VISUAL BASIC/

C# PROGRAMMING

(330)

REGIONAL – 2019

**Production Portion:**

Program 1: Unit Conversion Utility (400 points)

***TOTAL POINTS***  *(400 points)*

**Graders: Please double check and verify all scores and answer keys!**

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*Workplace Skills Assessment Program* competition.

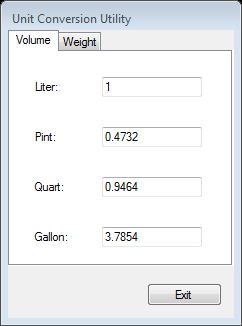
# Unit Conversion Utility

Responsive applications that do not require any sort of buttons to confirm operation are intuitive and easy to use. In this exercise, you will create a Visual Basic or C# Windows Form Application that handles the functionality of unit conversion to handle instant computation as soon as the input value is changed. For simplicity, only volume and weight conversions will be explored.

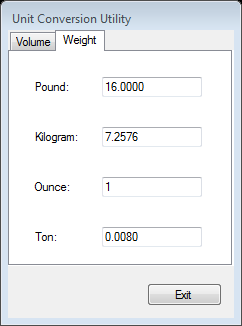
**Requirements:**

1. You must create a C#/VB Windows Form Application named CS \_330\_ContestantNumber, where ContestantNumber is your BPA assigned contestant number (including dashes). For example, CS\_330\_01\_2345\_6789. If you are using VB, use VB instead of CS in the application name.
2. Your name and contestant number must appear as a comment at the top of the main source code file.
3. Application on Exit button press must ask for confirmation to close, with the Title of the confirmation box being “Confirm” and the text being “Are you sure you wish to exit the Unit Conversion Utility?”
   1. Exit button must be named “exitButton”
4. The main form must not have minimize, maximize, or close buttons in the Form Handle.
5. The main form must have text “Unit Conversion Utility” for its title.
6. The main form must have a tab control containing two tabs.
   1. The tab control must be named “unitTabs”, with Dock set to Top.
   2. The first tab must be named “volumePage” with text “Volume.” It must also have four labels and four textboxes, with label text “Liter:”, “Pint:”, “Quart:”, “Gallon:”, and names “literBox” ,”pintBox”, “quartBox”, “gallonBox”.
   3. The second tab must be named “weightPage” with text “Weight.” It must also have four labels and four textboxes, with label text “Pound:”, “Kilogram:”, “Ounce:”, “Ton:”, and names “poundBox”, ”kgBox”, “ounceBox”, “tonBox”.
7. All textboxes must be tied to the same KeyPress event that blocks all non-digit or decimal input. Only one decimal is allowed in a textbox (i.e. 2.00 is valid, 2.00.0 is invalid).
8. On loading the main form, the application must load in the conversion factors from the file “convdata.txt”.
   1. Volume conversion data is on the first line, ordered by liter, pint, quart, and gallon.
   2. Weight conversion data is on the second line, ordered by pound, kilogram, ounce, and ton.
   3. Conversion is scaled by the first unit, thus in the case of volume 1 liter is equivalent to 0.4732 pints.
9. All textboxes must be tied to TextChanged events that parses the current input, then assigns the correct converted value to all other textboxes, displayed to the fourth decimal place.
   1. Hint: parse the current value, divide it by its conversion factor to normalize it, then for the other three boxes multiply by the corresponding conversion factor.
   2. Hint: use the Focused attribute to avoid infinite loops.

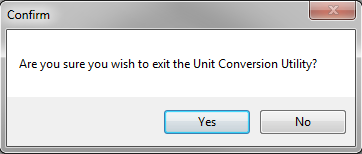
**Sample Pictures:**



**Figure 1:** The volume tab with an input of 1 in the liter field. Note that the pint, quart, and gallon fields output their conversion factor.



**Figure 2:** The volume tab with an input of 1 in the ounce field. Note that the pound, kilogram, and ton fields take the input from the ounce field, scaled by the ounce to pound conversion factor, and then scale it back to the corresponding to pound conversion factor.



**Figure 3:** The confirmation window. This should be opened when Exit is pressed. If “Yes” is clicked, the application should close, otherwise return to the main form.

You will have ninety (90) minutes to complete your work.

Your name and/or school name should *not* appear on any work you submit for grading.

