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FACULTY OF COMMERCE

DEPARTMENT OF COMMERCIAL ENGINEERING

LEVEL III, IV WEEKEND PROGRAM

MODULE TITLE: SOFTWARE DEVELOPMENT WITH VISUAL BASIC SYLLABUS

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ACADEMIC YEAR: 2017-2018

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CHAPTER 1: SOFTWARE DEVELOPMENT

Software development is the process of computer programming, documenting, testing, and bug fixing involved in creating and maintaining applications and frameworks resulting in a software product. Software development is a process of writing and maintaining the source code, but in a broader sense it includes all that is involved between the conception of the desired software through to the final manifestation of the software, sometimes in a planned and structured process.

Therefore, software development may include research, new development, prototyping, modification, reuse, re-engineering, maintenance, or any other activities that result in software products.

Software can be developed for a variety of purposes, the three most common being to meet specific needs of a specific client/business (the case with custom software), to meet a perceived need of some set of potential users (the case with commercial and open source software), or for personal use (e.g. a scientist may write software to automate a mundane task).

Embedded software development, that is, the development of embedded software such as used for controlling consumer products, requires the development process to be integrated with the development of the controlled physical product. System software underlies applications and the programming process itself, and is often developed separately.

There are many approaches to software project management, known as software development life cycle models, methodologies, processes, or models. The waterfall model is a traditional version, contrasted with the more recent innovation of agile software development.

1.1 Methodologies

A software development process (also known as a software development methodology, model, or life cycle) is a framework that is used to structure, plan, and control the process of developing information systems. A wide variety of such frameworks have evolved over the years, each with its own recognized strengths and weaknesses. There are several different approaches to software development: some take a more structured, engineering-based approach to developing business solutions, whereas others may take a more incremental approach, where software evolves as it is

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developed piece-by-piece. One system development methodology is not necessarily suitable for use by all projects. Each of the available methodologies is best suited to specific kinds of projects, based on various technical, organizational, project and team considerations.

Most methodologies share some combination of the following stages of software development:

- Analyzing the problem
- Market research
- Gathering requirements for the proposed business solution
- Devising a plan or design for the software-based solution
- Implementation (coding) of the software
- Testing the software
- Deployment
- Maintenance and bug fixing

These stages are often referred to collectively as the software development lifecycle, or SDLC. Different approaches to software development may carry out these stages in different orders, or devote more or less time to different stages. The level of detail of the documentation produced at each stage of software development may also vary. These stages may also be carried out in turn (a “waterfall” based approach), or they may be repeated over various cycles or iterations (a more "extreme" approach).

The more extreme approach usually involves less time spent on planning and documentation, and more time spent on coding and development of automated tests. More “extreme” approaches also promote continuous testing throughout the development lifecycle, as well as having a working (or bug-free) product at all times. More structured or “waterfall” based approaches attempt to assess the majority of risks and develop a detailed plan for the software before implementation (coding) begins, and avoid significant design changes and re-coding in later stages of the software development life cycle planning.

There are significant advantages and disadvantages to the various methodologies, and the best approach to solving a problem using software will often depend on the type of problem. If the problem is well understood and a solution can be effectively planned out ahead of time, the more

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"waterfall" based approach may work the best. If, on the other hand, the problem is unique (at least to the development team) and the structure of the software solution cannot be easily envisioned, then a more "extreme" incremental approach may work best.

1.2 Software development activities

1.2.1 Identification of need

The sources of ideas for software products are legion. These ideas can come from market research including the demographics of potential new customers, existing customers, sales prospects who rejected the product, other internal software development staff, or a creative third party.

Students of engineering learn engineering and are rarely exposed to finance or marketing. Students of marketing learn marketing and are rarely exposed to finance or engineering. Most of us become specialists in just one area. To complicate matters, few of us meet interdisciplinary people in the workforce, so there are few roles to mimic. Yet, **software product planning is critical to the development success and absolutely requires knowledge of multiple disciplines**.

Because software development may involve compromising or going beyond what is required by the client, a software development project may stray into less technical concerns such as human resources, risk management, intellectual property, budgeting, crisis management, etc. These processes may also cause the role of business development to overlap with software development.

1.2.2 Planning

Planning is an objective of each and every activity, where we want to discover things that belong to the project. An important task in creating a software program is extracting the requirements or requirements analysis. Customers typically have an abstract idea of what they want as an end result, but do not know what *software* should do. Skilled and experienced software engineers recognize incomplete, ambiguous, or even contradictory requirements at this point. Frequently demonstrating live code may help reduce the risk that the requirements are incorrect.

Once the general requirements are gathered from the client, an analysis of the scope of the development should be determined and clearly stated. This is often called a scope document.

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1.2.3 Designing

Once the requirements are established, the design of the software can be established in a software design document. This involves a preliminary, or high-level design of the main modules with an overall picture of how the parts fit together. The language, operating system, and hardware components should all be known at this time. Then a detailed or low-level design is created, perhaps with prototyping as proof-of-concept or to firm up requirements.

1.2.4 Implementation, testing and documenting

Implementation is the part of the process where software engineers actually program the code for the project.

Software testing is an integral and important phase of the software development process. This part of the process ensures that defects are recognized as soon as possible. In some processes, generally known as test-driven development, tests may be developed just before implementation and serve as a guide for the implementation's correctness.

Documenting the internal design of software for the purpose of future maintenance and enhancement is done throughout development. This may also include the writing of an API, be it external or internal. The software engineering process chosen by the developing team will determine how much internal documentation (if any) is necessary.

1.2.5 Deployment and maintenance

Deployment starts directly after the code is appropriately tested, approved for release, and sold or otherwise distributed into a production environment. This may involve installation, customization (such as by setting parameters to the customer's values), testing, and possibly an extended period of evaluation.

Software training and support is important, as software is only effective if it is used correctly.

Maintaining and enhancing software to cope with newly discovered faults or requirements can take substantial time and effort, as missed requirements may force redesign of the software.

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CHAPTER 2: INTRODUCTION TO VISUAL BASIC

2.1 Concepts

a.Visual: The "Visual" part refers to the method used to create the graphical user interface (GUI).

b.BASIC: (Beginners All-Purpose Symbolic Instruction Code) language, a language used by more programmers than any other language in the history of computing.

c. Visual Basic: Visual Basic is a Microsoft Windows Programming language. Visual basic allows user to create GUI. Visual Basic programs are created in an Integrated Development Environmental (**IDE**). The **IDE** allows the programmer to create, run and debug Visual Basic programs conveniently. : It is Language developed in early 1960's at Dartmouth College

c. Objects: is the collection of controls (labels,command button,textbox, checkbox etc) and form that allow user to create a project.

d. Events: An event is a specific action that occurs on or with a certain object.

Examples of event used in VISUAL BASIC are: click, Dblclick, change,load,keypress,mousedown etc

e.Procedure: a procedure is the block of visual basic statement enclosed by declaration statement (s**ub, function,operator,get,and set**) and a matching enddeclaration**.**

Eg. Private sub **command1_click**

Statement

End sub

f. Application: is similar to project .application is the collection of object that work together toaccomplish something useful. In visual basic is called project

g. Event procedures: are the code related to some object, this is code that is executed when a certain event occurs.

d) Method: method build –in procedure that can be invoked to impart some action to particular object.

2.2 The Importance of Visual Basic Program

1. It uses integrated development environment (IDE) which is easier for the user to minimize code writing.

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2. All visual programs follow the same concepts; therefore the user will become more familiar with visual approach for other visual languages.
3. It provides Input box and Output box as an interactive window with user.
4. It is able to connect to Internet, and to call Explorer.

2. 3 Visual BASIC ENVIRONMENT

Visual Basic implements graphical user interface that allows the use of graphics for different applications. It provides visual interactive windowswith user, like Dialogue box for (color, font) Input box, and Output box.Also it is able to create menu to simplify user application.
To run this program on user computer:

Start>programs>Microsoft Visual Studio 6.0>Microsoft Visual Basic 6.0.--> standard exe→open

It will appear on the computer screen as in the following picture.

To exit from Visual Basic and return to Windows is like exit from mostWindows applications.

There are three ways to close the Visual Basic asstated below.
1- Click on close button icon that appears in the upper-left corner of thescreen.
2- Press Alt+F4

3- Select File >Exit

2.4 Steps of Developing VB Application

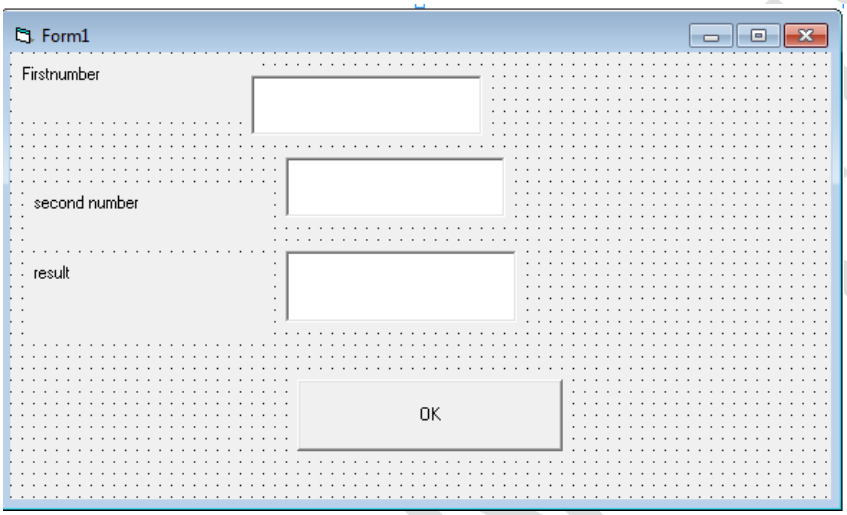
There are three primary steps involved in building a Visual Basic application:

1-**Draw** the user interface

2- **Assign** properties to controls

3- **Attach** code to control

Example: step1 and 2:



Step3: Private Sub Command1_Click()

a = Val(Text1.Text)

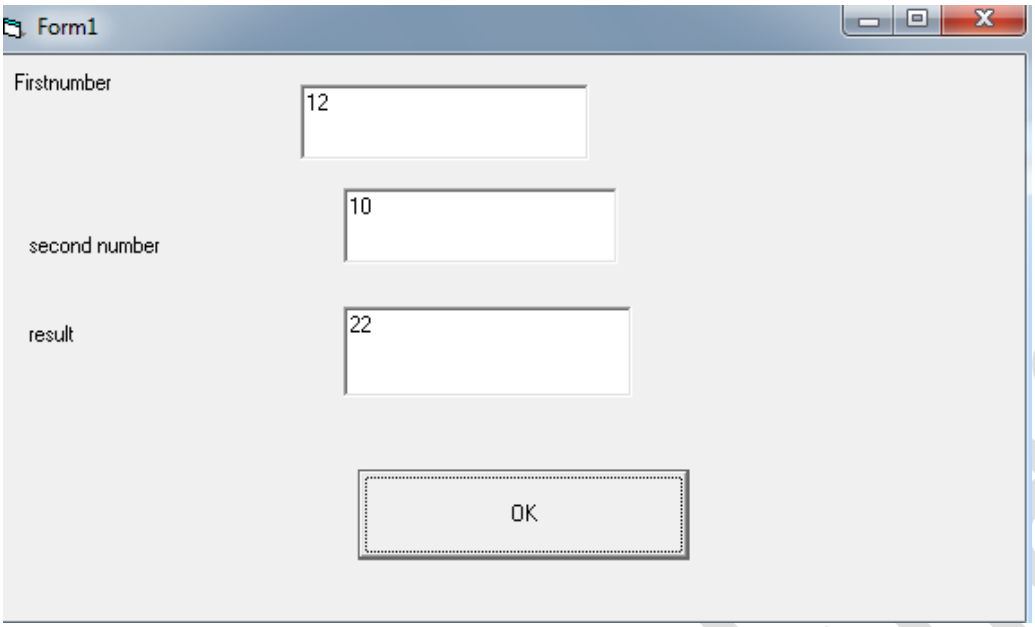
b = Val(Text2.Text)

result = a + b

Text3.Text = result

End Sub

Output



2.5 The modes used in VB6

There are three mode used in vb 6 those are:

Design mode: used to build application

Run mode: used to run application

Break mode: application halted(stop) and debugger is available.

2.6 Project

Project is a program designed to user application that may be simple(like calculator program) or complex (like word program). Visual basicprogram can create many types of projects. The most important or usualproject is the standard project (for window applications) and the DHTMLproject (for internet).

Working with Standard Projects:

The following working steps (create, save, add, open and delete)could be done:

a) To create project:

When program starts, project box appears-select Standard EXE >

Project window appears.

OR: File> New project> Box (select Standard EXE)> Project window appears.

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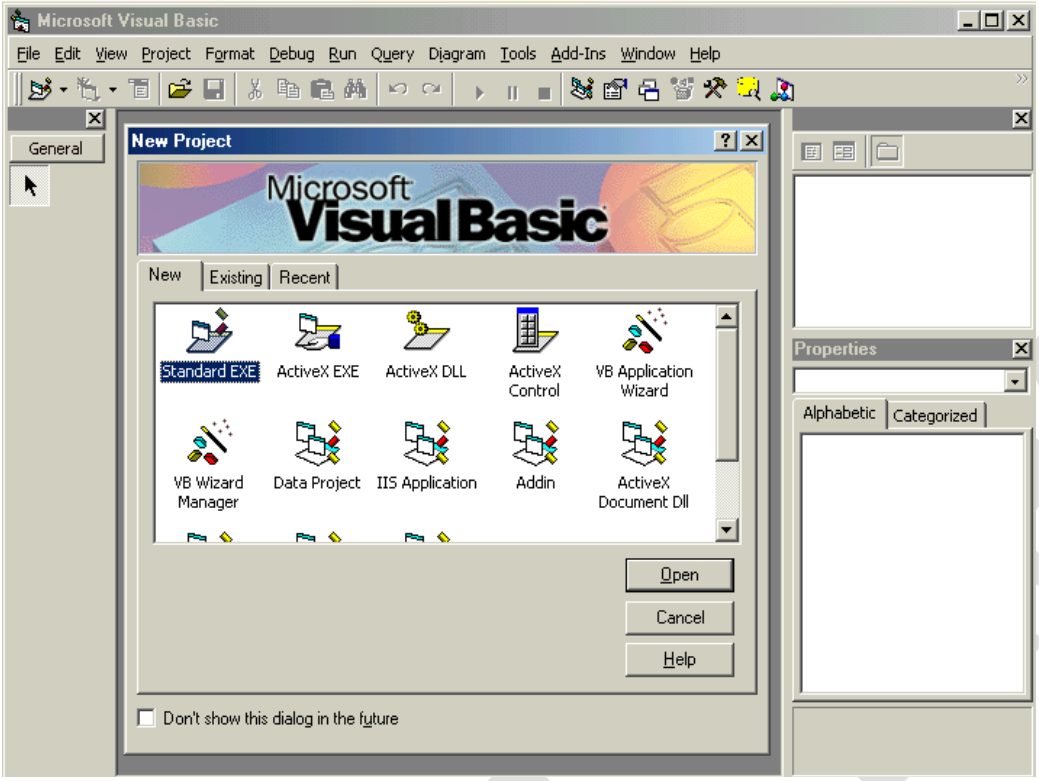


b) **To add project:** Any number can be added.

Project icon> Select Standard EXE> Project window appears.

Note: Usually first project runs first, but user can change that by:

Selecting project from project window > mouse list > Set as startup.

c) **To open an existing project:**

It is previously designed and saved on disc in a folder.

File> Open project> Box (select existing and look for the project) >

Project window

d) To delete a project:

Select project in Project window > Mouse list > Remove project.

e) To save project:The visual basic can save the project on disc in two ways, as anexecutable type or a non- executable type.

For project in non execution stage: There are many types of files summarized as follows:

1. **Project file**: it consists of all files which are related to specific project,also some other information with it. This could be saved with extension(.VBP)
2. **The form Files**: this contains form description and any Object orprogram related to it .This is saved with extension (.frm).

To save project for first time:

File>Save project (group) as>Box (project name)> forms saved then projects group saved.

To resave project: to save previously saved project in same placeFile>save project (group)

Note: If a form is modified it should be saved. To save a form:

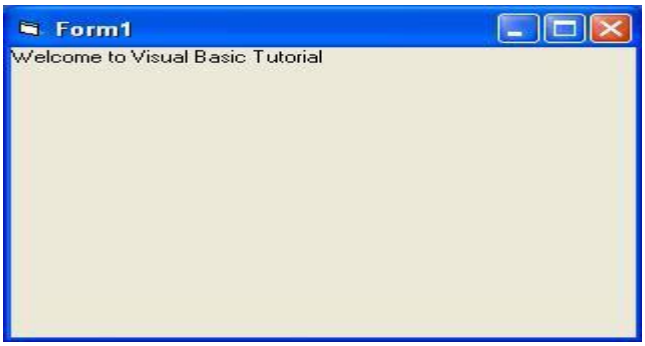
Select a form from Project window>File>Save project form1 as > Savebox (select form name). OR: File>Save project form1.

II- project for execution: This is the final stage so that it could be openedand run byWindows and no need for Visual Basic program. File> Makeproject.exe.

Item		Action steps	Remarks
Create project	New	File>New project	The user can open any number of projects.
	Exist	File>Open project	Project was already designed and saved.
	Recent	File>Open project	Project was recently designed and saved.
Save project		File>Save project group as	Visual Basic can deal with it (open and modify).
		File>Make project1.exe	For execution by window.
Delete project		File> Remove project	Select project before remove.

Example1 of application:

```
Private Sub Form_Load ( )
Form1.show
Print "Welcome to Visual Basic tutorial"
End Sub
```



CHAPTER 3: INTEGRATED DEVELOPMENTENVIRONMENT (IDE)

The IDE environment consists of many elements. Some elements are displayed when Visual Basic is started (By default) as in the following figure. Other elements are displayed if the user requires them. We will list some of these elements.

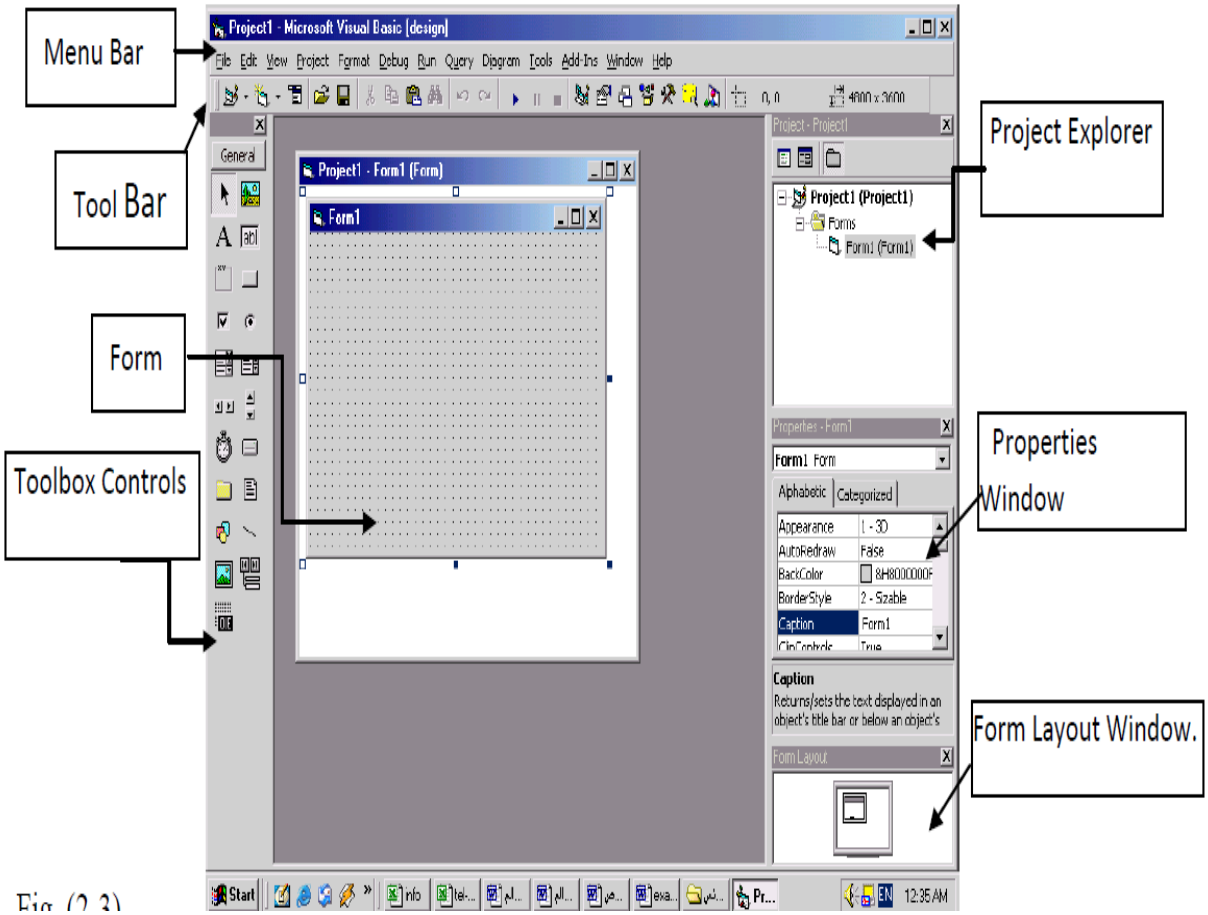


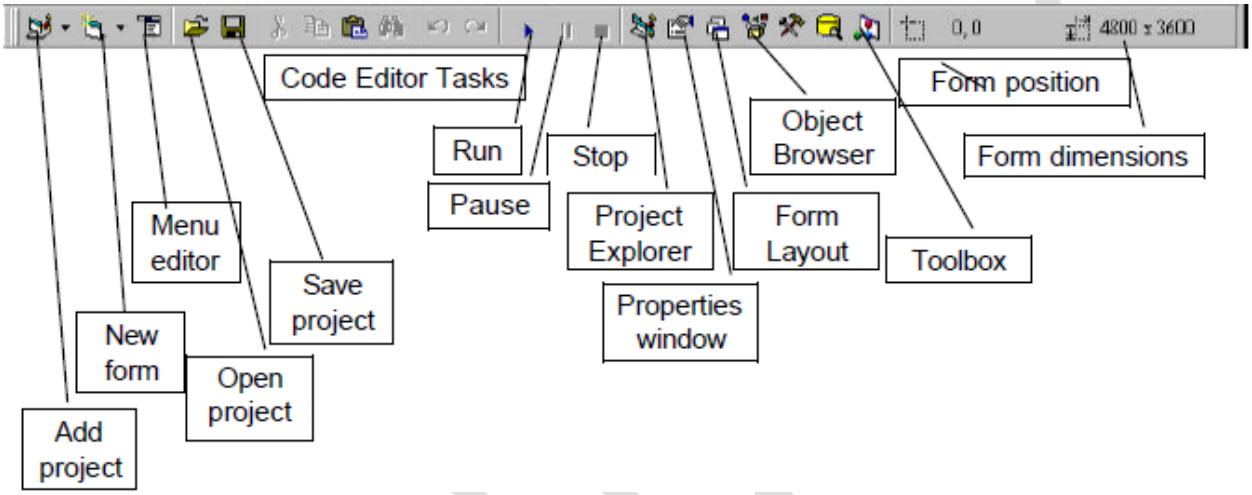
Fig. (2.3)

3.1 Menu Bar

Menu barcontains a standard command and specific command like (File, Edit, View, Project, Format, Debug, Run, etc.)

3.2Toolbar

Tool bar contains several icons that provide quick access to commonly used features.



3.3 ToolBox

ToolBox contains a collection of tools (controls) that are needed for project design. To show the toolbox press View> toolbox icon. The user can place the tool on form, and then work with the tool. To place the tool on form: click on tool>draw tool to form > the tool appears on form or double click on tool then the tool appears on form.

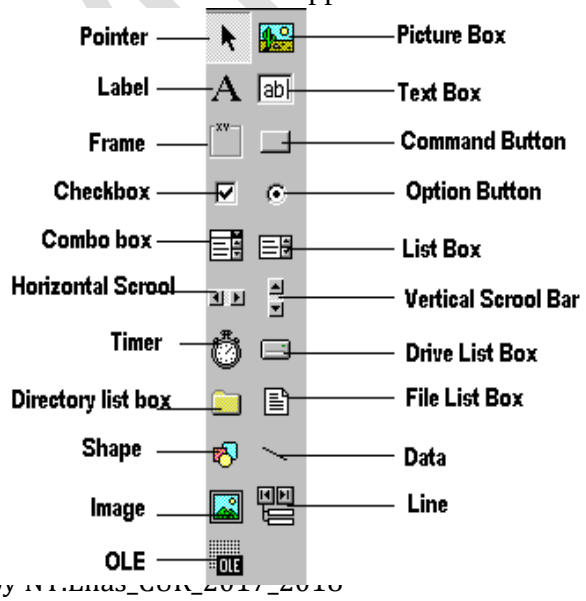
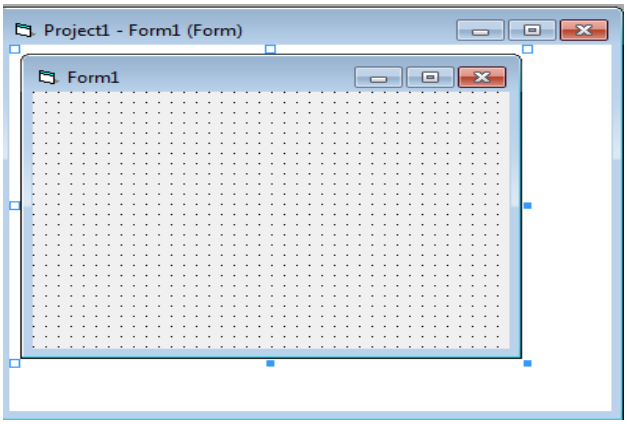


Table (1): Toolbox controls summary.

