BUILDING UP MATHEMATICS

Secondary Education

Second Year Humanities Section

Center for Educational Research and Development

National Textbook

New Curricula

Republic of Lebanon

Ministry of National Education, Youth and Sports

SPECIMEN

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The National Textbook Project

This is the second installment of textbooks completed by the Center as part of a three-stage effort to produce the books called for by the New Curricula. We are placing these books in the hands of students with the great hope that we are moving, step by step, toward the goal of acquiring sound and modern learning, using sophisticated educational means and up-to-date methodology that encourage and reinforce individual thinking and research, the acquisition of skills, the development of ethical and national attitudes, the feeling of national belonging as well as the feeling of belonging to humanity at large.

The on-going revolution in information, communication and educational technology has undoubtedly limited the role of the textbook and lowered the rank it used so recently to occupy. However, in our society and in many other societies, the textbook remains the basic means of education, and it is our duty to exert our utmost effort and care to come up with the best product as to form and content. Yet we should not lose sight of the fact that the textbook is not sufficient by itself but should rather be used as a stepping stone to access other sources of information. What is important is to keep a clear vision and maintain the right course toward our objective. The means should not turn into the end and the student should always remain the focus of the learning/teaching process.

No one ignores or denies the fact that textbook writing requires very high academic and educational qualifications and very wide field experience. The authors committees undeniably possess such qualifications and qualities, yet last year's textbooks did contain some faults and gaps which were duly pointed out by researchers in many articles, and, indeed, we have benefited from some of them. Such is the nature of human work, no matter how good the intentions or how great the effort exerted.

Constructive criticism is a real contribution to raising the standard of authorship, minimizing errors and filling gaps. We only hope that criticism will always be objective and motivated by a desire to enhance educational reform in order to achieve better products.

A favorite adage handed down from our old scholars: "He who criticizes you is as helpful as a co-author". Let all criticism directed at the Center be of this caliber.

In closing, we hope that we all will have benefited from our experience and that the textbooks of the third and final stage be closer to realizing our hopes and more beneficial to our students. We are now preparing ourselves to assess the parts so far achieved of the new curricula and to assure that our educational movement is proceeding on the right track for achieving the best results.

June 2, 1999

President, National Center for Educational Research and Development

Nemer FRAYHA

PREFACE

This book is an appealing and user-friendly mathematics handbook aimed at students in the second year of secondary education in the humanities section.

We set out on this project with the conviction that mathematics is, nowadays, essential to everyone in his or her social and professional lives. The wide range of activities demonstrates, on one hand, the diversity of knowledge required and on the other the methodology to acquire it. The topics of the official curriculum are addressed to meet the needs of the students. Instead of theoretical study of the classical notions of mathematics such as equations, derivatives, primitives, graphs, and so on, we have adopted a practical approach stressing on the application of these notions in specific areas particularly socioeconomic.

Clearly laid out probabilities are the first step of this new approach. They are taught as simply as possible as this area of mathematics, along with statistics, plays an increasingly important role in today's economic and social lives.

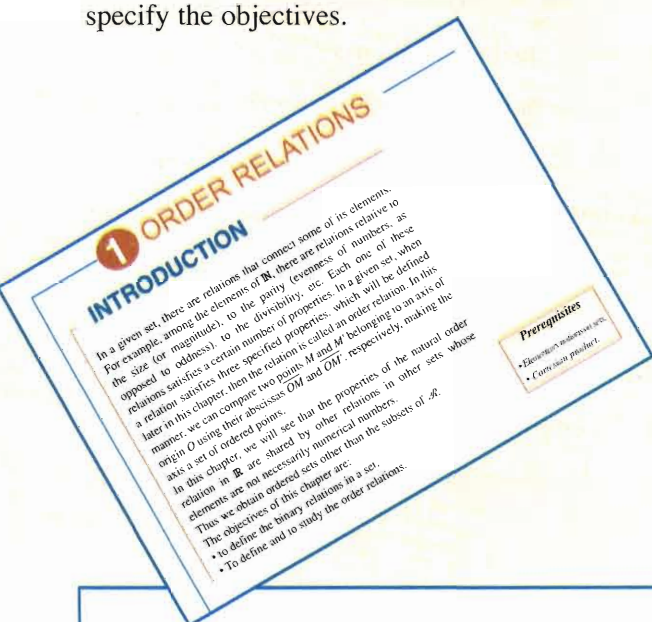
In this book, we aim to present mathematics following methodologies designed for it and adapted to it. We hope to motivate the students and to encourage them to find their own way in the world of mathematical notions and concepts so they can discover and benefit from their own mastery of these essential life skills.

