
Paper 4 B : Arithmetic

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1.1 Introduction

Concept of Arithmetic

Human beings always needs to develop their culture. Language and mathematics are two media which helps the human beings to develop their culture. So our child also needs language and mathematics for their development.

Every field of human culture e.g. Dance, Arts, Science, Painting, Music etc. needs mathematics because they are based on mathematics.

Mathematics is an abstract science and is called the science of sciences. It deals with observation, appreciation, evaluation and consideration of parts of things with precession. It also helps to compare them precisely; to establish relation between things and entities e.g. when we observe things in their shape and dimension, it is called geometry.

We also consider things from a quantitative point of view and that is why we introduce arithmetic. So it is also a branch of mathematics, which compares things precisely from the quantitative point of view and establish relationships between things from quantitative point of view.

Though things are concrete, the instruments we use to evaluate quantitatively are abstract. It is less sensorial and more intelligence.

We can appreciate things, more or less, but we are not happy with it. We want to establish relationships between things from quantitative point of view with precision.

The basis of arithmetic is a standard unit of measurement. Anything can be unit, e.g. a table; a chair; a boy; a mango etc. It is abstract and it is more difficult to approach to the child. So in a 'House of Children' we first offer geometry and then arithmetic.

Child already hear the names 1, 2, 3 etc. from environment and he knows that they are something which are related to counting.

Dr. Maria Montessori called it — "Awaking of mathematical mind." From this stage onwards the child no longer happy. He needs more precedes.

He needs to compare quantitative things in precision.

It is the stage when we offer him counting i.e. measuring i.e. how many times of unit are needed to measure a thing.

Counting can be built on two different foundations depending on the nature of the entities.

5 meter sari is variable of meter i.e. unbroken multiple of meter. 5 pieces of chalks are loose, individual identical units i.e. arithmetic of groups.

● **Types of Counting :**

There are two types of counting i.e.

- (1) An unbroken multiple of units of entities in terms of which we want to evaluate things precisely — which are call "Arithmetic of variable".
- (2) The entities can be composed of loose, individual, identical (identical in any point of view) units — which we call "Arithmetic of groups".

If the entities are 'Arithmetical of variable' — there we measure it and if the entities are 'Arithmetic of groups' then we count it.

● **House of Children :**

In a 'House of Children' we start with Arithmetic of variable and when our child

- (i) have a clear concept of unit and their roles in counting.
- (ii) knows what is the relation between quantity of one and above one.

(iii) knows the relation exists between the quantities in succession from 1 to 10. Then he is ready from group counting or 'Arithmetic of Group'.

We use the material which is similar to long stairs and we call it 'NUMBER RODS'. The length of this rod materialises the natural succession of numbers and the relation that exists between the shortest and the longest rod.

● Number Rods :

Material Description :

The number rods consists of 10 rods. The shortest one is 10 cm long and red in colour. Other rods gradually increase by 10 cm with red and blue colour alternatively. So the longest rod is 100 cm and which is an arithmetical variable of the smallest rod.

Two types of counting we find out in No. rods because here we measure it and also count it by colour.

In a environment the Number rods are display on a stool, in a same manner like a long-stair.

Invitation : I hope that you have already worked with long stair. Look here we have another rods like long-stair and call it 'NUMBER RODS'.

Come, I will show you, how we work with this.

● Presentation of Number Rods :

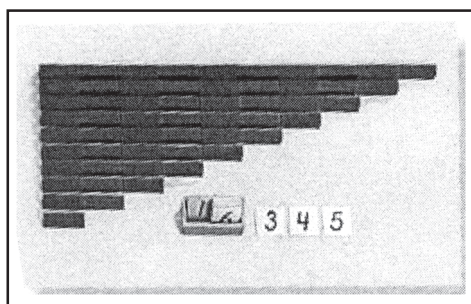
Place of Presentation : "On Working Mat".

Presentation : (Individual Activity — Individual Presentation)

The child brings all the rods on the working mat; He hold the rods like long-stairs.

Adult helps the child to arrange the rods on the mat like long-stairs but red section of all the rods are in the left-hand side of the adult and with the left square face on the same line.

The rods are also arranged in their successive order of length.



1st period : The adult now takes the rod of 'ONE' and says to the child. "This is rod of ONE". "Look, this is rod of ONE". Next the adult takes the rod of 'TWO' and says to the child — "This is rod of Two", "Look, this is ONE, TWO."