Control	Description
Pointer	Used to interact with controls on the form(resize them, move them, etc.). The pointer is not a control
PictureBox	A control that display images or print the result.
Label	A control that displays uneditable text to the user.
TextBox	A control for accepting user input. Textbox can also display text.
Frame	A control for grouping other controls.
CommandButton	A control that represents a button. The user presses or clicks to initiate an action.
CheckBox	A control that provides the user with a toggle choice (checked or unchecked)
OptionButton	Option buttons are used in groups where only one at a time can be true.
ListBox	A control that provides a list of items.
ComboBox	A control that provides a short list of items.
HscrollBar	A horizontal scrollbar.
VscrollBar	A vertical scrollbar.
Shape	A control for drawing circles, rectangles, squares or ellipse
Line	A control for drawing line.
DrivelistBox	A control accessing the system disk drivers.
DirlistBox	A control accessing directories on a system
Filelistbox	A control accessing file in a directory
Image	A control for displaying images. The images control does not provide as many capabilities as a picturebox.
OLE	A control for interacting with other window applications.
Timer	A control that performs a task at programmer specified intervals. A timer is not visible to the user.

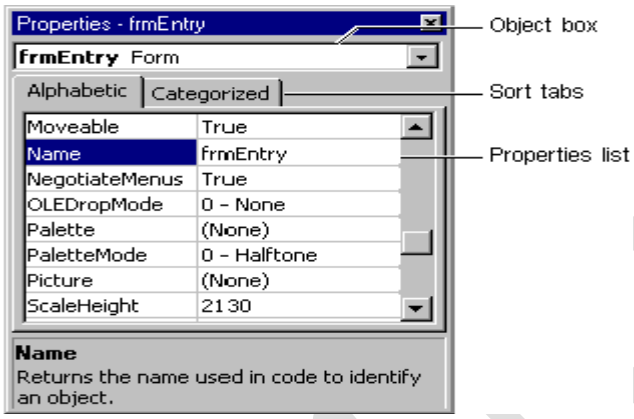
3.4 Form Designer

Form designeris a window for each form to customize the designedinterface of the application. Using the form designer, the user can addcontrols, graphics, and text to create the desired form appearance.



3.5 Properties Window

Properties windowis a List of properties settings for a selected form ora control. These properties are characteristics (such as size, visible, or color)of the selected object it provides an easy way to set properties. To show the properties window press View> properties window icon.

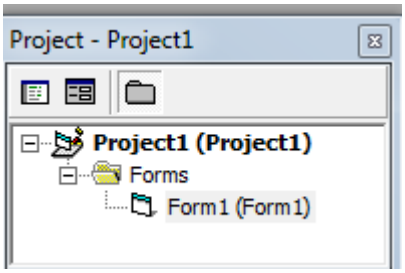


Properties name	Objective
Name	Used to represent name of object in code.
Caption	Name appears on object.
Back color	Background color for object.
Fore color	Color of text written on object.
Font	Font style type and size
Visible	The tool is visible or invisible.
Enable	The tool enable or disable
Height	Length of object
Width	Width of object
Top	Coordinates of top of object on screen
Left	Coordinates of left of object on screen
Text	Allows inputting and editing text in object.

3.6 Project Explorer Window

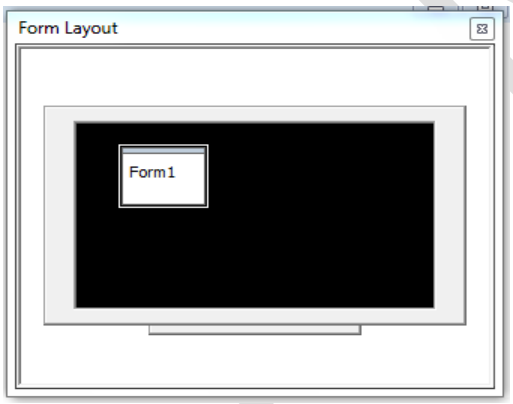
The window titled Project-Project1 is called the Project Explorer and contains the project files. The project explorer window's tool bar contains three buttons, namely view code, view object and toggle folders. When pressed, the view code button displays a window for writing Visual Basic code. View object, when pressed, displays the form. Double-clicking form1 (form1) also displays the form. The toggle folders button toggles (i.e., alternately hides or shows) the forms folder.

The forms folder contains a listing of all forms in the current project. To show the Project Explorer window press View> Project Explorer window icon



3.7 Form Layout Window

The Form Layout window specifies a form's position on the screen at runtime. The Form Layout window consists of an image representing the screen and the form's relative position on



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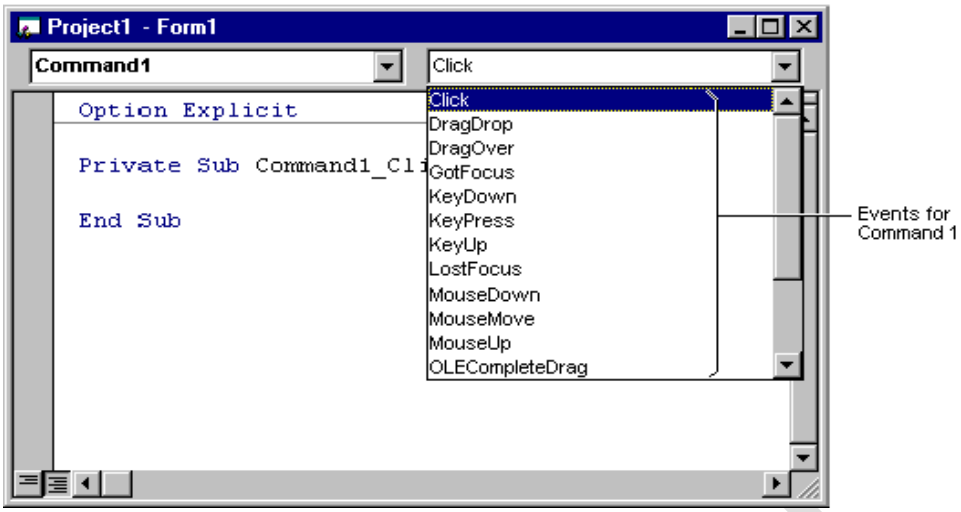
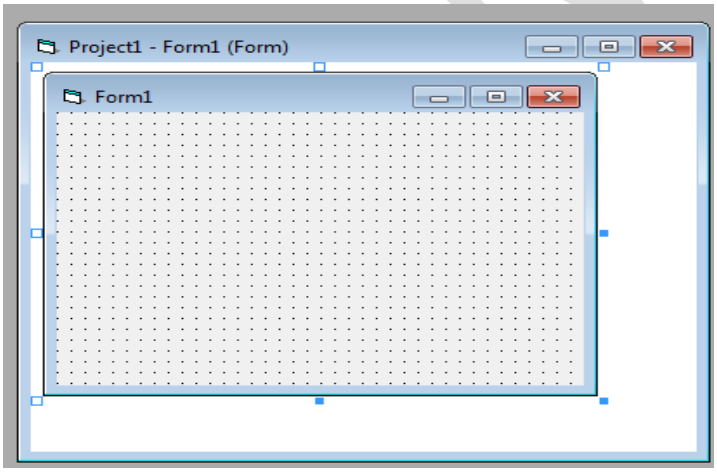
3.8 Code Editor Window

Code Editor Window is used to write a VB codefor an application. For each form there is a separate code editor window.It is displayed when user clicks on form or object in form.



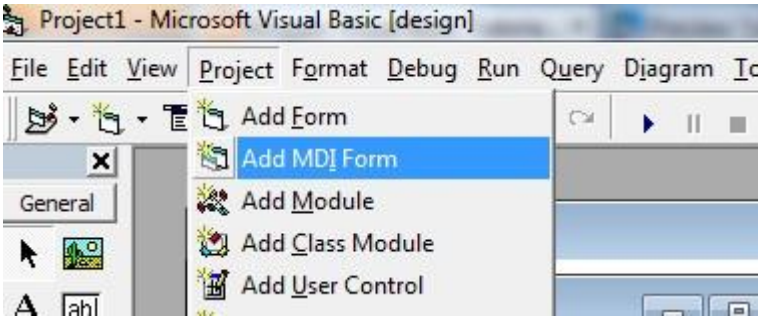
3.9 Environment options (SDI, MDI)

SDI: single document interface is one where all windows appear independently of one other without unification of a single parent window .



MDI: multiple documentinterfaces is one that allows you to view multiple windows within a larger window.

How to add an MDI form to the current project?



Project > Add MDI form. Click Project from the menu bar and click Add MDI form.

Restrictions of the MDI form

1. You can have only one MDI form per project.
2. You can't place most controls on an MDI form. The only controls that can be placed on the surface of the MDI form are Timer, Picture Box.

These restrictions are there because MDI forms are special type of forms, only used to handle multiple child forms.

How does the MDI form work?

In your project, there will be only one MDI parent form with one or more MDI child forms (or simply child forms).

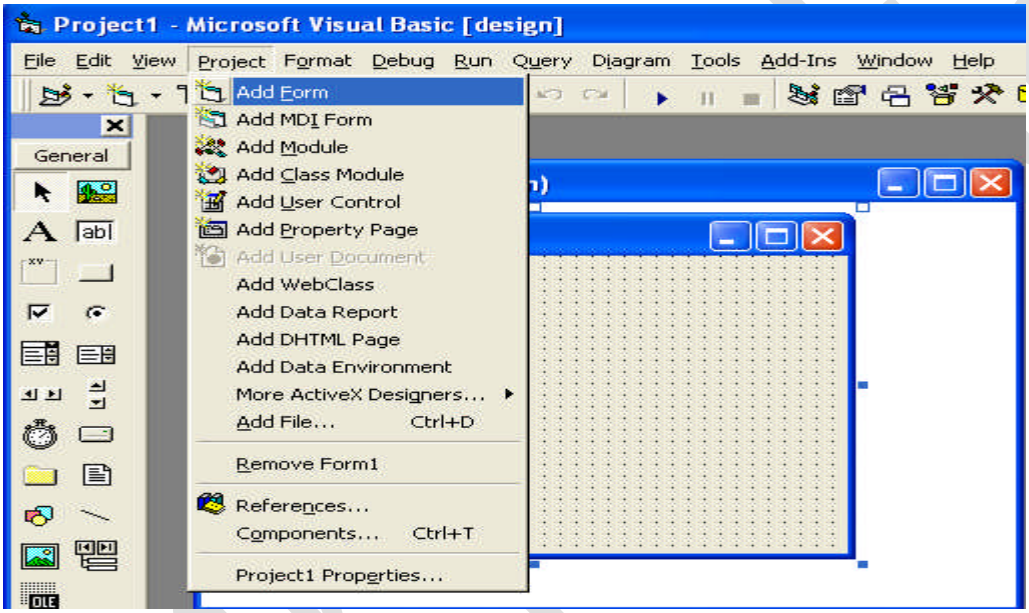
- ✓ **MDI child form:** To add a child form, you have to add a regular form, and set the MDIchild property to True. You can have many child forms. You can show an MDI child form using the Show method as same as the regular forms.
- ✓ **AutoShowChildren property of an MDI form:** The default value is True. When its True, the MDI child forms are displayed when they are loaded. When the value is False, only then you can keep it hidden after loading, otherwise not.

CHAPTER 4: VISUAL BASIC CONTROLS

Controls: is the graphical features drawn on forms that allow user interaction (textbox, labels, command button)

4.1. Forms

The form is the most important visible object, without it no control can bedisplayed. It is a window that can be designed and modified to fit user applications. In the standard project the form Designer creates and modifies visual forms .When user starts visual Basic program a form is automatically displayed in Designer window. The designer can add any number of forms to the project of his application by pressing: add form from project menu.



The forms also have properties and events.

4.1.1 Form properties

Properties list has a predefined value (numeric or string) and could be changed, some properties could be rewritten like caption, and some could be selected from option list by pressing on down arrow on the side.Others could be rewritten or by browsing the computer files when the user clicks on the dotted button on the right side a dialogue box appears. The browsing button appears when the user clicks inside the box.

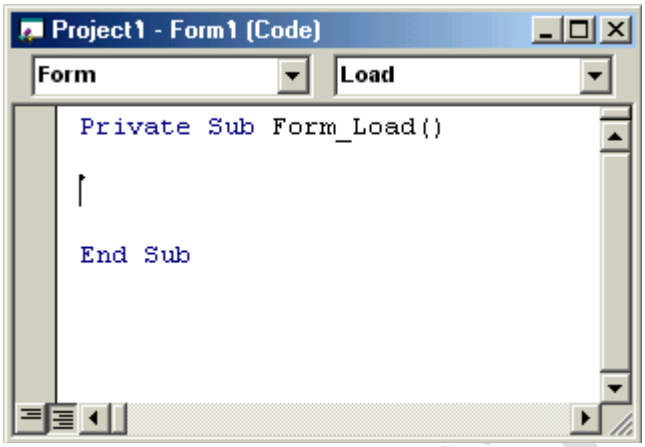
The most important properties of the form are listed in the following table:

4.1.2 Code form

The code is written in code Form and it will be edited quickly bycode editor .The codes are of two categories:

1- Declaration is written before any procedure in the code

2- Statements. The user selects the required event then code statements are written inside these event procedures.



4.1.3 Form and event

The forms and controls support events (generation, interaction withmouse and keyboard). The most important events for the form aredescribed in the following table.

Event	Action taken when
Click	Single click on object.
DbClick	Double click on object.
load	Loading the object

Examples:

1- Design a form such that: in event load, when project runs, the formbackcolor property changed (chose any color).

Eg:**code:**

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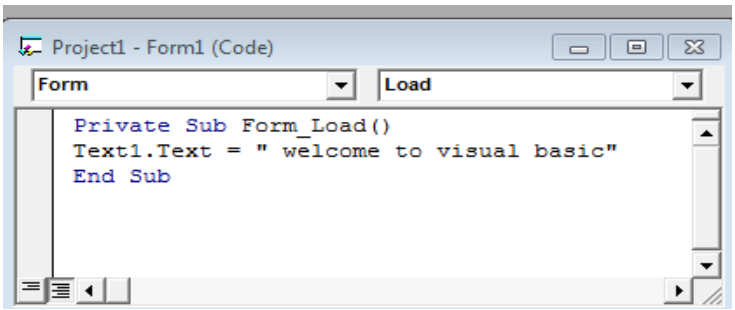
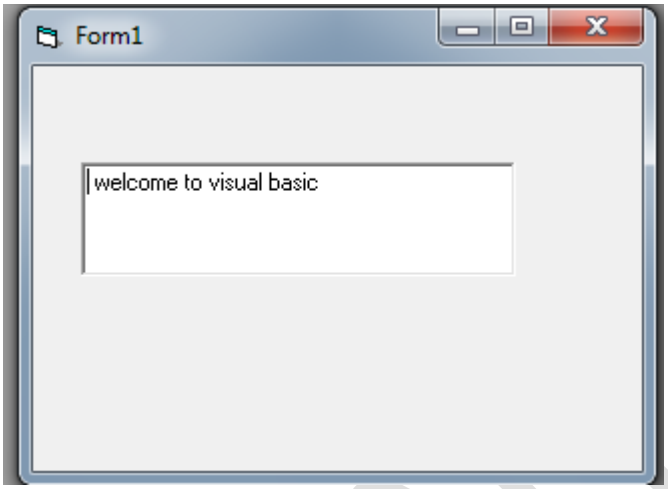
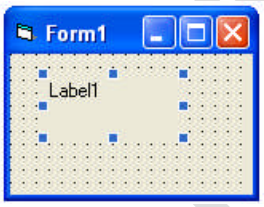


Result



4.2 Labels



Label is used to display fixed text on form

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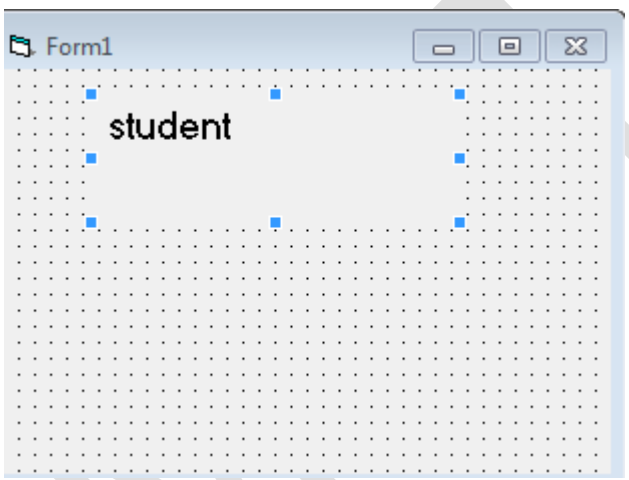
Property name	Objective	Code	Stage of Changing
Caption	String appear on label	$label_{no.}$.caption= "any name"	Design and run
Autosize	To resize tool to fit text	$label_{no.}$.autosize= true or false	Design and run
Backcolor	Background color for label	$label_{no.}$.Backcolor=Qbcolor(no.)	Design and run
Forecolor	Color of text written on label	$label_{no.}$.forecolor=Qbcolor(no.)	Design and run
Font	Font style, type and size	Size: $label_{no.}$.fontsize= no. Style: font { italic, bold, underline } Type: label.FontName = "arial"	Design and run
visible	The label appear or disappear	$Label_{no}$.visible= true or false	Design and run
Enabled	The label enable or disable.	label $_{no.}$. Enabled =true or false	Design and run

Example1: Design a form contains label "Student" in size 14.

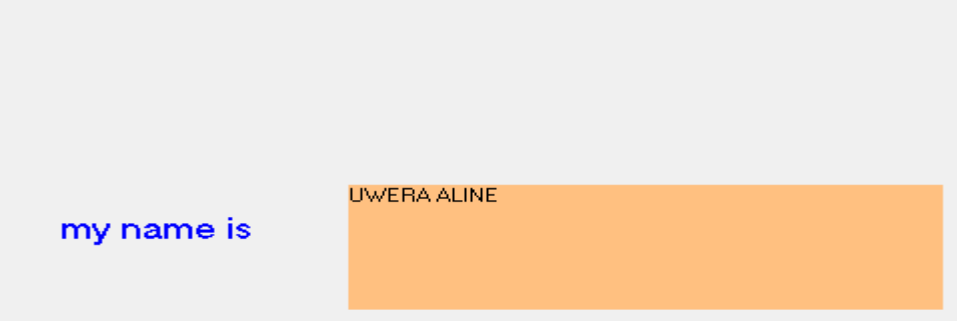
Draw label →Caption: student, Font:14



Example2: write program in VB that displays your name in label

Answer:

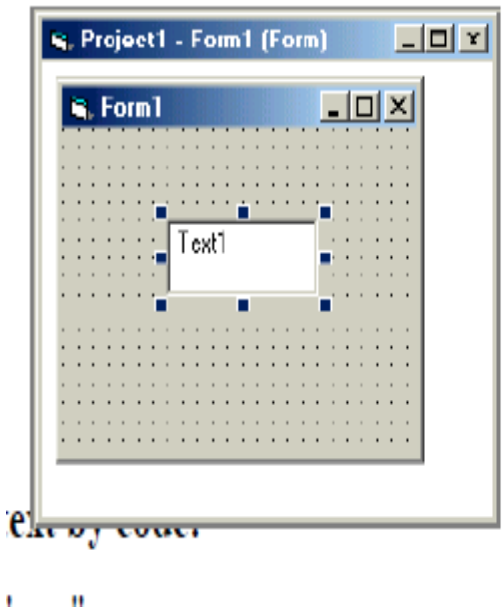
```
Private Sub Label2_Click()
Label2.Caption = "UWERA ALINE"
End Sub
```

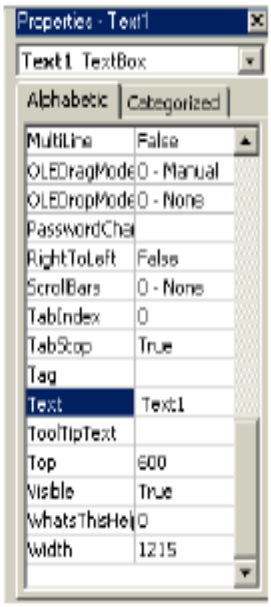


4.3 Text Box

The textbox is a box for entering and displaying text (characters or values) inuser project. This tool is used frequently in most of the application. The textbox hasproperty window, with no caption, but with space for text. The most important property of this tool is the text content which is described in the following:

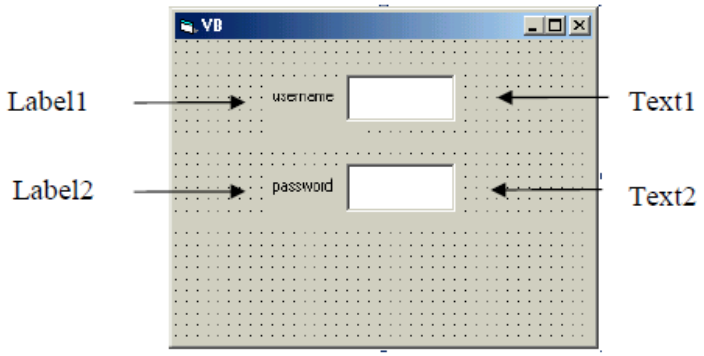
Property name	Objective	Code	Stage of Changing
Text	String appear on textbox	text $_{no.}$. text = "any name"	Design and run
multiline	To enter more than one line	true or false	Design
Backcolor	Background color for textbox.	text $_{no.}$.Backcolor=Qbcolor(no.)	Design and run
Forecolor	Color of text written on textbox.	text $_{no.}$.forecolor=Qbcolor(no.)	Design and run
Font	Font style, type and size.	Size: text $_{no.}$.fontsize= no. Style: $font \begin{cases} italic \\ bold \\ underline \end{cases}$ Type: label.FontName = "arial"	Design and run
visible	The textbox appear or disappear	text $_{no}$.visible= true or false	Design and run
Enabled	The textbox enable or disable.	text $_{no.}$. Enabled =true or false	Design and run
passwordchar	A row of symbols appear instead of letters	Text$_{no}$.passwordchar=(symbol)	Design and run
Setfocus	Put the focus on the specified textbox	Text$_{no}$.setfocus	Run





Example: Design a form to enter username and password such that the title of the form is VB.

Sol: design stage



Form1	
caption	V.B
Text1	
text	
Text2	
Text	
Label1	
caption	username
Label2	
caption	password

Example: Design a form with one textbox, set the text properties so that this massage appears when project runs (welcome to visual basic world).

Eg: There are two methods:

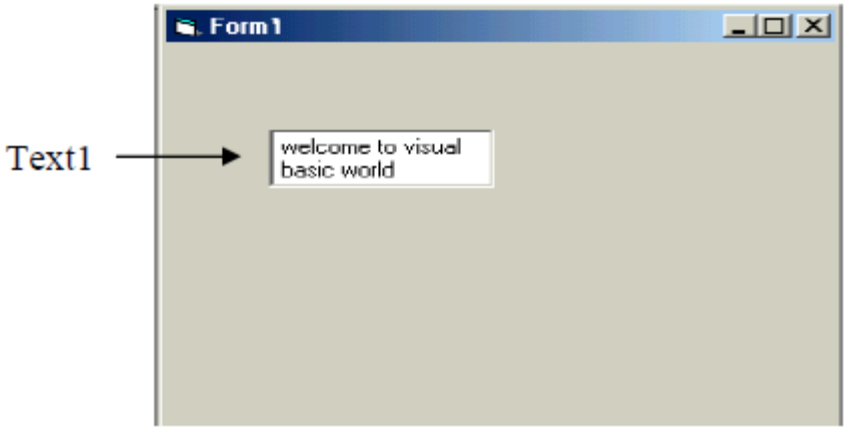
First method: changing property by code:

```
Private Sub Form_Load()
Text1.Text = "welcome to visual basic world"
End Sub
```

Second method: by properties window

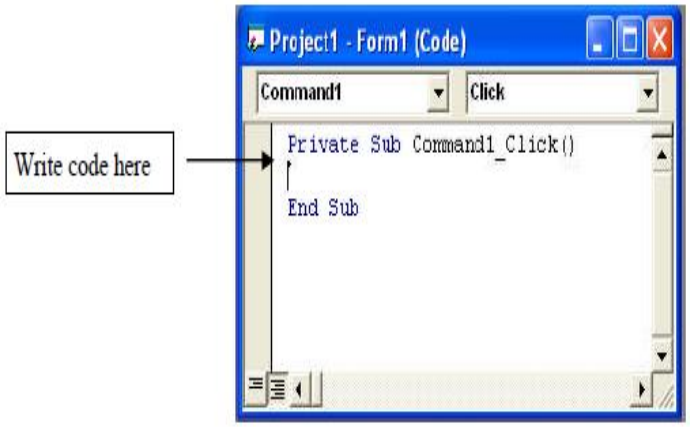
Text1	
text	Welcome to visual basic world

Running stage



4.4 Command button

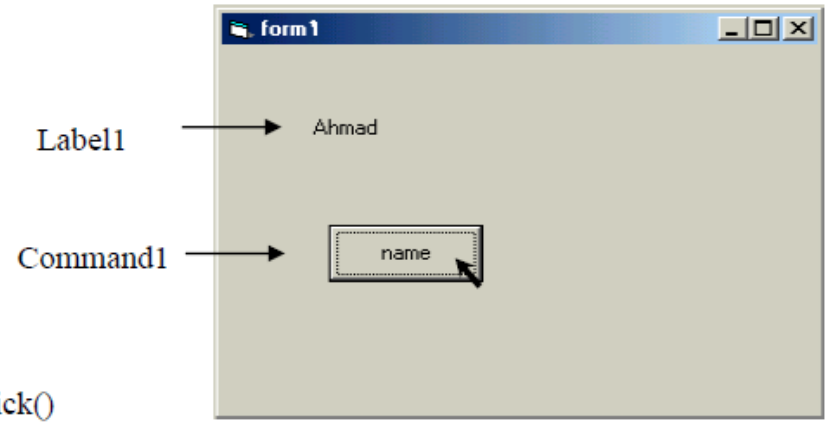
It acts as a switch. To deal with tool property> click on command button> propertywindow appear> change setting of any desired property. Usually change set itscaption property to a suitable string.To make the button functional; the user should add some code. To do this: click on command tool> code form appears with click event procedure. Write code in this event or other events like keypress event.



