



PME Mathematics 3



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 introducing the Decimal System with the Golden Beads materials
2. To learning more manipulations in addition and subtraction
3. To give a bird's eye view of the quantities.

THE GOLDEN BEAD MATERIAL



Many children can recite with pleasure numbers well beyond twenty and sometimes with accuracy and confidence. This though does not mean that the child had a proper understanding of numbers and their place value.

In the Montessori setting once the child has a thorough understanding of the numbers 1 to 10 he can be introduced to the numbers beyond 10 using the Montessori Golden Bead apparatus. The child can handle numbers in the decimal system up to 9000 and all he needs is a thorough understanding of numbers 1 to 10, because at this stage in the Montessori Mathematics system the child is taught simply to continue counting in tens.

TEACHING THE NAMES OF QUANTITIES

Description of Materials

- 1 Golden Bead Unit
- 1 Ten Bead Bar
- 1 Hundred Square
- 1 Thousand Cube
- 1 Operational Mat

Objectives:

To teach the names of the quantities

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Introduce the column on the mat, pointing to each column and name saying, "This is Unit, Ten, Hundred, Thousand."
- Place the bead materials on the respective columns and introduce them saying

"This is 1 unit" (place 1 Golden Unit in the U column)

"This 1 Ten Bead Bar" (place 1 Ten-Bead Bar in column T)

"This is 1 Hundred Square" (place 1 Hundred Square in column H)

"This is 1 Thousand Cube" (place 1 Thousand Cube in column TH)

Now use the Three Period Lesson to teach the child the names of the quantities:

First Period:

"This is One"

Second Period

"Show me One"

Third Period

"What is this?"

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

Age: 4 years

COUNTING THROUGH 1-1000

Description of Materials

- 9 Golden Beads
- 9 Ten Bead Bars
- 9 One Hundred Squares
- 1 Thousand Cube
- 1 Operational mat

Objectives:

- To give the child an understanding of the decimal system
- Ten ones make ten
- Ten tens make one hundred
- Ten one hundreds make one thousand.

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Take the 9 units and place them one under the other on the operational mat in the U column
- Count with the child 1 to 9, when you reach 9 say “ and one more makes ten”
- Place a Ten Bead Bar on the ten column of the operational mat.
- Now take the rest of the Ten Bead Bars and place them side by side, on at a time and count together “one ten, two tens, three tens... nine tens” and then say “and one more makes one hundred:
- Place 1 one Hundred Square in the H column on the operational mat and begin to place the rest of the hundred squares one on top of the other and count “One Hundred, Two Hundred, Three Hundred...Nine Hundred” and then say “ and one more makes One Thousand”.
- Place the 1 Thousand Cube on the Th column.
- You can now say to the child “We can see from this that Ten Units make One ten, Ten Tens make One Hundred, Ten Hundreds make One thousand.”
- 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: Guided by the teacher

Age: 4 years plus

BEAD PRACTISE

Description of Materials

- 9 Golden Beads
- 9 Ten Bead Bars
- 9 One Hundred Squares
- Up to 9 Thousand Cube
- Trays and pots to carry beads
- Operational Mat

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Objectives:

To give a child practice in handling the Golden Beads and finding the specified quantities

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- First prepare the bank, ie. The place where all the Golden Beads are placed on one table
- Lay out the operational mat on another table
- Invite a few children to do this exercise together, and give each child a tray
- Ask the child to bring a quantity of Golden Beads, eg. "Can you get me 3 hundred and one ten bead bar please?". Start from the simple to the more complex figures eg. "Three thousand, five hundreds, six tens and seven units."
- The child goes to the bank, collects the quantity of beads places them on the tray and brings it over to you
- Take the beads and place them on the operational mat as your count them " 1 thousand cube, 2 thousand cube, 3 thousand cube, 1 hundred square,...5 hundred square, one ten bead bar, ...six ten bead bar, 1 unit, 2 unit, ...seven unit."
- Each child has a turn going to the bank.
- 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: Teacher Guided

At this point the child is handling large quantities of beads like 3567, but he still only has to count up to 9.

Age: 4 years plus

NAMING THE CARDS

Description of Materials

- Sets of numeral cards
- Units in Green
- Tens in Blue, 2 times the length of the units
- Hundreds in Red, 3 times the length of units
- Thousands in Green, 4 times the length of units

Objectives:

To teach the child the written symbols for 1, 10, 100, and 1000.