The adult hold rod at the middle with the left hand and points out the section with two fingers of the right hand. "So, this is the rod of TWO". Next the adult

takes the rod of THREE and says to the child — “This is the rod of THREE.”
“Look, this is ONE-TWO-THREE, So this is rod of THREE.”

IInd Period : Now the adult asks the child various questions like these,

Adult — “Give me rod of ‘3’.
Show me rod of ‘2’
Hide rod of ‘3’.
Count rod of ‘2’ etc.

At the conclusion of the above, the adult asks the child to put rod I here, then rod of 2 before rod of one and rod of 3 before it i.e. arrange the rods in succession.

III period : Now the adult asks the child some questions and child replies as follows :

Ad — Which rod is this?
Ch — ‘One’
Ad — Which rod is this?
Ch — ‘Two’
Ad — ‘Count this’.
Ad — ‘Which rod is this?’
Ch — ‘Three’
Ad — Count this etc.

After these three names, the child needs another name-lesson for ‘4’ and ‘5’.

Ist period : The adult ask the child to show the rod of ‘1’.

Ad — “This is

Ch — “Rod of ONE”

Ad — “This is

Ch — “Rod of TWO”

Ad — Count this.

Ad — “This is

Ch — “Count this.”

Then adult takes the rod of ‘4’ and says to the child, “This is rod of Four.”
Now adult points out the section.

ONE, TWO and THREE and the child says, 1, 2, 3 and then adult say
FOUR.

“So this is rod of FOUR.”

Next in same manner adult says Rod of FIVE.”

IInd period : Same as before.

III period : Same as before.

In this manner the adult give all the names of rods from ONE to TEN.

● **Control of error :**

The control of error lies in 3rd period.

● **Direct aim :**

- (1) To help the child associate the already familiar names of quantities from 1-10 with the precise quantities they signify.
- (2) Helps the child to get to know the succession of natural number from 1-10.

Indirect aim :

- (1) To help the child have a clear concept of numerals.
- (2) To give the child a firm foundation for the decimal system of numbers.

Age of presentation : Around 3½ years of age.

Check your Progress :

Q.1. How many rods in Number rods?

What's the length of smallest are and the longest are?

Ans. There are Ten rods in Number rods.

The length of the smallest rods is 10 cm and longest one is 100 cm i.e. 1 meter.

Q.2. In number rods why we use Red and Blue colour?

Ans. These red and blue colour is primary colour and they are extremely contrast.

Q.3. How many period in name-lesson?

Ans. In name-lesson there are three periods.

1st period we say the names.

2nd period we give so many commands about that names.

3rd period is for confirmation. Adult ask about the names and child will confirm it.

● **Exercises of Number Rods :**

Exercise 1 :

Presentation : Arranges of the rods in succession away from the place of presentation.

Adult ask the child "Bring the rods of 5."

Child bring the rod of 5 then adult ask the child to count the rod. The child count the rod of 5 and put back the rod at its place then repeat the activity.

Exercise 2 :

This exercise is same as Exercise 1 but in this case keep all the rods away from the presentation place in mixed-up.

Exercise 3 :

Same as Exercise 1 and 2 but here the adult asks the child “Bring 5” not rod of 5.

Memory Exercise : Is not possible here.

Direct and Indirect aim : Same as “Number Rods.”

● **“Sand-paper Figures” :**

Material description : In a box we have ten sand-paper figures which are pasted in middle of a rectangular boards which are blue in colour. A white line is drawn below each figure to help the child to realize the actual position of the figure. The figures are 0, 1 2, 3, 4, 5, 6, 7, 8, 9.

Place of presentation : ‘Chowkie.’

Invitation : “You have know all the name of numbers. Come today I show you how to write these numbers.”

● **Presentation :**

Before presentation child must do finger tips bathing activity.

Then child bring Number 1 and place it on the chowkie.

The adult ask the child “Look, how I hold this. Hold the figure with left index finger and thumb at left base corner.

Then adult slowly trace the number using the finger tips of he right index and middle finger. When doing the activity adult folds all other fingers and thumb in such a manner that the tracing is visible to the child.

When tracing the figure, the adult mentions the name of the Number and give some pauses and then repeat the tracing.

One day we present only one name.

When the adult presents ‘0’ then child asks, “What is 0?” Then the adult says, “It is nothing.

