
SOLUTIONS MANUAL
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TUTORIAL 3

Welcome Application

Introduction to Visual Programming

Objectives

In this tutorial, you will learn to:

- Set the text in the `Form`'s title bar.
- Change the `Form`'s background color.
- Place a `Label` control on the `Form`.
- Display text in a `Label` control.
- Place a `PictureBox` control on the `Form`.
- Display an image in a `PictureBox` control.
- Execute an application.

Outline

MULTIPLE-CHOICE QUESTIONS

3.1 Property _____ determines the `Form`'s background color.

a) `BackColor` b) `BackgroundColor`
c) `RGB` d) `Color`

3.2 To save all the project's files, select _____.

a) **Save > Solution > Save Files** b) **File > Save**
c) **File > Save All** d) **File > Save As...**

3.3 When the ellipsis `Button` to the right of the **Font** property value is clicked, the _____ is displayed.

a) **Font Property** dialog b) **New Font** dialog
c) **Font Settings** dialog d) **Font** dialog

3.4 `PictureBox` property _____ contains a preview of the image displayed in the `PictureBox`.

a) `Picture` b) `ImageName`
c) `Image` d) `PictureName`

3.5 When setting the `BackColor` property, the _____ tab allows you to create your own color.

a) **Custom** b) **Web**
c) **System** d) **User**

3.6 The `PictureBox` class has namespace _____.

a) `System.Windows.Forms` b) `System.Form.Form`
c) `System.Form.Font` d) `System.Form.Control`

3.7 A `Label` control displays the text specified by property _____.

a) `Caption` b) `Data`
c) `Text` d) `Name`

3.8 In _____ mode, the application is executing.

a) start b) run
c) break d) design

3.9 The _____ command prevents programmers from accidentally altering the size and location of the `Form`'s controls.

a) **Lock Controls** b) **Anchor Controls**
c) **Lock** d) **Bind Controls**

3.10 Pixels are _____.

a) picture elements b) controls in the **Toolbox**
c) a set of fonts d) a set of colors on the **Web** tab

Answers: 3.1) a. 3.2) c. 3.3) d. 3.4) c. 3.5) a. 3.6) a. 3.7) c. 3.8) b. 3.9) a. 3.10) a.

EXERCISES

For Exercises 3.11–3.16, you're asked to create the GUI shown in each exercise. You use the visual programming techniques presented in this tutorial to create a variety of GUIs. You are creating only GUIs, therefore your applications will not be fully operational. For example, the **Calculator** *GUI in Exercise 3.11 does not behave like a calculator when its* `Button`*s are clicked. You learn how to make your applications fully operational in later tutorials. Create each application as a separate project. If you accidentally double click a control in* ***Design*** *view, the IDE displays the* `Form`*'s source code. To return to* ***Design*** *view, select* ***View > Designer****.*

3.11 ***(Calculator GUI)*** Create the GUI for the calculator shown in Fig. 3.35.

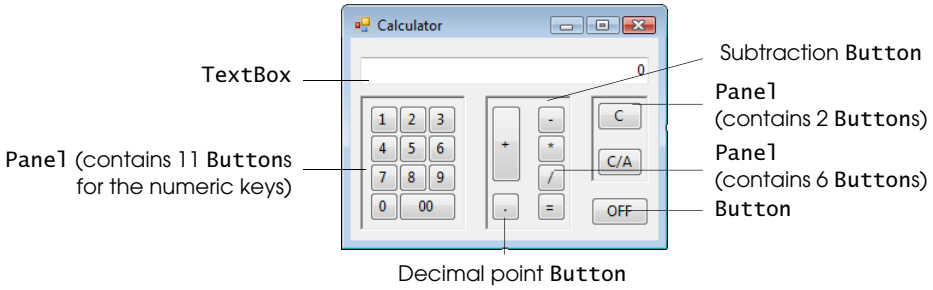
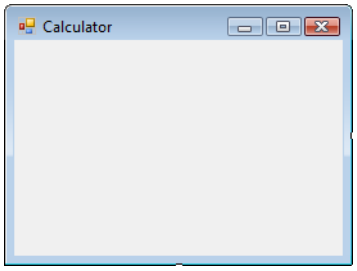


Figure 3.35 **Calculator** GUI.

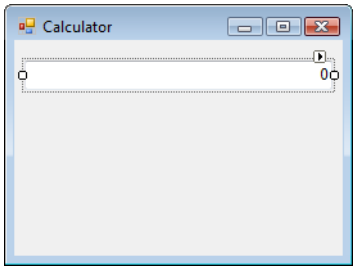
a) ***Creating a new project.*** Create a new **Windows Forms Application** named `Calculator`.

b) ***Renaming the Form file.*** Name the `Form` file `Calculator.vb`.

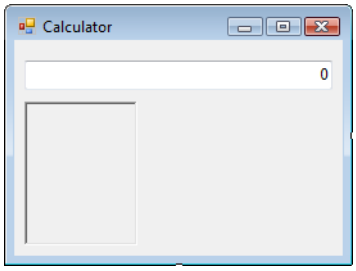
c) ***Manipulating the Form's properties.*** Change the `Text` property of the `Form` to `Calculator`. Change the `Font` property to 9pt `Segoe UI`. Change the `Size` property of the `Form` to `272, 204`. Note that Visual Studio resizes a `Form` when you change its font size. *Be sure to set the font size before setting the* `Form`*'s size.*



d) ***Adding a* `TextBox` *to the Form.*** Add a `TextBox` control by double clicking it in the **Toolbox**. A `TextBox` control is used to enter input into applications. Set the `TextBox`'s `Text` property in the **Properties** window to `0`. Change the `Size` property to `240, 23`. Set the `TextAlign` property to `Right`; this right aligns text displayed in the `TextBox`. Finally, set the `TextBox`'s `Location` property to `8, 16`—this property specifies where the upper-left corner of the control is placed on the form.

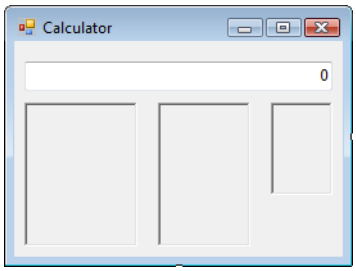


e) ***Adding the first* `Panel` *to the Form.*** `Panel` controls are used to group other controls. Double click the `Panel` icon (Panel) in the **Toolbox** under the **Container** category to add a `Panel` to the `Form`. Change the `Panel`'s `BorderStyle` property to `Fixed3D` to make the inside of the `Panel` appear recessed. Change the `Size` property to `88, 112`. Finally, set the `Location` property to `8, 48`. This `Panel` contains the calculator's numeric keys.