The authors

USING THIS BOOK

I. INTRODUCTION

Before executing a job, we should have a clear idea about it. We have to define and specify the objectives.


1 ORDER RELATIONS

INTRODUCTION

In a given set, there are relations that connect some of its elements. For example, among the elements of $\mathbb{N}$, there are relations relative to the size (or magnitude), to the parity (evenness of numbers, as opposed to oddness), to the divisibility, etc. Each one of these relations satisfies a certain number of properties. In a given set, when a relation satisfies three specified properties, which will be defined later in this chapter, then the relation is called an order relation. In this manner, we can compare two points M and M' belonging to an axis of origin O using their abscissas $\overline{OM}$ and $\overline{OM'}$, respectively, making the axis a set of ordered points.

In this chapter, we will see that the properties of the natural order relation in $\mathbb{R}$ are shared by other relations in other sets whose elements are not necessarily numerical numbers.

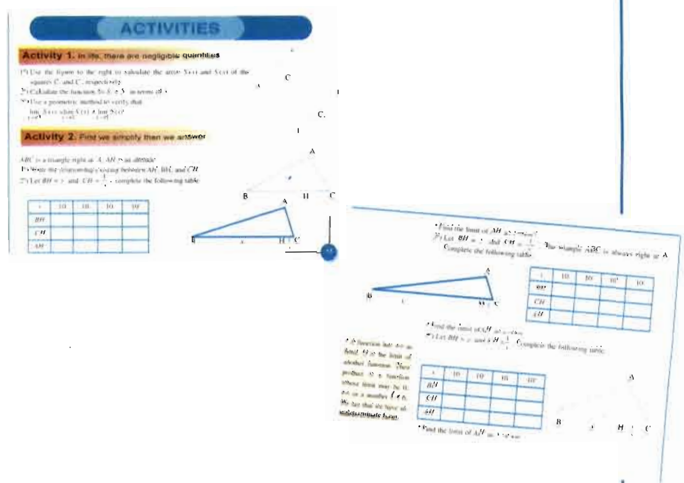
Thus we obtain ordered sets other than the subsets of $\mathbb{R}$.

The objectives of this chapter are:
• to define the binary relations in a set.
• To define and to study the order relations.

Prerequisites
• Cartesian product.

II. ACTIVITIES

A field where we have to use acquired knowledge, strengthen the capacity to acquire more, and prepare for additional work.

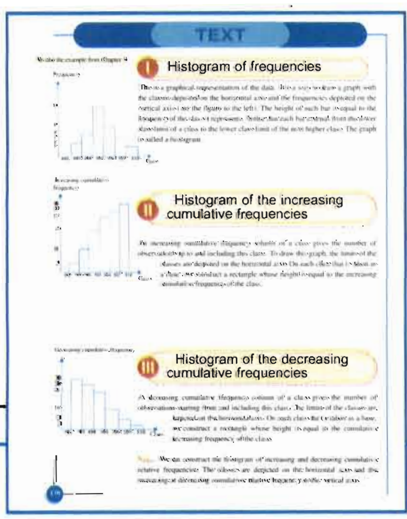

ACTIVITIES

Activity 1. In life, there are negligible quantities

Activity 2. First we simplify then we answer

III. TEXT

Where we find appropriate answers to solve problems. The fruitful relationship between the practice and the conclusions that we make help us become more efficient.


