Chapter ONE

Basic Concepts in information technology

Computers are information Processing machines used in different departments and organizations. They can be connected all over the world. Therefore; more productivity and good quality with less cost and legal constraints.

Computers Perform three main operations:

1. Receive input (Data raw facts)
2. Process it according to predefined instructions
3. Produce output (information which is meaningful data).

Computer System:

The components of a computers system are:

1. Hardware:

Physical Components like screen, cables, keyboard, System Box and printer. The hardware cannot do anything without

Software.

2. Software :

A set of instructions that tells the computer what to do and how to do it. Such as: word processing, Computer games, and Graphics program.

3. Users :

A person who uses the software on the computer to do some tasks.

Information technology (IT) :

A set of tools that are used to receive, process, store, retreive, print and transmit information in an electronic form through computers. These forms can be Text, sound, picture, or video.

Types of computers :

According to their capacity and performance computers are classified into five categories :

1. Mainframes :

Room-sized, expensive, high speed, very powerful, large storages capacities. They are used in banks, government departments and large organizations.
They are connected to a large number of terminals that could be dump (can not operate on their own ; or intelligent terminals (have a processing power themselves that can be used by the user).

2. Mini computers :

Do the same jobs as a mainframe, but on a smaller scale. They are used where personal computers would be inadequate.

3. Personal computers (PCs)

can be set on a desk. They are not expensive, therefore, they are very popular. PCs are manufactured under different names like IBM compatible which can run the same programs as computers made by IBM. Macintosh computers use operating systems which are only made by Apple.

4. Laptop computer :

It is small, briefcase - sized and portable. It has a small screen and a small keyboard. Many times it is a powerful as PC but more expensive.

5. Palmtop Computer :

It is a hand-held computer which is called Notepad. It has a small screen and keyboard. It does some special functions but it is cheap.

6. Network Computer :

A large PC type computer called a server is connected to small PCs called clients or terminals. A client is a monitor with a keyboard and a small box which contains the CPU and the main memory. The client does not have any hard disks therefore it is unable to work independently. A client downloads applications and data from the server into its main memory. Then any changes which are made will be stored in the server.

7- Super Computers :

Computers with very high speed, used in large scientific and research Laboratories, weather forecasting, space operations and so on. cost several million dollars.

The major components of a PC are :

System Unit

It is a box, which contains ; the Center Processing unit (CPU), Main memory Drives ; and the Power Supply.

: Input Devices :

Consists of devices that allow people to put data into the computer in a form that the computer can use examples are the Keyboard and Mouse.

: Output Devices :

consists of devices that translate information processed by the computer into a form that humans can understand

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Example is monitor, which displays the results of work that is done by the CPU.

4. Peripherals :

Any piece of hardware that is connected to computer. Examples are printer, scanners, and Modem. These are used to perform special input and output tasks.

Chapter Two

Hardware

Central Processing Unit (CPU):

Every PC's system unit contain at least one chip called microprocessor or CPU attached on the motherboard to perform computer processing.

The CPU follows the instructions of the software or a program to process data producing information.

Parts of a CPU:

1. Arithmetic and Logic unit (ALU)

Perform arithmetic operations and logical operations and control the speed of those operations.

2. Registers or Immediate Access Memory

where the data used by the ALU and the program instructions which are used by the control unit, are stored.

3. Control Unit

Tells the rest of the computer system how to carry out a program instructions it directs the movement of electronic signals between main memory and the arithmetic unit it also direct these electronic signals between main memory and the input and output devices.

Input Devices :

allow you to input information to the computer.

1. Keyboard :

contains the standard typewriter keys plus a number of specialized keys. The standard keys are used to enter words and numbers Examples of specialized keys are so-called function keys labeled F1, F2 and so on.

2. Mouse :

A small hand held device, which has the shape of mouse. As it is moved a rolling ball on the underside transmits information

to the computer, which moves the cursor. The cursor is the symbol on the screen that shows where data may be entered next. It has two or three buttons to perform many actions. It works when any of the buttons pressed down.

3. Track ball :

It is a mouse turned upside down. The user rotates the ball with the fingers to move the cursor on the screen. It saves the space which taken up by the mouse and the mouse mat.

4. Touch pad :

it is a touch sensitive device when the finger moves on its surface, the cursor of the screen will move. its used in laptops and some keyboards.

5. Touch screen :

Is a video display screen that has been sensitized to receive input from the touch of the finger.

6. Light pen :

It is a Light sensitive stylus or pen-like device connected by a wire to the computer terminal. The user brings the pen to a desired point on the display screen and presses the pen button which identities that screen location to the computer. it can be used in moving a cursor selecting objects or reading a bar code.

7. Scanner :

converts page contents text, images, Picture and graphics and so on into electronic signals. These signals can be stored in a computer and manipulated. It can also be used to read bar codes.

- optical scanners : It can be flatbed, sheetfed hand held drum or stationary scanners.
optical character Recognition (OCR) is a system which decode scanned inputs into binary format that computer can understand, edit, compute, and process.

8- Joystick :

is a small hand lever that can be moved in any directions to control movement on the screen. can include buttons to perform some actions used for playing games on the computer.

9. Microphone :

: is used to record sounds on the computer, ow speech to control the computer, or put spoken text directly into the word -ocessor

10. Disk Drives :

-re used to transmit data from files -at are stored in different storage types -> main memory of a computer.

11. Digital Camera :

like ordinal camera but it uses flash memory or floppy to save mages.

12. Video camera :

connect to computer to be used in video conferencing or to store movies.

Output Devices :

allow you to output information from the computer.

1. Video Display unit (VDU) :

(monitors) : display the work being done by CP. displays the results of processing displays text, graphics, images, form and so on.