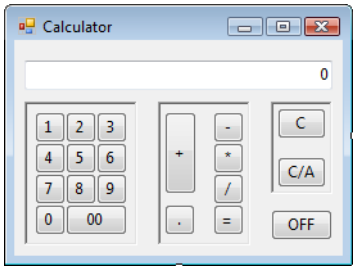


f) ***Adding the second `Panel` to the `Form`.*** Click the `Form`. Double click the `Panel` icon in the **Toolbox** to add another `Panel` to the `Form`. Change the `Panel`'s `BorderStyle` property to `Fixed3D`. Change the `Size` property to `72, 112`. Finally, set the `Location` property to `112, 48`. This `Panel` contains the calculator's operator keys.

g) ***Adding the third (and last) `Panel` to the `Form`.*** Click the `Form`. Double click the `Panel` icon in the **Toolbox** to add another `Panel` to the `Form`. Change the `Panel`'s `BorderStyle` property to `Fixed3D`. Change the `Size` property to `48, 72`. Finally, set the `Location` property to `200, 48`. This `Panel` contains the calculator's **C** (clear) and **C/A** (clear all) keys.



h) ***Adding `Button`s to the `Form`.*** There are 20 `Button`s on the calculator. To add a `Button` to a `Panel`, double click the `Button` control (Button) in the **Toolbox**. Then add the `Button` to the `Panel` by dragging and dropping it on the `Panel`. Change the `Text` property of each `Button` to the calculator key it represents. The value you enter in the `Text` property appears on the face of the `Button`. Finally, resize the `Button`s, using their `Size` properties. You can select more than one control and set their common properties (e.g., `Size`) at the same time. Each `Button` labeled `0`–`9`, `*`, `/`, `-`, `=` and `.` (decimal point) should have a size of `24, 24`. The **00** and **OFF** `Button`s have size `48, 24`. The **+** `Button` is sized `24, 64`. The **C** (clear) and **C/A** (clear all) `Button`s are sized `38, 24`. To align the numeric `Button`s as they appear in Fig. 3.35, select the **1** `Button` and set its `Location` property to `6, 6` and its `Lock` property to `True`. Place the **2** and **3** `Button`s to the right of the **1** `Button`. Select the three `Button`s in the top row (**1**, **2** and **3**). Use the **Format > Horizontal Spacing > Remove** option to place the `Button`s directly next to each other. Use the **Format > Align > Middles** option to place them in a straight row. Repeat the process to vertically align `Button`s **1**, **4**, **7** and **0** using the **Format > Vertical Spacing > Remove** and **Format > Align > Centers** options. You can drag and drop the rest of the numeric `Button`s into position—the IDE "snaps" each `Button` into alignment with those around it. The **Format** menu contains many useful options. You can display many of the **Format** menu options in a Visual Studio toolbar—right click the toolbar in the IDE and select **Layout**.



i) ***Saving and closing the project.*** Select **File > Save All** to save your changes. Then select **File > Close Project** to close the project for this application.

3.12 ***(Alarm Clock GUI)*** Create the GUI for the alarm clock in Fig. 3.36.

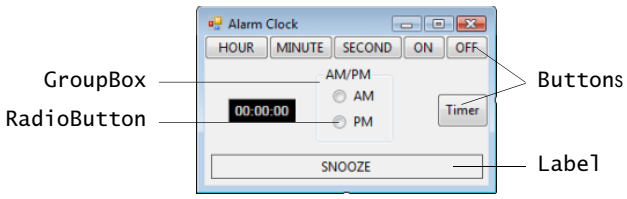
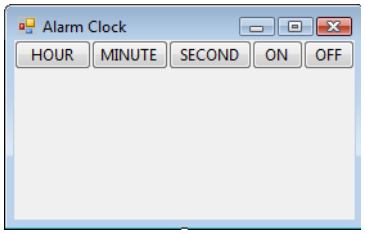


Figure 3.36 **Alarm Clock** GUI.

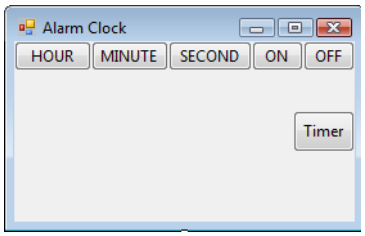
a) ***Creating a new project.*** Create a new **Windows Forms Application** named `AlarmClock`.

b) ***Renaming the Form file.*** Name the `Form` file `AlarmClock.vb`.

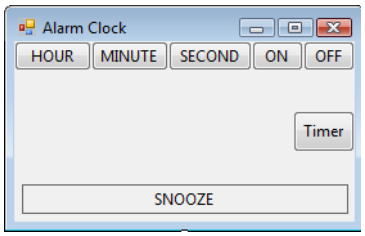
c) ***Manipulating the Form's properties.*** Change the `Font` property of the `Form` to 9pt `Segoe UI`. Change the `Text` property to `Alarm Clock`. Change the `Size` property of the `Form` to `276, 176`. Remember to change the `Font` property's size before you set the `Form`'s `Size` property.



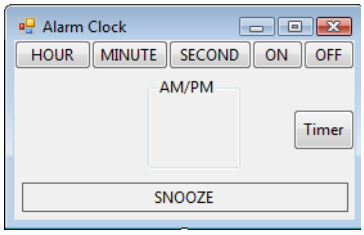
d) ***Adding `Button`s to the `Form`.*** Add six `Button`s to the `Form`. Change the `Text` property of each **Button** to the appropriate text. Change the `Size` properties of the **Hour**, **Minute** and **Second** `Button`s to `60, 23`. The **ON** and **OFF** `Button`s get size `40, 23`. The **Timer** `Button` gets size `48, 32`. Use the **Format > Horizontal Spacing > Remove** option to align the `Button`s in the top row as shown in Fig. 3.36.



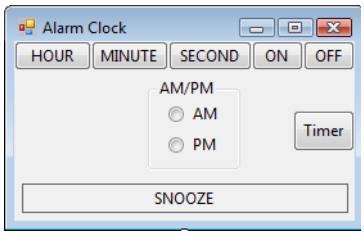
e) ***Adding a `Label` to the `Form`.*** Add a `Label` to the `Form`. Change the `Text` property to **SNOOZE**. Set its `AutoSize` property to `False` and its `Size` to `248, 23`. Set the `Label`'s `TextAlign` property to `MiddleCenter`. Finally, to draw a border around the edge of the **SNOOZE** `Label`, change the `BorderStyle` property of the **SNOOZE** `Label` to `FixedSingle`.



