 al.Add("Value");  
al.Add("Value 2");  
1 al.Add("Value 3");  
2 al.Add("Value 4");  
  
// Remove a specific object from the ArrayList collection.  
al.Remove("Value 2"); // Removes "Value 2"  
  
// Remove an object from a specified index.  
al.RemoveAt(2); // Removes Value 4  
  
// Retrieve an object from a specified index.  
string valueFromCollection = (string)al[1]; // Returns "Value 3"
```

Every element in an *ArrayList* has the data type *object*. When you retrieve an item from an arraylist it is returned as an object. That means you need to *Cast* (*Convert*) it to the Data type of the receiving variable.

Using List Collections

page 3-13

- Add objects of any type

```
Coffee coffee1 = new Coffee(4, "Arabica", "Columbia");
ArrayList beverages = new ArrayList();
beverages.Add(coffee1);
```

what and why is that?

- Retrieve items by index

```
Coffee firstCoffee = (Coffee)beverages[0];
```

Every element in an *ArrayList* has the data type *object*. When you retrieve an item from an *ArrayList* it is returned as an object. That means you need to *Cast* (*Convert*) it to the Data type of the receiving variable.

```
class Program
{
    static void Main(string[] args)
    {
        ArrayList items = ... ArrayList();
        items.Add(3);
        int result = ...
    }
}
```

converts the 3 to an object!

int ArrayList.Add(object value)

Adds an object to the end of the *ArrayList*.

Exceptions:

NotSupportedException

compile. why not?

- Create a delegate for the event

```
public delegate void OutOfBeansHandler(Coffee coffee,  
EventArgs args);
```

- Create the event and specify the delegate

```
public event OutOfBeansHandler OutOfBeans;
```

A delegate is a data type that can point to a function.]

Matches my demo 00g-AbsoluteBasicsDelegate. A delegate is a data type that can point to a method.

The diagram illustrates the use of delegates in C# through a code editor and a terminal window.

Code Editor (Program.cs):

```
1  using System;
2  using System.Collections.Generic;
3  using System.Linq;
4  using System.Text;
5  using System.Threading.Tasks;
6
7  namespace _00_AbsoluteBasicsDelegate
8  {
9      class Program
10     {
11         delegate int MyDelegate(int val);
12
13         static void Main(string[] args)
14         {
15             int y = 45;
16             Console.WriteLine($"The cube of {y} is {Cube(y)}");
17
18             MyDelegate m = Cube;
19             Console.WriteLine($"The cube of {y} is {m(y)}");
20
21             Console.ReadLine();
22         }
23
24         static int Cube(int x)
25         {
26             return x * x * x;
27         }
28     }
29 }
30
31
32 }
```

Annotations:

- A red arrow points from the text "this is a data type that I have defined." to the `delegate int MyDelegate(int val);` line.
- A blue arrow points from the text "this delegate can point to any method that accepts 1 int and returns an int." to the `MyDelegate m = Cube;` line.
- A green arrow points from the text "I declare a variable called 'm' of type 'MyDelegate' and assign it 'Cube'" to the `MyDelegate m = Cube;` line.
- A red arrow points from the text "I call Cube by using my delegate variable." to the `m(y)` part of the second `Console.WriteLine` call.

Terminal Window:

```
C:\Users\Admin\Desktop\MarksFiles\MarksCode\Module-03-Basic CSharp Constructs\Demos\00-AbsoluteBasicsDelegate\00-AbsoluteBasic
The cube of 45 is 91125
The cube of 45 is 91125
```

Matches my demo **00j-UsingADelegate**. The reason for implementing a delegate in this example is so the console application can get feedback while the **ProcessFiles** method is executing.

The screenshot shows two open files in Visual Studio:

- Class1.cs** (FileUtility.Util namespace):
 - Contains a **FeedbackMessage** delegate declaration: `public delegate void FeedbackMessage(string message);`
 - Contains a **pointerToFeedback** field: `public FeedbackMessage pointerToFeedback;`
 - Contains a **ProcessFiles** method implementation:

