

**Ministry of Higher Education &
Scientific Research
Al- Mustansiriya University
College of Engineering**

First Year

Computer laboratory



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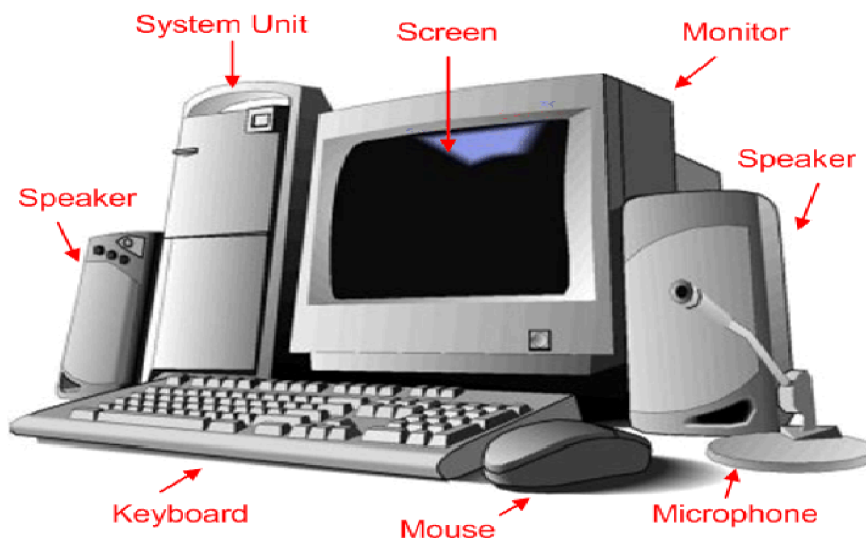
EXPERIMENT NO.1

Computer Hardware

1- What makes up a personal computer (PC)

There are four elements that make up a personal computer system. The user, software, hardware and electricity all work together to form the whole system. The equipment itself (the computer, monitor, printer, etc.) is called HARDware because you can physically touch the components. The programs are called SOFTware because they function only while the computer is turned on.

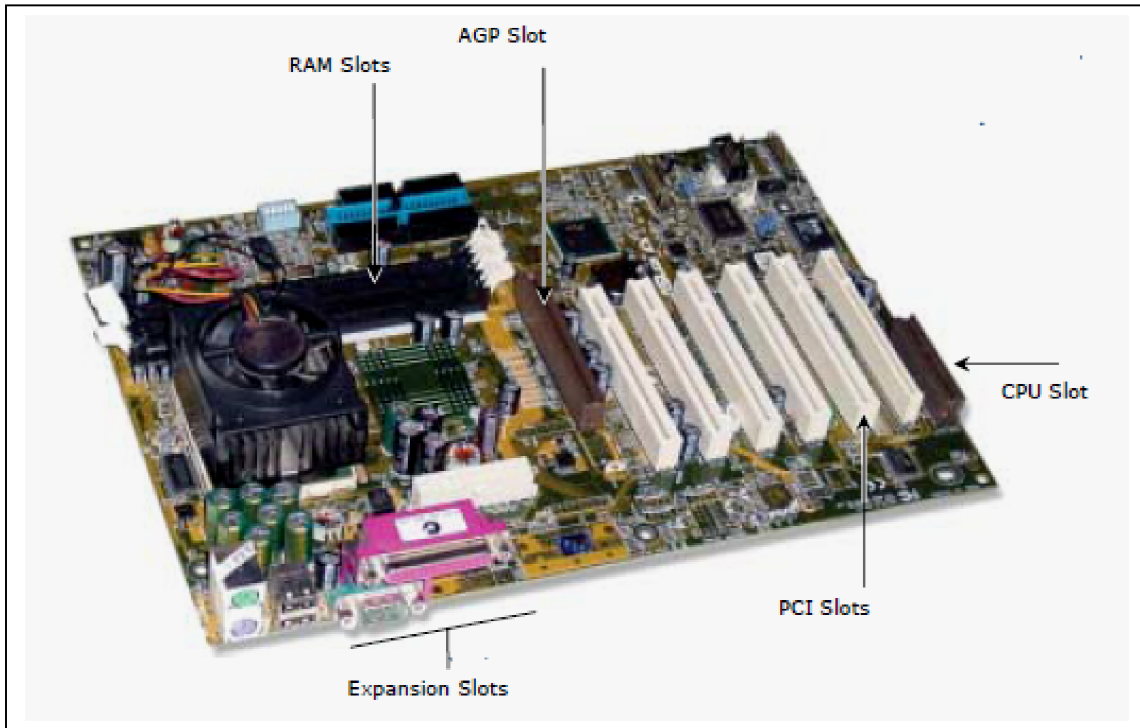
The following picture shows an example of a personal computer system (PC). The system unit or box, monitor, keyboard, and mouse are part of the system hardware.



There are four major hardware component parts on a system: the Central Processing Unit (CPU), Random Access Memory (RAM), Input/Output (I/O) Devices, and Storage Devices.

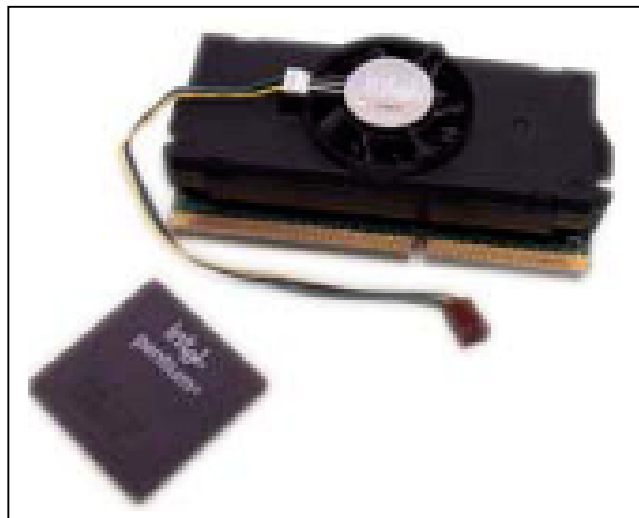
2- The Motherboard

The largest electronic circuit board in the computer is called the motherboard. It is the foundation of the computer and consists of the CPU, RAM, and ROM BIOS. The motherboard lies on the bottom of the box or the side of a tower.



3- The Microprocessor Chip

The microprocessor chip is the “brain” of the computer and is located on the motherboard. This can also be referred to as the CPU or Central Processing Unit. It is the component that receives and executes instructions from the software programs and the user. Each model or type of CPU processes information and instructions at a different speed measured in Gigahertz (GHz).



4- The Power Supply

Every system box has a power supply that converts the AC (alternating current) coming from a wall outlet to the DC (direct current) format needed by a computer. A power supply for a computer needs between 5v and 12v, with 5v needed for the circuit boards and 12v for hard drives and CD-ROMs. Newer computer systems generally use lower voltages.



5- Memories

In order for a computer to be able to store information, either about its configuration or data files, the computer needs to have memory chips installed. Memory is measured in bytes; in very simple terms, one byte is equal to one character. Officially, computers were developed using a numbering system of 1s and 0s. These two unique numbers are designed to represent the charged or uncharged nature of electricity. This is known as the binary system. These two digits essentially make a bit and eight bits make one byte. With the advancement of computer technology, the availability for storage capacity has grown:

1 Kilobyte = 1,028 Bytes	or 1 Thousand Bytes
1 Megabyte = 1,028,000,000 Bytes	or 1 Million Bytes
1 Gigabyte = 1,028,000,000,000 Bytes	or 1 Billion Bytes
1 Terabyte = 1,028,000,000,000,000 Bytes	or 1 Trillion Bytes

All data processed in a computer is made up of bytes, in various combinations as calculated by the computer. Every file used in a software program by the computer has a specific file size, based on the instruction for that feature. For example, if a data file is 102Kb in size, this means that the file contains 102,000 characters (in simple terms). Generally, there are two types of memory: ROM and RAM

A- Read-Only Memory ROM

ROM is a class of storage medium used in computers and other electronic devices. Data stored in ROM cannot be modified, or can be modified only slowly or with difficulty. Sometimes called non-volatile memory as it is not erased when the system is switched off.

Experiment No. 1

ROM memories have gradually evolved from fixed read-only memories to memories that can be programmed and then re-programmed.

-ROM(Read Only Memory).

