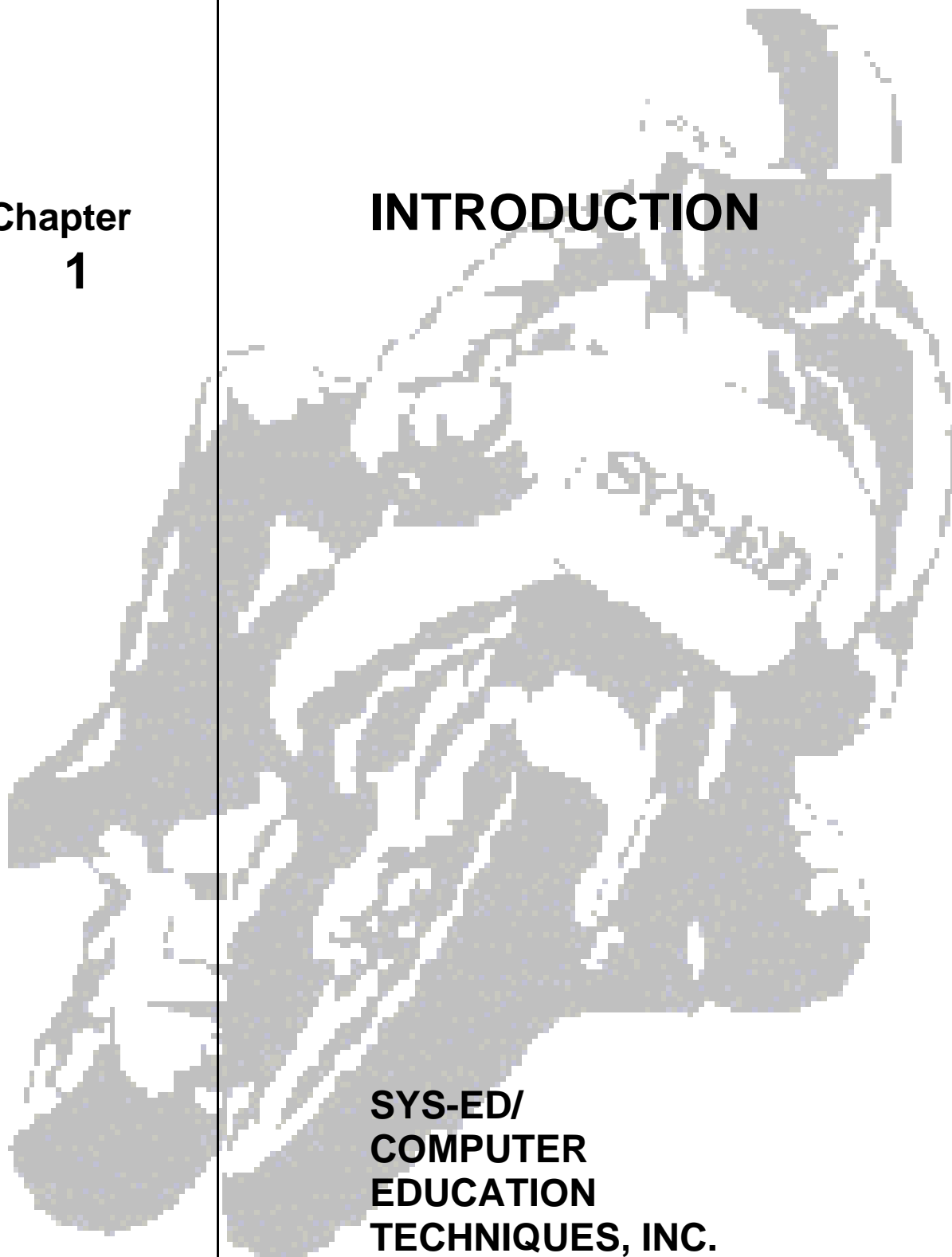


**Chapter
1**

INTRODUCTION

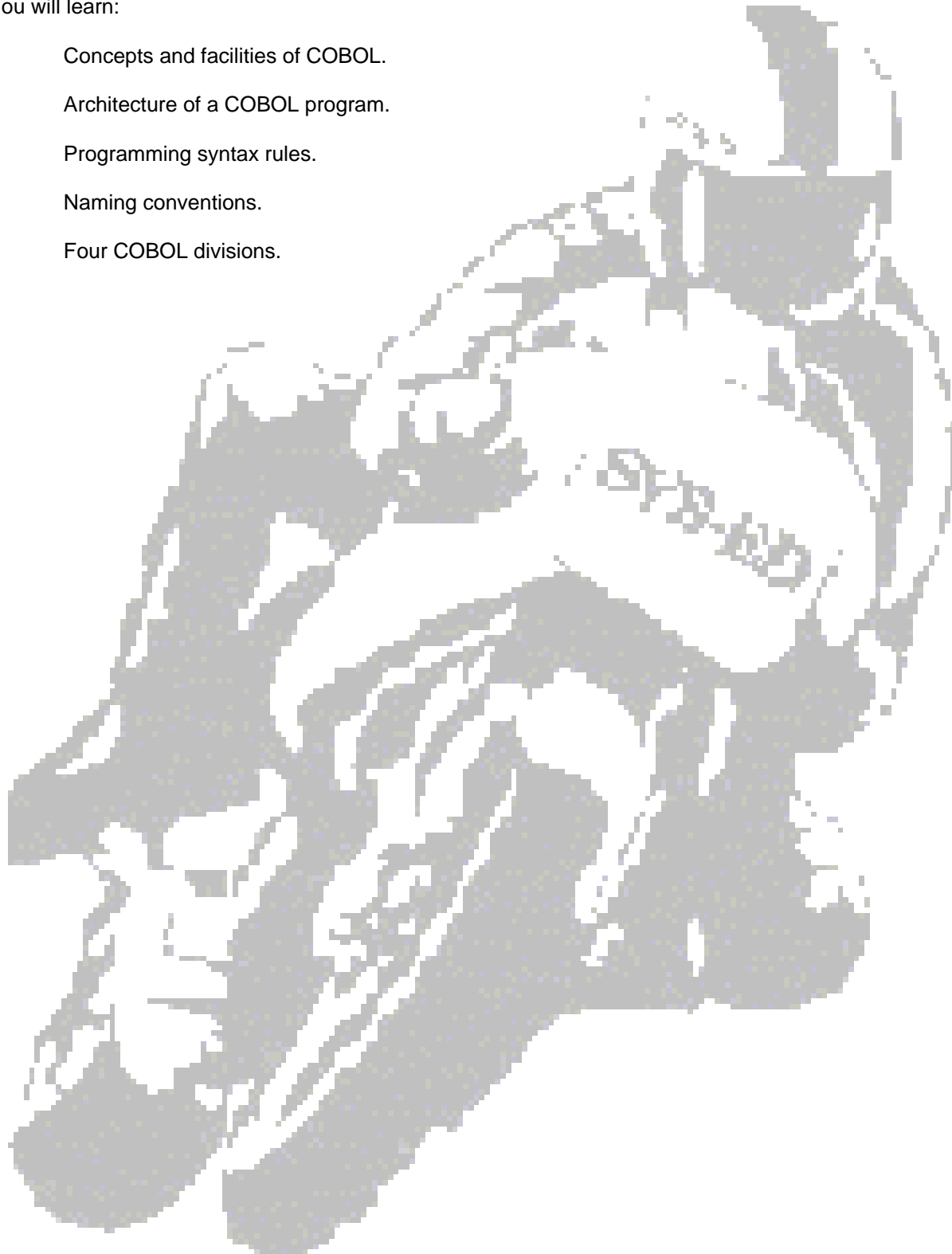


**SYS-ED/
COMPUTER
EDUCATION
TECHNIQUES, INC.**

Objectives

You will learn:

- C Concepts and facilities of COBOL.
- C Architecture of a COBOL program.
- C Programming syntax rules.
- C Naming conventions.
- C Four COBOL divisions.



1 Definition of COBOL

COBOL is the acronym for Common Business Oriented Language. It is a programming language designed to simplify the development of business oriented application programs.

COBOL is a high-level programming language based on the English language that allows computer programs to be developed in a paragraph-and-sentence like form using words common to the business world.

COBOL is comprised of:

- C Elements
- C Rules
- C Definitions in accordance with the COBOL rules
- C Executable source programs

2 History and Evolution of COBOL

1959	The CODASYL Committee was launched by the Department of Defense.
1960	CODASYL produced the first official version of COBOL.
1961	CODASYL produced the second official version of COBOL.
1963	The American National Standards Institute formed a committee for developing COBOL standards.
1965	CODASYL produced the third official version of COBOL.
1968	American National Standards Institute (ANSI) COBOL was released.
1974	A new version of ANSI COBOL is released.
1984	IBM released a new COBOL compiler: VS COBOL II.
1985	A new version of ANSI COBOL is released.

