Montitute®

Module 5 (Sample)

Mathematical Exercises (part 1)

Chapter 2

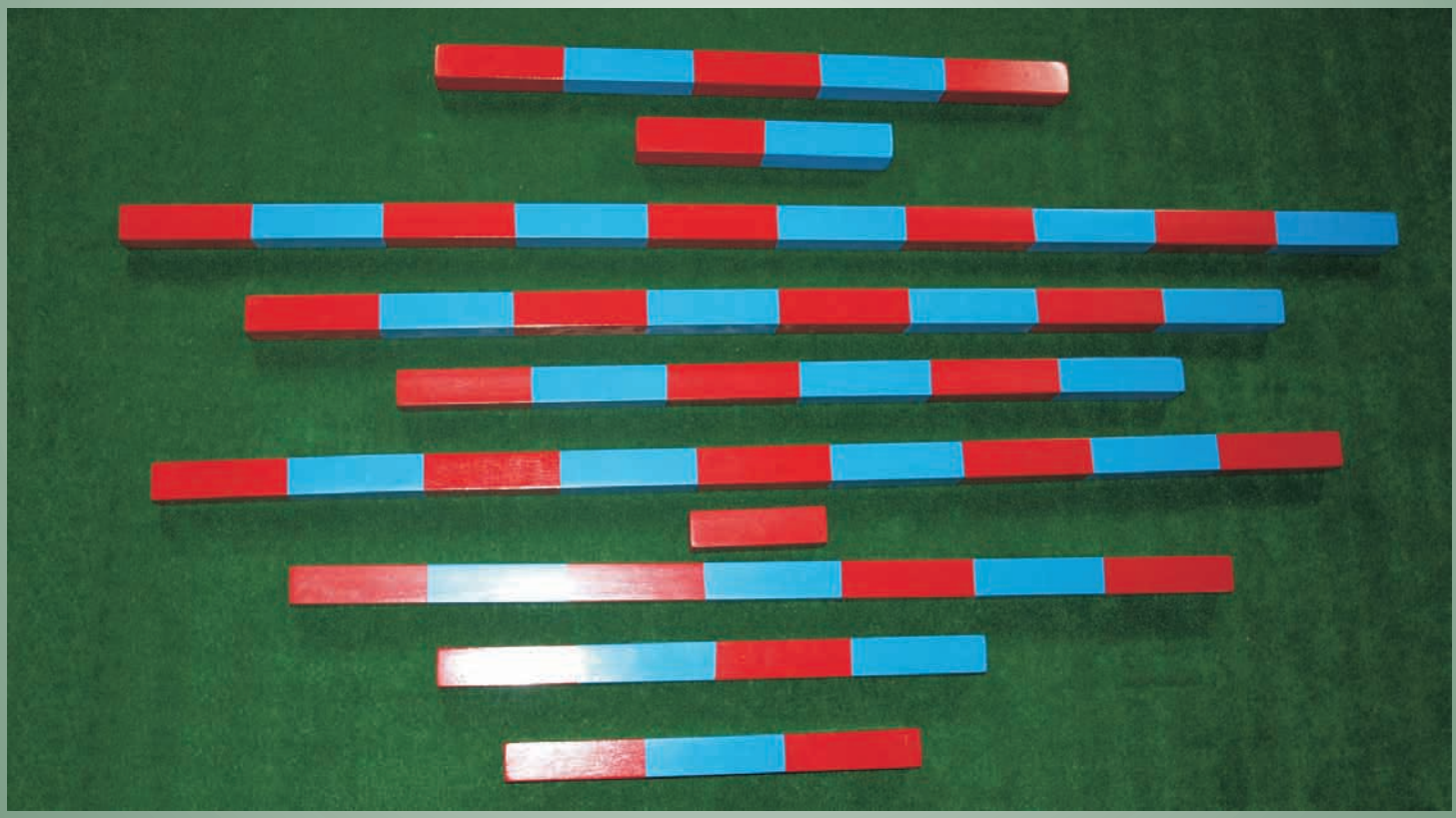
Introducing Numbers 0 to 10

"Rarely, however, can he count with certainty the fingers of one hand, and when he does succeed in doing this, there is always the difficulty of knowing why, … The extreme exactness and correctness of a child's mind needs clear and precise help. When numerical rods are given to children, we see that even the smallest take a lively interest in counting."

