2015

Software Design & Build Fundamentals

LEARN TO DESIGN & BUILD A WINDOWS C# APPLICATION

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This document location

Exercise files github
Task A

Question 1
What is SDLC?
What role does design have?

Question 2
Using Appendix A.
Draw diagram to describe program features using paper or P.C

Question 3
a. How to use Visual Studio 2013?
b. What are the C# basics?

Developing Software is Fun!
Don't be intimidated … take a little at a time

Lessons

1 – 3: Workflow, Visual Studio Interface
4 – 7: C# Programming Language
8 – 11: Working with Data
12 – 16: Concert Booking Application

The Set-up

1. Download and install Visual Studio Community 2013
2. Create GitHub account and create a new repository called Csharp-Basics
3. Download and install the latest version of GitHub for windows version 7, 8, 8.1
4. On your PC in users\username\documents create new vsprojects folder
5. Open PowerShell type following text

```
C:\Windows\system32> cd c:\
C:\>
```

Change directory (cd) to vsprojects folder and git clone into folder

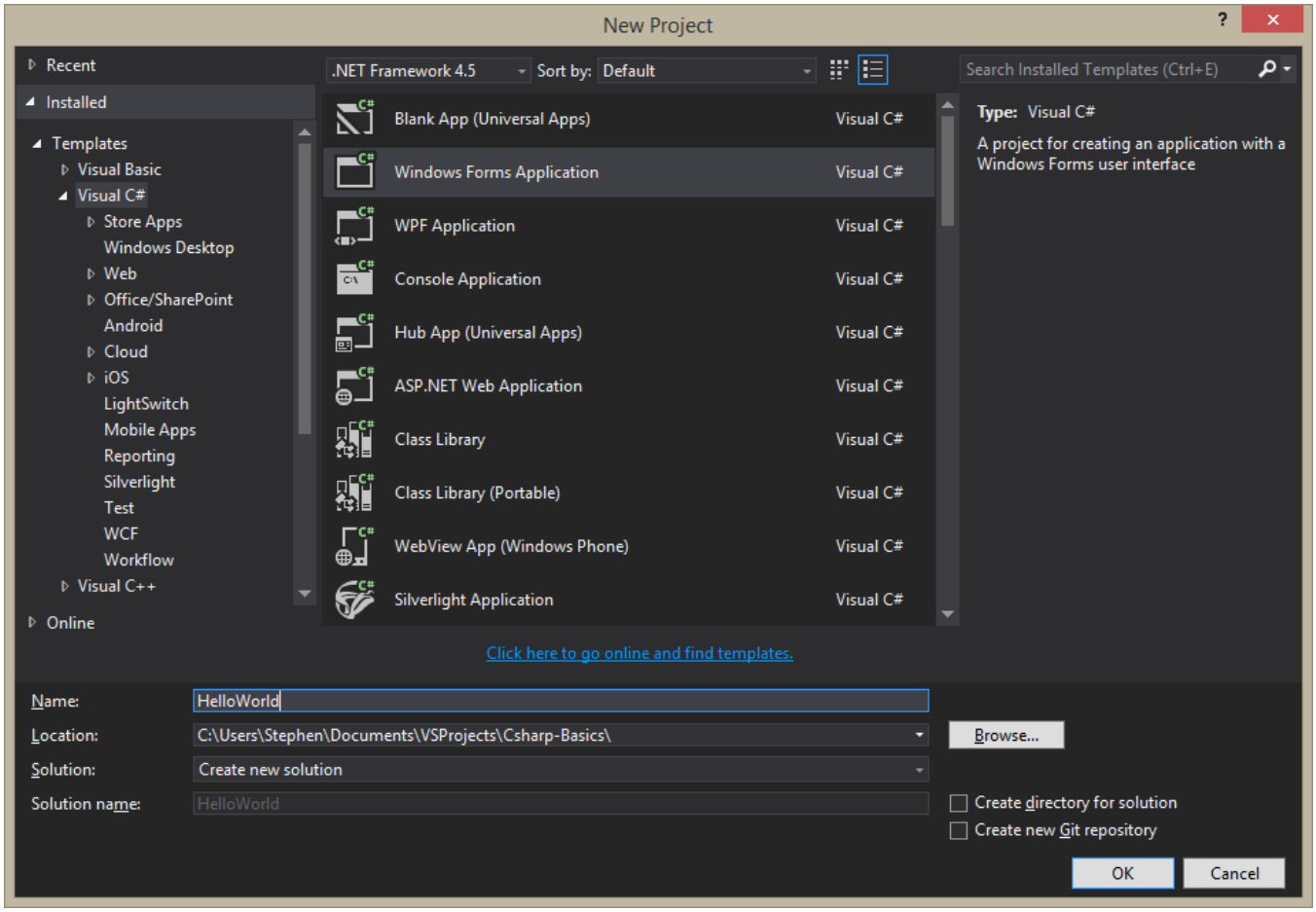
```
C:\> cd c:\users\username\documents\vsprojects
C:\users\username\documents\vsprojects> git clone "HTTPS clone URL"
```

```
C:\users\username\documents\vsprojects> dir
C:\users\username\documents\vsprojects> cd csharp-fundamentals
C:\users\stephen\documents\vsprojects\csharp-basics [master]> git version
git version 1.9.5.msysgit.0
```

