



PME Mathematics 4



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

Mathematics

Lesson Objectives:

1. The introduction of Multiplication and Division
2. Fractions
3. Introduction to Money

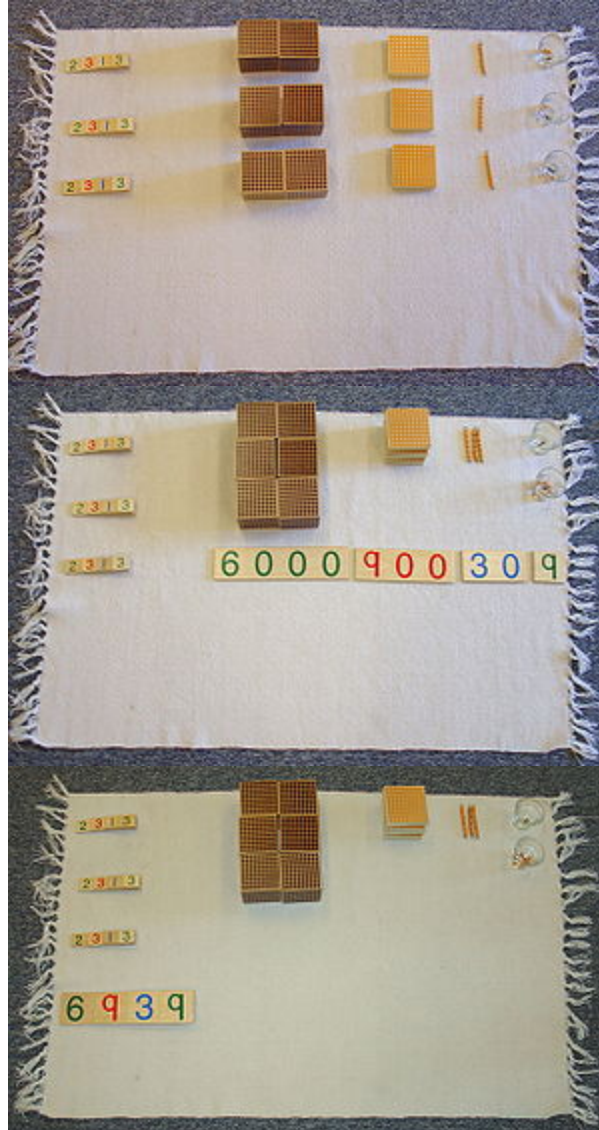
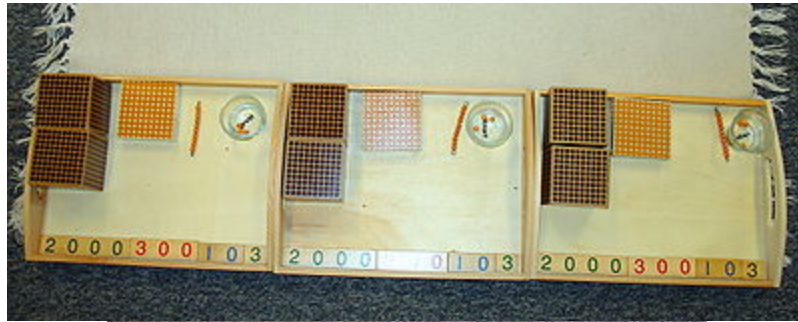
MULTIPLICATION WITHOUT CHANGING

Description of Materials

- A full set of Golden Beads
- 1 set of large number cards
- 3 sets of small number cards
- 3 trays
- 3 small bowls for units
- A floor mat

Objectives:

To help the child understand that multiplication is an addition in which quantities added are not different, as in addition, but in fact they are all the same.





Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station (This can be done as a group presentation)
- Ask the child to lay out first the golden beads then the large and small number cards on the appropriate workstation.
- Give the child or in a group each of 3 kids for example take the same small number cards and have them go to the bank to collect the exact number of beads. If it is one child they need to go on this number 3 times.
- The sum to work out is 2313×3
- Get the child to lay out the beads and start counting, have them place the corresponding large number cards besides the golden beads
- Have the child or children now notice that they had the same amount of beads
- 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 to start with but later the child's own understanding now acts as the control of error.

