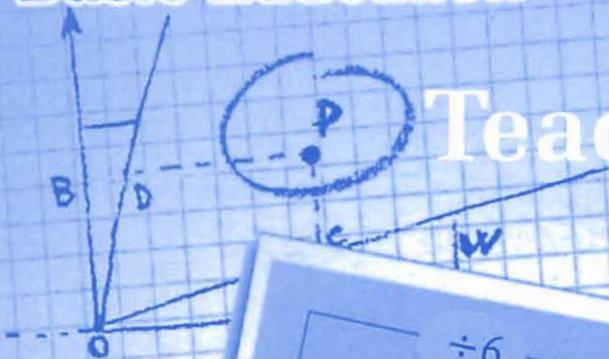


Building up Mathematics

Basic Education

6th Grade

Teacher's Guide



National
Textbook

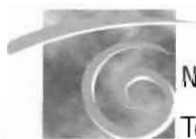
NEW CURRICULA

Republic of Lebanon
Ministry of Education and Higher Education

■
**BUILDING UP
MATHEMATICS**
Teacher's Guide ■

Basic Education
Grade six

Educational Center for Research and development






National
Textbook

New Curricula



General Coordinator
Victor MELHEM

Language Reader
Ahmad Oweini ■



BUILDING UP MATHEMATICS


Teacher's Guide

Basic Education
Grade Six

Habib Abou Nader (Coordinator)
Saria Majzoub Daher

Kassem Beydoun
Maurice Charbel
Mirna Melhem
Nada Moubarak Feghali

Educational Center for Research and development

■ **Documentary Research :** Iconographic Team, ECRD
■ **Publishing and Distribution :**  **Educational Company**
for Printing, Publishing and Distribution S.A.R.L.
Layout : Technical Team, LEPC s.a.l.
Impression: Dar Lubnan

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First Published 2000
3rd Printing 2009

The National Textbook Project

By issuing the textbooks for the third year of each educational cycle, the Educational Center for Research and Development will have completed the third and last installment of 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 learning, using sophisticated educational means and up-to-date methodology that encourage and reinforce individual thinking and research, acquisition of skills, 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-aids 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 qualities. Yet the textbooks of the last two years contained some negative aspects. Such is the nature of human work, no matter how good the intentions or how great the effort extended. Here constructive criticism constitutes a real contribution to raising the standard of authorship, minimizing errors and filling gaps. We say that, with all due appreciation and respect to all those who have contributed to the success of this project.

The Educational Center for Research and Development is embarking this year on a process of evaluating the New Curricula and related textbooks, teacher training courses and student achievement. This is a natural and necessary step now that the new system has been put into effect. This process aims at identifying the curricular objectives that have been achieved as well as those that have not been achieved, with a view to proceeding with the positive aspects and correcting the negative ones.

As part of this correction process, we plan to review the versions that have been issued in order to secure good textbooks for our students, who always deserve the best.

March 13, 2000

**President, Educational Center for
Research and Development**

Nemer FRAYHA

Introduction

This book was designed to meet the needs of the sixth grade in basic education. Its purpose is to respond to the spirit of the new curriculum prescribed the decree No. 10227 of 8 March 1997, and to complement the series entitled "Building up mathematics" for the second stage in basic education.

Deriving its goals from educational research work based on formative and mathematical epistemology, the curriculum requires a particular teaching method that develops in the students a sense of initiative and freedom.

The method challenges the students with actual problems taken from real life and the environment urging them to conjecture, experiment and verify different solutions so as to gradually arrive at approaches that will later enable them to build their own models, as personal early initiatives of genuine mathematical models.

The activities presented in the various chapters constitute actual challenges to be met by the students. Students should address those challenges with independence and a sense of freedom in dealing with various data and premises so as to develop their skills and their ability to express themselves and to communicate.

In order for the objectives set out at the beginning of each chapters, to be achieved, it is hoped that those who will use book as a teaching tool will observe to the following:

1. The order and sequence of the lessons;
2. The methodological structure of each lesson... "Getting familiar with my book".
3. The guidelines presented in the Teacher's manual.

Critical comments, inquiries and suggestions by users of the book are welcome and will be given the utmost attention.