Dr. Maria Montessori

The Number Rods

The Number Rods are ten wooden rods varying in length from 1 decimeter (10 centimeters) to 1 meter (100 centimeters). Each decimeter on every rod is colored alternately (and repeatedly) with red and blue. *The first decimeter length of each rod is always red.* Thus, the first rod is entirely red. The second, which is two decimeters long, is colored red and blue, and so on. These rods are equal in dimensions to the red rods (sensorial material).



Exercise 1
The Number Rods
Introductory Exercise

MATERIAL
- The number rods
- A floor mat, preferably dark green *(or any other colour not matching with blue or red shades)*, measuring about 4 feet by 3 feet.

AGE
4 years onwards

PURPOSES
- To introduce the number rods to the children.
- To establish the likeness between long rods and number rods.
- To indirectly enable the children to visualize the successive increase in quantity from 1 to 10 (in terms of length at every successive rod).

EXERCISE

Note: Complete work cycle is to be observed

1. Set the mat on the floor.
2. Bring the rods on the workplace and place at random horizontally with red ends on the left as shown in the picture on the previous page.
3. Introduce the number rods e.g. by saying “These are the number rods”. Further explain the analogy between the number rods and the long rods e.g. by saying, “Do you remember some material in the classroom, that you have used previously, which looks like the number rods?”

4. Wait for the response in terms of “red rods” from the child, else, point to the red rods for him.
5. Tell the child that the number rods can also be arranged in the same way as the long rods.
6. **Beginning with the rod of one**, arrange the rods in order of length, just like the red rods, with red ends on the left, lined up evenly.
7. Allow the child to take over at any stage.

Exercise 2
The Number Rods
Learning to count from 1 to 10

MATERIAL
Same as in Introductory Exercise.

PURPOSES
- Introduction to counting 1 – 10.
- To understand the quantitative value/significance of each number.
- To learn the names "one" to "ten" and to associate the names with the quantities.
- Awareness of the sequence of numbers 1 to 10.
- Awareness of the quantitative relationship between numbers, e.g. 2 is more than 1 and 3 is more than 2, etc.

EXERCISE

Note: Complete work cycle is to be observed

1. Set the mat on the floor at the place of work.
2. Take the first three rods i.e. rods of one, two and three, and start Three Period Lesson.

Period 1:
- Move the first rod close to the child.
- Point towards it and say “This is the rod of one”. Name it several times. "One...one...this is one."

- Then, slide the second rod in front of the child and say, “This is the rod of two”. Then count the partitions touching the center of each segment with forefinger, being careful not to hide the rod with the hand, i.e. point to red side of the rod and say “one”, and then point to the blue part and say “two”.
- Repeat a few times.

- Then, take the rod of three and repeat the above steps. Name it several times like above. "Three...three...this is three." Finally, count the segments, "One...two...three", touching segments of the rod.

Period 2:

- Having introduced the first three rods, say “Show me the rod of one”. The child will probably show or handover the rod of one. Then, say “Show me the rod of two” and so on.
- Extend the second period till you are sure the child is ready to move on to period 3.

Period 3:

- Point to any one rod and say 'What is this?” and wait for the child to answer.
- At naming a rod correctly, also ask the child to count the rod. For example, place the rod of three in front of him and ask, "How much is this?” Or “What is this?". If he says "Three", then she asks him to count it. He counts the segments, "One, two, three." This can be repeated several times with each of the rods.
- On succeeding days, add one or more rods to those already learned, until the child can count all the rods. The rods are left on the shelf for the child to count whenever he likes.

Exercise 3
Sandpaper Numbers

MATERIAL
Ten green wooden/acrylic cards with the numerals 0 to 9, cut out of the finest grade sandpaper, mounted on each card. The format of the numerals must be similar to the numeric writing pattern which the school follows. (Numeral '0' is skipped in this exercise and is presented after working with the Spindle Boxes.)

PURPOSES
- To learn to recognize the written symbol for numbers 0 to 9.
- To associate numerals with their spoken name.
- Preparation for writing.

AGE
4 years and older

EXERCISE

Note: Complete work cycle is to be observed.

1. Sensitize your and the child's fingers.
2. Move the material to a table (preferably).
3. Select the first two to three cards i.e. 1, 2 & 3 and place them towards the top of the table. **(Zero is introduced after the child has worked with spindle boxes).**
4. Using a multisensory approach, involving the child's sense of sight, touch and hearing, begin Three Period Lesson as described on the next page.

Sensitizing Fingertips

Invite the child by telling him that before we can work with the sandpaper numbers, we must clean our hands and sensitize our fingertips.

PRESENTATION
- Take the child over to the sink.
- Wash your hands with soap.
- Fill up a bowl with warm water.
- Put your fingertips of the dominant hand into the water.
- Let them soak for a little while.
- Dry them by rubbing gently against the towel.
- Ask the child to sensitize his fingers in the same way.

