C#

C SHARP is Microsoft's development of C++, and incorporates object oriented methods more so than does C++. It also incorporates more consistent packaging of what would be extra downloads in other systems. It is complete with an IDE, and the IDE does much of the syntax checking. For documentation, what works well is an internet search on "C# FUNCTIONS TEXT FLOAT TO INTEGER" or some such question. Usually the first few choices will provide the answer. The Visual Express packages were language specific whereas the Visual Studio packages which replaced them are computer specific while covering several languages all in the one package.

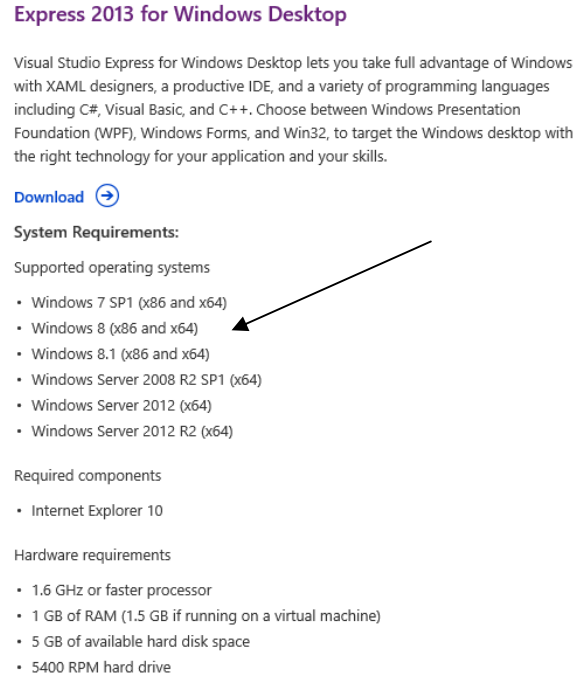
C# Overview
http://en.wikipedia.org/wiki/C_Sharp_(programming_language)#Implementations

A free IDE ~ not needed as the Visual Studio package has an excellent IDE
http://en.wikipedia.org/wiki/SharpDevelop

Microsoft resources: http://msdn.microsoft.com/en-us/vstudio/hh341490.aspx

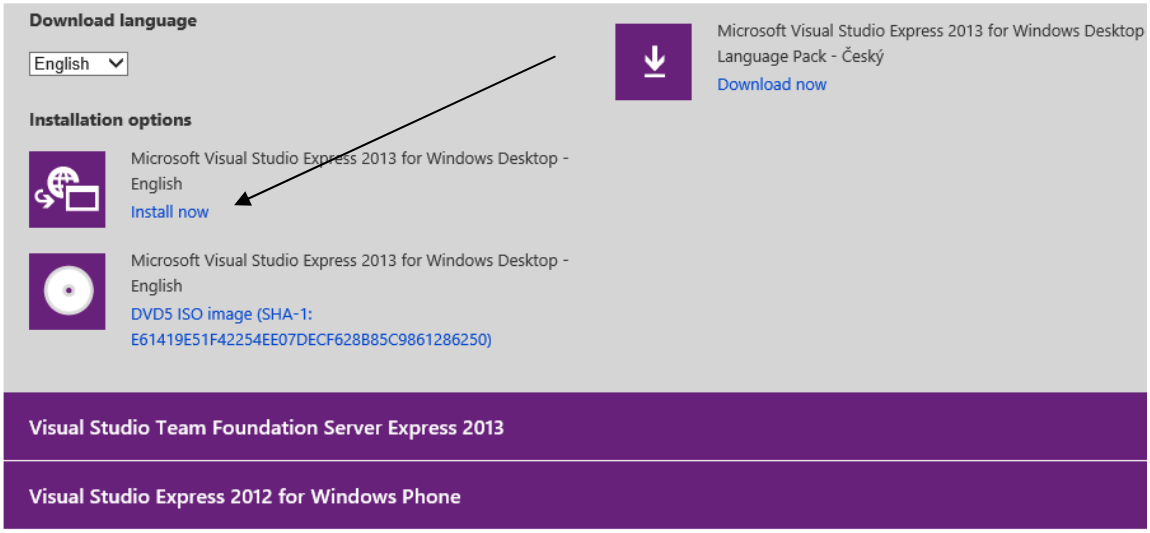
then you must register. This involved an email address and a password that you select. Then it sends a verification email with a link you click on to confirm. Do not be surprised if the link takes you to a page-not-found. I had to try several times.

For Windows 8 use the following, the other choice demands Windows 8.1 and it means it.

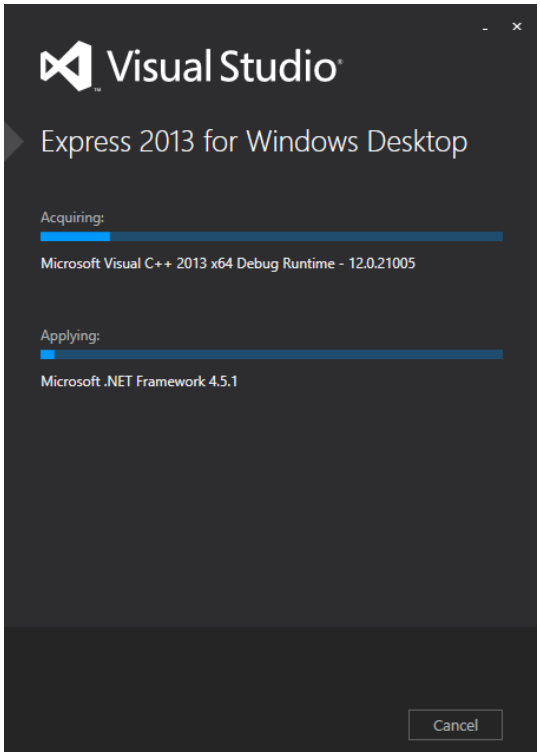


The Microsoft system works first time, and it does generate an exe file and that runs also. This is an improvement over the early editions of the Visual Express applications.

