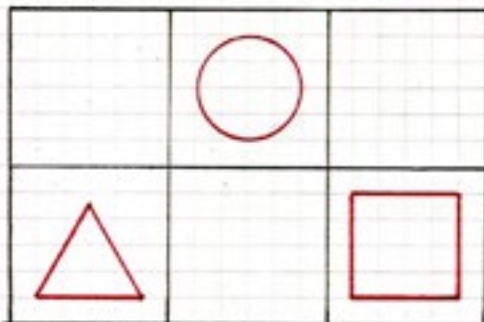


LEVEL # 1: Explorations of Figures

Materials: The geometry cabinet of plane insets
A Comparison

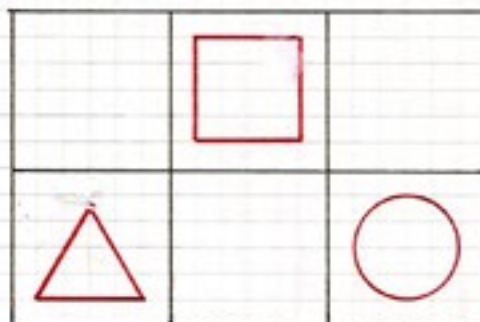
The Children's House organization The Elementary School organization

Drawer # 1: The Presentation Frame



Arrangement related to finger movement: sensation of forms.
1) In triangle the child traces a side and then hits a major shift
2) The circle annuls his memory of the triangle and prepares him for the experience of the
3) square
The triangle and square differ only in the greatness of the angle, a subtle distinction at this point; thus the circle is an important break.

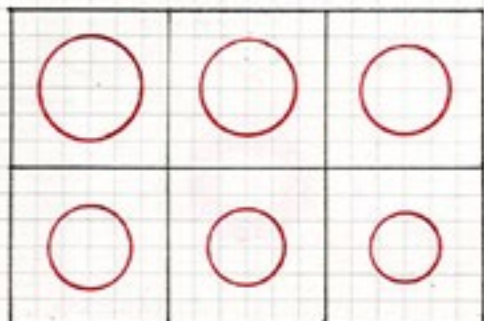
Nomenclature: triangle, circle, square



Arrangement:
1) Triangle is the first possible polygon.
2) Square is the immediately successive polygon.
3) Circle is the limit of a series of regular polygons with an infinite number of sides.

Nomenclature: triangle, square, circle

The Circles

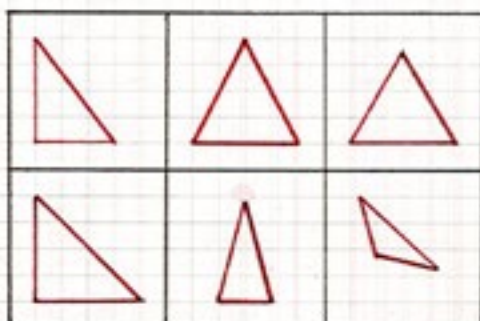


Arrangement: Circles arranged from largest to smallest, because the child has already been introduced to the first one here.

Nomenclature: circle, circle, circle, circle, circle, circle

Drawer # 2:

The Triangles (because the triangle is shown first in the index drawer)



Nomenclature: scalene triangle, isosceles triangle, equilateral triangle, right-angled triangle, acute angled triangle, obtuse-angled triangle

Arrangement: first row represents a movement towards perfection, equilateral

Materials: Explorations of Figures...
the Geometry Cabinet...

Children's House organization...

Elementary School organization...

The Triangles...

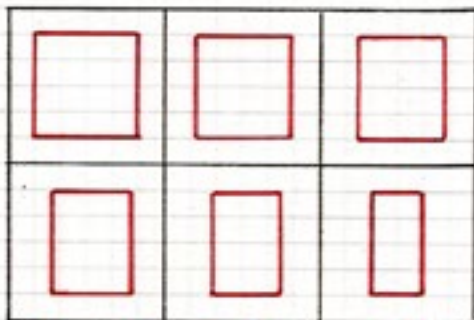
Arrangement...

the second row begins with the right-angled triangle because it is "the measuring angle" - used as a point of reference for determining the other angles.

