Exploring

POLYDRON

SPHERA

Bob Ansell

www.polydron.com

Contents

About the Author

Bob Ansell is a Senior Lecturer in Mathematics Education at University College Northampton. He has been both a head of mathematics in a secondary school and a coordinator of mathematics in a primary school. In addition, he has written many resource publications supporting teachers in the effective use of Polydron.

email: bob@edweb.co.uk
internet: www.edweb.co.uk

Photocopying Rights

Introduction

The Sphera range of Polydron consists of four new pieces designed to allow a much wider range of models to be made.

The four pieces, shown on the right, allow the construction of the main curved solids which children need to understand. These solids are the sphere, the cylinder and the cone.

But, because of the flexibility of the Polydron system, the new shapes can be used in conjunction with existing ones to produce a wonderful range of new models.

For example, the activity called Build a castle uses all of the new Polydron shapes, together with some more familiar ones, and allows children to make and extend a range of buildings.

Part of a circle

Part of a sphere

Part of a cone

Part of a cylinder

This booklet is designed to encourage and support teachers in their introduction of these four exciting new Polydron shapes, by offering some stimulating learning experiences for pupils.

Polydron has always been designed to promote exploration and creativity as a vehicle for understanding through the practical application of ideas. In the classroom you can exploit the opportunities offered by this approach by encouraging your pupils to investigate many aspects of mathematics and technology.

A book for teachers containing many photocopiable Polydron Sphera activities, together with support and teachers notes, is available from Polydron International at the address shown on the back of this booklet.

Creating the right environment

It is important for children to be provided with a large range of challenging and stimulating work and be offered the chance to discuss the principles and practice of mathematics with other children and with teachers. Many teachers would agree that they are most successful when they are able to focus the attention of children on a particular aspect of mathematics by using a stimulus.

Creating the right learning environment is not easy. Polydron and Frameworks are well known for their use as a motivator in free play, and each has great strength in this context. But the material has a much greater potential. The benefits of careful planning by teachers and the use of reflective intervention to support and extend children's learning turns these good resources into great ones.

Polydron Sphera provides:

- a fun resource material to work with
- a stimulus to learning
- a focus for discussion and debate
- a means of recording an activity by making something
- a natural step by step approach to problem solving
- a way for pupils to gain satisfaction by completing a challenge

When using Polydron Sphera always try to see beyond the immediate construction. Using the material is fun, and there is a lot of research which suggests that when children are having fun they learn more readily. Therefore it is important to allow children time to construct and explore and to resist the pressure to move on too quickly.

Finally, always try to have openended extension questions on hand. A number of these are provided in the teacher's notes.

Getting to know the shapes

The first three activities on pages 7, 8 and 9 are designed as foundation exercises for those who have not met the shapes before. Below and on the next page you will find some teacher's notes to support these activities. These activities could be used for children who require additional support before they can begin more demanding work, or with younger children when teachers recognise that they are ready to work with written worksheets.

The final two activities are for those who wish to explore the potential of Polydron Sphera. These activities use all of the pieces and develop the ideas met in the first three activities.

The sphere

Objectives

To familiarise children with those Polydron Sphera pieces for constructing a sphere and a hemisphere.

To consolidate knowledge of the sphere.

To introduce the term hemisphere.

Prior Knowledge

It is assumed that children are familiar with Polydron. If they are not it may be a good idea to introduce children to ordinary Polydron before introducing Sphera.

Teacher Support

The activity is straightforward and most of the vocabulary should be familiar. This is essentially an exploration of new material. The term hemisphere is used and, although some children will be unfamiliar with this word, a picture is shown.

It may help to have rubber bands available to hold the two halves of the hemisphere together.

In addition to the shapes shown in the activity, you can encourage children to make four or eight smaller sections of a sphere.

The cylinder

Objectives

To familiarize children with the Polydron Sphera pieces for constructing a cylinder and a half cylinder.

To consolidate knowledge of cylinders.

Prior Knowledge

It is assumed that children are familiar with Polydron.

Teacher Support

This activity is straightforward and most of the vocabulary should be familiar. There is no name for half of a cylinder and it is referred to simply as half a cylinder.

For younger children or those who need additional support you may want to select the parts for the activity yourself. You will need 8 cylinder pieces, 4 squares and 16 circle pieces.

It may help to have rubber bands available to hold the two halves of the cylinder together.