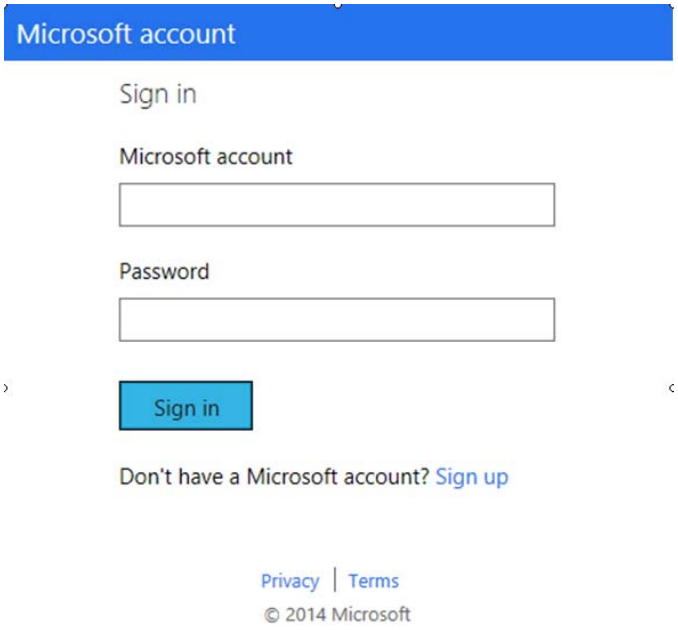
The system is downloaded and installed,, it wants your email and the password you chose for Visual Studio, expect to enter it several times. By the way, while the IDE is excellent at identifying source code problems, it is not overburdened with help, so, check the **NOTE:** sections of this article.

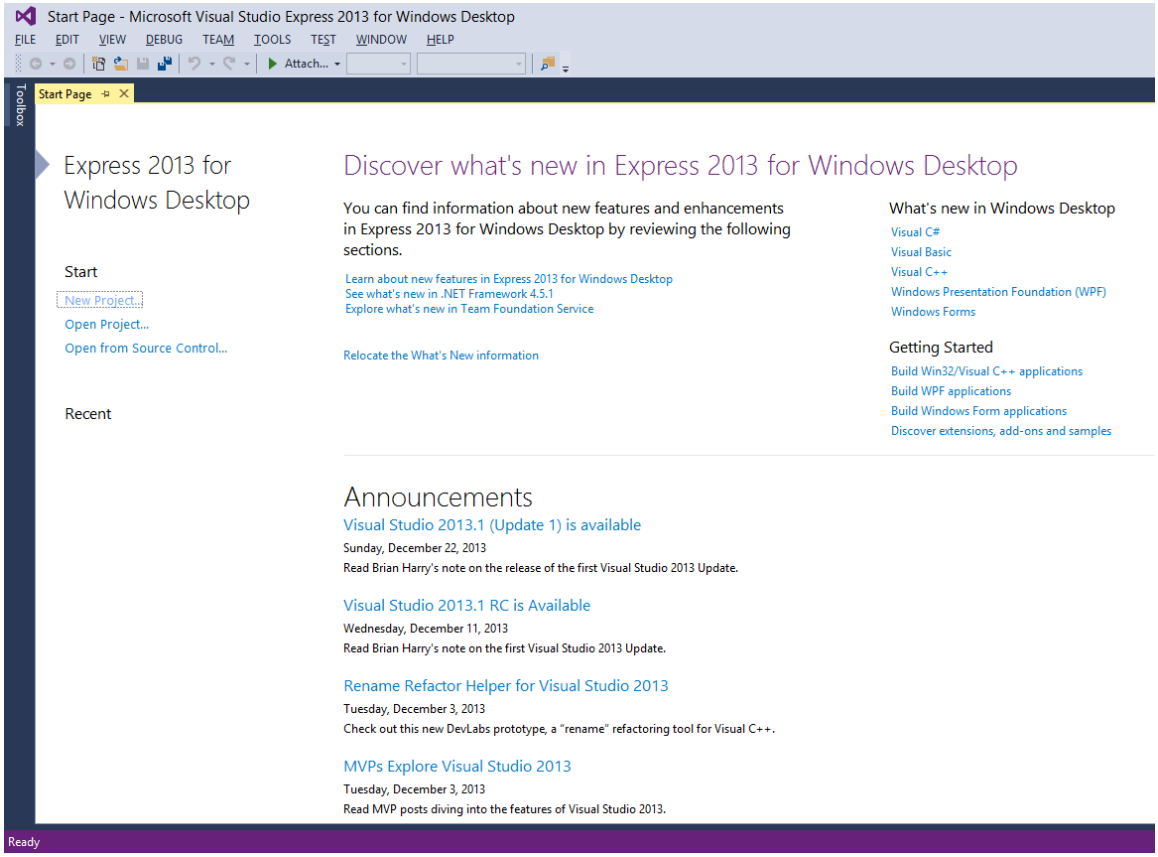


then



After download and installation, a computer restart is required. Then locate the system in the ALL PROGRAMS list as VISUAL STUDIO 2013 and then VS EXPRESS 2013 FOR DESKTOP, and right click and create a desk top entry. Once done, click on the shortcut on the desktop when it will want you to sign in, use the same userid and password as before.





