



Module 3
Exercises of Sensorial Development

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Chapter 4

Exercises of Development of the Visual Sense



Visual exercises are an integral part of Montessori sensorial training program. They are further subdivided into the following groups;

- 1) Exploring Dimensions
- 2) Exploring Colours
- 3) Exploring Shapes
- 4) Exploring Patterns

4.1 Exploring Dimensions



In this group of exercises the child learns to develop his ability to discriminate between objects having similar shapes and colors but varying in length, width, height or thickness.

It is time now to move on to exercises. Let's begin with the cylinders.

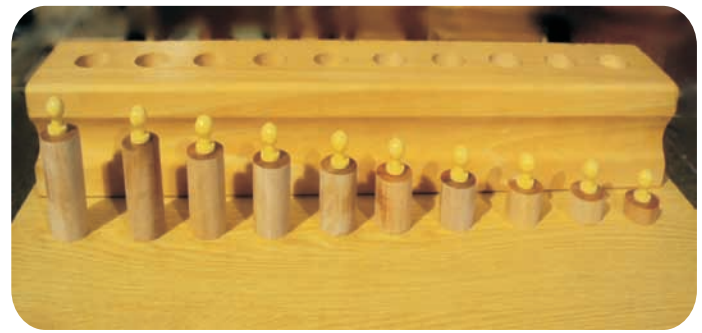
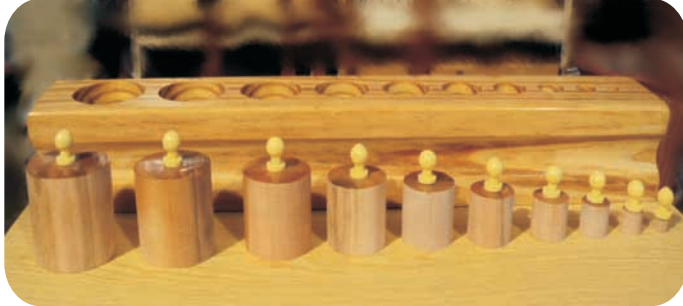
Exercise 1 The Cylinder Blocks

Material

The material consists of four finely lacquered wooden blocks; each containing ten cylinders. The cylinders vary in size in a regular way by 1/2 cm, either in height or diameter or both. Each cylinder has a wooden/plastic knob to hold it.

Block 1 (Big / Small)

The cylinders in this block vary both in height and diameter by 1/2 cm. The largest one is 5.5 cm in both height and diameter, whereas the smallest one is 1 cm in height and diameter. Both the height and the diameter decrease in succession. The largest cylinder is the tallest and thickest.

**Direct Aim**

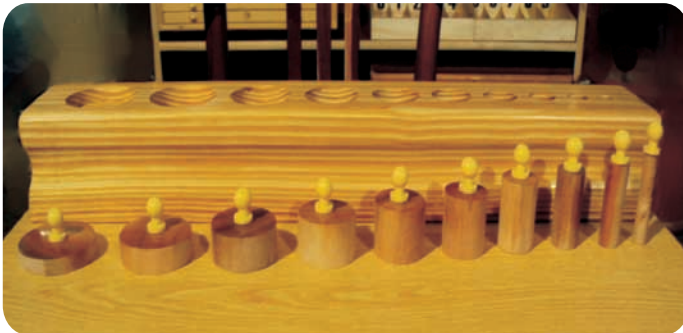
The child learns to judge size by sight.

Indirect Aims

1. After the child has learned to discriminate between dimensions, he begins to observe the environment with interest and more intelligence.
2. The child develops coordination of movement.
3. The child is given an indirect preparation for writing. The fingers and thumb, which will later hold the pencil, are being used to hold the knobs. These fingers are also used in the manipulation of most tools (e.g. spoon, scissors, brush, etc.). Therefore, the hand is being trained for manipulative skill.
4. Indirectly prepares the child for mathematics.

