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MATHEMATICS

Textbook for Class X

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NCERT Campus
Sri Aurobindo Marg
New Delhi 110 016 **Phone : 011-26562708**

108, 100 Feet Road
Hosdakere Halli Extension
Banashankari III Stage
Bengaluru 560 085 **Phone : 080-26725740**

Navjivan Trust Building
P.O.Navjivan
Ahmedabad 380 014 **Phone : 079-27541446**

CWC Campus
Opp. Dhankal Bus Stop
Panihati
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Publication Team

Head, Publication Division : *M. Siraj Anwar*
Chief Editor : *Shveta Uppal*
Chief Production Officer : *Arun Chitkara*
Chief Business Manager : *Bibash Kumar Das*
Editor : *Bijnan Sutar*
Production Assistant : *Rajesh Pippal*

Illustrations
Joel Gill and Arvinder Chawla

Cover
Arvinder Chawla

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Foreword

The National Curriculum Framework, 2005, recommends that children's life at school must be linked to their life outside the school. This principle marks a departure from the legacy of bookish learning which continues to shape our system and causes a gap between the school, home and community. The syllabi and textbooks developed on the basis of NCF signify an attempt to implement this basic idea. They also attempt to discourage rote learning and the maintenance of sharp boundaries between different subject areas. We hope these measures will take us significantly further in the direction of a child-centred system of education outlined in the National Policy on Education (1986).

The success of this effort depends on the steps that school principals and teachers will take to encourage children to reflect on their own learning and to pursue imaginative activities and questions. We must recognise that, given space, time and freedom, children generate new knowledge by engaging with the information passed on to them by adults. Treating the prescribed textbook as the sole basis of examination is one of the key reasons why other resources and sites of learning are ignored. Inculcating creativity and initiative is possible if we perceive and treat children as participants in learning, not as receivers of a fixed body of knowledge.

These aims imply considerable change in school routines and mode of functioning. Flexibility in the daily time-table is as necessary as rigour in implementing the annual calendar so that the required number of teaching days are actually devoted to teaching. The methods used for teaching and evaluation will also determine how effective this textbook proves for making children's life at school a happy experience, rather than a source of stress or boredom. Syllabus designers have tried to address the problem of curricular burden by restructuring and reorienting knowledge at different stages with greater consideration for child psychology and the time available for teaching. The textbook attempts to enhance this endeavour by giving higher priority and space to opportunities for contemplation and wondering, discussion in small groups, and activities requiring hands-on experience.

The National Council of Educational Research and Training (NCERT) appreciates the hard work done by the textbook development committee responsible for this book. We wish to thank the Chairperson of the advisory group in Science and Mathematics, Professor J.V. Narlikar and the Chief Advisors for this book, Professor P. Sinclair of IGNOU, New Delhi and Professor G.P. Dikshit (Retd.) of Lucknow University, Lucknow for guiding the work of this committee. Several teachers

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contributed to the development of this textbook; we are grateful to their principals for making this possible. We are indebted to the institutions and organisations which have generously permitted us to draw upon their resources, material and personnel. We are especially grateful to the members of the National Monitoring Committee, appointed by the Department of Secondary and Higher Education, Ministry of Human Resource Development under the Chairpersonship of Professor Mrinal Miri and Professor G.P. Deshpande, for their valuable time and contribution. As an organisation committed to systemic reform and continuous improvement in the quality of its products, NCERT welcomes comments and suggestions which will enable us to undertake further revision and refinement.

Director
National Council of Educational
Research and Training

New Delhi
15 November 2006

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Preface

Through the years, from the time of the Kothari Commission, there have been several committees looking at ways of making the school curriculum meaningful and enjoyable for the learners. Based on the understanding developed over the years, a National Curriculum Framework (NCF) was finalised in 2005. As part of this exercise, a National Focus Group on Teaching of Mathematics was formed. Its report, which came in 2005, highlighted a constructivist approach to the teaching and learning of mathematics.

The essence of this approach is that children already know, and do some mathematics very naturally in their surroundings, before they even join school. The syllabus, teaching approach, textbooks etc., should build on this knowledge in a way that allows children to enjoy mathematics, and to realise that mathematics is more about a way of reasoning than about mechanically applying formulae and algorithms. The students and teachers need to perceive mathematics as something natural and linked to the world around us. While teaching mathematics, the focus should be on helping children to develop the ability to particularise and generalise, to solve and pose meaningful problems, to look for patterns and relationships, and to apply the logical thinking behind mathematical proof. And, all this in an environment that the children relate to, without overloading them.