Example: Design a form with label, such that when click on the command button"name" your name appears on label (at running stage).

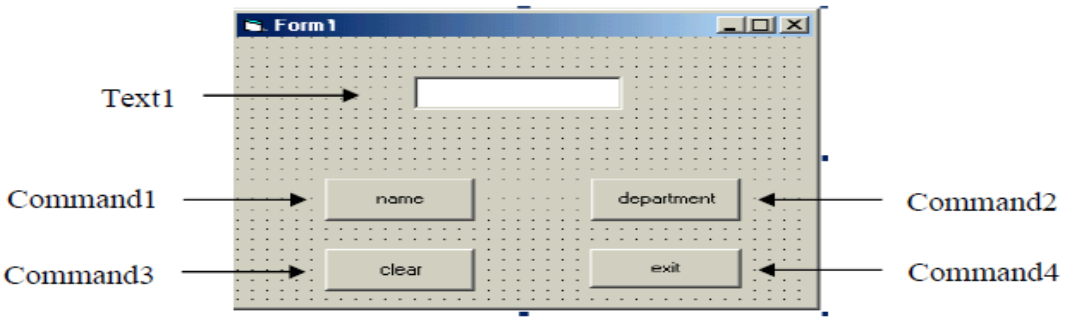
sol:

Label1	
caption	
Command1	
caption	name




```
Private Sub Command1_Click()
Label1.Caption = "Ahmad"
End Sub
```

Example: Design a form to appear your name and department in textbox, when click on command button "name" and "department" respectively so that you can clear theseinformations when click on command "clear" and stop project when click on command "exit".



Text1	
text	
Command1	
caption	name
Command2	
caption	department
Command3	
caption	Clear
Command4	
caption	exit

```
Private Sub Command1_Click()
Text1.text="Muna"
End Sub
Private Sub Command2_Click()
Text1.text="Science"
End Sub
Private Sub Command3_Click()
Text1.text=" "
End Sub
Private Sub Command4_Click()
end
End Sub
```

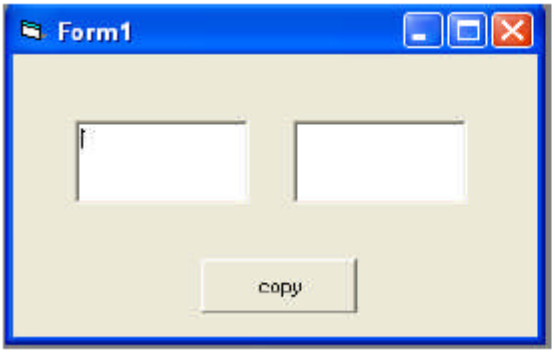
Example: Design a form contains two textbox so that when click on command button"copy" the text copied from first textbox to the second textbox but in size (28).

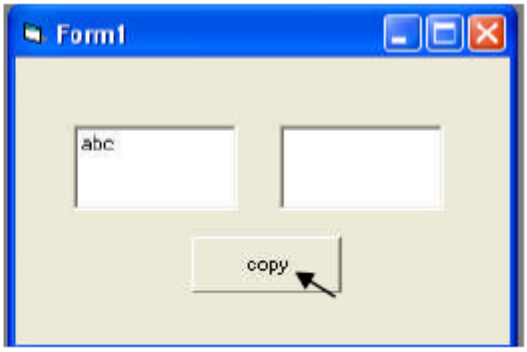
Sol:

Text1	
text	
Text2	
Text	
Command1	
caption	copy

```
Private Sub Command1_Click()
Text2.Text = Text1.Text
Text2.FontSize = 28
End Sub
```

At run stage this window appear





4.5 Option button

Option button is used only as a group of buttons. When the user selects one of them the others are deselected automatically. All other properties of this control are similar to those in form and command button where they are fully discussed which are caption, font, enabled, backcolor and visible beside an important property which is value that takes true or false and it used with if statement. The option button usually takes click event.

Example: Design a form with three option buttons " red ", " green " and " blue " such that when we click on options the color of the form colored by red, green and blue respectively.

option1:caption	green
option2: caption	blue
option3: caption	red

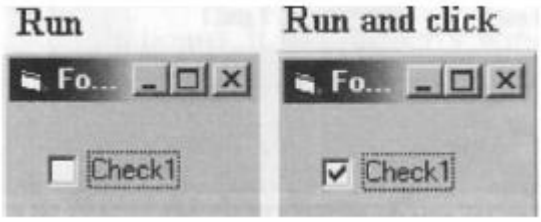
```
Private Sub Option1_Click()
Form1.BackColor = vbGreen
End Sub

Private Sub Option2_Click()
Form1.BackColor = vbBlue
End Sub

Private Sub Option3_Click()
Form1.BackColor = vbRed
End Sub
```

4.6 Check box

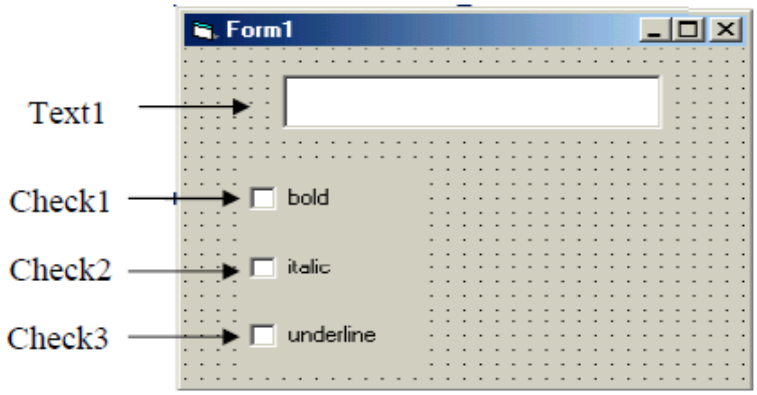
Any number of check boxes can be used on a form. They work independently. Its Property value could be changed in design stage manually, or in running stage by code.



Example: Design a form with one text box and three check boxes such that when click on boxes the following is done: change typing to bold, italic, underline.

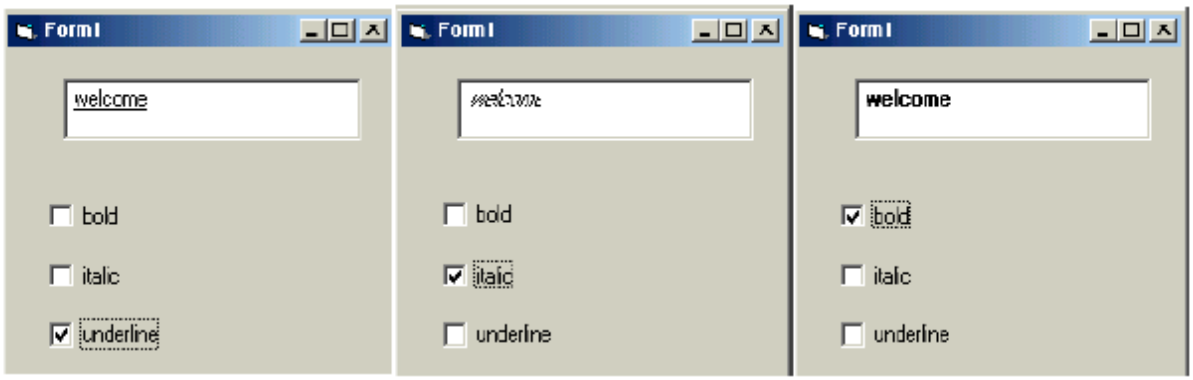
Sol:

Text1	
Text	•••
Check1	
caption	Bold
Check2	
caption	Italic
Check3	
caption	underline




```
Private Sub Check1_Click()
Text1.FontBold = Check1.Value
End Sub
Private Sub Check2_Click()
Text1.FontItalic = Check2.Value
End Sub
Private Sub Check3_Click()
Text1.FontUnderline = Check3.Value
End Sub
```

Run stage:



4.7 Timer

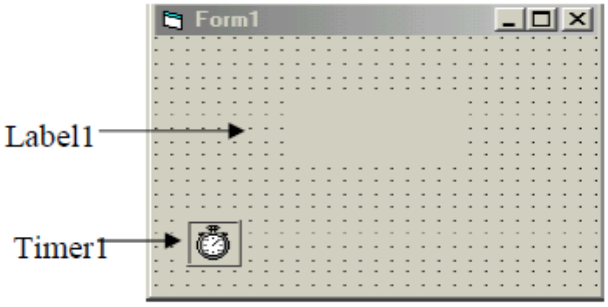
Timer returns the time in millisecond. It may be used to measure execution time of code (program efficiency).

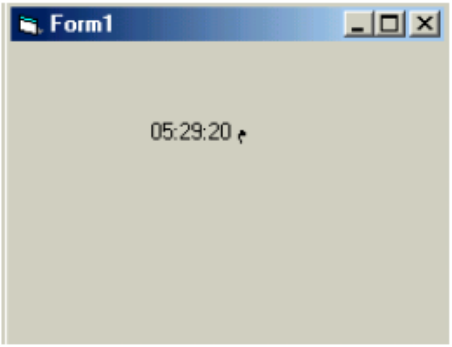
Property name	Objective and code
interval	To repeat the code according to event. It takes an integer values (0-65535) and measured in millisecond
enabled	timer$_{no.}$. Enabled =true or false

Ex: design electronic clock to display the time in seconds.
sol:

Timer1	
interval	1000
Label1	
Caption	

```
Private Sub Timer1_Timer()
Label1.Caption = Time
End Sub
```





4.8 List Box

What is a list control in Visual Basics 6.0?

A list control in Visual Basics 6.0 is a control which helps to display data vertically to the user on the form of a list.

A list box has many entries and is selected by the user. These entries are not generated automatically, there are entered by methods **AddItem**, the method **RemoveItem** help to delete these entries from a list. To clear the whole content of a list we use **Listname.clear** , To refresh list content we use Listname.Refresh

Example:

List the following department names in a Visual Basics 6.0 list control:

Computer Electronics

Computer science

Accounting

Secretary

Construction

To add these elements on a list we write the following codes:

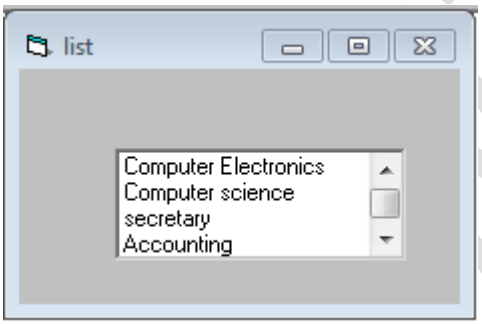
ListA.AddItem “Computer Electronics”

ListA.AddItem “Computer science”

ListA.AddItem “secretary”

ListA.AddItem “Accounting”

ListA.AddItem “Construction”



4.9 ComboBox

A comboBox control is a combination of TextBox control and ListBox control on only one entity. It allows to add entries or to select from a list predefined values.

List the following department names in a Visual Basics 6.0 ComboBox control:

Computer Electronics

Computer science

Accounting

Secretary

Construction

To add these elements on a ComboBox we write the following codes:

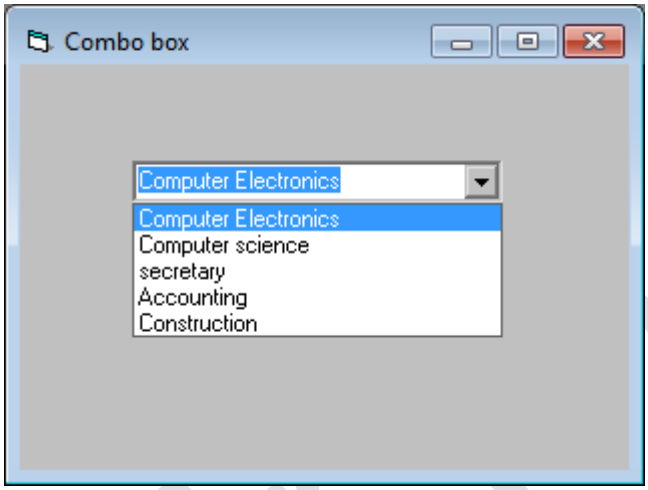
Combo1.AddItem “Computer Electronics”

Combo**1**.AddItem “Computer science”

Combo1.AddItem “secretary”

Combo1.AddItem “Accounting”

Combo1.AddItem “Construction”



Note: the procedure for add a list box and combo box must be placed in form not in control itself, and they are two way to add it.

- ✓ One by using procedure

  Private sub form_Load()

  Combo1.AddItem “programming”

  Combo1.AddItem “networking”

  End sub

- ✓ Second by pass to list an combo box control properties

CHAPTER 5: CODE ELEMENT

5.1 Declaration of variables and constants and data types

5.1.1 Data types used in visual basic

Visual Basic is rich in its data types. Data types are used to declare the variables. At the time of declaration, memory is allocated for the variables. Different data types are used to store different types of values.

Table: Memory storage for data types

Data Type	Storage	Data Type	Storage
Byte	1 byte	String (variable-length)	Length + 10 bytes
Boolean	2 bytes	String (Fixed-Length)	Length of string
Integer	2 bytes	Currency	8 bytes
Long	4 bytes	Decimal	12 bytes
Single	4 bytes	Object	4 bytes
Double	8 bytes	Variant (numeric)	16 bytes
Date	8 bytes	Variant (text)	length +22 bytes

Table: Data types & their value range

Data Type	Value Range
Byte	0 to 255
Boolean	True/False
Integer	-32,768 to 32,767
Long	-2,147,483,648 to 2,147,483,647
Single	-3.402823*10^3 to -1.401298*10^45 for negative values 1.401298*10^-45 to 3.402823*10^38 for positive values
Double	-1.79*10^308 to -4.94*10^-324 for negative values 4.94*10^-324 to 1.79*10^308 for positive values
Date	January 1, 100 to December 31, 9999
String (Variable length)	0 to approximately 2 billion characters
String (Fixed length)	1 to 65,400 characters
Currency	-922,337,203,685,477.5808 to 922,337,203,685,477.5807
Decimal	+,-79,228,162,514,264,337,593,543,950,335 if no decimal is used +,-7.9228162514264337593543950335 (28 decimal places)
Object	Any object
Variant (numeric)	Any value as 16px as Double
Variant (text)	Same as variable length string

5.1.2 Declaration of variable and constant

5.1.2.1 Variables

Variable is used to store value. The value of the variable may vary during the program execution.

Declaration of a variable

The declaration means defining the variable type. When you declare a variable, memory space for the variable is reserved. This is called memory allocation. Different amount of memory space is reserved for different data types.

You can declare a variable with the Dimkeyword.

Syntax:

Dim variable As [Type]

Example:

```
Private Sub cmdSum_Click()
Dim m As Integer
Dim n As Integer
Dim sum As Integer

m = 10 'm is a variable, 10 is a constant
n = 30
sum = m + n

Print "The sum is " & sum

End Sub
```

Output: The sum is 40

You can declare many variables in one line as follows and assign multiple variables in one line using ':' operator.

```
Private Sub cmdSum_Click()
Dim m As Integer, n as Integer, sum as Integer
m = 10 : n = 30
sum = m + n

Print "The sum is " & sum

End Sub
```

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Output: The sum is 40

Explicit declaration: is the variable declared in declaration section or at the beginning of a procedure.

Example:

Dim mynumber as integer.

Implicit declaration: The variable is declared "on the fly" its data type is deduced from other variable:

Example: Dim firstnumber As integer ' explicit declaration

Dim secondnumber As integer 'explicit declaration

Result= firstnumber+ secondnumber '**Implicit declaration**

Rules of naming variable

- ✓ A variable name must begin with an alphabet.
- ✓ It cannot be more than 255 characters.
- ✓ The variable name must not contain any special character like %,&,!,#,@ or $.
- ✓ It has to be unique within the same scope.
- ✓ They may include letters, numbers, and underscore(_)
- ✓ You cannot use a reserved word or keyword

Dim X As Integer
Dim Balance As Currency
Dim Y As Long
Dim A AS Double,
B As Double
Dim Month As Date
Dim Max As Single
Dim Name As String

Dim Z,V,C

5.1.2.2 Declaration of Constants

Constant: Constant is a fixed value that does not change during the program execution. You can define your own constant to use it in your program.

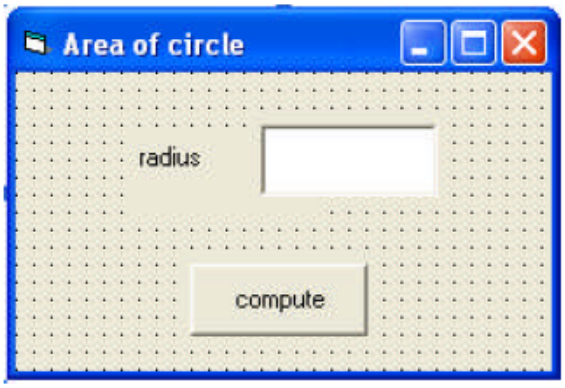
It is a space in memory filled with fixed value that will not be changed.

Constant may be declared as:

Const constant name = value

Example: Declare x as a constant (P), then compute the area of a circle. Putsuitable design.

Sol:



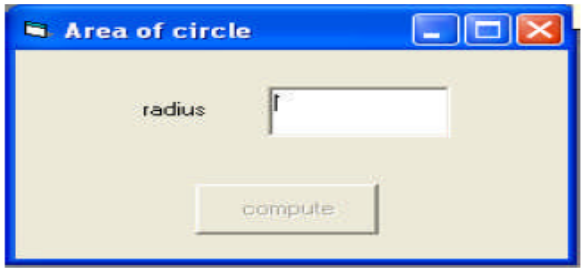
Form1	
caption	Area of a circle
label1	
Caption	radius
Text1	
text	فارغ
Command1	
caption	compute
Enabled	false

code stage:

```
Const p = 3.14159
Dim a, r As Single

Private Sub Text1_Change()
Command1.Enabled = True
End Sub

Private Sub Command1_Click()
r = Val (Text1.Text)
a = r ^ 2 * p
MsgBox ("area=" & a)
Text1.Text = " "
Text1.SetFocus
End Sub
```



Example2:

You can create your own constant to use it in your program. The value of the constant remains unchanged throughout the program.

Example3:

```
Private Sub cmdCalculate_Click()
Const pi = 3.1415926 'or Const pi As Double = 3.1415926
Dim area As Double, r As Double
r = 2
area = pi * r * r
Print area
End Sub
```

Output: 12.5663704

5.2 Visual Basic operators

1- The simplest operators carry out arithmetic operations. These operations in their order of precedence are:

Operation Code	Operation
^	Exponent
*,/	Multiplication and division
\	Integer division
Mod	Modulus – rest of division
-,+	Subtraction and addition

2- To Concatenate two strings, use the & symbol or the + symbol

4 There are six Comparison operators in Visual Basic.

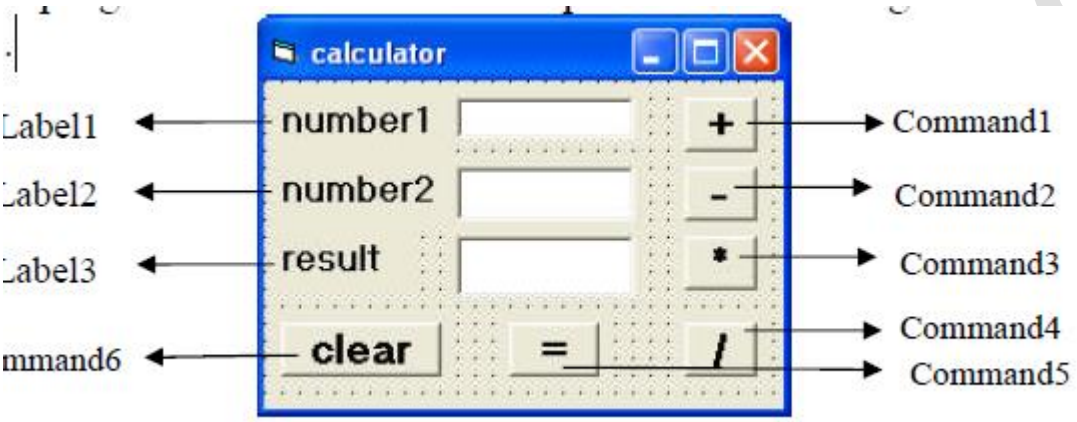
Operation Code	Comparison
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
=	Equal to
< > or > <	Not equal to

4-There are three logical operators:

Operation Code	Operation
Not	Logical not
And	Logical and
Or	Logical or

Note: Logical operators follow arithmetic operators in precedence.

Example3: write a program to execute the four operations according to the following design.



Code stage:

```
Dim a,b, c as single
Private sub command1_click ()
a =val(text1.text)
b=val(text2.text)
c=a + b
 text3.text=c
End sub

Private sub command2_click ()
a =val(text1.text)
b=val(text2.text)
c=a – b
text3.text=c
End sub
```

```
Private sub command3_click ()
a =val(text1.text)
b=val(text2.text)
c=a * b
text3.text=c
End sub

Private sub command4_click ()
a =val(text1.text)
b=val(text2.text)
c=a / b
text3.text=c
End sub

Private sub command5_click ()
Text3.text=cstr(c)
End sub
Private sub command6_click ()
Text1.text=" "
Text2.text=" "
Text3.text=" "
End sub
```

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CHAPTER6: CONDITIONAL STATEMENTS

There are two types of conditional statements:

1- If statement

2- Select case

6.1. If statement

The comparison operations are used with conditional statements. The comparison operations are: (<, <=, >, >=, =, <>, and, or)

There are four structures for if statement.

a) Simple structure If.. then:

Used for running one programming statement only if the required condition satisfied.

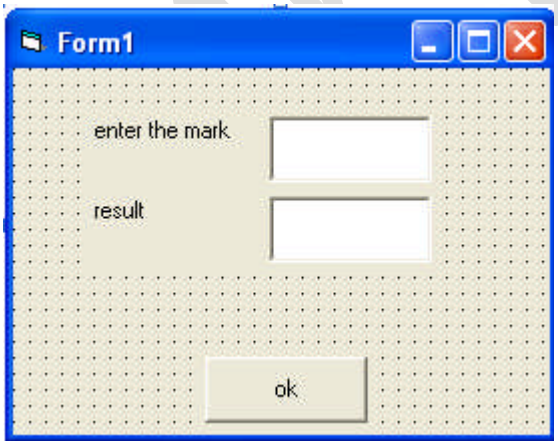
The general form is:

If *condition* ***then*** *statement*

Example 1: write a program to enter a mark of a student then print (pass) ifhe successful.

Sol:

```
Dim x as integer
Private sub command1_click()
X= val (text1.text)
If x>= 50 then text2.text= "pass"
End sub
```



b) **If block structure:** Used for running many programming statements ifthe required condition satisfied.

The general form is:

If condition **then**

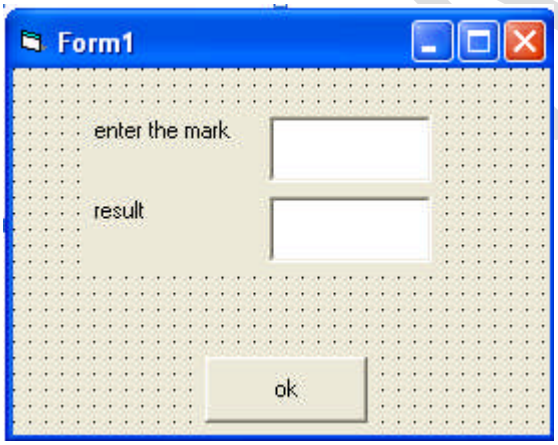
Statements

End if

Example 2: write a program to enter a mark of a student then print (pass)in size 18 if he successful.