Block 2 (Deep / Shallow)

In this block the cylinders vary in height and diameter by 1/2 cm. The height of the cylinders increases by 0.5 cm (from 1 cm to 5.5 cm), where as the diameter decreases in succession by 0.5 cm (from 5.5 cm to 1 cm). The tallest cylinder is the thinnest and the shortest is the thickest.

**Age**

2½ to 5 years

Block 3 (Thick / Thin)

In this block the cylinders are all the same height i.e. 5.5 cm. They decrease by 1/2 cm only in diameter in succession (from 5.5 to 1 cm).

**Block 4 (Tall / Short)**

In this block the cylinders are all the same diameter i.e. 2.5 or 3 cm. They decrease by 1/2 cm only in height in succession (from 5.5 to 1 cm).

Tip»

We should begin with Blocks 1 or 2 as there are two differences in dimension i.e. height and diameter. Block 3 comes next with one difference in dimension i.e. diameter only. Block 4 is by far the most difficult of the four blocks and should be introduced at the end as the circumferences of the holes are all the same and, therefore; does not offer as great control of error as other blocks. **This should not be brought into the classroom until some children are really proficient with the first 3 blocks.**

Exercise I

- 1) The directress takes the consent of the child and moves block 1 to the work place (which should preferably be a table in the case of cylinder blocks) with the help of the child. She also indicates the place of the block in the shelf to place it back after use.
- 2) The child is made to sit / stand on the left hand side of the directress for the clarity of view. However, if the directress is left-handed the child should be on the right hand side.
- 3) She begins the exercise holding the knob of the first cylinder with the first two fingers and thumb of her dominant hand (the way we normally hold a pencil).



- 4) She removes it and places it on the table in front of the block without making a noise. She removes each cylinder in turn, holding them in the same way, placing them silently in front of the block in mixed order.



- 5) When all the cylinders have been removed, she pauses. She looks at the cylinders carefully, selects the largest (or smallest) and returns it noiselessly to its place, looking for the appropriate hole. She replaces the cylinders in order in this way.





6) The directress may complete the presentation and invite the child to try the exercise himself or at any point of the lesson the child may join in. If he begins removing and replacing cylinders, he can be left to work alone.

The child continues to use Block 1 as presented for as long as he likes. He may, then, be presented with Block 2 and 3 according to the presentation or

use any of 1, 2, or 3 without a further lesson. He can use Block 4 when that is brought into the classroom.

Important: Block 4 is considered to be the most difficult. So, this block is not brought into the classroom until some children are proficient with the first 3 blocks.

Exercise II

When the child has mastered using all the blocks, he can be shown how to use two sets together, mixing the cylinders from both and replacing them.



Exercise III

When the child has mastered working with two sets together, the directress can show him how to take any three sets, place them on the table in the form of a triangle, take out all the cylinders and place in the middle of the triangle. The cylinders are then placed back in their corresponding sockets.



Exercise IV

When the child can easily deal with three blocks at a time, he can be shown how to use all four sets together. They are placed on a table in the form of a square; all the cylinders are brought out and

placed inside the square in mix order. They are then placed back.



Points to Remember

1) Dealing with Mistakes

It is important to note the child may commit mistakes in the first few attempts but he should not be interrupted when he is working. An effort to correct him can be made some other day but not when he is working and attempting to do the exercise himself. For example;

- The child may hold the cylinders incorrectly after the first presentation.
- He may make mistakes in putting them in the holes.
- The child may probably handle them noisily.
- He may put back the cylinders in the wrong order.

Whatever is the case he must not be interrupted when working, except when he is damaging the material with some kind of misuse or trying to hurt someone with it (which happens very rarely).

To deal with the above mentioned mistakes the directress may take the block the next day or some other day and show him the right way to handle the cylinders. For example:

- The teacher shows the child her hand, points out her first two fingers and thumb, and demonstrates how she holds the knob and removes a cylinder. She then says to the child, "Show me your hand. You have two fingers here and a thumb. Take out this cylinder using these two fingers and thumb." The child will enjoy taking out cylinders and replacing them while the teacher watches him. He will begin to handle the material correctly.