At which point you may get started.

NOTE: A quick note, file names this system generates can be long. Where you can, make them meaningful and short. This is because when you copy them, the complete path and file name character count may exceed the file systems limits. This is a file and folder name issue, nothing to do with the size of the actual files themselves.

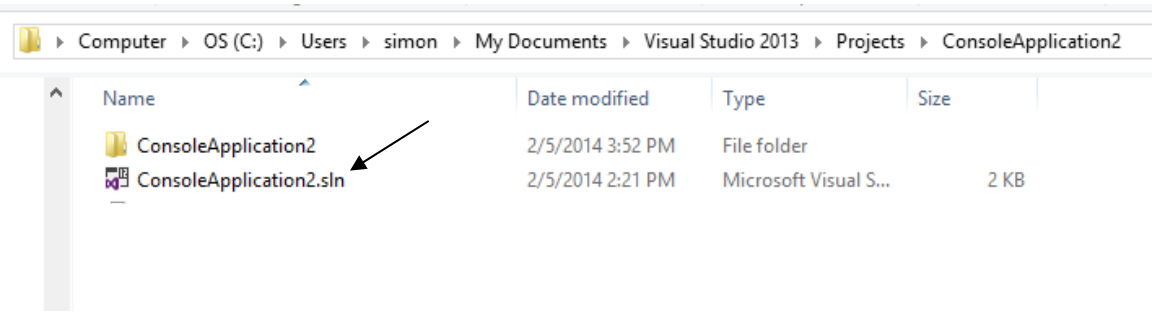
THE SIMPLEST KIND OF APPLICATION ~ CONSOLE APPLICATION TYPE ~ hDial

The simplest form of C# programming is the **Console Application**. Do FILE, NEW PROJECT, then select CONSOLE APPLICATION. You write your programand to test it:-

- BUILD is used to compile and like: BUILD SOLUTION
- DEBUG is used to execute it: DEBUG START DEBUGGING

```
// console application only ~ our copy we will call hDial.cs

using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace ConsoleApplication2
{
    class Program
    {
        static void Main(string[] args)
        {   int i, ii;
            double lat, sinlat, lng, hla, hlat;
            float j, corh;
            string line;

            float fData = 12.345f;      // no reason for this here at all, merely
            int   iData = (int)fData;   // a type conversion

            System.Console.WriteLine("*** Illustrating Shadows ~ hDial.cs in c# ***");
            System.Console.WriteLine("Enter a latitude: ");
            line = System.Console.ReadLine();
            lat = Convert.ToDouble(line);

            System.Console.WriteLine("Enter a longitude offset (+W -E): ");
            line = System.Console.ReadLine();
            lng  = Convert.ToDouble(line);
            corh = (float)(lng * 4 / 60);

            for (i = -6; i < 7; i++)  {

                if (i == 0) { System.Console.WriteLine(" "); };
                if (i == 1) { System.Console.WriteLine(" "); };

                sinlat = Math.Sin(lat * 2 * 3.1416 / 360);

                // get the hour angle of the sun
                ii = (-1) * i;
                j = 15 * (ii + corh);

                /* get the resulting hour line angle ~ atan(sin(lat)*tan(hr*15) */
                hlat = sinlat * Math.Tan(j * 2 * 3.1416 / 360);

                /* get the hour line angle back to degrees */
                hla = 360 * (Math.Atan(hlat)) / (2*3.1416);

                System.Console.WriteLine("Hour: " + i + "hour line angle: " +
                       Math.Round(hla, 2, MidpointRounding.ToEven));
            }
            line = System.Console.ReadLine();
            System.Console.WriteLine("END");
        }
    }
}
```

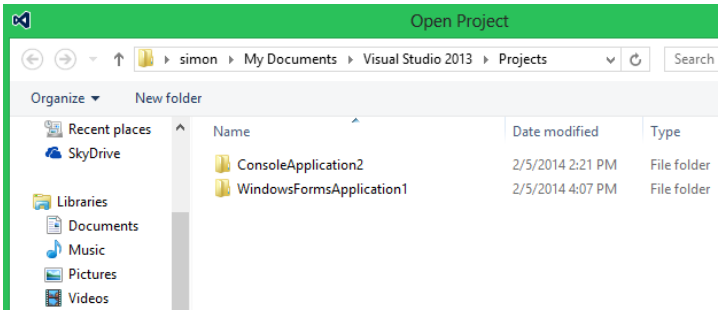
Once saved, you may locate your project is in:--



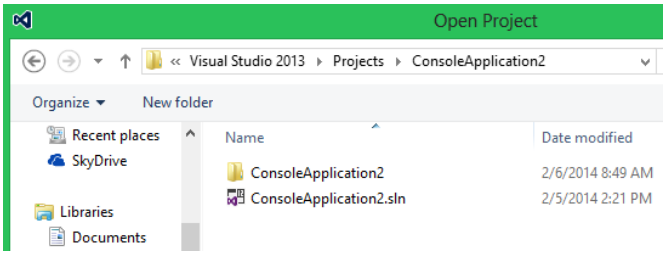
And your copy is only saved in your specified folders if you do a PUBLISH. PUBLISH is used for sending a final copy somewhere somehow. **NOTE:** You can cave the above folders wherever you wiah and restore them back in the event you screw things up badly. I do that.