3 COBOL: Advantages and Disadvantages

Advantages:

- C Easy to learn.
- C Easier to debug than assembler type language.
- C The programmer becomes oriented towards the development of application programs, not a comprehensive knowledge of the object language instruction set.
- C It is used across different hardware and systems software.
- C In relation to a program written in machine-oriented language, there is a reduction in the total program length.

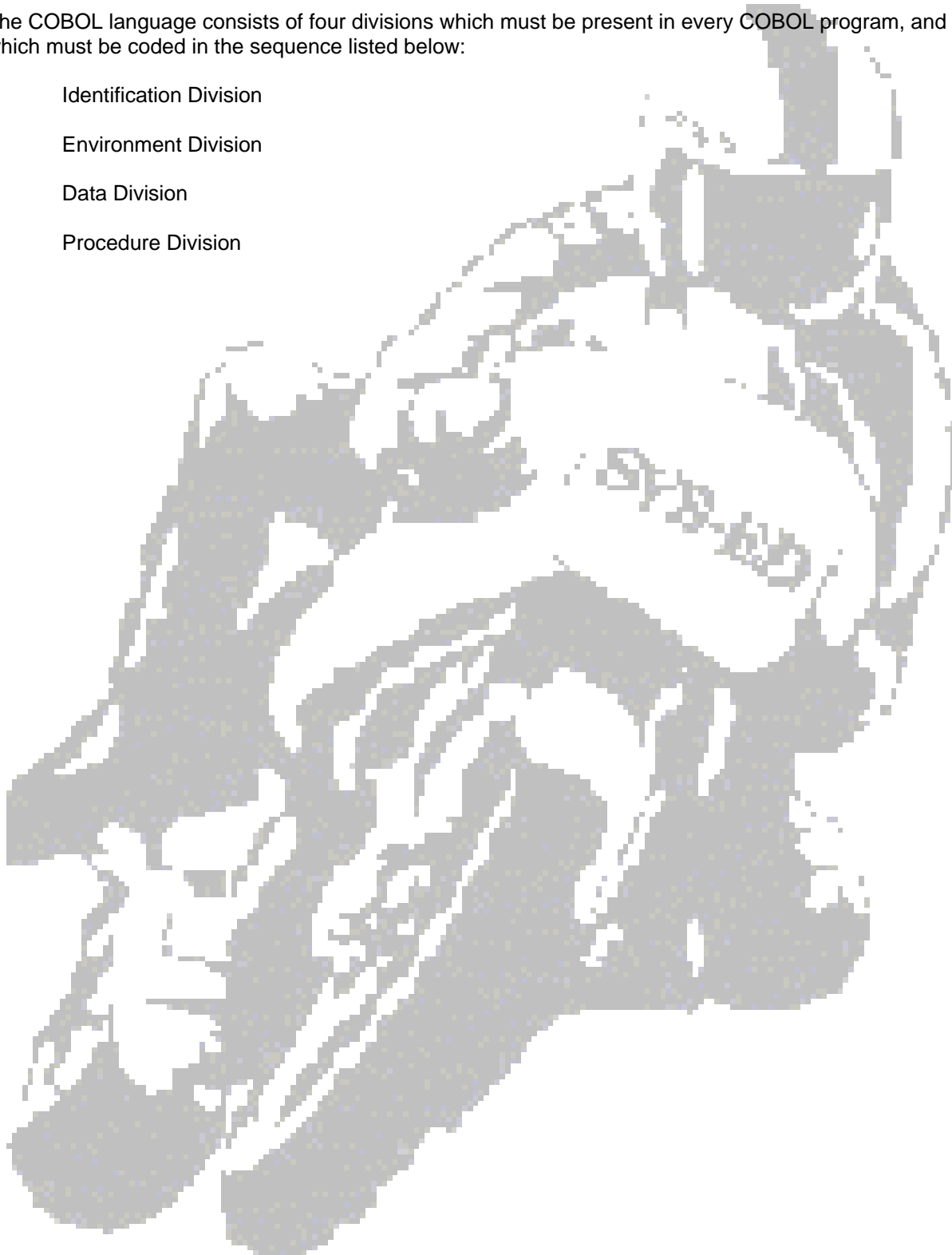
Disadvantages:

- C The amount of time and resources to compile a COBOL program is greater than that of a machine-oriented programming language.
- C The object code is not as efficient as when programming in a machine-oriented language.
- C A COBOL programmer may still need to know how to read and interpret a 'core' dump.
- C Some applications require processing which cannot be performed by a high-level language.