Sol:

```
Dim x as integer
Private sub command1_click()
X= val(text1.text)
If x>= 50 then
text2.text= "pass"
text2.fontsize=18
end if
End sub
```



c) **If.. Then.. Else structure:** Used for running many programmingstatements if the required condition satisfied. And running anotherprogramming statements (after else) if the required condition not satisfied.

The general form is:

If condition **then**

Statements

Else

Statements

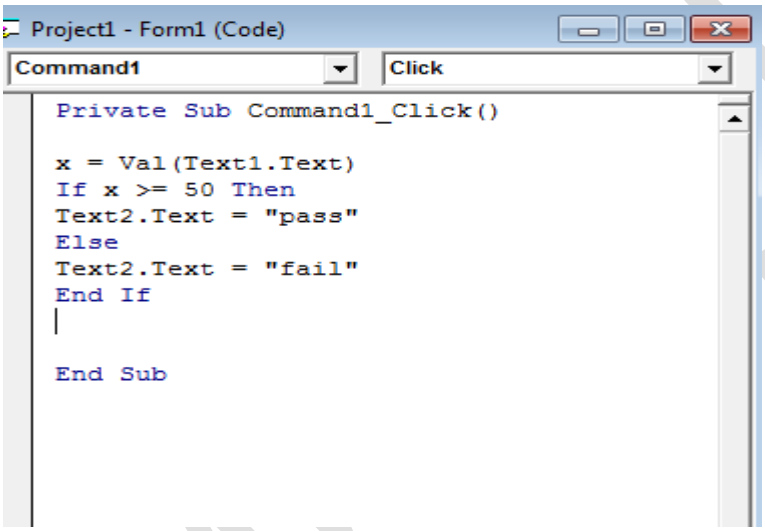
End if

Example3: write a program to enter a mark of a student then print (pass) if he successful and print (fail) otherwise.

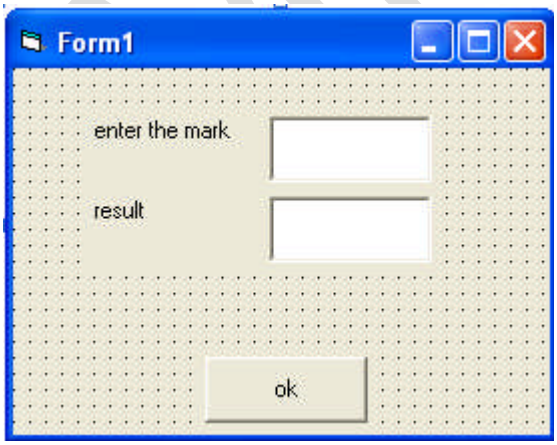
Sol:

Dim x As Integer

Private Sub command1_click()



End Sub



d) **If.. Then.. Elseif.. Else structure:**

Used if we have many conditions to be satisfied

Example 4: write a program to enter a user name and display the message(hello) three times. The first one for (Muna), the second one for (Maha) andthe third for any user as a guest.

Sol:

```
Dim x As String
Private Sub command1_click()
x = Text1.Text
If x = "Muna" Then
MsgBox "hello, Muna"
ElseIf x = "Maha" Then
MsgBox "hello,Maha"
Else
MsgBox "hello, guest"
End If
End Sub
```

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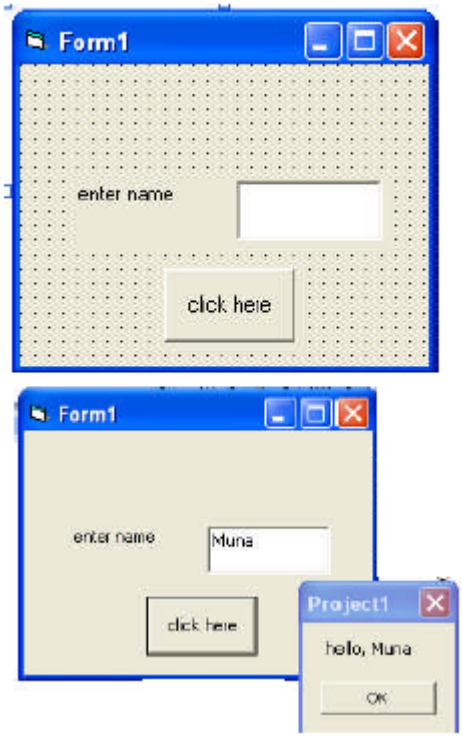

Example 5: Write a program to classify any entered number according toits sign and display the phrase (negative number) when the number isnegative and the phrase (positive number) when the number is positive,otherwise display the phrase (neither positive nor negative).

Sol:

```
Dim x As Single
Private Sub command1_click ()
x = Val(Text1.Text)
If x > 0 Then
MsgBox "positive number"
ElseIf x < 0 Then
MsgBox "negative number"
Else
MsgBox "neither positive nor negative"
End If
End Sub
```

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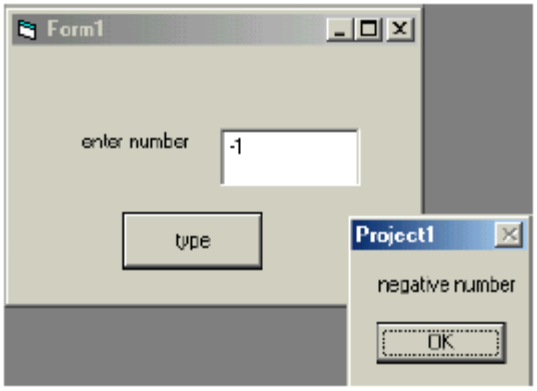

Nested If statement:

It can be takes the following structure:

```
If condition then
    If condition then
        Statements
    End if
End if
```

structure2

structure 1

Note: Any structure of if structures can be used insteade of structure 1 and 2 above.

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6.2 Select case statement

If you have a lot of conditional statements, using If..Then..Else could be very messy. Formultiple conditional statements, it is better to use Select Case .

The format is :

```
Select Case expression
Case value1
Block of one or more VB statements
Case value2
Block of one or more VB Statements
Case value3
Block of one or more VB statements
Case value4
Case Else
Block of one or more VB Statements
End Select
```

Example 7: write a program to print the days of the week when we enter its number

Sol:

```
Dim x As Integer
Private Sub Command1_Click()
x = val(Text1.Text)
Select Case x
Case 1
MsgBox ("Sunday")
Case 2
MsgBox ("Monday")
                Case 3
MsgBox ("Tuesday")
Case 4
```

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MsgBox ("Thursday")

Case 5

MsgBox ("Wednesday")

Case 6

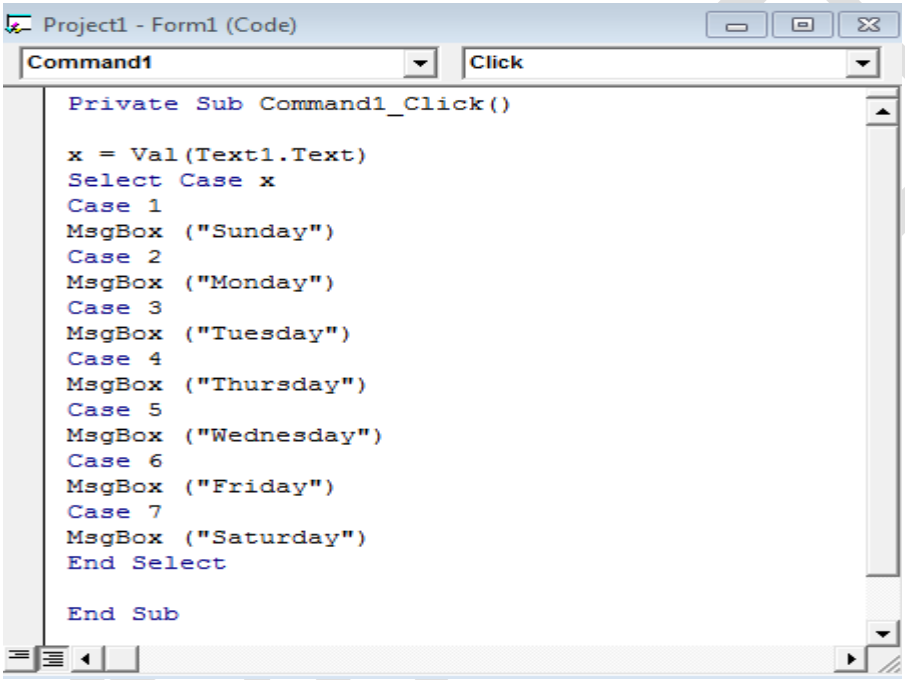
MsgBox ("Friday")

Case 7

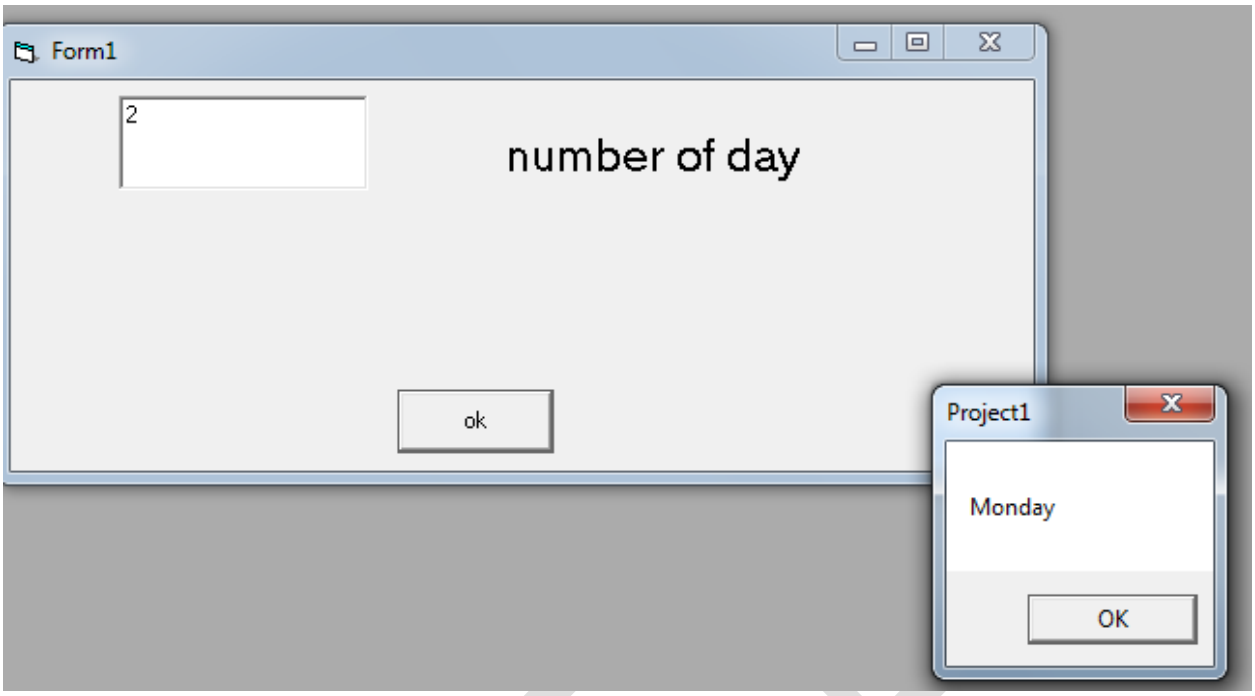
MsgBox ("Saturday")

End Select

End Sub



Running



Example2: Examination Grades

```
Dim grade As String
Private Sub Compute_Click( )
Grade=txtgrade.Text
Select Case grade
Case "A"
result.Caption="High Distinction"
Case "A-"
result.Caption="Distinction"
Case "B"
result.Caption="Credit"
Case "C"
result.Caption="Pass"
Case Else
result.Caption="Fail"
End Select
```

*Please note that grade is a string, so all the case values such as "A" are of String data type.

Example3

```
Dim mark As Single
Private Sub Compute_Click()
'Examination Marks
mark = mrk.Text
Select Case mark
Case Is >= 85
comment.Caption = "Excellence"
Case Is >= 70
comment.Caption = "Good"
Case Is >= 60
comment.Caption = "Above Average"
Case Is >= 50
comment.Caption = "Average"
Case Else
comment.Caption = "Need to work harder"
End Select
```

NB: * Note we use the keyword Is here to impose the conditions. This is generally used for numeric data.

CHAPTER 7: LOOPS STATEMENTS

7.1 Looping

The format are:

i)While–wend

ii)Do-while

iii)For-next

While–wend

While– wend first checks whether the condition is true. The statements will be executed as long as the condition remains true.

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The general form is

WHILE<condition>Statements

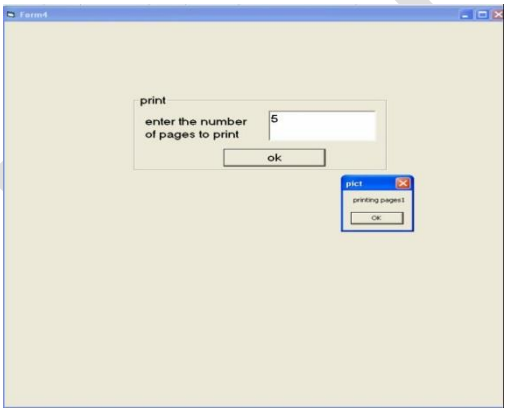
WEND

Example

Aim: To print the number of pages

Properties

Control	Property	Value
Frame1	*Caption*	*Print*
Label1	*Caption*	*Enter thenumber of pages to print*
Text1	*Text*	*Empty*
Command1	*Caption*	*ok*



Code

PrivateSub Command1_click ()

Whilei <Val(Text1.Text)

i =i +1

MsgBox("printingpages" &i) Wend

End Sub

DO – WHILE

Do–loopexecutesablockofstatementsaslong astheconditionistrue.Iftheexpression isfalsetheprogramcontinuestothestatementfollowing theloopstatementandthatwill be executed

Thegeneral format is

DO
WHILE<condition>Statements

LOOP

Aim:To find out number of words in a sentence

Properties

Control	**Property**	**Value**
Frame1	*Caption*	*Frame1*
Text1	*Text*	*Empty*
Label1	*Caption*	*Enter a lineof text*

Code

Private Sub General-declarations()

Dim d As String

Private Sub Text1_MouseDown()

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```
d =Text1.Text
position =1

Do While position >0

position =InStr(position +1, d, " ")

words =words+1

Loop

MsgBox("the number of words is " &words)

End Sub
```

Instr()function finds space in the text and returns positive number. When no more spaces, it returns 0 and instr(start point, line of text to be counted, the parameter to count i.e. space)

Example .1

```
Do while counter <=1000
num.Text=counter
counter =counter+1
Loop
```

* The above example will keep on adding until counter >1000.

The above example can be rewritten as

```
Do
num.Text=counter
counter=counter+1
```

Loop until counter>1000

6.2 For....Next Loop

The format is:

For counter =start Number to end Number (Step increment)

One or more VB statements

Next

Example:

(a) For counter=1 to 10

display.Text=counter

Next

(b) For counter=1 to 1000 step 10

counter=counter+1

Next

Example6: Write a program to find the summation of undetermined number of positive numbers such that the program will be stopped when we enter negative number.

Sol:

```
Dim x, sum As Single
Private Sub command1_click()
sum = 0
x = Val(InputBox("enter x", "summation"))
Do While x >= 0
sum = sum + x
x = Val(InputBox("enter x", "summation "))
Loop
MsgBox (CStr(sum))
End Sub
```

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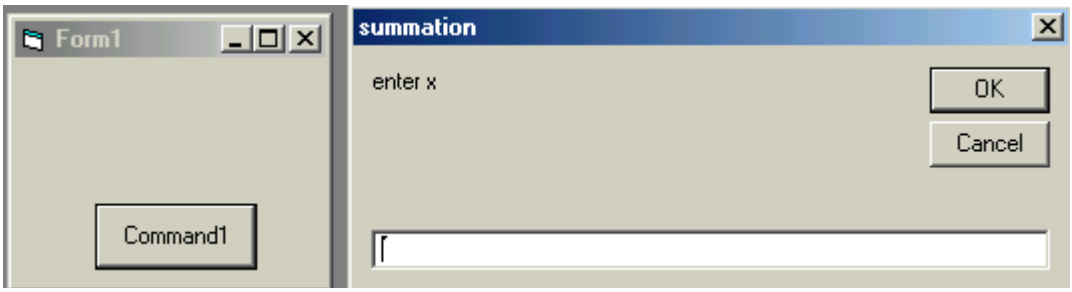

Example7: Write a program to find the summation of the numbers from 5 to 15.

Sol:

```
Dim I, sum as integer
Private Sub command1_click ()
sum = 0
For i = 5 to 15
Sum = sum + i
Next i
Label1.caption = "sum ="&cstr(sum)
End Sub
```

Example8: Write a program to find the summation of 10 numbers.

Sol:

```
Dim i as integer
Dim x, sum as double
Private Sub command1_click ()
sum = 0
For i = 1 to 10
x = val(inputbox ("enter number"))
Sum = sum + x
Next i
Label1.caption = "sum="& cstr(sum)
End Sub
```

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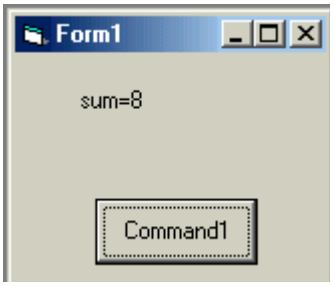

Running stage:

For example if we entered the numbers: 1, 5, -1, 3, 2, 0, -1, 3, 0, -4 then sum=8

Example9: Write a program to find the average of n numbers.

Sol:

```
Dim i as integer
Dim x, sum, av as Double
Private Sub command1_click ()
i = 1: sum = 0
n = val (text1.text)
Do while i <= n
x = val(inputbox ("enter number"))
Sum = sum + x
i = i + 1
Loop
Av = sum/n
Text2.text = av
End Sub
```

Example10: Write a program to print multipliers of 5 (from 5 to 50)

Sol:

```
Dim i as integer
Private Sub Command1_Click ()
i = 5
Do until i > 50
Print i
```

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```
i = i + 5
Loop
End Sub
```

Example11: write a program to find the average of numbers that dividable by 3 (without remainder) from 3 to 99.

Sol:

```
Dim I, n, sum as integer
Dim av as Double
Private Sub command1_click ()
i = 3 : n = 0
sum = 0
Do while i <= 99
Sum = sum + i
i = i + 3
n = n + 1
Loop
Av = sum/n
Print "av ="; av
End Sub
```

Example12: write a program to print (welcome) ten times, the first one with theordinary size and color. Then make the color changed and the size bigger at each
time.

Sol:

```
Dim i As Integer
Private Sub Command1_Click()
Print "welcome"
For i = 1 To 9
FontSize = 10 + i
ForeColor = QBColor(i)
Print "welcome"
```

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Next i

End Sub

Series:

To compute the value of series, we use suitable loop statements according to theboundaries (limits) of each series.

Example13: Find

Sum=1+x+x2+x3+…+xn , where x is an integer.

Sol:

```
Dim I, n, x, sum as integer
Private Sub command1_click ()
sum = 1
n=val(text1.text)
x=val(text2.text)
For i = 1 To n
Sum = sum +x^i
Next i
Text3.text=sum
End Sub
```

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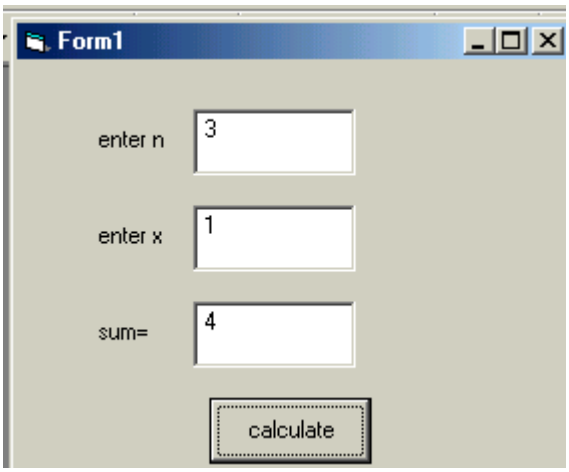

7.3: Nested loop

The nested loops are the loops that are placed inside each other. The most innerloop will be executed first, then the outer ones. These loops should neither intersect,nor have the same index. As follows:

```
For i = 1 To n
For j = 1 To m
Statements
Next j
Next i
```

Example14: write a program to print the multiplication table.

Sol:

```
Dim I, j As Integer
Private Sub command1_click()
For I = 1 To 10
For j = 1 To 10
p = I * j
Print I; "*"; j; "="; p,
Next j
Print
Next I
End Sub
```

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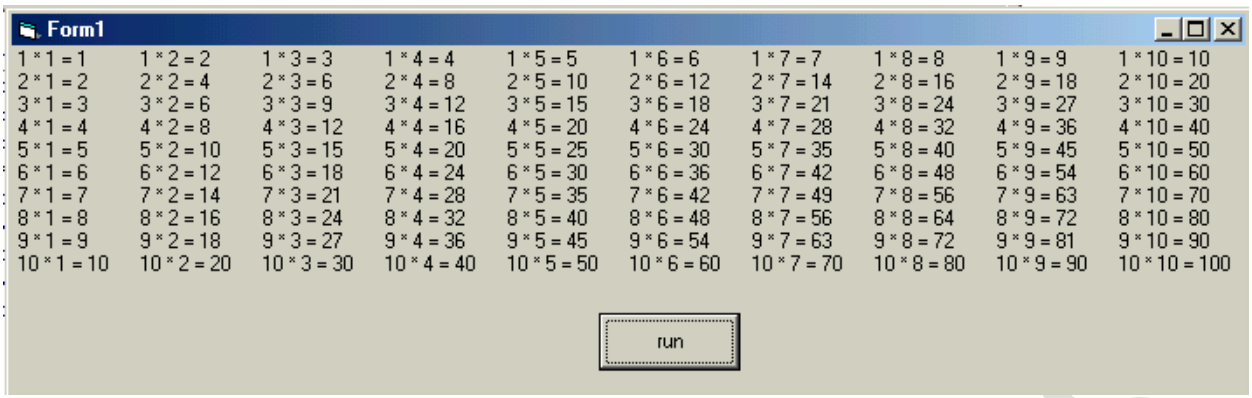


Example15: write a program to generate the numbers in the following form.

1

2

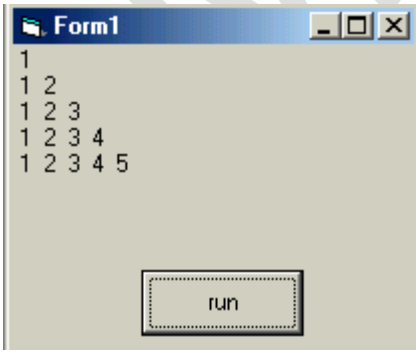
1 2 3

1 2 3 4

1 2 3 4 5

Sol:

```
Dim I, j As Integer
Private Sub command1_click()
For I = 1 To 5
For j = 1 To i
Print j;
Next j
Print
Next I
End Sub
```



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CHAPTER 8: FUNCTIONS IN VISUAL BASIC

Functions are similar to normal procedures but the main purpose of the functions is to accept certain inputs and pass them on to the main program to finish the execution. They are two types of function, the built-in functions (or internal functions) and the functions created by the programmers.

The general format of a function is function Name(arguments)where arguments are values that are passed on to the functions.

We are going to learn two very basic but useful internal functions, i.e. the MsgBox( ) and InputBox ( ) functions.

8.1 MsgBox ( ) Function

The objective of MsgBox is to produce a pop-up message box and prompt the user to click ona command button before he /she can continues. This message box format is as follows:

yourMsg=MsgBox(Prompt, Style Value, T itle)

The first argument, Prompt, will display the message in the message box. The Style Value will determine what type of command buttons appear on the message box, please refer Table 7.1 for types of command button displayed. The Tit le argument will display the title of the message board.

Table 7.1: Style Values

Style Value	Named Constant	Buttons Displayed
0	vbOkOnly	Ok button
1	vbOkCancel	Ok and Cancel buttons
2	vbAbortRetryIgnore	Abort, Retry and Ignore buttons.
3	vbYesNoCancel	Yes, No and Cancel buttons
4	vbYesNo	Yes and No buttons
5	vbRetryCancel	Retry and Cancel buttons

We can use named constant in place of integers for the second argument to make theprograms more readable. In fact, VB6 will automatically shows up a list of names constantwhere you can select one of them.

example: yourMsg=MsgBox("Click OK to Proceed", 1, "Startup Menu")

and yourMsg=Msg("Click OK to Proceed". vbOkCancel,"Startup Menu")

are the same.

