INFORMATION PROCESSING
AND
COMPUTER PROGRAMMING
AN INTRODUCTION

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PREFACE

Information Processing and Computer Programming: An Introduction— a simply stated but authoritative text, has been specifically oriented with the beginning student in mind. The major concentration of study is directed toward the logic and principles of computers and the use of computers. These concepts are introduced with an actual machine language program, and their relationship with various aspects of computers, including modern data processing devices and programming languages, is presented in a progressive manner. The beginning student's first experience in information processing and computer programming should be both an interesting and rewarding one. To this end the text is designed to permit the student to actively participate in the learning communications. The student involvement study supplement at the end of each chapter is intended to give the student an opportunity to learn by doing, with practical problems, the lessons presented in each chapter. A good understanding of the fundamental principles, as they are presented in each chapter, will insure the student's comprehension of the more complex modern data processing systems and languages.

Chapters 1–3 introduce the student to a brief history of data processing, the need for data processing presented in terms of everyday business applications, and the media and languages used to collect and store the vast amounts of data needed to provide management with decision-making information.

Chapters 4–6 are designed to give the student an early appreciation of the nature of problem solving using available planning aids, good forms design concepts, and effective data organization prior to learning the details of the computer devices used.

Chapter 7 introduces the student to the basic fundamentals of numbering systems used with computing devices.

Chapters 8 and 9 provide the beginning student with the details of flowcharting, program writing and machine operations using an actual business problem. The problem solution is presented in actual or native maching language coding, together with a brief history of the development of symbolic programming systems.

Chapter 10 presents machine- and problem-oriented languages in three separate sections. Section A contains a limited instruction set of IBM System/360 Assembler Language, Section B a limited instruction set of FORTRAN IV, and Section C a limited instruction set of BASIC. Each section is self-supporting with a detailed explanation of every programmed statement for the language presented, a solution illustration, and a study supplement. This method of presentation will permit the instructor or student in a self-study situation to select one, all, or any combination of languages most suited to a particular need.

Chapters 11 and 12 present and describe the latest developments in data processing devices, systems, and programming languages.

Chapters 13 and 14 introduce the student to data communications devices and techniques, source data automation, remote data processing, and time-sharing networks.

Chapter 15 familiarizes the student with advance techniques used by business management to solve the more complex business and industrial problems.

Chapter 16 provides a brief overview of the organization and management of data processing departments.

The Case Study Problem Statement is introduced early in Chapter 4. This permits the student to work the solutions for the same problem as he progresses through each chapter of the text and to visualize in an orderly fashion the relationship of each step in the solution.

All computer concepts, programming illustrations, and study problems are IBM System/360 oriented.

Since the exact sequence of the introduction of unit record machines may vary, the unit record machines have been presented in an appendix so that they may be introduced in whole or in part at any point desired. Appendices A, B, and C introduce the IBM 80-column, UNIVAC 80-column, and IBM 96-column punch card machines.

The glossary at the end of each chapter is included to further fortify the student's knowledge of the terms used in the chapter.

The author expresses his appreciation to the manufacturers who provided information and illustrations used in the text. Specific credit is included with illustrations wherever appropriate.

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CONTENTS

1 DATA PROCESSING DEFINED

INTRODUCTION

The functions of and the need for recordkeeping can be traced historically to a point when man first took possession of property. This property reflected his status within the community. Each time a citizen joined a new community, he would bring with him all his worldly possessions. In order to account for his share of the community wealth, the community leader would furnish him with some medium of exchange (pebbles, sea shells, sticks, or coins) to represent his share of the community holdings. The act of determining the amount and size of the medium of exchange to which the citizen was entitled constitutes the origination of data. Data as used here is a general term to denote any or all facts, numbers, letters, or symbols that refer to or describe an object, idea, condition, or situation. The selection of a medium and the determination that the medium was accepted as a means of accounting constitutes the act of recording. Accounting is the theory or system of keeping, analyzing, and interpreting business facts. When the citizen accepted the medium and placed it with his other possessions, he was in effect storing data. When it was necessary to portray his wealth, he would display his medium of exchange according to size and number. This process represents the act of arranging or sorting. Presenting his display to other citizens represents the act of reporting or communicating.

This chapter presents a preliminary overview of the functions and devices used in the processing of data. With this preliminary background as a beginning, subsequent chapters as they relate to the data processing need should become more meaningful.

DATA VERSUS INFORMATION

At this point a distinction between the terms "data" and "information" should be made. The term "data" is generally used to define letters, numbers, symbols, or pieces of knowledge which, when used alone, do not become useful to management. However, when combined with other letters, numbers, symbols, or pieces of knowledge, the results become information. Information, then, is the result of processing or combining data. This is accomplished in such a way as to produce meaningful management information. For example, in a payroll application, the employee's hours worked as it stands alone is considered to be data. When the employee's hourly rate is multiplied by the employee's hours worked, the result, net pay, is considered to be useful management information in the payroll register. It is important to note that such a fine distinction between these two terms cannot always be made. For instance, in the foregoing example, if the hours worked were used in a purely labor distribution application, hours worked could have been considered to qualify under the definition of information.

DATA PROCESSING CYCLE

Not unlike the functions performed in the early citizen's data processing system, our modern day data processing systems are composed of a data processing cycle (Figure 1-1). The data processing cycle is composed of the following steps.