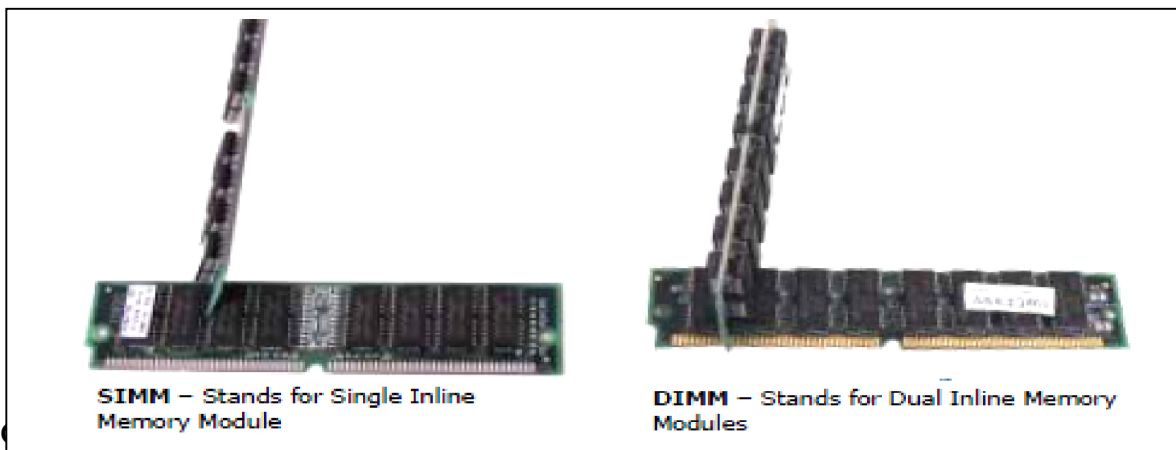
-PROM (Programmable Read Only Memory).

-EPROM(Erasable Programmable Read Only Memory).

-EEPROM(Electrically Erasable Programmable Read Only Memory).

B- Random Access Memory (RAM)

RAM is a kind of electronic pool of memory where the computer can hold programs and data. It is located on the motherboard with the CPU. The computer uses RAM to temporarily hold the current software program and the current data created by the user; this may also be referred to as system RAM. It is important to remember that RAM is only a temporary, changeable storage location. It is erased when you turn off the computer.



Cache (pronounced as “cash”) memory helps to speed up the processor by storing frequently used instructions and data in this area. There are two types of memory used for cache:

- DRAM or Dynamic RAM
- SRAM or Static RAM

6. Identifying Input/Output Units

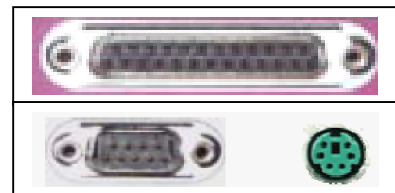
Input/Output, or I/O, refers to the communication between an information processing system (such as a computer), and the outside world, possibly a human, or another information processing system. Inputs are the signals or data received by the system, and outputs are the signals or data sent from it. Keyboard or a mouse may be an input device for a computer, while monitors and printers are considered output devices for a computer.



7- Recognizing Input/Output Ports

Ports are the connection plugs at the back of a computer (or other device) that allow you to connect an input/output device. Ports can be categorized into these types:

- **Parallel ports** come in a variety of sizes and are generally used for connecting printers.
- **Serial ports** are used for connecting a mouse or modem.
- **USB (Universal Serial Bus) ports** are used to connect newer models of devices such as mouse, modems, keyboards, scanners, etc. These support the plug-and-play (the operating system will recognize the new device and try to install it)
- **Network or Internet ports** look like telephone jacks. These ports allow you to connect either to another computer on a network, a modem, or the Internet directly.



8. Storage Drivers

Storage drivers are required to store software programs and to keep permanent records of the work done. These drivers are:

A. Disk Drives: Like CD, DVD, Blue-Ray Discs

B. Hard Disc Drivers: Hard drives range in capacity more than 1TB (Terra Byte)



1 = Magnetic Disks

2 = Read/Write headers

3 = headers actuator

4 = The common axis

C. Flash or Memory Cards

Flash or memory cards are used generally in computers, smart phones, digital cameras, satellite receivers, TVs ...etc. These cards or sticks come in a variety of storage capacity



Flash Card

Memory Card

Flash Reader

EXPERIMENT NO.2

Operating System (Windows 7)

1- What is Windows?

Windows is an operating system from Microsoft Corporation, the developer of DOS (Disk Operating System). It is a graphics based environment, allowing users to easily integrate data and graphics, and easily maneuver between applications. The operation environment was introduced by Microsoft in the early 1980's, and has advanced with the following versions:

1. Windows 3.x
2. Windows NT
3. Windows 95
4. Windows 98
5. Windows 2000
6. Windows Millennium
7. Windows Mobile
8. Windows XP
9. Windows Vista
10. Windows 7
11. Windows 8
12. Windows 10

2- Using the Mouse

The mouse is a pointing device used to move the cursor or pointer arrow around on the computer screen. As you work with Word, you will need to remember the common terms described below:

Experiment No. 2

Click: Point the mouse at the desired item, and then quickly press down and release the left mouse button.

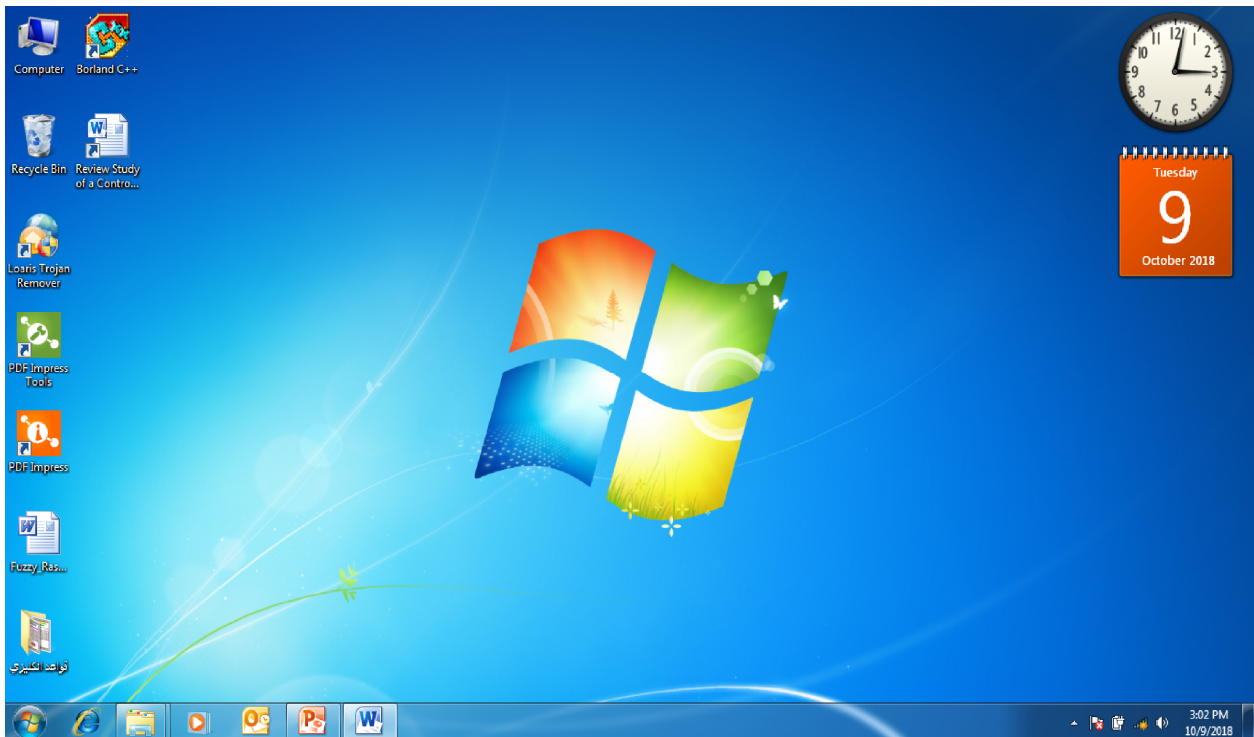
Double-Click: Point the mouse at the desired item, and then click the left mouse button twice in rapid succession.

Drag: Point the mouse cursor at the desired item or range; then press and hold down the left mouse button as you move the pointer. Release the mouse button when you have moved the item to the desired location or selected the range you want.

Right-Click: Point the mouse at the desired item, then quickly press down and release the right mouse button.

3- Looking at the Desktop

After installing Windows 7 the desktop will look similar to the following picture. You will notice several objects or icons on the desktop. The number of icons or folders on your screen (desktop) will depend on the user that being use this PC.



Generally The PC desktop contain the following elements:

Experiment No. 2

Desktop: It is the work area on which Windows, icons, menus, and dialog boxes appear and may contain shortcuts to frequently used files, programs, or web pages.