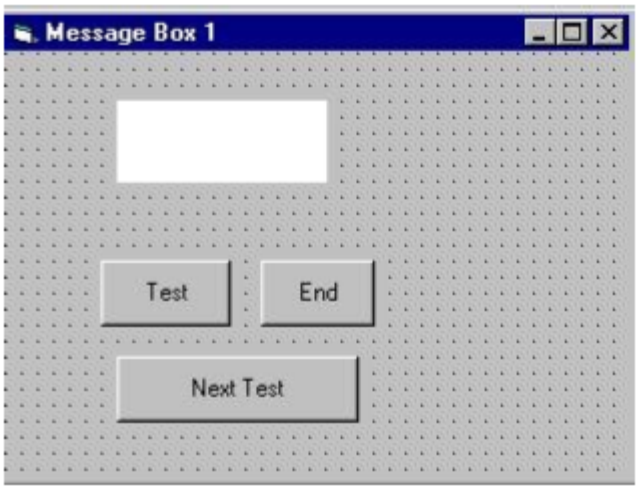
yourMsg is a variable that holds values that are returned by the MsgBox ( ) function. Thevalues are determined by the type of buttons being clicked by the users. It has to be declaredas Integer data type in the procedure or in the general declaration section. Table 7.2 shows the values, the corresponding named constant and buttons.

Table 7.2 : Return Values and Command Buttons

Value	Named Constant	Button Clicked
1	vbOk	Ok button
2	vbCancel	Cancel button
3	vbAbort	Abort button
4	vbRetry	Retry button
5	vbIgnore	Ignore button
6	vbYes	Yes button
7	vbNo	No button

i. The Interface:

You draw three command buttons and a label as shown in Figure 7.1



ii. The procedure for the test button:

```
Private Sub Test_Click()
Dim testmsg As Integer
testmsg = MsgBox("Click to test", 1, "Test message")
If testmsg = 1 Then
Display.Caption = "Testing Successful"
Else
Display.Caption = "Testing fail"
End If
End Sub
```

When a user click on the test button, the image like the one shown in Figure 10.2 will appear.As the user click on the OK button, the message "Testing successful" will be displayed and when he/she clicks on the Cancel button, the message "Testing fail" will be displayed.

To make the message box looks more sophisticated, you can add an icon besides the message.

There are four types of icons available in VB as shown in Table 7.3

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Value	Named Constant	Icon
16	vbCritical	
32	vbQuestion	
48	vbExclamation	
64	vbInformation	

In this example, the following message box will be displayed:

You could draw the same Interface as in example 10.1 but modify the codes as follows:

```
Private Sub test2_Click()
Dim testMsg2 As Integer
testMsg2 = MsgBox("Click to Test", vbYesNoCancel + vbExclamation, "Test Message")
If testMsg2 = 6 Then
display2.Caption = "Testing successful"
ElseIf testMsg2 = 7 Then
display2.Caption = "Are you sure?"
Else
display2.Caption = "Testing fail"
End If
End Sub
```

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8.2 The InputBox( ) Function

An InputBox( ) function will display a message box where the user can enter a value or amessage in the form of text. The format is

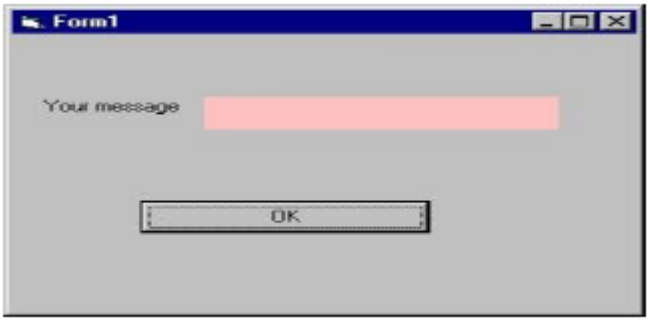
myMessage=InputBox(Prompt, Tit le, default_text, x-posit ion, y-posit ion)

myMessage is a variant data type but typically it is declared as string, which accept the message input by the users. The arguments are explained as follows:

- Prompt: The message displayed normally as a question asked.
- Title: The title of the Input Box.
- default-text: The default text that appears in the input field where users can use it as his intended input or he may change to the message he wish to key in.
- x-position and y-posit ion - the posit ion or the coordinate of the input box.

Example

i. The Interface



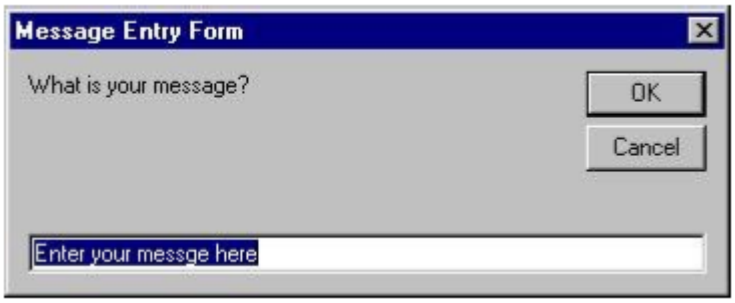
ii. The procedure for the OK button

```
Private Sub OK_Click()
Dim userMsg As String
userMsg = InputBox("What is your message?", "Message Entry Form", "Enter your messge
here", 500, 700)
If userMsg <> "" Then
message.Caption = userMsg
Else
message.Caption = "No Message"
```

End If

End Sub

When a user click the OK button, the input box as shown in Figure 10.5 will appear. After user entering the message and click OK, the message will be displayed on the caption, if he clicks Cancel, "No message" will be displayed.



8.3 VAL() Function

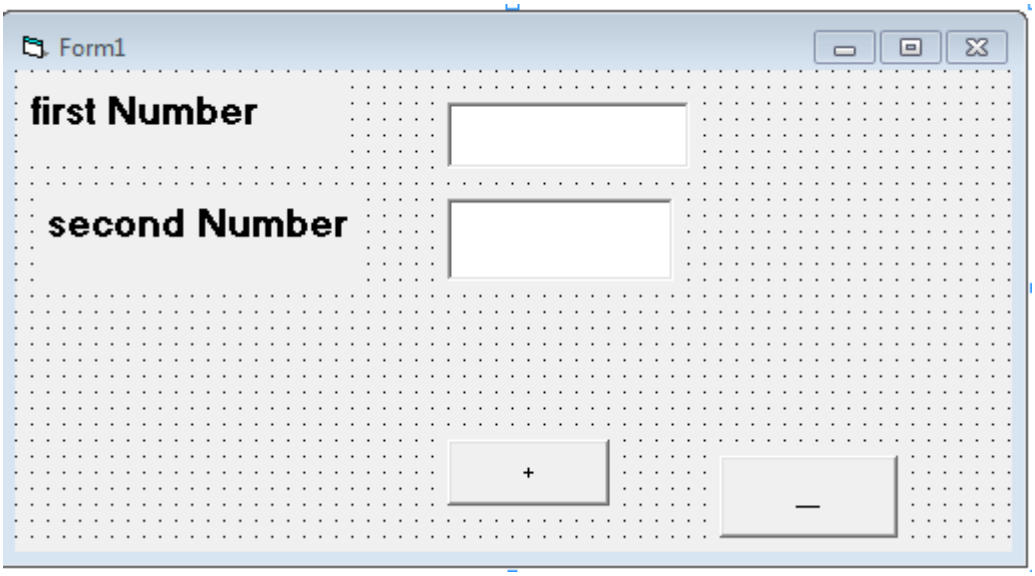
Visual Basic provides number of built in functions. The Val function is one of it. Val function converts the text data into a numeric value.

The general form of Val function is as follows:

Val(Expression to Convert)

The **Str** is the function that converts a number to a string while the **Val** function converts a string to a number. The two functions are important when we need to perform mathematical operations.

Example2: Write a program to add and subtract two integer numbers after putting a suitable design. Use message box for outputting.

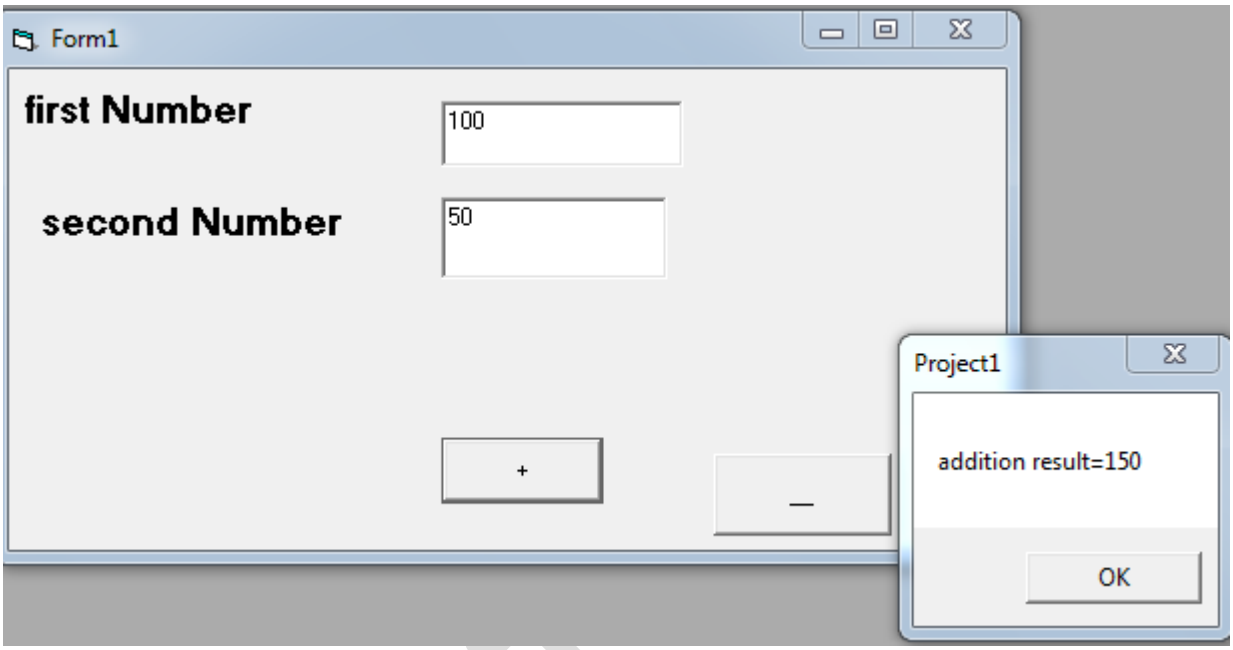


Code:

```
Dim x, y, z As Integer

Private Sub Command1_Click()

x = Val(Text1.Text)

y = Val(Text2.Text)

z = x + y

MsgBox ("addition result=" & z)

End Sub

Private Sub Command2_Click()

x = Val(Text1.Text)

y = Val(Text2.Text)

z = x - y

MsgBox ("subtraction result=" & z)

End Sub
```

Running stage

Enter two values in text1 and text2. When click on command (+) or (-) the addition or subtraction result appears in message box.



8.4 Sqr() Function

The Sqr function returns the square root of a number. This function takes a Double type argument and returns a double implying that you can work with large numbers using the Sqr function.

Example:

Print Sqr(9)

Output: 3

8.5 Ucase() Function

The **Ucase** function converts all the characters of a string to capital letters.

Syntax: **UCase(*string*)**

Example: strNew = UCase("Visual Basic") ' strNew = "VISUAL BASIC"

8.6 Lcase() Function

The **Lcase** function converts all the characters of a string to small letters.

Syntax: **LCase(*string*)**

Lcase(“Visual Basic”) =visual basic

8.7 Len() Function

Returns a Long containing the length of the specified string

Synthax: Len(*string*)

Where *string* is the string whose length (number of characters) is to be returned.

Examples:lnglen=Len(“visual basic” ‘lnglen=12

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CHAPTER 9: VISUAL BASIC MENUS

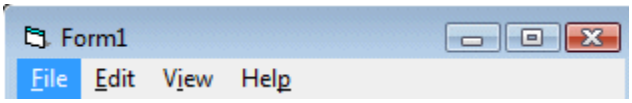
9.1 Menu creation

Definition

An on-screen list of available functions, or operations, that can be performed currently.

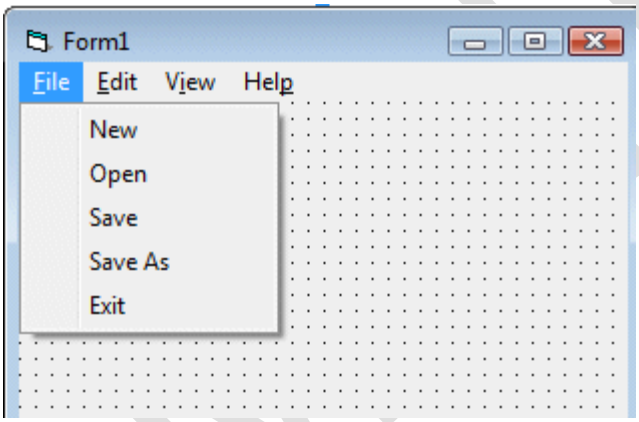
Menu bar

A row of menu titles typically located at the top of the application's window on screen. The File menu is often the first menu title on the menu bar. See menu bar:



Menu panel

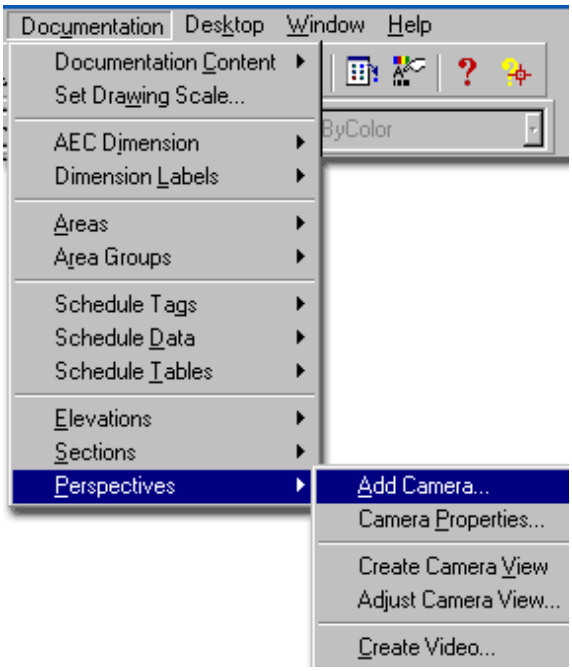
The formal name for the list of options that is displayed when you select a menu from the menu bar. See meu pane.



Pull-down menu

Also called a "drop-down menu" or "pop-down menu," the common type of menu used with a graphical user interface (GUI). Clicking a menu title causes the menu items to appear to drop down from that position and be displayed. Options are selected either by clicking the menu item or by continuing to hold the mouse button down and letting go when the item is highlighted.

See drop down menu



How to create menu in VB?

VB programmers can create menus by first selecting the **form** that will host the menu and then using the **VB Menu Editor.**

- The Menu Editor is available only when a form is being designed. It is located on the Tools menu in VB6.

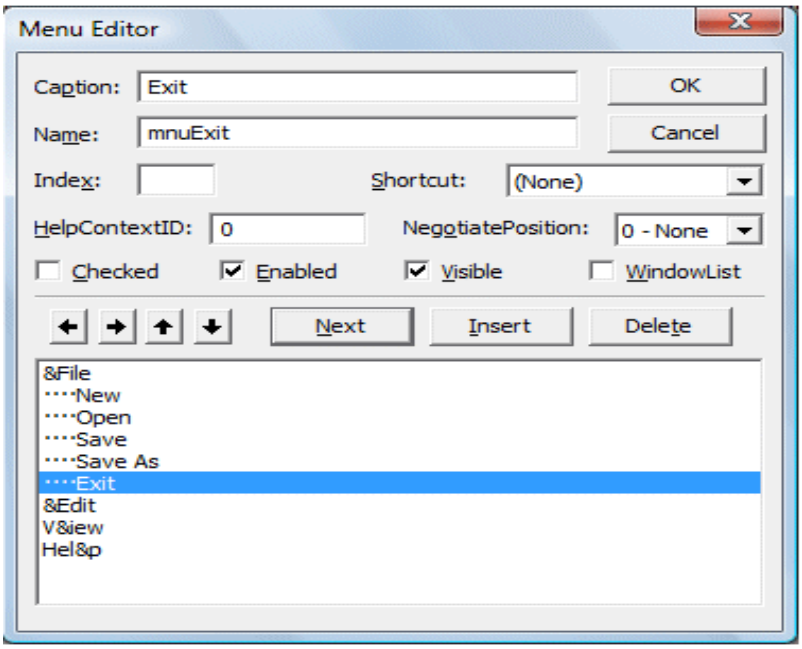
The first step in creating a menu is to enter the menu item's **caption.** The caption can incorporate the **ampersand (&)** for an access key designation, also known as an accelerator key. This enables the user to see an underlined letter in the menu and use the Alt key along with the accelerator key.

After the caption of the menu item has been set, the menu requires an **object name** for programmatic reference. The **menu names** can be any valid object name. Naming conventions are preferred to allow for easier reading of source code and quick identification of objects Menus use the three-**letter prefix "mnu"** before the selected name.

You can implement a **separator bar** in a menu (separator bar is: **a horizontal line that visually defines the boundary between two groups of menu items)** by putting a single dash **(-)** as the entire caption for a menu item. This item then becomes the separator bar on the runtime menu.

You must remember that even separator items in a menu must each have their own unique Name property.

- Menu items can also have their appearance properties set at design time through the Menu Editor. Properties such as **Checked**, **Enabled**, **Visible**, **WindowList**, and a **shortcut key** can all be specified.



In addition a drop-down list of possible shortcut key combinations allows the programmer to assign a shortcut key to this particular menu item. Unlike the accelerator or access key mentioned above, the shortcut key can be pressed by the user without its corresponding menu item being visible. Windows automatically displays the shortcut key assignment when the menu item is displayed. All of these properties are also available at runtime except for the shortcut key.

How to change properties of menu?

To change the desired property of the menu object, just use the object **name** followed by the **property name** and **the value.** Examples of such runtime changes are given in the following section.

e.g.: file. Visible = True

Attaching Code to a Menu Item's Click Event Procedure

A menu control has a single event procedure: the **Click** event procedure. The Click event procedure is the place where you write or call the code that you want to execute when the user chooses the menu item.

E.g.

```
Private sub mnuExit_click()

End

End sub
```

You can access a menu control's Click event procedure by single clicking the menu item from the design time copy of the menu.

9.2 Submenu creation

The submenu refers to the level in the menu structure the items will appear. An object may be a top-level menu item, sub-menu item, or a sub–sub-menu item.

Sub-level menu items have four small dots (**….**) preceding the menu caption; sub– sub-menu items have eight dots (**……**). The menu items and sub menu can also be reorganized according to position in the menu.

To control the level and position of the menu item being entered, just use the four direction arrows in the Menu Editor. The up and down arrows reposition menu items for order. The left and right arrows allow menu items to be top-level, sub-level or sub–sub-level.

Aim*:to createa menu of Edit and do theoperations of Cut, Copy, Paste.*

Properties

Control	Property	Value
Text1	*Caption*	*Empty*
Text2	*Caption*	*Empty*

Menu editor

Menu	Property	Value
Edit	*Caption*	*Enter thedayof theweek*
	Name	*ed*
Cut	*Caption*	*Cut*
	Name	*edcu*
Copy	*Caption*	*Copy*
	Name	*edcop*
Paste	*Caption*	*Paste*
	Name	*edpas*

Code

```
 Private Sub edcop_Click()

 Clipboard.SetText  Screen.ActiveControl.SelText

End Sub

Private Sub edcu_Click()

Clipboard.SetText  Screen.ActiveControl.SelText

Text1.text=" "  End Sub


Private Sub edpas_Click()

Screen.ActiveControl.SelText =Clipboard.GetText()

End Sub
```

The code explanation

Seltext means selected text in the active control will be set as text for copying or cutting and it is sent to the clipboard. The text in the clipboard will be put on the active control of the screen. The active control here is the text box control.

You will be getting output appear on the second textbox

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CHAPTER 10 : DATABASE CONCEPT

a) Database: a database is the collection of related information on stored in manner that is available to the user for different purpose. it is a structure object that could be a data or metadata
   Examples: hospital database, bpr database etc.

b) Database management system (DBMS): is a computer software program that is designed to manage databases that are installed on a system hardware or network.

   Examples: MS ACCESS, ORACLE, MYSQL, SQL SERVER

The basic operations of DBMS

The operations used in database are summarized in CRUD

Create: you can create database and tables with DBMS

Read: you can read and retrieval data that are in database through DBMS

Update: you can modify your data through DBMS

Delete: you can delete data that are in database through DBMS

c) **Data** is facts that can be recorded and have an implicit (understood) meaning or elements that can be manipulated by a computer.
d) **Information:** is data after manipulation by a computer(output)
e) **Metadata:** metadata is the data about data .example student is string type

g) **Entity:** is a thing that exists and distinguishable object in environment.

h) **Attribute**: is the proprieties that describes the entity and the relationship

I) Primary key: is unique identifier for a record.

j) Foreign key: is the primary for the other table or entity

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k) Relational Database Management System (RDBMS): is the software used to design database in form of table.

L) Relational database: is the collection of relations with different names (relation=table)

10.1 IMPORTANCE OF DATABASE

Database system is organization that controlled by DBA(database administrator), someone who has the ability of changing the structure , and make the necessary modification of database.

The following are the advantages of database

1. **Data independence** : Data independence is the ability to modify the schema definition in one level without affecting a schema definition in a higher level.

   There are two types of data independence

   1. **Physical data independence** : the ability to modify the physical schema without causing application program to be rewritten
   2. **Logical data independence:** the ability to modify the conceptual schema without changing the application program.

2. Data access: each piece of data in database should be available to all users who need them.

3. Data integrity: refers to the validity of data, the meaning of data is consistent (regular) and correct.

4. Data integrity and security: If data is always accessed through the DBMS, the DBMS can enforce integrity constraints on the data. For example, before inserting salary information for an employee, the DBMS can check that the department budget is not exceeded

5. Data recovery after break down: Data recovery is the method used to restore data after damaged or corrupted of hardware or software .in order to protect data we must use the backup software

Backup: is refers to making copies so that these additional copies may be used to restore

6. **Concurrent transaction**: is ability of application program to have multiple independent connections at the same time. Using concurrent transaction, an application can connect to the

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several databases at the same time and can establish several distinct connections to the same database. The DBMS protects users from the effects of system failures.

7. **Reduction of redundancies**: the database or DBMS has the ability of eliminate the repartition of one record in database by using the Primary key which is the unique identifier.

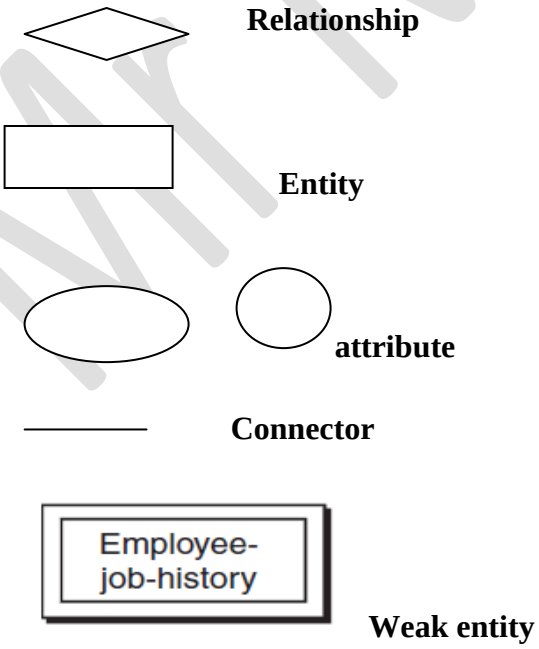
Disadvantages of database

Cost: Cost is one among the disadvantages of DBMS. When you have the computer that have the small capacity of storage, you must purchase the new hardware that support your database and you can give the money to the someone who design the database (programmer someone who design the database).

10.2 ENTITY RELATIONSHIP DIAGRAM (ERD)

DEFINITION: ERD is a tool for analyzing the semantic features of an application that are independent of event. Entity relationship modeling helps reduce data redundancy. The entity-relationship (ER) data model allows us to describe the data involved in a real-world enterprise in terms of objects and their relationships and is widely used to develop an initial database design.

Graphical notation used in ERD



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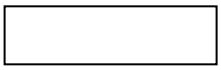
10.3 DIFFERENT COMPONENTS OF ENTITY RELATIONSHIP DIAGRAM

1. **Entity: I**s any object in the real world that is distinguishable from other object.

Entity represented by rectangle 

Entity type is a collection of entities that share common properties .

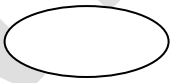
An **entity instance** is an individual occurrence (value of propriety) of an entity type

Examples: student, employee etc

An entity class has the common proprieties (attributes)

2. Attributes :(in conceptual level is the property)

The attributes are the proprieties that describe the entity and relationship.eg name, age, salary, price etc

Attribute is represented by circle or oval  **or**

Entity Type: Collection of entities that all have the same attributes, e.g., persons, cars, customers etc.

Entity Set: Collection of entities of a particular entity type at any point in time; entity set is typically referred to using the same name as entity type.

Types of attribute

There are two categories of attribute: identifiers and descriptors

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- **Identifier**

An identifier (or key) is a property(attribute) or a group of properties that play the particular role of enabling to distinguish every occurrence of the entity compared to all others.

Types of identifier

1. Simple identifier: identifier is said to be identified, when it is made of only one property.eg. **studentnumber**

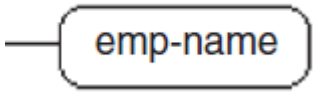
2. Compound identifier: identifier is compound when it is constituted by two parts or more**.**

Eg: studentid and courseid

3. **Relative identifier**: relative identifier is the characteristic of the weak entity.

