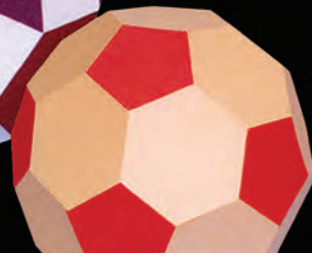
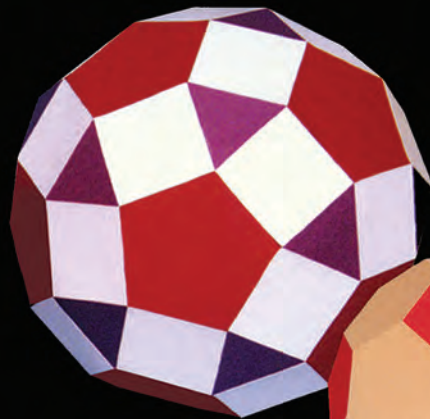


3D Magic

Dr. D. V. Navathe



This unique book welcomes persons of all ages. Geometry here becomes a dear friend guiding us in turning the simple and proportionate figures on plain paper into graceful 3D models.

The book gives procedures of making 40 such models with their 2 D figures on paper. The instructions are in English. They include choosing the size and quality of paper, other preparations, volume of the model, difficulty level, time requirement etc. This is a special feature of the book. This book is also published in Marathi by the name, 'त्रिमितीची किमया'.

A curriculum of 3D models was developed in Jnana Prabodhini's educational setup. Based on this experience we affirm that this activity will challenge your brain and hands at the same time. It will also enhance the precious abilities like concentration, perseverance, sense of beauty, creativity, three dimensional thinking, quality work and precision.



3 D Magic

(40 Geometrical Models)

Author

Dr. D. V. Navathe

Educational Activities Research Centre

Sixth Publication

Jnana Prabodhini

510, Sadashiv Peth, Pune 30.

3 D Magic

(Diagrams & method of making 40 Geometrical Models)

- Publisher** : Shri. V. S. Deshpande
Secretary, Jnana Prabodhini, Pune 30.
- Printer** : Editor, Chhatra Prabodhan, Pune 30.
- Typesetting** : Chhatra Prabodhan, Jnana Prabodhini, Pune 30.
- Cover & Internal Design** : Shri. Satish Deshpande, Pune.
- Diagrams** : Swapna Deshpande, Pune.
- Model Photography** : Shri. Bharat Ketkar, Pune.

© all rights with Publisher

First Edition : Rashtriya Saur Vaishakh 14, Sake 1925, 30 April 2003/ 1000 Copies

Second Edition : Rashtriya Saur Ashadh, Sake 1927, July 2005/ 1000 Copies

Third Edition : Rashtriya Saur Shravan, Sake 1936, August 2014/ 1000 Copies

Price : Rs. 90/-

Preface

This book is the last chapter in the educational career of late Dr. D. V. Navathe. He had an inexhaustible source of energy in him. Starting as a teacher in 1937 in Gujarath he moved all over the world performing various roles. From Gujarath he came to Pune and then went to London, Narayangaon, Delhi, Nairobi and then again came to Pune. In London he was a researcher, in Delhi and Nairobi he was an educational administrator, in Pune he was a teacher and advisor. While working as an advisor he also started teaching model making.

I remember having discussions with Dr. Navathe about the use of paper models of regular geometrical solids. This was sometime in 1992. We were discussing how to propagate the project method being used in Jnana Prabodhini Prashala. We wanted a set of tasks which could be completed in specific time, which could be planned in advance, which would give lasting learning experience, which could be done by students on their own and which would demand perfection. Two tasks came to our mind, one involved the use of laboratory and the other was making paper models. Dr. Navathe made the second idea his own mission.

He said that paper model making was a transferable learning experience. It involved visualisation of three dimensional objects, developing the surface of those object in two dimensions, visualising steps of cutting and folding the developed surface on paper and reproducing the concrete shape which was only seen by the mind's eye. He said that this series of action would meet the demands of the required set of tasks.

