Information and Communication Technology

The Programming Projects

Student Book

Third Secondary

Unit One
2016/2017
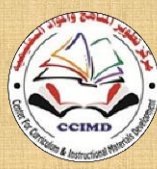
Information and Communication Technology

Third Secondary

Unit One

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Introduction

This book presents a comprehensive vision of the relationship between science, technology and society, which reflects the role of information and communication technology and its innovations in various fields of life and community development, through training students on the skill of the implementation of some software projects based on the Markup language HTML, programming languages PHP &VB.NET and applications such as Expression Web.

Those projects help students practice many of the technological skills and conscious behaviors by using information and communication technology, in addition to the development of their multi positive attitudes.

The first unit of the book deals with implementation of a project to convert a number between the numerical systems programmatically, and this unit includes a simplified explanation of numerical systems as a cognitive basic background, followed by Display the unit topics that represent the stages of implementation of the project, and the implied skills that the students have to train on.

The second unit deals with the Logic Gates which is considered the basics for the electronic integrated circuits and it represents the basics for the computer and electronic devices, and how it performs through applied projects production which stimulate it , with showing some life applications to employ the idea of Logic Gates , by considering life decisions as a set of issues or mathematical formulas which can be evaluated and judged right or wrong , which is considered a lifestyle and style of thinking which helps in taking life decisions in a scientific method , which represents a very important input to qualify you, dear student, for your future life , and qualification towards the specialized study in this field.

GOD GRANTS SUCCESS

STAFF

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Aims of INFORMATION & COMMUNICATION TECHNOLOGY book for Third-grade general secondary:

❖ Acquiring some basic concepts and processes for computer systems and information and communication technology basics.

❖ Taking into account certain aspects of Intellectual Security (human, moral and social life) that are concerned with the use of Information & Communication Technology.

❖ Using the technological production tools (Visual Basic .Net & PHP…………) in supporting and developing education.

❖ Producing work and projects that is relatively creative by using technological processes, programs and tools.

❖ Employing technological communication tools in communication, interaction, cooperation and exchange of content and insights with others, in order to support learning.

❖ Using technological (tools and resources) in data processing, evaluating and reporting the results.

Unit one

Project of producing programs for converting a number between the numerical systems

By the end of the unit students will be able to:

1- Identify some concepts and advanced scientific terms related to computer (programming languages–numerical systems–..).

2- Employ computer programs in implementing learning tasks.

3- Suggest simple projects to convert a number between numerical systems using VB.NET &PHP languages.

4- Employ information and communication technology applications in the construction of educational content.

5- Practise VB.Net & PHP skills.

6- Employ electronic communication media to support learning tasks related to the learning project.

7. Select the appropriate tools, methods and technological applications to search for the information needed to resolve the problems.

First topic
Numerical Systems

Learning outcomes

By the end of the topic students will be able to:

1. Conclude the meaning of the numerical system of binary, decimal, and hexadecimal.

2. Analyze the number in the decimal numerical system.

3. Convert a number of binary numerical system to its equivalent in decimal numerical system.

4. Convert a number of decimal numerical system to its equivalent in the binary numerical system.

5. Convert a number of hexadecimal numerical system to its equivalent in the decimal numerical system.

6. Convert a number of decimal numerical system to its equivalent in the hexadecimal numerical system.

7. Convert a number of hexadecimal numerical system to its equivalent in the binary numerical system.

8. Convert a number of binary numerical system to its equivalent in the hexadecimal numerical system.

Introduction

Dear student, you should know that each numerical system has its own mathematical calculations, you have already studied the basic calculations of the system of numerical decimal in mathematics for primary cycle "addition, Subtraction multiplication and division". We will content ourselves to shed light on some numerical systems and converting between them, to be input to the production of a project to convert a number between the numerical systems.

The difference between "digit" and "number":

Before starting the project, we should review of what you have already studied concerning the difference between the "Digit" and the "Number":

"Number"	**"Digit"**
The numerical value which consists of one digit or more, or it's the numerical value which represents a single box or more.	The value of one symbol of the basic symbols of numbers, which occupies a single box (allocated to the value of ones or tens or hundreds …… etc)
Example:	Example:
Study the numbers (26), (264) and (1679), the first number consists of two digits, the second number consists of three digits, the third number consists of four digits, as example the digit (3) perhaps represent a number if its series consists of one digit and so on.	1-0-6-8 Thus, each one represents a number in ones series. While 23- 67. 48-59, represents 3,7,8,9 one number in ones series, represents 2,6,4,5 one number in tens series.

Decimal Numerical system is the oldest and most commonly used in everyday dealings, we will start taking it as a prelude to the study of numerical systems.

Firstly: Decimal Numbering System

Decimal numerical system was called by that name because it consists of ten symbols or numbers starting from (0) to (9); "0,1,2,3,4,5,6,7,8,9".

Each number in the decimal number has rank determines its value in number.

For example:

The number $(256)_{10}$ consists of three digits: 6−5−2 and each digit has a value according to his position at the number as in the table:

Hundreds (100)	Tens (10)	Ones (1)
2	5	6

As shown in the following table:

Number	Hundreds (100)	Tens (10)	Ones (1)
$(256)_{10}$	2	5	6
Value Calculation	2 x 100 = 200	5 x 10 = 50	6 x 1 = 6
By adding the parts values in the number we get the value it represents.	200 + 50 + 6 = $(256)_{10}$		

Because the system was called the decimal numerical system so the base equal to (10), and parts values are arranged from the right position to the left as follows:

$$\ldots\ldots\ldots \text{ ،}(10)^4 \text{،}(10)^3 \text{،}(10)^2 \text{،}(10)^1 \text{،}(10)^0$$

Remember: One of the basics of math is that any number (not equal zero) raised to power zero equal one.

Therefore the above table can be represented as follows:

Number	Hundreds (100) $(10)^2$	Tens (10) $(10)^1$	ones (1) $(10)^0$
$(256)_{10}$	2	5	6
Value Calculation	$2 \times (10)^2$ $2 \times 100 = 200$	$5 \times (10)^1$ $5 \times 10 = 50$	$6 \times (10)^0$ $6 \times 1 = 6$
BY Adding the parts values in the number we get the value it represents.	$200 + 50 + 6 = (256)_{10}$		

What do you notice from the previous table؟
Discuss this with your colleagues and your teacher

◆Number 256 was written in the following manner: $(256)_{10}$ to indicate that the number of "decimal system" where the number was written in brackets next to it the base of the system is written.