Lesson 1 Hello World

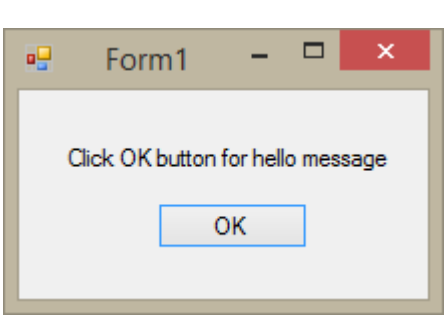
Let's create a HelloWorld windows application. Open Visual Studio select new project. Select Visual C# and Windows form application. In the Windows dialog change name and location to:

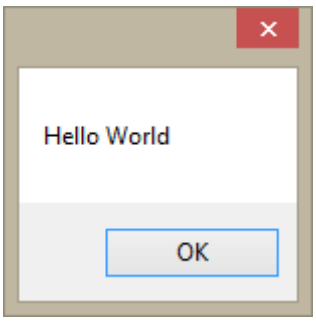
- Name: HelloWorld
- Location: click Browse button navigate to vsprojects\Csharp-Basics folder – GitHub clone
- Create new folder Lesson1
- Click OK button



Run debug click start button, this is a basic windows form click x and close. This is a complete windows app, however it does not do anything. Go to C:\Users\username\Documents\VSProjects\ Csharp-Basics\Lesson1\HelloWorld\bin\Debug and click HelloWorld.exe

Create a button that once clicked displays a message box that displays Hello World. Go to toolbox select button. Double click button and into Form1.cs type `MessageBox.Show("Hello World");`
Two tabs code design view and debug app using the start button.





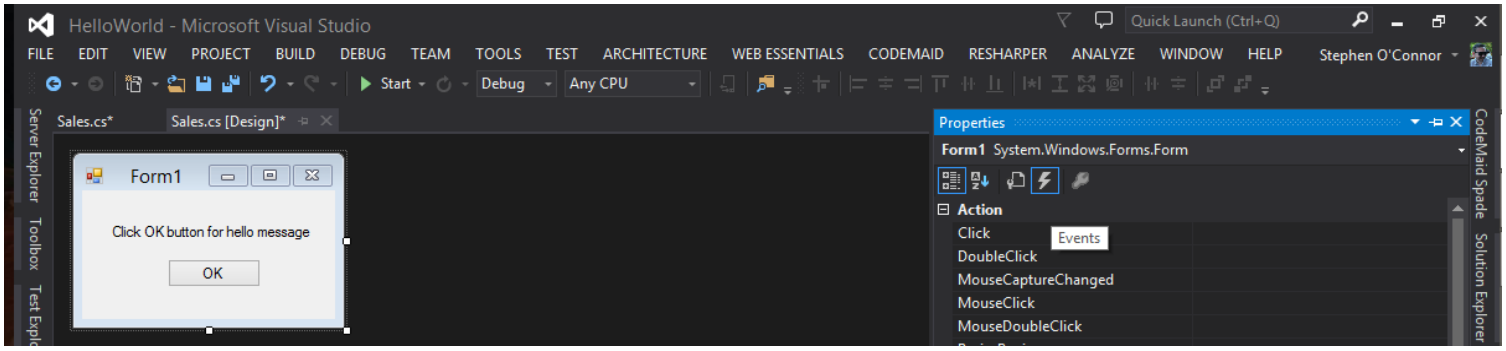
Solution explorer file description. Shut down reopen visual studio. Looking at Debugging. Set break points to step through each line of code.

What are Events? "Event Driven Programs"

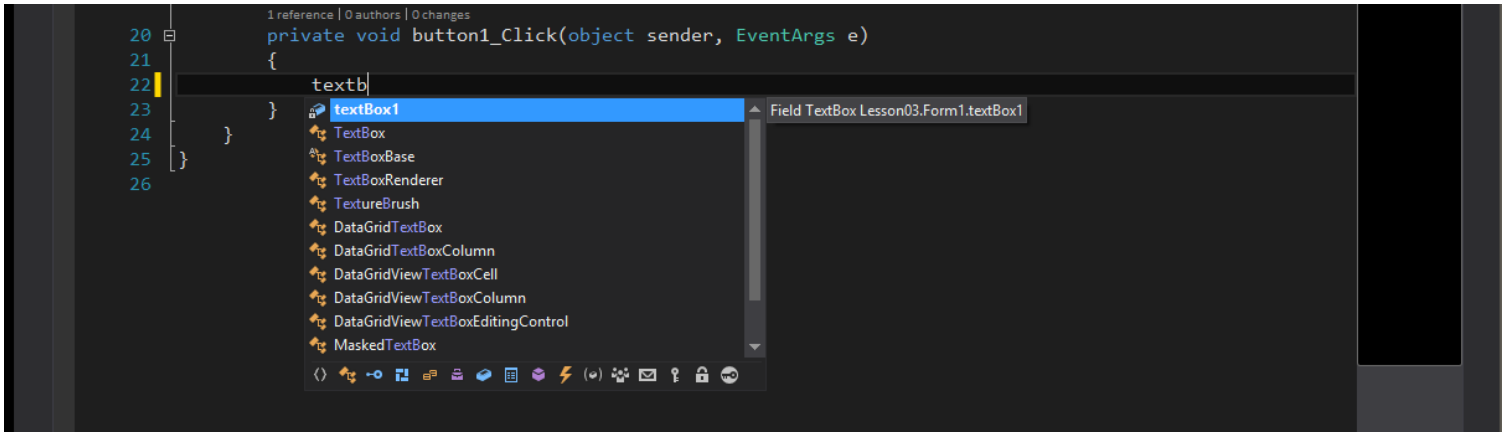
Response to events like open file, exit, new file, print file. Hundreds of events that an app can react to. Double click on the OK button an event handler is created and given a default name. When the event is triggered the end user clicks the button. Event handler event default name button1_Click Curly braces … { } ... define a bock of code. Events are triggered in an app. App can respond or ignore those events. Write code in Event Handlers to handle events. Code must be written inside of code block defined by curly braces. Methods are the basic building blocks of writing code. An event Handler is a more specific type of a method.

```
private void button1_Click(object sender, EventArgs e) // event handler
{
    MessageBox.Show("Hello World"); // event
}
```