- Suggest to the child to stimulate his fingertips in the same way in the future.

Period 1

- Sit beside the child and take the first numerals i.e. 1, leaving the other numerals to top side.

- Bring the numeral "1" card in front of you, and holding it steady with your left-hand, gently trace the numeral with the index and middle fingers of your dominant hand in the right way of writing it.
- Trace the numeral three times and each time say its name like, "One...this is one...this is the way we write… one."

- Slide the numeral towards the child and say, “Would you like to try that?”
- Continue to repeat the name of the numeral each time the child traces the number (if the child is not saying the name himself). The child is not asked to say the name at this point, but he may do so spontaneously.
- Make sure that the child traces the numeral in the right direction of writing it, using his dominant hand.
- Slide away the first numeral toward the top of the table, and bring down the numeral 2 in the front.
- Trace it lightly at least three times and say its name in the same way as you did with numeral ‘1’. Invite the child to try that.

- Put away numeral 2 and repeat the above steps with numeral 3.

Period 2

- Place all numerals in front of the child in the right sequence 1, 2, 3 from left to right.
- Ask, “Can you show me one?”
- When the child shows you 1, ask him to trace it for you once again.

- Repeat the above question for numerals 2 and 3, asking the child to trace the number each time on showing correctly.
- Change places of the numerals and ask the same questions one by one again.
- Repeat many times till you are sure that child can make the association between all the numerals and their names.
- Extend ‘Period 2’ as per requirement.

Period 3

- Place all numerals in front of the child.
- Point to a numeral and say, “What is this?”
- When the child tells you its name ask him to trace that.
- Repeat for all the numerals.

5. Ask the child to put the material back, saying, "Today we learned to write the numbers 1, 2 and 3".
6. Add more numbers in the already learned numbers on subsequent days.
7. Leave the box in the shelf and tell the child that he can work with sandpaper numbers anytime he likes.

Exercise 4
Number Rods & Numerals

MATERIAL
- The Number Rods.
- One set of white wooden/acrylic cards with the numerals 1 to 10 normally in black or red.
- Large felt mat for floor exercise.

PURPOSES
- To relate the numerals 1 to 10 with the corresponding quantities.
- To see the numerals 1 to 10 in sequence.

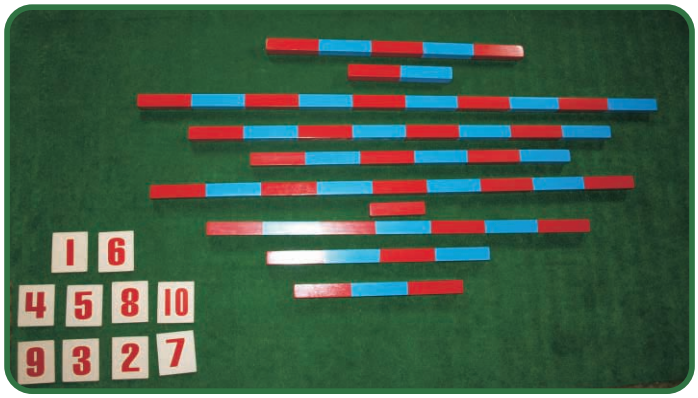
AGE
4 years and older

PRELIMINARY STEP
As the child is, so far, familiar with numerals 1 to 9 only, introduce number 10 by showing the 10 card.

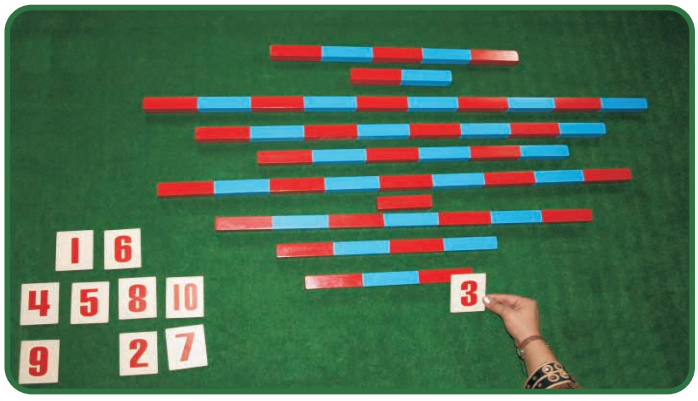
EXERCISE 1

Note: Complete work cycle is to be observed.

