**COMPUTER STUDIES SS1 SECOND TERM**

 **{PRINT AND SPIRAL BAND}**

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**PROGRAMMING LANGUAGE**

**Definition of Terms**

**Program:** A computer program is a sequence of related instructions (commands) that tell the computer how to accomplish a specific task. A program can also be defined as a set of instructions that are executed by the CPU.
**Programming:** Programming is the act of writing computer program. Computer programs are written by trained and qualified people called programmers.
**Computer language:** Computer language is a language used by, or associated with the computer.
**Programming Language:** A computer programming language is an artificial language that can be used to control the behavior of a machine, particularly a computer. Programming language is a means through which a programmer communicates with the computer in solving different categories of problems.
**Syntax:** Syntax are set of rules governing how the words in the language are written.
**Semantics:** Semantics are meanings associated with each word used in a particular language.
Markup languages like HTML are generally not regarded as programming languages, but they are computer languages. Programming language foster the communication of programs among programmers and computer; markup language communicate the formatting or structure of document between human and computer.

**Levels of Programming Language**
There are three levels of programming language
1. Machine Language
2. Low-Level Language (Assembly Language)
3. High-Level Language

**Machine Language**

This was the first generation programming language (GL1). A computer will only understand one language, which is machine language. There are two symbols in machine language; these are 1 and 0 generally called binary digits or bits.
**Advantages**
1. It is directly understood by the computer.
2. Programs written in machine language run very fast.
3. Program written in machine language needs less memory to run
**Disadvantages**
1. All operation codes have to be remembered
2. It is machine dependent
3. It is hard to amend or find errors in a program written in machine language.

**Low Level Language**

A low-Level programming Language is programming that provides little or no abstraction from a computer’s microprocessor. The word low does not imply that the language is inferior to high-level programming languages but rather refers to the small or nonexistent amount of abstraction between the language and machine: because of this, low-level languages are sometimes described as being “close to the hardware. An example of low-level language is assembly language, it was the second-generation programming language or 2GL. It was developed to overcome some of the many inconveniences of machine language. Assembly language is a mnemonic representation of machine language. It is one level above machine language. A program for translating low assembly language is called an assembler.
**Advantages of Low-Level Language**
1. It is easier to understand and use as compared to machine language.
2. It is easy to locate and correct error as compared to machine language
3. A program written in assembly language executes faster than that of a high-level language.
**Disadvantages of Low-Level Language**
1. Assembly language, like machine code, is also machine dependent
2. Difficult to remember the syntax.

**High Level Language**

These are programming languages that allow for programs to be written in forms that are readable to human beings. A high-level language is a programming language that, in comparison to low-level programming languages, maybe more abstract, easier to use, or more portable across platforms.
Examples of High-Level Language include
a. PASCAL
b. BASIC (Beginners All-purpose Symbolic Instruction Code)
c. C ++
d. Java
e. FORTRAN (Formula Translation)
f. COBOL (Common Business Oriented Language)
g. PROLOG
h. ALGOL (Algorithmic language)
i. APL (A Programming Language)
j. RPG (Report Program Generator)
k. Python
**Advantages of High Level Language**
1. It is easier to learn and use
2. It user friendly
3. Programs in high-level language requires less time to write
4. It is easier to maintain
5. It is machine independent
6. It does not require the programmer to know the computer hardware architecture
**Disadvantages of High Level Languages**
1. It takes time to execute or run because it must first be translated into machine code by a translator before it can be executed.
2. Programmers need to remember a large set of syntax and semantics

**Comparison of Machine Language, LLL and HLL**

|  |  |
| --- | --- |
| Language | Characteristics |
| 1. Machine Language | 1. Machine dependent2. Uses special code and the assignment of storage location |
| 2. Low-Level Language (Assembly language) | 1. Machine dependent<2. Uses mnemonics (symbolic operation code) and operand (symbolic storage address)3. 1 to 1 language |
| 3. High Level Language | 1. Machine independent2. Uses instructions that seem English like3. 1 to many languages, i.e. for one high-level instruction, many machine level statement may be generated |