Submit a copy your entire solution/project to the flash drive provided. You must submit your entire solution/project so that the graders may open your project to review the source code and/or build and execute your solution/project. **Submissions that do not contain source code will not be graded**.

Development Standards

* Standard name prefixes must be utilized for variables.
* All subroutines, functions, and methods must be documented with comments explaining the purpose of the method, the input parameters (if any), and the output (if any).

Your application will be graded on the following criteria:

**Solution and Project**

The project is present on the flash drive \_\_\_\_ 10 pts

The project is named according to the naming conventions \_\_\_\_ 10 pts

**Program Execution**

Code copied to USB drive and program runs from USB \_\_\_\_ 20 pts

*If the program does not execute, then the remaining items in the program executive section receive a score of zero.*

The program contains an Exit button that asks for user confirmation \_\_\_\_ 25 pts

The exit button is named “exitButton” \_\_\_\_ 15 pts

The main form does not have minimize, maximize, or close buttons

in the Form Handle \_\_\_\_ 25 pts

The main form has a tab control named “unitTabs” with Dock is set to Top \_\_\_\_ 25 pts

“unitTabs” control has a “volumePage” and a “weightPage” with correct text \_\_\_\_ 25 pts

Each tab page has the correct text boxes and labels \_\_\_\_ 25 pts

All text boxes have proper input validation \_\_\_\_ 25 pts

On form load, conversion data is loaded properly \_\_\_\_ 25 pts

On input change, conversions are performed automatically \_\_\_\_ 20 pts

Conversions are performed correctly \_\_\_\_ 30 pts

**Source Code Review**

Code is commented at the top, for each function, and as needed \_\_\_\_ 10 pts

Code uses reasonable and consistent variable naming conventions \_\_\_\_ 10 pts

Code for reading convdata.txt is present \_\_\_\_ 10 pts

Code for parsing the input file is present \_\_\_\_ 10 pts

Code for volConv array is present \_\_\_\_ 20 pts

Code for wgtConv array is present \_\_\_\_ 20 pts

Code to limit character input to numbers and decimal points is present \_\_\_\_ 20 pts

Code to update text fields is present \_\_\_\_ 20 pts

**Total Points:** \_\_\_\_ **/ 400 pts**

SOURCE

Form1.cs

using System;

using System.Collections.Generic;

using System.ComponentModel;

using System.Data;

using System.Drawing;

using System.IO;

using System.Linq;

using System.Text;

using System.Threading.Tasks;

using System.Windows.Forms;

namespace unitconverter

{

public partial class Form1 : Form

{

double[] volConv = new double[4];

double[] wgtConv = new double[4];

void ReadConversionData()

{

FileStream fs = new FileStream("convdata.txt", FileMode.Open, FileAccess.Read);

using (StreamReader sr = new StreamReader(fs))

{

string[] tokens = sr.ReadLine().Split(' ');

for (int i = 0; i < tokens.Count(); i++)

volConv[i] = double.Parse(tokens[i]);

tokens = sr.ReadLine().Split(' ');

for (int i = 0; i < tokens.Count(); i++)

wgtConv[i] = double.Parse(tokens[i]);

}

}

public Form1()

{

InitializeComponent();

ReadConversionData();

}

private void literBox\_TextChanged(object sender, EventArgs e)

{

if (literBox.Focused)

{

double tarVal = double.Parse(literBox.Text) / volConv[0];

pintBox.Text = (tarVal \* volConv[1]).ToString("N4");

quartBox.Text = (tarVal \* volConv[2]).ToString("N4");

gallonBox.Text = (tarVal \* volConv[3]).ToString("N4");

}

}

private void pintBox\_TextChanged(object sender, EventArgs e)

{

if (pintBox.Focused)

{

double tarVal = double.Parse(pintBox.Text) / volConv[1];

literBox.Text = (tarVal \* volConv[0]).ToString("N4");

quartBox.Text = (tarVal \* volConv[2]).ToString("N4");

gallonBox.Text = (tarVal \* volConv[3]).ToString("N4");

}

}

private void quartBox\_TextChanged(object sender, EventArgs e)

{

if (quartBox.Focused)

{

double tarVal = double.Parse(quartBox.Text) / volConv[2];

pintBox.Text = (tarVal \* volConv[1]).ToString("N4");

literBox.Text = (tarVal \* volConv[0]).ToString("N4");

gallonBox.Text = (tarVal \* volConv[3]).ToString("N4");