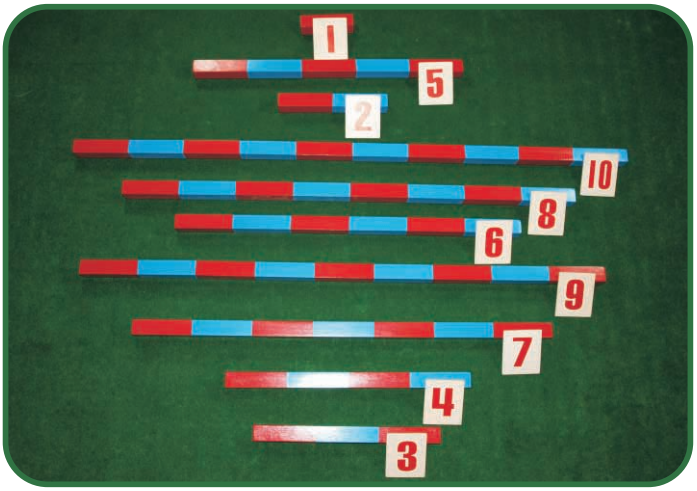
1. Place the rods and numeral cards at random on the mat.



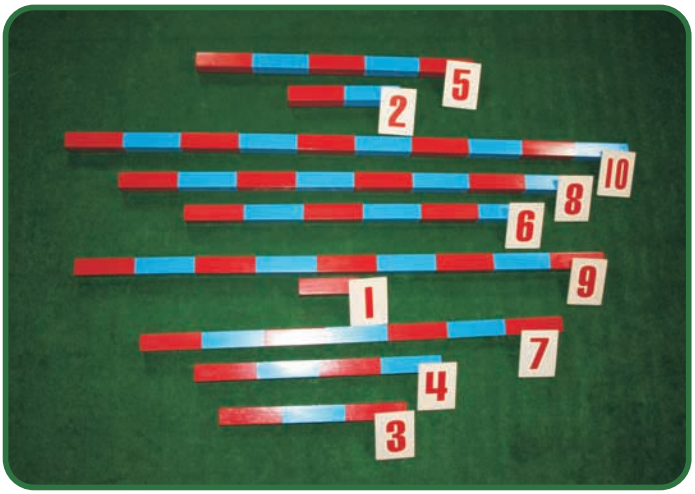
2. Point to a rod and ask the child to count it and then find the corresponding numeral from the number cards. For example, pointing to the rod of three, you ask him to count it. After the child has counted, you ask him to find the number 3 from the cards and place it next to the rod (towards the right end of the rod).



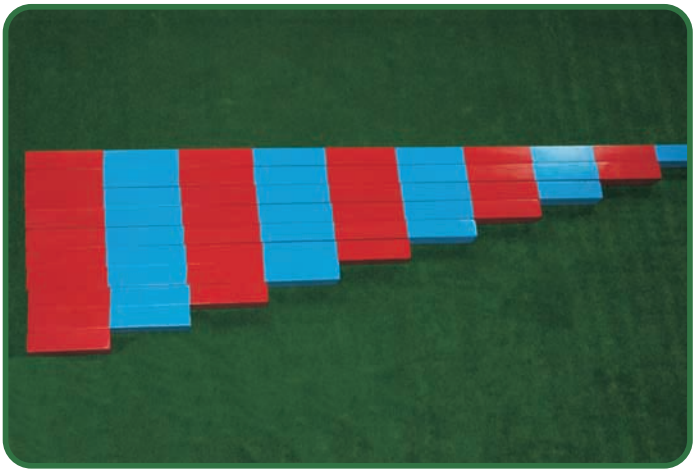
3. Continue in the same way till all numerals and rods are associated.



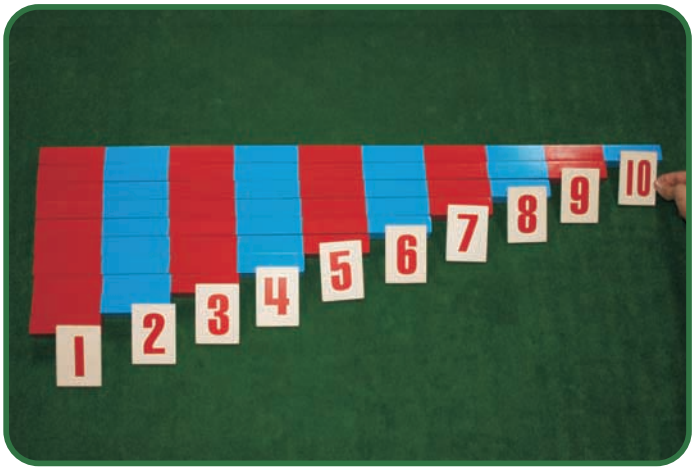
EXERCISE 2
1. Place the rods and numeral cards at random on the mat.
2. Ask the child to find rod 1 and the numeral card 1, and place the card next to the rod.
3. Ask the child to continue placing the rest of the numeral cards with the corresponding number rods.