If you wish to change your application's programming, do:-

FILE, OPEN PROJECT,

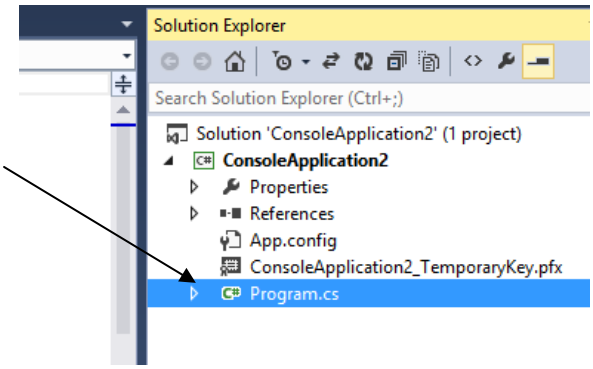


Then click on the desired project folder, and then select the .SLN file (SLN means Microsoft Visual Studio **S**o**l**utio**n**)



NOTE: And if no source code comes up, then locate it as the .CS file

click the Program.cs and it will open up for you to mess with it. Program.cs is the main program. When using forms, then Program.cs invokes your program: Form1.cs etc



The above general principles work for the next two levels of C# programming. Those next two levels use forms. And sometimes when loading the project for changes, the graphical depiction of the form does not appear, only the coded version. The next section for Windows Form Application discusses those issues.

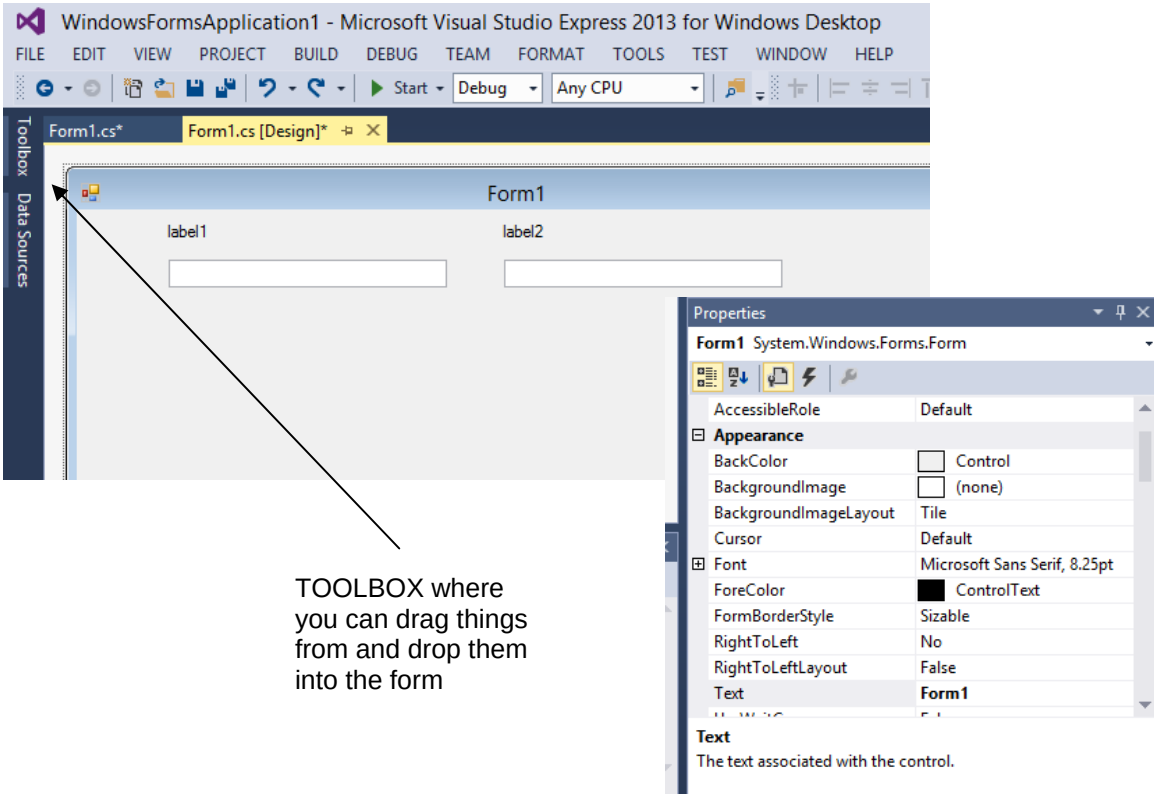
So, the next step is **Windows Form Application**, which is GUI based, but text only, which we will cover next, armed with the above helpful ideas.

http://msdn.microsoft.com/en-us/library/360kwx3z(v=vs.90).aspx

And the next step after that will be WPF, **Windows Presentation Foundation (WPF)** application which allows graphics.

