

A vertical wooden abacus with five visible segments. Each segment has a number on the left and a zero on the right. The numbers are 1, 2, 3, 4, and 5 from top to bottom. The abacus is positioned in the center of the page. A teal banner is overlaid on the bottom half of the image, containing the text 'PME Mathematics Lesson 2'.

PME Mathematics Lesson 2



This week we shall continue the study of Mathematics in the Montessori 3 to 6 years setting.

Mathematics

Lesson Objectives:

1. To study the core lessons for counting from 11 to 100
2. To learn the Snake Game
3. To introduce the concepts of simple addition and subtraction

THE SPINDLE BOXES

Description of Material:

- Two boxes exactly the same each with five compartments. At the back of each compartment is painted the numeral symbols in black Starting from 0 and progressing serially up to 9.
- A container with 45 spindles, 8 ribbons or elastic bands, and a basket.

Objectives:

- To clarify the idea that the symbols represent a certain quantity of objects
- To introduce the concept of zero and its symbol
- To reinforce the natural sequence of the numerals

Presentation:



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- Bring the material to the worktable.
- Name the material introducing the work to the children. Point out the compartments and the numerals, which the child should know.
- Point to all the numbers, one at a time and have the child give the number names. Tell the child that these numbers will tell us how many spindles to put in the box.
- Point to the number 1, have the child read it and then say, "We will put 1 spindle in this box." Then place one spindle in the compartment. Repeat same for 2, counting the spindles as you place them, "One, two" Continue this up to 4.
- Have the child place the correct spindles in the remaining compartments.
- Once all of the spindles have been placed, look at compartment 0 and notice that there is nothing in it. Say, "This is zero, Zero means nothing. That is why there is nothing in this spot."
- Have the child tie a rubber band around the two spindles and replace them in the 2 slot. Repeat for the other spindles.
- Then take out the 1 spindle and place it gently back into the basket. Take out the other spindles group by group, and after taking off the rubber bands, place them one by one (counting as the child does this) back into the basket.
- Then ask the child why there were no spindles in the 0 container. The answer should be "There are no spindles because the box says zero and zero means nothing"
- Have the child replace the material on the shelf.

Control of Error:

If the counting has been done incorrectly there will be either an insufficient number of spindles or some left over at the end.

Age:

4 years+ (after the child has worked with the number rods and cards)

An Extension:

THE ZERO GAME

Variation 1:

Invite a small group of children to come and play the game.

Ask one child to "Jump 5 times"

Encourage the group to count out the number as they are doing the action

Get the group to whisper 7 times.

Have another child to do another action a certain no of times

Ask a child to do something else zero times.

Then ask, "Why didn't you do anything?"

Discuss the concept of zero

Give each child a chance to carry out an activity as well as a chance to do something zero times.

Variation 2:

Place a number of similar objects on the table, then write numerals 0 to 9 on ten separate pieces of paper and fold them up separately. Get each child to pick one piece of paper and go and fetch the correct corresponding objects from the table. The child with zero will find it difficult to return with nothing.

Aim: To reinforce the concept of zero

Control of Error:

The child's own knowledge.

Age:

4 years+ (after the child has worked with the spindle boxes)

SEGUIN BOARD A



Description of Materials

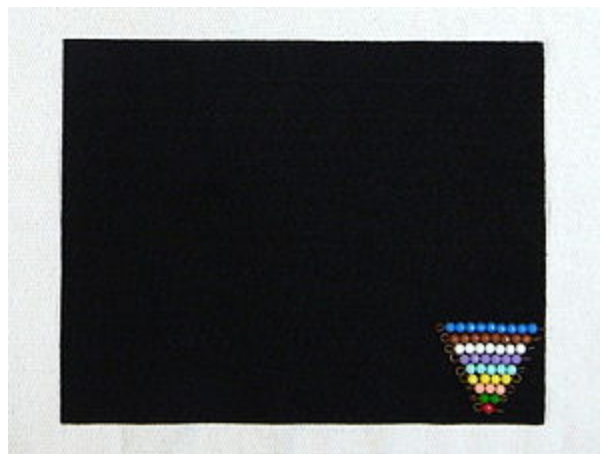
- 9 Ten Bead Bars,
- One coloured Short Bead Stair,
- A small felt mat