Types of Monitors :

* Cathode Ray Tube (CRT) :

It is a vaccum tube used as a display screen in a computer or video display terminal. This kind is found not only in the screens of desktop computers but also in television sets and in flight information monitors in airports.

* A Flat Panel Display :

Is a thin display screen that uses any of a number of technologies in order to reduce screen size and weight, The technologies include liquid crystal display (LCD) electro luminescent and plasma displays. The screens in laptop computers must be flat panel display.

characteristics of monitors :

* Colors : Depends on the construction of the monitor and the graphic adapter.

* Size : when measured diagonally, the common size are 15", 17", 19", 21".

* Resolution : The number of dots or pixels that can be displayed on the screen. High resolution means better quality and a clearer display.

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2. LED Displays : Light Emitting Diode - (LED)

small light sources that are used to indicate that equipment is switched on as well as to indicate the level of activity.

3. Printers :

are a device that converts computers output into printed images. Hard copy refers to printed output. software copy refers to output that is in the form of sound or displayed on a compute screen.

* Daisy wheel :

characters are raised on a wheel which strikes the ribbon placed between them and paper, it is an impact, which is both is low and noisy. it produces carbon copy.

* Dot matrix :

Form letter, numbers and other images out of Dots, using pins to strike on an inked ribbon against paper.

Then inexpensive machines are the most popular one used with microcomputer. it is used to print drafts. It produces carbon copies.

* Inkject :

Spray one or more colors of small droplet of ink at high speed onto paper. its running cost is high. Carbon copies can be produced. it is a color printer with either a one color cartridge or a multiple color cartridge. It is quiet but slower than the laser printers.

* Laser printer :

use a laser beam source to create dot-like images on a drum. These images are then treated with magnetically charged ink-like toner and transferred from drum to paper.

It is high quality, robust printer which is for heavy use. It is very quiet and much faster than inkjet. It is running cost is low. The colored laser printer is very expensive and carbon can not be printed.

4. Plotters :

A special printer, which uses pens to draw on the paper and is under the control of the computer and the mapping software. It is used to draw maps as well as complex technical drawings.

5. Speakers :

They are used in multimedia to produce sounds. They can be used either with loudspeakers or with headphones.

6. Speech Synthesizers :

It is software that produces sounds that resemble human speech.

7- Removable media :

used to saving documents on floppy disks or CD Roms, or any removable media so that it can be used in any other computer or as a back up.

8- Projecter : Devices that connect to a computer to display outputs on large board.

CHAPTER THREE

Memory, Stored Data, Computer Performance

Memory:

The term memory is referred to computer main memory, OR RAM (Random Access Memory). RAM is the location where data and programs are stored (temporarily until they are no longer needed. RAM is volatile, means that the data is only there while the power to the computer is turned on (when the computer is shut off, the content of RAM is erased). RAM is comprised of chips attached to motherboard Memory speed is measured in Megahertz (MHz) like CPU Speed.

Kinds of Memory:

1. RAM:

The main memory in a computer. t

keeps system software, programs and data which are needed when the computer is working. It is a volatile memory.

RAM is divided into same sized locations that each of them has a unique address.

2. ROM : (Read Only Memory)

It is another part of the main memory but with a very small capacity. It keeps instructions, which make the computer work when turning it on. It is not volatile The computer can not write on it.

3. Cache Memory :

It is linked to the CPU has very fast chips, keeps frequently used programs and data ; therefore, it helps to increase the speed of the computer.
It reduces the gap speed between the RAM and the CPU.

4. Flash Memory :

Memory that is divided into blocks, so it saves and erased data in faster

way. It is a non volatile memory that can be used to save BIOS in computers, It can be used also in Mobiles, Portables, digital camera and printers.

Data Representation in the Memory :

All information processed by computer is Handled and stored in the binary form : 1 or 0, which is called BIT, A group of 8 BITs called a Byte. A Byte is a memory unit, which represents a character, so it is used to measure the memory capacity.

Storage Capacity :

Is represented by Kilobyte, Megabytes and Gigabytes.

Bit = 0 , 1

Byte = 8 Bit

Kilobyte (KB) = 1024 Byte = 2^{10} Byte

Megabyte (MB) = 2^{20} Byte

Gigabyte (GB) = 2^{30} Byte

Memory chips :

RAM is manufactured on microchips or chips. They are assembled on small cards that can be inserted into slots inside the system unit. You can upgrade your computer, purchase extra memory and insert them in the appropriate slots.

Storage Devices :

Storage Devices also called secondary storage systems or external storage include the disks and other storage media used to store data permanently

To keep software programs and data permanently you have to save your work on the storage devices before shutting down your computer.

Kinds of Storage Devices :

1. Magnetic Tape :

like cassette, it was used in the old computers for many years.

2. Hard disk :

It is located within computer. It s the most important storage media in the computer system. It keeps software and programs. It is composed of several magnetic disks in a single unit. Extra Hard Disk units can be added externally or internally.

3. Floppy Disk :

It s a small and portable magnetized disk in plastic case. It is 3.5 inches square and has 1.4 MB Capacity. It is used to transfer files from one computer to another. It is slower than the Hard Disk.

4. CD-ROM :

(Compact Disk - Read Only Memory)

It is an optical disk which uses laser to read information. It can store large amounts of data up to 650 MB. It is suitable for storing multimedia software. It is robust but slower than Hard disk.

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5. Zip Drive :

It is similar to floppy disk, It has storage capacity usually 100 MB and More.

6. DVD : (Digital Versatile Disk)

It is a high capacity development of CD-ROM. It can store a Gigabyte of information. It is used to store high quality films and video.

7. Smart cards :

contains Computer circuit that can save and process some data.