http://msdn.microsoft.com/en-us/library/bb655895(v=vs.90).aspx

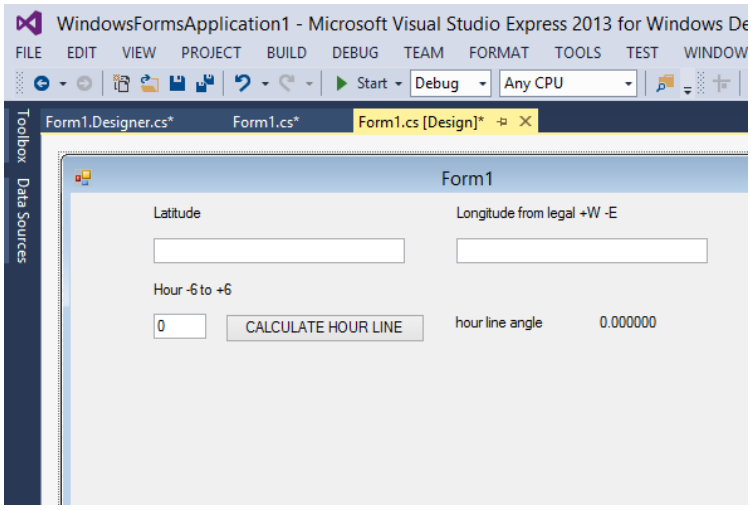
Windows Form Application, which is GUI based, but text only.



TOOLBOX where you can drag things from and drop them into the form

When you do a FILE and then NEW PROJECT, then Windows Form Application, a form will pop up. The process is similar to the Visual Basic process, and the Lazarus GUI process, so only key issues will be discussed here. As with VB and Lazarus, buttons trigger events and they in turn invoke user code. When a BUTTON is double clicked when in the form, a stub of code is generated to handle the event; this is where the guts of the program lie.

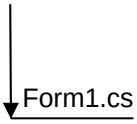
The final form for this application



The key labels are “lat”, “lng”, “hour” for input, with “hla” for output.

The following is the C# program using just forms.

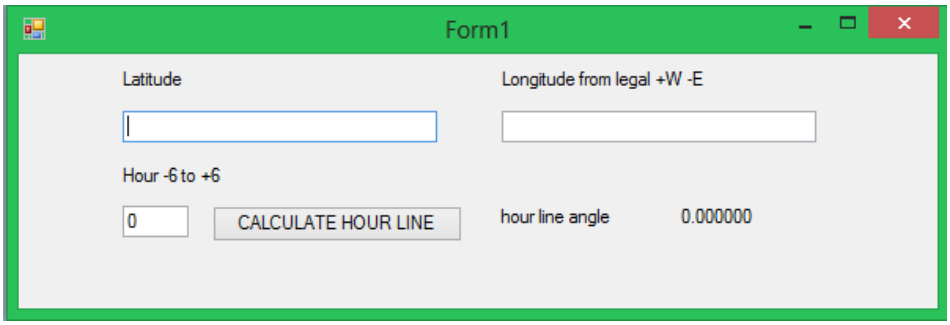
```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Threading.Tasks;
using System.Windows.Forms;
namespace WindowsFormsApplication1
{   static class Program
    {   /// The main entry point for the application.
        [STAThread]
        static void Main()
        {   Application.EnableVisualStyles();
   Application.SetCompatibleTextRenderingDefault(false);
            Application.Run(new Form1());
        }
    }
}
```



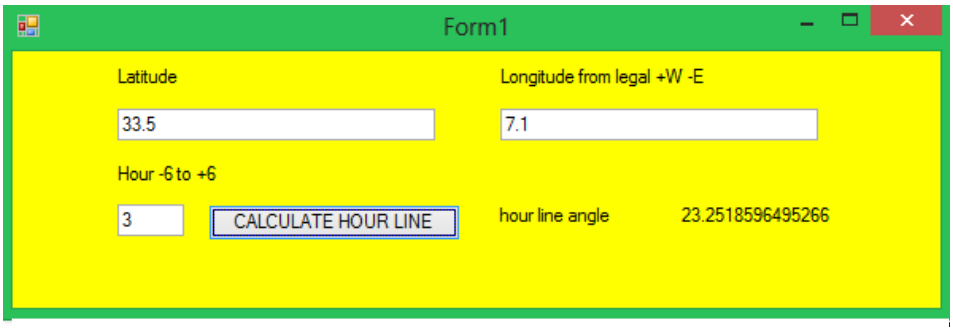

```
using System;                                   // This is Form1.cs, which is invoked by
using System.Collections.Generic;               // Program.cs (see above inset)
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace WindowsFormsApplication1
{
    public partial class Form1 : Form
    {
        public Form1()
        {
            InitializeComponent();
        }

        private void calc_Click(object sender, EventArgs e)
        {
            // get lat and lng and calculate hla
            double dHLA = 100.000;
            string sHLA = "123.45";
            this.BackColor = Color.Yellow;

            double dLAT, dLNG, dHOUR;
            // string sLAT, sLNG, sHOUR;

            dLAT  = Convert.ToDouble(lat.Text);  // Get the data
            dLNG  = Convert.ToDouble(lng.Text);
            dHOUR = Convert.ToDouble(hour.Text);
            dHOUR = dHOUR - (4 * dLNG / 60);

            dHLA = Math.Atan( Math.Sin(dLAT *2*3.1416/360)  *
                              Math.Tan(15*dHOUR*2*3.1416/360) ) ;
            dHLA = 360  *  dHLA  /  (2*3.1416);
            dHLA = Math.Round(dHLA, 3, MidpointRounding.ToEven);
            sHLA = Convert.ToString(dHLA);

            hla.Text = sHLA;                    // Put the data
        }


    }
}
```

This is the simplest form of C# programming for a TEXT FORM.