- Similarly, if the child is being noisy, on another day, the teacher can take a block and sit beside him. She speaks very softly. "Listen. I can take the cylinders out and put them on the table without making any noise at all. Are you listening?" The teacher demonstrates how to handle the cylinders quietly. "Now, I will listen to you. You try it." Let the child try. Children love this. Their attention is drawn to noise, and they begin to use their hands well and to make a great effort to handle the material without making any noise. The teacher also shows that the cylinders can be returned noiselessly to their sockets.
- Likewise, if the block has been introduced at the right age, the child will have difficulty in replacing cylinders. That is normal... the teacher must not interfere and have patience. Corrections will not help. **No one can train the eye to judge size.** The child learns through repeated activity.

2) Do Not Hurry

Do not introduce the exercise 2, 3 and 4 until children have really mastered the 4 blocks used singly. The aim of this exercise is never to get the children work quickly, but to allow them work for as long as they want to carry on. This self practice allows children to reach abstract conception of dimensions. Their visual sense develops the ability to discriminate between sizes which can be achieved only through active interaction with the environment and not through verbal explanations and adult interruptions. This must be understood as applying to all the apparatus.

3) Don't Forget the Purpose of the Exercise

This exercise is a sight exercise, so there is no need to use a blindfold. It is not possible to match the size of the cylinders to the size of the holes using the sense of touch as some holes are too narrow for the fingers to reach the bottom. The cylinders are used on a table - not on the floor because when we place the block on a table, the distance between eyes and the cylinders is comparatively lesser than when we have it on the floor. This helps in visual discrimination.

Control of Error

The material is self-correcting. If a mistake has been made, there will always be one cylinder that does not fit. In blocks 1, 2, and 3, a cylinder will not either enter the socket or will remain loose if the

child is not inserting the right cylinder in the right socket. In Block 4, because the diameter is the same, all can be returned but some will be too tall and others too short to fit the holes. Most children can see that this is incorrect.

Three Period Lesson

All vocabulary is to be introduced by Three Period Lesson. Please refer to **Chapter 3 (Three Period Lesson)** for details. Introduce adjectives, comparatives and finally superlatives separately for each block as given below.

• Vocabulary Block 1

- i. Big-Small
- ii. Big-Bigger-Biggest
- iii. Small-Smaller-Smallest

• Vocabulary Block 2

(Some experts believe that there should be no vocabulary with this block as no dimension is isolated. However, the others suggest the following vocabulary for this block.)

- i. Deep-Shallow
- ii. Deep-Deeper-Deepest
- iii. Shallow-Shallower-Shallowest

• Vocabulary Block 3

- i. Thick-Thin
- ii. Thick-Thicker-Thickest
- iii. Thin-Thinner-Thinnest

• Vocabulary Block 4

- i. Tall-Short
- ii. Tall-Taller-Tallest
- iii. Short-Shorter-Shortest

Games

- Grading from an extreme.
- Grading from the middle.
- Matching the cylinders to the hole.

Exercise 2

The Pink Tower

Material

The material consists of ten wooden cubes varying in size from 1 cubic centimeter to 1 cubic decimeter (1cm^3 to 10cm^3). The Pink Tower is available in two versions;

- (1) Cubes finely painted with pale pink paint.
- (2) Plain wooden cubes finely lacquered.



Note: A strong pink must be avoided; otherwise children become more interested in color than size. Plain wooden version is made up of lightly varnished wood. In plain version a very good hard wood must be used.

Preparation for Mathematics

One important feature of this material is that it indirectly prepares the child for mathematics. The following are a few indirect concrete experiences that the child gets while working with this material.

- There are 10 cubes and because 10 is the basis of our number system the child gets familiar with the number system also.
- The largest cube would hold 1 liter and the smallest one would hold 1ml of liquid.
- Preparation for cube root.
- Eight of the smallest make the second cube ($2 \times 2 \times 2 = 8$).
- Twenty-seven of the smallest make the third cube ($3 \times 3 \times 3 = 27$).