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Lay out the numeral cards on the table and introduce the symbols, “This is Unit, This is Ten, This is hundred, This is thousand.”
- Show the children how many zeroes each quantity has, “See ten has 1 zero, hundred has 2 zeroes, and Thousand has 3 zeroes”
- Then superimpose the four cards by covering all the zeroes and say “ Now we are going to cover all the zeroes”
- Introduce the number you have made to the child, “This is one thousand, one hundred and eleven”
- Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.

Age: 4 years

CARDS IN SEQUENCE

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Description of Materials

- Numeral cards 1 to 9 in green,
- 10 to 90 in blue
- 100 to 900 in red and
- 1000 to 9000 in green
- A floor mat

Objectives:

To familiarise the child with the sequence of numbers up to 9000

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Encourage the child to count after you as you lay out the cards in sequence, starting with 1,2, 3 and so on.
- When you reach 9, ask “What comes after 9?” and lay out 10, 20, 30,... on a new row to the left of the unit row as you count “ten, 2 tens, 3 tens, ...9 tens. What comes after 9 tens?”
- Continue counting as you lay out the hundred cards to the left of the tens, “ 1 hundred, 2 hundred,...9 hundred. What comes after 9 hundred?”
- Do same by placing thousand cards to the left of the hundreds and continue counting, “1 thousand, 2 thousand,...9 thousand”.
- All the cards are now laid on the mat.
- 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: Guided by the teacher

Age: 4 years

CARD PRACTISE

Description of Materials

- Large Numeral Cards 1 – 9 in green
- 10 - 90 in blue
- 100 – 900 in red
- 1000 – 9000 in green
- A tray
- A floor mat

Objectives:

To give the child practice in recognising the written symbols

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Invite the child to lay out the cards in sequence on the floor mat
- Give the child a tray and ask child to bring a number. E.g. “Can you bring me 2 tens and 5?”
- The child collects the cards required, lays them out on the tray and brings it to you.
- Superimpose the zero and we now have “22”
- Lots of exercises can be given to aid recognition of numbers, start with quantities from one place value and then combine quantities from all places. E.g.

3 units

6 tens

2 hundreds

7 hundreds and 4 tens

1 thousand, 5 hundreds, 9 tens and 2 units

- Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.
- This exercise can be done as a group activity

Control of Error: Guided by the teacher

Age: 4 years

COMBINING QUANTITY AND SYMBOLS

Description of Materials

- 9 Golden Beads
- 9 Ten Bead Bars
- 9 Hundred Squares
- Up to 9 Thousand Cubes
- A complete set of cards
- Trays and pots to carry units
- 2 floor mats and an Operational mat

Objectives:

To give the child practice in associating the quantity of numbers with the written symbols using the cards and beads.

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Invite the child to lay out the cards on the mat in sequence.
- In the meantime prepare the bank and lay out the operational mat on a separate table
- Give the child a tray and ask him to pick up the large number cards of the number e.g. “2 thousand, 3 hundred, 5 tens and 4 units”
- Once done ask him to get the corresponding golden bead materials from the beads bank.
- Now ask the child to bring the tray to the operational table, and place the golden beads on the mat as he counts and checks the amounts. The large number cards are placed to the right of the beads.
- Give the child lots of exercises to do.
- Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.
- This can be done as a group exercise

Control of Error: Guided by the teacher.

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Age: 4 years

BIRD'S EYE VIEW

Description of Materials

- 45 Golden Beads Units
- 45 Ten Bars
- 45 Real hundreds squares (not imitation)
- At least 3 real thousand cubes
- A complete set of large Number Cards with the thousand cards removed except for those which there are real thousand cubes
- Sufficient floor mats to contain the completed exercise



Objectives:

To give the child a birds eye view of the association between quantity with the written symbols using the cards and beads.

Presentation:

- This should be done as a group activity
- Show the children where the materials are kept on the shelf, name them and carry to the work station
- Invite the children to lay out the cards in sequence, on the floor mats

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- Ask the children to place the quantities beside the number cards.
- The children will continue building the beads and cards in sequence. You act as a facilitator and keep things in order. To make it easier there should be no more than 4 children in the group.



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: Guided by the teacher

Age: 4 years plus

ADDITION WITHOUT CHANGING

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Description of Materials

- Unlimited Golden beads(No more than 9 thousand)
- Large Number Cards
- 3 Sets of Small Number cards
- At least 3 trays and pots for carrying units
- A floor mat

Objectives:

To give the child a concrete experience of 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 lay out the cards on the floor mat
- Setup the bank and lay out the operational mat on the table
- Set an addition question e.g. $1543 + 2351$
- Give the child a tray and specify the number to bring to the table e.g. the first number. The child goes to the bank to collect the quantity of golden beads, then proceeds to get the small number cards and place them on the operational mat.
- Get the child to do the same for the second number
- The two amounts are arranged one under the other, with units below units, tens below tens and so on.
- Now ask the child to start counting the beads starting from the units. As each column is counted, the beads are placed together right at the bottom of the mat.
- The total at the bottom is noted and the child is asked to get the corresponding large number cards, which is superimposed in sequence and placed right at the bottom of the mat
- At the end of the exercise tell the child that he has added together two smaller numbers and made one large number.
- 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: Teacher guided

Age: 4 years

ADDITION WITH CHANGING

Description of Materials

- Golden Beads no more than 9 thousand
- Large Number Cards
- 3 sets of Small Number Cards
- An operational mat
- A floor mat
- Trays and posts for carrying units

Objectives:

To give the child a concrete experience of addition

Presentation:

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- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Invite the child to lay out the Large and Small Number cards on the mat.
- Set up the “bank”, then lay out the operational mat on a table
- Then set an addition question e.g. $533 + 328$. Give the child a tray and ask to get the small number cards then the corresponding amount of beads from the bank. (If this is done as a group activity, give two children a tray each tell each what number to collect.)
- The child places both the number cards and golden beads in a tray and carries them to the operational mat.
- Ask child to place the beads on the mat and the small number cards beside it on the right. The two amounts are arranged one under the other, with each under the correct place value, i.e. units under units, tens under tens etc.
- Invite the child to start counting the beads starting with the units. As each column is counted i.e. added together, the beads are placed together right at the bottom of the mat.
- 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: 4.5 to 5 years

SUBTRACTION WITHOUT CHANGING



Description of Materials

- Unlimited Golden beads (No more than 9 thousand)
- Large Number Cards
- 2 Sets of Small Number cards
- At least 1 tray and pot for carrying units
- A floor mat
- An operational mat

Objectives:

To give the child concrete experience of subtraction.

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Invite the child to lay out the Large and Small Number Cards on the floor mat.
- Set up the Bank and lay out the operational mat on a separate table.
- Now set a subtraction question, such as $4755 - 3641$.
- Ask the child to fetch the Large Number Cards and corresponding Golden Beads for 4755 and place them on the operational mat in their places with the cards at the side.
- Then ask the child to take away 3641 beads from the Golden Beads laid on the mat, she places these on the tray. Now ask child to fetch the corresponding Small Number Cards and place on the tray as well.
- Now ask “What is the total left on the operational mat?” The child will then count the beads left on the mat, and should now fetch the corresponding Small Number Cards which should be placed beside the beads
- At the end of this operation, tell the child “ We had 4755 and we subtracted 3641. What we have left is 1114.”
- 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: Teacher guided.

Age: 4 years plus

SUBTRACTION WITH CHANGING



Description of Materials

- Unlimited Golden beads (No more than 9 thousand)
- Large Number Cards
- 2 Sets of Small Number cards
- At least 1 tray and pot for carrying units
- A floor mat
- An operational mat

Objectives:

To show the child how to "change" when doing subtraction.

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Invite the child to lay out the Large and Small Number Cards on the floor mat.
- Set up the Bank and lay out the operational mat on a separate table.
- Now set a subtraction question, such as $4224 - 3545$.
- Ask the child to fetch the Large Number Cards and corresponding Golden Beads for 4224 and place them on the operational mat in their places with the cards at the side.
- Then ask the child to take away 3545 beads from the Golden Beads laid on the mat, she will now realise that she does not have enough units to take away when she tries to take away 5 units from 4 units.
- Now ask the child to change one of the Ten Bead Bars on the mat for 10 Golden Beads at the Bank. The 10 Golden beads exchanged are now placed together with the rest on the mat. The child now takes away 5 units away and places these on the tray.
- Next the child tries to take away 4 Ten Bead Bars from 1 Ten Bead Bar, since this cant be done the child proceeds to change a Hundred square for 10 Golden Bead Bars, once these are placed with the other Ten Bead bars, the child can now take away 4 Ten Bead Bars and place them also on the tray.
- The child goes on to try taking away five hundred square beads from 1 hundred square Beads. As the child is sees that this can't be done, the child proceeds to exchange on of the Thousand Cube and exchanges it at the bank for 10 hundred square beads. The child can now remove 5 hundred square beads and proceed to take away three thousand from three thousand.
- Now ask child to fetch the corresponding Small Number Cards and place on the tray as well.
- Now ask "What is the total left on the operational mat?" The child will then count the beads left on the mat, and should now fetch the corresponding Small Number Cards which should be placed beside the beads

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- At the end of this operation, tell the child “ We had 4224 and we subtracted 3545. What we have left is 679.”
- 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: Teacher guided

Age: 4 years plus