EXERCISE 3
1. Place the rods and numeral cards at random on the mat as in Presentation 1 and 2.
2. Invite the child to build the stairs.



3. Point to rod 1 and say, “This is the rod of 1”.
4. Then hold the number card of 1 and say, “This is how we write 1”. Place it next to the rod of 1.
5. Do the same for rod of 2 and 3 and then invite the child to continue.
6. Continue till all the cards are placed in correct sequence from 1 to 10 along with the stairs made up of rods.



EXTENSION

Do the exercises some other day in reverse order by showing numerals and asking children to find corresponding rods to place them together.

Exercise 5
The Spindle Boxes

MATERIAL

- A wooden box with ten compartments. The numerals 0 to 9 written at the back of the box.
- 45 wooden/plastic spindles.

CONTROL OF ERROR

There are exactly 45 spindles to be placed in all the compartments, which is exactly the sum of all the numbers 0 to 9. So, there is exactly the right number of spindles to be placed in the compartments. If a mistake is made, the child will be left with either more than nine or less than nine spindles.

PURPOSES

- To introduce the concept of zero.
- To see the numerals 0 to 9 in sequence.
- To associate the corresponding loose quantities with the numerals.

AGE

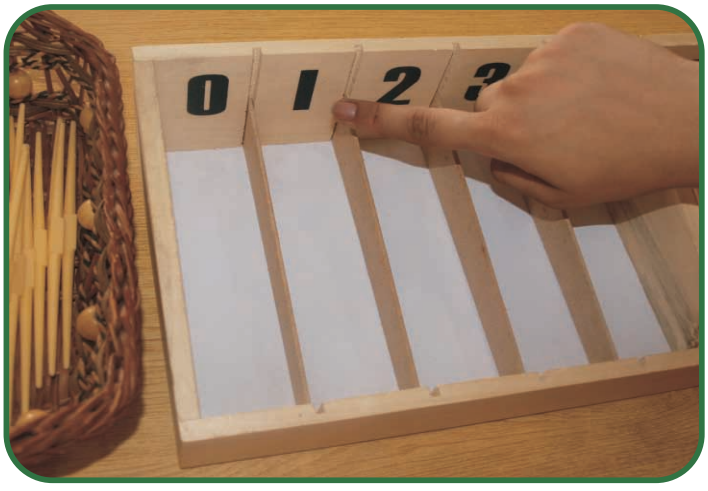
4 years and older

EXERCISE

Note: Complete work cycle is to be observed.

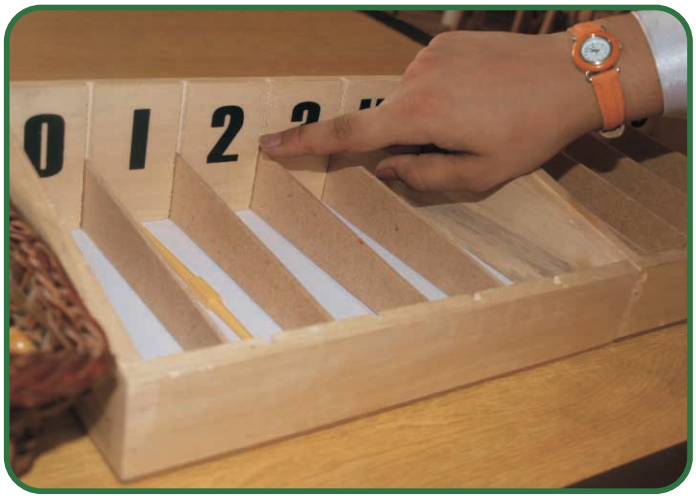
1. Bring the material to a table with the help of the child.
2. Take all the spindles out of the box and lay them on the table in front of the box with the help of the child.
3. To make sure that the child can recognize numbers till 9, point to the compartments one by one and ask the child, “What number is this?”.

4. Then, point to 1 and say, “One”.



5. Pick up one spindle with your right hand and put it in the palm of the left hand counting one. Then, put it in the compartment 1.

6. Then point to number 2 on the spindle box and say “two”. Pick up one spindle with your right hand and put it in the palm of the left hand saying one. Then, take the second spindle with your right hand and put it in the palm of the left hand along with the previous spindle and say 2. Put both the spindles in compartment 2.