The Rectangles

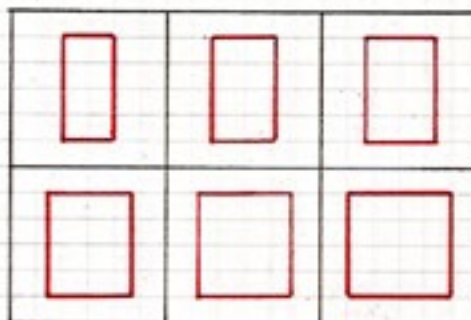
Drawer #3

The Quadrilaterals (following the progression of the index)



Nomenclature: square, rectangle, rectangle, rectangle, rectangle, rectangle

Arrangement: beginning with the largest rectangle (the square) which the child met in the index



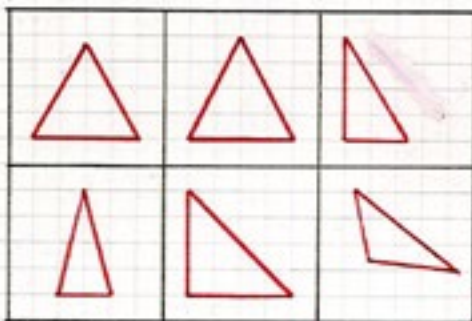
Nomenclature: rectangle, rectangle, rectangle, rectangle, rectangle, square

Arrangement: moving towards the perfection of the quadrilateral

The Triangles

Drawer #4

Regular Polygons having more than 4 sides (showing the progression of polygons between the square and the circle)

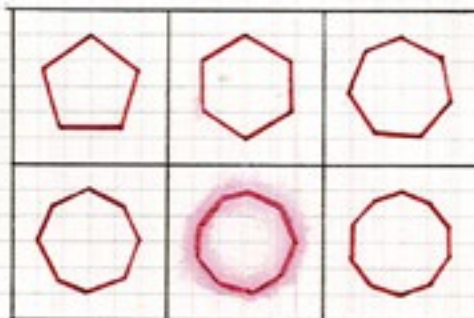


Nomenclature: equilateral triangle, isosceles triangle, scalene triangle...

acute-angled triangle, right-angled triangle, obtuse-angled triangle.

Arrangement:

- 1) row in regard to sides begins with familiar equilateral and that point, triangle becomes less perfect
- 2) small to larger angles.



Nomenclature: pentagon, hexagon (sexagon), heptagon (septagon), octagon, nonagon (enneagon), decagon

NOTE: In black are the alternate terms from Latin roots.

Materials: Exploration of Figures...
the geometry cabinet...
Children's House organization...

Elementary School organization...

The Drawer of Polygons

Drawer #5

As shown in Drawer #4 for
Elementary School.

Arrangement: the same

Nomenclature: the same:
pentagon, hexagon, heptagon,
octagon, nonagon, decagon

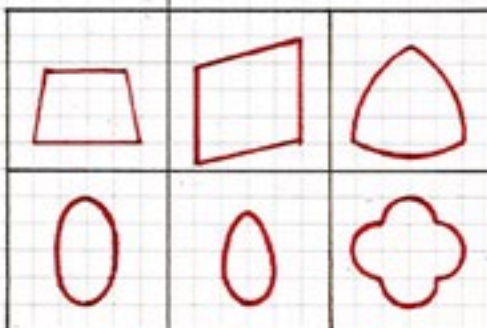
The Circles

As shown in Drawer #2 for
Children's House

Arrangement: may be from
largest to smallest or
smallest to largest

Nomenclature: the same: circle

Drawer #6 Various Other Figures



Nomenclature: **trapezoid, rhombus,**
curvilinear triangle, ellipse,
oval, quadrifoil (first flower).