Age: 4.5 – 5 years

MULTIPLICATION WITH CHANGING

Description of Materials

- A set of Unlimited Golden Beads
- Large Number Cards
- At least 2 sets of Small Number Cards
- At least 2 trays and unit pots to carry the unit beads
- An operational mat
- A floor mat

Objectives:

To show the child that changing in multiplication is the same as in addition

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- This can be done as a group activity. Invite the child to lay out the large and small number cards on the floor mat
- Set up the bank on a table and lay out the operational mat on another table.
- Set a multiplication question that requires changing e.g. 1247×2 .
- The exercise is now carried out in the same manner as in Addition with changing. Let the child do the exercise though you may need to remind him of what to do when the units, tens, hundreds are added and they reach 10 of each as in the Addition with changing 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: Teacher guided

Age: 4.5 to 5 years

DIVISION WITHOUT CHANGING



Description of Materials

- A set of Unlimited Golden Beads
- Large Number Cards
- At least 2 sets of Small Number Cards
- At least 2 trays and unit pots to carry the unit beads
- Skittles or mini men for sharing
- An operational mat
- A floor mat

Objectives:

To give the child concrete experience of division

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- This can be done as a group activity
- Invite the child to lay out the large and small number cards on the floor mat.
- Set up the bank on one table and the operational mat on another.
- Set the question e.g. $969 \div 3$.
- Ask the child to place the beads and the corresponding large number cards for 969 on the operational table.
- Either give 2 children a tray or place 2 skittles on the operational table and commence sharing the beads between them, starting this time from the thousands.
- After this is done ask each child to count the number of beads they have. (Or the number of beads each skittle gets)
- Ask them to fetch the corresponding small number cards. The children or child realises that they have the same amount of beads
- Explain to the children that, "Division is like subtraction, but this time we take away all and divide equally" and the answer to the question is whatever quantity is on the tray"
- Set another question and now let the child do the dividing.
- 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: 4.5 to 5 years

DIVISION WITH CHANGING

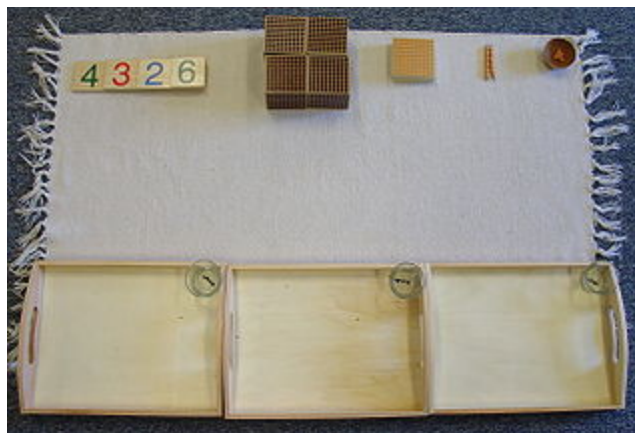
Description of Materials

- Unlimited Golden Beads
- Large Number Cards
- At least 2 sets of Small Number Cards
- At least 2 trays and unit pots to carry the unit beads
- An operational mat
- A floor mat

Objectives:

To show the child how to 'change' when doing division

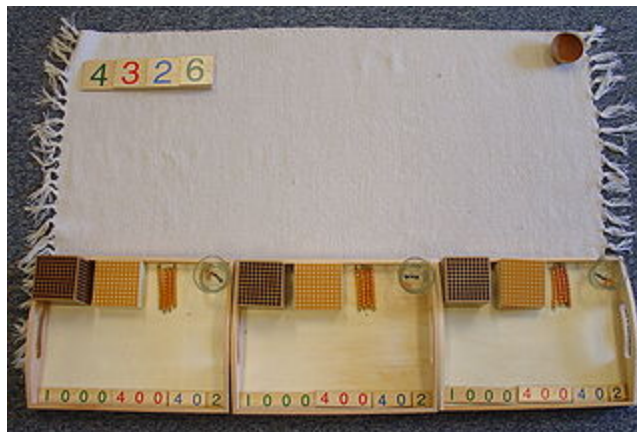
Presentation:



- Show the child where the materials are kept on the shelf, name them and carry to the work station
- This can be done as a group activity
- Invite the children to lay out the Large and Small number cards on the floor mat
- Set up the bank and the operational mat
- Set a division question that involves changing but without a remainder e.g. 4326 : 3
- Carry out the exercise the same way Division without changing is done, except the when the child finds out that the thousands will not divide equally, explain that they can change the one that is left over at the bank for Hundred Squares.