Stored Data :

8 Bits combine to make a Byte, which is a character A. set of characters (A, L, I) makes a field (ALI). A set of fields makes a record and a set of records makes file, which is stored in a folder or directory.

other files like documents, which contain text, sounds, graphics, images, and so on stored in a form of a set of Bits.

There are alot of operations that can be made on files: creating, naming, saving, deleting, moving, copying, retrieving, updating, displaying, printing, executing, uploading, downloading, importing, Exporting, compressing and protecting.

Computer performance:

It means the factors that affect the speed of CPU processing:

1. Clock Speed:

The faster the clock speed the more instructions will be executed in one second, so the more efficient the computer will be.

2. Memory Capacity:

If the memory does not have enough space, the computer will have to use a part of a hard disk as a virtual memory. A Hard disk is slower than the main memory, so the computer will be slow.

- Hard disk speed :

Because 90 % of our needs are stored in a hard disk, the access speed of data and software will affect computer performance

- Bus speed :

Bus transfers the data, controls the signals and the instructions between computer parts. The faster it is the more efficient the computer will be.

- Graphics acceleration :

It has its own processor and memory for displaying graphics. The CPU then will be relieved of this task. So the speed will be increased.

CHAPTER FOUR

"Software"

Introduction:

Hardware can not work without programs. A program is a set of sequence instructions that tell the computer what to do. Software is a collection of programs, data and information. Hardware is built on physical equipment but software (Logical component) is built on thinking, knowledge and planning. A programmer is the person who makes the program using one of the computer programming Languages.

Computer Software:

There are two kind of Software:
System Software and Application Software

Types of software according to usages:

1. System software:

It is the Software which is used by the

computer or operates a computer system such as operating systems programming language and translators.

a. Programming Languages:

A set of words, rules, syntax and semantic used by a programmer to input his instructions to the computer to do a special task. There are many programming Languages. Each of them is designed to solve specific kinds of problems. To be a programmer you have to learn one of the computer programming Languages: some of the Programming Languages are: FORTRAN, PASCAL, C++, and JAVA

Generations of Programming Languages:

1. Machine Language:

it is written in 1, 0.
It depends on the computer architecture it is difficult a language, which does not need any translator.

2. Assembly Language:

Depends on using some of the Mnemonic symbols like MUL for multiply and SUB for subtract.
It uses addressing Symbols. Other accounting Systems can be used instead of binary system. It is easier than machine Language, but it still depends on computer architecture. A translator is needed and is called Assembler.

3. Third Generation Languages or High Level Languages
use statements that one can understand. It needs translators, it can be used very easily to solve complex problems. They are undependable of the computer architechure

4. Application Generators;
called Fourth generation Languages. They are database Languages used to create files, forms, queries and reports without the writing of any programs. It uses very simple statements or instructions It does the job by telling the computer what the user needs, but without telling how

to do it.

5. object oriented Languages:

These languages consist of a collection of objects. Every object contains its variables or data; and its operations or methods objects interact with each other by sending messages. An important characteristic of these Languages is Encapsulation, which means that the data and its operations are collected in the same place. You can not access any data on any object without using the specific instruction for that object

6. Compilers and Interpreters

Programs that translate the source code into the object code. A compiler translate a whole program. the object code can be executed them.
The interpreter translates and executes one instruction at a time.

7. operating system:

The most important system software. it holds all the instructions that

make the computer work : starting the computer ; displaying on the monitor; using the keyboard ; saving and loading files ; using secondary memory .

managing Application software by being an interface between them and the computers equipments usually an O. S. is supplied with the computer on the hard disk , and it is loading into computer memory automatically when the computer is switched on. sometimes you have to input some information to configure your computer like adding a printer.

Functions of operting Systems :

1. Booting up
2. User interface
3. tasks and Resources management
4. Monitoring
5. files management
6. System security

Types of operating systems:

1. Multi-tasking OS
2. Multi-processing OS
3. Time-sharing OS
4. Network OS
5. Real time OS

2. Application Software:

it is the software used by users like word processors; Spread sheets; data bases; E-mail programms, graphics and drawing programms, presentation tools, publishing softwars, games, multimedia programms.

Types of software According to Source:

1. commercial software:
Any software you buy, which is usually licensed to the user, will have various conditions connected with its use
2. Shareware:
software that is distributed

freely via internate or CD's for a tryout a period before making the purchase. After that, some functions may be disabled. paid-up users may get additions and free updates.

3. Freeware :
Software that is distributed freely. No payments is expected. Authorise may ask for feedback to improve the next version. It is copyright software.

4. Public Domain Softwar

it is ownership has be relinquished to the public, freely available and without any copyri

Interface :

It is the way that the user used to deal with the computer or communicate his commands to the comp.ter.

1. Command line interface :
Commands had to be typed on a keyboard as a line of te

it is slow process , and required = high degree of computer knowledge

2. Graphical user interface (GUI :

uses pictures ; windows ; menu ; and Icon's to represent objects and commands .
The user can select his needs by pointing the mouse at and then clicking on it .

System Development :

involves the design , development and the implementation of computer operations to replace or update some process within the organization

steps of System Development :

1. Define requirements :
understand the business problem or opportunity
2. Assess feasibility to determine whether a new or improved information system is feasible solution

Basic Language :

ALgorithem :

It is a group of sequantial steps to excute a mathematical or Logic operation.

Example 1 :

Find the result of Add two numbers A+B using the ALgorithem ?

Solution :

1- Start
2. Read the two numbers A & B
3. Find the result of add A & B Let C = A + B
4. Print the result C
5. End or Stop

Example 2 :

Find the average of five degrees such as D_1, D_2, D_3, D_4, D_5., using the ALgorithem ?

Solution :

1. Start

2. Read the five degrees D_1, D_2, D_3, D_4, D_5
3. Calculate the average of five degrees
$$Av = (D_1 + D_2 + D_3 + D_4 + D_5)/5$$
4. Print the result Av
5. STOP

Example 3 :

Find the larger number between a group of numbers using the ALgorithem.