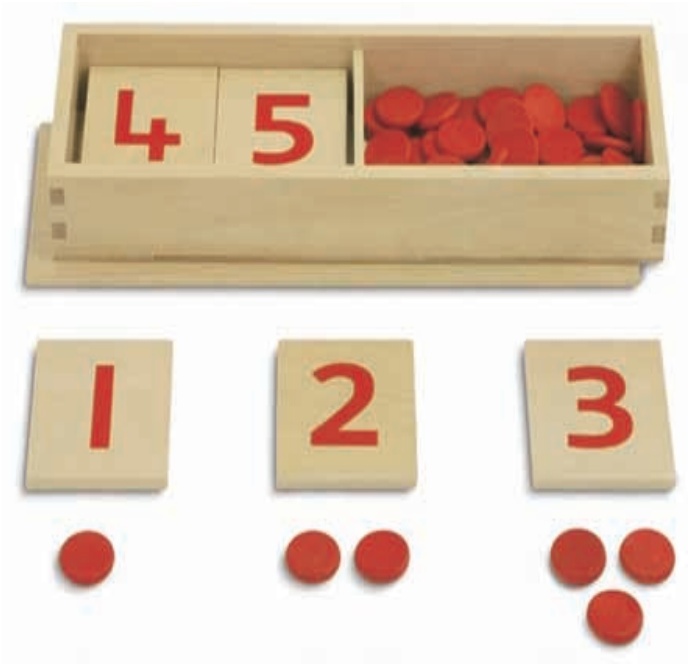
7. Continue in the same way till the right quantity of spindles is placed in each of the compartments.

8. When this has been done, point to zero on the back of the box and tell the child, "This is called zero. This is the way we write zero. **"Then say, "you see this compartment is empty, that is because zero means nothing, We do not put anything in the zero compartment."** At this stage show him the numeral ‘0’ from sandpaper numbers and ask him to trace that.
9. Once the child understands the exercise, he can continue working independently and take the spindle box and do the exercise as often as he likes.

10. Sometimes a child has trouble accepting that "zero means nothing" and is tempted to put some spindles in the zero compartment. If this happens, give some extra help to the child.

Exercise 6
Number Cards & Counters

MATERIAL
- Cut-out numerals or number cards from 1 to 10 in red on white cards.
- 55 counters all the same size and color.



PURPOSES
- To give the concept of even and odd numbers through a visual and concrete experience.
- To provide further practice in arranging the numerals 1 to 10 in a sequence and associate corresponding quantities with them.

AGE
4 years and older

EXERCISE

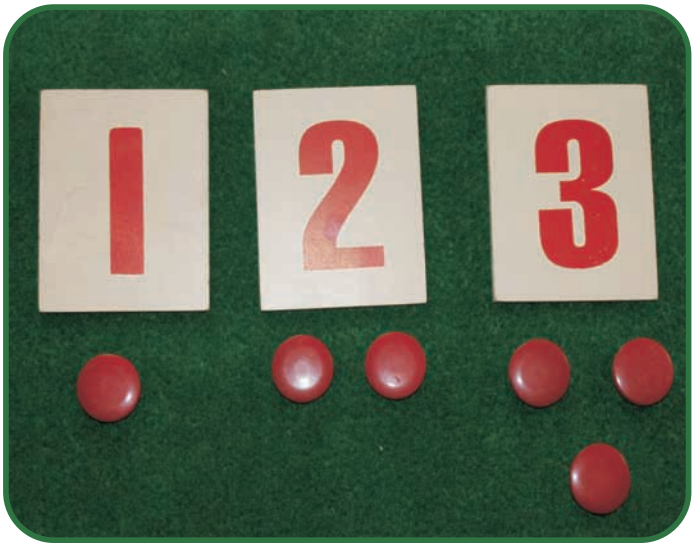
Note: Complete work cycle is to be observed.

1. Introduce the material to the child and bring to a big table.
2. Take out all the cards and lay them on the table in mixed order.
3. Find 1 and place it on the extreme left hand side of the table.
4. Then, find 10 and place it on the extreme right hand side of the table.
5. Ask the child to arrange the rest of the numeral between 1 and 10.