Put the Hundred Squares with the hundred squares they already have and continue dividing equally between the two. Proceed like this until all the beads have been divided equally.



When finished, ask the child to count the number of beads on their tray and to fetch the corresponding small number cards. At this point the children realise that each person has gotten the same amount of beads



- Explain to the child that “Division is like subtraction, but this time we take away all and divide equally and the answer is whatever is left in the tray.”
- 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 directed

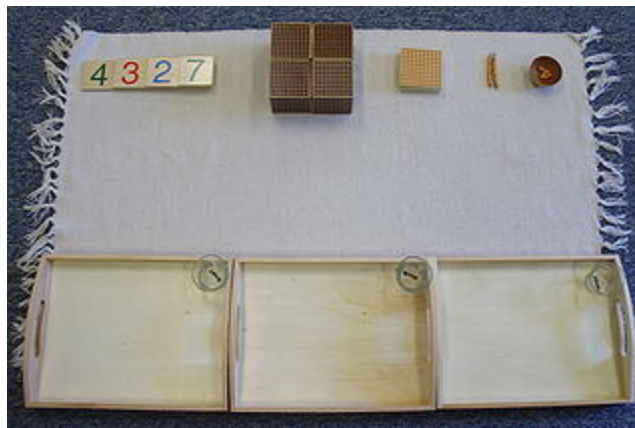
Age: 4.5 to 5 years

DIVISION WITH CHANGING & REMAINDER

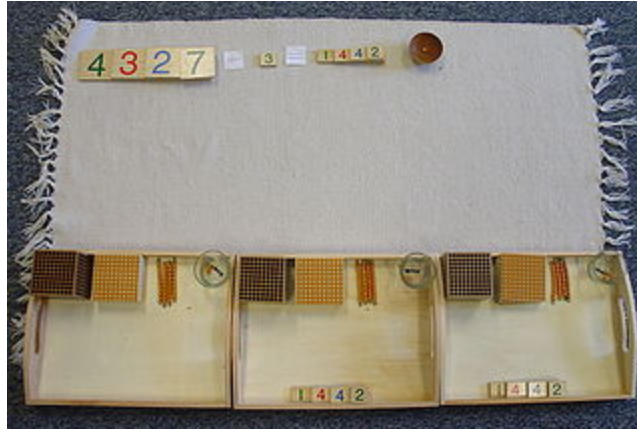
Description of Materials

- Unlimited Golden Beads
- Large Number Cards
- At least 2 sets of Small Number Cards
- 2 trays and unit pots for carrying
- An Operational mat
- A floor mat

Objectives:



- To show the child how to change when doing division and taking note of remainders.
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Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- This can be done as a group activity
- 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.
- Set a division question that involves changing and a remainder, e.g. $4327 \div 3$
- This exercise is carried out in the same manner as with Division with changing.
- The child will come to the end where he will find that he is unable to divide up the quantities equally and that there is 1 unit left on the mat
- Now explain to the child that there will be situations when the quantities cannot be divided up equally, and what is left over is called the remainder.
- Show the child how to record this down on paper $4327 \div 3 = 1442 \text{ r. } 1$
- 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: 4.5 years plus

MULTIPLICATION BOARD



Description of Materials

- Multiplication Board
- A box of 100 beads of the same colour
- 9 small cards 1 – 9
- Mix sum cards
- Work Cards with Multiplication Tables
- Summary of Multiplication Tables

Objectives:

To give the child a concrete experience of Multiplication Tables

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Select a work card for the child to work on e.g. 2 times table.
- Show the child how to slot in the small 2 card in the slot provided on the board
- The first question is 1×2 . The red counter is placed over the 1 on the board and then 2 beads are counted and placed on the board under the counter. The answer to 1×2 is 2.
- Show the child how to record the answer in the red box etc.
- The next question is 2×2 . So move the red counter to 2 then proceed to count 2 more beads and place them on the board.
- There are now 4 beads in total on the board. Therefore 2×2 is 4.
- Ask the child to continue working through the card.
- 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 top of the board and the cards placed on the side control the table being worked on. The child uses the summary of multiplication table as a control to check his multiplication sum cards.