So Zero is nothing.

● **Control of error :**

If the child’s tracing is in an incorrect direction or if he associates the wrong number with the symbol, the control of error lies in the adult.

Direct aim : To help the child associate the already familiar names of quantities with their symbols by means of his visual, muscular acoustic sense and tactile sense.

Indirect aim : To help the child prepare himself directly for writing and reading by recognising the figures.

Age of presentation : 3½ years of age.

● “Special Name-Lesson for Sand-paper Figures”

In English 6 and 9 figures are similar in appearance, so we give special name-lesson.

Presentation : (I.A. – I.P.)

1st period : In a tray adult carry only these two figure 6 and 9, not whole box.

First adult keep figure 6 on chowkie — child says ...

“This is ... 6”.

Then adult keep another figure ‘9’ on Chowkie and child says, “This is 9”.

Adult ask the child to trace the figure.

2nd period :

Now adult says —

“This is ... 6”.

“This is ... 9”.

Then adult asks so many questions about 6 ad 9 e.g.

Trace 6, put 6 here, trace 9 etc.

3rd period :

Here adult says —

“This is ... “ and

“This is ... “

The child responds and mentions the number.

Check your Progress :

Q.1. How many figures in sand-paper figure? What are the names of that figures?

Ans. There are ten figures.

The figures are ‘0’, ‘1’, ‘2’, ‘3’, ‘4’, ‘5’, ‘6’, ‘7’ ‘8’, ‘9’.

Q.2. Why we drawn white line below the figures?

Ans. It is an indication mark, child can understand by seeing he white line, which is the actual position of the figure.

Q.3. When we offer special Name-lesson?

Ans. When the objects are similar in appearance; similar sounding names, or both, similar in appearance and similar sounding names, then we offer special Name-lesson.

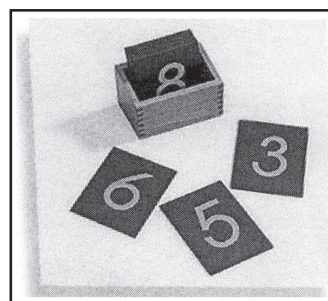
Q.4. Why we have only 0 to 9 figures in sand-paper figure box?

Ans. These 0 to 9 figures are basic numbers in our society because we can make any number by the help of these ten figures.

● “Number Rods and Number Cards”

Material description : In a box here are ten number cards i.e. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and it is displayed on the right side of the ‘Number Rods’. The base of all cards are white and numbers are printed in black, without any indication mark below the numbers.

In this box “Number 10” is a single card but there is no zero (0) card.



● Presentation :

(Individual Activity – Individual Presentation)

Invite the child and ask him to bring number rods and keep it on working mat in succession and then bring box of cards. The adult now picks up the card 1 and asks the child, “What is this?” The child says “1”. Then the adult asks the child, “Where is the rod of 1?” Then the child shows the rod of 1. Then the adult asks the child to count the rod of 1 and keep the card of 1 near the rod of 1.

Then the adult picks up the card of 2 and asks the child to find out the rod of 2 and count it and then put this card of 2 near the rod of 2 and repeat the activity up to the card of 9.

Then the adult picks up the card of 10 and tells the child, “This is ... TEN”. The child says, “Why? This is 1 and 0”

The adult says, “Yes, this is 1 and 0 makes 10. So we count the rod of 10 and then keep this card 10 near the rod 10.

Then the adult asks the child, “Look, how I put back the cards in succession.”

The adult takes first the card of 10, and keeps it one side of the mat, then the card of 9 and so on. Till all the number cards are placed in succession.

Control of error : Lies in the child’s counting.

Direct aim : To help the child associate quantities from 1 to 10 with symbols by using the names of the quantity.

Indirect Aim : Same as “Number Rods”.

Age : 3½ yrs. of age and only after having completed tracing of sand paper figure and special name-lessons.

● Exercise

Exercise 1 : Bring the rods on working mat and keep it in succession. Then mix-up all the cards and keep it up-side down.

The child picks up one card and sees the number and then finds out that number of rods. Counts that rod and keeps the card at the side of that rod and repeats the activity.

After this activity, the child put back the cards like presentation.

Exercise 2 : Same as Exercise 1 but here cards are in succession but the rods are mix-up.

Exercise 3 : Same as Exercise 1 and 2 but here both cards and rods are mixed-up.