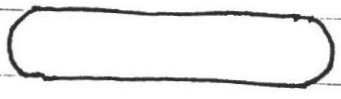
Solution :

1. Start
2. Read the number A, B, C
3. Find the larger number from between A, B, C let it B
4. Print the large number B
5. STOP OR END

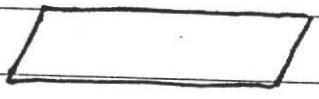
Flow charts :

is a group of connected shapes pointing to the necessary process in the program.

This flow charts helps for showing the solution steps from the starting to the end.

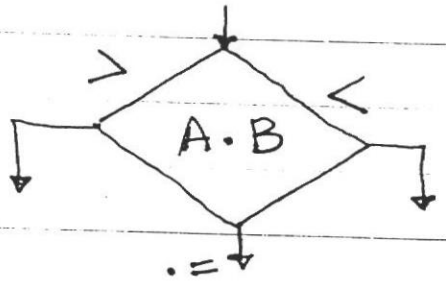


Start , end, stop

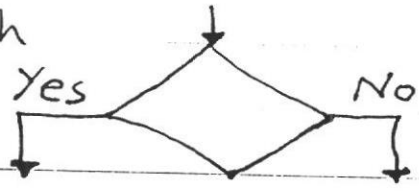


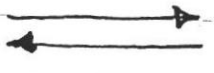
Read, write, print

Process

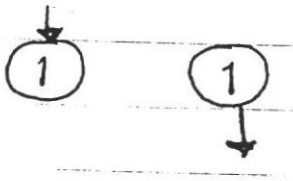


Decision or Branch





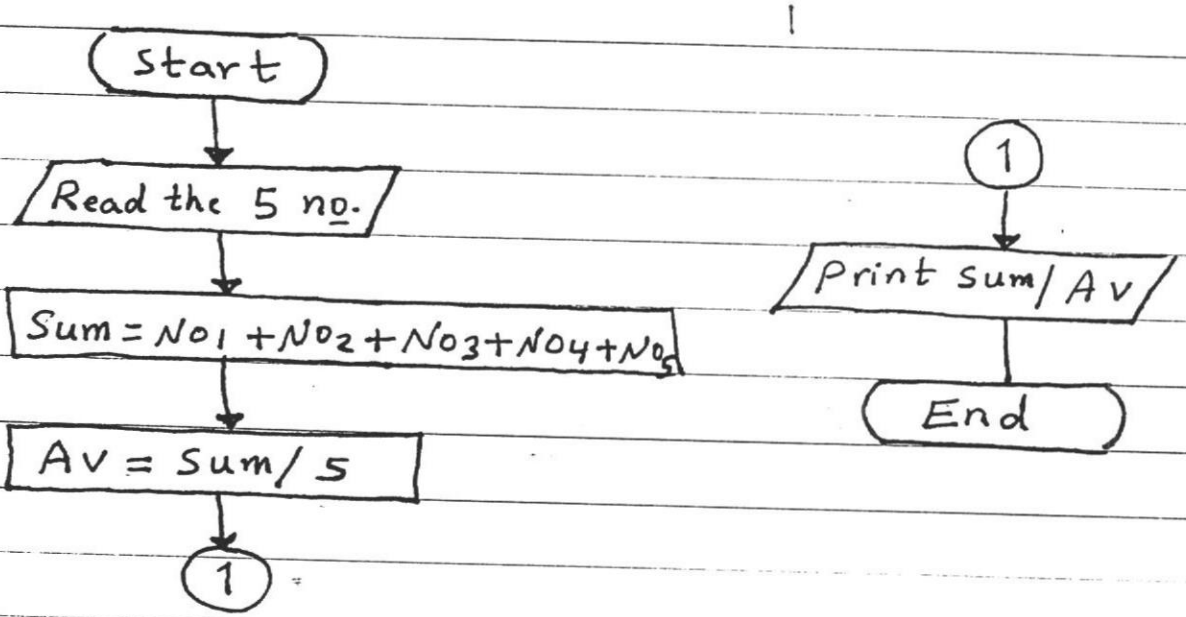
Flow lines



connector

Example :

Draw the flow charts for reading five numbers, calculate the summation and the Average of these numbers and then print the result.



H.W :

1. Draw a flow chart to find the numbers of positive and negative number for 10 numbers
   if P = represent positive number
   N = represent negative number

2. Draw a flow chart to find the value of C if:
   $C = A - B$ if $A \geq B$
   $C = A + B$ otherwise

3. Draw the flow chart to find the mean for ten numbers.

BASIC Language :

BASIC = Beginners All-purpose Symbolic Instruction Code

Basic statement → line No. + Keyword + parameter

ex :

```
10    LET   X=5
20    LET   Y=50
30    LET   Z=(X+Y)/2
40    print Z
50    End
```

Constants and Variables in Basic Languages :

1. Constants :

a- Numerical constants

1 - integer constants 10, -2, 3

2 - Real constants 0.2, -2.5, 10.5

3 - Exponential constants .2E5 → 2×10^5

-2.5E10 → -2.5×10^{10}

b- String constants

"Computer", "Table No.1"

2 - Variables :

a- Numerical variables
A, B, C, X5, N2

b- String variables
A$, B$, C$, X5$, N2$

```
10 LET A=5
20 LET Name$ = "Ahmed"
```

Operating types in Basic Languages :

1- Arithmetic operations :