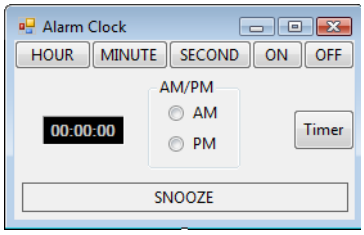
f) ***Adding a `GroupBox` to the `Form`. `GroupBox`es*** are like `Panel`s, except that `GroupBox`es can display a title. To add a `GroupBox` to the `Form`, double click the `GroupBox` control (GroupBox) in the **Toolbox**. Change the `Text` property to `AM/PM`, and set the `Size` property to `72, 72`. To place the `GroupBox` in the correct location on the `Form`, set the `Location` property to `104, 29`.



g) ***Adding AM/PM `RadioButtons` to the `GroupBox`.*** Add two `RadioButtons` to the `Form` by dragging the `RadioButton` control (RadioButton) in the **Toolbox** and dropping it onto the `GroupBox` twice. Change the `Text` property of one `RadioButton` to `AM` and the other to `PM`. Then place the `RadioButtons` as shown in Fig. 3.36 by setting the `Location` of the **AM** `RadioButton` to `16, 16` and that of the **PM** `RadioButton` to `16, 40`. Set the `AutoSize` property to `False` and set their `Size` properties to `48, 24`.



h) ***Adding the time `Label` to the `Form`.*** Add a `Label` to the `Form` and change its `Text` property to `00:00:00`. Change the `BorderStyle` property to `Fixed3D` and the `BackColor` to `Black`. Set the `AutoSize` property to `False` and set the `Size` property to `64, 23`. Use the `Font` property to make the time bold. Change the `ForeColor` to `Silver` (located in the **Web** tab) to make the time stand out against the black background. Set `TextAlign` to `MiddleCenter` to center the text in the `Label`. Position the `Label` as shown in Fig. 3.36.



i) ***Saving and closing the project.*** Select **File > Save All** to save your changes. Then select **File > Close Project** to close the project for this application.

3.13 ***(Microwave Oven GUI)*** Create the GUI for the microwave oven shown in Fig. 3.37.

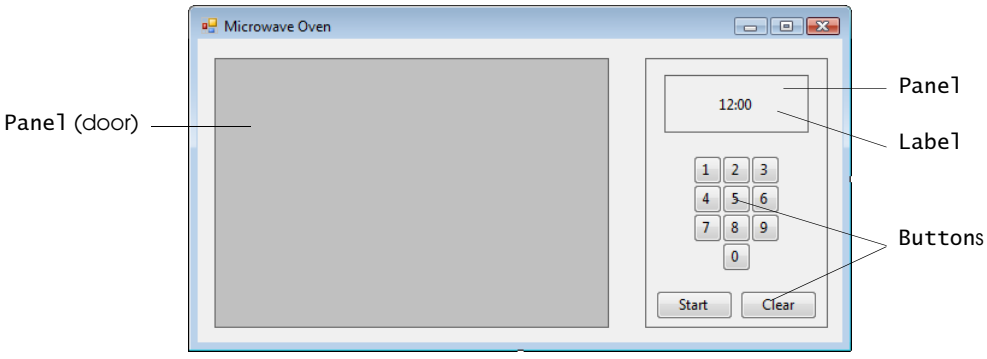
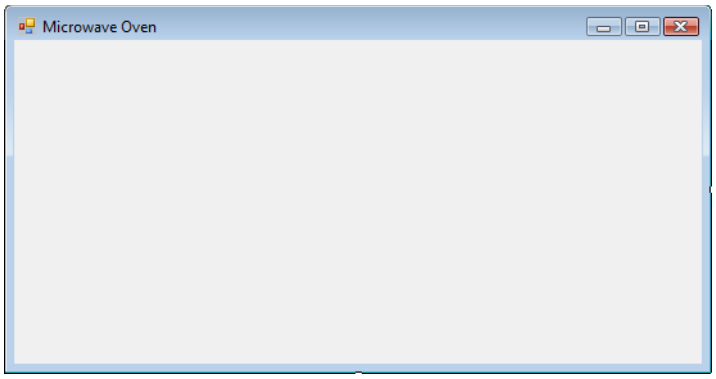


Figure 3.37 **Microwave Oven** GUI.

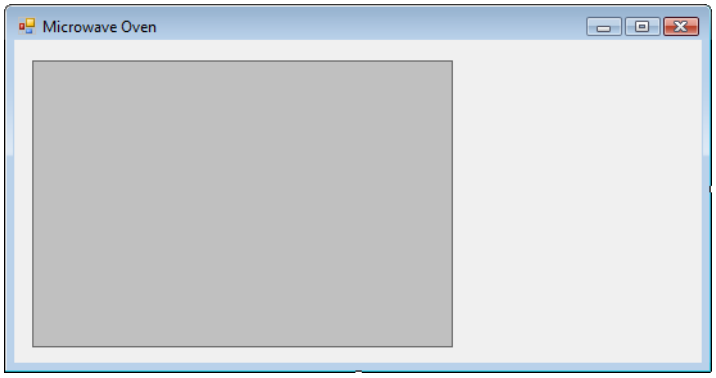
a) ***Creating a new project.*** Create a new **Windows Forms Application** named `Microwave`.

b) ***Renaming the Form file.*** Name the `Form` file `Microwave.vb`.

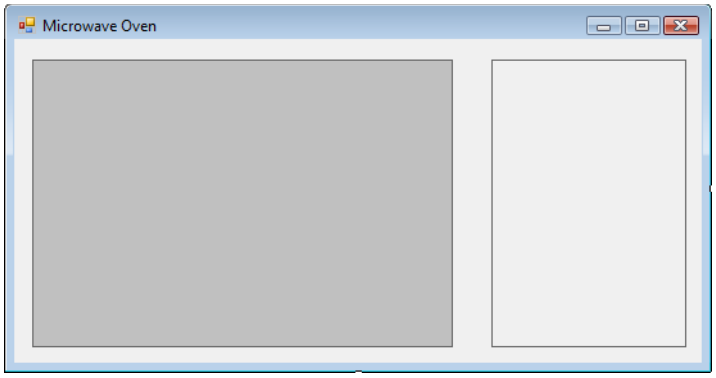
c) ***Manipulating the Form's properties.*** Change the `Form`'s `Font` property to 9pt `Segoe UI` and the `Text` property to `Microwave Oven`. Change the `Size` property to `552, 288`.