Taskbar: The taskbar is located at the bottom of the screen. It contains the Start button, the taskbar notification area, and may display the Quick Launch bar or other toolbars. As you open a program or file, a button will be displayed on the taskbar for each open item.

Start Button: Use this button to start programs, open documents, find items on your computer, get help, as well as log off and shut down your computer. Depending on how the desktop was set up, you may not see the following desktop icons until they have been selected to display on the desktop.

Mouse Cursor: The pointing arrow is the symbol on the screen, representing the movement or action of the mouse. As you slide the mouse along the desk, the arrow will follow in the same direction.

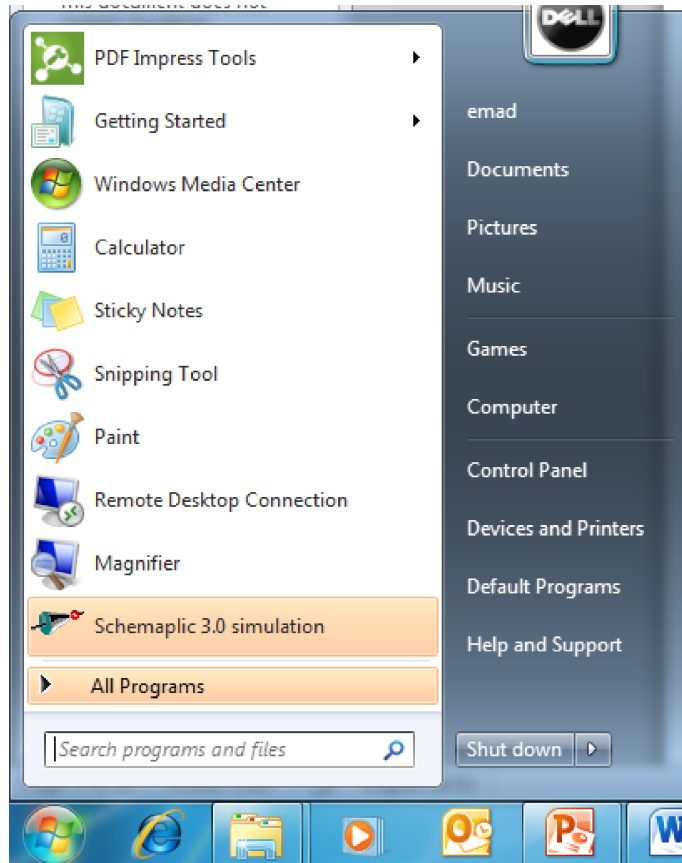
Icons: The shapes and images that represents a short cut for the installed program is called “Icons”. Some of standard icons are:

- 1. My Computer:** This folder allows you to quickly access storage devices (i.e., 3½" floppy disk, hard drive, CD-RW, DVD-ROM drive, or network drive) that have been mapped to your computer.
- 2. Recycle Bin:** This is a temporary storage place for deleted files. You can use it to retrieve or restore files deleted in error. The deleted files are not actually removed from the hard disk until you empty the Recycle Bin.

4- Using the Start Button

This button is the primary means of starting programs, finding files, accessing online help, logging off the network, switching between users or shutting down the computer.

Experiment No. 2



The most important sub menus displayed are:

All Programs: Contains a submenu which lists all of your installed programs.

Documents: Contain the stored documents like; pictures, videos, texts, notes, and many other kinds of documents.

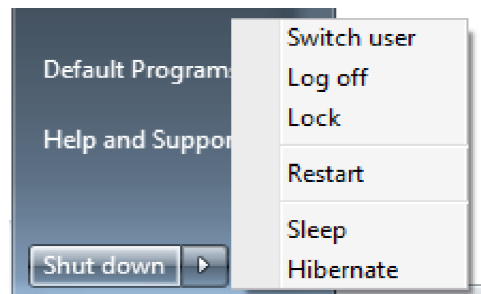
Control Panel: Change settings and customize the functionality of your computer.

Devices and Printers: View and manage devices, printers and print jobs.

Help and Support: Find help topics, tutorials, troubleshooting and other support services.

Shut down: Close all opened programs, shut down Windows, and then turn off your computer. See picture below:

Experiment No. 2



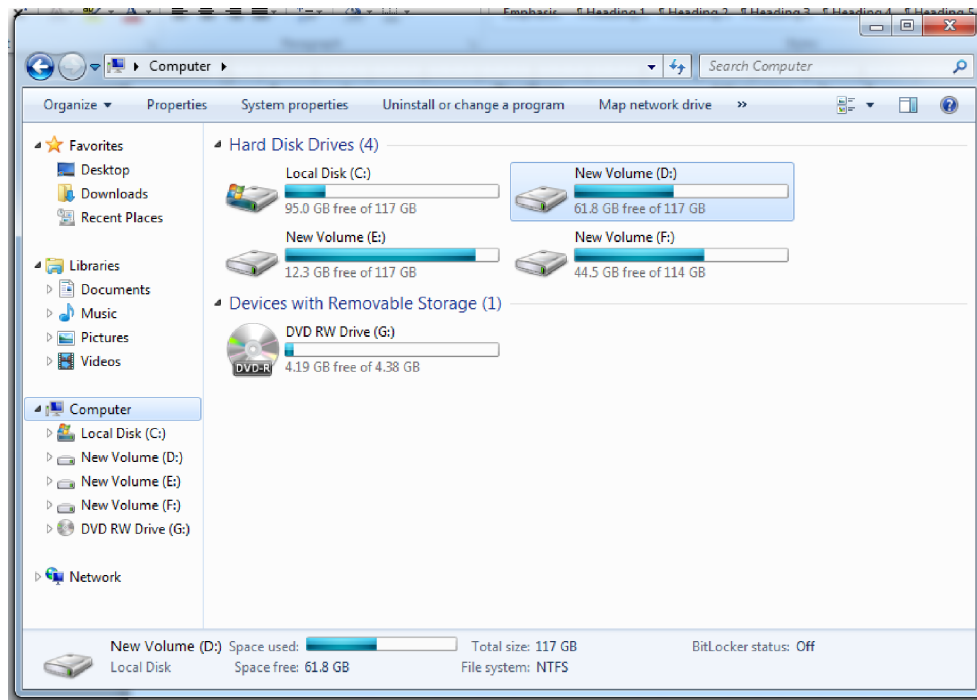
5- Using the Taskbar

By default, the taskbar is visible at the bottom of the Windows desktop. The taskbar contains the Start button, toolbars, a notification area, the clock, and displays a taskbar button for each open program.



6- Looking at a Typical Window

When programs or folders are opened, they appear on the desktop in their own individual windows. You can potentially have multiple windows displayed on the screen; you are not limited to displaying one at a time. Each window shares similar features, as noted in the following:



Experiment No. 2

Title Bar: Displays the name of the feature or application program currently active (e.g., My Computer).

Minimize/Maximize/Restore/Close: These three buttons always appear at the far right side of an application program window.



- **Minimize button** allows you to temporarily suspend the window and put it as a button on the taskbar for later use.
- **Maximize button** maximizes the window to full screen.
- **Restore button** restores the size of the window to the screen size.
- **Close button** closes the application or document window.

Status Bar: This appears at the bottom of the opened window and displays information about the status of any request being made, such as Ready, Number of objects, etc.

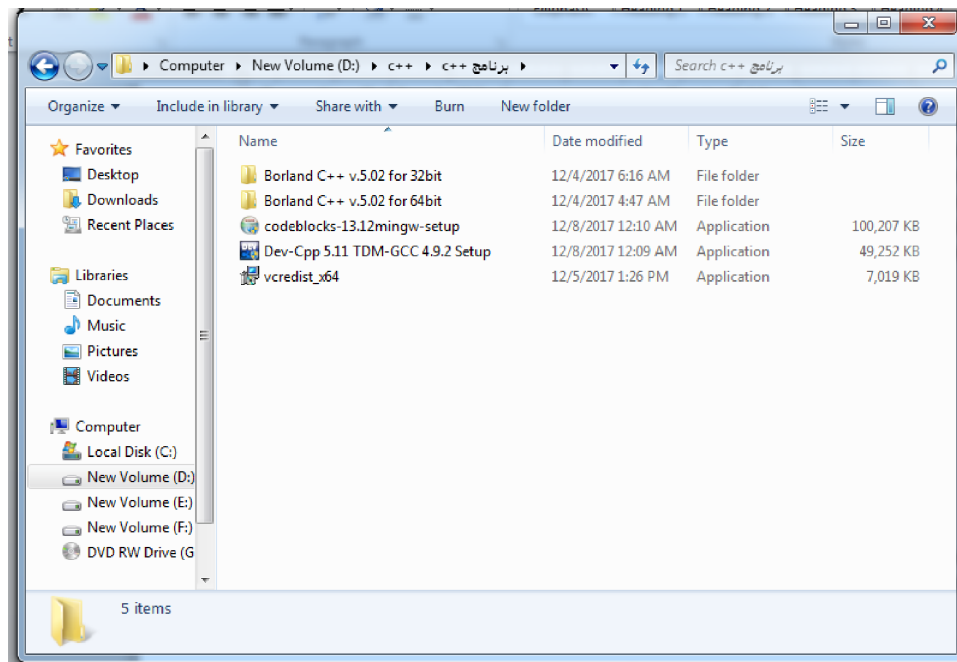
Scroll Bar: If displayed, appears at the far right and bottom of the window when there are more items than can be shown in the current window size.