Nomenclature:
trapezoid (trapezium)
rhombus
Triangle of Reuleaux
(curvilinear triangle)
ellipse
oval
quadrifoil (first flower)

Note: the curvilinear triangle is named the Triangle of Reuleaux for the German engineer who invented it in the 19th century.
the curvilinear triangle is the simplest orbicular curve after the circle (orbicular: having form similar to a circle; circular)
the curvilinear triangle is constructed with an equilateral triangle, substituting for these sides the arc of the corresponding circle.

Note: On this drawer is found the set of 4 orbicular curves:
circle, Triangle of Reuleaux, ellipse, oval

All the figures in the cabinet are constructed, partially or wholly, on base 10cm: the equilateral triangle sides are 10, also the sides of the square, the diameter of the large circle is 10, the height of the rectangles is 10, all regular polygons are inscribed in the circle of diameter 10cm. In the 6th drawer we find 10cm. as the major base of the trapezoid, the minor diagonal of the rhombus, the cord of the arc of the Triangle of Reuleaux, the major axis of the ellipse and oval, the major axis of the quadrifoil.

Materials: Exploration of figures...

Additional Insets for the Elementary School
Just as we need more precise nomenclature in the elementary school, we also need several more precise figures for our exploration.
Therefore, we include a box of additional plane inset figures.

After the introduction of drawer #2: The Triangles, we need:

1) the acute-angled scalene triangle



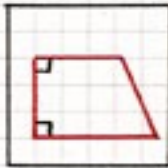
2) the obtuse-angled scalene triangle



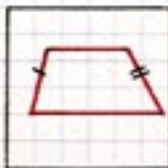
After the presentation of drawer #6: Various Other Figures, we show

1) 3 trapezoids in addition to the already introduced isosceles trapezoid

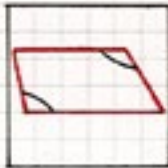
right-angled trapezoid:
2 perpendicular sides, the third side perpendicular to the major and minor base.



scalene (generic) trapezoid:
the two oblique sides are not equal



obtuse-angled trapezoid:
2 obtuse angles which are opposite



2) parallelogram



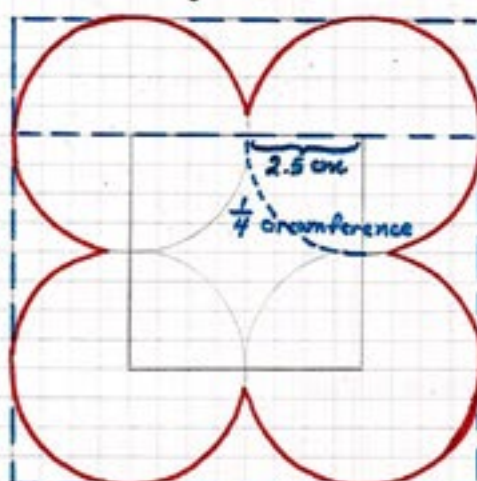
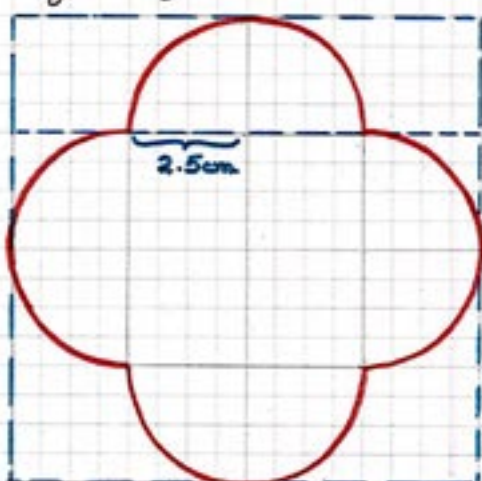
Materials: Exploration of figures...
Additional insets...

- 3) **common quadrilateral**
all different angles and
different sides



- 4) **the quadrilobed flower** (the second flower)

a comparison of the constructions for:
first flower: and second flower



The two are interesting in the relationship
of contour and area.

Flower #1 - 4 semi-circles,
circle diameter 10 cm. -
or 2 whole circumferences.

Flower #2 - contour
is $\frac{3}{4}$ circumference 4 times
or: $\frac{3}{4} \cdot 4 = \frac{12}{4} = 3$

Relationship of the flowers is 2 : 3.