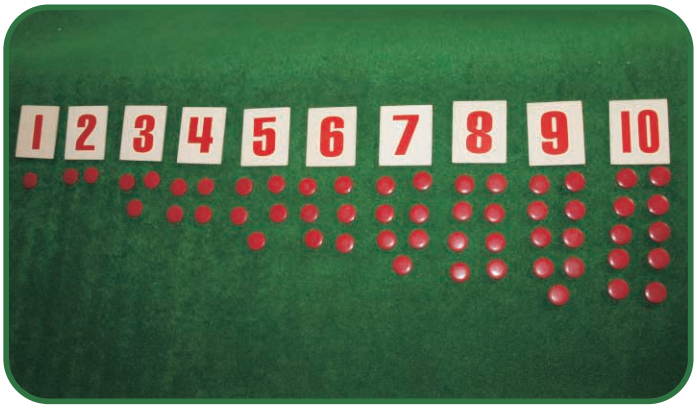
6. Point to card 1 and say, "one". Take one counter and place it below the card 1 saying, "one".

7. Point to card 2 and say, “two”. Then, place two counters below card 2 horizontally while counting the counters. (Place the first counter and say “1”. Then place the second counter beside it leaving a little space between the two in the middle and say “2”.)

8. Then, point to card 3 and say, “three”. Place three counters below the card, while counting each counter, in such a way that 2 counters are in one row similar to the counters under card 2, while the third counters is slightly below the two counters in the middle.



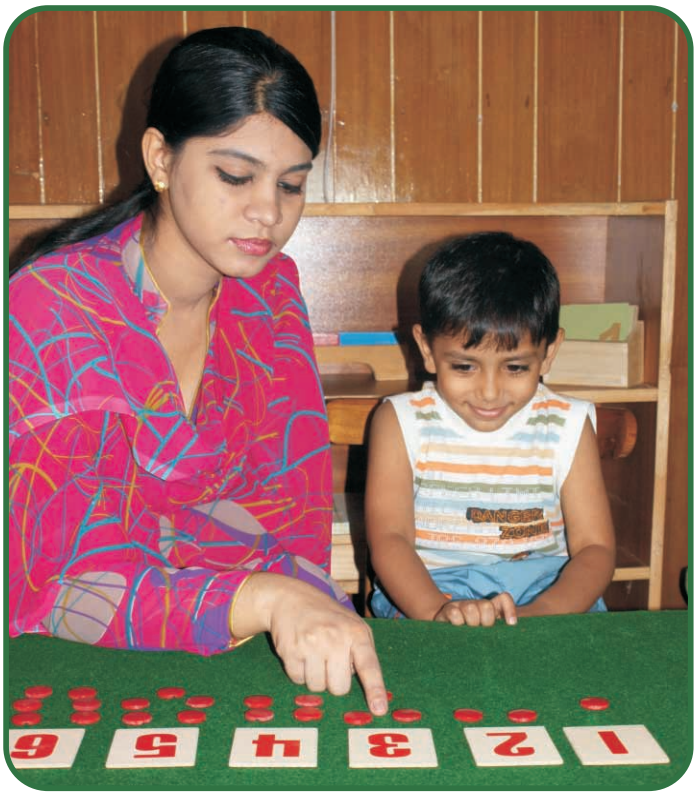
9. Continue to arrange the counters in pairs, with the odd ones underneath in the same way till 10 as shown in the picture below.



10. Allow the child to take over at any stage if he has understood the arrangement pattern.

Period 1

- When the arrangement of counters is complete, place your index finger at the base of each number card in the middle and slide down. If it is hit by a counter say, “odd”, and if the finger passes through without hitting any counter say, “even”.



Period 2

- Ask the child if he can show you an odd number or an even number one by one.
- "Can you show me an odd number?"

- "Can you show me an even number?
- "Can you show me another odd number?"
- And so on.

Period 3

- Point to a number and ask what number is this. The child says its name e.g. 5. Then ask, "What is it… even or odd?"
- Repeat for all the numbers.

CONTROL OF ERROR

There are 55 counters to be placed under the numbers, which are exactly the sum of all the numbers 1 to 10. So, there is exactly the right number of counters to be placed. If a mistake is made, the child will be left with either more than ten or less than ten counters at the last number.

Note

In this series of exercises for teaching the understanding of the quantities and the numerals 1 to 10, each material serves a specific purpose, as described below.

1. **Number Rods** - The quantities are fixed and the numerals are loose. By building the rods into a stair, from the shortest to the longest, and placing the number cards on the end segment of each rod, the child sees the numbers in correct sequence.
2. **Spindle Box** - The quantities are loose and the numerals are fixed in sequence along the top of the box.
3. **Cards and Counters** - Both numerals and quantities are loose. This is the first time we have asked the child to sequence number without providing a control for the sequencing.