◆The base of decimal numerical system is (10).

◆The rank of each part in the number began with a base system (10) raised to graded power starting from 0 and increase by 1 with the following grade and so on. Therefore, the first number in the ones part is (6) multiplied by the value of rank $(10)^0$, to determine the value of the number and the second number in tens part (5) was multiplied by the value of rank $(10)^1$ and so on.

2 x (10)²	5 x (10)¹	6 x (10)⁰
2 x 100 = 200	5 x 10 = 50	6 x 1 = 6

From the following, we conclude that:

- ◀ System Name: decimal numerical system
- ◀ System base: 10 which is derived from its name.
- ◀ System components: $0,1,2,3,4,5,6,7,8,9$
- ◀ Start from 0 to the previous digit to the numerical system name.

Practice (1)
Analyze number in the decimal numerical system
### Activity Book page (5)

It is worth mentioning that each numerical system has its own calculations, and we have already studied the basic calculations of the system of numerical decimal in mathematics since the primary stage: "addition−subtraction−multiplication−division" but we confine ourselves here to shed light on some of the different numerical systems and converting between them just.

Secondly: Binary Numbering System:

When we insert some letters on computer, or digital photo through a scanner or digital camera, or digital sound through the microphone, or digital video through a mobile phone or digital camera, the computer converts all these inputs in all its forms to the numbers so we can deal with it.

To know why the computer does not deal only with numbers, first of all we should identify the way computers work from the inside, which is simply based on the idea that:
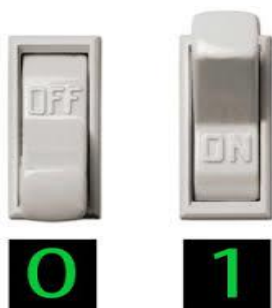
The computer is an electronic device adopts the idea of its work on the electric current passage (it is "On") or there is no current (it is "Off"), and therefore there are huge numbers of infinitesimal electronic circuits that are either connected (On) or disconnected (Off).

What is happening in the computer that the state of simplest electronic circuit changes between the connected or disconnected to represent data that is entered into the computer.

Computer work is based on the binary numerical system. It was so-called "binary numerical system" because it consists of two symbols or two digits only (0) and (1). The two digits can be represented by a switch for running an electric lamp: either the switch is (On) then the lamp lighted, it is represented by (1), or the switch is (Off) then the lamp shuts down. It is represented by (0).
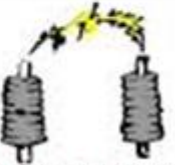
Computers also relies in its work on the conversion of all inputs to the binary system where data inside the computer are dealt with two values of voltage (0 volts and 5 volts). It has been agreed to represent each of these two values with the numbers (0, 1) to become computer language or the so-called the language of the machine or machine code.

While considering the binary system, you will deal with the following terms:

Terms relayed to binary system
bit (Binary Digit)

The smallest unit reflecting the data in the computer, is called "bit", and it is used to express the number of parts that make up the binary digit and take only one value of two (0 or 1).

Binary digit case			
0	2 + 2 = 5 FALSE	OFF	Low electrical voltage
1	2 + 2 = 4 TRUE	ON	High electrical voltage

Example:

- Binary number (1100) consists of 4 bits.
- Binary number (100101) consists of 6 bits, and so on.

Data storage unit (Byte)

The smallest unit stored inside the computer's memory which is stored one symbol (letter, digit or symbol such as ? Or * or . ....), each letter or digit or symbol is represented by Byte, and consists of (8) bit.

Byte

| 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |

bit
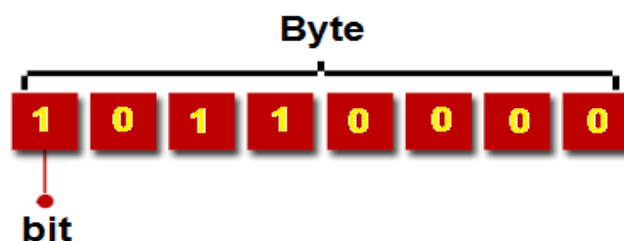
The number of binary possibilities

The number of binary possibilities indicate the number of possibilities that can be obtained from a certain number of digits (bits), it is calculated from the following mathematical equation:

$$N=2^n$$

Where:

N = the number of possible combinations of $(0, 1)$.

n = number of bits

Example:

If the binary number contains two bits then the number of possibilities are:

$$N=2^2=4$$

So, there are four possibilities of any binary number. It is illustrated as follows in table 1:

A	B
0	0
0	1
1	0
1	1

Table (1)

− If the binary number consists of (3) bits The number of possibilities are:

$N = 2^3 = 8$

So, there are 8 possibilities for binary number as a table (2)

A	B	C
0	0	0
0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0
1	1	1

Table (2)

Consider the table and notice:

– For each bit in the binary number rank which determines its value in the number.

Because this system is called binary numerical system, we can put its parts arranged from right to left as follows:

$$.... (2)^4 , (2)^3 , (2)^2 , (2)^1 , (2)^0$$

For example: the binary number $(101)_2$ is made up of three digits $(1, 0, 1)$

There is a value for each bit depends on the value of its rank in the binary number which appears in the following table:

	$(2)^2$ 4	$(2)^1$ 2	$(2)^0$ 1
$(101)_2$ **analysis**	1	0	1
The value	1 x 4 = 4	0 x 2 = 0	1 x 1= 1
By adding the value of bits in the binary number we get an equivalent value in the decimal system.			

$$4 + 0 + 1 = (5)_{10}$$

Consider the previous table, what do you notice؟ Discuss this with your classmates and your teacher

- The number (101) is written in the following manner: $(101)_2$

  Where the number is written in parentheses and next to the parentheses the base of binary system is written. This indicates that the number is related to "binary system".

- The base of binary number system is (2).