In a graded syllabus of projects, Dr. Navathe said that paper model making could be a step between collection type of projects and making schematic or working models of instruments and systems. During the last 7/8 years, he devoted his maximum energy in developing the syllabus in teaching it and in developing new

trainers for this activity of model making.

Many who observed his involvement in the subject when he was in his 80's were amazed by it. I hope that the readers and users of this book will be able to get a feel of some of this involvement. This book can be used for teaching geometry, to give practice in accuracy and diligence and to introduce the project method of learning.

Dr. Girish S. Bapat

Director, Jnana Prabodhini

The Author speaks

Mathematics is a very important subject in the school curriculum. Geometry is a part of that subject. It is observed that if it is taught properly, students do get interested in it; they learn to think consistently and to present their thoughts in an orderly manner. Students also like to draw attractive and proportionate figures for theorems in geometry. This builds up a mindset to do anything and everything clearly, in proportion and beautifully.

Geometrical figures are to be drawn on paper only in a single dimension. However, once they are actually seen in three dimensions right before one's eyes, a liking is developed to make their models. If this liking is nurtured as an art or as a hobby, many beautiful and attractive models can be made from paper. They can contribute a lot to the happiness in life.

For last few years, I have been teaching how to make some simple, three-dimensional models in geometry to boys and girls in Jnana Prabodhini.

While making these models, the necessary figures must be drawn very meticulously, in exact measures. Even a small mistake of one millimeter cannot be tolerated. That mistake may result in making the model graceless and deformed. Moreover, only the person who makes it can pick up the mistake. Therefore, he feels like correcting it. After correction, if folded and pasted at right places, the model that gets ready pleases the maker as well as the spectator.

Since this hobby complements the studies, we started teaching it to students of standards IX and X. It was included as an optional subject in hobby classes.

This art of making three dimensional models was first practiced by Plato in Greece. It is learnt that Plato made six kinds of models. Records are found that triangles, squares, pentagons and hexagons were later joined in 13 different but symmetrical ways by Archimedes and his disciples.

It is planned, first to teach the schoolchildren a basic, preparatory model. From the same model several different models can be made. By now, the number of models so developed has increased tremendously. Some of these models have been used to make lanterns during Diwali. Every Diwali issue of "Chhatra Prabodhan" carries a "recipe" for a new lantern.

We received several inquiries from local and out-of-station schools about the syllabus and teaching methodology of this subject. Hence, we thought of writing a book and this is it ! The book first carries a diagram of a model and then an explanation of how to make the model from the same.

First it is necessary to draw the diagram in the exact proportion you want. Then score the lines to be folded with a blunt-edged knife or a pin. Cut off the whole diagram with a pair of scissors. The model will be ready when you fold at the right places and apply gum. It is our experience that if every fold is sharp, if care is taken not to stain the paper with gum and if the right angles are neat, the model turns out to be graceful and beautiful. You can also try the models and enjoy the pleasure of creation.

In the production of this book, all the work relating to drawing the diagrams and trying out the recipe given is done by two of my students Mrudula Gokhale and Kalyani Deo. I thank them for that.

The same model can be made by different methods; e.g. a cube. The book has only one method. It is simple to teach and saves paper. Therefore, it is included in the book.

Most of the models of the Archimedes group turn out to be round shaped. They use the triangle, square, pentagon and hexagon only. While sticking these, one has the choice to apply the tape to either the triangles or squares. The model will get a good round shape if increased from all sides. Its beauty will increase if different shapes are coloured differently.

While making the models given in the book, if someone thinks of something new and if a new model is created, I will feel the joy of fulfillment.

Dada Navathe

Contents

- **Preface**
- **The author speaks**
- **Part I - Introducing the requirements**
- **Part II - Basic Models (15)**
- **Part III - Balls (10)**
- **Part IV - Stars (11)**
- **Part V - Miscellaneous (4)**
- **Index I - Typewise models**
- **Index II- Difficulty levelwise models**
- **Index III - Timewise models**