1.	Addition	A+B
2.	Subtraction	A-B
3.	multiplication	A*B
4.	Division	A/B
5.	Exponent operation	A^B

2. Relational operation :

$>$, $<$, $=$, $\leq$, $\geq$, $<>$
$<=$, $>=$

3. Logical operation :

AND , OR , NOT

Functions	in Basic Language
$Sin(X)$	SIN(X)
$Cos(X)$	COS(X)
$Tan(X)$	TAN(X)
$Tan^{-1}(X)$	ATAN(X)
$\sqrt{X}$	SQR(X)
$\|X\|$	ABS(X)
e^X	EXP(X)
$Ln\ x$	LOG(X)
$Log\ x$	LGT(X)
π	PI

Examples :

write the following in Basic Languages:

1. $2abc \longrightarrow 2*a*b*c$

2. $\frac{a+b}{2c} \longrightarrow (a+b)/(2*c)$

3. $4c(a+b) \longrightarrow 4*C*(a+b)$

4. $a\sqrt{x+y} \longrightarrow a*(X+Y)\text{^}0.5$

$a*SQR(X+Y)$

5. $\frac{abc}{x^2} + \frac{1}{-b} = \longrightarrow a*b*C/X\text{^}2 + 1/(-b)$

6. $(5a)^{\frac{1}{5}} \longrightarrow (5*A)\text{^}(1/5)$

H.W :

1. $Log(X+Y)^2$

2. $\sqrt{x-y^2} - \frac{Z'}{\cos(X+Y)}$

3. $\sqrt{|\sin(a-|b|)|}$

4. $\sqrt[10]{5x^2 - 8y^3}$

5. $\frac{|a|}{c} - \frac{b^2}{|d|}$

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"Basic Statements"
"Input / Output statements"

1- LET statement :

used with arithmetic operations to define the value of variable and its presence is optional .

ex_1 :
```
10  LET  A = 5
10       A = 5
```

ex_2 :
```
10  LET  X = X + 2
```

ex_3 :
```
10  LET  A = Z * X - B/2
```

ex_4 :
```
10  LET  X$ = "JAWAD"
```

ex_5 :
```
10  LET  B = C - 5.080
```

ex_6 : $A_1 = A_2 - (x/y) / (z+w)$

(2) REM statement :

use to allow explanatory remarks to be inserted in a program.

ex1 :

```
10 REM this is the main program
```

ex2 :

```
10 REM Calculate the square root
```

example 3 :

write a program in Basic Language to Calculate the area of a circle with radius R and then print it.

```
10 REM This program Calculate Area of circle
20 READ R
30 LET A= 3.14 * R ** 2
40 Print "A= "; A , "R= " ; R
50 DATA 9
60 END
```

3- Input/Output statement :

a- Read Statement :

use to read values from a data statement and assign then to variables.

* A Read statement must always be used with a data statement.

* Read statement assign variables to DATA statement values on a one-to-one basis : if the number of variables in list of variables exceeds the elements in the DATA statement an (out of data message is printed referring to this fault.

ex1 :
```
10 Read X, Y, Z
20 DATA 5, 10, 20
```

ex2 :
```
10 Read X
20 DATA 2
```
X = 2

ex3 :
```
10 Read X
20 Read Y
30 Data 5, -2
```
X = 5
Y = -2

ex4 : 10 Read X, Y X = 5 Y = -2
20 Data 5
30 Data -2

Note:

if the number of variables specified in Read statement is fewer than the number of elements in the data statements, the extra data is ignored, or may be required for other READ statement.

ex1 : 10 Read A, B, C
20 D = A * B * C
30 Data 2, 4, 6, 8, 10
A = 2 , B = 4 , C = 6

ex2 : 10 Read A$
20 Data "table"

ex3 : 10 Read X, Y
20 Read Z, A$
30 Data 20, 2, 15, "Computer"

(*) The values in the Read statements must be in agreements with the variables types in the Data statements.

(*) DATA statement can be put in any place of the program, but preferred before the END statement.

(b) Input statement :

use to prepare the program for input from the terminal during program execution.

Line number input list of variables separated by commas .

ex1 :
```
10 input A
20 X = A^2
30 print X

Run
? 2
 4
```

ex2 :
```
10 input A, B, C
20 X = A * B * C
30 print X

Run
? 2, 3, 4
X = 24
```

ex3 :
```
10 input A$ , A, B
20 X = A + B
30 print "X = "; A$
Run
? "Computer" , 10, 40
X = 50 Computer
```

ex4 :

```
10  input "your name is" ; N$
20  input "your Telephone no." ; T$
30  print "name=" ; N$
40  print "Tele. No. =" ; T$
```

Run

```
your name is ? KKK
your Telephone No. ? 4444657
 Name = KKK
 Tele. No. = 4444657
```

ex5 :

write a program in Basic Language to calculate and print the value of the following equation

$$Y = A + B$$

Solution :

```
10  input A, B
20  LET  Y = A+B
30  print y
40  END
```

C- output statement
// print statement

print statement
use to output a display to the screen.

[Line No. print List of expressions]

* Expressions in the List may be numeric and/or string expressions, Separated by commas (,) or semicolons (;)

* String constants in the list must be enclosed in double quotation " ".

ex1 :
```
10  X = 10
20  Y = X + X
30  print y
Run
 20
```

ex2 :
```
10  print
20  print "university"
Run
space
university
```

* Below several types for writing print statement

```
10  print  A, B, C
10  print  "A="; A, "B="; B, "C="; C
10  print  "NAME:"; N$, "WAGE:"; W$
10  print
10  print  X*Y/2; A, A$; P$(I); K(I)
```

Notes:

* if the data are separated by commas in the print statement, then each line of the output will be divided into five equal zones and each zone print one value.

* if the last term in the print statement end by commas, so the printed results of the second print statement printed in same line of the first print statement.

* if the data separated by Semicolon (;) in print statement in stead of commas (,) so the output data printed five values in the same line ignoring small space between them.