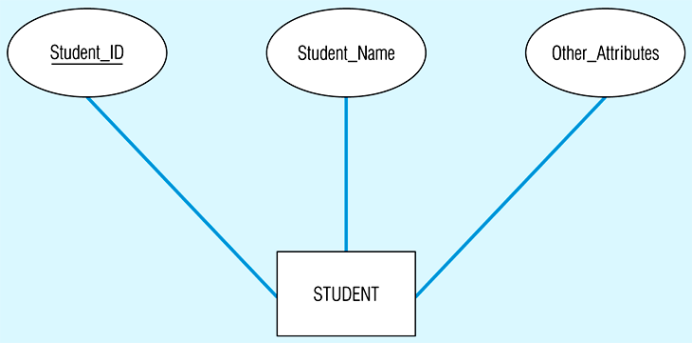
- **A descriptor**

A descriptor (or nonkey attribute) is used to specify a nonunique characteristic of a particular entity instance.



Both identifiers and descriptors may consist of either a single attribute or some composite of attributes.

- **Simple attribute**: is an attribute that is not divided into subparts.



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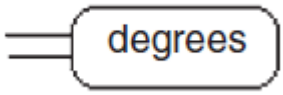
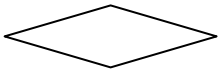
- **Composite attribute**: is an attribute that is divided into subparts for example

- M**ultivalued attributes**: A multivalued attribute of an entity is an attribute that can have more than one value associated with the key of the entity. For example, a large company could have many divisions, some of them possibly in different cities.



3. Relationship

Relationship is the association among two or more entities . The collection of similar relationship is called relationship set .it represented by Diamonds



Example:

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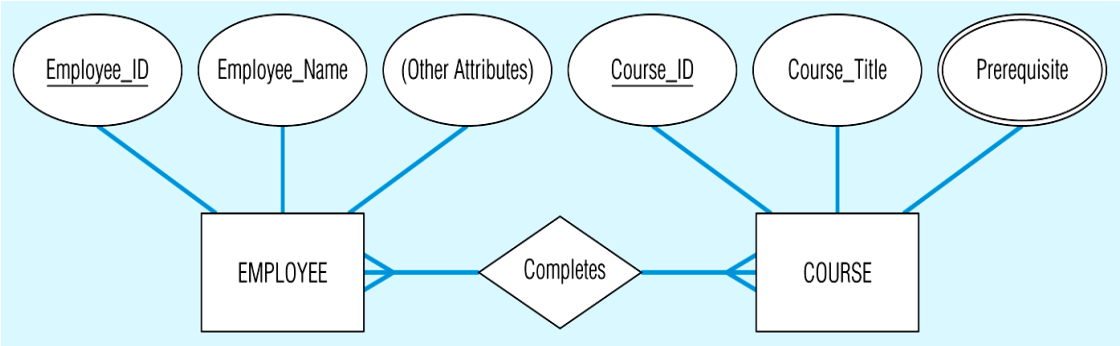
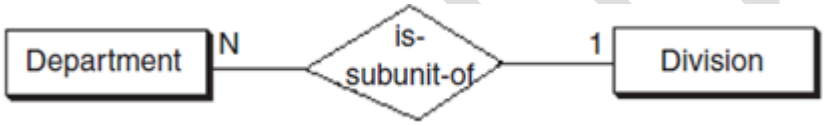


Degree of a relationship

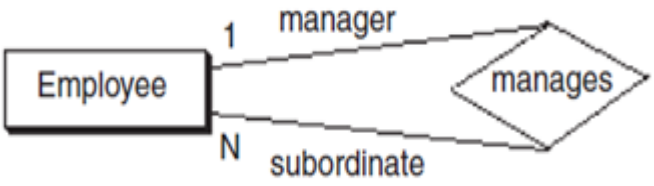
The degree of a relationship is the number of entities associated in the relationship.

1. **Unary relationship:** Is between the instances of a single entity type (also called recursive relationships)
2. **Binary relationship**: is the binary relationship, an association between two entities, is by far the most common type in the natural world.

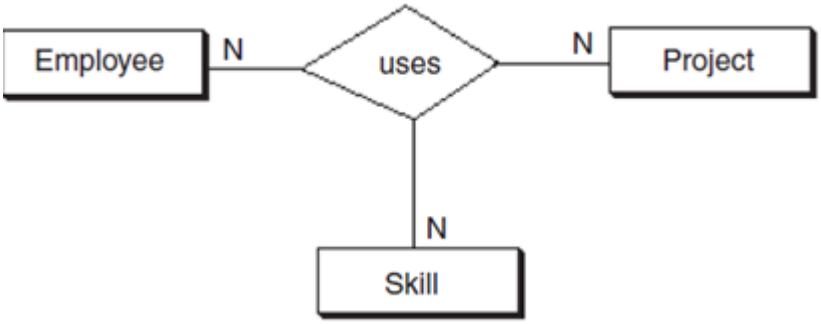


- ✓ Binary recursive relationships

The binary recursive relationship construct is a diamond with more connections to the same entity



3. **Ternary Relationships:** A ternary relationship is an association among three entities. The ternary relationship construct is a single diamond connected to three entities



Cardinality of a relationship

Relationships between data tables define cardinality when explaining how each table links to another. In the relational model, tables can be related as any of the following categories of cardinality.

Categories of cardinality

1. **One-to-one(1:1)**

Example1: the relationship between the president and the country

2. **One-to –many**

The relationship that associates one entity to more than one entity.

3. **Many-to-many**

The relationship between employee and department is an example of many to many

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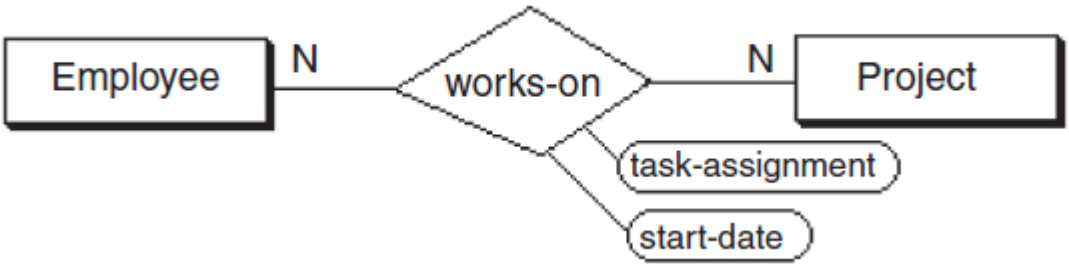
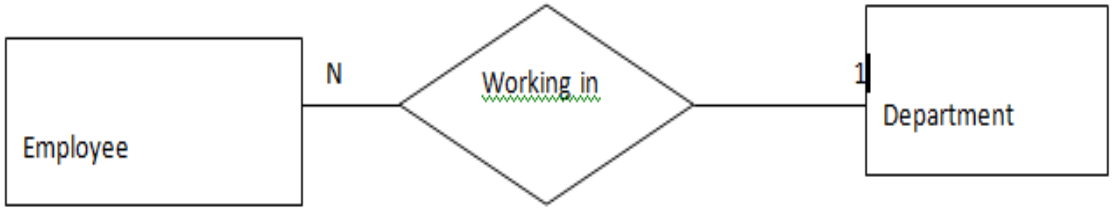


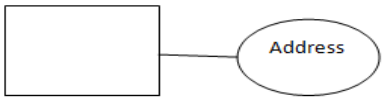
4. **Many to one relationship**

The relationship between employee and department is an example of many to one relationship



5. **Occurrence**: Is the value of properties or the content of the properties

Example:



Address is occurrence

10.4 Integrity constraints(Ic)

Integrity constraints are the Conditions that are specified on a database schema, and restrict the data that can be stored in an instance of the database. If a database instance satisfies all the integrity constraints specified on the database schema, it is a **legal** instance.

A DBMS **enforces** integrity constraints, in that it permits only legal instances to be stored in the database.

Integrity constraints are specified and enforced at different times:
1. When the DBA or end user defines a database schema, he or she specifies the ICs that must hold on any instance of this database.
2. When a database application is run, the DBMS checks for violations and disallows changes to the data that violate the specified ICs.

Types of data integrity

There are three types of data integrity

- ✓ Entity integrity
- ✓ Referential integrity
- ✓ Domain integrity

1. **Entity integrity** :(not allowing multiple rows to have the same identity within a table) the entity is a constraint on primary key value. It states that any primary key cannot contain null value. If primary key contains null value, it is not possible to uniquely identify a record in a relation. Entity integrity ensures that it should be easy to identify each entity in database.

2. Referential integrity: (requiring the existence of a related row in another table, e.g a customer for a given customer ID) .The referential integrity is a constraint on foreign key value. It states that if a foreign key exists in a relation, the foreign key value match with the primary key value of some tuple in its parent relation. Otherwise the foreign key value must be completely null.

3. Data domain integrity :(restricting data to predefined data type,e.g date). Each attribute must have the same data type.

More about relation

a) Properties

1. All items of a given relation are of the same kind.

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2. For a row, each column must have an atomic value (indivisible) and a column cannot have more than one value.
3. A relation does not contain two rows, which are identical in every column.
4. The order of the row within a relation has no significance
5. Columns of a relation are given distinct name and their order has no significance

Let's consider the following SCHOOL database schema. The tables are STUDENTS and COURSES.

STUDENTS

AdmNo	Name	RollNo	BatchCode	
1001	Ajay	1	01	500
1002	Kabera	2	01	490
1003	Joseph	1	02	490
1004	Asha	3	01	450
1005	Mary	2	02	460
1006	Rajab	1	03	400

COURSES

BatchCode	BatchName
01	Science
02	Commerce
03	Humanities

In the above SCHOOL database STUDENTS and COURSES are relations. AdmNo, Name, RollNo, BatchCode and Marks are the attributes of STUDENTS relation. Each tuple consists of a value for each attribute. The domain of the attribute **Marks** is any integer value between 210 and 600. Since the relation STUDENTS consists of 5 attributes its degree is 5. Cardinality of STUDENTS is 6 because there are 6 tuples in it.

b) Keys

A relation is defined as a set of tuples. All the tuples in a relation must be distinct. Therefore there should be a way to identify a tuple in a relation. Keys help to distinguish between tuples.

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- ***Candidate Key***

A candidate key of a relation is a set of attributes that uniquely identifies a row. In the *STUDENTS* relation ***AdmNo*** can uniquely identify a row. Therefore it can be considered as a candidate key. There may be more than one candidate key in a relation. It can be a composite key (combination of two or more attributes). For example, a combination of *RollNo* and *BatchCode* can also be used to identify a particular student. Therefore *RollNo+BatchCode* can be considered as a candidate key of *STUDENTS* relation

- ***Primary Key***

A primary key is a set of one or more attributes that can uniquely identify a tuple in a relation. A relation can contain only one primary key. The database administrator selects one of the Candidate keys as the primary key. In the STUDENTS table ***AdmNo*** is selected as primary key.

Characteristics of primary key

- ✓ It can be one or more attributes
- ✓ Must be unique with the domain(primary key does not allow duplicate value
- ✓ It must always have a value(it cannot contain null value

- ***Alternate Key***

A candidate key that is not the primary key is called an alternate key. In case of two or more candidate keys, only one of them can serve as the primary key. Others are alternate keys. In our example the combination of *RollNo+BatchCode* since *AdmNo* is taken as primary key.

- ***Super key***

It is the set of all attributes, which uniquely identifies a row. It is the superset of candidate keys.

- ***Foreign Key***

It is the attribute of the current table, which refers to the primary key of some other table. Foreign key is used to relate a field in one table to a field in another table. In our example *BatchCode* of the STUDENTS table is a foreign key since it refers to the Primary key of COURSES relation.

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CHAPTER 11: DATABASE PROGRAMMING

This is the most important part of visual basic whereby we are going to produce a back end where we are going to store the large volume of data.

Database

A database is a collection of records that can be manipulated with ease. The manipulation

of data is done by structured query language (SQL).the SQL is a simple English like language that user's can use to request a database for details, Often abbreviated as DB. A collection of information organized in such a way that a computer program can quickly select desired pieces of data. You can think of a database as an electronic filing system.

Traditional databases are organized by fields, records, and files. A field is a single piece of information; a record is one complete set of fields; and a file is a collection of records. For example, a telephone book is analogous to a file. It contains a list of records, each of which consists of three fields: name, address, and telephone number.

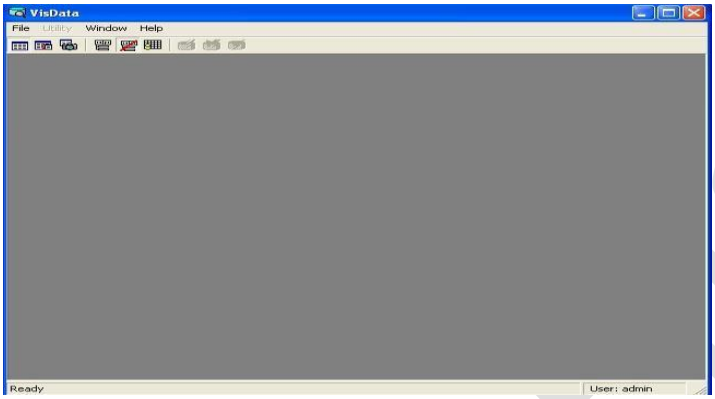
To access information from a database, you need a database management system (DBMS). This is a collection of programs that enables you to enter, organize, and select data in a database.

Increasingly, the term database is used as shorthand for database management system. In Visual Basic it is incorporated in the form of Visual Data Manger.

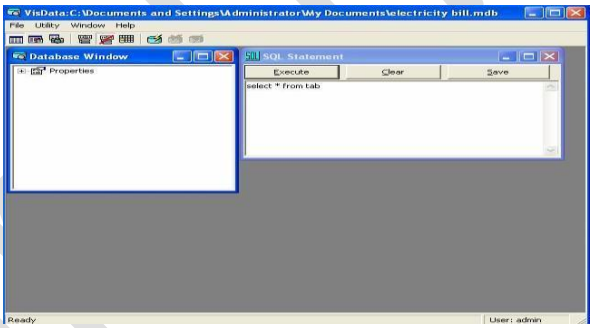
For designing database from visual basic u choose *Add-Ins* menu → *Visual Data Manger*. You will be getting a Visdata screen like one shown below.

In that go to *file* menu → *new* → *Microsoft access* → *version 7.0 mdb*

It will ask for the name of the database .give name (user defined).for example I m going to give as electricity bill

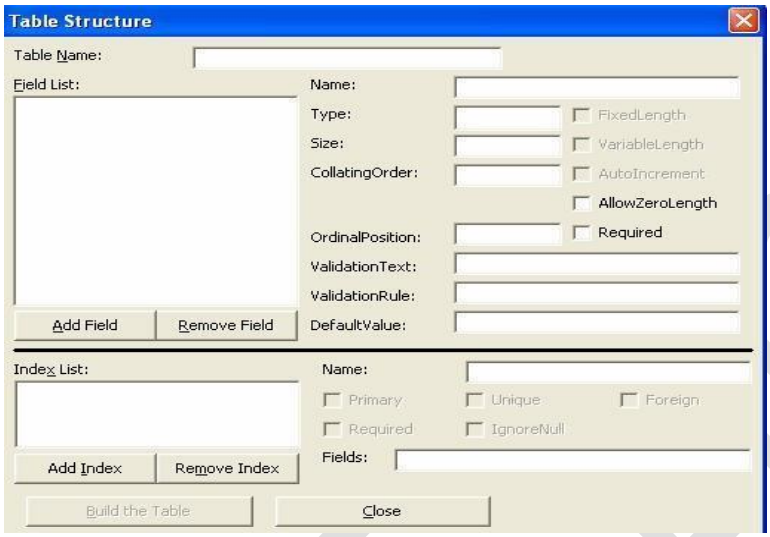


Then you will be getting a screen like this below



Next

In this right click on the properties you will be getting a menu, in that select a new table.



Give the *table name* and click on the *add field*.

Include all the fields that is necessary (for ex here customer's name, bill no, price/unit, unit, total amount) and then click build the table. When you want to include values to the records then double click on the table name and it will open for input of data and give values and then click *update*. When once giving values is finished then click close.

Note down the path of the database where you have stored. Now designing the database has been finished.

Now it is the turn of the front end. Take up a form.

Data control

Data control provides access to databases through controls on your form. It makes the job of the developer easier when data has to be manipulated in a database.

Example

Aim: we are going to produce an electricity bill

Properties

Control	**Property**	**Value**
Label1	*Caption*	*Electricity bill*
Label2	*Caption*	*Customer's name*
Label3	*Caption*	*Bill no*
Label4	*Caption*	*Unit*
Label5	*Caption*	*Price per unit*
Label6	*Caption*	*Total*
Text1	*Caption*	*Empty*
Text2	*Caption*	*Empty*
Text3	*Caption*	*Empty*
Tect4	*Caption*	*Empty*
Text5	*Caption*	*Empty*
Data1	*Caption*	*Empty*

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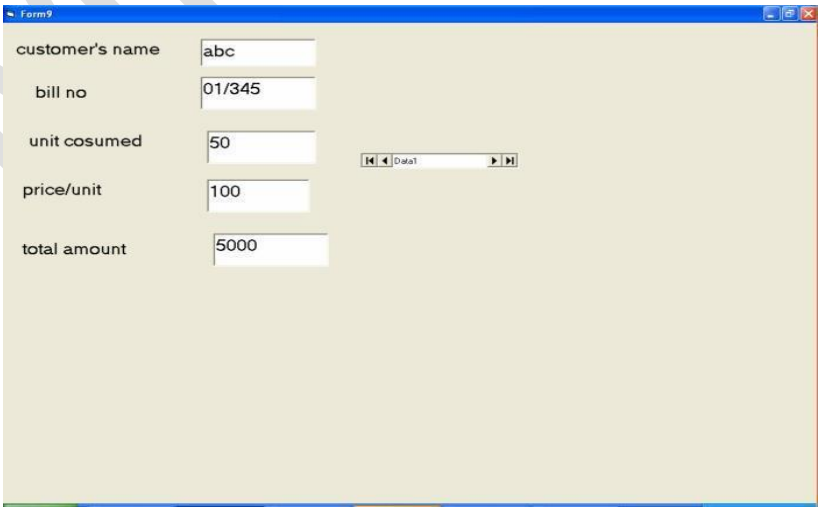
Connecting database and displaying corresponding fields to the form do the following

Control	Property	Value
Data1	*Data source*	*Select the Database name*
	Record source	*Select the record name*
Text1	*Data source*	*Data1*
	Data field	*Customer's name*
Text2	*Data source*	*Data1*
	Data field	*Bill no*
Text3	*Data source*	*Data1*
	Data field	*Unit*
Text4	*Data source*	*Data1*
	Data field	*Price per unit*
Text5	*Data source*	*Data1*
	Data field	*Total amount*

Now run your application it will show the records in the database. You can navigate between the records.

Output



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To make the database work thro' code

Example

Aim: To have the information of employees

Properties:

Control	**Property**	**Value**
Label1	*Caption*	*Name*
Label2	*Caption*	*Id*
Label3	*Caption*	*age*
Label4	*Caption*	*department*
Label6	*Caption*	*Total*
Text1	*Caption*	*Empty*
Text2	*Caption*	*Empty*
Text3	*Caption*	*Empty*
Tect4	*Caption*	*Empty*
Data1	*Caption*	*Empty*

To set up the database

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Control	Property	Value
Data1	*Data source*	*Select the Database name*
	Record source	*Select the record name*
	Visible	*False*
Text1	*Data source*	*Data1*
	Data field	*name*
Text2	*Data source*	*Data1*
	Data field	*id*
Text3	*Data source*	*Data1*
	Data field	*Age*
Text4	*Data source*	*Data1*
	Data field	*dept*

Code:

```
Private Sub Command1_Click()
Data1.Recordset.MoveFirst
End Sub

Private Sub Command2_Click()
Data1.Recordset.MoveLast
End Sub

Private Sub Command3_Click()
Data1.Recordset.MoveNext
If Data1.Recordset.EOF Then MsgBox "this is last record" End If
End Sub
```

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```
Private Sub Command4_Click()
Data1.Recordset.MovePrevious If Data1.Recordset.BOF Then
MsgBox "this is first record" End If
End Sub


Private Sub Command5_Click() End

End Sub

Private Sub Command6_Click()
Data1.Recordset.AddNew
End Sub

Private Sub Command7_Click()
Data1.Recordset.Delete
MsgBox "record deleted" End Sub

