A Programming Language, by Kenneth E. Iverson. John Wiley and Sons, Inc., 1962.

The author has developed a language, resembling mathematical notation, which at the same time embodies the notion of a flowchart. Thus the language is suitable for describing algorithms and is essentially a programming language.

The aim of the author apparently was to establish a notation, with sufficient scope and flexibility, capable of describing the large variety of processes which occur in computer related areas. The language includes the usual set theoretic, logic, and matrix-vector operations, but in addition includes many special operations peculiar to programming problems (masking, for example), as well as file and tree operations. The operands of the language are literals or variables, (both either alphabetic or numeric), or structured operands, namely vectors, matrices, files, and trees. The latter have associated with them certain structural parameters such as the dimension of a vector or the leaf count of a tree. The first chapter explains the language and describes the various operations. A summary of the notation is included in the appendix for easy reference.

In the remaining chapters the language is applied to various types of problems. The applications are selected not only for their intrinsic interest but also for their ability to demonstrate the universality of the language. This is most readily seen from a list of chapter headings:

Chapter 2. Microprogramming
3. Representation of variables
4. Search Techniques
5. Metaprograms
6. Sorting
7. Logical Calculus.

In the chapter on microprogramming, the language is used to define the IBM 7090 instruction set. As a result, in the design and development of a computer, the language may form a means of precise communication between the computer programmer, the system designer, and the hardware designer.

A metaprogram is one in which the domain is a set of programs. If the range is also a set of programs, the metaprogram is in fact a translator. In this chapter, particular attention is given to formula evaluation procedures, translation from a complete parenthesis notation to Lukasiewicz notation, and vice versa.

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Among the applications, the chapter on sorting is by far the longest. First serial sorting methods are described and evaluated. Then various internal sorting methods are discussed and compared with regard to scan length, number of stages, number of transpositions, and storage requirements.

The material in the book was developed to a large extent in a graduate course at Harvard, and should be of interest to anyone studying general programming languages. Numerous problems are included to provide the necessary "finger exercises" and at the same time stimulate interest in programming techniques. The practical usefulness of the language appears limited since in its present form, it cannot be implemented on a computer.

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Ordinary Differential Equations, by Garrett Birkhoff and Gian-Carlo Roba. Ginn and Co., Boston, 1962. viii + 318 pages. $8.50.

Differential Equations, by H. S. Bear. Addison-Wesley, Reading, Mass., 1962. viii + 207 pages. $7.50.

Differential Equations, by C. W. Leininger. Harper, New York, 1962. x + 271 pages. $6.00.

These three new texts on ordinary differential equations typify three levels of approach to this subject, those of the mathematician, the applied mathematician, and the engineer, respectively. Thus Birkhoff and Rota begin their preface by stating "the theory of differential equations is distinguished for the wealth of its ideas and methods", and in the course of their book fully justify this ambitious and scholarly remark. Bear, however, "has given more than the usual emphasis to the mathematical explanations, in the conviction that there is little value in learning techniques by rote", and finally, Leninger asserts "that very few (texts) seem to be written for the student whose preparation is limited to the usual beginning course in engineering calculus".

An outstanding feature of Birkhoff and Rota is the great variety and diversity of the material treated, together with the brevity, lucidity, and simplicity with which the leading mathematical ideas are presented. A highly civilized combination of rigour and thoroughness with informality has been achieved. As the authors state at the outset, they have preferred to sacrifice superficial generality rather than breadth. Since the subject lends itself well to the development of many extensions of theorems by means of exercises, this is sound