BUILD is used to compile and like: BUILD SOLUTION
DEBUG is used to execute it: DEBUG START DEBUGGING



And the result it:-

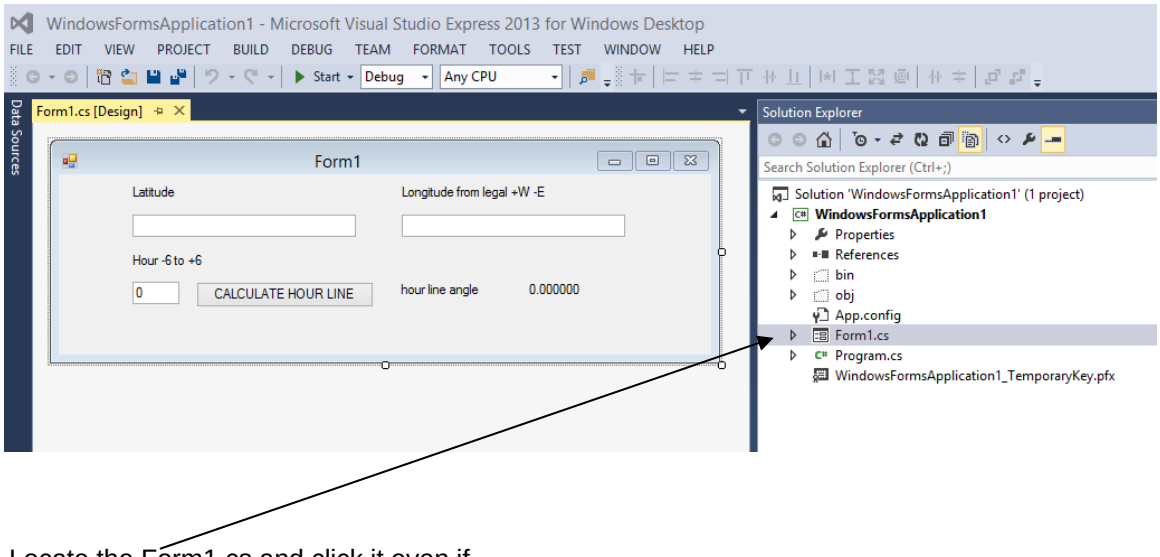


TIME OF DAY		Horizontal hour line angles with long corr	
am	pm	am	pm
12.00	12.00	3.93	-3.93
11.50	0.50	8.18	0.22
11.00	1.00	12.63	4.38
10.50	1.50	17.41	8.64
10.00	2.00	22.66	13.12
9.50	2.50	28.56	17.94
9.00	3.00	35.34	23.25
8.50	3.50	43.25	29.24
8.00	4.00	52.57	36.12
7.50	4.50	63.48	44.17
7.00	5.00	75.89	53.66
6.50	5.50	89.28	64.74
6.00	6.00	-77.28	77.28
		These have longitude correction	

For latitude 33.5 and longitude 112.1 from legal meridian of 105, we have the +7.1 longitude correction. Then, at 3pm we get an HLA of 23.25 degrees, which matches the Excel spreadsheet.

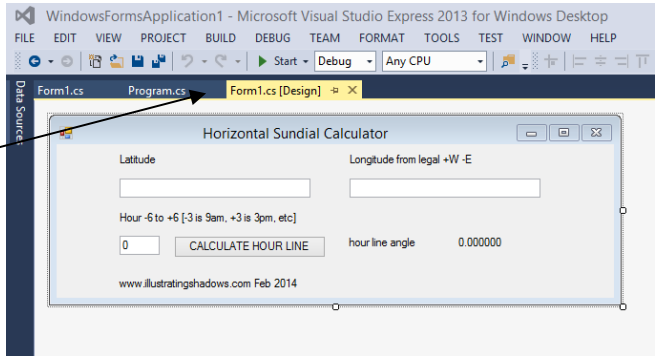
The general principles for console applications work for this (Windows Form Application) and the next level, Windows Presentation Foundation (WPF) of C# programming. These two levels use forms.

NOTE: Sometimes when loading the project for changes, the graphical depiction of the form does not appear, only the coded version. So, how does one get the graphical depiction to re-appear?



Locate the Form1.cs and click it even if the IDE shows Form1.cs as being there in the IDE. This will get Form1.cs [Design]

Whereas Program.cs was the main program in the console application, things are now different.



Form1.cs is actually the user program now, and with it should come up the form layout. With forms, the Program.cs is the code stub that invokes the Form code which is the main guts of the program.

NOTE: If that does not work, try VIEW on the top menu bar and then VIEW DESIGNER.