 **BASIC PROGRAMMING LANGUAGE**

**Origin of and Features of BASIC**

BASIC stands for **B**eginner’s **A**ll-purpose **S**ymbolic **I**nstruction **C**ode. It was developed in 1960 by John Kemeny and Thomas Kurtz to teach students at Dartmouth College. It has undergone a series of historical development, which has resulted in several forms of the language.
BASIC is now in form of VB.NET (Visual Basic.Net). The majority of BASIC languages use program translators called interpreters to allow the computer to understand and obey the BASIC statements in the computer program. Examples of such interpreters are:
BASICA
GwBASIC
Turbo BASIC
Quick BASIC

**BASIC Character Set**

The characters used in BASIC language include:
i. Alphabetic Characters: BASIC alphabetic characters consist of letters (A to Z)
ii. Numeric Characters: Numbers from 0 to 9 are used in BASIC language
iii. Special Characters: Special characters are characters that are not letters or numbers. They include punctuation marks, accent marks, ASCII control characters, formatting characters. Examples + % ^ # = ( ) etc

**BASIC variable**

A variable is a quantity that changes during the execution of a program. It can also be defined as a name that is used to represent some storage location.

**Types of Variables**

**1. Numeric Variables:** These are used to store numeric values such as 23, 98, 1.44 etc. Examples of numeric variables are; N, Y, P, SUM, AVERAGE, etc

2. String Variables: These are used to store alphabetic and alpha-numeric values. A string variable name is always written with a dollar sign ($) as the last character. E.g. Name$, AVG$, X$, etc

**Rules for coding variable**
i. In BASIC combining alphabets, numbers and the decimal point (a maximum length of 40 characters) may form a variable.
ii. No reserve word can be used as a variable name.
iii. Special characters cannot be used for naming a variable. iv. A string variable corresponds to string data whereas a numeric variable corresponds to numeric data,
v. In a program, each variable is referred to throughout the program by its name.

**Constants**
A constant is data that remains the same as the program runs (executes). Constants are values stored or assigned to variables.
**Types of Constants in BASIC**
BASIC allows two constants which are;
**Numeric constant:** Numeric constant in BASIC is any signed or unsigned number.
**Alpha-Numeric or string constant:** It consists of the combination of letters, digits, and other symbols that are treated in a manner completely analogous to a numeric constant. They are enclosed within inverted commas.

**Rules for numeric constants**
i. A number can have a maximum of 8 digits
ii. No comma is allowed
iii. A decimal point can appear anywhere
iv. If the value is quite larger it is expressed in exponent form
v. No blank space, special characters or any other letter is allowed in the number.

**BASIC Expressions and Operators**

In programming, an expression can be defined as the combination of operands and operators. Operands are the data items involved in an expression. Operators determine the action to be carried out on the operand in the expression. For instance, in the statement: LET C = A + B, A and B are the operands while “+” is the operator.
There are three major types of expression in BASIC. They are:
Arithmetic expression
Relational Expression
Logical expression

**Arithmetic Expression**
BASIC arithmetic expression is used to represent mathematical formulae in BASIC programming. Below is a list of BASIC arithmetic operators:
**Arithmetic Operators**

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Name** | **Function** |
|  ^ | Upper caret | Exponentiation |
|  / | Slash | Division |
|  \* | Asterisk | Multiplication |
|  + | Plus | Addition |
|  - | Minus | Subtraction |

**Arithmetic Expression**
Every arithmetic expression must appear on a single line. There is no superscript in BASIC as we find in algebra.