- Sixty-four of the smallest cubes make the fourth cube ($4 \times 4 \times 4 = 64$), etc.
- One thousand of the smallest cubes make the tenth cube ($10 \times 10 \times 10 = 1000$).

Direct Aim

Visual and muscular awareness of sizes leading to an abstract understanding of dimensions and intelligent observation of size in the environment.

Indirect Aim

1. Development of hand and eye coordination and perfection of movements.
2. Indirect preparation for mathematics.

Age

2 ½ to 5 years.

Exercise I

- 1) Select a mat and spread it on the floor to work. The work place should be a mat in the case of Pink Tower because of two reasons;
 - If the tower is built on the table, it goes higher than the height of the child.
 - If the tower topples down the paint may come off or the cubes may hurt the child.
- 2) Take the consent of the child and move Pink Tower (one to three cubes at a time depending on the size of the cubes) to the work place with the help of the child indicating the place of the tower in the shelf to place the material back after use.
- 3) The child is made to either sit or stand on the left hand side of the directress for the clarity of view; however, if the directress is left-handed the child should be on the right hand side.



- 4) Hold the largest cube with both your hands and move it closer to other cubes in order to compare the sizes and make sure that you are holding the biggest one.
- 5) After comparing place the biggest cube on the mat right in front of you, and look for the second biggest cube.



- 6) Now, hold the second biggest with both your hands and compare it with the others as in step 4.
- 7) Place the second biggest cube concentrically on the previously placed cube. One must place the cube right in the middle of the previously placed cube very carefully, so that she doesn't have to adjust its position after placing it.



Note: The teacher must place the cubes at the right position and avoid re-adjusting after a cube has been placed in position, as a child may think this is part of the lesson and copy her movements. Secondly, we already know that the presentation has to be made with an economy of movements. Therefore, the directress must practice making the tower herself, until she can build it perfectly before giving the lesson.

purpose of this step is that the child gets an idea how the tower becomes gradually narrower till it reaches its peak. Secondly, if there is an error the child can notice it.

- 8) Pause and look at the cubes, and then go for the next one. At this point the child can see that a deliberate choice is being made.
- 9) Compare and place all the remaining cubes in the same way.

Note: The bigger cubes should be held with both the hands as the child's hands are too small to hold the bigger cubes with one hand. However, the smaller cubes can be grasped with one hand. In this way, it is possible to judge size by touch as well as by sight.

- 10) After placing the last / smallest cube at the top of the tower, place both the hands on the sides of the biggest cube and slowly move them upward along sides of the tower, bringing your hands closer gradually as moving upward and avoiding contact with the cubes. Let the hands join each other over the top of the tower. The





Note: With developmentally delayed children or children with special needs, every other cube may be given at first (e.g. cube 1, cube 3, cube 5, cube 7, and cube 9). It does not matter which five the child works with. This way the difference between any two cubes in succession will be twice as great as when using all ten together. Thus, the child will have more chance of succeeding. When he can manage 5 well, he can have all the ten cubes. The child with serious difficulty in motor control, can grade the pieces in a row horizontally on the floor, rather than building them into a tower until his movements are more controlled.

The child will make mistakes at first, but will gradually perfect his ability to judge size with practice. The directress must not interfere and let the child continue his practice. If required, the directress may give him a new lesson some other day before he starts using the material. New lessons can also be given to help the child improve handling of the material.

The directress may have to give special instructions on how to hold the cubes and place them slowly over one another with extreme care, so that the paint does not come off and the corners do not get rough. Similar care is required while dismantling the tower. The child must start from the top of the tower and remove cubes one by one, and carefully place them on the mat. The tower must never be knocked down as this can seriously damage the material.