Age: 4 years plus

DIVISION BOARD



Description of Materials

- Division Board
- 81 green beads
- 9 green skittles
- Division tables to work on
- Summary of division tables up to 81
- Mix sum cards

Objectives:

To provide a concrete experience of division using a divisor up to nine.

Presentation:

- Show the child where the materials are kept on the shelf, name them and carry to the work station
- Select the division table to work with, if first question is 12 3, take 3 skittles and say “These 3 skittles represent 3 children”.



Place the skittles along the top of the board.



- Count out 12 green beads and ask child to share these beads between the 3 skittles.
- Ask child how many the children have each. Answer is 4
- So say out loud $12 \div 3 = 4$
- Now show child how to record this sum.

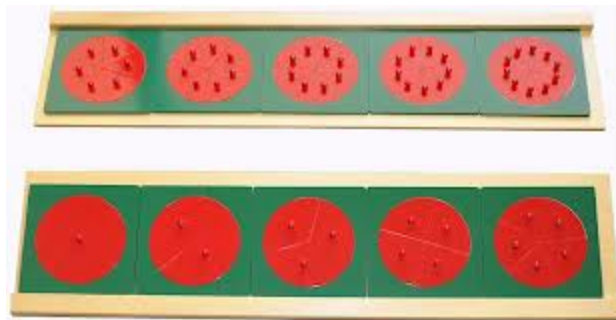


Return the materials to the proper place on the shelf and remind the child that he can work with the material whenever he wishes.

Control of Error: The skittles and the holes act as the control of error.

Age: 4.5 years

FRACTIONS



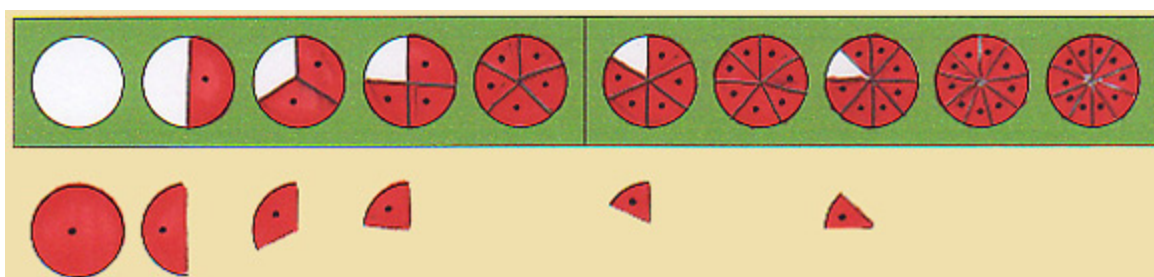
Description of Materials

- Red fraction circles in green frames (ten circles: 1 is undivided and the others are divided into 2 to ten equal parts)
- Labels with fractions written on them; 1 , $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, $\frac{1}{10}$
- Pencil and paper
- Skittles

Objectives:

- To help the child gain a sensorial impression of fractions
- To introduce the concept and notation of fractions
- To introduce simple operations with fractions

Presentation 1: Sensorial/ Tactile Exploration



- Show the child where the materials are kept on the shelf, name them and carry first tray of fractions to the work station
- Show the child the first circle and say “This is one whole circle, today we will be looking at fractions, which is dividing a whole into equal parts”
- Take out the first circle and place it in front of the of the tray.
- Then do the same with $\frac{1}{2}$ and $\frac{1}{3}$ pieces, just one piece each.
- Show the child how to carefully replace each fraction back into its spot.
- Then do the same for $\frac{1}{4}$ and $\frac{1}{5}$ fractions. Get the child to replace each one back into its spot.
- Repeat this a few times, then mix up the parts and invite the child to now replace them in the correct spots.
- Once the child is comfortable with the first tray he can now work on the second tray, exploring this as with the first tray. Then the child can work on both trays repeating the exercise of mixing up and replacing the fraction pieces.
- 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: Naming, Writing and Labelling