7- Looking at Files and Folders

A **file** is commonly referred to as a document. Files or documents are usually created from within a specific program. For example, you could use Microsoft Word to create word processing files such as letters, memos or reports. Files are represented with an icon and usually include a symbol of the associated program.

A **folder** is a container for programs and/or files and is a method of organizing information. Folders in Windows are very similar to folders in a conventional filing cabinet. Folders are represented with a yellow icon that looks like an actual file folder.

Experiment No. 2



A-Copying and Moving Files or Folders

You need to select the files or folders first prior to copying. Use one of the following methods to copy a file or folder:

1. Select **Edit** and then **Copy**. Move to the new location and then select **Edit, Paste**.
2. Press **Ctrl+C** Move to the new location and then press **Ctrl+V**
3. Right-click on the selection and then click on **Copy**. Move to the new location, right-click and then click on **Paste**.

B-Renaming Files or Folders

You can rename files in the same manner as with folders. To activate the Rename feature, use one of the following methods:

1. Click on the file icon to select it and then press **F2** to activate the Edit mode.
2. Right-click on the file and then click on Rename from the shortcut menu.
3. Click once on the folder to select it. Then click once in the folder name to activate the Edit mode.

C-Deleting Files or Folders

To delete a file or folder, select the required file or folder to be deleted and then use one of the following methods:

1. Select **File** and then **Delete**.
3. Press **Del**
4. Right-click and click on **Delete** from the shortcut menu.

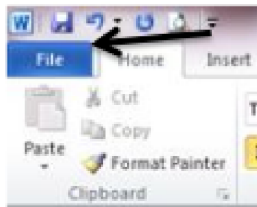
D-Restoring Files or Folders

If a file or folder is accidentally deleted, you can “undelete” or restore it to its original location. To restore a file or folder from within the Recycle Bin feature ; Select File then Right-click on it then click on Restore.

EXPERIMENT NO.3

Microsoft Word 2010

The Office File Tab

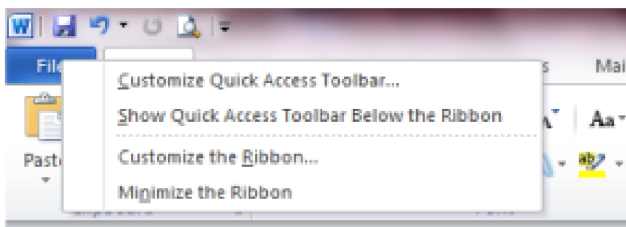


- Replaces the 2007 Office Button and is located in upper left corner.
- Basic commands are New, Open, Save, Save As, Open, Close Info, Recent, New, Print, Save and Send, Help, Options, and Exit

The Quick Access Toolbar



The Quick Access Toolbar is a customizable toolbar that contains a set of commands that are independent of the tab that is currently displayed. You can add buttons that represent commands to the Quick Access Toolbar, and you can move the

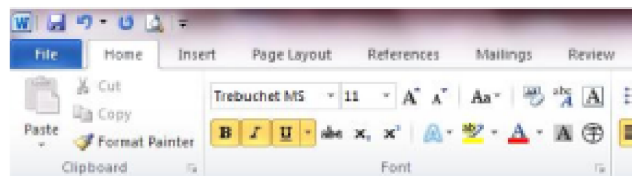


Quick Access Toolbar from above the Ribbon to below the Ribbon. Right click on any Tab and you will see these Ribbon options.

The Ribbon

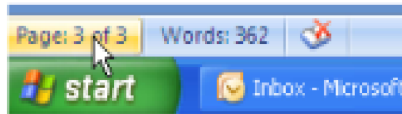
Grouping of your tools and commands by task

1. **Tabs**
 - a. File, Home, Insert, Page Layout, References, Mailings, Review, View, PDF, Add-Ins and Acrobat
2. **Groups** within each Tab Break which contains sub tasks
 - a. Such as Clipboard, Font, Paragraph, Styles and Editing when Home Tab is selected
3. **Command buttons** in each group to carry out commands or a display a menu of commands
 - a. Command buttons when Home is selected under Group: Clipboard are Cut, Paste, Copy and Format Painter



Experiment No. 3

The Status Bar



The status bar at the bottom of Microsoft Office programs indicates whether options such as word count, signatures, permissions, change tracking, and macros are turned on or off. You can also use features such as Zoom on the status bar. Right-click the status bar. Click the options that you want.

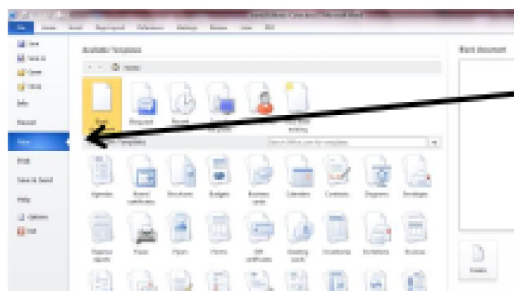
The view Toolbar



The view toolbar is located on the lower left-hand side of the screen. It lets you choose among Print Layout, Full Screen, Web Layout, outline and Draft Views. A slider lets you zoom in or out on your document.

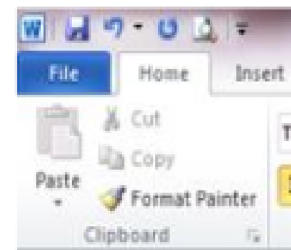
2. Basic Commands

Opening a new document or old document

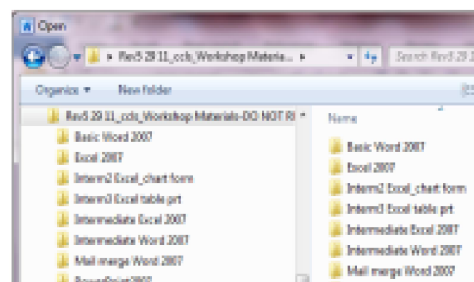


Click on the Office File Tab and choose New.

This is the screen you will view.



Click on Open and you will have to browse for the document. (.docx is the extension)



Experiment No. 3

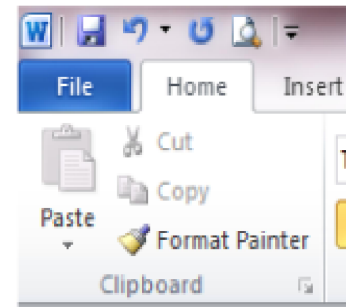
Cut (Ctrl +X), Copy (Ctrl +C) and Paste (Ctrl +V)

- Cut, Copy and paste are found under the Home Tab in Clipboard Group
- Remember to *Select Text* and then choose the *Command*
- Undo is a handy tool if you make a mistake.

Undo/Redo

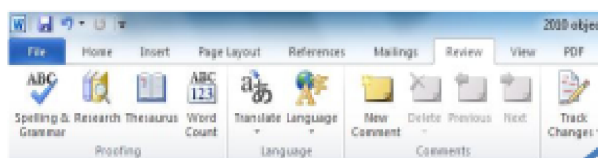
Undo (Ctrl +Z) 

Redo (Ctrl +Y) 

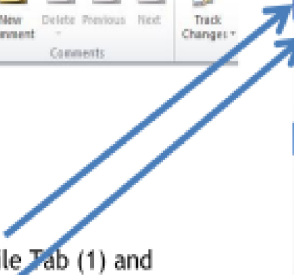


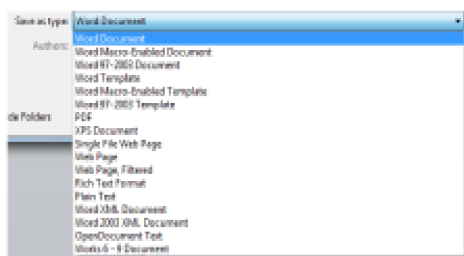
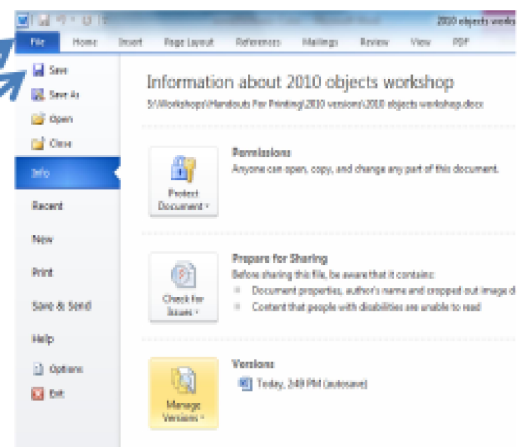
Spelling and Grammar (F7)

- Choose the Review Tab, under the Proofing Group
 - 1st command is Spelling & Grammar
- Wavy red underlines indicate spelling errors and green wavy underlines indicates grammar or punctuation errors.