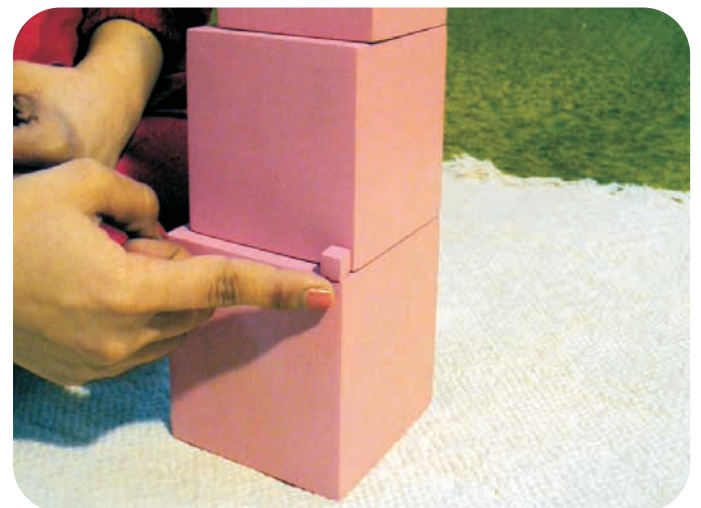
Exercise II

This exercise is introduced when the child has mastered Exercise 1.

- 1) Build the tower with one corner of each cube exactly above the other all the way up, with two sides of the cube exactly in alignment.
- 2) This will result in the formation of two ledges (1 cm. wide), on the other two sides of the tower.
- 3) As the smallest cube is 1 cm from all sides, it will fit on these ledges.



- 4) Take the smallest cube and run the cube along each ledge in turn with your index finger carefully.



Presentation

- 1) Take the material to a mat and make the child sit beside you.
- 2) Open the box and tell the child, "We call these the constructive triangles. Why? Because we can construct other figures with them."
- 3) Tell the child to take them out and group together the triangles of similar colour and size. Some children may need help at this stage.

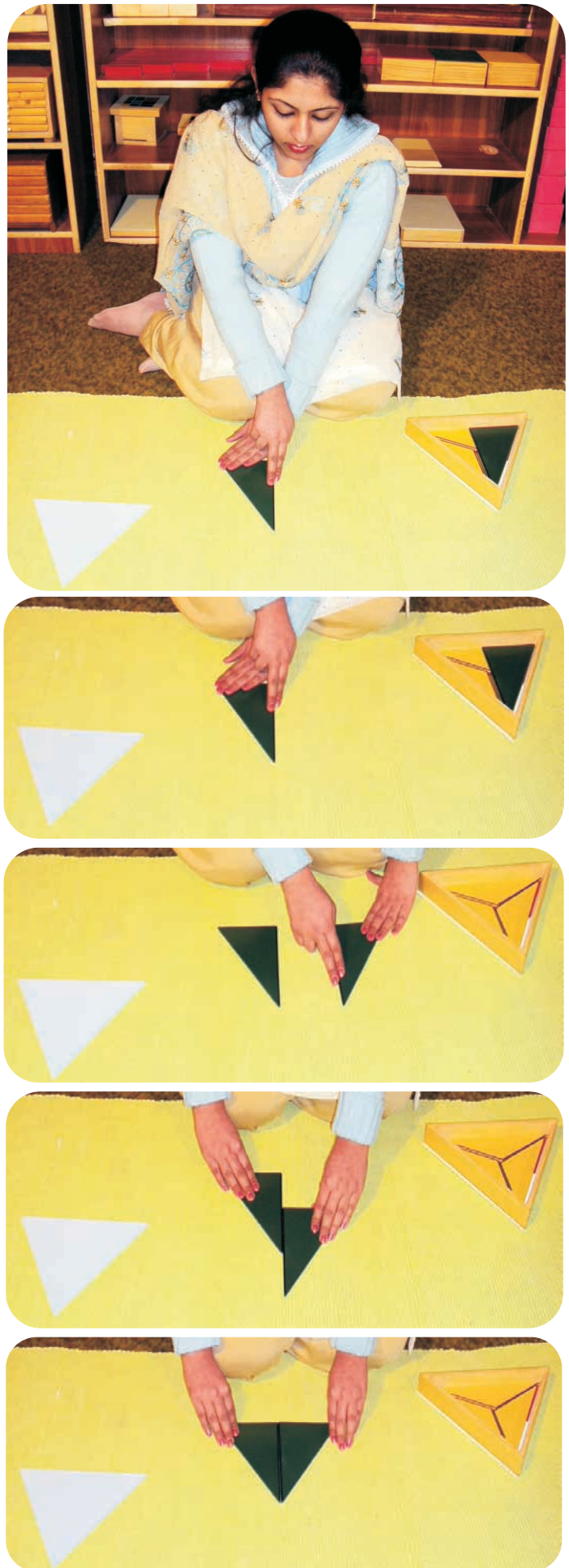
One Big Gray Equilateral Triangle:

- 1) Hold the big gray equilateral triangle and place it in front of you towards the top of the mat.



Two Green Right Angled Scalene Triangles:

- 1) Take a green right angled scalene triangle and place it in front of you.
- 2) With two fingers of the dominant hand trace the guideline from top to bottom very slowly.
- 3) Take the second green right angled scalene triangle and trace its guide line.
- 4) Slide the triangles together so that the guide lines on both the triangles join together. These two triangles now begin to look like the Gray Equilateral Triangle bisected from the midpoint of the base to the apex.



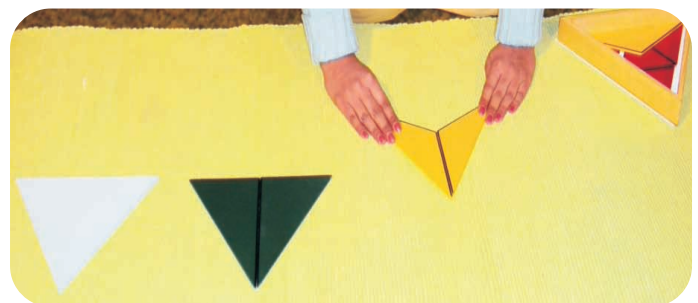
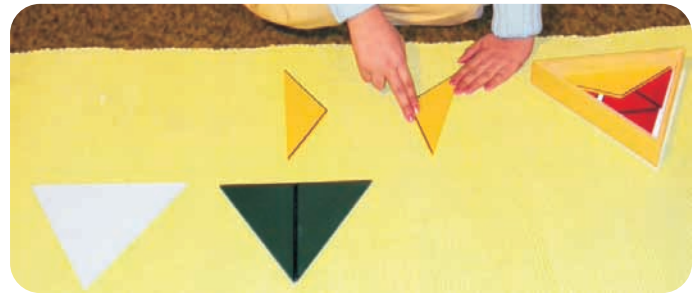
- 5) Take the Gray Equilateral Triangle and place it on this arrangement to show that they are equal.



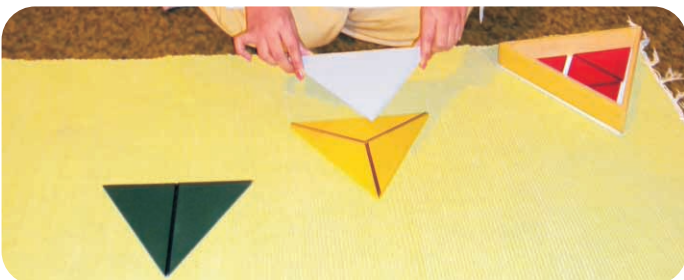
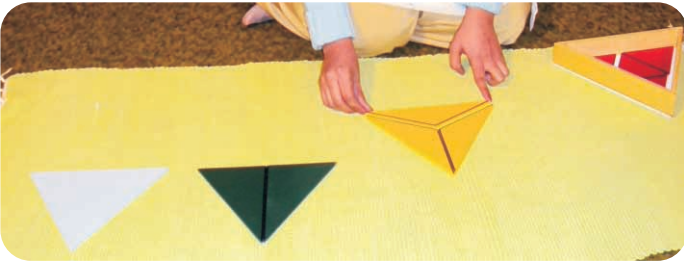
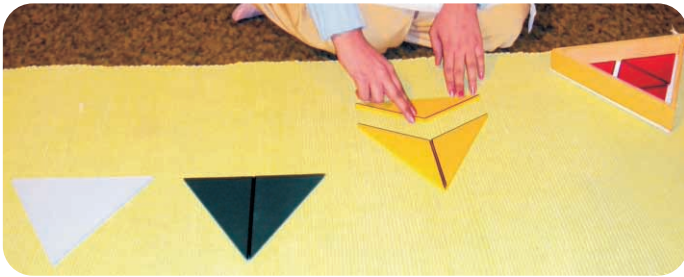
- 6) Remove the Gray Equilateral Triangle and return it to its place and slide away the green triangles towards the right gently so that their arrangement remains the same.