Check your progress :

Q.1. How many numbers in Number Card box?

Ans. There are ten cards i.e. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

● “Spindle Boxes”

Material description : There are two boxes without lids. Each box have five compartments. On the rear side of the 5 compartments of the 1st box, numbers from 0 to 4 are painted and on the 2nd Box the number 5 to 9 are painted.

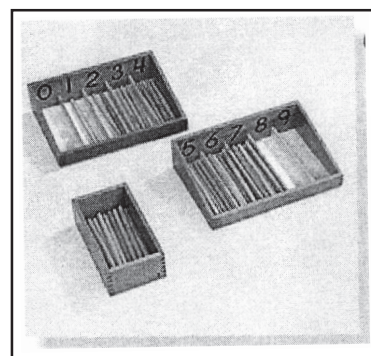
Spindles are kept in each compartment according to the numbers are painted on that compartment.

The Spindles are fusiforms.

Display : Display these boxes on a chowkie.

Characteristics :

- (i) Quantities are in form of groups.
- (ii) Number of the spindles are arranged in succession.
- (iii) the role plays by ‘0’ as a symbol.



Place of presentation : ‘Working mat’ or ‘Chowkie’.

Invitation : “You know counting 1, 2, 3, ... with number rods. Come, I will show you another material for counting.”

“Look, this is Spindle Box. You carry this box at the place of presentation without any noise.”

● Presentation : (I.A. – I.P.)

Keep the Box 1 at the middle of the working mat and adult asks the child, “Watch, how I try to take out the spindle without any noise or as little noise as possible.”

The adult pushes the spindle against the rear end of the compartment with his right thumb and lifts it so that he can hold the spindle with his index, thumb and middle finger and slowly takes it out. Spindles are kept to the left of the adult.

After taking out all the spindles from the box, then adult tells the child, “Now watch how I put back the Spindle.”

The adult indicates the number 1 and says to the child, “Here is one, so I put one

spindle here.” The adult picks up one spindle with the right hand index, thumb and middle fingers and places one end against the back wall and put it down slowly. So that there is as little noise as possible.

Next the adult tells the child, “Now watch, here is 2, so we put 2 spindles here.”

The adult puts one spindle in the compartment with the symbol 2 and after placing it he says ‘ONE’. Then he takes another Spindle and after placing he says, “This is another one, Now it is Two.”

Every child shows interest in ‘0’ and ask the adult, “Why is there no spindle?”

The adult asks the child, “What number is marked here?” The child says ‘0’. Adult says, “You know this is ‘0’ and ‘0’ means nothing. So there is no spindle here.”

After the child repeats the first box then he can use 2nd box and then he can use both the boxes together.

● **Control of error :**

Lies in the entire material. If a child makes a mistake in any one compartment, he can understand his error by himself.

Direct aim :

To help the child further consolidate—

- (i) his capacity to associate quantity with their symbols.
- (ii) his knowledge of succession of numbers.
- (iii) his ability to count.

Indirect aim :

To help the child —

- (i) realise that quantity above one can be made with the help of loose, individual identical units (they can be identical from any point of view).
- (ii) Pass from arithmetic of variable to arithmetic of groups.

Age : 3½ yrs. of age.

● **“Zero Activity”**

Presentation : Child here the sound ‘Nothing’, zero is nothing.

But that is not enough, they must feel what nothing is. For this purpose we employ exercises which amuse the child immensely. I place myself in the midst of them as they sit around in their little chairs; I turn to one who has already performed the counting exercise and say to him, “Come, dear, come to me zero times.”

The child almost always runs to me and then return to his place. “But my child, you have come once, and I said zero times.” He beings to wonder. “But what ought

I to do then?” “Nothing, zero is nothing.” “But how do I do nothing?” “Do nothing; you must stay where you are, you must not move, you must not come any times; zero means no times.”

We repeat the exercise, “You dear, throw me zero kisses with your finger-tips.” “Clap zero times.” etc.

With these activities the children being to realise the actual meaning of “zero”.

● **Control of error :**

To help the child, control of error is a social control of error.

Direct Aim : To help the child experience with his whole being, both intellectually and emotionally; that ‘0’ (zero) signifies absence of all quantities.

Indirect Aim : To help the child control his emotions by will effort directed by his intelligence.

Age : The child who shows interest about ‘0’ when working with spindle Boxes.