**Relational Expression**
Relational Expression is used for the comparison of two or more data items. BASIC relational operators are listed below:

|  |  |
| --- | --- |
| **Symbol** | **Name** |
|  < |  Less than |
|  > |  Greater than |
|  = |  Equal to |
|  <> |  Not Equal to |
|  <= |  Less than or equal to |
|  >= |  Greater than or equal to |

**Logical Expression**
Logical expression involve is an expression involving two or more relational repression joined by a logical expression. BASIC logical operators are:
AND
NOT
OR

**Evaluation or Arithmetic Expression**

To evaluate an arithmetic expression, the following order is followed:

|  |  |
| --- | --- |
| **Priority** | **Operator** |
| 1st | Parenthesis i.e. ( and ) |
| 2nd | Exponentiation |
| 2nd | Exponentiation |
| 3rd | Multiplication and Division |
| 4th | MOD and INTER Division |
| 5th | Addition and Subtraction |

Example: evaluate 4\*A\*B^2+ (A^2\*B+C)/(A+B) if A=2; B=4 and c=2
**Solution**
Step 1 Substituting we have ---- 4\*2\*4^2+ (2^2\*4+2)/ (2+4)
Step 2 evaluate terms in the parenthesis ---- 4\*2\*4^2+18/6
Step 3 evaluate 4^2 --------- 4\*2\*16+18/6
Step 4 evaluate 4\*2\*18 ------- 128+18/6
Step 5 evaluate 18/6 ------ 128 + 3
Step 6 evaluate 128+3 ----- 131

**BASIC Statements**

**LET Statement**
The let statement is used to assign a numeric or string value to a variable.
**Syntax**
LET [variable] = [constant] for numeric value
LET [variable]$ = [“value”] for string value
Example
LET X = 12
LET B$ = “Clementina”
LET AREA = L\*B

**INPUT Statement**
The INPUT statement is used to enter data into the computer with a user prompt or a group of variables during program execution.
**Syntax for numeric value**
INPUT “[prompt]”; [variable]
**Syntax for string value**
INPUT “[prompt]”; [variable$]
Example
INPUT “type in the number”; A
INPUT “Type in your name”; N$

**READ-DATA statement**
READ and Data are two statements concerned with each other which are used to put data in a line of the program and to read the data when it is needed.
Example
READ A, B, C
DATA 5, 6, 7
LET SUM = A+B+C
PRINT SUM
END

**REM (Remark) Statement**
The REM statement is used to insert comments or remarks into a BASIC program. The use of remark statements improves the readability of the program. REM is a non-executable statement.
**Syntax**
REM [remark]
Example
REM program to add six numbers

**PRINT statement**
This statement is used to transmit data from the computer memory to the output device.
Examples
PRINT A
PRINT “I Like Writing Program”

**Program Terminators (END and STOP Statements)**
The STOP statement is used to terminate the execution of a program at any point in the program. The END statement indicates the actual end of a program. The STOP statement may appear many times and anywhere, whereas an END statement can only appear at the end of a program and only once.
Example
REM END statement
PRINT “Good morning”
END

**FOR – NEXT**
Looping is used to have the computer do repetitive tasks in a fraction of the time that would otherwise be required. The most common type of loop used in QBASIC programming is the FOR...NEXT and WHILE WEND loop that repeats a series of instructions a specified number of times.
Syntax
FOR variable=x TO y [STEP z]
NEXT [variable][,variable...]
x,y, and z are numeric expressions.
STEP z specifies the counter increment for each loop.
Example 1: Write a program using FOR-NEXT state to print any statement five times **Solution**

FOR I = 1 TO 5
PRINT “the dullest pencil is better than the sharpest memory”
NEXT I
END

EXAMPLE 2: Write programming using FOR-NEXT statement to display odd numbers from 1 to 20
**Solution**
REM program to print odd numbers from 1 to 20
PRINT “odd numbers from 1 to 20 are”
FOR ODD =1 TO 20 STEP 2
PRINT ODD
NEXT ODD
END