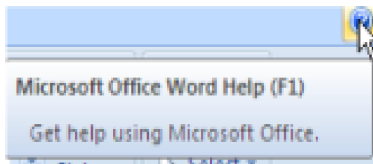
Save and Save As

- **Save-** Click on the Office File Tab (1) and Choose Save (2). File is saved in Microsoft Word format with an extension of docx.

- **Save As-** Click on the Office File Tab (1) and choose Save As.
 - This Save As command gives you the choice of where to save the file and how to save the file.
 - Here are the Save as File formats listed below as well as PDF file.



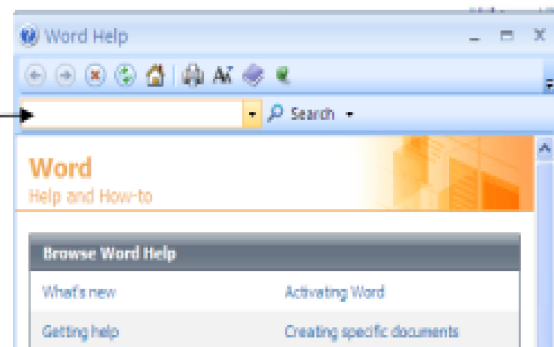
Experiment No. 3

Help Feature- F1



Type in whatever you are searching for

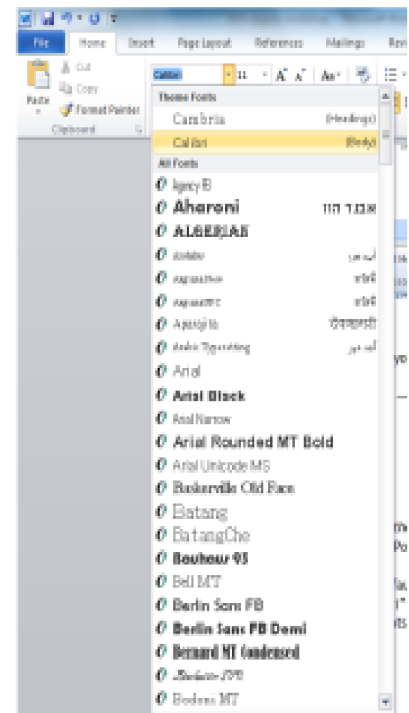
Click on Search.



3.Formatting

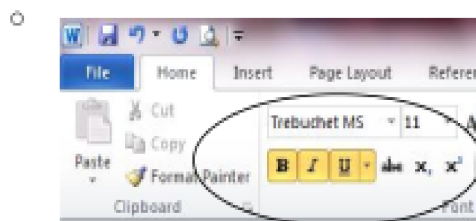
Changing Font

- Always *Select the text* that you want to make changes to. Click in front of the text with the insertion. Point and drag across the text until the text is highlighted.
 - The default font is now Calibri which looks like this “Calibri”
 - The fonts appear as they look in the menu



B, I, U (Bold, Italic, Underline)

- Always *Select the text* that you want to make changes to. Click in front of the text with the insertion. Point and drag across the text until the text is highlighted.

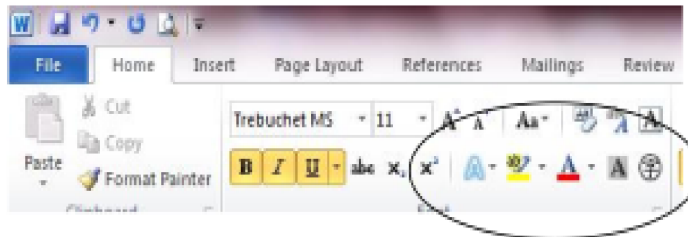


- Work like on and off switches

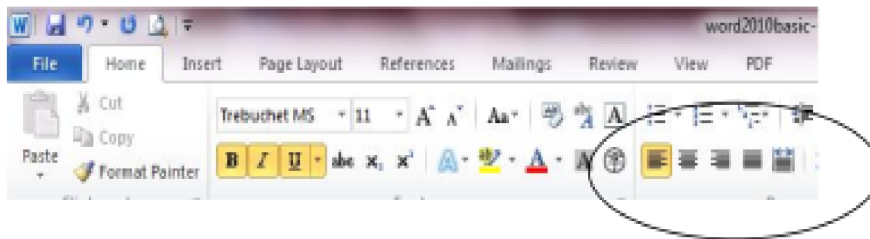
Experiment No. 3

Text Highlight Color & Font Color

- Always Select the text that you want to make changes to. Click in front of the text with the insertion. Point and drag across the text until the text is highlighted.



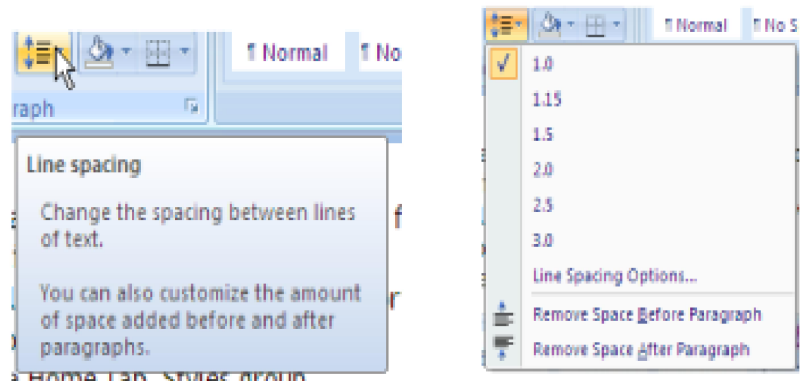
Align Text (Left, Center, Right, Justify)



Line Spacing

Click on this Command in Paragraph grouping under Home Tab.

Here are your choices for spacing
Single spacing is 1.0 and so on.