● **Chit Game**

Presentation : (Group Activity – Group presentation)

In a box, we have ten slips of paper on which a number from 0 to 9 are written and folded.

In another small basket there are 45 little cowries. Invite the children to come one by one, takes out a slip; carries it to his place, look at it stealthily, fold it again to hide the secret. Again we invite them to come one at a time and take the cowries corresponding at the number written on your slip.

The child with ‘0’ written as his slip does not comes, because ‘0’ means nothing.

The adult then check the number of cowries and number of slips are coincide or not. The activity being challenging can be repeated.

● **Control of error :**

Lies in the material.

Direct Aim : To give the child further opportunities to apply his ability in associating quantities with symbols.

Also further helps the child to consolidate his knowledge with regard to significance of ‘zero’.

Indirect Aim : To help the child control his emotion by applying his will a directed by his intelligence.

Age of presentation : 3½ yrs. of age and have an experience with ‘0’ activity.

Check your progress :

Q.1. Why we hold the spindle with three writing fingers?

Ans. It is directly helps the child for holding any writing instruments.

Q.2. Why '0' in the first box?

Ans. We give the presentation with first box and child can see that '0' means absence of all quantities.

Q.3. Say the names of the activity which helps the child to realise that '0' means absence of all quantities?

Ans. 'Zero' activity and 'Chit game'.

● "Number Cards and Counters"

Material Description : In a box, we have ten number cards from 1 to 10. In the same box there are 55 small attractive and identical objects called counters. This box is displayed next to the spindle boxes.

Place : Working mat.

Presentation : (I.A. – I.P.)

Ask the child to bring the box and mixed up all the cards on the mat. Then adult asks the child, "Keep all the cards one after another from 1 to 10 and keep some space between the cards." The child puts '1' then adult ask the child, "What comes after 1" keep this here." The child keeps '2' and so on.

After placing all the cards, the adult checks up the sequence of the cards. Now adult asks the child, "We have put these counters below these numbers. "So this is?" Child says '1'. Adult — "So we keep one counter below one." In this way child does the activity. The child is free to arrange the counters in any design he wishes.

● Control of error :

Lies in the material and helps the child in counting and correcting the mistakes.

Direct Aim : To helps the child to further associate each symbol with its equivalent quantity from 1 to 10 and thus become aware of the names of the numerals in succession.

Indirect Aim : To help the child confirm to himself, indirectly that he knows the numbers in succession from 1 to 10 and can also associate correct quantities with their corresponding symbols.

"Even and Odd"

Presentation : Ask the child. "Keep the cards from 1 to 10 on the working mat in

succession and keep the counters below the cards in rows of two or two together". In between the two rows of counters there must be some space."

We use an indicator and give name-lesson of "Even" and "Odd".

1st period : The adult places the indicator between the rows of the counters and asks the child, "How many counters are on this side?" (e.g. pointing to the left). The child says "3". Then adult asks, "And on that side (pointing to the right side)" The child says "3". Then adult says, "So the number of counters on both sides of the indicator are equal. This is called on EVEN NUMBER. So 6 is an EVEN NUMBER.

In this way adult helps the child to understand at least any three even numbers.

Then adult places the indicator between the rows of counters of an ODD NUMBER says 5, and asks the child, "How many counters on this side?" The child says "2" and how many counters of that side? Child says '3'.

The adult then says, "So the number of counters of one side is '2' and other side is '3'. So both the sides, the number of counters are not same. This is called 'ODD NUMBER'. So '5' is an 'ODD NUMBER'.

In this way adult helps the child to understand at least any three ODD NUMBERS.

II Period : Adult asks the child so many question about 'ODD' and 'EVEN' number like this — "Count on EVEN NUBVER Counters.

Show me any 'ODD NUMBER' card. Give me any ODD NUMBER counters etc.

III Period : The adult asks the child, "What number is this?" This child says — '6'. The adult asks, "What is 6? 'ODD' or 'EVEN NUMBER?'"

Child says — "EVEN NUMBER".

Adult — "What number is '3'?"

'EVEN' or 'ODD'

Child says — "ODD NUMBER"

● Control of error :

Lies in the IIIrd peiod.

Direct Aim : To helps the child to get to know the two names 'ODD' and 'EVEN'.

Indirect Aim : To keep the child's interest alive in working with number cards and counters.

Check your Progress :

Q.1. How many counters in "NUMBER CARDS AND COUNTES" Activity.

