Montessori Primary

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Mathematics 2

Addlo Montessori

Montessori Primary Mathematics - Place Value

An Introduction

With Mathematics there are several materials the children still use in Lower Primary which were also used in the 3 to 6 setting, but there are a couple of new and exciting materials for them to learn from as well. I will order the materials and the lessons the way I think would help the children most under each area.

Primary Mathematics has several sections that you need to pay attention to, they include Place Value (Numeration), Number Operations, Word Problems, Fractions and Decimals, Squaring and Cubing, Algebra, Power of Numbers, Other base systems, Measurements, Data and Geometry.

I am well aware that it is not all these areas that are covered in our curriculum. I do think though that if possible we should widen the scope of work the children do especially since the work will always start with concrete materials. If and when these topics are dealt with at Secondary level the children would have had a prior experience to aid a better understanding of what to do.

Also I do want to recognize that some of the materials could be very expensive. We will look at some of them and go through a process of how you can make some of them or something similar to start with. I would like to emphasize though, that care should be taken in making your materials as neat, safe and beautiful as possible and remember be precise. If you do not follow the measurements then the whole purpose of using the materials falls apart and understanding will not occur.

The Story of Numbers

The fifth Great Lesson is where Mathematics usually starts with our Lower Primary students. Let the children work on this for a while before you move on to other parts of the Mathematics work. This will allow the children who may require remedial work some time to do what everyone else is doing in the class following their interest in finding out more about the numbers of the past.

Since Roman Numerals are part of what is expected in the Nigerian Mathematics scope of work do make sure you have materials for the children to explore but make other number value systems available as well. I would suggest that the Igbo, Yoruba and other number systems should be explored at this time as well as other Western and Asian counting systems the children may be interested in. While the world uses the decimal system today, many cultures used different systems, it is important for the children to know this.

The Yoruba counting system for example is based on counting in twenties, it can be quite complicated as it relies in part on addition and then on subtraction. This could help children practice their simple number operations. While learning a bit or number history or anthropology.

Continuing Remedial and Revision Work

There are still so many Place Value lessons that you should revise and ensure that all children can work conveniently with before you undertake doing more extensive mathematical exercises with the children.

1. Review the Large Number Cards

2. The Cards in sequence 1 –9999

3. Number Quantities with the Golden Beads

4. Combining Quantity and symbols

5. The Bank Game

6. The Birds Eye View

7. **The Hundred Board**

The Hundred Board

This is used to practice sequential counting from 1 to 100 in number symbols.

1. Practice placing the tiles from 1 to 100

2. Child can now do different exercises, fill in the gap, what is the missing number, what is the next number, what number comes before...

3. Is this number **greater than** or **less than**?

4. A group of children (2 –3) can play number scrabble.

5. A group of children (2–4) can play the number order game.

6. Skip counting in 2's, 5's and 10's

Place Value

Since you would have spent quite some time telling the children stories of what happened many years ago, ranging into the 100's of millions, I think a good place to start would be the Geometric Hierarchy of Numbers

1. Geometric Hierarchy of Numbers Material

Pre-requisite: Review and go through the Decimal system, counting 1 to 100 then 1000 using the Bank Cards and Bank Game.

The concrete materials to represent one unit to one million.

Description of Materials

1,000,000 cube - 50 x 50 x 50 cm – green

100,000 square –50 x 50 x 10 cm – red

10,000 bar - 50 x 10 x 10 cm – blue

1,000 cube - 10 x 10 x 10 cm – green

*100 square –10 x 10 x 1 cm – red

*10 bar - 10 x 1 x 1 cm – blue

*1 unit - 1 x 1 x 1 cm - green

*(in a tray)

Wooden number cards representing 1 - 1,000,000

The Golden Bead Tray of 1,10,100, and 1000 beads

Objectives

To give the child more understanding of the decimal system

To reinforce the decimal place value

To give a concrete experience of the difference in quantity of a million compared to one unit.

To show the child how to count " ten times more'

To learn to read numbers from 1 to 1,000,000 in multiples of ten.

Presentations:

    1. First relate the Golden Bead Material to the Geometric Hierarchy tray

Ask the child to bring the Golden Bead Tray and Hierarchy Tray to the workstation

Lay out the Golden Beads starting from right to left starting with the units, then place the hierarchy equivalent below each of the Golden bead material set out.

Show the child that they are the same amount by exploring and asking questions.

    1. Give the child a concrete experience of 1,000,000

Bring the green thousand cube, blue ten thousand bar, the one hundred thousand square and the one million cube to the workstation.

Lay them on the mat from right to left starting with the thousand cube and ending with the million cube.

Point to the green thousand cube and ask the child 'What is this?'

Answer is 'One thousand.'

Now place the cube on the blue 10,000 bar and start counting measuring as you go along, 'One thousand, two thousand'... counting up to ten thousand.

