

Study Guide to Accompany
COMPUTERS AND DATA PROCESSING
Concepts and Applications

STEVEN L. MANDELL

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**COMPUTERS AND
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Concepts and
Applications

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INTRODUCTION

This study guide has been designed to accompany *Computers and Data Processing: Concepts and Applications*, published by West Publishing Company. Throughout its development, emphasis has been placed on providing a vehicle that can assist the student in learning the text material. No design will ever take the place of conscientious student effort; however, the approaches incorporated within this study guide will make the task less difficult.

The structure of the study guide parallels the textbook. Within each chapter the student will encounter distinct segments. A list of KEY TERMS with definitions is provided at the beginning to orient the student toward the important concepts covered in the text. A series of multiple choice questions with explanatory answers has been formatted into a STRUCTURED LEARNING environment. Utilizing this technique, the student can "walk through" the material in a progressive fashion. TRUE/FALSE and MATCHING questions permit the student to obtain immediate feedback on comprehension. SHORT ANSWER exercises provide the student with an opportunity to express an understanding of the material. The even-numbered problem solutions are presented in the ANSWER KEY so that the student can evaluate and diagnose progress.

The appendix to the study guide is designed to support the BASIC programming appendix found in an optional version of the text. The section structure also parallels the text material; however, a slightly different format is utilized. A scaled-down version of STRUCTURED LEARNING is presented initially as a review mechanism. A WORKSHEET is then provided for the student to apply programming concepts and techniques. Two PROGRAMMING PROBLEMS are presented as the ultimate evaluation exercise for each section. Once again the even-numbered problem solutions are incorporated into an ANSWER KEY.

Good luck!

Steven L. Mandell

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INTRODUCTION TO DATA PROCESSING

KEY TERMS

Automatic data processing (ADP) - The collection, manipulation, and dissemination of data by electromechanical machines to attain specified objectives.

Computer - A general-purpose machine with applications limited only by the creativity of the humans who use it; its power is derived from its speed, accuracy, and memory.

Data - A fact; the raw material of information.

Data processing - A systematic set of techniques for collecting, manipulating, and disseminating data to achieve specified objectives.

Field - A meaningful item of data, such as a social security number.

File - A grouping of related records; sometimes referred to as a data set.

Garbage in--garbage out (GIGO) - A phrase used to exemplify the fact that the meaningfulness of data-processing results relies on the accuracy and/or relevancy of the data fed to the processor.

Information - Data that has been organized and processed so that it is meaningful.

Input - Data that is submitted to the computer for processing.

Next-sequential-instruction feature - The ability of a computer to execute program steps in the order in which they are stored in memory unless branching takes place.

Non-destructive read, destructive write - The feature of computer memory that permits data to be read and retained in its original state, allowing it to be referenced repeatedly during processing.

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Output - Information that comes from the computer as a result of processing.

Program - A series of step-by-step instructions that provides a problem solution and tells the computer exactly what to do; of two types--applications and system.

Record - A collection of data items, or fields, that relate to a single unit.

Storage - The part of a computer that provides the ability to recall information; memory.

Stored program - Instructions stored in the computer's memory in electronic form; can be executed repeatedly during processing.

STRUCTURED LEARNING

1. The computer can perform all of the following except
 - a. add, subtract, multiply, divide
 - b. exercise independent intelligence to solve problems
 - c. compare numeric and alphabetic characters
 - d. store and retrieve information

* * * * *

(b) Computers can perform only the instructions supplied by a programmer; their IQ is zero. Although artificial intelligence is being developed, it has not been implemented on the computer.

2. Computers derive most of their power from
 - a. speed
 - b. accuracy
 - c. memory
 - d. all of the above

* * * * *

(d) Computers perform only those activities that a human is capable of performing; however, the speed and accuracy of the operations and the virtually unlimited recall of data make the computer an effective tool.

3. A nanosecond is equivalent to
 - a. 1/1,000 of a second (thousandth)
 - b. 1/1,000,000 of a second (millionth)
 - c. 1/1,000,000,000 of a second (billionth)
 - d. 1/1,000,000,000,000 of a second (trillionth)

* * * * *

(c) Computers perform calculations at an amazing speed. Their speed is measured in nanoseconds--one nanosecond being one billionth of a second.

4. All of the following steps are involved in data processing except
- | | |
|-------------|------------|
| a. classify | c. store |
| b. sort | d. extract |

* * * * *

(d) Data-processing operations include all of the above except extract. The sort operation could be used to extract or organize data as necessary.

5. Which of the following represents the arrangement of data items from the most simple element to the most complex?
- | |
|-----------------------------------|
| a. field, file, record, data base |
| b. field, record, file, data base |
| c. file, field, record, data base |
| d. data base, record, field, file |

* * * * *

(b) Understanding these terms is important since they are the building blocks for all data processing. The careful structuring of data elements leads to efficient processing and effective decision-making.

6. In the health-care field, computers are used for
- | | |
|-----------------------|----------------------------------|
| a. patient monitoring | c. maintaining medical histories |
| b. medical diagnosis | d. all of the above |

* * * * *

(d) The health-care field is one example of the many practical applications of computers. Human imagination seems to be the only limitation on their use.

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7. A file is
- a. a meaningful item of data
 - b. a grouping of related records
 - c. data that has been organized and processed so that it becomes meaningful
 - d. a collection of data items that relate to a single unit

* * * * *

(b) Records pertaining to a common application form a file.
File manipulation is an important procedure in data processing.