Objectives:

To teach the child quantities 11 to 19

Presentation 1:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Place the materials on the felt cloth
- Use the 3 period lessons to teach and remind the child of names of the materials
- Invite the child to build a triangle with the short bead stairs



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- Take a ten bead bar and a short bead stair from the triangle built starting from 1 place them together on the workstation and say “1 ten bead bar and 1 bead bar makes 11. 10 and 1 makes 11”
- Then take a ten bead bar and a 2 short bead bar place them together under the “11” and say “1 ten bead bar and 2 bead bar makes 12. 10 and 2 make 12 and repeat the same for 13.
- Introduce the numbers 11 to 19 in sets of 3, i.e. 11-13, 13-15, 15-17, and 17-19.
- Now use the Three Period Lesson to teach the names of the numerals.
- Return the materials to the proper place on the shelf and remind the child that he can work with the material building the numbers 11 -19, whenever he wishes.

Presentation 2:

Description of Materials:

Seguin Board A and a large felt mat

Objectives:

To teach the child the symbols 11 to 19

Presentation:

PME Mathematics 2

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Point to the first 10 and ask the child “What is this?” The child should reply “This is 10”.
- Then say “I am going to cover the zero. 10 and 1 makes 11” cover the zero but slip 1 over 0 and say “ This is 11”
- Show the child 12 and 13 teach these in sets of three too.
- Then use the Three Period Lesson to teach the names of the symbols.
- Return the materials to the proper place on the shelf and remind the child that he can work with the Seguin board and cards building the symbols 11 -19, whenever he wishes.

Presentation 3:

Description of Materials

For Presentation 3: Seguin Board A, 9 Ten Bead Bars, One coloured Short Bead, Cards 1 to 9 and a large felt mat.

Objectives:

To teach the child combination of quantity and symbol

Presentation

PME Mathematics 2

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Place the materials on the large felt mat on the floor
- Select the first card which is the Number 1 card and slip it over the first 10 on the board covering the 0
- Take on Ten Bead bar and the one short Bead Stair and place it to the left of the Number 11 and say “10 and 1 makes 11”
- Ask “Do you know what comes after 11?” “ The child should answer “12”. Show child how to build till 13 and then encourage the child to continue building till 19 in a similar manner.

Control of Error: The Golden Bead and Short Bead Stair provide the correct number of beads needed in the right order (once the stair has been built), so the quantities can be built without error.

Age: 4 years

SETS OF CARDS

Description of Materials:

- A set of cards with simple pictures, containing only pictures of objects, not in a formal pattern
- A set of numeral cards 1 to 19

Objectives:

- To do further practice in counting and associating the correct number of objects with the numerals.
- To provide an activity that will help the child grasp the concept of conservation of numbers.
- To help the child relate the concept of numbers to everyday situations by depicting everyday objects
- To provide further practice in sequencing.

Presentation:

PME Mathematics 2

- Show the child where the materials are kept on the shelf, carry to workstation and name the materials.
- Place materials on the table and ask the child to place the numeral cards in the correct order
- Then ask the child to find all the pictures having just one object and place it under the 1 and all pictures having 2 objects to place them under the 2 card, etc.
- Return all materials to their proper place on the shelf after the exercise and remind the child that he can always return to work on this activity whenever he wishes.

SEQUIN BOARD B



Description of Materials

- 45 Ten Bead Bars
- A Small felt mat

Objectives:

To Teach quantities and Numerals 10 to 20

Presentation 1:

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- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Place the materials on the small felt mat
- Place one Ten Bead Bar in front of child and ask, “What is this?” The child should answer “This is Ten” or “ a Ten Bead Bar”
- Place 2 Ten Bead Bars a little to the right of the first Ten Bead Bar and say “1 ten, 2 tens makes twenty”
- Take three Ten Bead Bars and place them again to the right of the Twenty and say “1 ten, 2 tens, 3 tens make thirty”
- Use the Three Period Lessons to teach the three new numbers at each lesson, (10-30, 30-50, 50- 70, 70–90, and then 10-90)
- Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.