4 The Four Divisions of COBOL

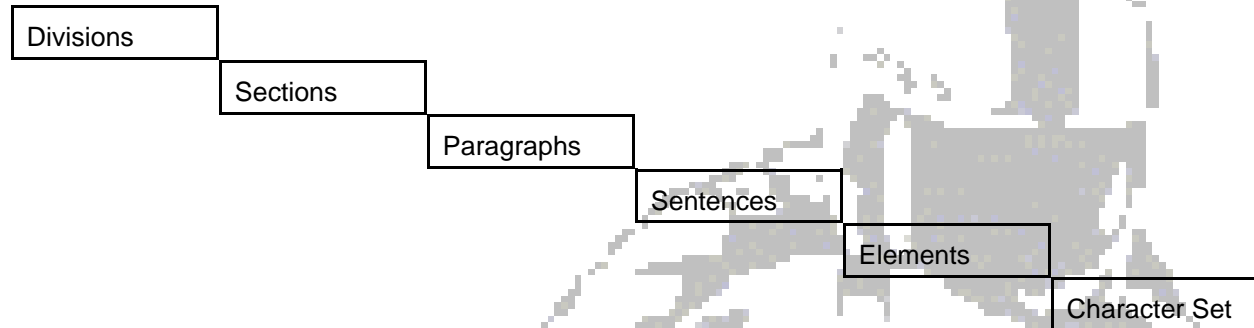
The COBOL language consists of four divisions which must be present in every COBOL program, and which must be coded in the sequence listed below:

- C Identification Division
- C Environment Division
- C Data Division
- C Procedure Division



5 Basic COBOL Program Structure

The basic structure of a COBOL program is a hierarchy consisting of the following levels:



Some levels are optional; while other levels are required. Depending upon the situation, a header or a paragraph name must precede divisions, sections, and paragraphs.

A header may be a single reserved word or a combination of reserved words that have definite meaning in the context of COBOL.

6 COBOL Coding Form

The COBOL coding sheet contains multiple lines.

Each line provides for 80 columns of information.

- C Column 1 to 6 are reserved for a page and line number or sequence number.
- C Column 7 is used to indicate a comment line with an asterisk (*), while a hyphen (-) in that column indicates the continuation of a literal.
- C Column 8 is the beginning of margin A; this is where the names of divisions, sections, and paragraphs start.
- C Column 12 is the beginning of margin B; this is where all other items of a COBOL program start.
- C Column 73 to 80 are reserved for program identification.

7 COBOL Character Set

The complete COBOL character set consists of the following characters:

Character	Meaning
0,1,...,9	digit
A,B,...,Z	letter
	space
+	plus sign
-	minus sign or hyphen
*	asterisk
/	slash
=	equal sign
\$	dollar sign
,	comma
;	semicolon
.	period (decimal point)
" or '	quotation mark
(left parenthesis
)	right parenthesis
>	greater than symbol
<	less than symbol

7.1 Characters Used in Words

Words used in a COBOL program are composed of a combination of 30 characters or less, chosen from the following characters:

Character	Meaning
0,1,...,9	digit
A,B,...,Z	letter
-	hyphen (a word cannot begin or end with a hyphen)

Example of Characters Used in Words

An example of a COBOL word would be:

THIS-IS-1-COBOL-WORD

7.2 Characters Used for Punctuation

The following characters are used for punctuation:

Character	Meaning
	space
,	comma
;	semicolon
.	period
" or '	quotation mark
(left parenthesis
)	right parenthesis

Example of Characters Used for Punctuation

```
MOVE 'ABC' TO WS-FIELD.
```

7.3 Characters Used for Editing

Characters used for editing data are single characters or unique two-character combinations belonging to the following set:

Character	Meaning
B	space
0	zero
+	plus sign
-	minus sign
CR	credit symbol
DB	debit symbol
Z	zero suppression
*	check protection
\$	dollar sign
,	comma
.	decimal point
P	decimal position
/	date separator

7.4 Characters Used in Arithmetic Expressions

Characters used in arithmetic expressions are as follows:

Character	Meaning
+	addition
-	subtraction
*	multiplication
/	division
**	exponentiation

Example of Characters Used in Arithmetic Expressions

Arithmetic expressions are used in conjunction with the COMPUTE Statement.

```
COMPUTE WS-TOTAL = (WS-FIELD-A * 5) / (WS-FIELD-B + 100).
```

```
COMPUTE NET-PAY = GROSS-PAY - TOT-DEDUCTION.
```

7.5 Characters Used for Relation-Conditions

Characters used for relation-conditions are as follows:

Character	Meaning
>	greater than
<	less than
=	equal to
>=	greater than or equal
<=	less than or equal

Example of Characters Used for Relation-Conditions

Relation-conditions characters are used with the IF and PERFORM Statement.

```
IF WS-FIELD-A > WS-FIELD-B . . .
PERFORM . . .
```

8 Types of COBOL Words

A word used in a COBOL program is composed of a combination of characters chosen from the set of characters.