**Simple Basic Programs**

Example 1: Program to find the sum and difference between two number
10 REM this program accepts two numbers and finds their sum and difference
20 INPUT “Type the first number and press ENTER”; NUM1
30 INPUT “Type the second number and press ENTER”; NUM2
40 LET SUM = NUM1 + NUM2
50 LET DIFF = NUM1 – NUM2
60 PRINT “first number is “; NUM1
70 PRINT “second number is “; NUM2
80 PRINT “================”
90 PRINT NUM1; “+”; NUM1 “=” ; SUM
100 PRINT NUM1; “-“ ; NUM2 “=” DIFF
110 END
Example 2: a program to calculate the area and perimeter of a rectangle
10 REM program to find the area and perimeter of a rectangle
20 INPUT “Type the length of the rectangle”; L
30 INPUT “Type the in the breadth of the rectangle”; B
40 LET AREA = L\*B
50 LET PERI = 2 \* (L + B)
60 PRINT “The area of the rectangle is “ ; AREA
70 PRINT “The perimeter of the rectangle is” ; PERI
80 END

### Communication System

## Meaning of ICT

ICT is an acronym that stands for Information and Communication Technology.
Information is referred to knowledge obtained from reading, investigating, studying and researching. It can also be defined as processed data.
Communication is an act of transmitting messages.
Technology is the application of scientific knowledge for practical purposes, especially in industry.

## Definition of ICT

ICT can therefore be defined as technologies that provide access to information through telecommunication.
It is also defined as the use of a diverse set of technological tools and resources to communicate, create, disseminate, store and manage information.

## Communication strategies in ICT

There are two types of communication strategies in ICT:
**1. Synchronous communication**
This is a communication strategy where all parties involved in the communication need to be present and available at the same time. E.g. online chat, video conferencing, etc.
**2. Asynchronous communication**
Asynchronous communication does not require that all parties involved need to be present and available at the same time. E.g. Discussion forum, Blogs e-group, etc.

## Types of ICT

The following are types of ICT:
1. Broadcasting
2. Telecommunication
3. Data network
4. Information system
5. Satellite communication

**Broadcasting**
Broadcasting is the distribution of audio and video content to a dispersed audience via any electronic mass communication medium. Types of broadcasting include Radio broadcasting, Television broadcasting, Satellite TV system broadcasting and Webcasting.

**Telecommunication**
Telecommunication is the transmission of information over a significant distance, for communication. A basic telecommunication system consists of three primary units; a transmitter, a transmitting medium and the receiver. Types of telecommunication systems include:
o Public Switched Telephone Network (PSTN) – landline.
o Mobile phone (GSM)
o Circuit Switched Packet Telephone (CSPT)
o Satellite Telephone
o Fixed Wireless Telephone

**Data Network**
Data network is an electronic communication process that allows for orderly transmission and receptivity of data only.
**Types of Data Networks**
**• Personal Area Network (PAN):**It refers to the interconnection of information technology devices or gadgets within the environment of an individual user (typically within 10 meters). PAN may be wired with the computer such as USB and Firewire. A wireless Personal Area Network (WPAN) can be made possible with network technology such as infrared Data Association (irDA) and Bluetooth.
**• Local Area Network (LAN):** A local area network is a computer network covering a small local area, like a home, office, or school.
**• Campus Area Network (CAN):** CAN is a network that spans a limited geographical locality like university campus, military bases.
**• Metropolitan Area Network (MAN):**MANs are large computer networks usually spanning a large city. It is connects multiple LANs to form larger network, so that the computer resources can be shared.
**• Wide Area Network (WAN):** WAN is a computer network covering a broad geographical area comprising a region, a state, a country and a continent.
**•Internet:** The internet is a worldwide network of computers that share information
**• Virtual Private Network (VPN):** A VPN is network that hides your online identity, allowing you to browse the internet anonymously.

**Information Systems**
Information system is an integrated set of components for collecting, storing, processing and communicating information.
Types of the informative system include:
i. Data processing system
ii. A global positioning system (GPS). GPS is a satellite-based navigating system.

**Satellite communication**
A satellite is an object that moves around a larger object. Satellite communication, in telecommunication, is the use of artificial satellites to provide communication links between various points on Earth. Approximately 2,000 artificial satellites orbiting Earth relay analogue and digital signals carrying voice, video and data from one or many locations worldwide.