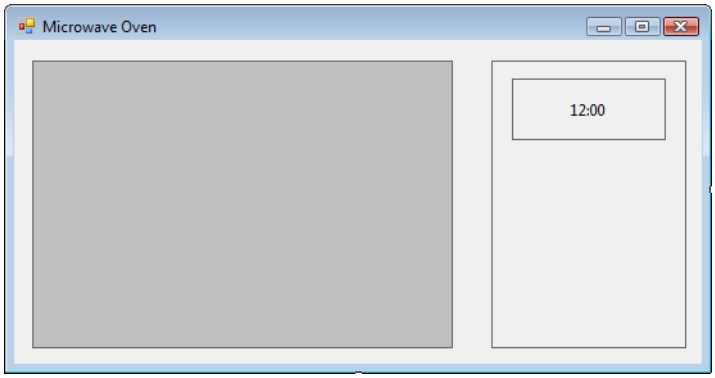
d) ***Adding the microwave oven door.*** Add a `Panel` to the `Form` by double clicking the `Panel` control (Panel) in the **Toolbox**. Select the `Panel` and change the `BackColor` property to `Silver` (located in the **Web** tab) in the **Properties** window. Then change the `Size` to `328, 224`. Next, change the `BorderStyle` property to `FixedSingle`. Position the `Panel` as shown in Fig. 3.37.



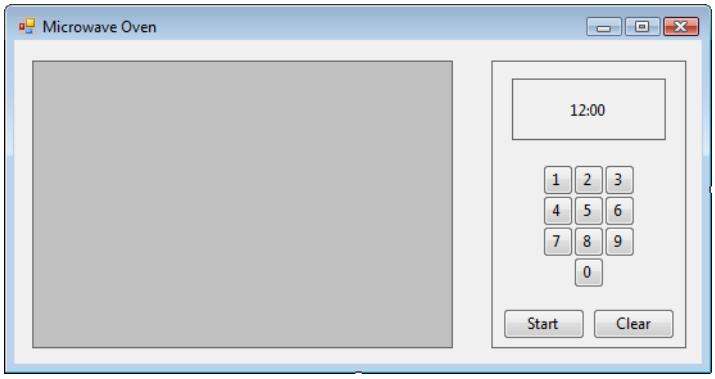
e) ***Adding another Panel.*** Add another `Panel` and change its `Size` to `152, 224` and its `BorderStyle` to `FixedSingle`. Place the `Panel` to the right of the door `Panel`, as shown in Fig. 3.37.



f) ***Adding the microwave oven clock.*** Add a `Label` to the right `Panel` by clicking the `Label` in the **Toolbox** once, then clicking once inside the right `Panel`. Change the `Label`'s `Text` to `12:00`, `BorderStyle` to `FixedSingle`, `AutoSize` to `False` and `Size` to `120, 48`. Change `TextAlign` to `MiddleCenter`. Place the clock as shown in Fig. 3.37.



g) ***Adding a keypad to the microwave oven.*** Place a `Button` in the right `Panel` by clicking the `Button` control in the `Toolbox` once, then clicking inside the `Panel`. Change the `Text` to `1` and the `Size` to `24, 24`. Repeat this process for nine more `Button`s, changing the `Text` property in each to the next number in the keypad. Then add the **Start** and **Clear** `Button`s, each of `Size` `64, 24`. Don't forget to set the `Text` properties for each of these `Button`s. Finally, arrange the `Button`s as shown in Fig. 3.37. The **1** `Button` is located at `39, 80` and the **Start** `Button` is located at `8, 192`.



h) ***Saving and closing the project.*** Select **File > Save All** to save your changes. Then select **File > Close Project** to close the project for this application.

3.14 ***(Cell Phone GUI)*** Create the GUI for the cell phone shown in Fig. 3.38.

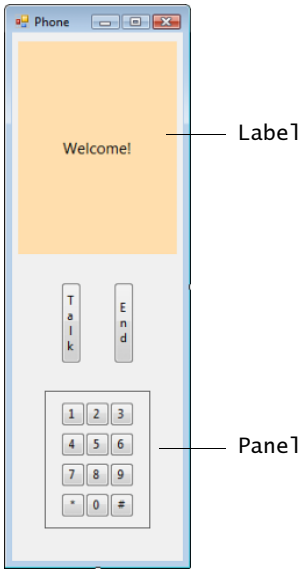


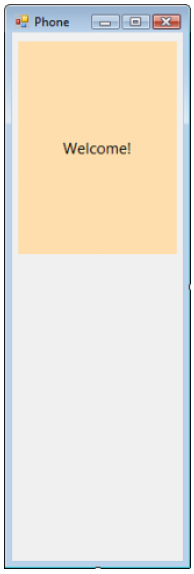
Figure 3.38 **Cell Phone** GUI.

a) ***Creating a new project.*** Create a new **Windows Forms Application** named `Phone`.

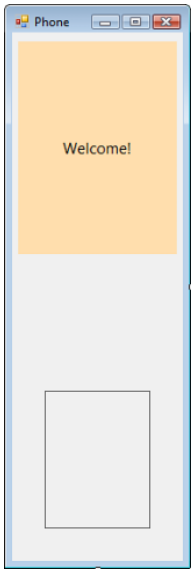
b) ***Renaming the `Form` file.*** Name the `Form` file `Phone.vb`.

c) ***Manipulating the `Form`'s properties.*** Change the `Form`'s `Font` property to 9pt `Segoe UI`. Change the `Text` property to `Phone` and the `Size` to `184, 558`.

d) ***Adding the display `Label`.*** Add a `Label` to the `Form`. Change its `BackColor` to `Aqua` (in the **Web** tab palette), the `Text` to `Welcome to Deitel Mobile Phone!`, `AutoSize` to `False` and the `Size` to `156, 210`. Change the `TextAlign` property to `MiddleCenter`. Then place the `Label` as shown in Fig. 3.38.



e) ***Adding the keypad `Panel`.*** Add a `Panel` to the `Form`. Change its `BorderStyle` property to `FixedSingle` and its `Size` to `104, 136`.



f) ***Adding the keypad `Button`s.*** Add the keypad `Button`s to the `Form` (12 `Button`s in all). Each `Button` on the number pad should be of `Size` `24`, `24` and should be placed in the `Panel`. Change the `Text` property of each `Button` such that numbers `0`–`9`, the pound (`#`) and the star (`*`) keys are represented. Then add the final two `Button`s such that the `Text` property for one is `Talk` and for the other is `End`. Change the `Size` of each `Button` to `20`, `80`, and notice how the small `Size` causes the `Text` to align vertically.

g) ***Placing the controls.*** Arrange all the controls so that your GUI looks like Fig. 3.38.

h) ***Saving and closing the project.*** Select **File > Save All** to save your changes. Then select **File > Close Project** to close the project for this application.