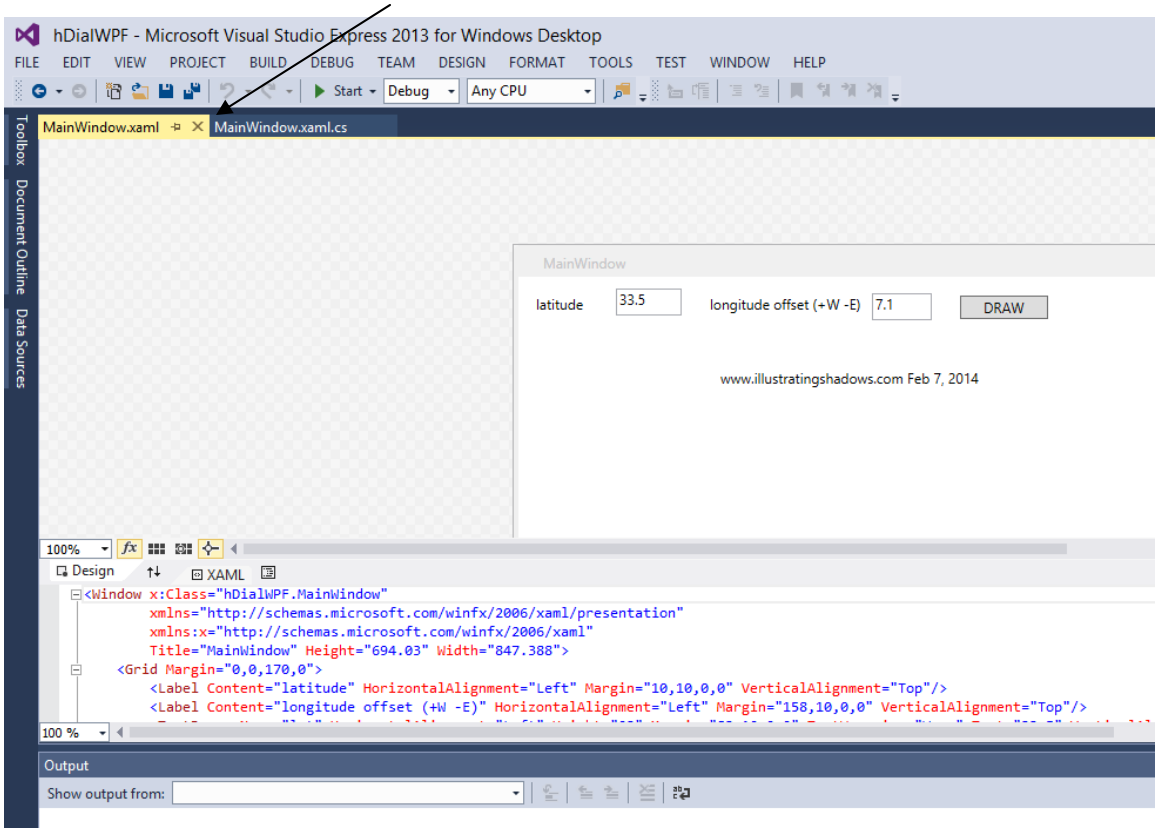
NOTE: Sometimes the forms design comes up but not its associated program. In that case use FILE, OPEN, and open the Form1.cs file.

Windows Presentation Foundation (WPF) application

The most advanced application for the PC is however the WPF. There are a couple of graphical systems provided with WPF, one is “stackpanel”, the other is “canvas”. Not being over supplied with documentation, I tried “stackpanel” first, it did what it implied, it stacked graphical objects one below the other. So then I tried “canvas” which I have used before with “Java Script”. That worked well.

As before, a form was designed, and that will be also where the graphics is displayed, obliterating the buttons and so on.

The main program is called by default “MainWindow.xaml.cs”



The code was fairly straight forward, and since this is part of the PBE (programming by example) system, there are labels holding data, hour lines, and circles as well all displayed.

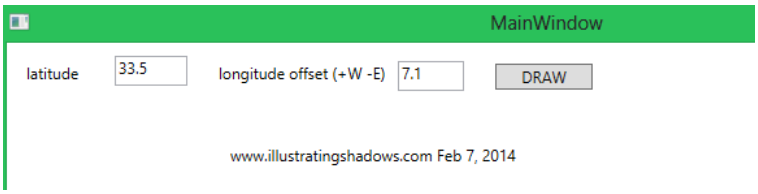
```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows;
using System.Windows.Controls;
using System.Windows.Data;
using System.Windows.Documents;
using System.Windows.Input;
using System.Windows.Media;
using System.Windows.Media.Imaging;
using System.Windows.Navigation;
using System.Windows.Shapes;

namespace hDialWPF
```