Private Sub Command8_Click() Data1.Recordset.Update MsgBox "data
saved"
End Sub

Private Sub Command9_Click()
Data1.Recordset.Edit
End Sub
```

Output: navigate thro' the buttons provided

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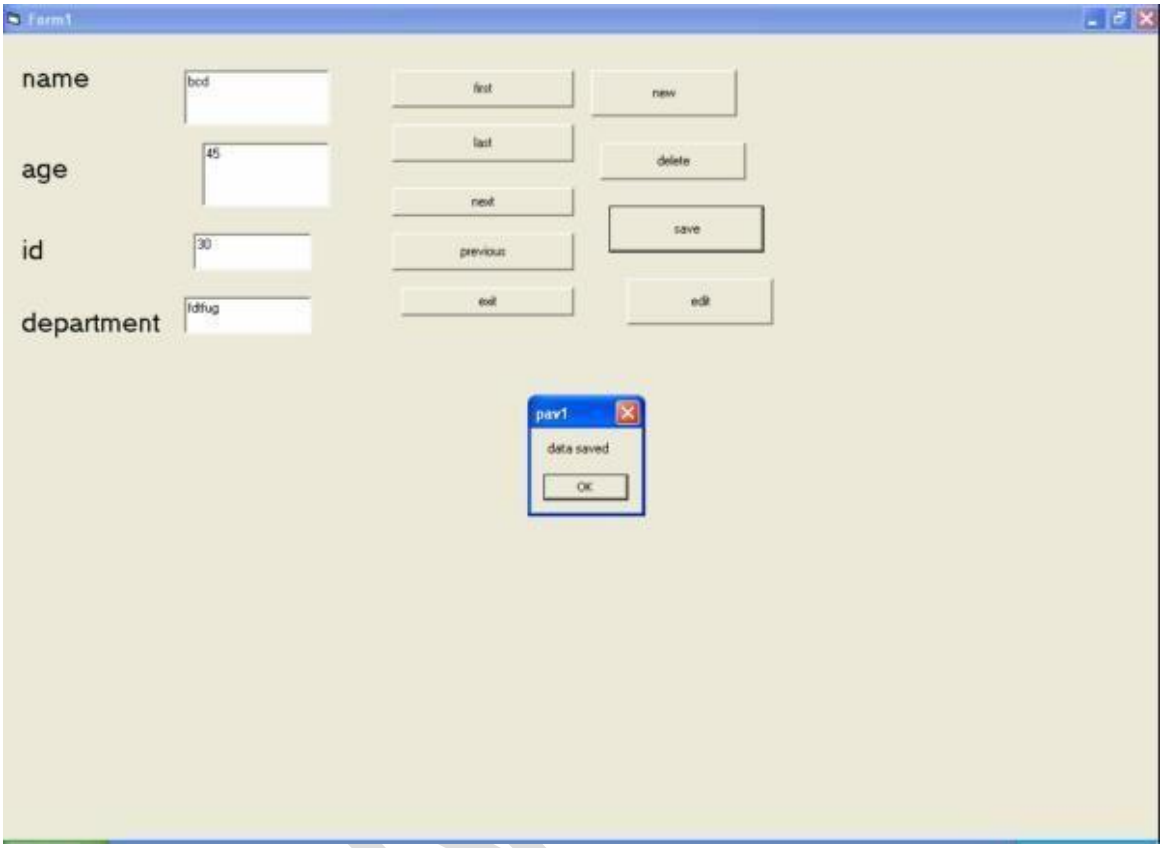
Form1
name
bcd
age
45
id
30
department
fdfug
first
new
last
delete
next
save
previous
exit
edit
pav1
data saved
OK

ADODC

The Background to ADO

In the early days of computing, dumb terminals were wired to powerful mainframe computers. The centralized Information Services (IS) department of a company ran the computing show. The mainframe gurus told us what we could and could not do. Then in

August of 1981, the first IBM personal computer was released and the world changed. Control was eventually wrested from the centralized IS department at companies and flowed to the every individual with a personal computer.

Each personal computer had its own CPU and hard drive to run programs and store data. Centralized computing for many day to day activities disintegrated and each person with a personal computer took individual control if their data destiny. But there were problems too. For example, lots of individual computers sitting on people's desks, and all wanted to share information and common data. Out of the many desktop solutions to this need to access data by distributed computing stations was Data Access Objects (**DAO**).

Now, with VB6.0, a brand new Jet database engine 3.51 just made this solution stronger. In fact, Jet 3.51 is faster and more robust than Jet 3.5 that shipped with VB 5.0. Microsoft wanted to enhance a proven, strong database access solution and, when developing desktop database solutions using .mdb or ISAM files, Microsoft says the combination of Jet and DAO is definitely the way to go. Microsoft has upgraded DAO and will continue to support this approach for the foreseeable future. And don't forget, DAO is the most popular desktop database access method around applications using DAO is tremendous.

The Limitations of DAO

As seen two needs of modern business rapidly emerge that require a new and more sophisticated approach to gathering data.

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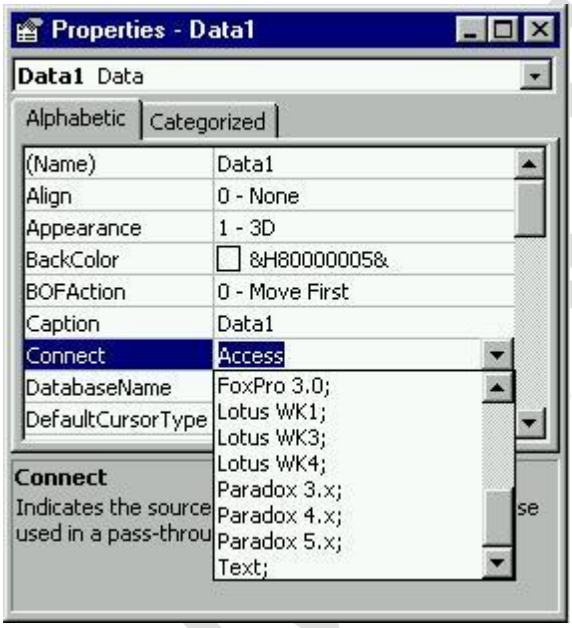
- The first need is that of **accessing legacy data** - that is, information that is stored around the business enterprise in disparate forms in various types of computers.
- The second need is that of accessing **non-relational** data.

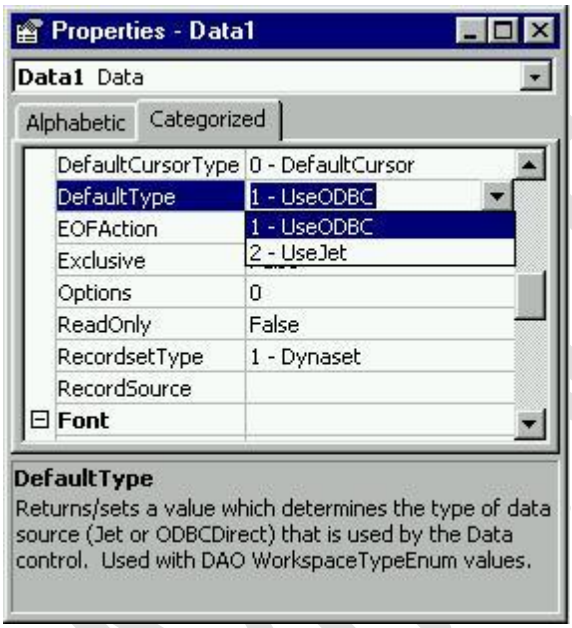
The Quest for Data

While .mdb databases (native to the Access database system) are easy, there are times when programmers need to get data from other desktop sources. For example, we might need to read or write data from dBASE, Paradox, FoxPro, or other databases. We might also need to retrieve information from Excel or Lotus spreadsheets, or even text files. If you take a look at the intrinsic (built-in) data control in VB 6.0, you will notice that there are several additional data sources that the control can talk to in addition to its native Access.



The real benefit of connecting to one of the external **ISAM** (Indexed Sequential Access Method) file types listed in the connect property of the data control is that we can work on the data - as is - without changing its structure. We can leave the data where it is and use VB6.0 to connect with the various data source types. So any applications that created these files can continue to operate unchanged. We just go in and read or write data to and from these sources.

Microsoft's standard for providing data access to various data sources is **Open Database Connectivity** (ODBC). Essentially, this is a SQL approach to retrieving data. ODBC is supported by all sorts of software applications from spreadsheets to word processors to databases. ODBC provides **database interoperability**, which really means that it gives us methods by which data can be exchanged among different databases.



Using ODBC Direct allows you to deploy client/server applications using Microsoft Access without using Microsoft Jet as the middle layer. ODBC Direct is an interface directly to ODBC. So in most cases, it is faster.

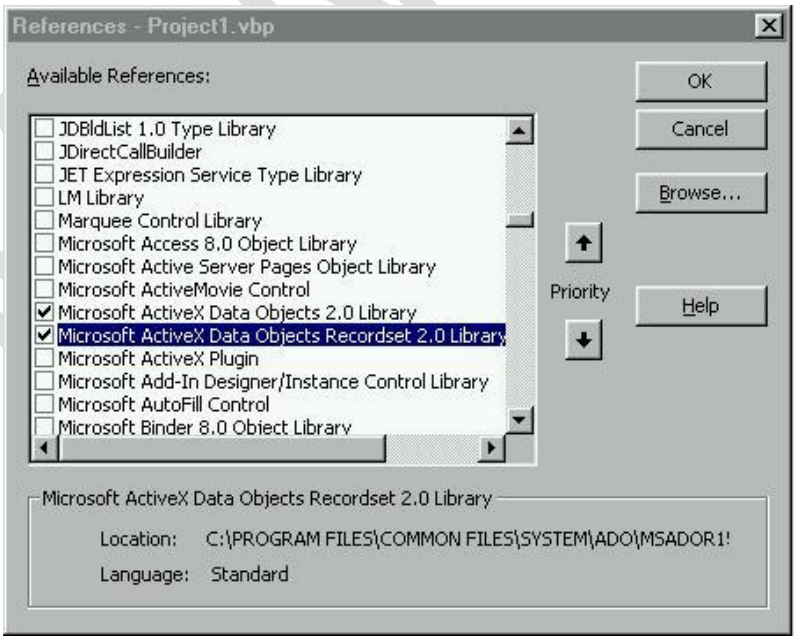
If your application is hitting a Microsoft Jet .mdb or any other file-share databases it supports, you should use the Microsoft Jet path. This is because ODBC Direct was created specifically to access

remote data. You should also use Jet if you want to join data in tables stored in different back-ends such as Oracle and SQL Server. You would need Jet in this case because it provides heterogeneous joins. You can create tables using ODBC Direct by executing SQL statements, but it's more convenient to use the Jet *TableDef* object.

Active X Data Objects Data Control (ADODC)

With the ADO data control, we can be connected to more databases of different types. Depend upon the code it can be accessed from the same interface.

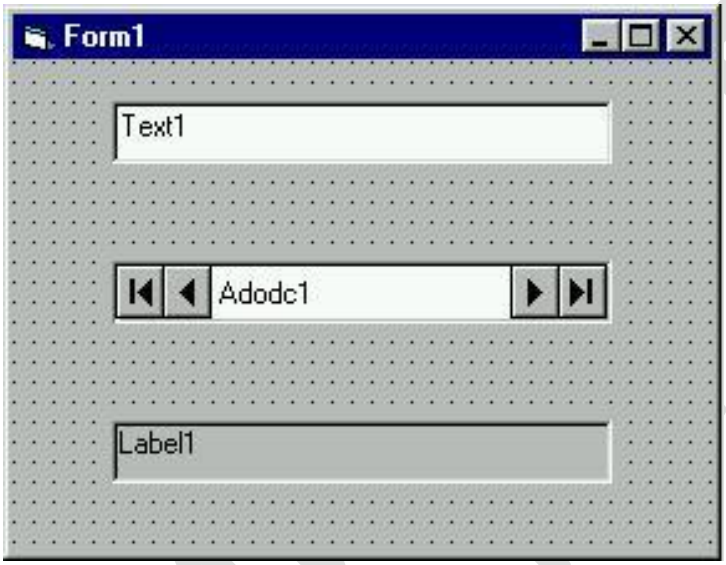
1. Start a new project. Now go into the Project | References dialog and add the Microsoft ActiveX Data Objects 2.0 Library and ActiveX Data Objects Record set 2.0 Library references to your project. Now VB 6.0 knows about the ADO components we want to use.



Then right click on your tool palette and select Components. Select the Microsoft ADO Data Control 6.0 (OLEDB):

Click OK. This will add an ADO data control to your palette.

2. Name the default form in the project frmADO. Draw an ADO Data Control (ADODC) on the form. Next, draw a textbox and label as shown on the form as well. We are going to create a simple bound text box program like our first data control program. And we will use the label to show where we are in the record set.



In order to hook up the ADODC to ourBiblio.mdb database, we must first set some properties.

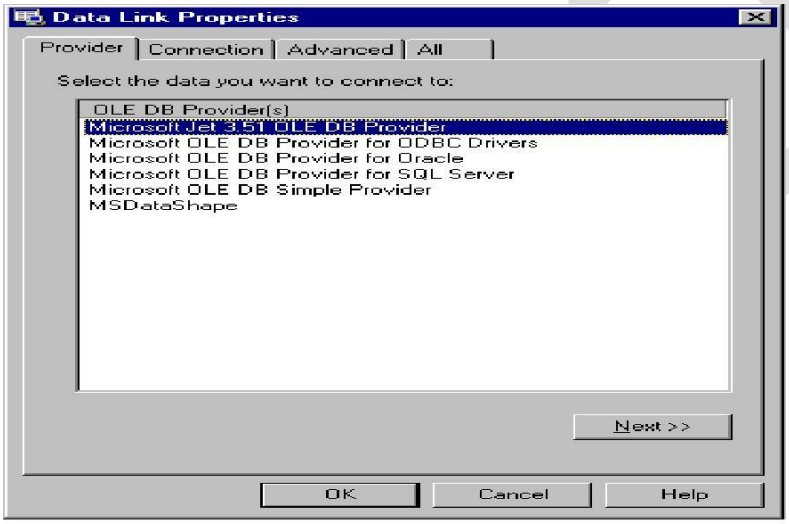
Right click on the ADODC and select ADODC Properties. This will bring up a Property Page dialog box for the control. The first thing we must do is tell the control some important information. Unlike the singular *Database Name* property we need to set on the standard data control, the ADO data control requires a *connection string*. The connection string consists of the specific OLE DB provider to use, as well as the data source we want to access. The connection string is the critical piece of information the ADODC control needs to find the data source.

Steps to Set Up the ADODC Connection String

Since setting up the Connection String must contain just about every piece of information required connecting to our data source, this comes in very handy indeed! Recall that the connection string needs to know things like the location and name of the database, any passwords that might be required, and the OLE DB data provider.

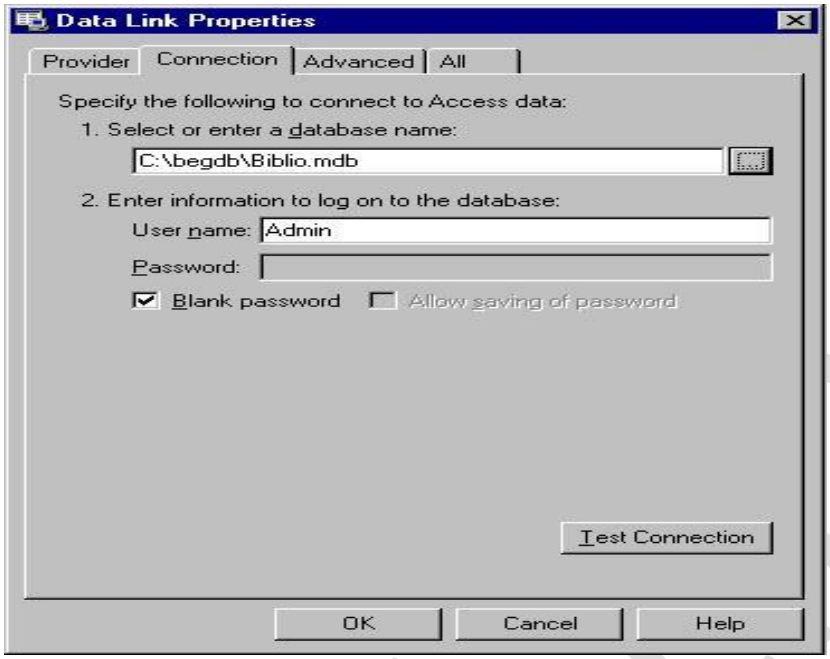
Click the Build button and let's step through the process.

We are presented with another set of property pages for the Data Link. Notice the list of OLE DB Providers that are shipped with VB6.0. If we wanted to connect to a generic ODBC source, we have a provider for ODBC Drivers. Notice that we have providers for Oracle and SQL Server. And as time goes on, all of the major database providers will ship their own OLE DB providers



Select the Microsoft Jet 3.51 OLE DB Provider.

Click the *Next* >> button. This brings up the Connection tab. Here is where we must tell VB the location and name of the database we will be using. Click the button with the ellipsis and locate the usual\BegDB\Biblio.mdb database. Since the database does not require a password, don't change the entries for logging on to the database.



It is always a good idea to use the Test Connection option. This way, if there was something wrong with the location or name of the database, we would get an error advising us of this. Let's say that you entered the name of the database but forgot to add the .mdb extension. By testing the Data Link, we would know immediately:

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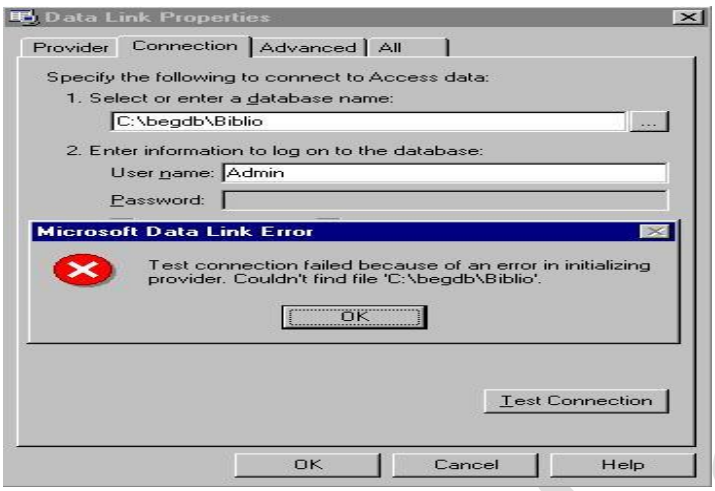
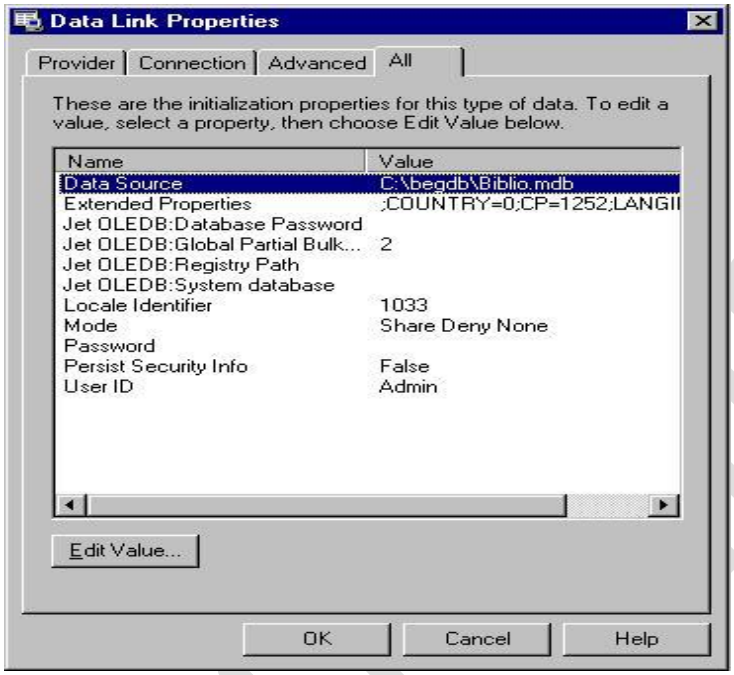


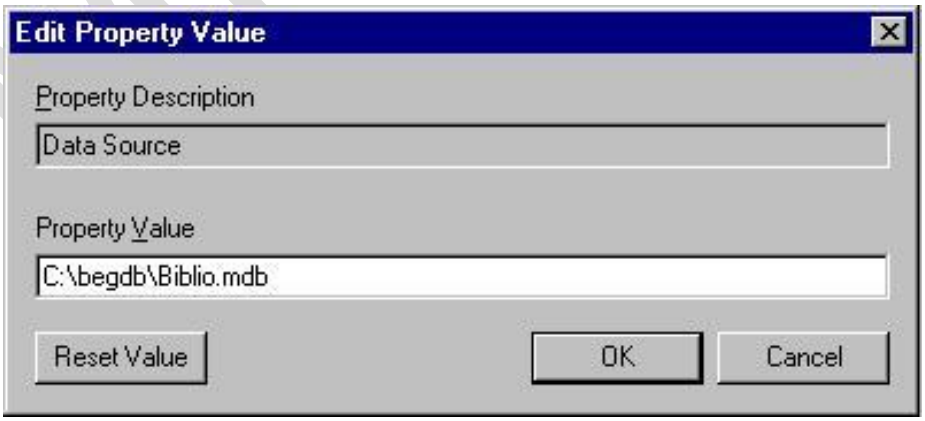
We can then correct the error in the name and location of the database and press Test Connection once again.

There, that's better. Now click the *Advanced* tab just to see what options are available to us. Leave the default *Share Deny None* (if you needed to open the database in a read- only, exclusive mode you would check the Read box)

Now click the *All* tab. Here you can see all of the information the Data Link property box garnered for us:

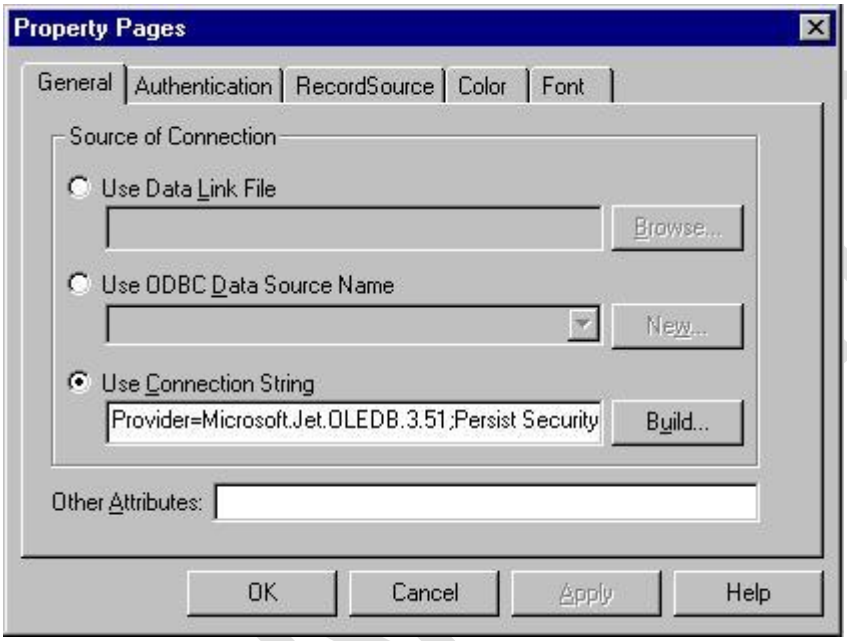


This is all of the information that will be used to create the connection string. If you need to modify any of the properties, simply click the *Edit Value*…button. Highlight any value you wish to edit and press the Edit Value button. This will give you a chance to modify any value in the connect string prior to clicking the *OK* button.

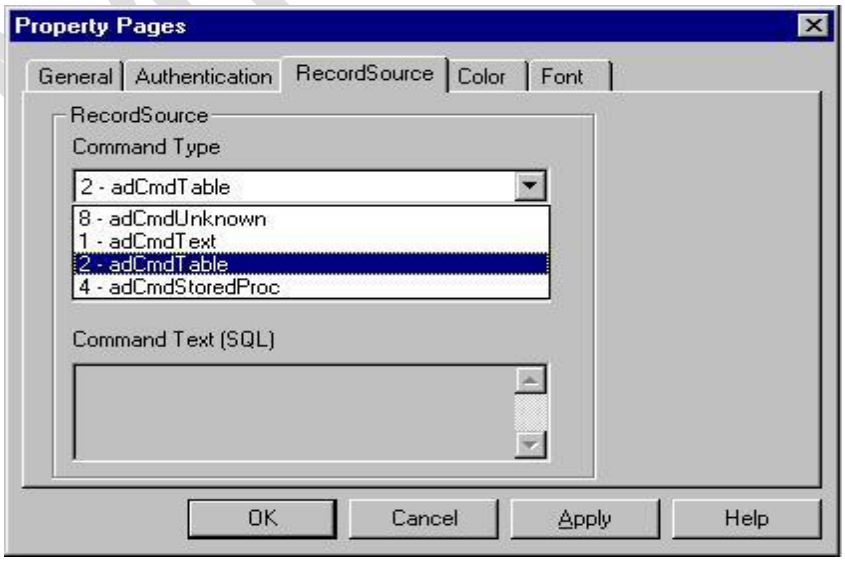


After the connection string is built, click OK to dismiss the property pages for the Data

Link. Now the control has the information it needs to connect to the data source. However, we still need to inform the data control which table(s) we wish to access. Right click on the ADODC data control again and select ADODC Properties. Notice that the connection string text box is now filled in:



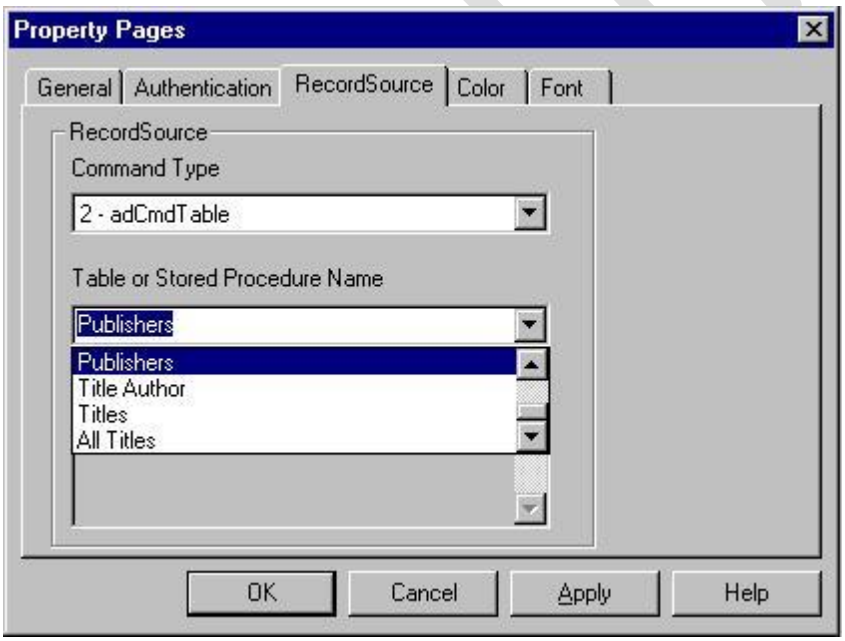
Click on the *Record Source* tab and click the drop down list box for the *Command Type*:



Select *2 – adCmdTable*. Now the control knows we want to access records from a table directly. If the *DataSource* is not known in advance, then *adCmdUnknown* is selected. If we were going to issue a SQL command, the *adCmdText* would be selected, and the bottom text box, Command Text (SQL), would become enabled. Finally, if we have stored, pre-compiled procedures, we would choose *adCmdStoredProc*. This time, be sure to select choice2 - adCmdTable.

Now the control knows that we want to access records from a table, and it knows the name of database from when we set up the Data Link. Now, the *Table or Stored*

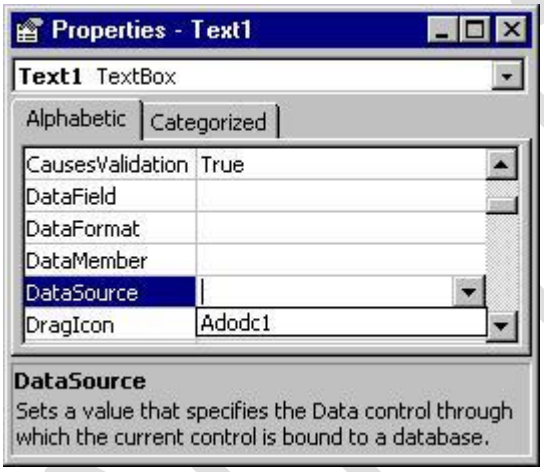
Procedure Name list box becomes enabled. Click the list box and all of the tables in the database are shown:



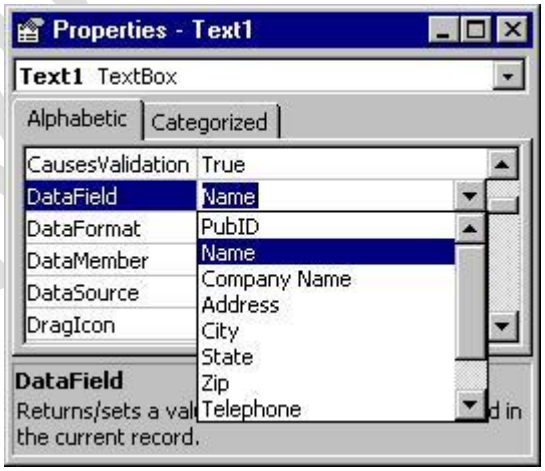
Select the *Publishers* table and click *OK*.

The data control now has the connection string built, and will be able to retrieve a recordset for us from the data source. Double-click on the data control to bring up the code window. You might notice that the *Adodc1 data control* has a few new event procedures.

3. Now that the ADODC data control has been set up, let's bind the *Text1 textbox*. Bring up the property dialog box forText1. Set *the DataSource property* to *Adodc1*.



Now click the drop down box for the *DataField*. Notice that just like the DAO data control; all of the valid fields are displayed:



Select the *Name field*.

Go ahead and *run the program*. You can see that it works as follows