The authors

PROGRAM OF SIXTH YEAR

ARITHMETIC AND ALGEBRA (110 h)

1. NATURAL INTEGERS (15 h)

- 1.1. Expanding a natural integer according to the powers of 10
- 1.2. G.C.F. and L.C.M. of two natural integers
- 1.3. Relatively prime numbers

2. FRACTIONS (10 h)

- 2.1. Irreducible fractions
- 2.2. Decimal fractions

3. DECIMALS (10 h)

- 3.1. Fractional writing of a decimal number.
- 3.2. Expanding a decimal number according to the powers of 10 and of $\frac{1}{10}$

4. INTEGERS (15 h)

- 4.1. Positive and negative numbers
- 4.2. Representation on the numerical axis
- 4.3. Comparison

5. ADDITION (5 h)

Addition of integers

6. SUBTRACTION (5 h)

Subtraction of integers

7. MULTIPLICATION (10 h)

- 7.1. Multiplication of fractions
- 7.2. Powers of exponents 2 and 3
- 7.3. Powers of 10

8. DIVISION (10 h)

- 8.1. Division of fractions
- 8.2. Quotient and ratio
- 8.3. Division of duration by a whole number

9. PROPORTIONALITY (20 h)

- 9.1. Percentage. Rates
- 9.2. Proportional sequences
- 9.3. Scale

10. ALGEBRAIC EXPRESSIONS (10 h)

- 10.1. Order of operations
- 10.2. Calculation on literal expressions
- 10.3. Numerical value of a literal expression

GEOMETRY (25 h)

1. LOCATION (2 h)

- 1.1. Relative positions of two straight lines in a plane
- 1.2. Relative positions of a straight line and a circle

2. SOLID FIGURES (3 h)

Patterns of solids

3. PLANE FIGURES (10 h)

- 3.1. Adjacent angles, vertically opposite angles
- 3.2. Bisector of an angle
- 3.3. Perpendicular bisector of a segment
- 3.4. Triangle: particular triangles; particular straight lines in a triangle
sum of angles of a triangle

4. TRANSFORMATIONS (10 h)

- 4.1. Central symmetry
- 4.2. Study of figures from their elements of symmetry

MEASUREMENT (20 h)

1. AREA (8 h)

- 1.1. Area of a parallelogram, of a triangle
- 1.2. Metric units of area

2. ANGLE (2 h)

Complementary angles; supplementary angles

3. VOLUME (10 h)

- 3.1. Calculation of volume: cube, rectangular prism, right circular cylinder, ball
- 3.2. Metric units of volume

STATISTICS (5 h)

1. HANDLING DATA (5 h)

Interpreting data: circular diagram

HOW TO USE THE TEXTBOOK

The textbook is designed according to the new curriculum and takes into consideration the following principles:

1. Building up Mathematics

Building up Mathematics carries a lot of meaning in itself. The student must progressively build up his mathematical knowledge, one step at a time.

Then he will be led to deal with his own discoveries and those of others (the class and the teacher). He will be able to conceptualize and know the universal language of mathematics.

2. Context

The proposed activities must deal with real-life situations that are familiar to the Lebanese student in order for him to understand them. His knowledge must not be strange to his environment.

3. Epistemological Considerations

The language and teaching aids used, as well as the level of difficulty, complexity, and abstraction the introduced notions must be adaptable to the age and level of the student. The sociological and cultural environment must be taken

into consideration as well as the most recent results of research in epistemology and in the field of mathematics.

4. Optimization of Classroom Management

A comfortable environment must be provided for each student to be able to participate in group and collective work. This environment consists of an atmosphere of trust, of encouragement for initiative and cooperation, and of the freedom to express, question, criticize constructively, and argue.

Therefore, the teacher should take these fundamental principles into consideration and respect the structure of the chapters in the textbook:

- 1. Introduction:** The objectives are listed (and sometimes the prerequisites).
- 2. Activities:** These situations will stimulate the student's sense of research. He can guess and then verify.
- 3. Text:** A simple and clear explanation where the teacher summarizes the results of the activities and establishes the new knowledge.

4. **Focus:** A formulation that summarizes necessary and useful information.
5. **Exercises:** They are of several types: review, direct application, practice, as well as hands-on activities.
6. **Self-Evaluation:** General exercises that the student must solve and correct alone (he will find the answers at the end of the textbook).
7. **Problems:** They are chosen to enable the correct use of the acquired knowledge and its application in new and various domains.
8. **Just for Fun:** It consists of openended problems and activities that allow the student to enjoy discovering the beauty of mathematics.

We hope that the teachers will find that this guide helpful. We look forward to the teacher's comments on using the new textbooks.

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