## APPLICATION AREAS OF ICT

ICT has different types of applications for different fields. These fields are explained below:
**Teleconferencing**
The word tele means distance. The word conference means discussion and consultation. It is simply defined as the process of holding a conference via telephone or network connection. Teleconferencing is the live exchange and mass circulation of information among several persons and machines remote from one another but linked by a telecommunication system

**Video conferencing**
With videoconferencing people can interact as if they were talking face to face with both images and sound relay in real-time. Thus far video conferencing has been used in the following fields; Business, Distance learning, Home offices, Legal environment and Telemedicine.

**Telepresence**
Telepresence also called virtual presence, is a technique to create a sense of physical presence at a remote location using multimedia such as sound, vision and touch.

**Telecommunication and Networking**
Telecommunication is the process of sending and receiving an electrical signal over a large distance by electronic means. A single telecommunications circuit consists of two stations, each equipped with a transmitter and a receiver. There are certain mediums of telecommunication systems such as coaxial cables, fibre optics, radio frequency and air etc. a telecommunication network is a network of nodes and links and the communication signal passes through one link to another.

**Tele-computing**
It is a generic (common) term referring to the use of computers for communication. The term includes communication using computers linked either one-to-one or in networks of interlinked computers. The most common use of interlinked computers now is by the way of the internet and Intranet. An intranet is a private network which serves a single organization, such as a corporation.

**Messaging**
The most common forms of messaging are emails, paging, Short Message Service (SMS), Enhanced Message Service (EMS), Multimedia Message (MMS) and Instant Messaging.

**Information Search, Retrieval and archival**
Information Retrieval is the science of searching for documents, information within documents, and metadata about the document, as well as that of searching relational databases and the World Wide Web. An Archival Information System consists of an organization of people and systems that has accepted the responsibility to preserve information and make it available for a designated community

## ICT-Based Gadgets

A gadget is a small technological device or an appliance that has a particular function. An ICT gadget is therefore any technological tool that can be used to manipulate information.
Examples of ICT gadgets include computers, Automated teller machines (ATM), Dispensing machines, Radio sets, Television sets, Fax machines, Telephone, GSM, etc.
**Mobile Phone**
Cell phones, also known as mobile phones or wireless phones, are hand-held phones with built-in antennas. Unlike home phones, cell phones can be carried from place to place with minimum fuss.
**Computer**
A computer is a programmable machine that inputs, processes and outputs data. A computer system refers to the computer and all its equipment.
**Fax Machine**
Fax machine is a short form for a facsimile machine. It is a device that can send or receives text and pictures (graphics) over a radio broadcast or a telephone line.
**Automated Teller Machine (ATM)**
Automated Teller Machine also known as automated banking machine (ABM) or cash machine is a computerized telecommunication device that provides the client of a financial institution with access to financial transactions in public space without the need for a cashier, a human clerk or a bank teller.
**Dispensing machine**
A dispensing machine is a machine that gives items to customers automatically after the customer inserts currency or credit into the machine.
**Point of sale (POS) machine**
Electronic retail payment device which reads a customer's bank's name and account number when a bank card or credit card is swiped through a magnetic stripe reader, contacts the bank and if funds are available transfers the customer-approved amount to the seller's account, and prints a receipt.
**Radio Set**
A radio receiver (commonly also called a radio) is an electronic device that receives radio waves and converts the information carried by them to a usable form. It is used with an antenna. The antenna intercepts radio waves (electromagnetic waves) and converts them to tiny alternating currents which are applied to the receiver, and the receiver extracts the desired information
**Television**
Television or TV is a telecommunication medium used for transmitting sound with moving images in monochrome (black-and-white), in colour, and in two or three dimensions.
**VR (Virtual Reality) Camera**
VR employs tracking and 3D near-eye displays to give the user an immersive feel of a virtual world. It can be used in entertainment, education and business.