



MATHS

# “Topology”

Ref. 20523



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## CONTENTS:

- 50 MODEL-PHOTOGRAPHS of 19.5 x 13.5 cm (25 cards printed on both sides).
- 14 GEOMETRICAL FOAM SHAPES: 2 red cubes, 2 quadrangular red pyramids, 2 rectangular red prisms, 2 blue cylinders, 2 triangular blue prisms, 2 yellow cones and 2 yellow spheres.
- 15 x 15 cm long rods.
- 1 PHOTOCOPIABLE CARD with the outline of the geometric shapes.
- Base to support the photographs.

## RECOMMENDED AGES:

From 4 to 8 years.

## EDUCATIONAL OBJECTIVES:

This material encourages the **development of logical-mathematical thinking** and **spatial structuration** by means of handling activities and reproducing the model-photographs. Numerous objectives can be achieved by using this material:

- Establishing a relationship between the two-dimensional example and the real three-dimensional space.
- Developing the perception of regions and limits in space.
- Facilitating the learning of spatial concepts: inside-outside, interior-exterior, in front-behind, on top-underneath, near-far, together-separate, one side-the other side, left-right, around, between, in the middle, etc.
- Encouraging initiation of spatial relationships between objects: proximity-distance, horizontal symmetry, vertical symmetry, vertical, etc.
- Knowledge of particular properties of the objects or figures in terms of their: shape (square, triangular, rectangular, pentagonal, hexagonal), size (large, small), volume (cube, prism, pyramid, sphere, cylinder, cone), colour (red, blue, yellow, green), surface and line (open, closed).
- Undertaking classifications by shape and/or colour.

## DESCRIPTION:

- The game contains **50 model-photographs**: 48 numbered 1 - 48, on which the various geometric shapes and rods appear distributed in accordance with the concept being studied in each case, plus 2 model-photographs lettered A and B, which enable the child to familiarise him/herself with the view of a geometric figure from two different



perspectives: zenithal (from above) and oblique or inclined (the actual working position), and can be used by students who are experiencing difficulties in reproducing the compositions suggested by the photos.

- Bearing in mind the level of difficulty entailed in grasping concepts and to make the teacher's job easier, the material has been organised for guidance purposes in the following content categories:

CONCEPTS	PHOTOS
<b>Basic spatial concepts</b>	
Inside - outside	8, 9, 10*, 11, 12*
Interior- exterior	8, 9, 10*, 11, 12*
In front - behind	17, 18*, 19, 20*
Above - below	21, 22, 23, 24
One side – the other side	13*, 14, 15*, 16, 29, 30*, 31, 32, 33, 34
Near - far	25, 26, 27, 28
Together - separate	25, 26, 27, 28
Around	38*
In the middle	5, 6, 7*, 27
Between	11, 17, 33, 34
Left - right	13*, 14, 15*, 16, 29, 30*, 31, 32, 33, 34
<b>Classifications</b>	
Colour	14, 34
Shape	35, 36
Shape and colour	37
<b>Polygons</b>	
Polygonal line open - closed	1*, 2*, 3, 4
Triangle	2*, 6, 7*, 10*, 12*
Square	1*, 5, 7*, 12*, 19
Rectangle	4, 8, 9, 11
Pentagon	3
Hexagon	38*, 39
Diagonal	39, 40
<b>Relationships</b>	
Flat – three-dimensional	5, 6, 7*, 8
<b>Symmetries</b>	
Vertical axis symmetry	31, 40, 41, 42, 43, 44, 45, 46
Horizontal axis symmetry	47

\* The photos with an asterisk can be used simultaneously by two children, or for the student to copy the model previously set up by the teacher or another student. These photos are: 1, 2, 7, 10, 12, 13, 15, 18, 20, 30, 38.

## METHOD OF PLAY AND RECOMMENDATIONS FOR USE:

At these ages, the teaching – learning process of logical and mathematical concepts must be based on the reality of the child's environment and the handling of something specific, finally ending up as a symbolic representation. The educational process should follow these stages:

1. **Experiential:** Based on experience and the child's environment to get to discovery of the concept.
2. **Manipulative:** Handling the topological material to achieve an interiorisation of the concept through:
  - a) **Observation of the model-photograph.** Directed by the teacher, who should express the concept that is going to be studied and its relation with the other elements.
  - b) **Reproduction of the model-photograph.** This should be done by the student with the different geometrical shapes.
3. **Graphics:**
  - a) **Verbalisation** by the student in explaining the relationship between the elements.
  - b) **Graphic representation** of the concept learned on paper.

These three steps should be consecutive in time to be able to consolidate what has been learned.

## ACTIVITIES

To facilitate and optimise the use of the material, some **standard activities** are recommended which correspond to some of the previously-mentioned content categories.

### 1. Knowledge of the material: geometric shapes and rods

- **Objective:** Familiarisation with the material. This activity aims to help children learn the names of the geometric shapes and discover their characteristics.
- **Procedure:** The stages described in the system of play and recommendations for use should be followed with each geometric shape:
  - Start off with objects from real life and the child's environment which have a similar shape to the geometric shapes: ball, for sphere; dice for cube, etc.
  - Handle the shape to find out its characteristics: colour, shape, volume...
  - Make a copy using the photocopyable card.
  - The rods can be freely handled to construct different figures.

### 2. Basic spatial concepts: inside-outside, in front-behind, above-below...

- **Objective:** Assimilation of the inside-outside concepts



- **Procedure:**
  - Outline a circle on the floor with chalk or a rope. The children get "inside" and come "outside" the circle, collect toys and go and play "inside" the circle, etc.
  - Observe model-photograph no. 8
  - Reproduce the model-photograph with the material. While handling the material, give verbal explanations: "I am putting the rectangular prism "inside" the rectangle", "I am setting another rectangular prism "outside" the rectangle"
  - Use other geometric shapes in similar situations to those described above.
  - Follow the same process with model-photos nos. 9, 10, 11 and 12
  - Draw some figures "inside" the circle and others "outside".

### 3. Polygons: triangle, square, rectangle...

- **Objective:** Recognition of flat figures
- **Procedure:**
  - Show the children objects that have a particular shape so they can observe them. For example: a picture, a tile, a window... Ask them about their characteristics: What is the shape of the picture? What are its sides like? How many sides does it have? etc. Look for other objects that have the same shape.
  - Observe model-photograph no. 1.
  - Reproduce the model-photograph with the material. While handling, explain out loud: "I am going to make a square" "I am making it with four rods", "The rods are all the same", etc.
  - Follow the same process with model-photos nos. 5, 7, 12 and 19.
  - Draw objects that are square in shape.

### 4. Symmetries

- **Objective:** To recognise objects placed symmetrically in relation to an axis
- **Procedure:**
  - For the child to discover the concept of symmetry based on the symmetry of the human body and symmetrical objects or animals such as a vase, an orange or a butterfly.
  - Observe model-photograph no. 31.
  - Reproduce the model-photograph with the material, explaining out loud the symmetrical elements that you are building or representing.
  - Follow the same process with model-photographs nos. 40, 41, 42, 43, 44, 45 and 46 for the vertical axis.
  - Complete drawings of figures with the symmetrical half that is missing (butterfly, human body, etc.). The axis of symmetry should be clearly depicted.