3.15 ***(Vending Machine GUI)*** Create the GUI for the vending machine in Fig. 3.39.

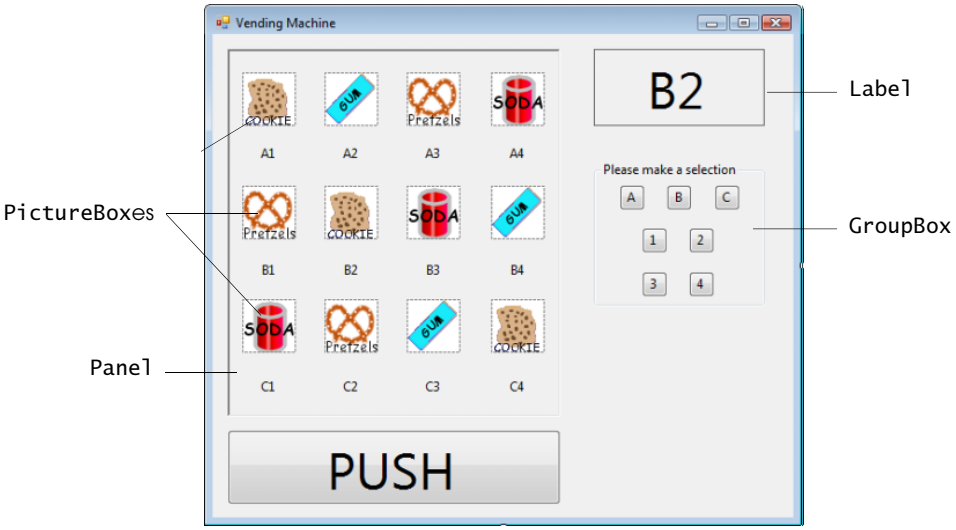
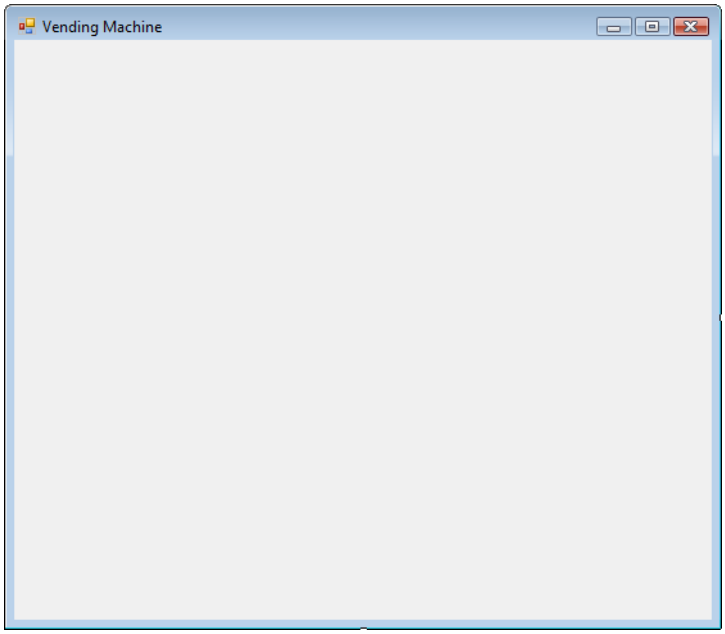


Figure 3.39 **Vending Machine** GUI.

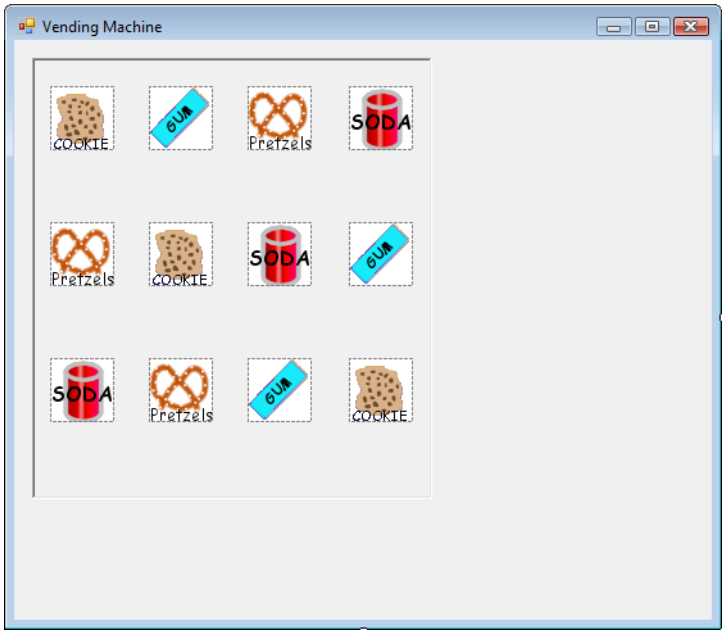
a) ***Creating a new project.*** Create a new **Windows Forms Application** named `VendingMachine`.

b) ***Renaming the Form file.*** Name the `Form` file `VendingMachine.vb`.