Presentation 2:

Description of Materials

Seguin Board B and a large felt mat.

Objectives:

To teach the quantities and numerals 10 to 90

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Place the materials on the large felt mat
- Start to introduce the symbols of 10-90 using the three period lessons and teach only 8 symbols per lesson
- Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.

Control of Error:

Age:

THE SNAKE GAME

Description of Materials

- A box containing one Black and White Short Bead Stair
- A box containing 2 Coloured Short Bead Stairs
- A box containing at least 9 Ten Bead Bars
- A Marker
- A small felt cloth

Objectives:

- To prepare the child for addition
- Indirect preparation for Number Bonds

Presentation:

PME Mathematics 2

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Show the child how to make a triangle with the Black and White Bead Stair, and say, “This is how we make the triangle”.
- Invite the child to build the 2 sets of Coloured Beads into triangles
- Then say, “We are going to make a snake with the coloured beads”.
- Take the coloured beads at random and start laying out a snake.
- Explain to the child that “ we are now going to change the coloured Snake to a Golden Snake, Using the Golden Ten Bead Bars”
- Begin to count to 10. (If the coloured Bead bars are 4, 2, 8... beads, the Tenth Bead will be reached on the fourth bead of the Eight Bead Bar leaving 4 over.)
- Put a marker in place at the end of the tenth bead, count how many beads are left on the rest of the bar (in this case the Eight Bar) remove the 4, 2, and 8 bar.
- Place these on the lid of one of the boxes and replace them with one Golden Ten Bead Bar and a 4 Bead Bar from the Black and White Bead Bars.
- Count the next 10, start from the Black and White Beads. The idea is to replace every ten beads with a Golden Ten Bead Bar and the remainder units with the Black and White Bead Bars.
- Continue to replace the coloured beads with the Golden and Black and White Bead Bars till all is done. The exercise would have been carried out correctly if the whole snake has turned golden, using up all the 9 Golden Ten Bead Bars for the 2 sets of Short Bead Stairs. If not that means there was an error in the process of carrying out the exercise.
- Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.

Control of Error:

The Black and White Bead Stair provides a Control of Error when the child changes Coloured Beads for Golden Beads. One of the lids is used to hold and later check the beads removed from the sake.

Age: 4 years

ADDITION WITH SMALL NUMBER RODS

Description of Materials

- Two sets of Small Number Rods
- Plain squared paper
- A pencil

Objectives:

- To introduce the child to addition with numbers 1 to 10
- To show the child how to record additions up to 10
- To provide controlled exercises for teaching number bonds.

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Invite the child to build 2 stairs with the number rods
- The rods on the left acts as a control of error and the rods on the right are used for addition purposes.
- So take a rod from the left and count e.g. Rod 7
- Then ask the child to pick a rod shorter than 7 from the right set of rods, the child may choose for example Rod 5.
- Place this rod below the Rod 7 and ask the child “How many more to make 7?”
- The child counts and answers “2”. Ask the child to take a 2-Rod and place it beside the 5-Rod and he would find they now are equal lengths with the 7-Rod.
- Explain that “5 plus 2 makes 7” and then show the child how to write “ $5+2=7$ ” on the plain square paper.
- Continue the presentation by showing a few more examples.
- Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.

PME Mathematics 2

Control of Error: One set of rods, acts as the control of error, as the answer the child has must be equal lengths with the first rod.

Language:

Explain that Addition is putting together and saying how many there are:

1. How many altogether?
2. What is the total?
3. How many did you start with?

These are the language patterns the child needs to develop and understood.

Exercise 1:

The child can take out the Small number Rods, make up some examples and record his answers on a plain squared paper.

Exercise 2:

In preparation to learning Number Bonds, when doing the above exercises, exchange places between the 2 addition rods and reinforce that for example, $5+2=7$ and $2+5=7$ as well.