- The rank of each part in the number began with a base of system (2) raised to graded power starting from 0 and increases 1 with the following rank and so on. To determine the value of the number, the first digit in the first bit (1) was multiplied by the value of rank $(2)^0$ and the second digit in the second bit (0) it was multiplied by the value of rank $(2)^1$ and so on.

$(2)^2$	$(2)^1$	$(2)^0$
4	2	1

From the following, we conclude that:
- System Name: Binary Numerical System.
- System base: 2 which is derived from its name.
- System components: 0,1

Conversion from binary numerical system to decimal numerical system

Notice:

- **The value of each bit in the binary number depends on the rank within this number (2^n).**

Where the first part on the right has the rank 0 in other words its value is $(2)^0$ or (1) and the second part has the rank 1 with the value $(2)^1$ or (2) and rank of the third part is 2 and its value is $(2)^2$ or (4) and so on.

To get the value of the decimal number that equivalent to the binary number, we multiply the value of each bit of the binary number by the value of the rank of its place within the number and add its multiplication outcome, then we get the decimal value of the corresponding number for it.

Practice (2)

Conversion from binary numerical system to decimal numerical system

Activity Book Page (7)

The conversion from the decimal numerical system to binary numerical system

To convert a number in the decimal numerical system to its equivalent in the binary numerical system, follow the following procedures:

- Divide the decimal number by 2, which is the base of the system transferred to (binary system).

- Quotient we get are divided by 2 and re-quotient divided by 2, and so on, until we get the quotient is equal to zero.

- The Remainder of the quotient each time is placed from right to left and you get the number of binary numerical system.

Notice:

At each step of division there is a remainder. The remainder of the division make a binary number:
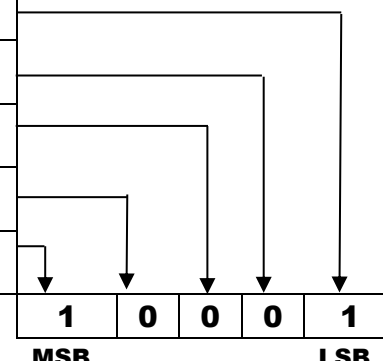
- The first outcome we get is called Least Significant Bit (LSB) in the binary number.

- The last outcome is called the Most Significant Bit (MSB)

Example:

Convert the number $(17)_{10}$ to an equivalent binary numerical system value.

To convert a number from decimal numerical system to binary numerical system corresponding, study the following chart, and follow the steps describing it. Re execute the procedures described on the chart.

Decimal Number	Remainder
17 ÷ 2 = 8	**1**
8 ÷ 2 = 4	**0**
4 ÷ 2 = 2	**0**
2 ÷ 2 = 1	**0**
1 ÷ 2 = 0	**1**

1	0	0	0	1
MSB				**LSB**

(A diagram illustrates converting a number from decimal numerical system to the binary system)
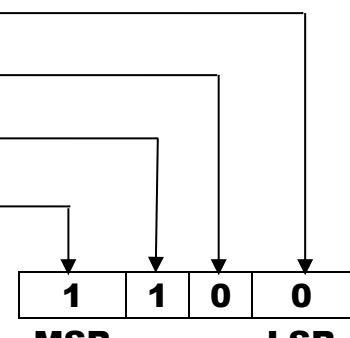
From the above, it is clear that the number (17) in the numerical decimal system = (10001) in the binary numerical system and is expressed as follows:

$$\text{Number } (17)_{10} = (10001)_2$$

Example:

You can convert the number $(12)_{10}$ to the equivalent value of a binary numerical system as follows:

Decimal Number	Remainder
12 ÷ 2 = 6	**0**
6 ÷ 2 = 3	**0**
3 ÷ 2 = 1	**1**
1 ÷ 2 = 0	**1**

1	1	0	0
MSB			**LSB**

Then the number $(12)_{10}$ = $(1100)_2$

Practice (3)

"Converting a number from of decimal numerical system to their equivalent in the binary numerical system"

Activity Book Page (9)

Thirdly Hexadecimal Numbering System

Hexadecimal numerical system is so called because it consists of sixteen symbol or number starting from (0) to (9) Any "0.1, 2.3, 4.5, 6.7, 8.9," The rest of the numbers are expressed by letters (A, B, C, D, E, F) where the letter "A" represents value (10) and the letter "B" value (11) and the letter "C" value (12) and the letter "D" value (13) and the character "E" value (14) and the letter "F" value (15).

Dear student, you can deduce the following:

- System Name: hexadecimal numerical system.
- System base: 16
- Components of the system: "0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F"

Clear to us the importance of studying numerical hexadecimal through the various uses, which illustrated by the following examples:

- To express the addresses of storage places in the computer memory.
- To express the color scheme in some programming languages.
- To express the hardware addresses of the computer which are used to connect these components together.
- When you connect any hardware component of a computer through Ports, each port takes hexadecimal numerical system address.
- Network interface cards in computer using hexadecimal numerical system as physical address (MAC Address).

Converting from hexadecimal numerical system to decimal numerical system

Each digit value or part in the number of hexadecimal depends on the rank inside it, where the first part on the right has the rank 0 and value $(16)^0$ = (1) and the second part has the rank 1 and value $(16)^1$ = (16) and the third part has the rank 2 and value $(16)^2$ = (256) and so on.

To set the value of the decimal number equivalent to the number of hexadecimal multiply the value of each part inside the hexadecimal number in the value of its own rank part, and then collect the inner product we get the value of the decimal number equivalent, which can be illustrated in the following example:

Example:

Convert the number $(156)_{16}$ to an equivalent decimal numerical system value.

Procedures	$(16)^2$ 256	$(16)^1$ 16	$(16)^0$ 1
Analysis of $(156)_{16}$	1	5	6
Value Calculation	1 x 256 = 256	5 x 16 = 80	6 x 1 = 6
By adding the parts values in hexadecimal number we get an equivalent value in the decimal system.	256 + 80 + 6 = $(342)_{10}$		

Example:

Convert the number $(F9B)_{16}$ to an equivalent decimal numerical system value.