* if the String variables followed by Semicolon (;) this lead that the

printed string variables without space between their characters and the data printed immediately after them as :

```
10  print "WAGE = " ; W$
                        if W$ = 180
```

The result printed as
WAGE = 180

4. Restore statement :

Line No. Restore

The appearance of this statement in the program causes to repeat reading the same data from the begining.

ex1 :

```
10  Read X, Y, Z
20  print X, Y, Z
30  Restore
40  Read A, B, C
50  Print A, B, C
60  DATA 10, 20, 30, 40, 50, 60
```

When the statement 20 executed

X = 10 Y = 20 Z = 30

when the statement (30) executed then the pointer return to the begining so when statement (40) executed then

A = 10 B = 20 C = 30

but if the statement Restore not present the A, B, C defined it value by 40, 50, 60

5. END Statement :

used to terminate program execution. End statement may be placed anywhere in the program.

To terminate execution . An End Statement at the end of the program is optioned.

Ex :

```
10  input x
20  print "x="; x
30  z = x * x
40  END
50  print "z="; z
60  END
Run
? 5
z= 25
```

Example 1 :

write a program to calculate The cubic root of any number input and then print the input number and its cubic root .

```
10 print "what! is the number=" ; N
20 LET  CR = N^(1/3)
30 print "number is=" ; N
40 print "Cubic root is=" ; CR
50 END
```

Example 2 :

write a program to the Area and circumference of a circle .

```
10 REM Calculate Area & Circumference of circle
20 PI = 3.14159
30 input "Radius is = " ; R
40 LET  Area = PI * R^2
50 LET  CIR = 2 * PI * R
60 print "Area=" ; area
70 print : print
80 print "Circumference=" ; CIR
90 END
```

Example 3 :

write program to calculate the result of this function and then print the numbers input and output and the result

$$Z = (\sqrt{x+y} * K) / m$$

```
5   REM  Calculate
10  input  X, Y, k , M
30  print  "Z="; Z
20  Z = ((X+Y)^0.5 *K) / M
40  print  "x="; x
50  print  "y="; y
60  print  "K="; K
70  END
```

Ex.

```
10 LET A=2.1
20 LET B=33.5
30 PRINT A
40 print A, B
50 print A ; B
60 END
```

Run

```
2.1
2.1            33.5
2.1 33.5
```

```
10 LET A=2.1
20 LET B=33.5
30 print "A="; A
40 print "A="; A ,"B="; B
50 print "A="; A ;"B="; B
60 END
```

Run

```
A= 2.1
A= 2.1          B= 33.5
A= 2.1 B= 33.5
```

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حاسبات

CHAPTER SEVEN 55

Control Statements

1- Unconditional Goto Statement use to branch unconditionally out of normal program Sequence to a specified line number.

Line no. Goto Line number

↓

Line number is any valid line no. within the program

EX:
```
10 input A, B, C
20 Av = 1/3 * (A+B+C)
30 print "Average= "; Av
40 print : print
50 Goto 10
60 END
```

Run

? / 1, 2, 3

Average = 2

Space →

Space →

? 5, 5, 5

Average = 5

EX:
```
10 Read R
20 print "R= "; R
30 A = 3.14 * R^2
40 print "Area= "; A
50 Goto 10
60 DATA 5, 7, 12
70 END
```

Run

? R=5 Area = 78.5
? R=7 Area = 153.86
? R=12 Area = 452.16
out of DATA

(2.) Conditional ON ..... Goto Statement use to branch to one of several specified Line numbers, depending on the value returned when an expression is evaluated.

Line no. ON expression Goto Line numbers The value of expression determines which line number in the list will be used for branching for example in the value is 3, the third line number in the list will be the destination of the branch

* The value of expression must be always positive and integer.

```
10  ON (X) Goto 40, 80, 100
```

X = 1 ⟶ 40
X = 2 ⟶ 80
X = 3 ⟶ 100

Example: Write a program to calculate Area of group of shapes depending on the value of M.
if m=1 calculate the area of rectangle
if m=2 calculate the area of circle
if m=3 calculate the area of Square

```
10  input m
20  ON m Goto 30, 80, 130, 180
30  REM Area of Rectangle
35  input x, y
40  A = x * y
50  print "M=" ; M ; "length" ; x ; "width" ; y
60  print "Area of rectangle=" ; A
70  Goto 10
80  REM Area of circle
85  input R
90  A = 3.14 * R * R
100 print "m=" ; M ; "Radius=" ; R
110 print "Area of circle=" ; A
120 Goto 10
130 REM Area of Square
135 input x
140 A = x * x
150 print "m=" ; M ; "Side length=" ; x
160 print "Area of Square=" ; A
170 Goto 10
180 END
```

Run

? 2
m = 2 Radius = 1
Area of circle = 3.14

? 1
"

Ex 1: write a program to calculate and print the payroll of each worker in a group if:

$(W = H * R)$ where W = Payroll

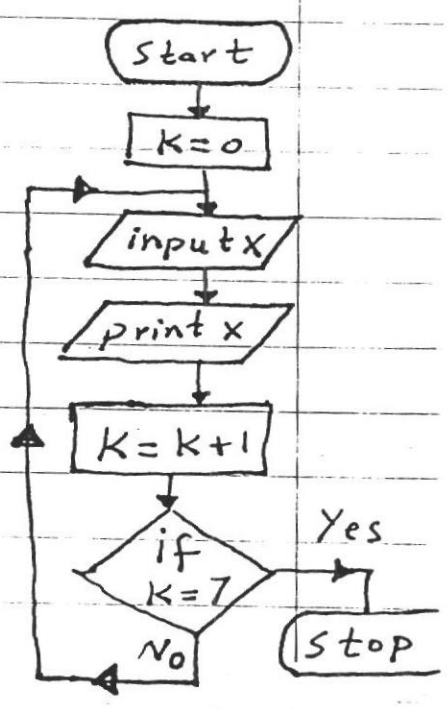
H = No. of hours R = $/1hr

```
100  Rem  Simplified Payroll Program
200  DATA 40,3,75,28,2,25,38,25,-999
300  Read H
400  if H = -999 Then 900
500  Read R
600  LET W = H *R
700  Print "Computed Wage", W
800  Goto 300
900  End
```