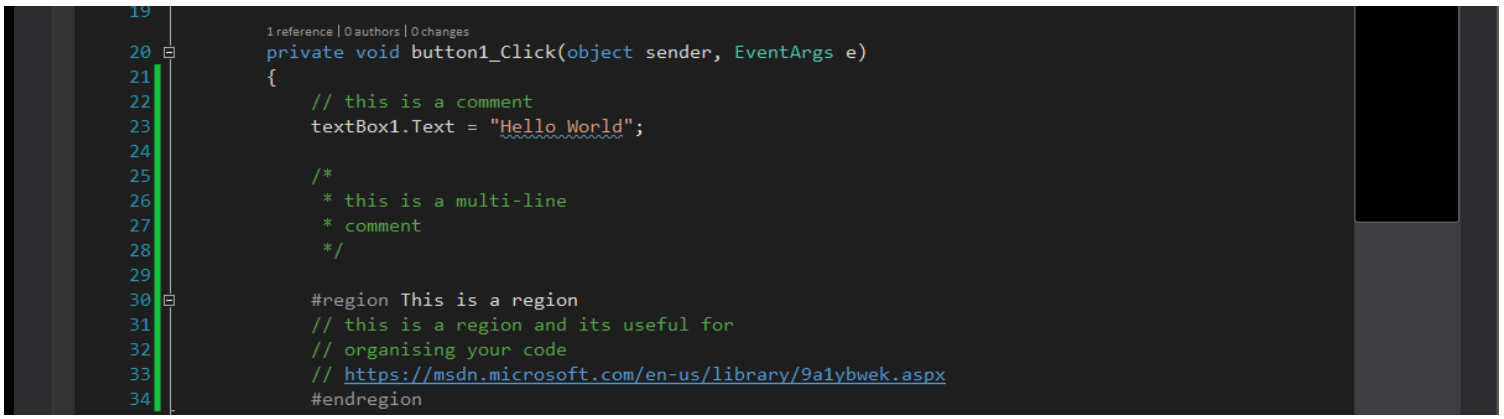
Events



IntelliSense

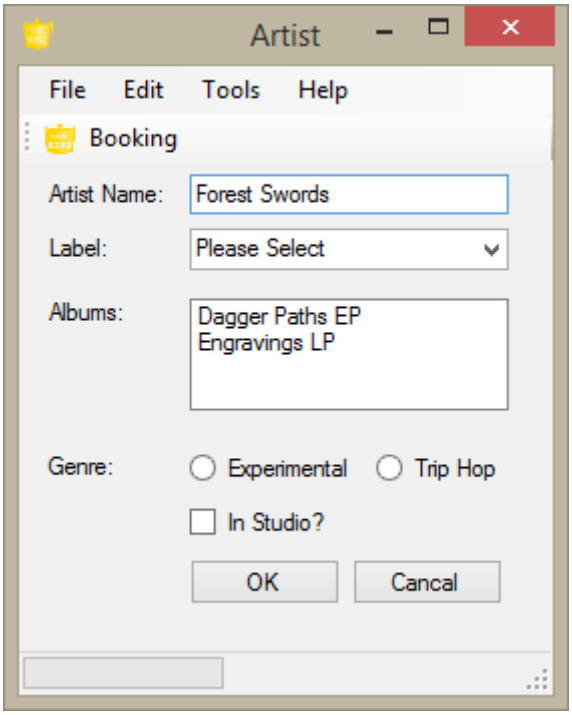


Comments and regions



Lesson 2 **Design Best Practices**

Arrange controls in columns and rows. Labels left input boxes, data entered on the right. Ok Cancel buttons on the right. Use standard fonts and colors. Keep it simple. Use standard, succinct descriptions (names) for controls. Don't make the user "think", easy for the user to use.



Buttons
Allow user to communicate a decision or to trigger some action.

Labels
Non-interactive descriptions or text usually displayed on the left-hand side of other controls.

Text Boxes
Allow for unstructured user input.

Check Boxes
Allow for yes /no or on /off type user input. Used together to allow off "Check all that apply"

Combo box
Text and list box combination. User can select item in the list, or type in a selection that is not in the list.

Menu strip
Add menu to app, select Insert Standard Items.

Tool strip
Add toolbar to app. Includes progress bars, textboxes, combo boxes & more

Status strip
Add status bar to app to provide feedback to the user

Tool Strip Container
Hosts other controls like the menu strip, Toll Strip and the Status Strip to provide user app customization.
Arrange toolbars top left bottom right

Tips
Make sure the right control is selected before making any changes in the Properties window.
Set tab order. Click VIEW and Tab Order click item to make first.
Tab Order starts with the control from the left-hand corner logically to the lower right-hand corner.

Lesson 3 Variables and Datatypes

x = 4
y = x + 6
What does y equal?