The cone

Objectives

To familiarize children with the Polydron Sphera pieces for constructing a cone and quarter cone.

To consolidate knowledge of the cone.

Prior Knowledge

It is assumed that children are familiar with Polydron.

Teacher Support

This activity is straightforward and most of the vocabulary used in the activity should be familiar. The cone is described using the terms base and sloping face.

For younger children or those who need additional support you may want to select the parts for the activity yourself. You will need 8 cone pieces, 8 right angled triangles and 8 circle pieces.

The sphere

❑ Make a sphere with 8 of these pieces.

❑ This is half of a sphere.
It is called a hemisphere.

❑ Make two of these and put them together to make a sphere.

❑ This football is a sphere.

The cylinder

❑ Use 4 of these pieces to make a cylinder.

❑ Add a top and a bottom to your cylinder.

❑ Make two of these half cylinders and put them together to make a cylinder.

❑ What shapes can you find which are like a cylinder?

The cone

❑ Make this cone.

❑ You will need 4 of these pieces for the sloping face.

❑ You will need 4 parts of a circle for the base.

❑ Make another cone from four solids like this one.

❑ Make a double cone by joining two cones together.

Wibbly-wobbly

❑ Make this solid. It has a cone for the top and a hemisphere for the base.

❑ Spin and roll your wibbly-wobbly and notice that it nearly always stops with the point up.

❑ Open up your wibbly-wobbly and stick a large piece of modelling clay where the top and bottom join.
Close up your solid.

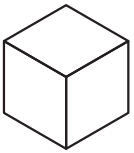
❑ Spin and roll it again. Does it stop with the point up?
Describe the way it spins and rolls.

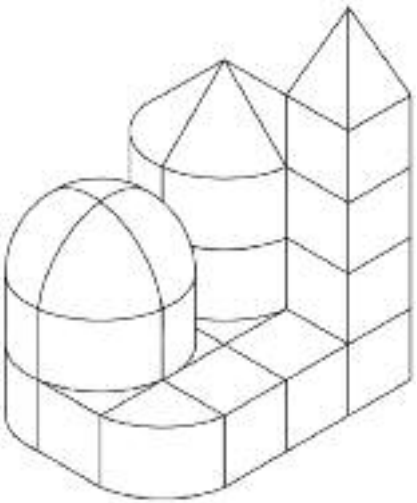
❑ Add a cylinder ring to the middle of your wibbly-wobbly.

❑ Explore the way your new model spins and rolls.

Build a castle

- ❑ We are going to build the castle below from lots of smaller Polydron models.
- ❑ You will need to make:-
  - ◆ 12 cubes
  - ◆ 3 quarter sections of a cylinder
  - ◆ 1 square-based pyramid
  - ◆ 1 dome or hemisphere
  - ◆ 1 cone
  - ◆ 3 cylinders





- ❑ Rearrange your shapes to make a different castle.
- ❑ What other buildings can you make from this set of shapes?

First published 2000

Polydron
Kemble
Cirencester
Gloucestershire
GL7 6BQ
England

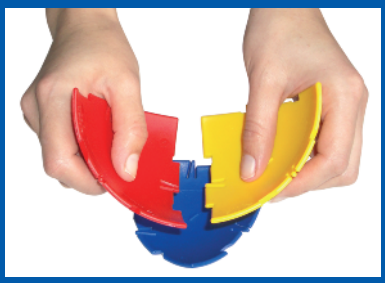
Tel: +44(0)1285 770055
Fax: +44(0)1285 770171

Email: headoffice@polydron.com

www.polydron.com

POLYDRON SPHERA

The Polydron Sphere can be a little difficult if you do not have a simple solution. It is well known that 'Polydron' snaps together easier on a flat surface, but in the case of 'Sphera' this is not possible. To overcome this problem we have a simple and effective solution.



1

When connecting the first two pieces of the Sphere place a third piece underneath to act as the assembly surface. This will help the pieces to snap together securely.

2

Follow the same practice when joining the next five pieces to continue making the full sphere.

3

Keep the piece with the middle cut out until last. This piece can be easily manipulated into place with some care. Once the sphere has been assembled it can rest on the hollow final piece that will prevent it from rolling.

Polydron, Kemble, Cirencester, Glos. GL7 6BQ, England.
Tel: +44(0)1285 770055 Fax: +44(0)1285 770171 Email: headoffice@polydron.com Web: **www.polydron.com**