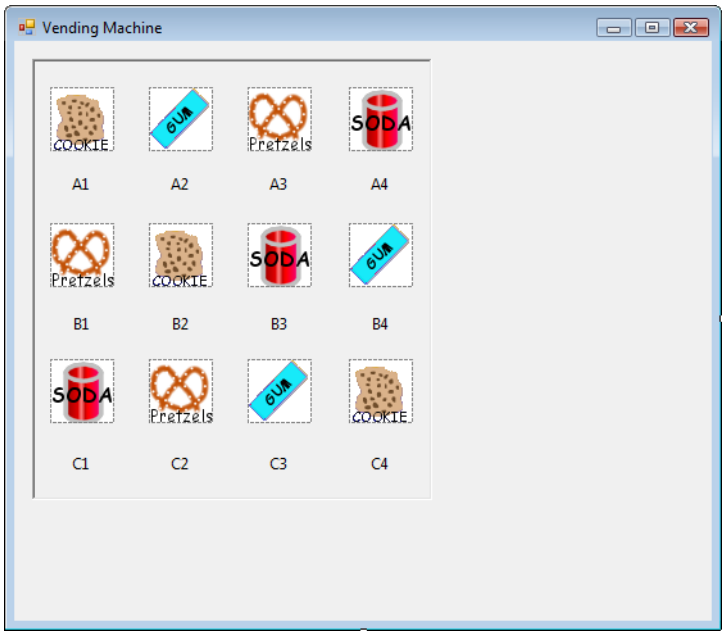
c) ***Manipulating the Form's properties.*** Set the `Font` property of the `Form` to 9pt `Segoe UI`, the `Text` property to `Vending Machine` and the `Size` to `560, 488`.



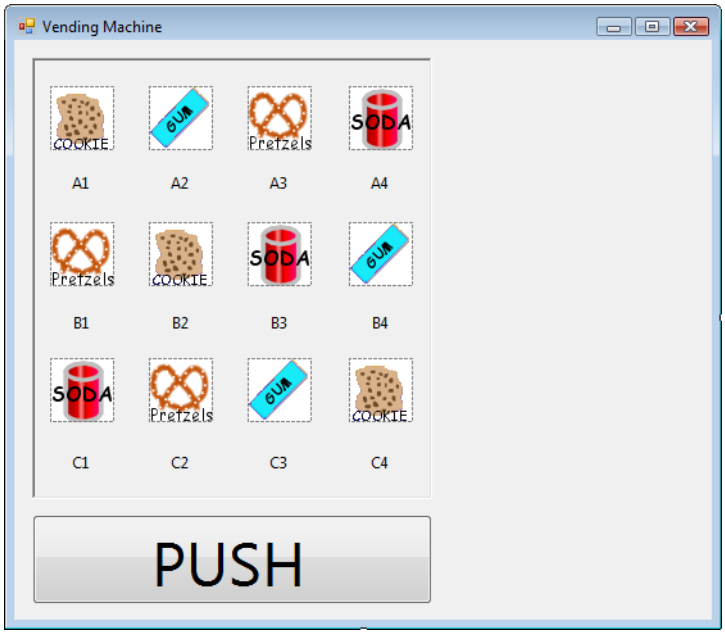
d) ***Adding the food-selection Panel.*** Add a `Panel` to the `Form`, and change its `Size` to `312, 344` and `BorderStyle` to `Fixed3D`. Add a `PictureBox` to the `Panel`, and change its `Size` to `50, 50`. Then set the `Image` property by clicking the **Choose Image** `Button` and choosing a file from the `C:\Examples\Tutorial03\ExerciseImages\VendingMachine` directory. Repeat this process for 11 more `PictureBoxes`.



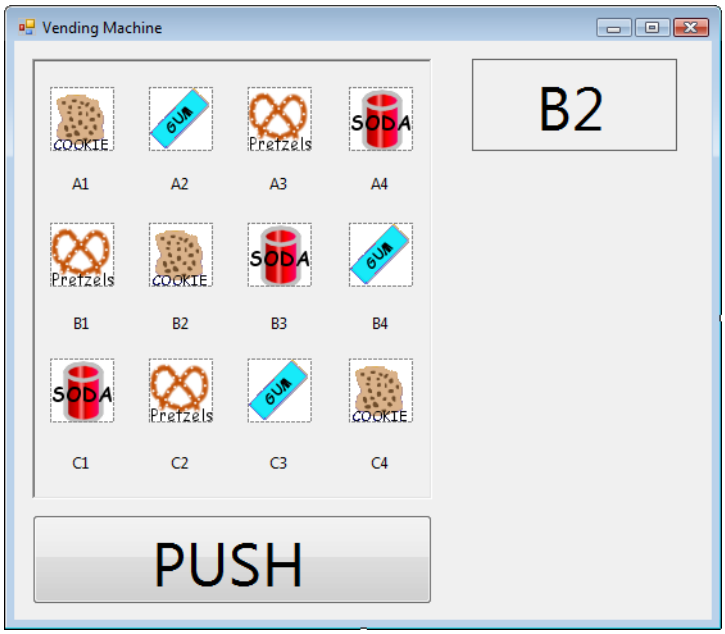
e) ***Adding Labels for each vending item.*** Add a `Label` under the first `PictureBox`. Change the `Text` property of the `Label` to `A1`, the `TextAlign` property to `MiddleCenter`, `AutoSize` to `False` and `Size` to `50, 16`. Place the `Label` so that it's located as in Fig. 3.39. Repeat this process for `A2` through `C4` (11 `Label`s).



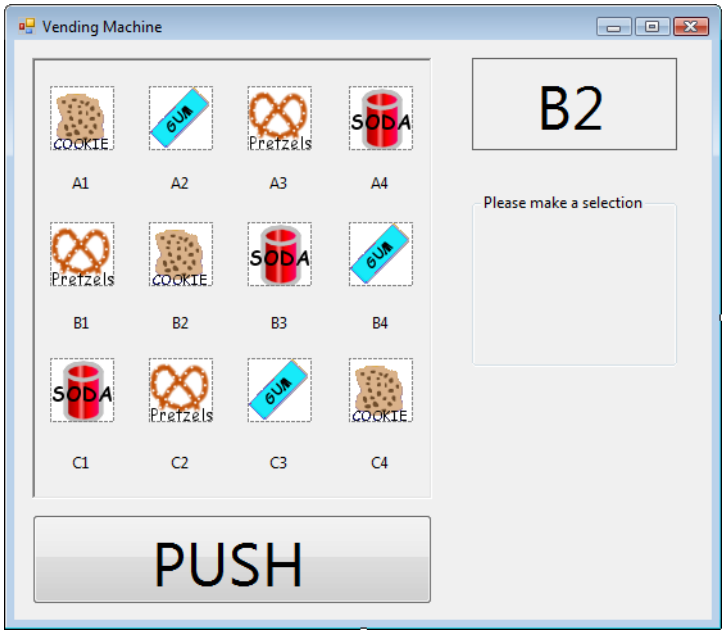
f) ***Creating the vending machine door (as a `Button`).*** Add a `Button` to the `Form` by dragging the `Button` control in the **Toolbox** and dropping it below the `Panel`. Change the `Button`'s `Text` property to `PUSH`, its `Font Size` to `36` and its `Size` to `312, 70`. Then place the `Button` on the `Form` as shown in Fig. 3.39.