LEVEL #1: The Exploration of Figures

Materials

1. The Geometry cabinet: as illustrated for the elementary school.
2. A box containing reading labels (naming the figures in the cabinet.)
3. Two boxes containing the same figures that we have in the cabinet:
 - a) Series one cards are like photographs of the figure: the surface of the figure colored in.
 - b) Series two cards present only the contours (a thin red line).

NOTE: In the children's house there is a third box in the middle of these two which represents a passage toward the thin periphery image: the perimeter in it is a thicker line and provides a movement towards the third abstract image which is the freest of the material.

4. The Commands.

Presentation: For the Casa and For the Elementary

The children's house work begins with the movement and the word: the movement of the child's eye, looking for the shape, is addressed and he is given the simplest nomenclature. We call his eyes and his hands.

At the elementary level, there is no movement and no word. There are, instead, many words. It is not enough to give the names; the child also needs the etymology, to call the attention of his imagination. The sense of touch is now not important. We give the name at the elementary level, but then we modify the third period lesson to discover what elements the child has related to the figure.

Casa Presentation

1. Take the figure carefully out of the drawer inset, trace first the contour of the inset and then, slowly, the contour of the frame.
2. The Declaration: Give the name. "This is an equilateral triangle."
3. Continue with the second and third figures in the row.
4. Then place all three insets on the mat and repeat the names of each.
5. Second period: Show me which is the equilateral triangle.
6. Third period: What is this?

NOTE: The child doesn't know that the scalene triangle is made of three unequal sides; he only knows the word related to the shape. Many times the children don't remember the exact nomenclature.

Elementary Presentation: The Triangles

1. Take the first, the scalene triangle from the frame and place it on the mat, and then proceed with the exploration of the etymology.

This is the declaration: the first period.
1. This is a scalene triangle. What do you think it means? In Latin it means "the shape of a ladder."

It is a little hard to see that relationship:

First we have the cultural reason, the cultural point of view. Then we have the historical angle, and then the etymological. . . all this before we give the geometrical reference.



This is a tree. This is a ladder that farmers climbed to pick the fruit of the tree. Notice that each step of the ladder is different from the next. This is the ladder the Greeks referred to when they named the scalene triangle. It means that this triangle is formed of sides with three different lengths.

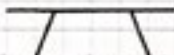
EXPLORATION OF FIGURES. . .

Presentation: The Triangles. . .

2. Introduce the isosceles triangle and the etymology. 2. The word "isosceles" means "having equal legs."
Can a triangle have legs?
How many legs do you have?
Two legs---two equal legs.
This triangle has two equal sides.
So, when we define an isosceles triangle as having two equal sides, we might say "two equal legs."
3. When several---probably all---of the drawer has been introduced, give the second period lesson. We want to include here the memory of the elements of the figure. 3. What do we remember about this triangle?
4. Third period lesson. 4. What is this.

TWO MORE EXAMPLES OF ETYMOLOGY OF THE FIGURES:

The trapezoid: trapezoid in Greek means "small table." The Greek farmer's table was shaped like this:



In this trapezoid, we have not man's legs, but those which he has built for his house. What we call the oblique sides were the legs of the table, built thusly for added stability.

The rhombus: the word rhombus refers to a "top" which spins on the vertex of one angle.



Wooden tops in this shape have been spun by children of many countries.

But originally this symbol was worn by Greek priests during religious ceremonies. They, in fact, created "the top," and only later did children discover that it would spin.

The ellipse: means "that from which something is missing." If I say "something is missing," I imply a figure from which nothing is missing. And that, of course, is the circle. So the etymology has the circle as a point of reference. The area of the ellipse is found as that of the circle --- minus.

Sometimes the etymology, if primitive, is not a help: "square" means "to make square." From the Old English. So this word originates in the shape.

5. Proceed with the matching of the labels with the figures. This is, as well as an identification of the figures discussed, a good reading exercise.
6. Introduce the figure cards.

THE COMMANDS: Here we have the main difference in this level work for the elementary child as opposed to the casa.