Note:

The word "Sums" is the answer to an addition question and must not be used for other mathematical exercises. Use "Exercise or example" instead.

Age: 4 years

Subtraction with Small Number Rods

Description of Materials

- 2 Sets of Small Number Rods
- Plain Squared paper
- A pencil

Objectives:

PME Mathematics 2

- To introduce the child to subtraction situations with answers/differences under 10
- To show the child how to record subtraction questions with answers under 10

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Invite the child to build two stairs with the Number Rods
- Select a rod from the right stair e.g. a 4-Rod. Then ask the child to select a rod shorter than it from the left stair.
- The child may select 2-Rod e.g. and place it beside the 4-Rod
- Invite the child to count the rods together “1,2,3,...6. Four and two makes 6. Lets take away 2
- Now remove the 2-Rod. Ask, “How many left?” Count “1, 2, 3, 4. So 6 take away 2 is 4”
- Show the child how to record the statement on the plain squared paper, i.e. $6 - 2 = 4$
- Do a few more examples.
- Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.

Control of Error: The Rods act as a Control of Error because the quantities are fixed.

Language:

1. Take away. Starting point is a set of objects, from which you take away a smaller number of objects. The answer is always what is left. Ask “How many are left.
2. Comparisons. Starting point are 2 sets of lengths, heights, capacities, weights, etc.

How many more situations?

How many more cups are there than plates?

How much more water does the cup hold than the glass?

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What is the difference in height between two people, Harry and Liz?

What is the difference in price between books bought at Agege Market and CMS Bookshop?

Age: 4 years

ADDITION WITH SHORT BEAD STAIRS



Description of Materials

- A set of coloured Bead Bars 1 to 9
- 3 sets of Addition Cards with Red Boxes for answer space.

Objectives:

- To provide the child with further experience of number combinations up to 10
- To also provide the child with further written experience in addition

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Invite the child to build a triangle with the Short Bead Stair
- Based on the Addition Cards, assist the child through the exercises. E.g., $2 + 5$. Take the 2 Short Bead Bar and then the 5 Bar place them together and count the total number of beads “1, 2, 3...7” The answer is 7, so show the child where and how to record the answer on the red answer square.
- Encourage the child to work through the cards and record the answer.
- Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.

Control of Error: The Short Bead Stair acts as a Control of Error while the red boxes on the Addition Cards controls the place the child puts the answers.

Age: 4 years

SUBTRACTION WITH SHORT BEAD STAIR

Description of Materials

- One Short Bead Stair
- 3 Sets of Subtraction Cards with red boxes for answer space.

Objectives:

To support the subtraction activity introduced with the Number Rods and give the child further practice.

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Invite the child to build a triangle with the Short Bead Stair
- Give the child a work card and assist him to work through the questions on the card. E.g.

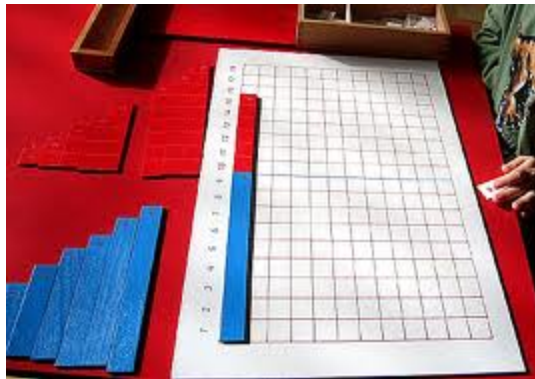
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- Take a 9 short bead Stair. Cover the 5 beads at the right end of the bar and count the uncovered beads.
- Show the child how to record the answer on the answer square.
- Encourage the child to do more exercises.
- Show the Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.