Ex: 2 Draw a flow-chart and write a program to print the following values

5, 7, 8, 9, 10, -6, 0

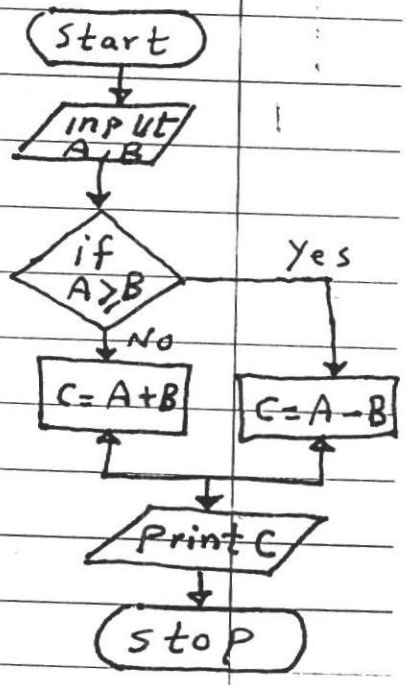
```
10 LET K=0
20 Input X
30 print X
40 LET K=K+1
50 if K=7 Goto 70
60 Goto 20
70 End
```



Ex 3 : Draw a flow-chart and write a Program to calculate the value C if :

C = A - B if A ≥ B
C = A + B otherwise

```
10  input A, B
20  if A >= B Then 50
30  LET C = A+B
40  Goto 60
50  Let C = A-B
60  print "C="; C
70  End
```



3- If ..... Then statement :

use to make a decision based on the result returned by an expression.

IF expression Then [Line number oR statement]

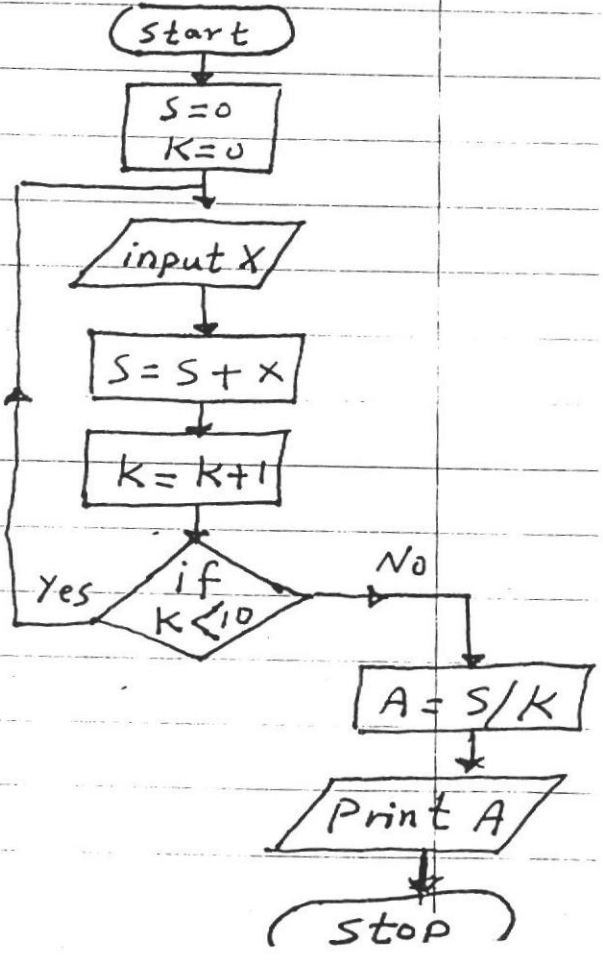
* If the result of expression is nonzero (1) (logical true) The Then is executed.
* If the result of expression is (zero) (false) The Then is ignored and the execution continues with the next statement

Ex:
```
10  input x, y
20  if x > y Then 50
30  print " y is greater than x"
40  Goto 60
50  print " x is greater than y "
60  End
```

Ex:
1. `10 if A$ = "Center" Then print "Computer`
2. `10 if A > B Then LET A = 40`
3. `10 if (X-(Y+21)/Z > X-Z Then 100`
4. `10 if A>B Then A=50 : B=60`

Ex 4: Draw a flow chart and write a program to Calculate and print the mean arithmatic value for 10 Numbers.

```
10 Let S=K=0
20 input X
30 Let S=S+X
40 Let K=K+1
50 if K<10 Then 20
60 Let A=S/K
70 print "A="; A
80 End
```



4- If ..... Then ..... Else statement :

If expression Then [line number or statement]
Else [Line number or statement]

if the result of expression is true The Then is executed, if the result of expression is false The Then is ignored and the Else is executed.