This is the philosophy with which the mathematics syllabus from Class I to Class XII was developed, and which the textbook development committee has tried to realise in the present textbook. More specifically, while creating the textbook, the following broad guidelines have been kept in mind.

- The matter needs to be linked to what the child has studied before, and to her experiences.
- The language used in the book, including that for 'word problems', must be clear, simple and unambiguous.
- Concepts/processes should be introduced through situations from the children's environment.
- For each concept/process give several examples and exercises, but not of the same kind. This ensures that the children use the concept/process again and again, but in varying contexts. Here 'several' should be within reason, not overloading the child.
- Encourage the children to see, and come out with, diverse solutions to problems.

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- As far as possible, give the children motivation for results used.
- All proofs need to be given in a non-didactic manner, allowing the learner to see the flow of reason. The focus should be on proofs where a short and clear argument reinforces mathematical thinking and reasoning.
- Whenever possible, more than one proof is to be given.
- Proofs and solutions need to be used as vehicles for helping the learner develop a clear and logical way of expressing her arguments.
- All geometric constructions should be accompanied by an analysis of the construction and a proof for the steps taken to do the required construction. Accordingly, the children would be trained to do the same while doing constructions.
- Add such small anecdotes, pictures, cartoons and historical remarks at several places which the children would find interesting.
- Include optional exercises for the more interested learners. These would not be tested in the examinations.
- Give answers to all exercises, and solutions/hints for those that the children may require.
- Whenever possible, propagate constitutional values.

As you will see while studying this textbook, these points have been kept in mind by the Textbook Development Committee. The book has particularly been created with the view to giving children space to explore mathematics and develop the abilities to reason mathematically. Further, two special appendices have been given — Proofs in Mathematics, and Mathematical Modelling. These are placed in the book for interested students to study, and are only optional reading at present. These topics may be considered for inclusion in the main syllabi in due course of time.

As in the past, this textbook is also a team effort. However, what is unusual about the team this time is that teachers from different kinds of schools have been an integral part at each stage of the development. We are also assuming that teachers will contribute continuously to the process in the classroom by formulating examples and exercises contextually suited to the children in their particular classrooms. Finally, we hope that teachers and learners would send comments for improving the textbook to the NCERT.

PARVIN SINCLAIR
G.P. DIKSHIT
Chief Advisors
Textbook Development Committee

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Textbook Development Committee

Chairperson, Advisory Group in Science and Mathematics

J.V. Narlikar, *Emeritus Professor,* Inter-University Centre for Astronomy & Astrophysics (IUCAA), Ganeshkhind, Pune University, Pune

Chief Advisors

P. Sinclair, *Professor* of Mathematics, IGNOU, New Delhi

G.P. Dikshit, *Professor* (Retd.), Lucknow University, Lucknow

Chief Coordinator

Hukum Singh, *Professor* and *Head* (Retd.), DESM, NCERT, New Delhi

Members

Anjali Lal, *PGT,* DAV Public School, Sector-14, Gurgaon

A.K. Wazalwar, *Professor* and *Head,* DESM, NCERT

B.S. Upadhyaya, *Professor,* RIE, Mysore

Jayanti Datta, *PGT,* Salwan Public School, Gurgaon

Mahendra Shanker, *Lecturer* (S.G.) (Retd.), NCERT

Manica Aggarwal, Green Park, New Delhi

N.D. Shukla, *Professor* (Retd.), Lucknow University, Lucknow

Ram Avtar, *Professor* (Retd.) & *Consultant,* DESM, NCERT

Rama Balaji, *TGT*, K.V., MEG & Centre, St. John's Road, Bangalore

S. Jagdeeshan, *Teacher* and *Member,* Governing Council, Centre for Learning, Bangalore

S.K.S. Gautam, *Professor* (Retd.), DESM, NCERT

Vandita Kalra, *Lecturer,* Sarvodaya Kanya Vidyalaya, Vikaspuri District Centre, Delhi

V.A. Sujatha, *TGT,* Kendriya Vidyalaya No. 1, Vasco, Goa

V. Madhavi, *TGT,* Sanskriti School, Chankyapuri, New Delhi

Member-coordinator

R.P. Maurya, *Professor,* DESM, NCERT, New Delhi

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