Say: 'There are ten 1,000's in ten thousand'

Then take the red hundred square align the blue bar to it and count up to ten against it from right to left, counting 'Ten thousand, twenty thousand'... till you get to 100,000

Say: 'There are ten 10,000's in 100,000'

Then take the green one million cube and align the red hundred thousand square to it and count up to ten against it from right to left, counting 'One hundred thousand, two hundred thousand... till you get to 1,000,000

Say: 'There are ten 100,000's in 1,000,000.'

1. **Provide a concrete experience of 1 to 1,000,000**

Lay out the materials from right to left starting with the green unit cube.

Point to the unit cube and say 'One'

'Ten times more makes ten' point to the blue bar and say 'Ten'

Then say: 'Ten times more of these ten bars will make 100' do this till you get to one million.

Ask the child to move the 1,000 cube and unit cube near to the million cube, Say the names emphasizing the one' and ask the child what they notice.

'They are all green'

'Green represents one of any place value.'

Do the same with the tens;' The tens are blue and blue represents ten of any place value

Now do the reds and say:' Red represents hundreds of any place value.'
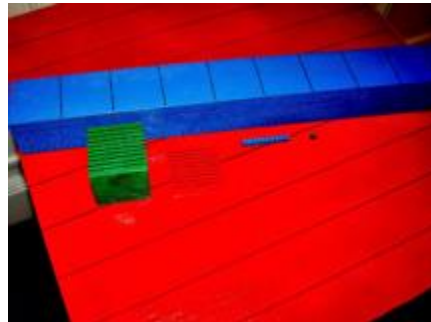
1. **Number symbols 1 to 1,000,000**

Set out the materials as before and ask the child to place the numbers 1, 10, 100, 1000 next to the right value material.

Now use the **three period lessons** to teach the child the symbols 10,000, 100,000 and 1,000,000.

Place them next to the right quantity.

Later on you can come back to the material to reinforce multiplying and dividing by 10's and 100's

Can you make this material: Yes. Be careful though they are not just a slab of wood as someone described them. An eye for detail is needed. The material could set you back several thousand dollars!

Number Bonds of Ten

Materials

You can use any of the following

Small number Rods

Decanomial Beads

Decanomial Rods

A floor mat

Pencil and a note book

Objectives

To discover that number bonds are two numbers put together to make a new number

To give the child visual reinforcement of the number bonds

To learn the key number bonds of doubles or near doubles e.g. 2 + 2, 1 + 3, 3 + 1 or 5 + 5, 4 + 6, 6 + 4

To arrange numbers in order: increasing or decreasing order

Presentation

Small number rods presentation

Place the small number rods randomly on the mat, with the red ends to the left.

Place the **Ten** rod at the top of the mat horizontally with the red end in the same left hand position.

Now ask the child to find the **Nine** rod and to place it under the ten rod making sure to place the red end to the left and align it exactly to the **Ten** rod.

Ask the child to find the rod that will make the **Nine** rod exactly the same length as the **Ten** rod.

Say to the child: "9 + 1 = 10"

Continue in the same way until you have built all the bonds of ten.

The child can record the bonds in their book.

Use the other materials if you have them to build these bonds it helps to create variety.

Bead Chains: Skip Counting with the Short Bead Chains

Materials

(Skip Counting in 5's)

The short bead Chain of 5

A bead square of 5

The Labels or arrows 1 –25

A floor mat.

Objectives

To skip count in 5's

To help the child understand the multiplication tables of 5 up to 5 x 5

To prepare the child for understanding of square numbers and working in base 5 in later work

To prepare for understanding later work of skip counting in 5's up to 5 x 5 x 5

Presentation

Fold the short 5 bead chain into a square of 5, then put the square of 5 above it to show that they are the same.

Now pull out the folded square and get the child to count the beads, place the correct arrow against the first five beads. The next arrow is placed when the child counts up to 10, continue in this way, placing the arrows as each 5 is reached, eventually the child would have skip counted to 25 (5, 10, 15, 20, 25)