Experiment No. 3

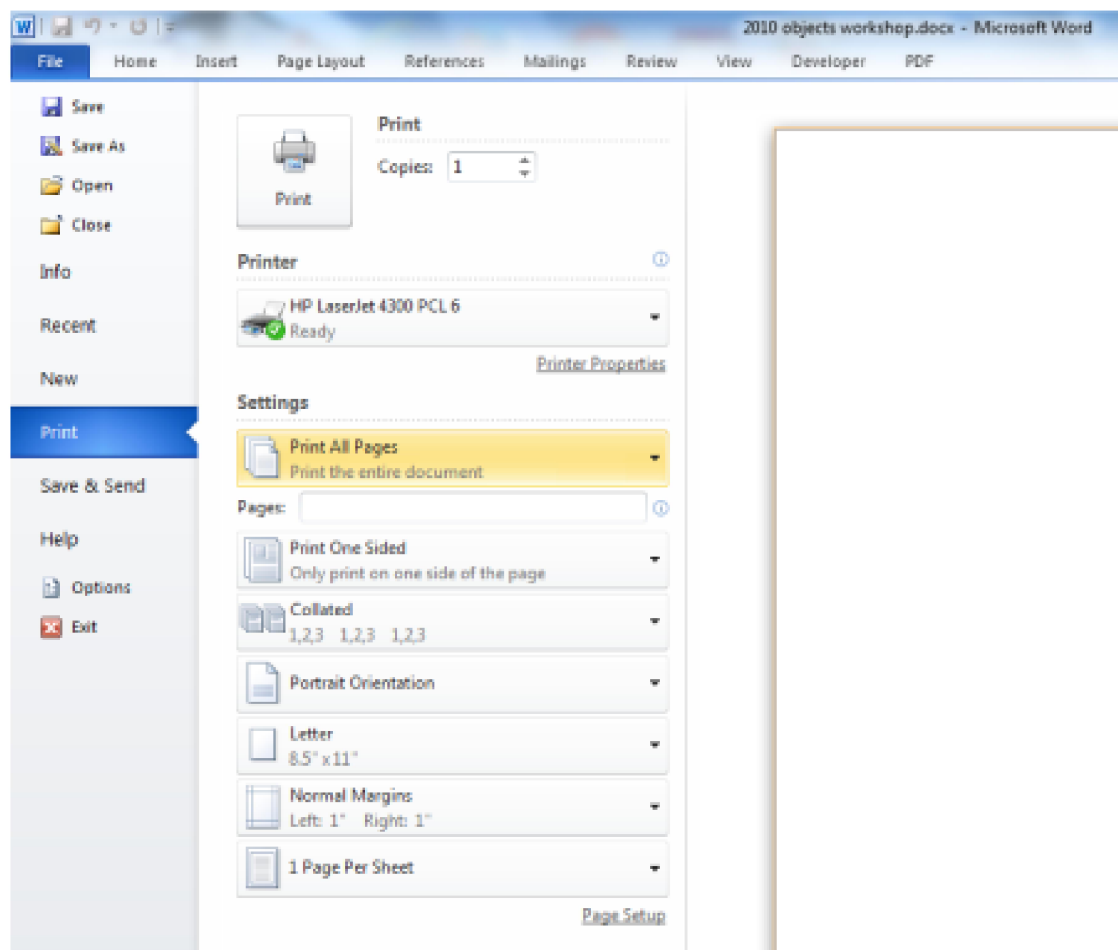
4. Printing Documents

Print Preview and Print Command are now combined in the Excel 2010 Version

- Click the **Microsoft File Tab**, click **Print** and you will see your Document in the Print Preview mode.
- If you do not want to complete the printing, remember to Close the Print Preview and Print views in order to return to your Microsoft Word document by clicking on the **Microsoft File Tab**.

Print Documents

- Click the **Microsoft File Tab**, click **Print** and your choices are listed below.



EXPERIMENT NO.4

C++ Operators

1. Write a C++ program to enter three floating point values and computes and prints their arithmetic average, sum and product.
2. Write a C++ program that asks for a temperature in Fahrenheit and display it in Celsius. Use the formula:

$$C^{\circ} = \frac{5}{9}(F - 32)$$

3. Write a C++ program that prints a box, an oval, an arrow and a diamond as flows:

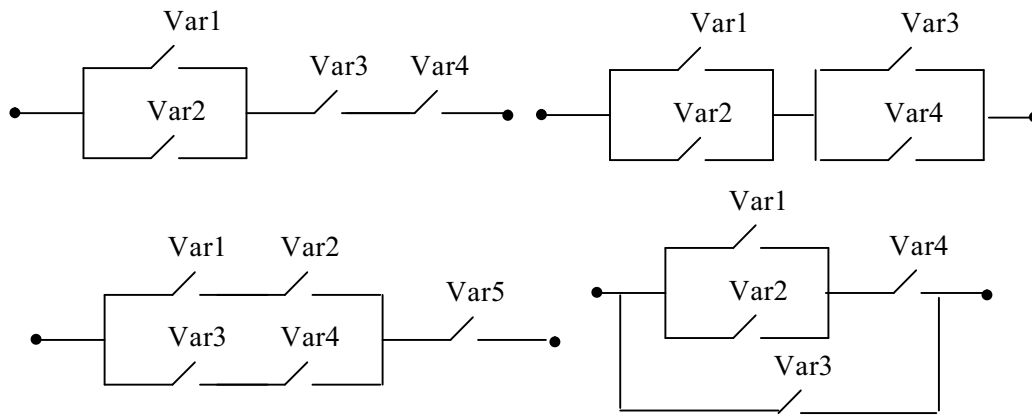
```
*****      ***      *      *
*      *      *      *      ***      *      *
*      *      *      *      *****      *      *
*      *      *      *      *      *      *
*      *      *      *      *      *      *
*      *      *      *      *      *      *
*****      ***      *      *
```

4. Write a C++ program to find the volume (v) and surface of a sphere (s) having radius (r). Where $v = \frac{4}{3} \pi r^3$ and $s = 4 \pi r$.
5. Write a C++ program that reads the radius of a circle (as double value) and computes and prints the diameter, the circumference and the area.
6. Write a C++ program to find and print the area of a triangle when you enter the base and height.
7. If you know that the radius of the circle inscribed in triangle with sides a, b, c is:

$$r = \sqrt{\frac{(s-a)(s-b)(s-c)}{s}} \quad \text{where } s = \frac{1}{2}(a+b+c)$$

Experiment No. 4

8. Write a C++ program to input the triangle sides then find and print the radius (r).
9. Write a C++ program to enter your birthday in the form (year / month / day) and print your age in days.
10. Write a C++ program to read a time in (hour: minutes : second) and prints it in second.
11. Represent the following keys in a C++ program using logical operators:



If you know that **Var1** to **Var5** are entered Boolean values.

12. Write a C++ program to find and print a, b, and c from the following equations, enter only x.

$$a = 1 - \frac{x^2}{4!} + \frac{x^4}{2!}$$

$$b = \frac{x^3 - 4a^2 + x}{x^2 + 2a + 2}$$

$$c = (a - b)^2 + (a + b) / 32$$

Hint: The symbol (**n!**) mean factorial of number (n) = 1 * 2 * 3 * * n

13. The following series summation is an approximation for computing the natural logarithm of a value x:

$$\log x = (x - 1) - \frac{1}{2}(x - 1)^2 + \frac{1}{3}(x - 1)^3 - \frac{1}{4}(x - 1)^4$$

Experiment No. 4

14. Write a C++ program to compute and print the arithmetic expression below.

Enter the left-side variables

$$1) W = \frac{a^3 - b^3}{d^3 + 17}$$

$$2) Z = \frac{1}{x} + \frac{1}{x^2} + \frac{1}{x^3} + \frac{1}{x^4}$$

$$3) S = x + y^2 + \frac{t}{z}$$

15. Consider the arithmetic expressions

$$1. \quad a * b / -c * 31 \% 13 * d$$

$$2. \quad a * b * b - c * b + d$$

$$3. \quad a + b / c - 5 / d + 7 / e - 37 / 3$$

Write a C++ program to show the order in which the operations will be executed? if you know that: $a=10$, $b=20$, $c=14$, $d=8$, and $e=40$.

16. Write a C++ program to enter any two numbers (x and y) then find and print the value of Z from the following equations:

$$1. \quad Z = \sin(x^2) + \tan^3\left(\frac{y}{3}\right)$$

$$2. \quad Z = \ln\left(\frac{x}{y}\right)^4 - \sqrt{x^2 + y^2}$$

17. Write a C++ program to find and print (y) from the following equation:

$$y = 3 \sinh^{-1}\left(\frac{x}{2}\right) + x \cosh^{-1}\left(\frac{\sqrt{x^3}}{2}\right)$$

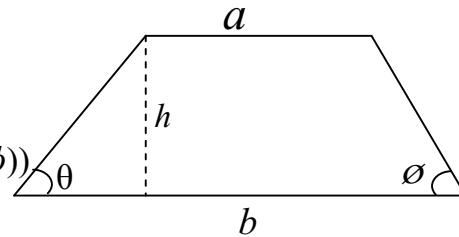
Hint: $\sinh^{-1}(u) = \ln(u + \sqrt{u^2 + 1})$ and $\cosh^{-1}(u) = \ln(u + \sqrt{u^2 - 1})$

Experiment No. 4

18. Write a C++ program to find and print (Area) and the Perimeter (circumference) for the shape below from the following equations:

$$Area = \frac{1}{2} h * (a + b)$$

$$Perimeter = a + b + h * (\csc(\theta) + \csc(\phi))$$



Enter the unknown variables.

Hint: $\csc(\theta) = \frac{1}{\sin(\theta)}$

19. Write a C++ program to find and print Y from the following equation:

$$Y = \frac{\cosh(x) + \sinh^2(x) - 4 \cosh(x) \cdot \sinh(x)}{4x^2 + 2 \sinh(x) - \cosh^2(x) - 6}$$

Hint: $\sinh(x) = \frac{e^x - e^{-x}}{2}$ and $\cosh(x) = \frac{e^x + e^{-x}}{2}$

EXPERIMENT NO.5

Selection Statements

1. Write C++ program to read an integer number and check if it is positive or negative, even or odd, and print a suitable messages in each case.

2. Write C++ program to input 3 numbers then print the largest and smallest one.

3. Write a C++ program to enter a character represent the person gender (M: for male, F: for female) and a number represents person length ((L) in inch) then find and print its perfect weight ((W) in pound) according to the following relations:

For male (M) : $W = (L \times 4) - 125$

For female (F): $W = (L \times 3.5) - 108$

4. Suppose the random bank offers 9% interest on balances of less than \$5000, 12% for balances of \$5000 or more but less than \$10000, and 15% for balances of \$10000 or more. Write a C++ program to enter a person balance then calculates a customer's new balance after one year.