Procedures	$(16)^2$ 256	$(16)^1$ 16	$(16)^0$ 1
Analysis of $(F9B)_{16}$	F = 15	9	B = 11
Value Calculation	15 x 256 = 3840	9 x 16 = 144	11 x 1 = 11
By adding the parts values in hexadecimal number we get an equivalent value in the decimal system.	**3840 + 144 + 11 = (3995)$_{10}$**		

Practice (4)

"Converting a number from hexadecimal numerical system to their equivalent in decimal numerical system**".**

Activity Book page (11)

Converting from decimal numerical system to hexadecimal numerical system

Dear student, you can take advantage of previous experience in converting decimal number to its equivalent in the binary numerical system, by following the same steps of converting from decimal to hexadecimal number as follows:

– **Start by dividing the number at 16.**

- Quotient that we obtain is divided by 16 and so on until we get the quotient equal zero.
- In every step of the division there is a remainder which is a hexadecimal number. It is called the remainder of the first division in hexadecimal number (LSB) and the last the remainder of the division is called (MSB)

This can be illustrated from the following example:

Example:

To convert the number $(1327)_{10}$ from the decimal numerical system to its equivalent hexadecimal numerical system, follow the steps outlined in the following chart:

Decimal Number	Remainder
1327 ÷ 16 = 82	F
82 ÷ 16 = 5	2
5 ÷ 16 = 0	5
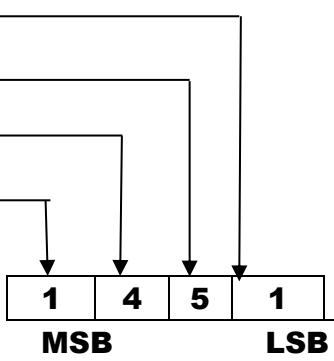
5	2	F
MSB		LSB

Then the number $(1327)_{10} = (52F)_{16}$

Example:

Convert the number $(5201)_{10}$ to its equivalent hexadecimal numerical value.

Decimal Number	Remainder
5201 ÷ 16 = 325	1
325 ÷ 16 = 20	5
20 ÷ 16 = 1	4
1 ÷ 16 = 0	1

1	4	5	1
MSB			LSB

Then the equivalent value of the number $(5201)_{10} = (1451)_{16}$

Practice (5)

"Converting a number from of decimal numerical system to their equivalent in hexadecimal numerical system "

Activity Book Page (13)

To facilitate the conversion process you can use the following table

Hexadecimal Number	Binary Number	Decimal Number
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
A	1010	10
B	1011	11
C	1100	12
D	1101	13
E	1110	14
F	1111	15

Table (3)

Example:

Convert the number $(16C)_{16}$ to its equivalent number in the binary numerical system.

$(16C)_{16}$	1	6	C
	0001	0110	1100
$(16C)_{16}$ =	$(101101100)_2$		

So the number $(16C)_{16} = (101101100)_2$

Example:

Convert the number $(A2D3)_{16}$ to its equivalent number in the binary numerical system.

$(A2D3)_{16}$	A	2	D	3
	1010	0010	1101	0011
$(A2D3)_{16}$ =	$(1010001011010011)_2$			

So the number $(A2D3)_{16} = (1010001011010011)_2$

Practice (6)

"Converting a number from hexadecimal numerical system to its equivalent number in the binary numerical system"

Activity Book Page (15)

Conversion from binary numerical system to hexadecimal numerical system

To convert from binary numerical system to a hexadecimal numerical system, we configure groups of binary numbers from right to left so that each group is composed of four binary digits. The last group is completed with zeroes on the left. Then an equivalent number in the hexadecimal system is assigned to each group; then you get the hexadecimal number.

Example: (You can use table no. (3), p. 28)

Find an equivalent to the number $(101001101100)_2$ in the hexadecimal system.

$(101001101100)_2$	1010	0110	1100
Hexadecimal Number	A	6	C
$(101001101100)_2 =$	$(A6C)_{16}$		

Example:

Find an equivalent to the number (100 1011010) in the hexadecimal system.

$(1001011010)_2$	0010	0101	1010
Hexadecimal Number	2	5	A
$(1001011010)_2 =$	$(25A)_{16}$		

Practice (7)
"Converting a number from of binary numerical system to its equivalent in the hexadecimal numerical system"
Activity Book Page (16)

Second subject

Producing a project to convert a number between numerical systems using VB.NET language

The learning outcomes

By the end of the topic, the learner will be able to:

1. Recognize the general procedures to implement a project to convert a number from one numerical system to another.

2. Produce a project to convert a number from one numerical system to another using VB.NET language.

3. Identify key elements for the producing a project using VB.NET language.

4. Design user interface window using VB.NET language. Explain the code used to convert a number from one numerical system to another.

We discussed at the beginning of the unit the goal of the project, and the requirements of its implementation, and reviewed what you have already studied in mathematics about the concept of numerical systems and how to convert numbers from one system to another as background knowledge of the project, The implementation of the project depends on identifying the programming language that you can use to produce the project, you can take advantage of what you have already studied in the Visual Basic .NET language.

General procedures to implement the project

1. Design a user interface with a GUI project "Graphical User Interface."
   - Determine the appropriate controls for each use in order to produce the project properly.
   - Adjust the controls properties in the light of your necessary requirements to produce the project.
2. Write the programming code.
3. Implement the project and make sure it is accurate.

And now we begin the implementation of procedures and phases of the project production using Visual Basic.NET language.

The project phases of implementation using Visual Basic .NET language

Firstly: The Design Phase

Dear Student, you can design project interface form window on your own, relying on previous experience in the use of editing software and image processing as you want to produce an image as a background for a form window, and then put the appropriate controls to achieve the goal of the project; entering a number of a certain numerical system and converting it and displaying an equivalent number to it in another numerical system.

a)   **Defining appropriate controls to implement the project:**

The following table shows the controls required to implement the project and the purpose of each of them:

Control tool	Their purpose
Form 1	Basic Object, on which we put all the controls used in the user interface object.
Label 1	An Object is used to display a specific label, to guide the user through an explanatory message giving what is required to enter in the adjacent text box.
TextBox1	An object is used to entre a number to be converted to another numerical system.