8. The stored-program concept refers to
- a. wired control panels that are plugged into the computer at the beginning of a job
 - b. instructions that are read into the computer using punched cards in discrete steps as the job progresses
 - c. using the internal memory of the computer to store both data and the set of instructions required to manipulate that data
 - d. maintaining programs in an archival file in case they are needed in the future

* * * * *

(c) The stored-program concept was crucial to the development of the computer. The ability to store both instructions and data in the computer's internal memory expanded its applicability.

9. The principle by which items stored in main memory can be read as many times as necessary is known as
- a. next-sequential-instruction feature
 - b. stored program
 - c. permanent memory
 - d. non-destructive read, destructive write

* * * * *

(d) Non-destructive read, destructive write means that instructions or data can be read as many times as necessary; but when data is written on top of the instructions, the previous contents are destroyed.

10. Which of the following is *not* true of computers?
- a. They are extremely well-suited for applications that are well-defined, repetitive, and involve a large number of records.
 - b. The cost and size of computers is steadily decreasing.
 - c. It is much like any other tool used by humans, i.e., it improves problem-solving capabilities and the capacity to handle complex relationships.
 - d. They exert a minimal impact on the daily lives of individuals.

* * * * *

(d) Computers are pervasive in society today. Utility bills, credit cards, and even supermarket registers are rapidly becoming computerized.

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TRUE/FALSE

1. T F Error-free computation by computers is possible because of the incorporation of internal, self-checking electronic features in the design of the computer circuits.
2. T F The use of electromechanical machines to perform procedures formerly executed manually is referred to as data processing.
3. T F The objective of data processing is to convert raw data into meaningful information for use in decision-making.
4. T F Keeping processed data for future reference is called summarizing.
5. T F The ability of the computer to process the same data over and over again is referred to as non-destructive write, destructive read.
6. T F A set of instructions that is placed into a computer's memory is a stored program.
7. T F During the past twenty years, both the size and cost of computers have undergone a substantial reduction.
8. T F Computer-assisted student instruction is possible through direct interaction between the computer and the student.
9. T F When computers came into common use, the term automatic data processing was used to describe the data-processing activities of the firm.
10. T F The arithmetic and/or logical manipulation of data is referred to as calculating.

MATCHING

- | | |
|--|----------------------------|
| 1. The constancy of computer-generated results is referred to as ____. | a. sort |
| 2. The generation of incorrect data or programs resulting in invalid output is called ____. | b. record |
| 3. The part of the computer where data is stored is the computer's ____. | c. output |
| 4. Raw facts that have been collected from different sources but do not allow meaningful conclusions without some processing are ____. | d. data |
| 5. The basic flow pattern of all data processing is ____. | e. garbage in--garbage out |
| | f. general-purpose |
| | g. accuracy |

6. A computer procedure that arranges data elements into a predetermined sequence to facilitate processing is _____.
 - h. memory
 - i. input, processing, output
 - j. program
7. A collection of individual data items that relate to a single unit is called _____.
8. A series of instructions to direct the computer in performing a given task is _____.
9. Since most computers can be used for many purposes, they are referred to as _____ machines.
10. Information generated by a computer as a result of processing is called _____.

SHORT ANSWER

1. What are the three basic functions that a computer can perform and why are they important?
2. What are the two factors controlling the speed of a computer?
3. Explain what is meant by "garbage in--garbage out."
4. What is the objective of all data processing--manual, automatic, or electronic?
5. Briefly explain the difference between data and information.

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6. How has the development of the stored-program concept expanded the applicability of computers?
7. What is meant by the next-sequential-instruction feature?
8. What is meant by electronic data processing?
9. Describe the basic pattern of all computer processing.
10. Why is the computer referred to as a general-purpose machine?

ANSWER KEY

True/False

2. F 4. F 6. T 8. T 10. T

Matching

2. e 4. d 6. a 8. j 10. c

Short Answer

2. The switching speed of the electronic circuits that make up the computer and the distance that the current has to travel control the computer's speed.

4. The objective is to convert raw data into information that can be used in the decision-making process.
6. Prior to the introduction of the stored program, the use of the computer was as problematical as manual procedures, requiring essentially the same amount of time and considerably more expertise. The use of the stored program has made computers a valuable tool for data processing in situations where the same instructions must be repeated many times.
8. EDP is data processing that is performed largely by electronic equipment such as computers.
10. The computer is said to be a general-purpose machine because it has a virtually unlimited range of functions or problems to which it can be applied.

EVOLUTION OF COMPUTERS

KEY TERMS

Accounting machine - Forerunner of the computer; could mechanically read data from punched cards, perform calculations, re-arrange data, and print results in varied formats.

Difference engine - A machine developed by Charles Babbage in 1822; used to compute mathematical tables with results up to five significant digits in length.

EDSAC - Electronic Delay-Storage Automatic Computer; the first "stored-program computer."

ENIAC - Electronical Numerical Integrator and Calculator; the first "electronic digital computer."

First-generation computer - Used vacuum tubes; developed in the 1950s; much faster than earlier mechanical devices, but very slow in comparison to today's computers.

Machine language - The only set of instructions that a computer can execute directly; a code that designates the proper electrical states in the computer as combinations of 0s and 1s.

Magnetic core - An iron-alloy doughnut-shaped ring about the size of a pin head of which memory is commonly composed; an individual core can store one binary digit (its state is determined by the direction of an electrical current).

Magnetic disk - A storage medium consisting of a metal platter coated on both sides with a magnetic recording material upon which data is stored in the form of magnetized spots; suitable for direct-access processing.

Magnetic drum - A cylinder with a magnetic outer surface on which data can be stored by magnetizing specific portions of the surface.