Control of Error: The red boxes control the place the child puts the answer. The Short Bead Stair controls the minuend. (The amount to start with)

Age: 4 years

ADDITION STRIP BOARD



Description of Materials

- A board with 12 blank squares down by 18 squares across.
- To sets of Number Strips from 1 to 9. One set, in red has lines separating the numbers and one set in blue that has no lines separating the numbers.
- Work Cards

Presentation 1: random examples up to 18

Presentation 2: addition questions in sequence,

e.g. $9 + 1$ to $1 + 9$

Objectives:

PME Mathematics 2

- To give the child further experience in addition situations
- To show the child ways of making 10, 9, 8 etc and reinforcing number bonds.

Presentation 1:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Invite the child to build the two sets of stairs from the number strips
- Based on the questions on the Work Cards eg., $3 + 9$, take a “3” strip from the blue set and a “9” strip from the red set, place them together on the first row of the board
- Count the total squares starting from the blue strip . The answer is 12 and point out to the child that the answer may be obtained by looking at the top row of the board where the red strip ends.
- Then say “Three and nine makes twelve”
- Now show the child how to record the answer on the answer square.
- Encourage the child to work through the questions on the work cards and to record the answers.
- Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.

Presentation 2:

PME Mathematics 2

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Invite the child to build the two sets of stairs from the number strips
- Then tell the child, “I am going to show you different ways to make 10”
- Take the “1” strip from the blue set and “9” strip from the red set and place them on the first row of the board.
- Then take the “2” strip from the blue set and the “8” strip from the red set and place them on the second row of the board. Continue building with the relevant strips until they are all used up.
- When completed the child will be able to see that for all these additions, the total is 10
- Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.

Variations:

- Switch the number strips alternating the blue and red strips on the board eg., $1 + 9 = 10$ and $9 + 1 = 10$
- Or on first row place one set and on the second row place the second set $1 + 9$ and then $9 + 1$,
- All the above shows a total of 10.

Control of Error: The answers are at the top of the board

Age: 4 years +

SUBTRACTION STRIP BOARD

Description of Materials

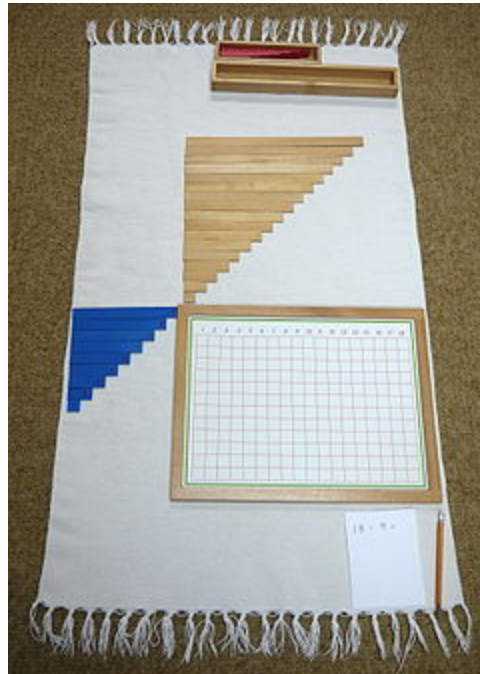
- A Number Line Board with numbers 1 to 18
- One Set of Number strips from 1 to 9 in blue
- One set of Blank Strips
- Subtraction cards with questions with minuends of up to 18

PME Mathematics 2

Objectives:

To give the child further experience in subtraction and to extend the subtraction activity up to 18.

Presentation:



- Show the child where the materials are kept on the shelf, name them and carry to the work station

The first problem is $18 - 9 =$

Take the no.9 strip and cover up the numbers starting from the end. The last visible number is the answer.

Show the child how to record the answer



The next set of subtractions to solve:

$17 - 9 =$ and $17 - 8 =$

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Lay the shortest of the plain wooden strips over the number 18 on the board.

Take the 9 strip and cover up the numbers starting from the end. The last visible number is the answer. Ask the child to record the answer.

Now ask the child to do on the next work. He should take 8 strip and cover up the numbers starting from the end. The last visible number is what the child should record.

Give the child more problems on another page eg. $13-9=$; $13-8=$; etc.

Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.

Control of Error: The numbers on the board act as the control of error.

Age: 4 years plus