Ex: 1. 10 if A>0 Then X=X+10 Else X=Y*Y
2. 10 if x>10 Then 70 Else y=x+1
3. 10 if X=0 Then 60 Else if x>0 Then 90 Else 15

4. 10 input x, y
20 if x>y Then print "x is greater than y"
Else if y>x Then print "y is greater than x"
30 Goto 10

H.W: write a program to calculate the value of x and y from:

$$\left.\begin{array}{l} X = A+10 \\ y = \sqrt{B} \end{array}\right\} \text{if } N \leq 0$$

$$\left.\begin{array}{l} X = 4AB \\ y = B\wedge 3 \end{array}\right\} \text{if } N > 0$$

Solution :

```
10 input N, A, B
20 if N<=0 Then X=A+10 : y= SQR(B)
                Else X= 4*A*B : y= B^3
30 print N, A, B
40 print X, y
50 END
```

Ex 1: write a program to calculate and print the value of Z where :

$Z = \sqrt{a^2+b^2+c^2}$ if j=1

$Z = \frac{\sqrt{a^2+b^2+c^2}}{abc}$ if j=2

$Z = Ln(a+b+c)$ if j=3

$Z = |(a-b+c)|$ if j=4

Solution :

```
10  input A,B,C,j
20  on j Goto 30, 50, 70, 90
30  Z= SQR ( A*A + B*B + C*C)
40  Go to 100
50  Z= SQR( A*A + B*B + C*C)/(A*B*C)
60  Go to 100
70  Z= LOG(A+B+C)
80  Go to 100
90  Z= ABS( A-B+C)
100 print Z
110 END
```

Ex2: write a program to print the values of x^K if K takes the following values:
K = 1, 2, 3, 4, 5

Solution:

```
10 input x
15 Let K=1
20 Let A = X^K
25 print A
30 if K=5 Goto 45
35 Let K=K+1
40 Goto 20
45 End
```

Ex 3: write a program to calculate the expansion of N if

$N! = N(N-1)(N-2)(N-3) \ldots 3, 2, 1$

Solution:

```
10 Let f=1
20 input N
30 Let F= F*N
40 Let N = N-1
50 if N<1 Then 70
60 Goto 30
70 print "The Factorial N is" ; F
80 End
```

* For and Next statements :

use to execute a series of instructions a specified number of times in a loop.

Line no. For variable = x To Y [step Z]

⋮

Line no. Next variable

* variable is used as a counter X, Y and Z are numeric expressions step Z specified the counter increment for each Loop

The first numeric expression (X) is the initial value of the counter

The second numeric expression (Y) is the final value of the counter

Program lines following The For statemer are executed until the Next statemen encountered, Then the counter is incremented by the amount specified by Step.
if step is not specified, the increment is assume to be 1.

Ex1:
```
10 For I = 1 To 10 step 1
20 input A
30 print I, A
40 next I
```

Run
```
? 5
1  5
? 8
2  8
```

Note: variable (I) must be Numeric

ex:
```
10 For I = 1 To 10
   :
100 Next I
```
✓ Right Statement

ex:
```
10 For A$ = 1 To X
10 For A+B = 1 To 10X
```
✗ worng Statement

Note:
if Step is negative, the final value of counter is set to be less than the initial value the counter is decremented each time through the loop and the Loop is executed until the counter is Less than the final value. ex:
```
10 For I = 50 To 10 step -2
   :
40 Next I
```

ex1: write a program to Find the average for the N of numbers ?

```
10  input "No. of numbers="; N
20  Sum = 0
30  For I = 1 to N
40  input X
50  sum = sum + X
60  Next I
70  Av = sum / N
80  print " Average=" ; Av
90  END
```

ex2 : write a program to find the value of Y from the N of terms.

$Y = 1 + 1/2 + 1/3 + 1/4 \ldots\ldots 1/N$

```
10  input N
15  Y = 0
20  For I = 1 to N
30  Y = Y + 1/I
40  Next I
50  print Y, I
60  END
```

Another solution

```
10  REM  main program
```

```
20  input "No. of terms = " ; N
30  Y = 0
40  I = 0
50  I = I + 1
60  Y = Y + 1/I
70  if I < N  then 50
80  print "No. of terms = " ;
90  print "sum of N terms " ; Y
100 END
```

ex3 : write a program to calculate and print the sum of odd numbers from 1 to 100

```
10 Let  S = 0
20 For K = 1 to 99 step 2
30 Let S = S + K
40 Next K
50 print "S = " ; S
60 END
```

ex4 : write a program to calculate each the sum of odd numbers and the sum of even numbers uniquely from 1 to 100 ?

Suppose $S_1 = 1+3+5+\dots+99$ odd numbers

& $S_2 = 2+4+6+\dots+100$ even number

```
10 LET S1 = 0
20 LET S2 = 0
30 For J = 1 to 99 step 2
40 Let S1 = S1 + J
50 Let S2 = S2 + J + 1
60 Next J
70 print "S1 = "; S1 , "S2 = "; S2
80 END
```

ex5 : write a program to calculate the product of the following numbers :
100 , 95, 90 , 85, ..., 5

```
10 Let S = 1
20 For I = 100 to 5 step -5
30 Let S = S * I
40 Next I
50 print "S = "; S
60 END
```

ex6 : write a program to find the large number and small number between 10 numbers.

```
10 input X
20 Let L = S = X
30 For I = 1 to 9
40 input X
```

```
50  iF x>L then 80
60  if x<S then 100
70  Go to 110
80  Let L=X
90  Go to 110
100 Let S=X
110 Next I
120 print "L=" ; L, "S=" ; S
130 END
```

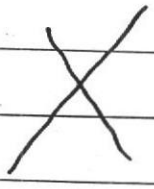
Nested Loops :

For - next Loop may be nested, that is a For-next Loop may be placed within the context of another For-next Loop when Loop are nested, each Loop must have a unique variable name as its counter. The next statement for the inside Loop must appear before that for the outside loop.

ex :

```
10  For I=1 to 10
 :
50  For j=1 t 5
 :
100 Next j
 :
200 Next I
```

ex
```
10 For I=1 to N
20 For J=1 to M
50 Next I
100 Next j
```



ex: write a program to Draw the following figure

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

Solution:

```
5 For A = 1 to 4
10 For B = 1 to 3
15 Print "*"
20 Next B
25 print
30 Next A
40 END
```