}

}

private void gallonBox\_TextChanged(object sender, EventArgs e)

{

if (gallonBox.Focused)

{

double tarVal = double.Parse(gallonBox.Text) / volConv[3];

pintBox.Text = (tarVal \* volConv[1]).ToString("N4");

quartBox.Text = (tarVal \* volConv[2]).ToString("N4");

literBox.Text = (tarVal \* volConv[0]).ToString("N4");

}

}

private void poundBox\_TextChanged(object sender, EventArgs e)

{

if (poundBox.Focused)

{

double tarVal = double.Parse(poundBox.Text) / wgtConv[0];

kgBox.Text = (tarVal \* wgtConv[1]).ToString("N4");

ounceBox.Text = (tarVal \* wgtConv[2]).ToString("N4");

tonBox.Text = (tarVal \* wgtConv[3]).ToString("N4");

}

}

private void kgBox\_TextChanged(object sender, EventArgs e)

{

if (kgBox.Focused)

{

double tarVal = double.Parse(kgBox.Text) / wgtConv[1];

poundBox.Text = (tarVal \* wgtConv[0]).ToString("N4");

ounceBox.Text = (tarVal \* wgtConv[2]).ToString("N4");

tonBox.Text = (tarVal \* wgtConv[3]).ToString("N4");

}

}

private void ounceBox\_TextChanged(object sender, EventArgs e)

{

if (ounceBox.Focused)

{

double tarVal = double.Parse(ounceBox.Text) / wgtConv[2];

kgBox.Text = (tarVal \* wgtConv[1]).ToString("N4");

poundBox.Text = (tarVal \* wgtConv[0]).ToString("N4");

tonBox.Text = (tarVal \* wgtConv[3]).ToString("N4");

}

}

private void tonBox\_TextChanged(object sender, EventArgs e)

{

if (tonBox.Focused)

{

double tarVal = double.Parse(tonBox.Text) / wgtConv[3];

kgBox.Text = (tarVal \* wgtConv[1]).ToString("N4");

ounceBox.Text = (tarVal \* wgtConv[2]).ToString("N4");

poundBox.Text = (tarVal \* wgtConv[0]).ToString("N4");

}

}

private void checkKeyPress(object sender, KeyPressEventArgs e)

{

e.Handled = (!char.IsDigit(e.KeyChar) && !char.IsControl(e.KeyChar) && (e.KeyChar != '.')) // allow numbers

|| ((e.KeyChar == '.') && ((sender as TextBox).Text.IndexOf('.') > -1)); // allow 1 decimal point

}

private void exitButton\_Click(object sender, EventArgs e)

{

if (MessageBox.Show("Are you sure you wish to exit the Unit Conversion Utility?", "Confirm",

MessageBoxButtons.YesNo) == System.Windows.Forms.DialogResult.Yes)

{

this.Close();

}

}

}

}

**Visual Basic Source Code Example**

Imports System

Imports System.Collections.Generic

Imports System.ComponentModel

Imports System.Data

Imports System.Drawing

Imports System.IO

Imports System.Linq

Imports System.Text

Imports System.Threading.Tasks

Imports System.Windows.Forms

Namespace unitconverter

Public Partial Class Form1

Inherits Form

Private volConv As Double() = New Double(3) {}

Private wgtConv As Double() = New Double(3) {}

Private Sub ReadConversionData()

Dim fs As FileStream = New FileStream("convdata.txt", FileMode.Open, FileAccess.Read)

Using sr As StreamReader = New StreamReader(fs)

Dim tokens As String() = sr.ReadLine().Split(" "c)

For i As Integer = 0 To tokens.Count() - 1

volConv(i) = Double.Parse(tokens(i))

Next

tokens = sr.ReadLine().Split(" "c)

For i As Integer = 0 To tokens.Count() - 1

wgtConv(i) = Double.Parse(tokens(i))

Next

End Using

End Sub

Public Sub New()

InitializeComponent()

ReadConversionData()

End Sub

Private Sub literBox\_TextChanged(ByVal sender As Object, ByVal e As EventArgs)