Variables represents a space in a computer's memory that is assigned to store a value. The name of the variable is then used in code to reference the value that is stored in that memory space. Declaring a variable is the act of allocationg space in he computer's memory for valus of a specific data type and giving the variable name.

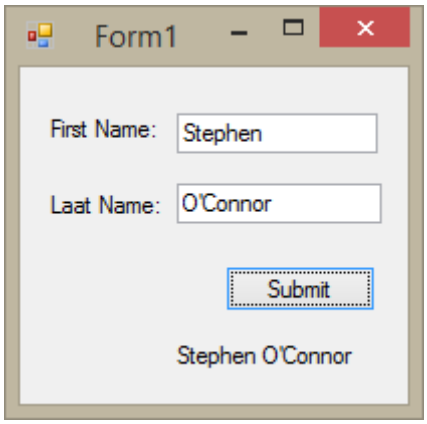
There are many available data types in C#, including ones that can store strings, dates, numbers, and more..

Three Basic Numeric data Types ..

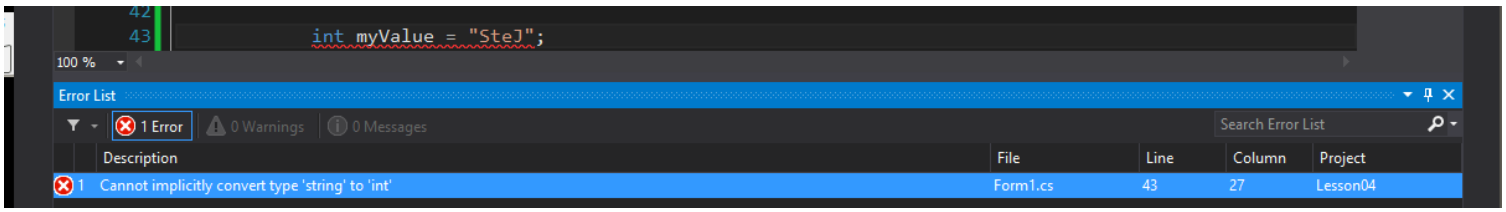
- Interger (int): -2,147,483,648 to +2,147,483,647
- Double (double): $\pm 5.0 \times 10^{-324}$ to $\pm 1.7 \times 10^{308}$ up to 15 decimal places
- Boolean (bool): true or false

When writing C#, C# is case sensitive. Consider a variable a bucket and the string literal can go into the bucket.

```
string hello; // hello is the bucket
hello = "hello world"; // string literal goes into the hello bucket
MessageBox.Show(hello); // hello var
MessageBox.Show("hello"); // string literal

// declare two vars
string firstTextBox = textBox1.Text;
string secondTextBox = textBox2.Text;

label1.Text = firstTextBox + " " + secondTextBox;
```



Declare a Variable with the wrong a data type error with discription.

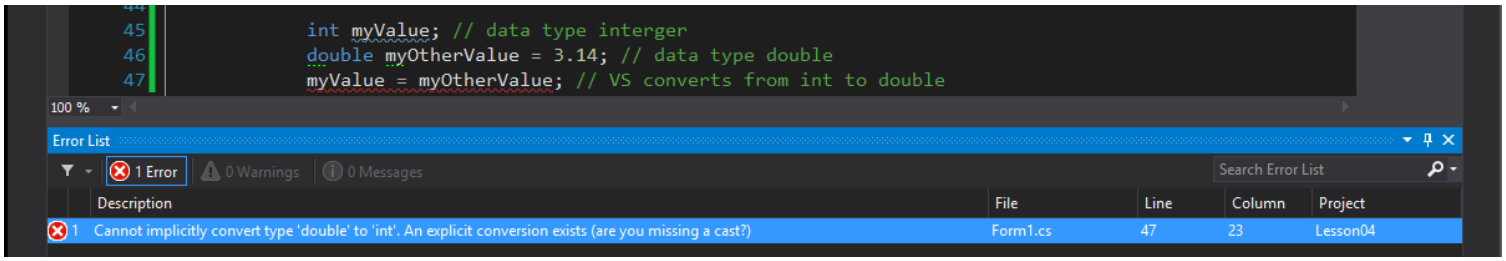


VS implictyly converts interger to double no loss of data

```
int myValue = 3; // data type integer
double myOtherValue; // data type double
myOtherValue = myValue; // VS converts from int to double
```

VS cannot convert double to interger loss of data

```
int myValue; // data type integer
double myOtherValue = 3.14; // data type double
myValue = myOtherValue; // VS cannot convert
```

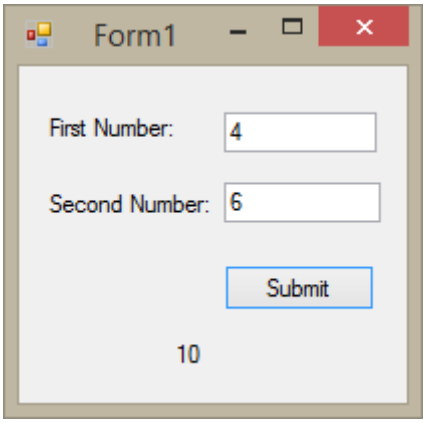


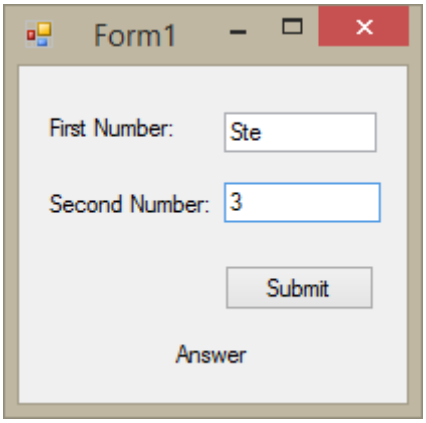
Create a Basic Calculator

To explicitly convert data types, lets look at the following example. With an explicit cast, either you are telling the compiler that **you know more than it does** - "please believe me, but check anyway": TextBox.Text cannot add two numbers and display the result in label1.Text