Extension Exercise 1
Memory Game

MATERIAL

- 11 slips of folded paper placed in a container with a number written on each… from 0 to 10.
- 11 sets of materials (with ten or more objects in each set) e.g. paper clips, cubes of pink tower, cylinders of knobless cylinders, pencils, ten crayons, ten shapes of metal insets, ten spoons, ten sandpaper letter etc.
- 11 trays

PURPOSES

- Reinforcement of numeric visual memory.
- To apply knowledge of numbers to everyday objects.

AGE

4 years (usually at the end of Group 1)

EXERCISE

1. Invite 11 children and ask them to sit in a circle.
2. Give each child a tary.
3. Ask each child to take a folded paper strip from the jar but not to look at what is written on it.

4. Tell the children that you would come to each child one by one and ask to get a some objects from the classroom.
5. Go to the first child and whisper in his ear what to get e.g. pencils. Also tell the child to open his folded strip, read the number silently and bring that many pencils.
6. Go to the second child in the circle and tell him to get something else e.g. crayons according to the number on his folded slip.
7. Continue in the same way by going to each child in the circle.
8. Once a child has collected what you asked for, he should sit back at his place in the circle.
9. Verify if each child has collected things according to the number written on the slip.
10. Discuss why the child who got the slip of 0 has brought nothing… because 0 means nothing.
11. Collect the slips back and repeat the game if the children are interested, otherwise ask children to return the materials to the shelves.

Extension Exercise 2
Actions Game

MATERIAL
Non required

PURPOSE
To apply knowledge of numbers to everyday life.

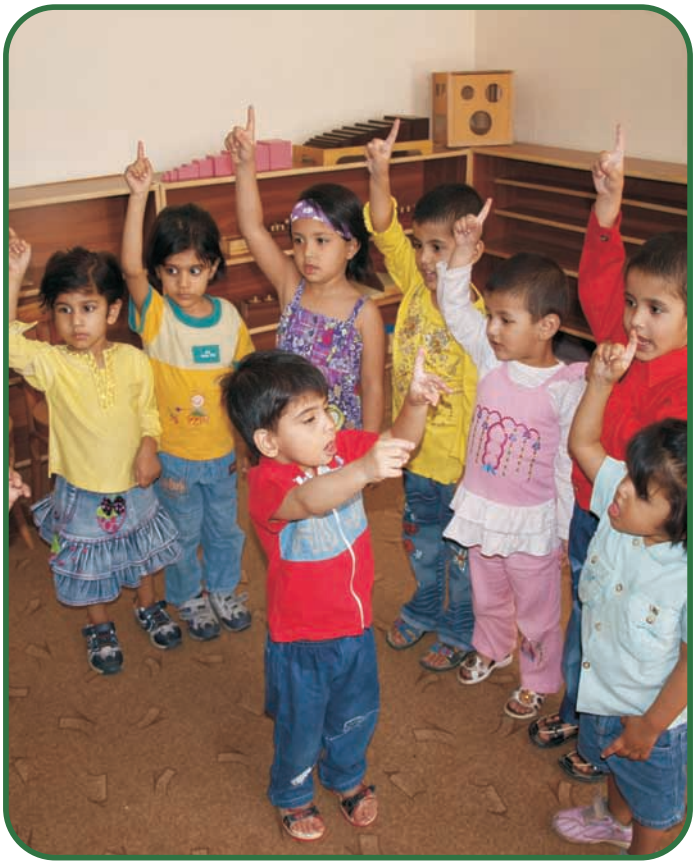
AGE
4 years (usually at the end of Group 1)

EXERCISE
1. Invite a few children and make them stand in a circle.
2. Ask children to perform certain actions a certain number of times, For example,
   - "Noor please stamp your feet 7 times."
   - "Fajar please knock at the door 5 times."
   - "Abdullah please clap your hands 4 times."
   - "Talha please jump ten times".
3. Ask other children to count along as a child performs.
4. Continue in the same way till the children are interested.

Extension Exercise 3
Number Poems & Rhymes

Poems and rhymes including numbers can be helpful in illustrating and reinforcing number vocabulary and concepts especially when involves actions. Following are just a few examples;

- One two, buckle my shoe,
  Three four, shut the door,
  Five, six, pick up stick,
  Seven, eight, lay them straight,
  Nine, ten, a big fat hen.



- Nine juicy apples,
  On my grandpa's tree,
  If you pick and eat one,
  How many will there be?

- Ten little monkeys jumping on the bed
  One fell down and bumped his head
  Mama called the doctor and the doctor said,
  "No more monkeys jumping on the bed !"

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