If literBox.Focused Then

Dim tarVal As Double = Double.Parse(literBox.Text) / volConv(0)

pintBox.Text = (tarVal \* volConv(1)).ToString("N4")

quartBox.Text = (tarVal \* volConv(2)).ToString("N4")

gallonBox.Text = (tarVal \* volConv(3)).ToString("N4")

End If

End Sub

Private Sub pintBox\_TextChanged(ByVal sender As Object, ByVal e As EventArgs)

If pintBox.Focused Then

Dim tarVal As Double = Double.Parse(pintBox.Text) / volConv(1)

literBox.Text = (tarVal \* volConv(0)).ToString("N4")

quartBox.Text = (tarVal \* volConv(2)).ToString("N4")

gallonBox.Text = (tarVal \* volConv(3)).ToString("N4")

End If

End Sub

Private Sub quartBox\_TextChanged(ByVal sender As Object, ByVal e As EventArgs)

If quartBox.Focused Then

Dim tarVal As Double = Double.Parse(quartBox.Text) / volConv(2)

pintBox.Text = (tarVal \* volConv(1)).ToString("N4")

literBox.Text = (tarVal \* volConv(0)).ToString("N4")

gallonBox.Text = (tarVal \* volConv(3)).ToString("N4")

End If

End Sub

Private Sub gallonBox\_TextChanged(ByVal sender As Object, ByVal e As EventArgs)

If gallonBox.Focused Then

Dim tarVal As Double = Double.Parse(gallonBox.Text) / volConv(3)

pintBox.Text = (tarVal \* volConv(1)).ToString("N4")

quartBox.Text = (tarVal \* volConv(2)).ToString("N4")

literBox.Text = (tarVal \* volConv(0)).ToString("N4")

End If

End Sub

Private Sub poundBox\_TextChanged(ByVal sender As Object, ByVal e As EventArgs)

If poundBox.Focused Then

Dim tarVal As Double = Double.Parse(poundBox.Text) / wgtConv(0)

kgBox.Text = (tarVal \* wgtConv(1)).ToString("N4")

ounceBox.Text = (tarVal \* wgtConv(2)).ToString("N4")

tonBox.Text = (tarVal \* wgtConv(3)).ToString("N4")

End If

End Sub

Private Sub kgBox\_TextChanged(ByVal sender As Object, ByVal e As EventArgs)

If kgBox.Focused Then

Dim tarVal As Double = Double.Parse(kgBox.Text) / wgtConv(1)

poundBox.Text = (tarVal \* wgtConv(0)).ToString("N4")

ounceBox.Text = (tarVal \* wgtConv(2)).ToString("N4")

tonBox.Text = (tarVal \* wgtConv(3)).ToString("N4")

End If

End Sub

Private Sub ounceBox\_TextChanged(ByVal sender As Object, ByVal e As EventArgs)

If ounceBox.Focused Then

Dim tarVal As Double = Double.Parse(ounceBox.Text) / wgtConv(2)

kgBox.Text = (tarVal \* wgtConv(1)).ToString("N4")

poundBox.Text = (tarVal \* wgtConv(0)).ToString("N4")

tonBox.Text = (tarVal \* wgtConv(3)).ToString("N4")

End If

End Sub

Private Sub tonBox\_TextChanged(ByVal sender As Object, ByVal e As EventArgs)

If tonBox.Focused Then

Dim tarVal As Double = Double.Parse(tonBox.Text) / wgtConv(3)

kgBox.Text = (tarVal \* wgtConv(1)).ToString("N4")

ounceBox.Text = (tarVal \* wgtConv(2)).ToString("N4")

poundBox.Text = (tarVal \* wgtConv(0)).ToString("N4")

End If

End Sub

Private Sub checkKeyPress(ByVal sender As Object, ByVal e As KeyPressEventArgs)

e.Handled = (Not Char.IsDigit(e.KeyChar) AndAlso Not Char.IsControl(e.KeyChar) AndAlso (e.KeyChar <> "."c)) OrElse ((e.KeyChar = "."c) AndAlso ((TryCast(sender, TextBox)).Text.IndexOf("."c) > -1))

End Sub

Private Sub exitButton\_Click(ByVal sender As Object, ByVal e As EventArgs)

If MessageBox.Show("Are you sure you wish to exit the Unit Conversion Utility?", "Confirm", MessageBoxButtons.YesNo) = System.Windows.Forms.DialogResult.Yes Then

Me.Close()

End If

End Sub

End Class

End Namespace