Ans. There are 55 Counters. The addition of 1 to 10 in 55.

Q.2. Why we offer ‘NUMBER CARDS AND COUNTERS’ activity?

Ans. Here child further associate both quantity and symbols and consolidate her knowledge about the Number from 1 to 10.

● **“Special Exercises with Number Rods”**

Exercise 1 :

Presentation : (I.A. – I.P.)

Child brings number rods and arranges them in succession on the working mat. Adult asks the child to bring rod of 10 in front of you and count it

Then adult ask the child to bring rod of 9, and keep it below rod of 10 and count it.

Then adult ask the child, “See a gap here, which rod will fill-up the gap? Count it.”

Child : ‘One’.

Then child bring rod of 1 and count it and then fill the gap.

Adult ask the child to count 9 and 1 together.

Adult : “So 9 and 1 together makes ten so $9+1 = 10$.”

Then adult asks the child to bring the next longest rod and put it below the rod of 9 and count the rod.

Adult : “Which rod will fill-up he gap. Cunt the blank portion.”

Child : “Rod of 2.”

Child bring rod 2, count it and fill-up the gap.

So 8 and 2 together makes 10.

So $8+2 = 10$.

In this way child will do the activity. When the child puts the rod of 5 and needs another 5 to fill-up the gap, then adult suggest to put the rod of 5 again in the blank portion and say the child that if we take 5 two-times it also makes 10.

So $5 \times 2 = 10$.

Exercise 2 :

Same as above but here child first bring longest rod, then bring any one rod below the longest rod and then fill up the gaps

e.g. $3+7 = 10$

$1+9 = 10$ etc.

Exercise 3 :

Here ask the child to bring any one rod and keep it in front of the child. Then bring any other rod keep it below the rod and count it, then fill up the gaps and put back all the rods.

e.g. Rod 5

Rod $3+2 = 5$ etc.

Exercise 4 :

Here child can do all these exercise mentioned above by keeping all rods in scattered way.

Exercise 5 :

Here hide rod of 10. Adult ask the child to bring longest rod i.e. 9 in front of the child and count it. Then next longest rod keep it below the rod of 9 and count it, then fill up the gap.

So $8+1 = 9$

In this way do the activity. Again hide rod of 8 and do the activity.

● **“Subtraction”**

Presentation : The adult asks the child to bring the number rods and makes them equal to ten.

Then adult takes rod of one from (9+1) and asks the child, “How many numbers have I takes away?”

Child — ‘ONE’

Adult — “Now how many are left? Count it.

Child — ‘9’.

Adult : “First I have 10, and if I take one from ten then it is 9.

So $10 - 1 = 9$. This is call subtraction.

In this way child will do the activity.

In case of 5, adult asks the child “Here we make 10 by doubling the 5.

Now if we fold this 10, then we get 5. So $10 \div 2 = 5$ and this is called division.

● **Control of error :**

Lies in the child’s counting.

Direct Aim : To help the child to apply and consolidate all the knowledge which he has acquired from quantitative symbols from number 1 to 10.

Indirect Aim : To help the child to have a glimpse of arithmetical operation addition, subtraction special case of multiplication and division.

Age : 4 yrs. of age.

Check your Progress :

Q.1. Why we offer special Exercise with Number Rods?

Ans. The Exercises helps the child to learn Addition, Subtraction, Multiplication and Division.

● **Decimal System (Static Part)**

Golden Bead Material :

Material Description : A box with four compartments, whose rightmost shallow compartment have 9 golden beads for units and in the next compartment we have 9 bars of ten, on each bar compose of 10 beads.

In the next compartment we have 9 bars of hundred. Ten bars of 10 makes together form a Hundred and it is square shape.

In the last compartment, have a cube of THOUSAND makes by ten bars of hundred together.

Along with these we also have a tray with green bowl on it.

Purpose : This activity helps the child to become aware of the simple laws that governs the decimal system by his own active personal experience.

Name of the Activity : ‘Name-Lesson’

Place : Working mat.

Invitation : “Come, today I show you a huge amount of beautiful materials.”

(Child and Adult bring the material and Adult keeps the box on his right side with the unit compartment near his right hand side.)

● **Presentation : (I.A. – I.P.)**

1st Period :

The adult takes one bead keeps it near the right side of the mat and says to the child—

“Look, this is ONE”.

“This is ONE”.