Three Yellow Obtuse Angled Isosceles Triangles:

- 1) Take a yellow obtuse angled isosceles triangle and place it in front of you.
- 2) (All these triangles have guidelines on two sides). With two fingers of the dominant hand trace the guideline (of side only) from top to bottom very slowly.
- 3) Take the second yellow obtuse angled isosceles triangle and trace its guideline (of side only).
- 4) Slide the triangles together so that the guidelines on both the triangles join together.



- 5) Take the third yellow obtuse angled isosceles triangle and trace its guidelines on both the sides. Also trace the left over guidelines of the previously placed two triangles.



- 6) Slide the third triangle with the previously placed triangles so that the guidelines join together.
- 7) These three triangles now begin to look like the Gray Equilateral Triangle divided into three equal pieces by lines drawn from each angle to the center of the triangle (along angle bisectors).
- 8) Take the Gray Equilateral Triangle and place it on this arrangement to show that they are equal.
- 9) Remove the Gray Equilateral Triangle and return it to its place and slide away the yellow triangles towards the right gently in such a way that their arrangement does not get disturbed.

Four Red Equilateral Triangles:

- 1) Take the red equilateral triangle (with guidelines on all the three sides) and place it in front of you, in such a way that a pointed end is facing towards you. We will call it the main triangle throughout this exercise for convenience.
- 2) With two fingers of the dominant hand trace the guideline (on one side only) on this triangle from top to bottom very slowly.



- 3) (The remaining 3 red triangles have guidelines on one side only). So take the second red equilateral triangle and trace its guideline.

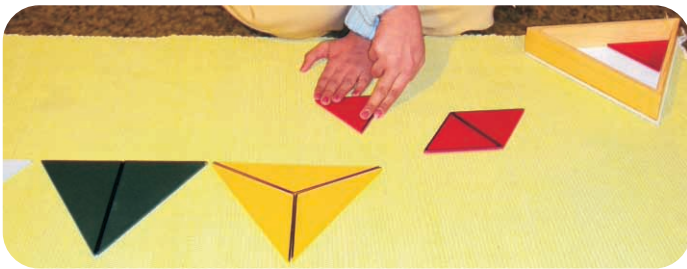




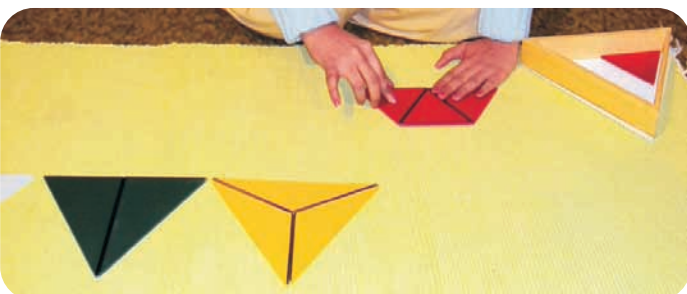
- 4) Slide this triangle together with the main triangle in such a way that the guideline on this triangle and traced guideline on the main triangles join together.



- 5) Take the third red equilateral triangle and trace its guideline. Also trace the second guideline of the main triangle.