```
    public long ProcessFiles(string path)
    {
        long totalBytesFound = 0;
        foreach (var file in Directory.GetFiles(path))
        {
            if (pointerToFeedback != null)
                pointerToFeedback($"Processing file: {file}");
            totalBytesFound += file.Length;
            System.Threading.Thread.Sleep(20);
        }
        return totalBytesFound;
    }
```
- Program.cs** (00_UsingADelegate.Program namespace):
 - Contains a **ProcessFeedback** method implementation:

```
    static void ProcessFeedback(string msg)
    {
        Console.WriteLine(msg);
    }
```
 - Contains a **Main** method:

```
    static void Main(string[] args)
    {
        FileUtility.Util util = new FileUtility.Util();
        util.pointerToFeedback = ProcessFeedback;

        long result = util.ProcessFiles(@"c:\windows\system32");

        Console.WriteLine($"The total bytes found is {result} ");
        Console.ReadLine();
    }
```

Annotations in red text and boxes:

- A red box surrounds the `pointerToFeedback` field in **Class1.cs**. A red arrow points from this box to the assignment statement `util.pointerToFeedback = ProcessFeedback;` in **Program.cs**. The text "this sets the delegate variable to point to a function" is written above this arrow.
- A red box surrounds the `ProcessFeedback` method definition in **Program.cs**. A red arrow points from this box to the call to `pointerToFeedback` in the **ProcessFiles** method of **Class1.cs**. The text "here the method is called using the delegate variable" is written below this arrow.
- The text "this method matches the delegate, i.e. returns void and accepts a string" is written below the `ProcessFeedback` method definition in **Program.cs**.

Events extend the idea of delegates and make things easier for the caller of a struct or class. Line 13 (left) is the extra key line I added to define an event. Then, line 14 (right) connects the event to a method. When line 29 (left) runs the method at line 24 (right) will execute.

```
12     public delegate void FeedbackMessage(string message);
13     public event FeedbackMessage FeedbackEvent;
14
15     public FeedbackMessage pointerToFeedback;
16
17
18     /// <summary>
19     /// Accepts a file path and returns the total bytes found for all fi
20     /// </summary>
21     /// <param name="path">the file path</param>
22     /// <returns>the total bytes</returns>
23     public long ProcessFiles(string path)
24     {
25         long totalBytesFound = 0;
26         foreach (var file in Directory.GetFiles(path))
27         {
28             if (FeedbackEvent != null)
29                 FeedbackEvent($"Processing file: {file}");
30             totalBytesFound += file.Length;
31             System.Threading.Thread.Sleep(20);
32         }
33         return totalBytesFound;
34     }
35
36 }
37
```

```
2     using System.Collections.Generic;
3     using System.Linq;
4     using System.Text;
5     using System.Threading.Tasks;
6
7     namespace _00_FromDelegates to Events
8     {
9         class Program
10        {
11            static void Main(string[] args)
12            {
13                FileUtility.Util util = new FileUtility.Util();
14                util.FeedbackEvent += Util_FeedbackEvent;
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
}
30
31
32
33
34
35
36
37
```

I included this example to show how a delegate and event was used in practice

It's easy to setup the event for me.
Autocomplete helps me.

This button class was written in 2001. The person who wrote it had no idea that it would call my method

```
1 using System;
2 using System.Collections.Generic;
3 using System.ComponentModel;
4 using System.Data;
5 using System.Drawing;
6 using System.Linq;
7 using System.Text;
8 using System.Threading.Tasks;
9 using System.Windows.Forms;
0
1 namespace WindowsFormsApp1
2 {
3     public partial class Form1 : Form
4     {
5         public Form1()
6         {
7             InitializeComponent();
8             button1.Click += Button1_Click;
9         }
10        private void Button1_Click(object sender, EventArgs e)
11        {
12            MessageBox.Show("hello");
13        }
14    }
}
```

Form1

Diagnostic Tools

Button1_Click(object sender, EventArgs e)

Press this