GroupBox1 GroupBox2	A group including a number of controls, such as: Radio Buttons or CheckBox.
RadioButton	An object is used in the case of selecting an element or one choice from a number of choices, for example, on the user's selection of only one from the three options presented in the first group box, and also choice of only one element of the three choices in the second group box.
Button1	An Object is used in the implementation of specific code when clicked on.

The following figure shows a proposed design for interface of the project window, and component of the controls necessary for the implementation of the project, study the figure and conclude the controls available to it, then discuss it with your teacher and your colleagues.
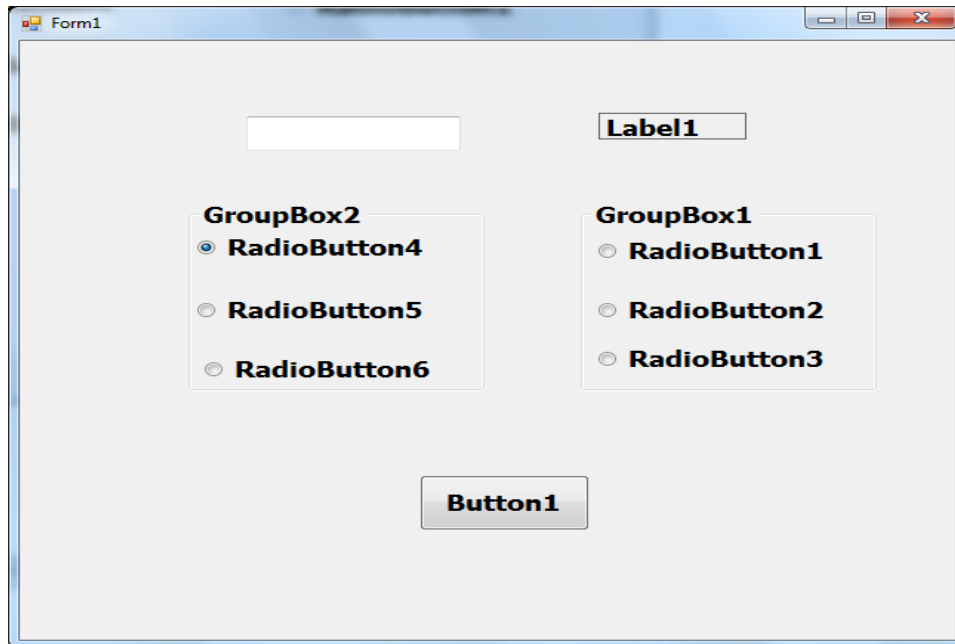
Figure 1 A proposal for the Project Interface Window

b) **Adjust the controls properties**

Through the application or programming language you choose e.g. VB.NET, you can incorporate the controls necessary for the production of a project "conversion of a number between numerical systems" as shown in the following figure:
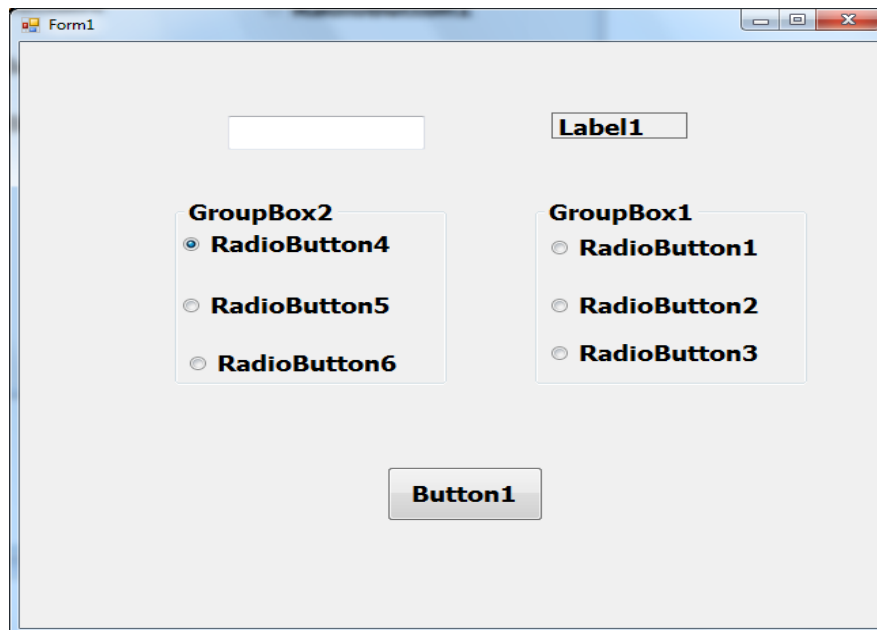
Follow the following steps

1. Open Visual Studio.NET

2. Choose the language used (Visual Basic.NET)

3. Create a new project

4. Insert controls on the form window (Form1)

5. After you insert controls on the form window, we need, dear student to adjust the properties of the controls so that we can write the programming code necessary to employ them and achieve the goal of the project, through the following table:

Control Tools	Properties	Value
Form1	Text RightToLeft	Convert between numerical systems Yes
Label1	Text AutoSize BorderStyle	Insert a numeric value to convert False Fixed Single
TextBox1	Text	" "
GroupBox1	Text	The system converted from
RadioButton1	Text	Decimal
RadioButton2	Text	Hexadecimal
RadioButton3	Text	Binary
GroupBox2	Text	The system converted to
RadioButton4	Text	Decimal
RadioButton5	Text	Hexadecimal
RadioButton6	Text	Binary
Button1	Text	Conversion

A table showing the properties of the controls Tools

Activity (1)
"Insert controls on the form window and adjust its properties using VB.NET languages"
Activity Book Page (18)

Secondly: writing programming code

The idea of code is summed up as follows:

1. **Select the object responsible for the implementation of the code, upon the occurrence of certain event on it.**
2. **Determine the program variables and declare them.**
3. **Determine the numerical system you want to transfer from.**
4. **Determine the numerical system you want to transfer to.**
5. **Write a code to convert a number of numerical system to another numerical system, using the following ways:**

- **Use the Internet to search for open source code and develop or modify it in the light of the requirements of your project.**
  Or
- **Use a ready function provided by the programming language you use.**