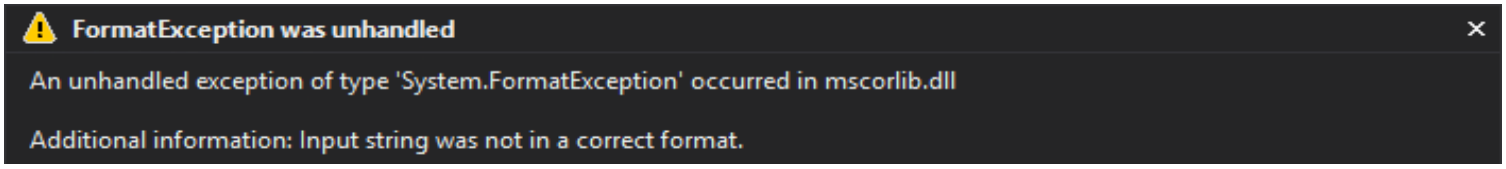
```
int firstTextBox = 0;
int secondTextBox = 0;
int result = 0;

firstTextBox = int.Parse(textBox1.Text);
secondTextBox = int.Parse(textBox2.Text);

result = firstTextBox + secondTextBox;
label3.Text = result.ToString();
```

Basic testing of the calculator.





Error: Cannot implicitly convert type 'int' to 'string'. Error is thrown cannot enter text.
{"Input string was not in a correct format."}



Convert data types
For int → int.Parse(myString);
For double → double.Parse(myString);
For bool → bool.Parse(myString);

Expressions Versus Statements

Expressions can be evaluted. This is a very basic expression

```
int x;
x + 3; // this is not a statement, it's an expression
```

Statements, this is a statement

```
x = x + 3; // this is an assignment
```

Valid Statements Consist of

- Assignment → myInterger = 3;
- Call → MessageBox.Show("Hello World");
- Increment → x++;
- Decrement → --x;

"Expressions can be evaluated.. Statements can be excuted."

```
label1.Text = firstTextBox + " " + secondTextBox; // statement
firstTextBox + " " + secondTextBox; // expression not a statement
```

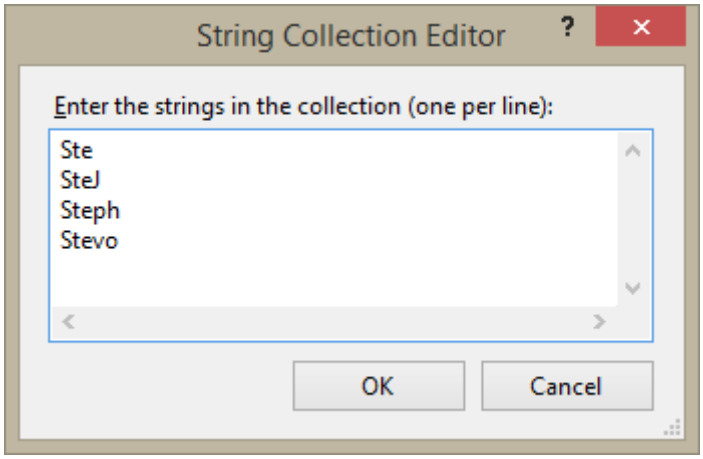
Evalutating Expressions

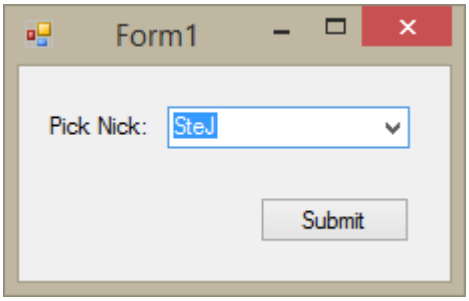
- (3 < 2) .. true or false?
- (3 > 2) .. true or false?
- Given: int x = 3;
    - (x == 3) .. true or false?
    - (x != 3) .. true or false?

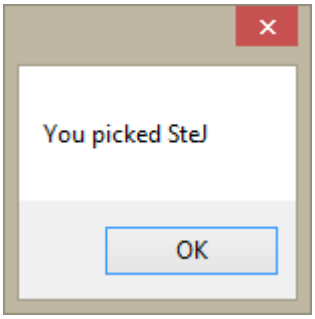
= Assignemnt telling: x is 4
== Evaluation asking: is this equal?
!= evaluates "not equal" 3 is not equal to 4: true

Lesson 4 Iteration and Selection Statements

Selection Statements decide whether or not to execute a block of code based on the evaluation of an expression. If condition else do this. Toolbox select and drag comboBox onto form1, select comboBox in design view click arrow select Edit Items. Type nicknames into dialog box, click OK







If and if else

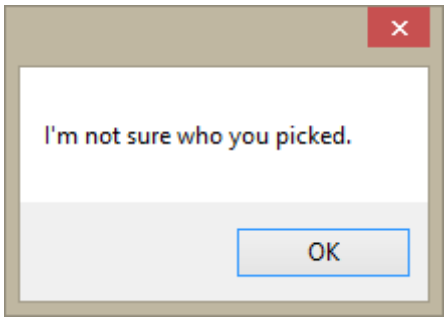
First and second examples of 'if' statements.