Naming

- Start with the first tray of fractions, ask the child to bring it over to the workstation
- Take out the whole circle and tell the child “This is a whole” and place it in front of the tray.
- Take out one of the group of 2 and say, “This is a half” and place it in front of the tray.
- Repeat this process up to the group of 5 saying “This is a third, fourth, and fifth”
- Use the 3 period lessons to teach the names and once the child is familiar with this tray do the same with the second tray.

Writing

- Once the child knows the names of the fractions, bring out both trays.
- Point to a few fractions and ask the child “What is this?” This will show you if the child is ready for the next step, if he knows the names.
- Tell the child “I will show you how to write fractions today”
- Point to the group of 2. Ask the child “How many pieces are there?” Answer is 2
- Then say “Yes there are 2 pieces, so I will write a 2.”
- Now take $\frac{1}{2}$ and place it in front of the tray.
- Ask the child “How many pieces are here?” Answer is One $\frac{1}{2}$
- Say “There is one” and write placing a line over the 2 and write 1 over the line.
- Replace the $\frac{1}{2}$ back on the tray
- Repeat this process for all the fractions.
- Remind the child that what you are doing is placing how many pieces there are all together on the bottom and the number of pieces we have taken out over the line.
- Teach the names Numerator and Denominator with the three period lesson.
- Take out $\frac{2}{3}$ or $\frac{3}{5}$ etc and have the child write these fractions.

Labelling

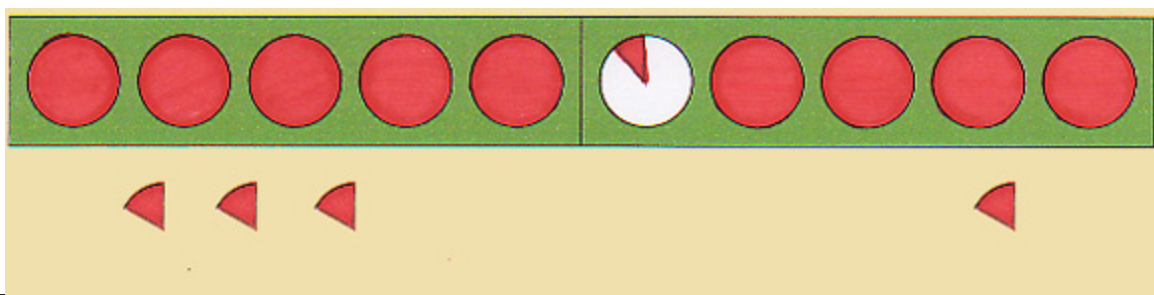
- Have the child bring out the 2 trays and labels
- Take out all the labels and place them in their corresponding piles in front of the trays.
- Have the child label each part of each fraction reading them out aloud as he does this.
- Check the child's understanding by asking for the numerator and denominator.

Addition with same denominator

- Have the child bring out an empty frame and the tray of the denominator you will be working with
- Give the child an addition with the same denominator problem to solve e.g. $\frac{1}{4} + \frac{2}{4}$
- Ask the child to place one part from the quarter tray in the empty frame and then to place 2 parts besides this
- Now count the pieces out aloud to arrive at the answer " 1, 2, 3, so $\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$
- Show child how to record this sum.
- Give the child some more sums to do.

Subtraction with same denominator

- Have the child bring out an empty frame and the tray of the denominator you will be working with
- Give the child a subtraction with the same denominator problem to solve e.g. $\frac{4}{6} - \frac{1}{6}$
- Ask the child to place 4 parts from the tray in the empty frame and then to remove one part from this.