TEXT

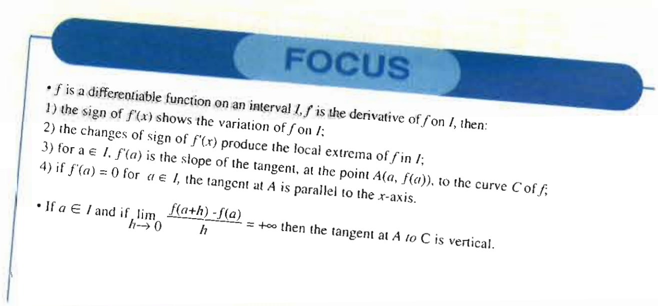
I Histogram of frequencies

II Histogram of the increasing cumulative frequencies

III Histogram of the decreasing cumulative frequencies

IV. FOCUS

A summary of the procedure and the tools necessary to accomplish the work.

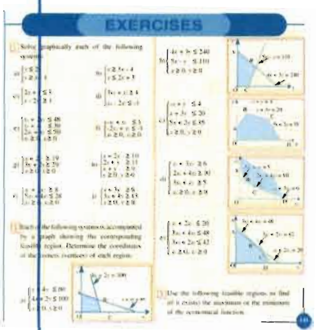

FOCUS

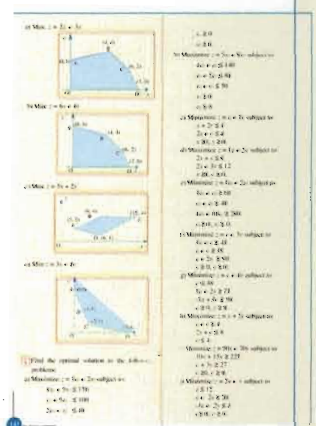
• f is a differentiable function on an interval I, f' is the derivative of f on I, then:
1) the sign of $f'(x)$ shows the variation of f on I;
2) the changes of sign of $f'(x)$ produce the local extrema of f in I;
3) for $a \in I$, $f'(a)$ is the slope of the tangent, at the point $A(a, f(a))$, to the curve C of f;
4) if $f'(a) = 0$ for $a \in I$, the tangent at A is parallel to the x-axis.

• If $a \in I$ and if $\lim_{h \to 0} \frac{f(a+h) - f(a)}{h} = +\infty$ then the tangent at A to C is vertical.

V. EXERCISES

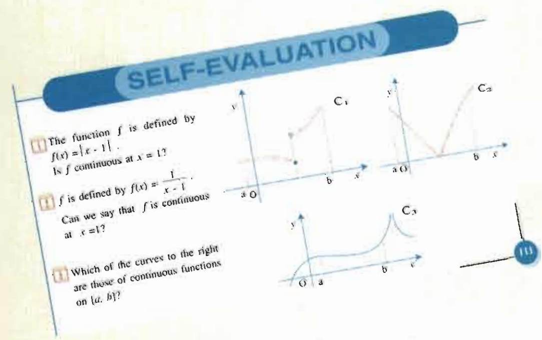
Everything is incorporated to ensure success.





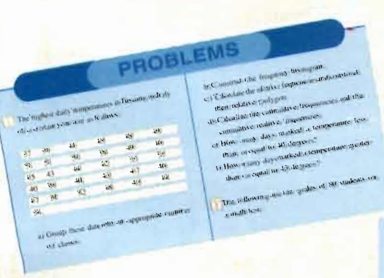
VI. SELF-EVALUATION

It is often necessary to take decisions alone and assume responsibility. At school and at work, one needs to face the truth and reality.



VII. PROBLEMS

To solve problems, we should rely on our analytical and synthesizing capacities. Furthermore, we should use different tools and strategies to succeed.



VIII. JUST FOR FUN

There are subjects that are attractive to some people and not to others.
Our objective is to make mathematics enthralling, interesting, and fascinating.