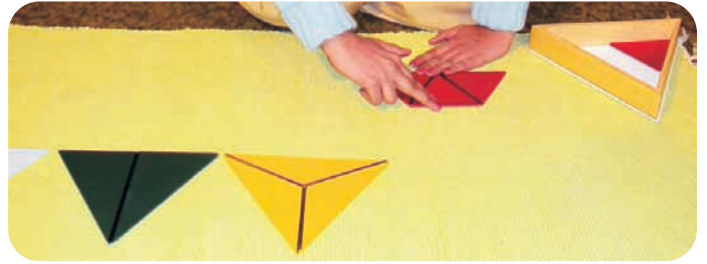


- 6) Now, slide the third triangle also with the main triangles in such a way that the guidelines join together.

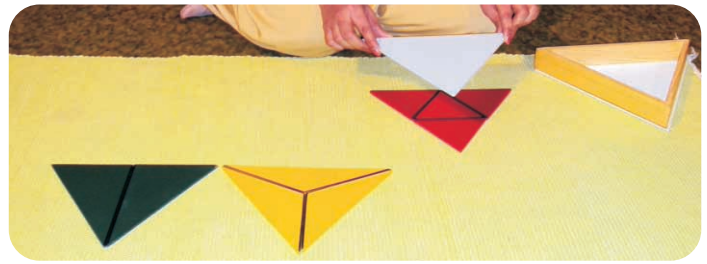
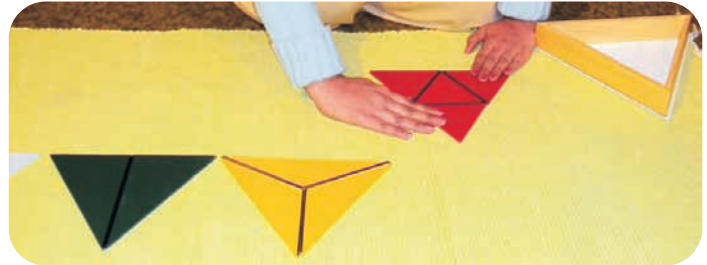


- 7) Take the fourth red equilateral triangle and trace its guideline. Also trace the third guideline of the main triangle.

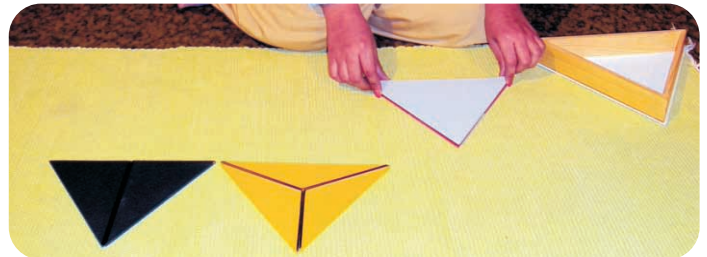
- 8) Slide the fourth triangle also with the main triangles in such a way that the guidelines join together.



- 9) These four triangles now begin to look like the Gray Equilateral Triangle divided into four equal pieces by a line touch the central points of all the side.



- 10) Take the Gray Equilateral Triangle and place it on this arrangement to show they are equal.



- 11) Remove the Gray Equilateral Triangle and place it next to this arrangement.

At the end we have four big equilateral triangles (gray, yellow, green and red) of the same size.



Rectangular Box 1

Material

- A Mat
- Rectangular Box of Constructive Triangles. It has the following triangles in it. (For convenience we name them as set i, set ii, set iii and set iv.)
 - i. Three pairs of large right angled scalene triangles in three different colors Green, Yellow, Gray.
 - ii. a pair of red triangles that form an isosceles trapezoid bisected diagonally.
 - iii. Two equilateral yellow triangles.
 - iv. Two green and two yellow large right angled isosceles triangles.

Exercises

- 1) Take the material to a mat and make the child sit beside you.
- 2) Open the box and tell the child, "This is another box of constructive triangles. Do you remember why we call them constructive

triangles? Because we can construct other figures with them."

- 3) Tell the child to take them out and group together the triangles of similar colour and size.

Making a Rhombus (set iii):

- a. Take the pair of yellow equilateral triangles.
- b. Trace the black guidelines of the triangles one by one and move them closer until they touch.
- c. Ask "what do we call this shape".
- d. If the child does not know the name, tell it.