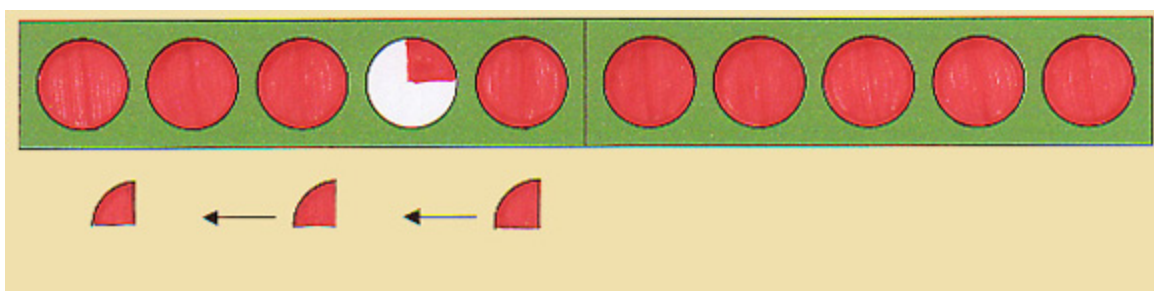
- Now count the pieces left aloud to arrive at the answer “ 1, 2,3 , so $4/6 - 1/6 = 3/6$
- Show child how to record this sum.

$$\frac{4}{6} - \frac{1}{6} = \frac{3}{6}$$

Give the child some more exercises to do.

Multiplication of fractions by a whole number

- Have the child bring out an empty frame and the tray of the denominator you will be working with
- Give the child an exercise: multiplication of a fraction with a whole number to solve e.g. $\frac{1}{4} \times 3$
- Remind the child that multiplication is the same as addition. Therefore to solve this sum we must bring out $\frac{1}{4}$ three times
- Ask the child to place 1 part 3 times to represent $\frac{1}{4} \times 3$ from the tray in the empty frame



- Now count the pieces out aloud to arrive at the answer “ 1,2,3, so $\frac{1}{4} \times 3 = 3/4$
- Show child how to record this sum.

$$\frac{1}{4} \times 3 = \frac{3}{4}$$

Give the child some more exercises to do

Division of fractions by a whole number

- Have the child bring out the 1st tray and some skittles
- Give the child a division with a whole number problem to solve e.g. $4/4 \ 2$
- Ask the child to tell you by how many are we dividing? Answer is 2. Ask child to place 2 skittles on the mat.
- Now ask how many $\frac{1}{4}$ pieces we need to share amongst the 2? Answer is 4.
- Ask child to count out the 4 $\frac{1}{4}$ pieces and share them amongst the 2 skittles.
- Ask child how many $\frac{1}{4}$ pieces each skittle has? Answer is $2 \frac{1}{4}$ pieces. Which is $2/4$. So $4/4 \ 2 = 2/4$
- Show child how to record this sum.

Control of Error: Teacher guided and the child's ability

Age: 4.5 years

Introduction to Money

Materials: 5, 10, 20, 50, 100, 200,500, 1000 Naira Notes in a basket placed on a tray with Golden beads materials. The tray should have the following:- 5 units, 8 golden ten bars, 8 golden beads hundred squares, 1 thousand cube.

Objective: To introduce the money to children

To help children recognise the quantity of money

Presentation 1: Tell the children you have something very important to show them today. Show them where the materials are kept on the shelves, say to them 'Today we are going to talk about money.'

Take the money out of the basket place on the table at the left hand side and pick up each note, look it over, front and back, and pass it around let each child examine the note. Pass around three or more of these notes and then place back in basket.

Presentation 2: Have a talk with the children about what Money is used for. Help them to see that sometimes money is not enough, through comments like, 'Sometimes I want to buy a packet of biscuits, but I decide not too, because I know I won't have enough for my transport fare by the end of the week if I spend the money.'

Presentation 3: Take out 3 notes and use the 3 period lesson to teach the children the notes: This is 5 Naira, This is 10 Naira, This is 20 Naira.. Show me... What is this?'

Take it nice and easy until you have gone through all of the notes. There should be no problems with this as the children can see the amount written on the note, but help them to get used to the notes and their differences.

Presentation 4: Get the children to match the golden material quantities to each note.

Presentation 5: Play the shopping game and let the children practice additions and subtractions with money playing the game.