Then adult shows the child one ten-beads bar and asks the child “How many beads are there? Count this.”

“Look, 1, 2, 9, 10.”

“So this is TEN.”

Then adult takes out a hundred and put it near the child and says, “Look, this is HUNDRED. There are so many tens are there. Count, how many tens in hundred?” Adult starts counting, “Count, 1 ten, 2 tens 10 tens.

So 10 tens makes Hundred.

So this is HUNDRED.”

Then adult takes out the cube of thousand and says to the child,

“Look this is

Child, “What is this?”

Adult, “Are you like to hold it?”

Then adult gives the cube to the child’s hand from a distance. Child sees the cube and feel it.

Adult, “This is THOUSAND.”

“There are so many hundreds stacked into one. Now we count how many hundreds are there.” Adult takes the cube in his left hand and traces with right hand’s finger from the side of the top most hundred.

Adult traces the sides and says —

“ONE HUNDRED, TWO HUNDRED TEN HUNDRED.”

“So this is THOUSAND, 10 hundred makes a THOUSAND.”

Adult will arrange all the quantities from right to left, i.e. THOUSAND — HUNDRED — TEN — UNIT.

2nd Period :

Adult asks so many questions to the child like this;

“Show me 10, Give me thousand, Hide 100, Count how many tens in hundred, Count how many 100 in thousand, Count 10 etc.

Then adult arranges the quantities from right to left.

3rd Period :

Adult asks the child —

“What is this?”

Child — ‘ONE’

Adult — “What is this?”

Child — ‘TEN’

Adult — “Count, how many beads in ten.”

Adult — “What is this?”

Child — “HUNDRED”

Adult — “Count how many tens in HUNDRED.”

Adult — “What is this?”

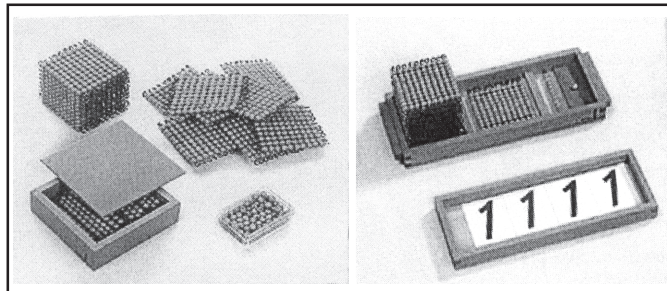
Child — “THOUSAND”

Adult — “Count, how many hundreds in THOUSAND.”

● Arranging with the Golden bead Material

Presentation : Adult arranges the quantities from right to left, e.g. TH – H – T – U.

Then adult asks the child “Look, here we have one bead and there are so many beads in the box. Now we count how many beads are there.”



Child then count the beads like 2, 3, and keeps all beads in one vertical line and distance

between two beads in equal to a bar of 10. After arranges 9 heads then child says, ‘there are no beads’.

Adult — “Suppose there is one more beads, then”

Child — “Then it will be 10”.

Adult — “Where is TEN?”

The child shows a ten bead bar.

Adult — “Look, there are so many tens in the box, count them and keeps it one vertical line.”

Child — Counts 1 ten, 2 tens, 3 tens 9 tens and put them in one vertical line.

Adult — “How man tens are there?”

Child — ‘9’

Adult — “Suppose there is one more ten then?”

Child — “Then it will be 10 tens.”

Adult — “What do we call 10 tens?”

Child — Ten tens are hundred.”

Adult — “Show me hundred.” Look there are so many hundreds in the box, you count and put them one vertical line.

Child will count one hundred, two hundred, upto nine hundred and keep them one vertical line.

Adult — “Suppose, there is one more hundred, then”

Child — Then it is 10 hundred.”

Adult — “What we calls ten hundred?”

Child — “THOUSAND”

Adult — “Where is thousand?”

Child — Show the thousand.

(The materials are displayed for presentation on the shorter side of the working mat).

● Formation of Quantity

Presentation :

After arranging the golden bead materials, the adult asks the child to bring a tray with green bowl and keep the bowl at the right base corner to the tray.

Then adult says the child, “I shall ask you some quantity and you will give me that much of quantity from these beads.”

Adult asks, “Give me 600 and you start to pick-up the beads from top.” Child takes 6 hundred beads bar from top and comes to the adult.

Adult check the number and ask him to put back the all bars.