There are two types of COBOL word: programmer's defined words and reserved words.

Rules for formulating words:

- C A word cannot be more than 30 characters in length.
- C A word cannot contain a space (the space is a word separator).
- C A word is terminated by:
 - ! space
 - ! period
 - ! right parenthesis
 - ! comma
 - ! semicolon

8.1 Reserved Words

Reserved words are predefined words which exist for syntactical purposes and cannot appear as programmer defined words. A reserved word may be used as a nonnumeric literal within quotes.

There are four types of reserved words: Key Words, Optional Words, Connectives, and Special Connectives.

Key Words	A word which must be present in a COBOL entry in the form of a COBOL statement. Key words are in upper case.
-----------	--

The three types of key words are:

- C Verbs such as MOVE, ADD, READ, etc.
- C Required words which appear in COBOL statements, such as the word TO. (i.e. ADD A TO B, MOVE B TO C, etc.)
- C Words which have a specific functional meaning such as NUMERIC, NEGATIVE, and Figurative Constants.

Optional Words	Upper case words in a COBOL statement that are not underlined. The presence or absence of an optional word in a COBOL statement does not alter the meaning of the statement.
----------------	--

For example:

ACCESS MODE IS - `MODE' AND `IS' are optional words

Connectives	Three types of connectives are used in a COBOL program: Qualifier Connectives, Series Connectives, and Logical Connectives
-------------	--

C Qualifier Connectives are used to associate a data-name or paragraph-name with its qualifier.

! OF and IN are qualifier connectives.

C Series Connectives are used to link two or more operands.

! A comma (,) is a series connective.

C Logical Connectives are used in compound conditions.

! AND, OR, AND NOT, and OR NOT are logical connectives.

Special Registers	Special Registers are commonly used predefined words in COBOL programs.
-------------------	---

For example:

RETURN-CODE, SORT-RETURN, CURRENT-DATE, and TALLY are special registers.

8.2 Constants

A constant is a unit of data whose value is not subject to change. COBOL provides for two types of constants.

Figurative Constants

A figurative constant is a constant to which a special value and data-name have been assigned. The name of a figurative constant is a reserved word.

The COBOL figurative constants and their meanings are listed below:

Character	Meaning
ZERO	Represents the value 0, or one or more occurrences of the character 0
ZEROS	
ZEROES	
SPACE	Represents one or more blanks
SPACES	
HIGH-VALUE	Represents one or more occurrences of the character that has the highest value in the computer's collating sequence
HIGH-VALUES	
LOW-VALUE	Represents one or more occurrences of the character that has the lowest value in the computer's collating sequence
LOW-VALUES	
QUOTE	Represents one or more occurrences of the quotation mark character - must be nonnumeric
QUOTES	

8.3 Literals

A literal is a string of characters whose value is determined by the set of its characters. A literal will be numeric or nonnumeric.

There are two types of numeric literals.

C Fixed-point numeric literal:

A string of digits chosen from the characters 0 thru 9, the plus or minus sign, and the decimal point.

This type of literal must not contain more than 18 digits, more than one decimal point, or more than one sign.

C Floating-point numeric literal:

A data item whose potential range of values is too large for fixed-point representation.

A floating-point is represented in the following format:

(+ or -) mantissa E (+ or -) exponent

Nonnumeric Literals

A nonnumeric literal is defined as a string of allowable characters in the Extended Binary Coded Decimal Interchange (EBCDIC) set, excluding the quotation mark.

A nonnumeric literal must be enclosed in quotation marks and can be 120 characters or less in length.

9 COBOL Names

There are three types of names used in a COBOL program.

Data Name

A word which contains at least one alphabetic character and identifies a data item in the data division.

The following names are formed according to the rules for data names:

- C File names
- C Index names
- C Record names
- C Report names
- C Sort file names
- C Sort record names

Condition Name

A value or a set of values that a particular data item may assume. The data item itself is called a condition variable. The condition name must contain at least one alphabetic character.

Procedure Name

Either a paragraph name or a section name. A procedure name may be composed solely of numeric characters.