5. Write a C++ program to find and print T from the below equations where a and b are input variables.

$$T = \begin{cases} a^2 + ab + \sqrt{ab} & \mathbf{a < b \quad AND \quad a < 10} \\ ab^2 - 2a + 5b & \mathbf{a = b \quad OR \quad b > 10} \end{cases}$$

6. Write C++ program to enter an integer number from 1 to 12, and print out the value of the corresponding month of year.

Experiment No. 5

7. Write C++ program to read a degree of student then print the grade to refer it.

Degree range	grade
0 - 49	Fail
50 - 59	Accept
60 - 69	Middle
70 - 79	Good
80 - 89	Very good
90 - 100	Excellent

8. Write a C++ program to enter a number represents a person age then display the following strings on the screen:

1. **"Wrong age"** if the age less than or equal to 0 years.
2. **"Child"** if the age less than 8 years.
3. **"Boy"** if the age greater than or equal to 8 years.
4. **"Young"** if the age greater than or equal to 18 years.
5. **"Old"** if the age greater than or equal to 35 years.
6. **"Very Old"** if the age greater than or equal to 65 years.

9. Define $f(x)$ as follows:

$$f(x) = \begin{cases} 3 - x & \text{if } x < 2 \\ 2 & \text{if } x = 2 \\ x/2 & \text{if } x > 2 \end{cases}$$

Write a C++ program to calculate $f(x)$ from the above equation then print $f(x)$ for any input value of x .

10. Write a C++ program to find W from the equations:

$$W = \begin{cases} X+Y & : X > 0, Y < 0 \\ X^2Y^3 + 5X & : X = 0, Y > 0 \\ \frac{2X}{3Y} + 4X & : X < 0, Y = 0 \end{cases}$$

Print W for each input values of X and Y .

Experiment No. 5

11. Write a C++ program to find the roots (X_1 , X_2) for the quadratic equation: ax^2+bx+c . Enter the constants (a, b, c) then check the following points:

1. if $a = 0$ display the message "Divided by zero".
2. if $b^2 < 4ac$ display the message "No real roots".
3. if $b^2 = 4ac$ display the phrase "Equal roots" then find the roots from the formula: $X_1 = X_2 = \frac{-b}{2a}$ and print it in new line.
4. if $b^2 > 4ac$ display the phrase "real roots" then find the roots from the formula: $X_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$, $X_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$ and print it in new line.

12. Write a C++ program to find z from the below equations.

$$z = \begin{cases} 2k - \sin(k) & : k = 1 \\ 2k^3 - 3 & : k = 2 \\ k - 2 & : k = 3 \\ k & : k < 1 \text{ or } k > 3 \end{cases}$$

Print z for each input value of k.

13. By using Switch function write a C++ program to enter any number then display the following on a message box:

- 1- "Divisible by 2" if the entered number can be divided by 2.
- 2- "Divisible by 3" if the entered number can be divided by 3.
- 3- "Divisible by 4" if the entered number can be divided by 4.
- 4- "Divisible by 5" if the entered number can be divided by 5.
- 5- "Divisible by 6" if the entered number can be divided by 6.
- 6- "Divisible by 7" if the entered number can be divided by 7.

Experiment No. 5

- 14.** If you know that the Tax office takes a tax for the imported goods according to their degrees as shown:

Goods degree	Tax
"A"	40% from price
"B"	10% from price
"C"	5% from price
"D"	2% from price
"E"	1% from price

Write a C++ program to enter the goods price and its degree then print the tax according to the table above.

- 15.** Write a C++ program to find the value of y from the following equation. Use

- 1- If statement only.
- 2- If else statement only.
- 3- Else if construct only.
- 4- Switch statement only.

$$Y = \begin{cases} (X^3 / 2)^4 - 4 & X > 10 \\ -0.25 X^2 - 1 & X = 10 \\ X^2 + 2X & X < 10 \end{cases}$$

- 16.** Write a C++ program to print the value of Y and Z according to equations below:

$$\begin{array}{lll} Y = \sin(x^2) - 3 & Z = 2\cos^2(x) - 1 & \text{if } r = 1 \text{ or } 2 \\ Y = x^6 / 2 - 4 & Z = -0.25 x & \text{if } r = 5 \\ Y = 4e^x - 1 & Z = 5\ln|x| + 2 & \text{Elsewhere} \end{array}$$

Use (a) Ternary operator only.

(b) If-else statement only.

(c) Switch statement only.

EXPERIMENT NO.6

Looping Statements

1. Use one of looping statements to write a C++ program that reads 10 marks, if the entered mark (≥ 50) print “pass” otherwise print “fail”.
2. Write a C++ program to read 20 integer numbers, then print.
 - a) Number of odd numbers.
 - b) Sum of odd numbers.
 - c) Number of even numbers.
 - c) Sum of even numbers.
3. Write a C++ program that determines whether the entered number is a prime number or not. Note that a prime is divisible by 1 and itself only.
4. Write a C++ program to enter 20 student degrees then calculate and print the percentage rate for the degrees greater than 60% but less than 70%.

Hint: percentage rate= (number under condition/whole number)*100%

5. A list contains the degrees of 80 students in computer course. Write a C++ program to find the succeeding rate after entering the student's degrees.
6. Write a C++ program to find and print the value of **m** from the following series:

$$m = e^{-1} * e^{-2} * e^{-3} * \dots * e^{-18}$$

7. Write a C++ program to find and print the value of **k** from the following equation:

$$k = \sum_{j=2}^n \sum_{i=1}^m x^i y^{-j}$$

Where: $x = 0.7$, $y = 1.5$, $n = 20$ and $m = 12$.

Experiment No. 6

8. Write a C++ program to find and print the following series:

$$s = x + \frac{x^3}{6} + \frac{x^5}{120} + \frac{x^7}{5040} + \dots + \frac{x^{21}}{5.1 E19}$$

9. Write a C++ program to print one of the following patterns.

```
*****          *****          *          *
*              *  *****          ***        ***
*              *  *****          *****      *****
*              *  *****          *****      *****
*              *  *****          *****      *****
*              *  *****          *****      *****
*              *  *****          *****      *****
*****          *****          *****          *
```

10. What is the output of the following C++ segment of code?

```
for ( ; ; )
{
    cout << "enter your number: ";
    cin >> x;
    if ( x % 2 == 0 ) continue;
    if ( x % 3 == 0 ) break;
    cout << "Bottom of loop" << endl;
}
```

11. Write C++ program to print the following series:

$$Sa = 1 + 2^2 + 3^3 + 4^4 + \dots + n^n$$

$$Sb = 1 - 3 + 5 - 7 + \dots + n$$

$$Sc = 1 + 1/1! + 2/2! + 3/3! + \dots + n/n!$$

12. What is the output of the following C++ segment of code?

```
for ( i = 0; i < 8; i ++ )
{
    if ( i % 2 == 0 )    cout << i + 1 << endl;
    else if ( i % 3 == 0 ) continue;
    else if ( i % 5 == 0 ) break;
    cout << "end program \n";
}
cout << "end ...";
```

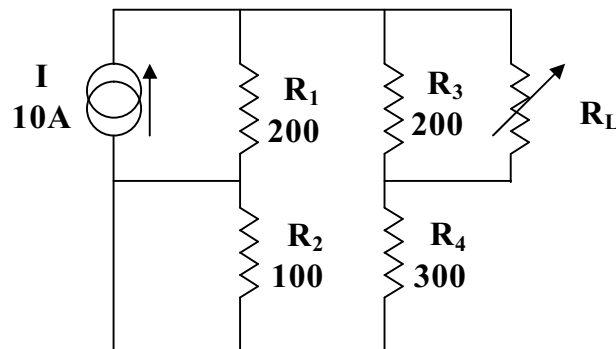
Experiment No. 6

13. Write C++ program to print the following table :

N	10 * N	100 * N	1000 * N
1	10	100	1000
2	20	200	2000
3	30	300	3000
4	40	400	4000

14. In year 1987 an Iraqi census was 17, 000, 000 and the Egyptian census was 50, 000, 000, if you knew that the population increment rate for Iraq 4% per year and population increment rate for Egypt was 3% per year. In what year the Iraqi census can exceed the Egypt census? Write a C++ program to solve this problem.

15. Write a C++ program to find the current in any branch and the voltage for any resistance in the circuit below if you knew that R_L values changes from 100Ω to $1K\Omega$ in steps of 100Ω . Print the current and voltage in branches for each value of R_L .