  Or

- **New code you prepared.**

Dear Student, you can study and interpret the code used to convert a number of numerical system to another using a ready function, by clicking on the command button "Convert":

Consider the code, and discuss its constituent parts with your colleagues and your teacher.
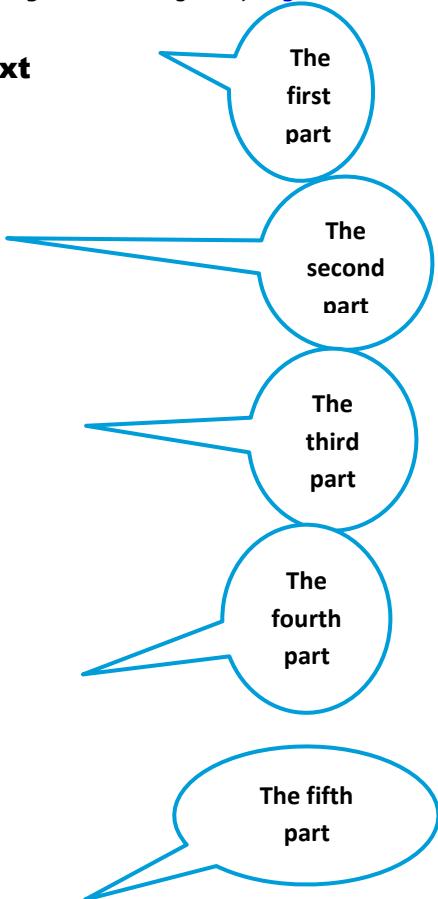
```
Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button1.Click
    Dim value As String = Me.TextBox1.Text
    Dim baseType As Integer
    Dim toBase As Integer
    Dim fromBase As Integer

    If Me.RadioButton1.Checked Then
      baseType = 10
    ElseIf Me.RadioButton2.Checked Then
      baseType = 16
      Else
         baseType = 2
    End If
    If Me.RadioButton4.Checked Then
      toBase = 10
    ElseIf Me.RadioButton5.Checked Then
      toBase = 16
       Else
          toBase = 2
    End If


    fromBase = Convert.ToInt32(value, baseType)
    MsgBox(Convert.ToString(fromBase, toBase))
  End Sub
```

The first part

The second part

The third part

The fourth part

The fifth part

The Code consists of five parts, which are as follows:

The first part "Event Handler"

```
Private Sub Button1_Click(ByVal sender As System.Object,
ByVal e As System.EventArgs) Handles Button1.Click
```

Its purpose: to assign programming code to button tool "convert", which carries the name Button1, so that the code is executed on clicking Button1.

The second part, "the declaration of variables"

```
Dim value As String = Me.TextBox1.Text
Dim baseType As Integer
Dim toBase As Integer
Dim fromBase As Integer
```

Its purpose: Use the command 'Dim' to declare the following variables:

• value: a string variable named 'value' assigned the value entered in the text box 'TextBox1', and required to find the equivalent.

• baseType: integer variable with the name 'baseType', will be used to determine the numerical system type converted from, whether (10 "decimal" or 16 "hexadecimal" or 2 "binary").

• toBase: integer variable with the name 'toBase', will be used to determine the numerical system converted to, whether it is (10 "decimal" or 16 "hexadecimal" or 2 "binary").

• fromBase: integer variable with the name 'fromBase', assigned the output of the number conversion.

The third Part: "identification of the number system converted from"

```
If Me.RadioButton1.Checked Then
    baseType = 10
ElseIf Me.RadioButton2.Checked Then
    baseType = 16
Else
        baseType = 2
End If
```

Its purpose: test the numerical system type to transfer from whether it is decimal, hexadecimal or binary, based on the value of the "RadioButton" chosen by the user in the "GroupBox1", and assigned it to the variable 'baseType'.

The fourth topic: "Determine the numerical system converted to"

```
    If Me.RadioButton4.Checked Then
       toBase = 10
    ElseIf Me.RadioButton5.Checked Then
       toBase = 16
       Else
           toBase = 2
End If
```

Its purpose: test the numerical system type you want to convert to either decimal or hexadecimal or binary based on the value of the "RadioButton" chosen by the user in the "GroupBox2" and assign it to the variable "toBase".

The fifth Part: "The use of conversion function".

```
fromBase = Convert.ToInt32(value, baseType)
MsgBox(Convert.ToString(fromBase, toBase))
```

Its Purpose:

(1) Use of the function ToInt32 from the class 'Convert' to convert the text value in the variable 'value' to the format of the numerical system you want to convert to, which is stored in the variable baseType, and assign the output to variable fromBase.

(2) Use the function Convert.ToInt32 to convert the value in variable fromBase to the numerical system required to transfer to which is stored to the variable toBase, and display the output in a message box MsgBox.

> **Activity (2)**
> Writing a project code to convert a number of numerical systems using "
> **".**the language of VB.NET
> Activity Book and Page (21)
> Discuss with your colleagues and your teacher what has been accomplished.

Thirdly, implement the program and teste

After you insert the controls, adjust their properties and type the code, you should implement of the project by pressing the Start Debugging button and entering a numerical value of a given numerical system and watching the conversion to its equivalent in other numerical systems.

Note: You can, Dear Student, use numbers from the previous examples to explain and verify the results of the implementation of the program.

Activity (3)
".Implementation of the program and testing it"
Activity Book Page (22)
Discuss with your colleagues and your teacher what has been accomplished.

Third topic
Producing a project to convert a number between numerical systems using the PHP language.

Learning outcomes

By the end of the topic, the learner will be able to:

1- Explain the requirements of producing a project to convert a number between numerical systems using the PHP language.

2- Produce a project to convert a number between numerical systems using the PHP language.

3- Explain the code used to convert a number between numerical systems using the PHP language.

4- Employ a web page in the conversion of a number of numerical systems.

5- Cooperate with his colleagues in the search for other codes to employ them in his project.

Producing a project to convert a number between numerical systems using the PHP language

Dear Student, using of PHP language opens you up new avenues for the production of a web site featuring Dynamic Web Pages where some data are processed and returns the result of processing on the web page.