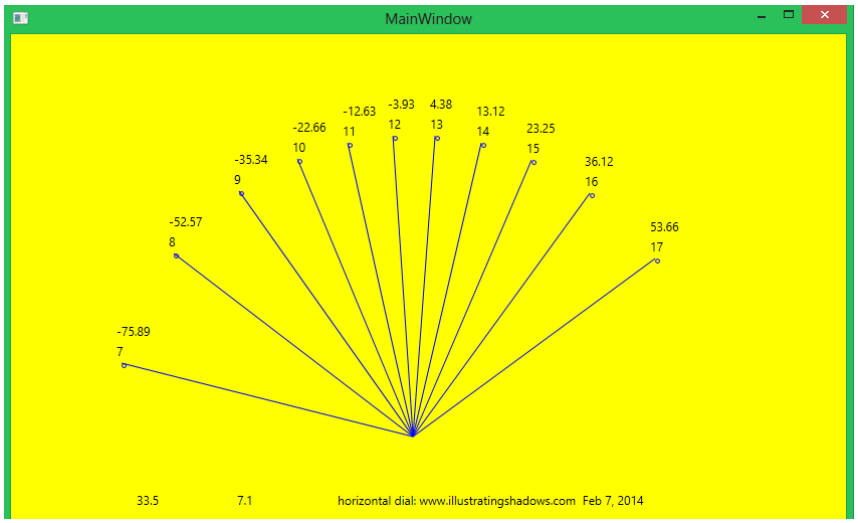
a FILE, NEW PROJECT, WPF Application generated by the IDE when you do

```
{
    /// <summary>
    /// Interaction logic for MainWindow.xaml
    /// </summary>
    public partial class MainWindow : Window
    {
        public MainWindow()
        {
            InitializeComponent();
        }

        private void drawDial_Click(object sender, RoutedEventArgs e)
        {
            // this is where we come when DRAW is clicked
            // in Windows Form Application we used:    this.BackColor = Color.Yellow;
            // In WPF (Windows Presentation Foundation) we use:
            this.Background = Brushes.Yellow;
            // http://stackoverflow.com/questions/979876/set-background-color-of-wpf-textbox-in-c-sharp-code

            // get lat and lng and calculate hla
            double dHLA, corrM;
            string lLat = "23.456";

            double dLAT, dLNG, dHOUR, sLat;
            // string sLAT, sLNG, sHOUR;

            dLAT = Convert.ToDouble(this.lat.Text);  // Get the data
            dLNG = Convert.ToDouble(this.lng.Text);
            sLat = Math.Sin(dLAT * 2 * 3.1416 / 360);

            corrM = 4 * Convert.ToDouble(this.lng.Text);
            corrM = Math.Round(corrM, 2, MidpointRounding.ToEven);
            // the following works but is not displayed as the graph trashes the window
               this.corr.Content = Convert.ToString(corrM);
               this.corrNote.Content = "Minutes";

            double radius = 300.0;

            // do not use "stackpanel" as it does what it says, stacks graphical images
            // do use "canvas" http://www.c-sharpcorner.com/uploadfile/mahesh/canvas-in-wpf/
            Canvas myCan = new Canvas();

            for (int hr = -5; hr <= 5; hr++)
            {
                dHOUR = hr - (corrM / 60);
                dHLA  = Math.Atan(sLat * Math.Tan(15 * dHOUR * 2 * 3.1416 / 360));
                dHLA  = 360 * dHLA / (2 * 3.1416);  // dHLA is now in degrees
                dHLA  = Math.Round(dHLA, 3, MidpointRounding.ToEven);

                if (hr == 0)
                { // at noon state the noon hour line angle
                  // the following works but is not displayed as graph trashes it
                    this.noonName.Content = "Noon hla:";
                    this.noonHla.Content = Convert.ToString(dHLA);
                }

                // http://msdn.microsoft.com/en-us/library/ms747393(v=vs.110).aspx
                // hla.Text = sHLA;                 // Put the data

                // Add a Line Element
                // NOTE: the web page's example differs on this line
                Line    myLine = new Line();
                Label   myHr   = new Label();
                Label   myHla  = new Label();
                myLine.Stroke = System.Windows.Media.Brushes.Blue;
                myLine.X1 = 400;                // dial center
                myLine.Y1 = 400;

                // NOTE: X2 is a displacement from X1, and ditto Y2
                myLine.X2 = myLine.X1+(int)(radius * Math.Sin(dHLA * 2 * 3.1416 / 360));
                myLine.Y2 = myLine.Y1-(int)(radius * Math.Cos(dHLA * 2 * 3.1416 / 360));
                myLine.StrokeThickness = 1;
```

also IDE generated

```
                myHr.Content = Convert.ToString(hr+12);
                    Canvas.SetLeft(myHr, myLine.X2-10);
                    Canvas.SetTop (myHr, myLine.Y2-25);

                myHla.Content = Convert.ToString(Math.Round(dHLA,
                                2, MidpointRounding.ToEven));
                    Canvas.SetLeft(myHla, myLine.X2 - 10);
                    Canvas.SetTop (myHla, myLine.Y2 - 45);

                Ellipse dot = new Ellipse();
                    dot.Height = 5;    dot.Width  = 5;    dot.StrokeThickness = 1;
                    dot.Stroke = System.Windows.Media.Brushes.Blue;
                    Canvas.SetLeft(dot, myLine.X2);
                    Canvas.SetTop (dot, myLine.Y2);

                myCan.Children.Add(myLine);
                myCan.Children.Add(myHr);
                myCan.Children.Add(myHla);
                myCan.Children.Add(dot);
            }

            Label details = new Label();
            Canvas.SetLeft(details, 120);
            Canvas.SetTop (details, 450);
            details.Content = this.lat.Text;
            myCan.Children.Add(details);

            Label offset = new Label();
            Canvas.SetLeft(offset, 220);
            Canvas.SetTop(offset, 450);
            offset.Content = this.lng.Text;
            myCan.Children.Add(offset);

            Label who = new Label();
            Canvas.SetLeft(who, 320);
            Canvas.SetTop(who, 450);
            who.Content = "horizontal dial: www.illustratingshadows.com  Feb 7, 2014";
            myCan.Children.Add(who);

            this.Content = myCan;
        }
    }
}
```





And finally, the online tutorial:-

http://msdn.microsoft.com/library/vstudio/dd492171(v=vs.120)