EXPERIMENT NO.7

Arrays

1. Write a C++ program that reads an integer array `a[10]` and finds the max value with its position and the min value with its position.
2. Write a C++ program that inputs an integer array `b[10]` and then reverse it and print the reversed array
3. Write a C++ program that exchanges the primary and diagonals of 4×4 matrix.
4. Write a C++ program that converts a two dimensional array into one dimensional array. Then print the 1D array.
5. Write a C++ program to multiply the array elements by 2.
6. Write a C++ program, print the square root of 2D array
7. Write a C++ program to split the odd number and even numbers of 1D array into two 1D arrays.
8. Write a C++ program to read 3×4 matrix then find the summation of each column
9. Write a C++ program to replace each element in the second diagonal with zero elements.
10. Write a C++ program to compute the number of zeros elements in the array.
11. Write a C++ program to find the summation of odd numbers in 4×4 matrix.
12. Write a C++ program to find the “A” element in 3×3 character matrix then return the index of its location.
13. Write a C++ program to convert 1D-array of size [16] to 2D-array of size 4×4 .
14. Write a C++ program to read `A[n,n]` of numbers then put 10 instead of even positive elements, and 20 instead of odd negative elements.

Experiment No. 7

15. Write a C++ program to read A[n,n] of numbers then find the minimum element and print its location.
16. Write a C++ program to read A[n,n] of numbers then find the maximum element and print its location.
17. Write a C++ program to read X[n,n] then exchanges the upper triangle with lower triangle
18. Write a C++ program to read B[n,n] then exchange row1 with row3.
19. Write a C++ program to read C[n,n] then exchange row0 with col3.
20. Write a C++ program to replace each element in the main diagonal with the elements in the second diagonal.
21. Write a C++ program to store 20 student names in a 1D array (N) and their degrees in another array (D) then calculate and print the student name that gets maximum degree and the student that gets minimum degree.
22. Write a C++ program to read the two 2D arrays A[n,n] and B[n,n] then find the addition of them and store it in array C[n,n].
23. Write a C++ program to enter and print horizontally the array A (20), then find and print the first three maximum numbers and the last two minimum numbers.
24. Write a C++ program to enter and print the two 1D arrays M[30] and N[30], then find and print the value of P from the following equation:

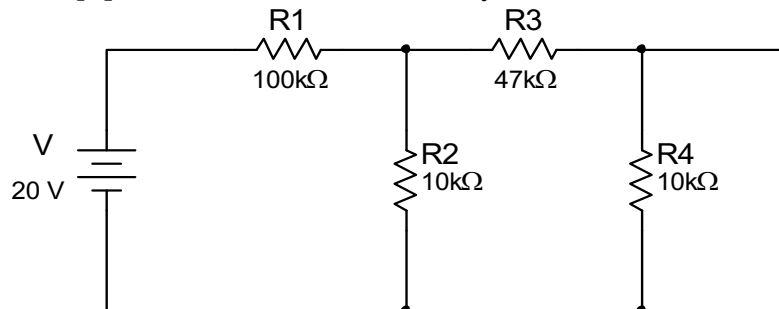
$$P = 2\lambda \sum_{i=1}^{30} M(i) * N(i)$$

where $\lambda = 2.15 * 10^{-22}$

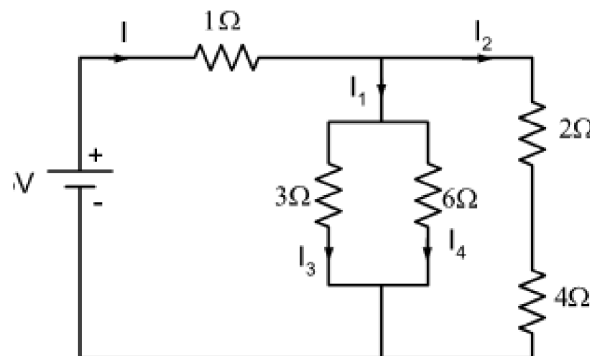
25. Write a C++ program to enter 120 degrees for 60 students in two objects (physics and mathematics). Store these degrees in two 1D arrays (P and M) then find and print the following:
 1. The mean between two opposite degrees.
 2. The succeeding rate in physics
-

Experiment No. 7

26. For figure shown below, write a C++ program to store the 5 values for the 5 resistors in array R[5] then calculate the current and voltage in each resistor and store it in two arrays I[5] and V[5]. Print all the resulted arrays.



27. If you know that the voltage source in the circuit below is setted as [10,20,30,40] volt. Write a C++ program to find the currents I1 to I4 and store these values in 2D array, each row contains the currents for the selected voltage source (mentioned above).



Hint: The matrix [I] must be of size [4*5].

28. Ten charges placed on a plate. Write a C++ program to enter the value for the ith charge in an array Q[10] and the distance from the center to the ith charge in another array r[10] then find and print the electrical potential (E) in the center of this plate according to the following equation:

$$E = \frac{1}{4\pi\epsilon_0} \sum \frac{Q_i}{r_i} \quad , \text{ where } \epsilon_0 = 8.85 \times 10^{-12}$$

EXPERIMENT NO.8

Functions

1. Write a C++ program that adds two numbers of different numeric data types (e.g. integers, float, double) using the function add().
2. Write a C++ program that multiply five numbers of different numeric data types (e.g. integers, float, double) using the function mul().
3. Write a C++ program to enter any number then print the triple of this number. Use the function Triple(n) to find the triple of any number.
4. Write a C++ program that evaluates the trigonometric function secant (sec()) if you know that: $\sec(x) = 1/\cos(x)$.
5. Write a C++ program that evaluates the function (fx()) if you know that:
$$fx(a,b) = \sin^2(a) + \cos(b^3+3).$$
6. Write a C++ program to enter two values (in feet and inch) representing a distance then by using functions convert this distance to meters and centimeters. I you know that: 1 foot=12 inch and 1 inch =2.54 cm
7. Write a C++ program to enter one integer value representing time in seconds distance then by using functions convert this time to equivalent hours, minutes, and seconds. Print it in the following form: hr : mn : sec.
8. Write a C++ program using function to input a student average and return 4 if the average is 90-100, 3 if the average is 80-89, 2 if the average is 70-79, 1 if the average is 60-69, and 0 if the average 0-59.
9. Write a C++ program using function to calculate the factorial of an integer entered number (n!).

Experiment No. 8

10. Write a C++ program using function to evaluate the following equation

$$z = \frac{x! - y!}{(x - y)!}$$

11. Write a C++ program to implement the function NthRoot (x, N) to return the Nth root for the argument (x) (i.e. $\sqrt[N]{x}$). Test the function by finding $\sqrt[5]{16}$.

12. As you know that the function Log(x) returns the natural logarithm for argument (x) (i.e. Ln(x)). Write a C++ program to implement the function LogEx(x,b) to find the logarithm for the argument (x) with any base (b) then find and print Log₄(9).

Hint: Use the relation $\text{Log}_b(x) = \frac{\text{Ln}(x)}{\text{Ln}(b)}$

13. Write a C++ program to implement the function RndMinMax(Min, Max) to generate a random number limited by the interval [Min, Max]. Test the function by generating a number in the interval [2, 10].

Hint: Use the relation $\text{Int}((\text{Max}-\text{Min}+1)*\text{Rnd}+\text{Min})$

14. Write a C++ program to implement the function $\tan^{-1}(x)$ using the series:

$$\tan^{-1}(x) = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \frac{x^9}{9} - \dots + \frac{x^{99}}{99}$$

Input x and rename the function as invtan().

15. Write a C++ program to implement the function e^x using the series up to 100 terms:

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} \dots + \frac{x^n}{n!}$$

Input x and rename the function as expx().

16. Write a C++ program to evaluate the following by the use of user functions:

Experiment No. 8

$$y = \begin{cases} 3 \sinh^{-1}\left(\frac{x}{2}\right) + x \cosh^{-1}\left(\frac{\sqrt{x^3}}{2}\right) \\ x \sinh^{-1}\left(\frac{1}{2}\right) + 2 \cosh^{-1}\left(\frac{\sqrt{3}}{2}\right) \\ \cos\left(2 \cosh^{-1}\left(\frac{x}{2}\right)\right) \end{cases}$$

Find y for each entered value for the three equations at the same time.

Hint: $\sinh^{-1}(u) = \ln(u + \sqrt{u^2 + 1})$ and $\cosh^{-1}(u) = \ln(u + \sqrt{u^2 - 1})$

17. Write a C++ program to find and find Y from the following equation:

$$Y = \frac{\cosh(x) - 4 \sinh(x)}{1 + 3 \sinh(x) - \cosh^2(x)}$$

Hint: $\sinh(x) = \frac{e^x - e^{-x}}{2}$ and $\cosh(x) = \frac{e^x + e^{-x}}{2}$