Requirements for the implementation of the project in PHP

(1) Implementation of the project through the web page depends on some of the basics of HTML markup language, the application of Expression Web, and the language of the PHP previously studied.

(2) Use of the application Expression Web to create Static Web Page, which helps to accomplish a large part of the project without trouble, and through the application you can find the corresponding HTML code for all what has been implemented.

Production phases of the project in PHP

The project production goes through the following phases:

Firstly: the Design Phase

Dear Student, you can design a Web page that contains the appropriate controls to achieve the goal of introducing a certain number of numerical system to be convert and its numerical equivalent be displayed in another system. The design phase goes through the following two steps:

A) Identify the elements of the texts and the appropriate control of the project.

B) The insertion of the controls on the Web page and setting their properties.

← Identify the elements of the texts and the appropriate control of the project:

You can determine the controls on the web page and summarize its purpose in the following table:

Control	Its purpose
Form	Keep all the controls used in the web page.
Text book	The user can enter the number to be converted.
Three 'submit' buttons	- The first "binary conversion": When pressed, this means that a binary number and its equivalents in the other two systems "decimal" and "hexadecimal" are calculated. - The second "Decimal conversion" when pressed, it means that the number is decimal and its equivalent are calculated to in other "binary" systems" and "hexadecimal". - The third "converting hexadecimal" when pressed, it means that the number is hexadecimal, and its equivalent in other "binary" and "decimal" system is calculated.
Three 'label' boxes	• The first shows the equivalent in the binary number • The second shows the equivalent in the decimal number • The third shows the equivalent in the hexadecimal number

The following figure shows a proposal for the design of Web pages that appear on the Internet browser screen, and the controls it include to produce the project.
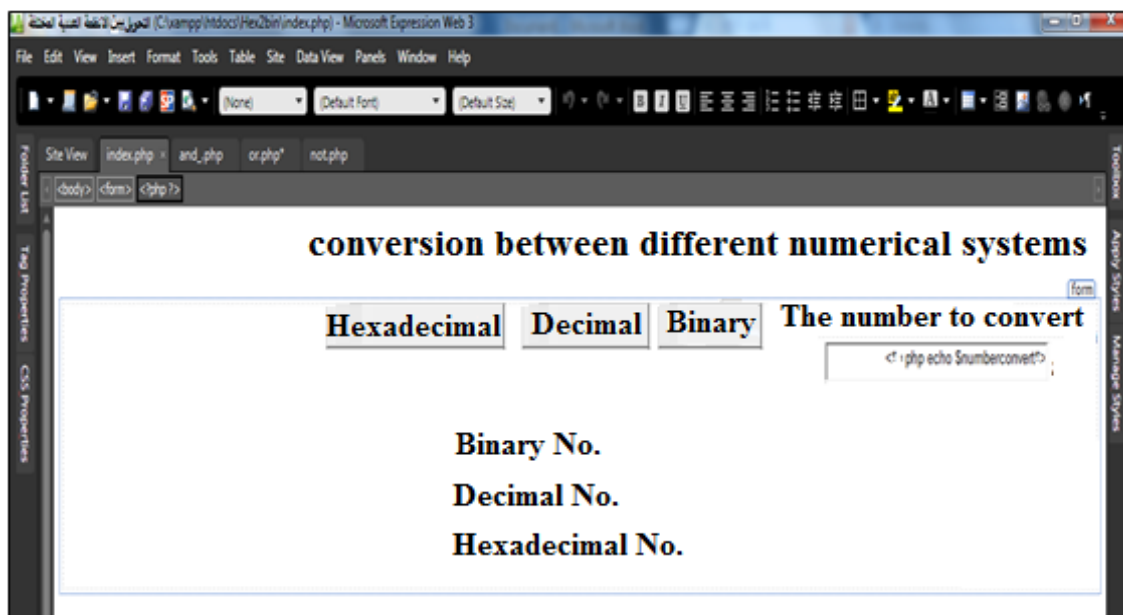
And you can use another design that includes other controls of the project.

◄   The insertion of the controls on the Web page and setting their properties:

There are many applications that you can Dear student use in addition of the Controls on the web page, such as the application of Expression Web, where you can through Control Tool Box texts, insert texts, addresses, and controls necessary to implement the design of the web page.

Activity (1)
"The insertion of the controls on the Web page and setting their properties"
Activity Book Page (23)
Discuss with your colleagues and your teacher what has been accomplished.

Secondly: writing of programming code, implementation and testing stage

After designing a web page, and the writing and the inclusion of titles, texts and controls, the stage of writing the code comes and follows the following steps:

1. Press the "Code" button at the bottom of the application window.

2. Add PHP code that processes the data and display processing output on the web page.

```
<html >
        <head>
                <meta                content='text/html;
charset=utf-
                8' http- equiv='Content-Type' />
                <title>conversion    among    nume
systems  </title>
        </head>
<body dir='RTL'>
                <h1> conversion among numerical
```

The first part

```
different systems  </h1>
<form method='post' action=' '>

<?php
    $numberconvert="";
    $numberbin="";
    $numberdec="";
    $numberhex="";
if(isset($_POST['Submit1']))
  {
   $numberconvert= $_POST['num'];
   $numberbin=$numberconvert;
   $numberdec=bindec($numberconvert);
   $numberhex=dechex($numberdec);
  }

if(isset($_POST['Submit2']))

  {
   $numberconvert= $_POST['num'];
   $numberbin=decbin($numberconvert);
   $numberdec=$numberconvert;
   $numberhex=dechex($numberdec);
        }

if(isset($_POST['Submit3']))

  {
   $numberconvert= $_POST['num'];
   $numberdec=hexdec($numberconvert);
   $numberbin=decbin($numberdec);
   $numberhex=$numberconvert;
  }
 ?>
```

The second part

The third part

<h3> The number to convert

```
<input name='num' style='width: 254px; height:
    29px' type='text' value='<?php echo
    $numberconvert; ?>' >   

<input name='Submit1' style='width: 118px'
    type='submit' value='Binary'>  

<input name='Submit2' type='submit'
    value='Decimal'>    
```

The fourth part

```
<input name='Submit3' type='submi
        value='Hexadecimal'>
   
            
          </h3>  <br>  <br>


<p>                              binary        number
     

      &nbsp
;
        
 <label id='Label1'> <?php echo $numberbin; ?>
     </label>      </p>
 <p>                  decimal                  number
     
               
    <label id='Label2'> <?php echo $numberdec;
?>
```

```
        </label>         </p>
        <p>hexadecimal number    
<label   id='Label3'><?php   echo   $numberhex;   ?>
   </label>         </p>
</form>
</body>
</html>
```

Consider the previous code, and discuss it with your colleagues and your teacher.