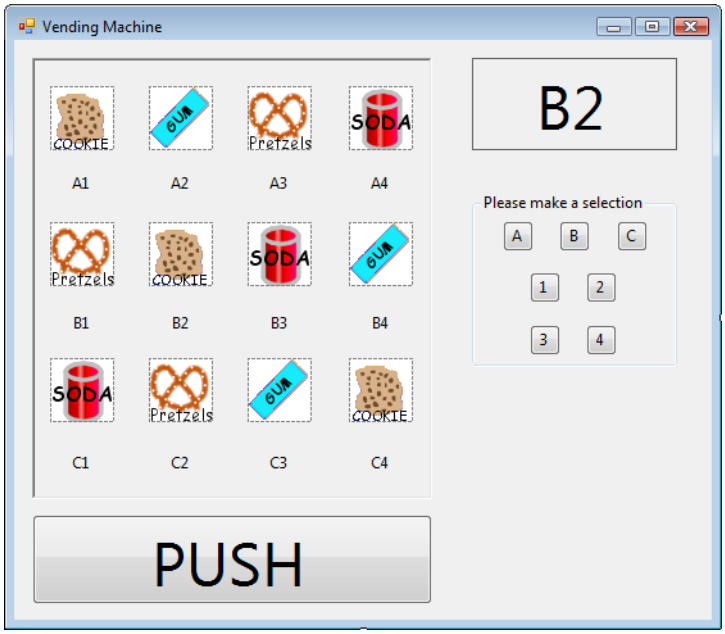
g) ***Adding the selection-display Label.*** Add a `Label` to the `Form`, and change the `Text` property to `B2`, `BorderStyle` to `FixedSingle`, `Font Size` to `36`, `TextAlign` to `MiddleCenter`, `AutoSize` to `False` and `Size` to `160, 72`.



h) ***Grouping the input Buttons.*** Add a `GroupBox` below the `Label`, and change the `Text` property to `Please make a selection` and the `Size` to `160, 136`.



i) ***Adding the input Buttons.*** Finally, add `Buttons` to the `GroupBox`. For the seven `Buttons`, change the `Size` property to `24, 24`. Then change the `Text` property of the `Buttons` such that each `Button` has one of the values `A`, `B`, `C`, `1`, `2`, `3` or `4`, as shown in Fig. 3.39. When you are done, move the controls on the `Form` so that they are aligned as shown in the figure.



j) ***Saving and closing the project.*** Select **File > Save All** to save your changes. Then select **File > Close Project** to close the project for this application.

Programming Challenge ▶

3.16 ***(Radio GUI)*** Create the GUI for the radio in Fig. 3.40. [*Note:* All colors used in this exercise are from the **Web** palette.] In this exercise, you create this GUI on your own. Feel free to experiment with different control properties. For the image in the `PictureBox`, use the file (`MusicNote.gif`) found in the `C:\Examples\Tutorial03\ExerciseImages\Radio` directory.

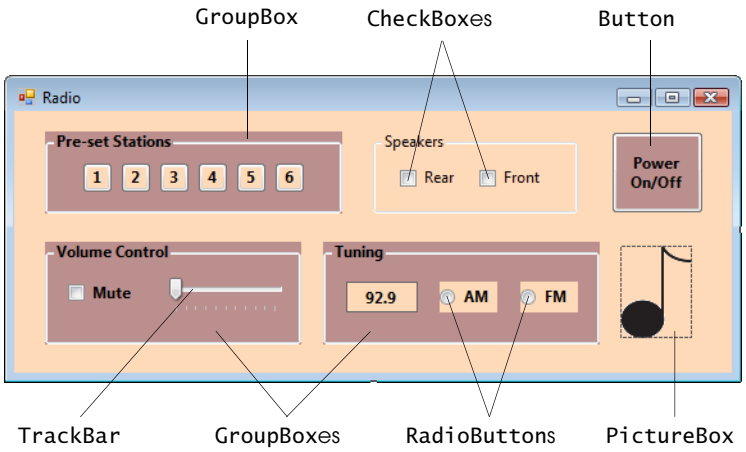


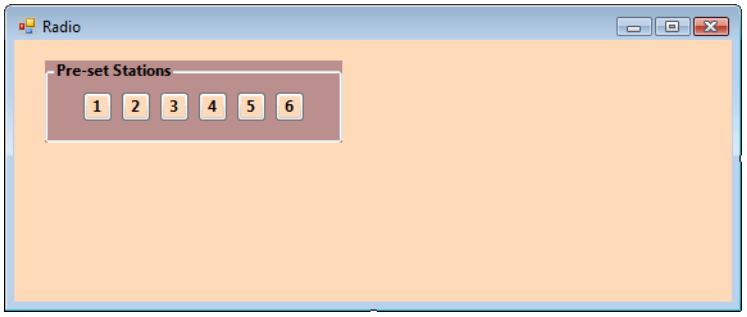
Figure 3.40 **Radio** GUI.

a) ***Creating a new project.*** Create a new **Windows Forms Application** named `Radio`.

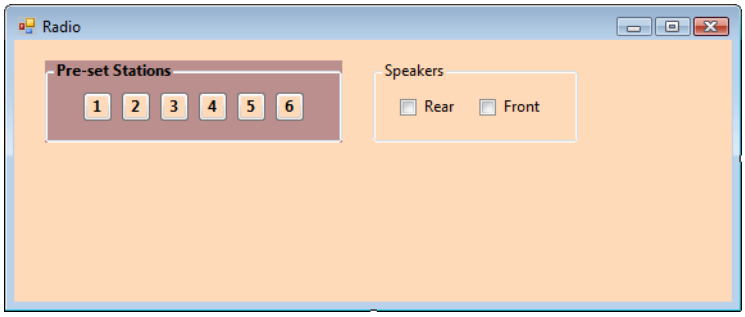
b) ***Renaming the Form file.*** Name the `Form` file `Radio.vb`.

c) ***Manipulating the Form's properties.*** Change the `Form`'s `Font` property to 9pt `Segoe UI`, the `Text` property to `Radio` and the `Size` to `576, 240`. Set `BackColor` to `PeachPuff`.