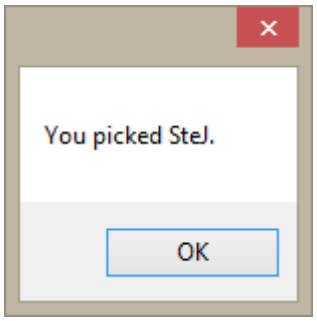
```
// 1. basic 'if' statement
if (comboBox1.Text == "SteJ")
{
    MessageBox.Show("You picked SteJ");
    comboBox1.Text = ""; // clears comboBox if selected
}

// 2. 'if' statement curly braces removed, one line of code to be executed
if (comboBox1.Text == "Steph")
    MessageBox.Show("You picked Steph"); // one line of code after 'if'
```

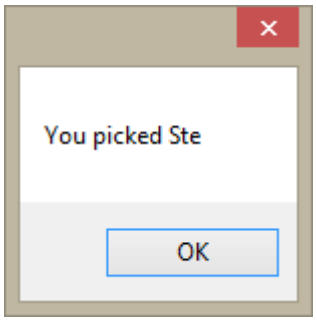
Third example of 'if' statement.

```
// 3. nested 'if' statement
if (comboBox1.Text != "Ste") // if not equal to Ste false go to else
{
    if (comboBox1.Text == "SteJ")
    {
        MessageBox.Show("You picked SteJ."); // SteJ is selected
    }
    else
    {
        MessageBox.Show("I'm not sure who you picked."); // Stevo or Steph selected
    }
} // end if
else
{
    MessageBox.Show("You picked Ste");
} // end else
```

In combox Select Stevo, SteJ and then Ste.

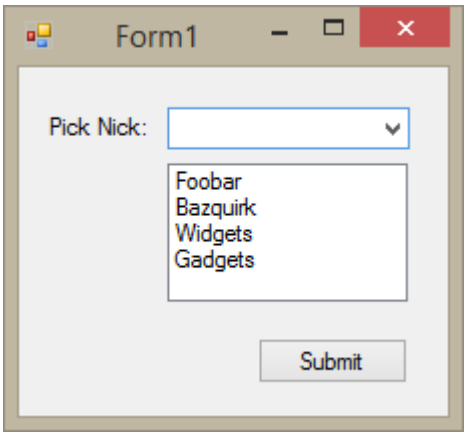


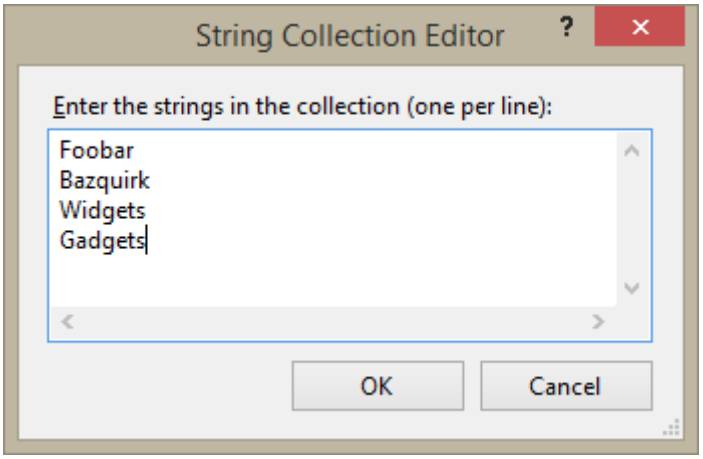




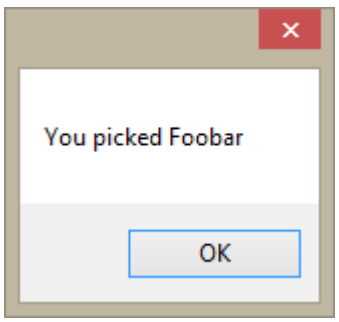
Switch

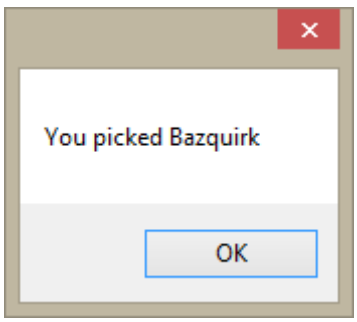
Drag and drop listBox from toolbox onto form1. Select listBox and click arrow. Type Foobar Bazquirk, Widgets & Gadgets into dialog box.

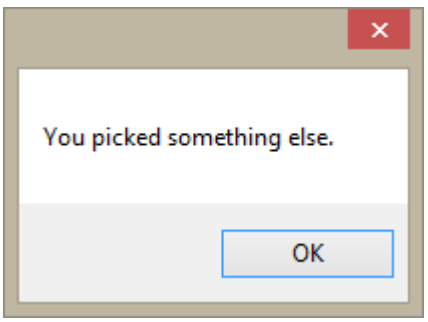





```
// 'switch' statement
switch (listBox1.SelectedItem.ToString())
{
    case "Foobar":
        MessageBox.Show("You picked Foobar");
        break;

    case "Bazquirk":
        MessageBox.Show("You picked Bazquirk");
        break;

    default:
        MessageBox.Show("You picked something else.");
        break;
}
```







Arrays

Type of collection that allows you to group together a bunch of values that are related in some way. All items in the array must be the same date type. Step add break point, debug and step in.