To the user, there is absolutely no difference between the intrinsic data control and our new ADO data control.

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CHAPTER 12: REPORT

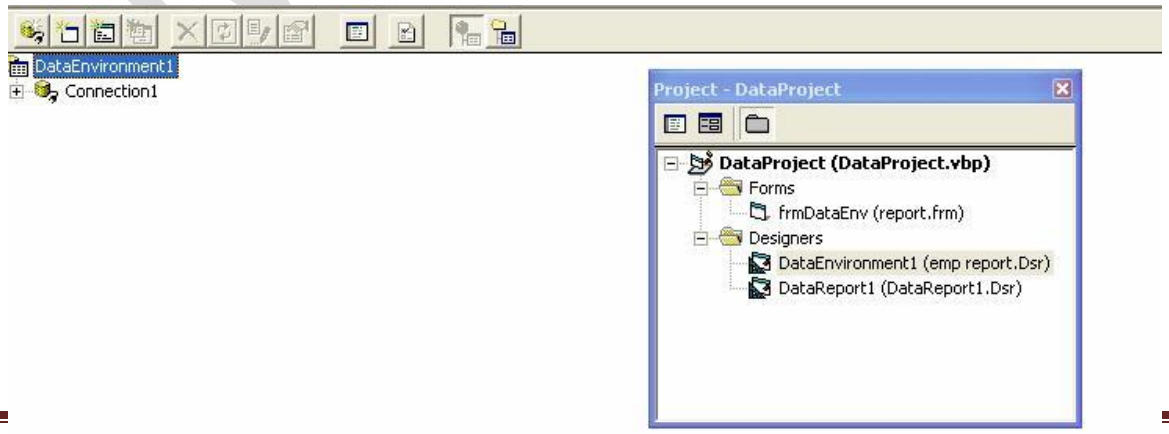
Data report

An equally important operation in database application development is that of generating reports. Generating hierarchical multi page reports with running totals and printing them properly has been a headache for developers. For getting a data report, *close* your current *Project*.

To establish a connection follow these steps

- From the *file* menu click *New*
- Select *data project.*

- Double click on the *data environment1* object in the *project explorer* to open the *data environment* window.



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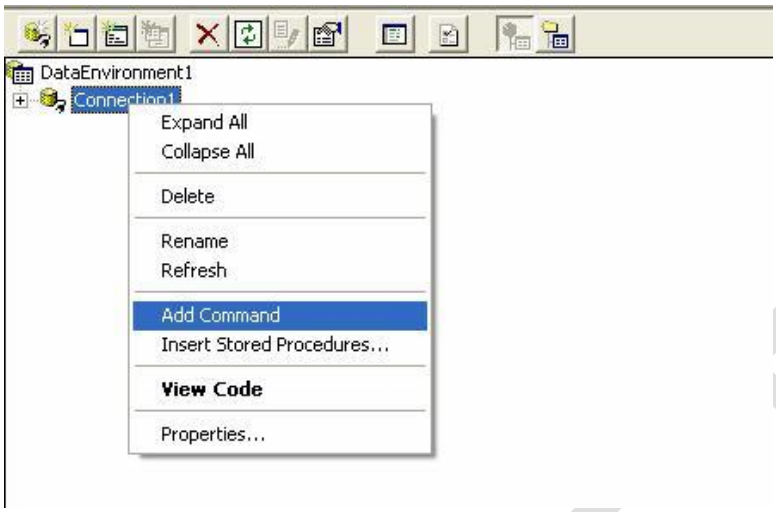
- Right click on the *data environment1* and from the shortcut menu, select *add command.*



- *Right click on the connection1 object, and from the short cut menu, select properties to open the data link properties window. Specify the driver in the provider.*

- *Specify the database to which you want to connect, in the connections tab.*

- *Click the test connection button to make sure the connection works.*

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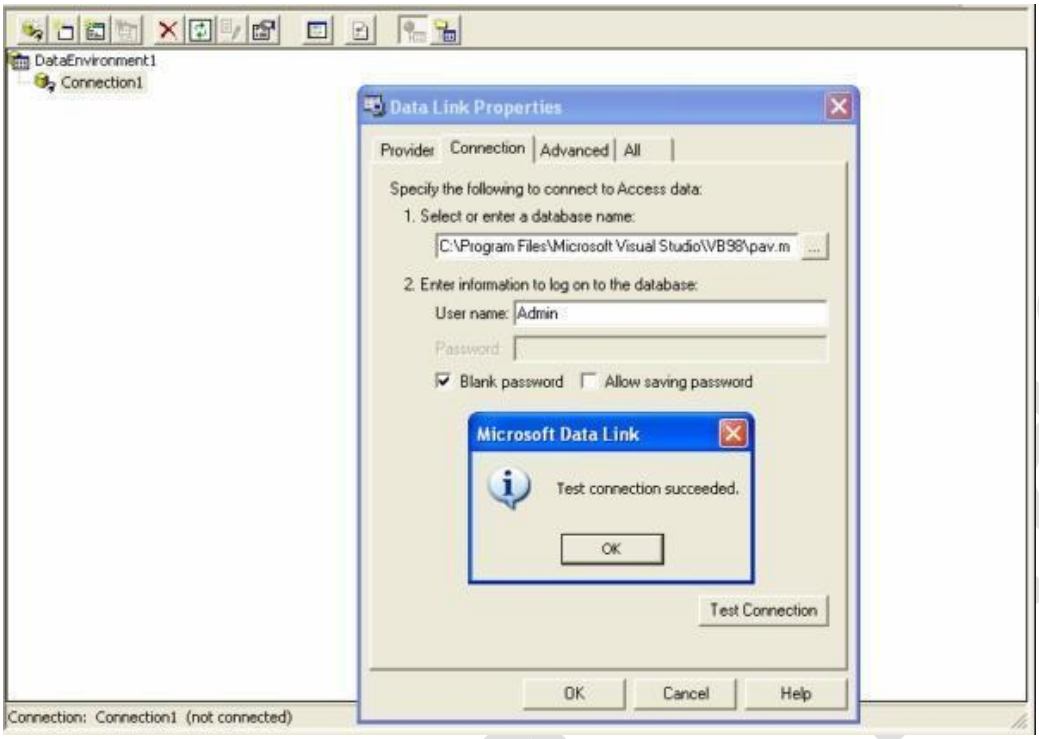
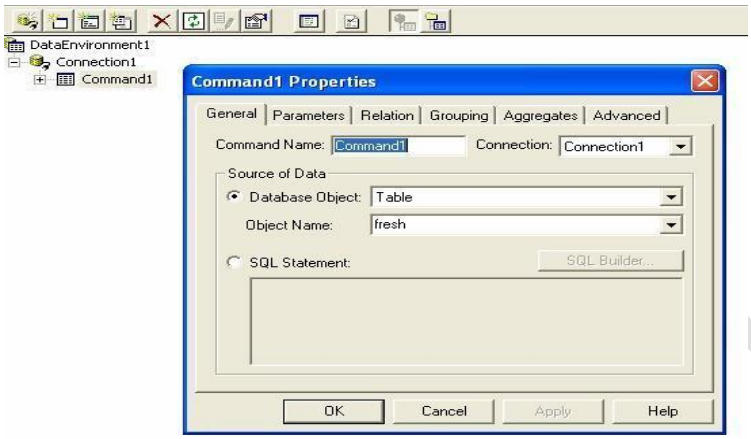


- Click *ok* to return to the *data environment* window.

To retrieve all the records from the database, follow these steps

- Right click on the *command1* object, select *properties* to open *command1 properties* window.
- In the *general* tab, set the *command name* to *command1* and *connection* to *connection1*
- In the *database* object, select *table* and in the *object name* box, select *name of the table* you want.



- Click *ok* to return to *data environment1* window. To prepare report follow these steps

- Double click on the *report designer*

- In the *properties window*, select *data source* as *data environment1* and *data member* as *command1*.

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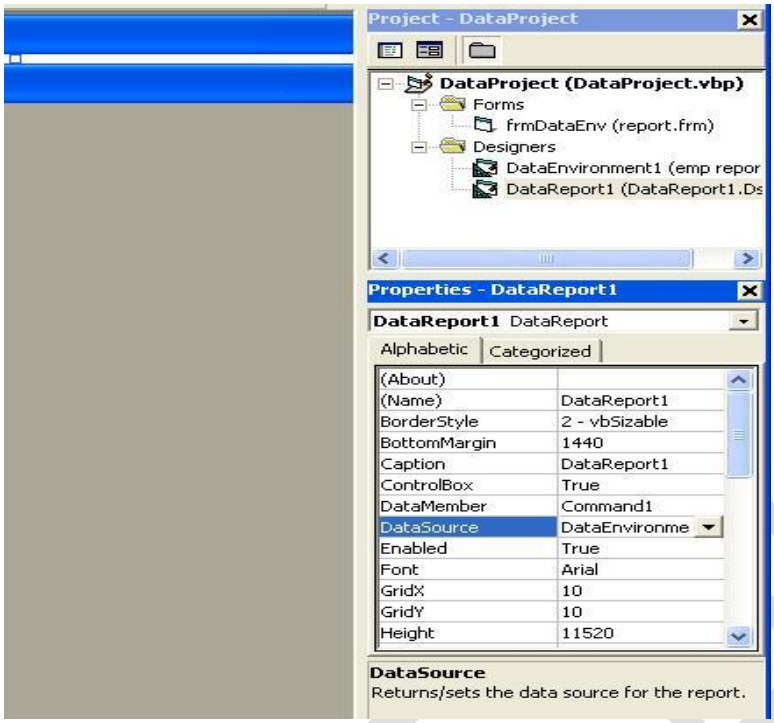

The template which is shown below contains a report, which is subdivided into *header*, *section*, *footer*.

- *Header* – what are the headings of the report you want put it there.
- *Section* - contains information's which are retrieved from the database.
- *Footer* – contains the information for the end of the report.
- In the *page header* right click, from the short cut menu select *insert control* and in that click *label control*. Write the name of the report.
- In the *detail* right click, from the short cut menu select *insert control* and in that click *label control*. Write the field name
- Go to the *data environment* window resize it and bring the fields from data

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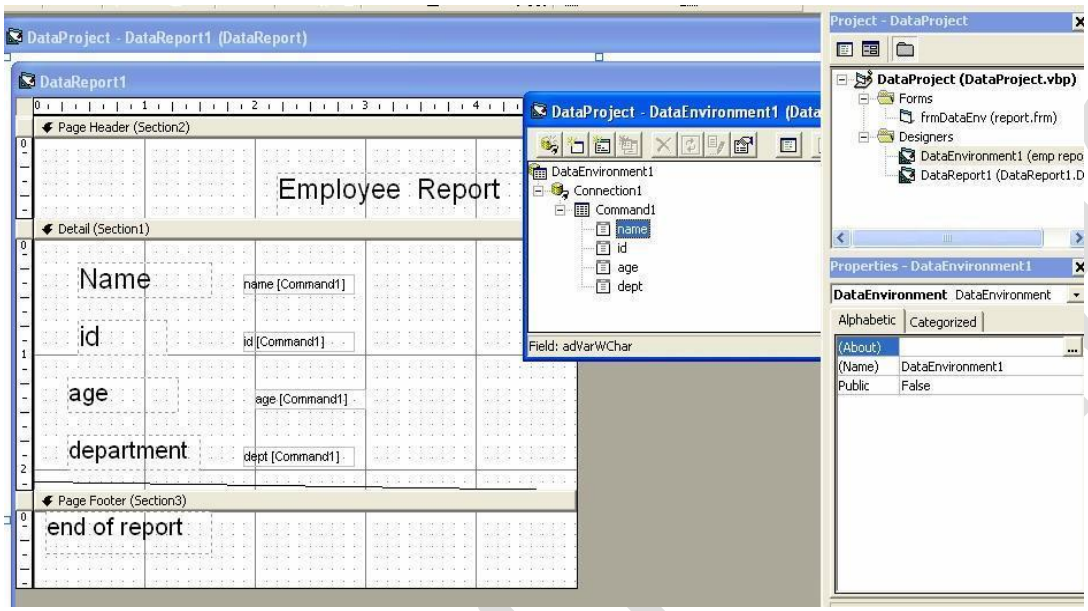
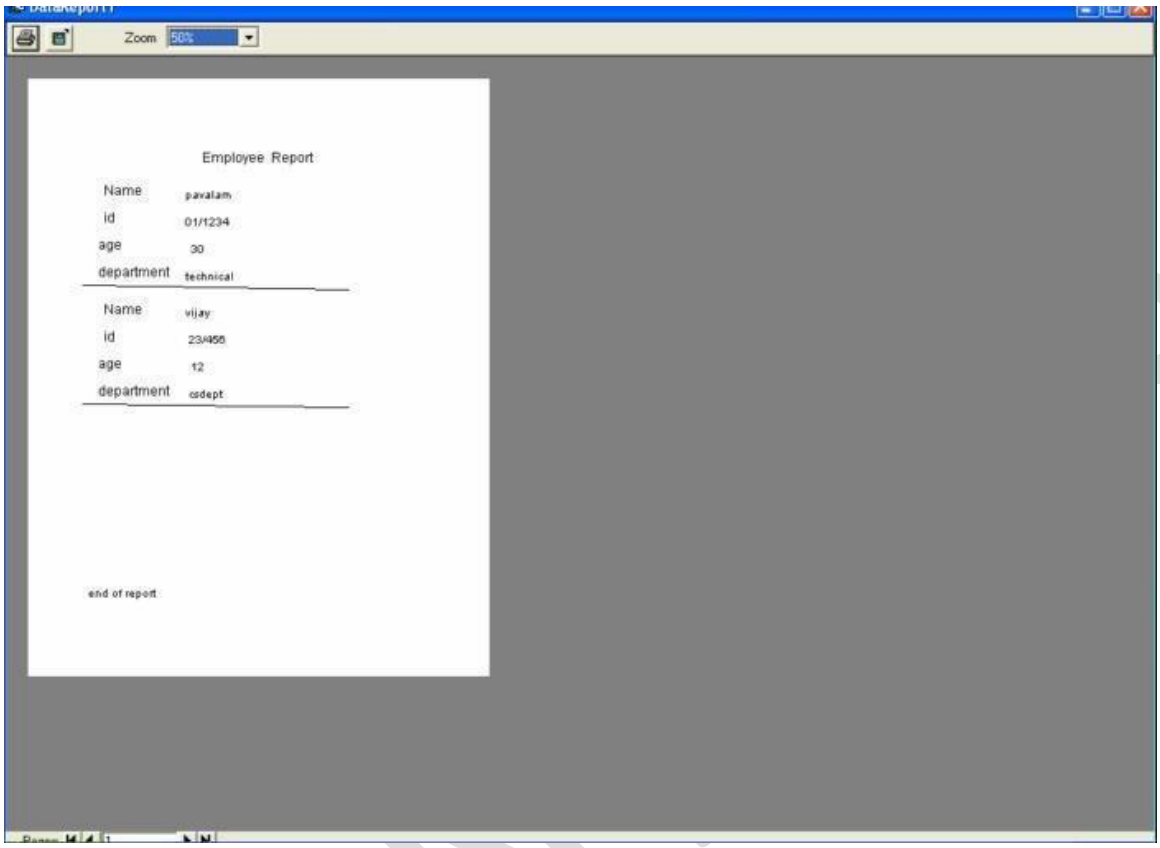
environment window to report's detail section. Likewise you continue until all

fields are finished.



- In the *page footer* right click *insert control* and from the sub menu select *label control*. Write its *caption* as end of report.
- Run the *data project*, the output will be in format as follows

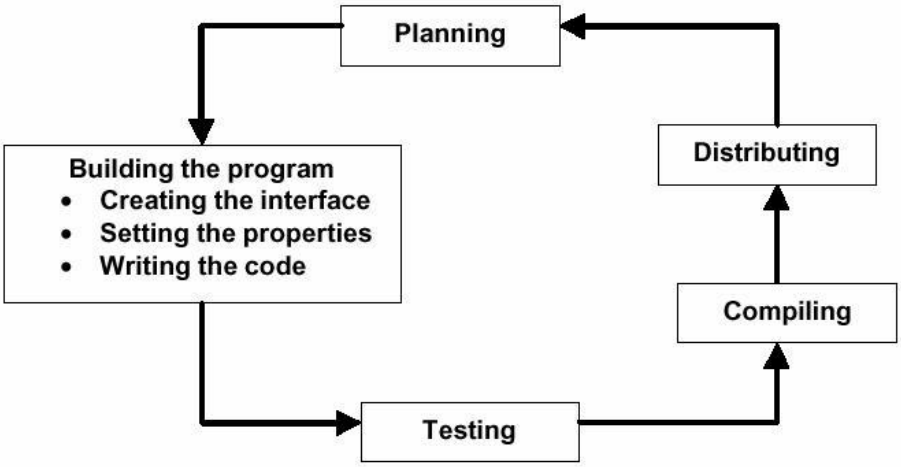

Zoom
Employee Report
Name pavalam
id 01/1234
age 30
department technical
Name vijay
id 23/456
age 12
department csdept
end of report

CHAPTER 13: DEBUGGING

Testing, Compiling and Distributing the Program

After you create a working version of your program, you need to test it carefully to verify

that it works correctly. If you wish to distribute your program, you also need to compile it into an executable program (a stand-alone Windows-based program) and give it to your users. If you decide to revise the program later, you repeat the process, beginning with planning and an analysis of any new goals. These steps complete the software development life cycle.



Testing and Debugging

Testing a program involves checking it against a variety of real-life operating conditions

to determine whether it works correctly. A problem that stops the program from running or from producing the expected results is called a software defect (bug).

If you've used software for any length of time, you've probably run into your share of computer glitches caused by faulty software. Now that *you* are the programmer, it's your job to stamp out these problems before they reach the end user. Fortunately for all of us, Visual Basic provides some excellent debugging tools to catch bugs.

Compiling

When you've finished creating and testing your program, you can compile it into an executable (.exe) file that will run under Windows or Windows NT. Creating an executable file with Visual Basic is as simple as clicking the **Make Project1.exe** command on the **File** menu.

If you plan to run your new Visual Basic application only on your own system, creating the executable file will be your final step. When you want to run your new program, simply double-click the program's .exe file in Windows Explorer. Or, use the file to create a shortcut icon that you can place on your Windows desktop.

Distributing

You might want to share a Visual Basic executable file with friends or colleagues or sell

your program. If so, you need to put the program and a few necessary support files, on a disk (or the network), where your users or customers can get at them. All Visual Basic programs require one or more **dynamic-link library (DLL)** files to run. To get your users up and running, you need to copy the necessary files from your hard disk to a distribution disk. The exact DLL files you need depend on these factors:

- The operating system that your users run.
- The Visual Basic features that your program uses.

Finding and Correcting the Errors

So far, the errors you have encountered in your programs have probably been simple

typing mistakes or syntax errors. But what if you discover a nastier problem in your program — one you can't find and correct by a simple review of the objects, properties, and statements in your application? The Visual Basic development environment contains several tools you can use to track down and fix errors (bugs) in your programs. These tools won't stop you from making mistakes, but they often can ease the pain when you encounter a mistake.

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Three Types of Errors

As you develop Visual Basic programs, three types of errors can produce unwanted results in your applications. These are described in the following topics:

- Logic errors
- Syntax errors
- Run-time error

Logic Errors

A logic error is a human error — a programming mistake that makes the program code produce the wrong results. Most debugging efforts focus on tracking down programmer logic errors. Consider the following If...Then decision structure, which evaluates two conditional expressions and then displays one of two messages based on the result:

If Age > 13 And Age < 20 Then
Text2.Text = "You're a teenager." Else
Text2.Text = "You're not a teenager." End If

Can you spot the problem with this decision structure? A teenager is a person who is between 13 and 19 years old, inclusive, yet the structure fails to identify the person who is exactly 13. (For this age, the structure incorrectly displays the message, ―You're not a teenager.‖)

This type of mistake is not a syntax error (the statements follow the rules of Visual Basic); it is a mental mistake, or logic error. The correct decision structure contains a greater than or equal to operator (>=) in the first comparison after the **If...Then** statement:

If Age >= 13 And Age < 20 Then

Believe it or not, this type of mistake is the most common problem in Visual Basic programs. It's a matter of code that works most of the time — but not all of the time — and it's the hardest problem to track down and fix.

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Syntax Errors

A syntax error (compiler error) is a programming mistake that violates the rules of Visual Basic, such as a misspelled property or keyword. As you type program statements, Visual Basic points out several types of syntax errors — and you won't be able to run your program until you fix each one.

Runtime Errors

A run-time error is any error — usually an outside event or an undiscovered syntax error — that forces a program to stop running. Two examples of conditions that can produce run-time errors are a misspelled file name in a **Load Picture** function and an open floppy drive.

Fixing Errors

To fix a syntax error, edit the incorrect statement (identified by Visual Basic) in the Code window. To fix a logic or run-time error, use break mode or the **Stop** statement to isolate the mistake.

- Using Break Mode
- Using the Stop Statement

Using Break Mode

One way to identify an error is to execute your program code one line at a time and examine the content of one or more variables or properties as it changes. To do this, you can enter break mode while your program runs and view your code in the Code window. Break mode gives you a close-up look at your program while the Visual Basic compiler runs it. It's like pulling up a chair behind the pilot and copilot and watching them fly the airplane. But in this case, you can touch the controls.

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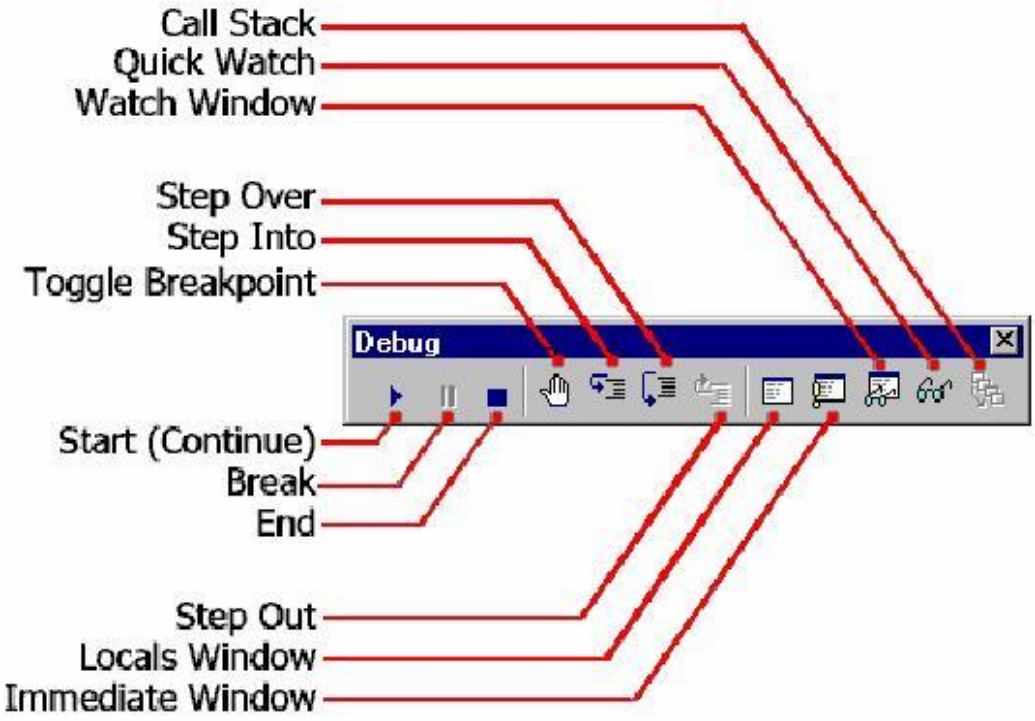
Visual Basic Resources for Debugging

While you debug your program, you may also want to open and use these Visual Basic resources:

Resource	**Function**
Debug toolbar	Provides tools devoted entirely to tracking do wn errors.
Watches window	Displays the contents of critical variables you're interested in viewing.
Immediate window	Provides a place to enter program statements and see their effect immediately.

This illustration below shows the **Debug** toolbar, which you open by clicking **Toolbars** in the **View** menu, and then clicking **Debu**g.



Using the Stop Statement

In Visual Basic, you can place a **Stop** statement in your code to pause the program and display the Code window. All you have to know is exactly where in the program code you want to enter break mode and start debugging.

For example, you could click the **Break** button to pause the program. Or, you could enter break mode by inserting a **Stop** statement at the beginning of the Command1_Click event procedure. The illustration below shows how the **Stop** statement method works,

```
Private Sub Command1_Click() Stop
'enter break mode Age
= Text1.Text
If Age > 13 And Age < 20 Then Text2.Text
= "You're a teenager." Else Text2.Text =
"You're not a teenager." End If
End Sub
```

When you run a program that includes a **Stop** statement, Visual Basic enters break mode as soon as it hits the Stop statement. While Visual Basic is in break mode, you can use the Code window, the **Step Into** button, and the **Quick Watch** button just as you would if you had entered break mode manually.

Finally, when you finish debugging, just remove the **Stop** statement.

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