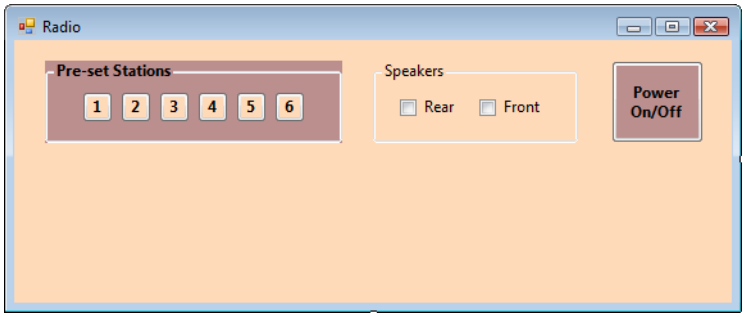
d) ***Adding the Pre-set Stations GroupBox and Buttons.*** Add a `GroupBox` to the `Form`. Set its `Size` to `232, 64`, its `Text` to `Pre-set Stations`, its `ForeColor` to `Black` and its `BackColor` to `RosyBrown`. Change its `Font` to `bold`. Finally, set its `Location` to `24, 16`. Add six `Buttons` to the `GroupBox`. Set each `BackColor` to `PeachPuff` and each `Size` to `24, 24`. Change the `Buttons`' `Text` properties to `1`, `2`, `3`, `4`, `5`, `6`, respectively.



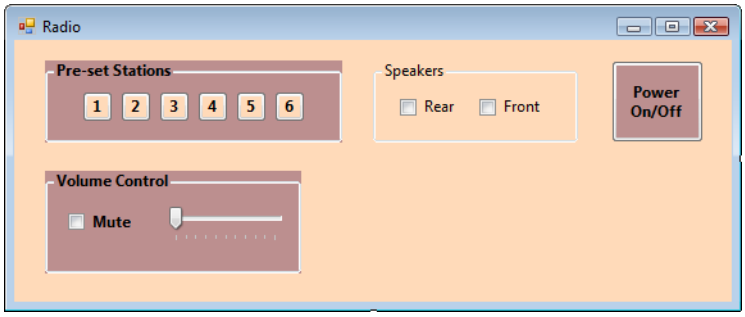
e) ***Adding the Speakers GroupBox and CheckBoxes.*** Add a `GroupBox` to the `Form`. Set its `Size` to `160, 64`, its `Text` to `Speakers` and its `ForeColor` to `Black`. Set its `Location` to `280, 16`. Add two `CheckBoxes` to the `Form`. Set each `CheckBox`'s `AutoSize` property to `False` and `Size` to `56, 24`. Set the `Text` properties for the `CheckBoxes` to `Rear` and `Front`.



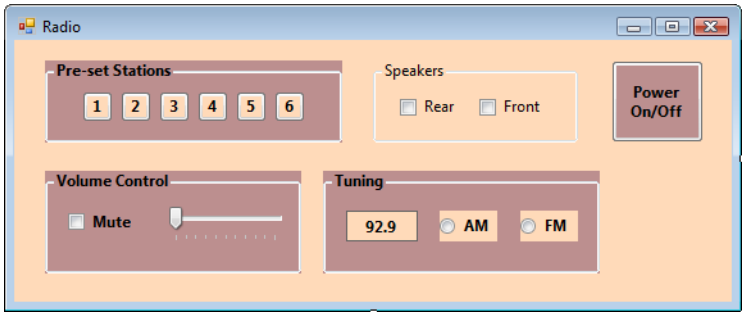
f) ***Adding the Power On/Off Button.*** Add a `Button` to the `Form`. Set its `Text` to `Power On/Off`, its `BackColor` to `RosyBrown`, its `ForeColor` to `Black` and its `Size` to `72, 64`. Change its `Font` style to `Bold`.



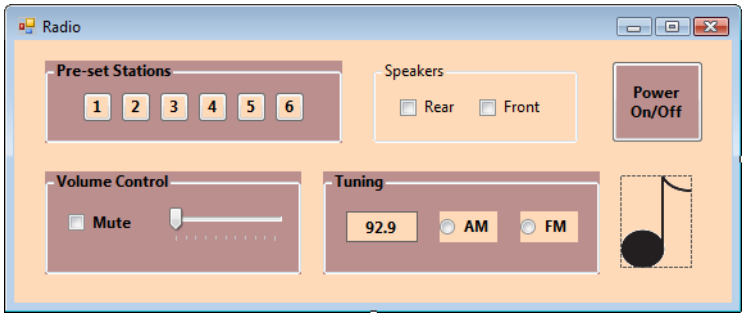
g) ***Adding the Volume Control GroupBox, the Mute CheckBox and the Volume TrackBar.*** Add a `GroupBox` to the `Form`. Set its `Text` to `Volume Control`, its `BackColor` to `RosyBrown`, its `ForeColor` to `Black` and its `Size` to `200, 80`. Set its `Font` style to `Bold`. Add a `CheckBox` to the `GroupBox`. Set its `Text` to `Mute` and its `Size` to `56, 24`. Add a `TrackBar` (TrackBar) to the `GroupBox`.



h) ***Adding the Tuning GroupBox, the radio station Label and the AM/FM RadioButtons.*** Add a `GroupBox` to the `Form`. Set its `Text` to `Tuning`, its `ForeColor` to `Black` and its `BackColor` to `RosyBrown`. Set its `Font` style to `Bold` and its `Size` to `216, 80`. Add a `Label` to the `GroupBox`. Set its `BackColor` to `PeachPuff`, its `BorderStyle` to `FixedSingle`, its `TextAlign` to `MiddleCenter` and its `Size` to `56, 24`. Set its `Text` to `92.9`. Place the `Label` as shown in Fig. 3.40. Add two `RadioButtons` to the `GroupBox`. Change the `BackColor` to `PeachPuff` and change the `Size` to `45,24`. Set one's `Text` to `AM` and the other's `Text` to `FM`.



i) ***Adding the image.*** Add a `PictureBox` to the `Form`. Set its `BackColor` to `PeachPuff`, its `SizeMode` to `StretchImage` and its `Size` to `56, 72`. Set its `Image` property to `C:\Examples\Tutorial03\ExerciseImages\Radio\MusicNote.gif`.



j) ***Saving and closing the project.*** Select **File > Save All** to save your changes. Then select **File > Close Project** to close the project for this application.