Interpretation of the code

Part I: "web page address on the Internet browser."

```
<html >
        <head>
                <meta content='text/html;  charset=utf-
                8' http- equiv='Content-Type' />
                <title>conversion     among     numerical
systems </title>
        </head>
<body dir='RTL'>
                <h1>  conversion   among   different
numerical systems </h1>
<form method='post' action=' '>
```

- The Code

<meta content='text/html; charset=utf-8' http-equiv='Content-Type' />

Is added by the Expression Web program to adjust the appearance of the letters in Arabic on a Web page instead of appearing it as illegible symbols.

– The code 'Title' is used in the development of the title of the web page.

– The code <body dir = 'RTL'> leads to change the direction of the appearance of text and controls on the web page from right to left.

– The code <h1> …. </ h1> is used to show the text in between in a size 1 : 6 so that the greatest is "6" and the smallest is "1".

– The code <form method = 'post' action =' '> is very important as it updates the web page refresh and the result of the processing will appear on the same page, through two properties of the model 'Form', the first property 'method' allocates the way of the transfer of page data from the model Form, the last property 'Action' determines the procedure to be done when you press the Submit button.

Part II: "**The declaration of the variables and making the processing**"

```
<?php

 $Numberconvert = ""; a variable receives number to be converted

 $Numberbin = ""; a variable receives a binary number

 $ Numberdec = ""; a variable receives a decimal number

 $Numberhex = ""; a variable receives a hexadecimal number


 if(isset($_POST['Submit1']))

test if the "dual−conversion" was pressed which means that the number to be
converted is binary and thus:

 {

 $numberconvert= $_POST['num'];

Pick up the number that has been entered in the text box and put it in the variable
numberconvert.

 $numberbin=$numberconvert;

Allocate the same "binary" number to the variable 'numberbin'

 $numberdec=bindec($numberconvert);
```

The function 'bindec' is used to convert variable numberconvert number of binary number system to its equivalent to a numerical number in the decimal system output variable numberdec and customize.

```
$numberhex=dechex($numberdec);
```

Dechex function is used to convert variable numberdec number of decimal numerical system equivalent to a numerical number in hexadecimal and customize the output of the variable numberdec where there is no direct conversion from binary to hexadecimal function.

```
}
if(isset($_POST['Submit2']))
```

Have you been testing the click on "hex conversion" button to any number you want to convert a decimal and thus:

```
{
  $numberconvert= $_POST['num'];
```

Pick up a number that has been entered in the text box and assigned it in the variable numberconvert.

```
$numberbin=decbin($numberconvert);
$numberdec=$numberconvert;
 $numberhex=dechex($numberdec);
   }
if(isset($_POST['Submit3']))
{
$numberconvert= $_POST['num'];
$numberdec=hexdec($numberconvert);
 $numberbin=decbin($numberdec);
```

```
$numberhex=$numberconvert;

 }

?>
```

Part III: "Code of controls insertion on the web page"

> **\<h3\>** the number to be converted
> Print the following text on the web page "number to be converted" with a font size 3.
>> **\<input name='num' style='width: 254px; height: 29px' type='text' value='\<?php echo $numberconvert; ?\>' \>   **
>
> Command input to show the text box controls and set its following properties: - **name='num'**: name of the control.
>
> - **Style = 'width: 254px; height: 29 px '** to determine the width and height of the control.
>
> - **Type = 'text'** to determine the type of control, it is a text box type to enter the number to be converted.
>
> **- Value = '\<? php echo $numberconvert; ?\> '**
>
> Value property show the value or content of the text box control, the variable **numberconvert** value has been introduced to show the number to be converted each time the web page is updated inside the text box.
>
> - **&Nbsp;** is used to leave a single space.
>
> The following three sentences include the insertion of three controls of a command button type which characteristics: the name, the display, the type and value have been adjusted.
>> **\<input name='Submit1' style='width: 118px' type='submit' value=' binary conversion' \> **

```
      <input           name='Submit2'          type='submit'
   value='decimal            conversion'                >
   
      <input           name='Submit3'          type='submit'
   value=        'hexadecimal        conversion        '>
   
                          
             </h3>   <br>   <br>
```

Remember**:**

– No particular order is required when writing control properties**.**

– In PHP, HTML languages, a control **Input (button) or Input(Submit)** can be inserted using code according to project requirements and function**.**

– At the end of the code, some distances   were left, and code </h3> was closed and two lines were left using the code <br>.

Part IV: "**printing the results through the Label control.**"

\<p> the binary number
**   **
**   **
**   **

- Printing the text "binary number" on the browser page and leaving several distances.

\<label id='Label1'> \<?php echo $numberbin; ?>
\</label> \</p>

– Inserting the object Label which shows the value of the variable numberbin.

- Use 'echo' in the following PHP code **\<? Php echo $ number in; ?>** to print the output of variable numberbin in the label.

- The conversion to the equivalent binary number output appears in the label next to the text box "binary number", and likewise the conversion to the equivalent decimal and hexadecimal output appears in its labels.

\<p> decimal number
**   **
**   **
\<label id='Label2'> \<?php echo $numberdec; ?>
\</label> \</p>

**\<p> hexadecimal number   **
\<label id='Label3'> \<?php echo $numberhex; ?>
\</label> \</p>

– The following code is used to close: form, body and html.

```
</form>
</body>
</html>
```

Activity (2)

"Writing a project to convert a number among numerical systems, and implementing and testing it using PHP language".

Activity Book page (25)

Activity (3)

"Virtual Tour"

Activity Book Page (32)

See you

In

Unit 2.