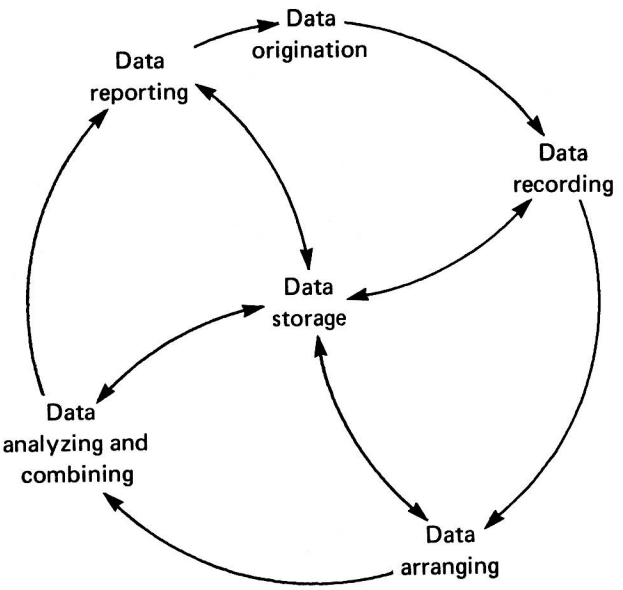

FIGURE 1-1. Data processing cycle.

Data Origination

Before data can be recorded or entered into a data processing system, the data must be originated or created. Most data is originated by the use of source documents on which data is first recorded in the business organization. As a general rule, source data is handwritten, typed, or printed on a business form (Figure 1-2).

Data Recording

While data written on business forms is in fact recorded by some means (usually by pencil or typewriter), the term "data recording," when used with reference to electromechanical or electronic devices, is the act of recording the data in some machine-readable form. This would include punch cards, paper tape, magnetic tape, as well as other types of recording media. Punched cards, paper tape, and magnetic tape as a recording media will be presented in detail in a later chapter. The term "media" is used to denote the material or configuration on which data are recorded. The act of data origination and recording could be combined. The use of such tools as the Port-a-Punch permits the origination and recording of data at the same time (Figure 1-3).

Data Arranging

Most data is not recorded in the same sequence in which it is to be stored and/or used in the preparation of reports. Data therefore must be rearranged into an acceptable sequence (Figure 1-4, see p. 4).

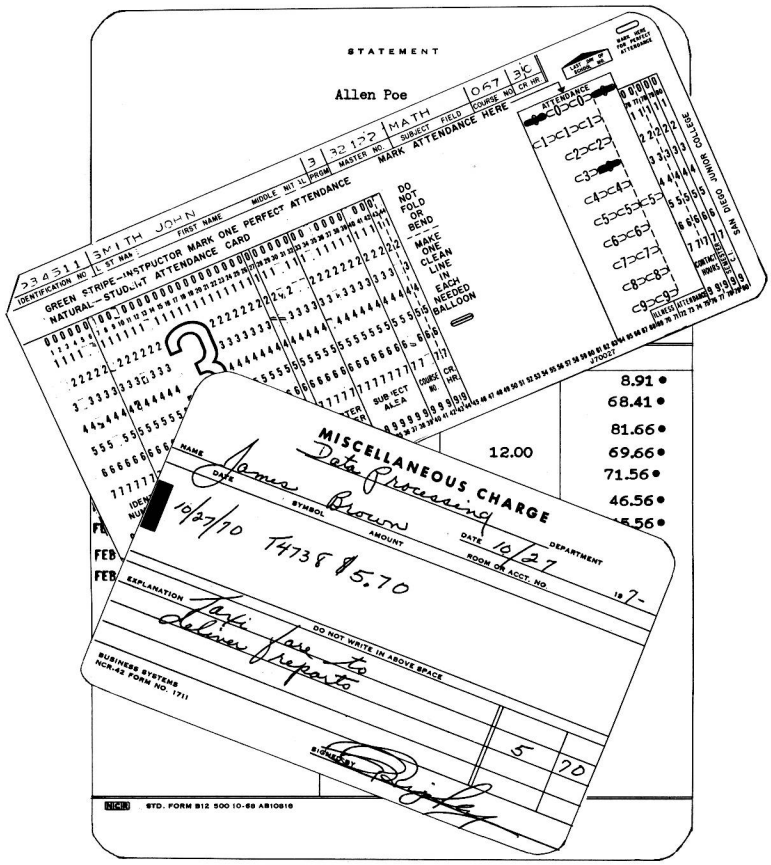

FIGURE 1-2. Various business forms on which data may be recorded in a business organization.

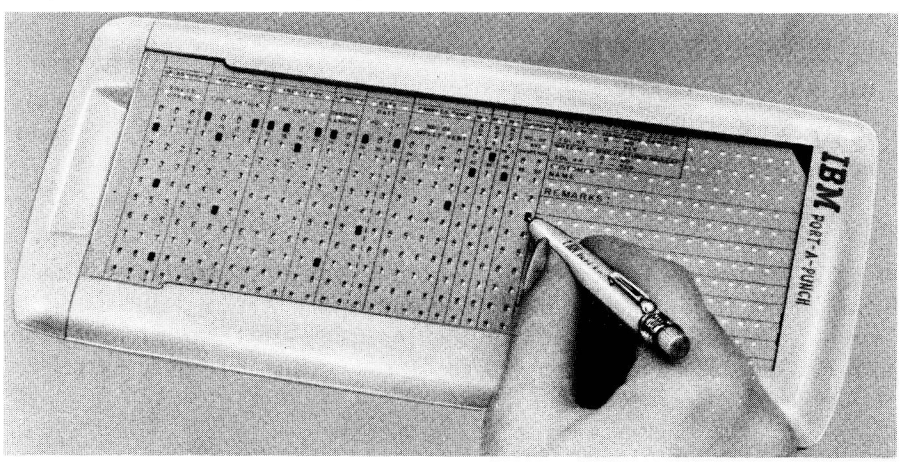

FIGURE 1-3. IBM Port-A-Punch. Prescored punch cards can be inserted into the holder and punched out with a stylus. (Courtesy International Business Machines Corporation.)