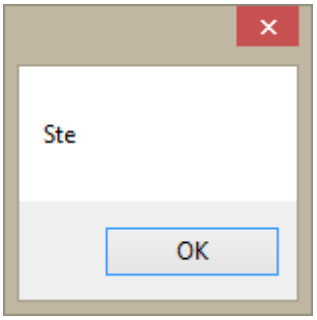
```
// arrays
// 1. sized array, set the size
string[] myArray = new string[2];
myArray[0] = "SteJ";
myArray[1] = "Steph";
// myArray[2] = "Stevo"; // causes an out of bounds exception
MessageBox.Show(myArray[1]);
```

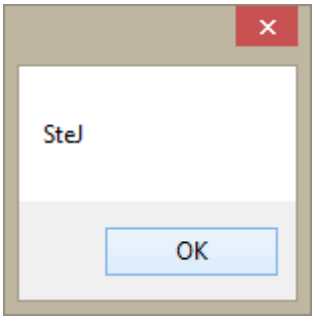
Iteration statements

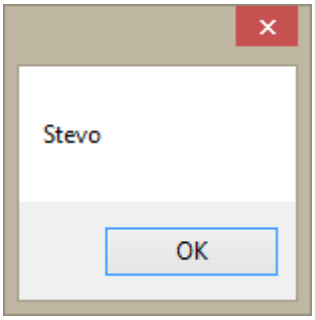
Loop through, or navigate through each item in an array one at a time.

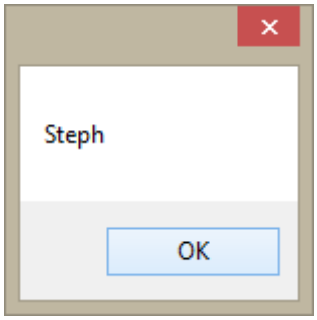
Foreach item (nickname) in array (myArray) MessageBox item (nickname, Ste).

```
// 2. intialized array [0] = Ste, [1] = SteJ, [2] = Stevo, [3] = Steph
string[] myArray = {"Ste", "SteJ", "Stevo", "Steph"};
// MessageBox.Show(myArray[1]); // test array

// create temp var with value of ncikname
foreach (var nickname in myArray)
{
    MessageBox.Show(nickname);
}
```



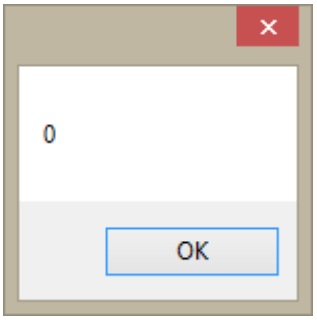


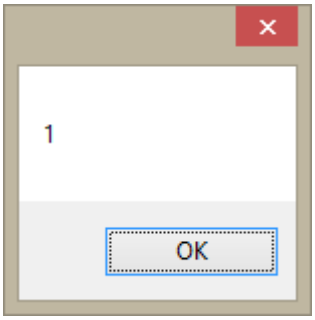


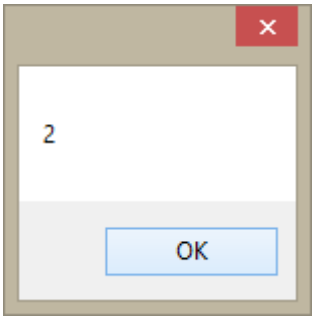


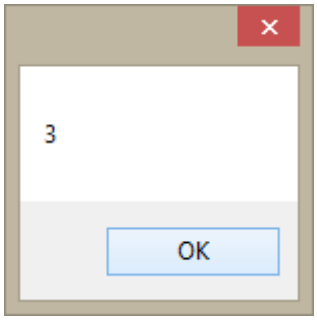
For Loop is index of myArray loop and display message I to a string myArray until length of array is greater than array length.

```
string[] myArray = { "Ste", "SteJ", "Stevo", "Steph" };
for (int i = 0; i < myArray.Length; i++)
{
    MessageBox.Show(i.ToString());
}
```





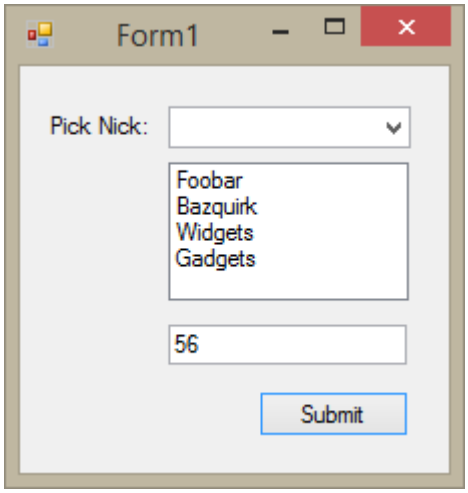


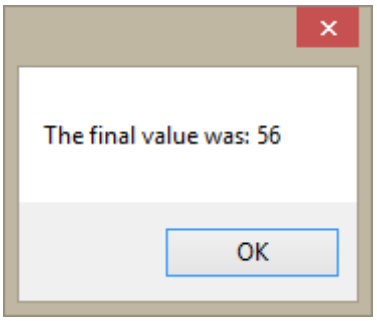


`While loop`, Drag and drop textBox onto Form1.

```
int i = 0;
while (i < int.Parse(textBox1.Text))
{
    i++;
}
MessageBox.Show("The final value was: " + i.ToString());
```