A 5 square on top of a folded 5 bead chain.
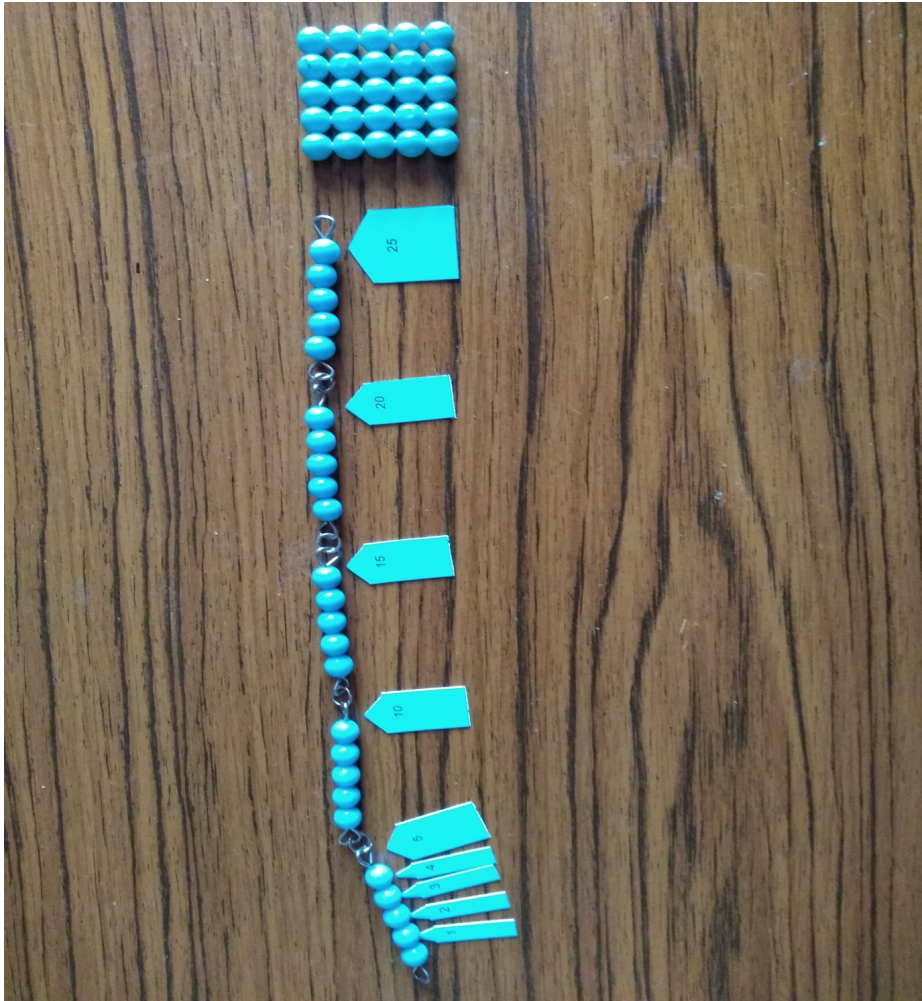
Bead Chains – The Hundred Chain

Materials

A Short bead chain of hundred made up of 10, Ten Bead Bars.

One Hundred Square

A set of small labels or arrows, for the 100 chain in green 1–9, blue 10 - 90 and red a single 100 label

A small tray and a floor mat (or large table mat).

Objectives

To skip count in 10's to 100

To reinforce the ability to count to 100

To help the child master the conservation of numbers and know that 100 is 100 no matter what it's shape is.

To prepare the child for later understanding of square numbers and working in different bases.

Presentation

Take the Hundred Chain and Hundred Square, as well as the arrows (labels) to the mat.

Set the arrows along the right hand side,(the 1-9, then 10-90, and then the 100)

Fold the 100 bead chain into a square, putting it beside the 100 square.

Place the spaure of a hundred over the folded square, showing that they are similar, and point out the fact that they both contain 100 beads.

Now carefully unfold the 100 chain, stretching it out to its full length, mention that the chain is changing length but it still has the same number of beads, 100, as the square.

Ask the child to count the beads, starting from the first on the left hand side.

Let the child continue counting, when he gets to the end of the second set of ten beads, say: "Yes we now have 2 tens, and two lots of tens make twenty."

Now place the **20** label at the end of the second bead bar.

Continue the exercise all the way until the child has counted to 100 when the red arrow is now placed by the last bead.

Now place the hundred square at the end of the chain.
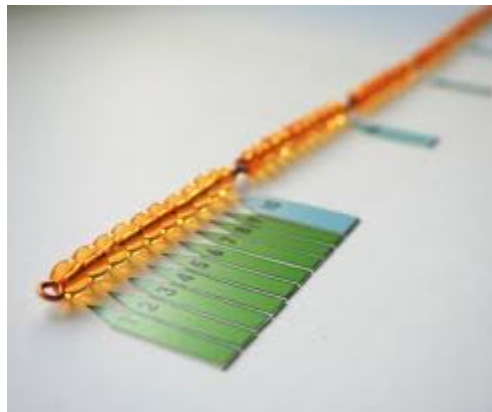
Extension

Bead chain of 100, position of numbers, showing < and > than

Materials

Add to the above the small cards with the symbols < and >.

Objectives

To compare the order of numbers 1 to 100 showing if they are < or >

To place numbers on the bead chain in random order

To practice counting on or back from any given number

To be able to read and arrange numbers in increasing and decreasing order.

Presentation

Bring the materials to the mat, place the chain in a straight line from top to bottom, spread the numbers randomly on the mat, now ask the child to look for 1 and 100 arrows and place them in the right positions of the chain.

Remind the child of the meanings of the symbols **less than** and **greater than**.

Ask the child to find a random number e.g. 35 and to place it in the right position on the chain

Then to look for 56 and do the same.

Ask the child if 35 is greater or less than 56.

When the child answers "less than", ask her to find the card that shows the symbol for 'less than'.

Place the card between 35 and 56.

Continue this exercise by choosing random pairs of numbers until the child is well practised.