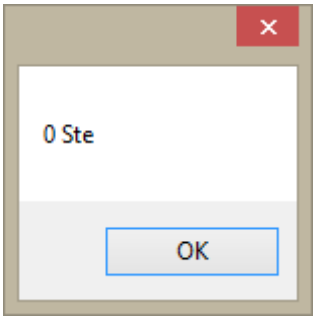
Debug and enter number into textBox

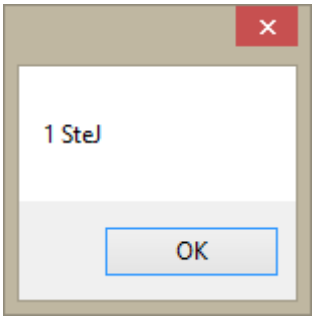


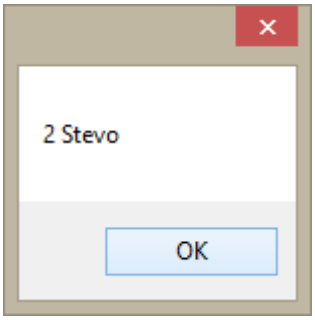


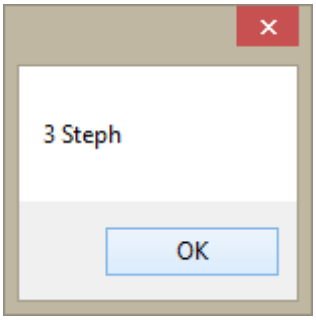
`Two nested for loops`, to get both index and name a two demensional for loop is created. A nested for loop, the second loop is a foreach.

```
// array [0] = Ste | [1] = SteJ | [2] = Stevo | [3] = Steph
string[] myArray = { "Ste", "SteJ", "Stevo", "Steph" };

// for and foreach loop
for (int i = 0; i < myArray.Length;)
{
    // temp value nickname
    foreach (var nickname in myArray)
    {
        MessageBox.Show(i++ + " " + nickname);
    }
}
```



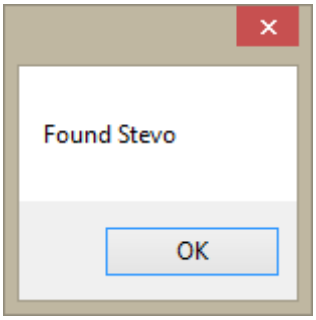




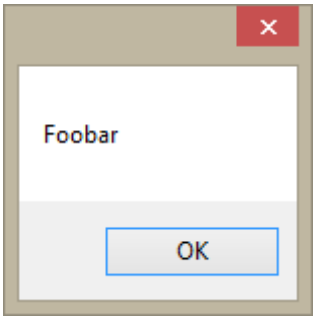


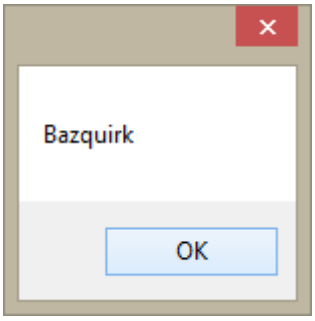
Go through the array if index = Stevo Message Found Stevo

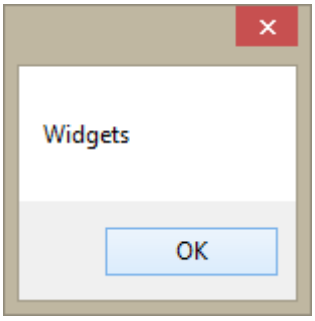
```
// Combining array, for and if
string[] myArray = {"Ste", "SteJ", "Stevo", "Steph"};

for (int i = 0; i < myArray.Length; i++)
{
    if (myArray[i] == "Stevo")
    {
        MessageBox.Show("Found Stevo");
    }
}
```

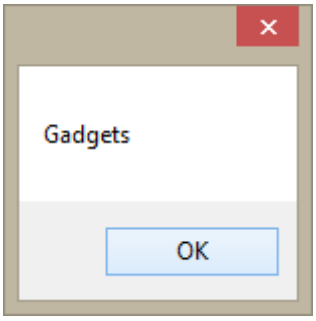



```
for (int i = 0; i < listBox1.SelectedItems.Count; i++)
{
    switch (listBox1.SelectedItems[i].ToString())
    {
        case "Foobar":
            MessageBox.Show("Foobar");
            break;

        case "Bazquirk":
            MessageBox.Show("Bazquirk");
            break;

        case "Widgets":
            MessageBox.Show("Widgets");
            break;

        case "Gadgets":
            MessageBox.Show("Gadgets");
            break;
    }
}
```









Write code for "Concert Booking" program
Operation of the booking seat plan
Create new file
Open existing file

Question 4
Error handling

Task B

Links

GitHub
http://git-scm.com/book/en/v2/Getting-Started-Git-Basics
https://windows.github.com/
https://help.github.com/articles/set-up-git/
https://github.com/blog/674-introducing-organizations

Microsoft
https://www.visualstudio.com/en-us/products/visual-studio-express-vs.aspx
MSDN microsoft.com
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https://msdn.microsoft.com/en-us/library/hcw1s69b.aspx

Design
SDLC Overview