Next adult asks the child, “Bring 1 thousand 2 hundred.”

Child carry the beads and adult will check it and says put it back.

Then adult ask the child, “Bring 2”.

Child — “2 of what? tens on hundred?”

Adult — “2 units and bring it in the green bowl.”

Child — “What is unit?”

Adult — “Look, these loose beads are called unit. When I ask any number like, 2, 3 etc., then you should understand it is unit and bring it from loose beads and keep them in the green bowl.”

Then adult asks the child, “Bring 1 thousand 3 hundred 3, i.e, combination of 3 hierarchy.

After that ask the child to bring combination of four hierarchy i.e, 1 thousand 3 hundred 4 tens and 1 and lastly asks the child to bring 1 thousand 9 hundred 9 tens and 9.

After checking the materials asks the child to put back the material in the box and asks the child, “How many beads are on the mat?”

Child says “Nothing”.

This 3 activities helps the child to have a clear idea about the unit of various hierarchies.

● Control of error :

- (1) In the 1st activity, “Name-lesson” control of error lies in the 3rd period.
- (2) In the 2nd activity, the control of error lies in the material.
- (3) In the 3rd activity, there is no need for control of error.

Direct Aim : To help the child enjoy handling large quantities within the frame work of decimal system of numeration.

Indirect Aim : To helps the child become aware of the law’s of the decimal system of numeration by means of his personal activity, the Laws are :

- (1) There can be only 9 units in any one hierarchy.
- (2) The number of hierarchies on a level are limited to three : Unit, Tens and Hundred.
- (3) In the number of levels there are no limit on which these three hierarchies repeat themselves.
- (4) The ratio between the unit of one hierarchy and the unit of next higher hierarchy is 1 : 10.
- (5) The relation between one level to the next higher level is 1 : 1000.

Age : 4 yrs. of age and know the numbers of 1 to 10 and significance of ‘0’.

● Decimal System (Static Part)

Card Material

Material Description : Card materials are keep on a wooden box whose one of the wall is collapsible.

There are 9 cards i.e. 1 to 9 units. The numbers are written in green on white base.

Another 9 card of ten (i.e. 10 to 90) which are as broad as unit card, but twice as long. The numbers are written in blue on white base, so blue colour stands for tens.

There are 9 cards of hundred which are as broad as unit card but three times longer. The numbers are written in red colour on white base, so red colour stands for hundred.

Along with these cards there is one card of thousand which is as broad as unit card but four times longer. The number is written in green as in unit cards because it is also a unit of the next higher level.

Display : In a box, first we keep thousand card then hundred card on it, in such a manner that they hide the three zeros of the thousand.

Ten number cards are placed on hundred by hiding two zeros of hundred. The unit cards are placed next to tens by hiding one zero of tens.

This card material is placed near the “Golden Bead Material”.

Place — On working mat.

● **Presentation : (I.A. – I.P.)**

Asks the child to bring the box on the working mat and keep the box at the right side of the adult and also bring a tray.

1st Activity : Name-Lesson

Tell the child, “you have already hear the names ONE, TEN, HUNDRED AND THOUSAND. Come today I show you how to write these names”.

1st period :

Show the child card 1 and asks him, “What is this?”

Child says — “ONE”

Show the card ‘10’ and asks the child, “What is this?”

Child says, “TEN”.

Adult — “How many zeros are there in Ten?”

Child — ‘ONE’

Adult — “So this is TEN”.

Then adult sow the card of hundred and tells the child, “Look, this is HUNDRED.”

“Count how many zeros are there in 100?”

Child — “TWO”

Adult — “So this is HUNDRED.”

Showing the card of thousand and say the child, “This is THOUSAND.”

Count how many zeroes are there in the thousand.

Child — “THREE”

Adult — “So this is THOUSAND.”

2nd Period :

Adult asks so many various questions to the child. Like this —

“Show me Ten.”

“Keep thousand here.”

“Hide ten”

“Count how many zeroes in hundred.”

“Where is unit? etc.

Then arrange the cards like TH-H-T-U.

3rd Period :

Adult — “What is this?”

Child — “ONE”

Adult — “What is this?”

Child — “TEN”

Adult — “Count how many zero in TEN.”

Child — “HUNDRED”

Adult — “Count how many zeroes in HUNDRED.”

Child — “TWO”

Adult — “What is this?”

Child — “THOUSAND”

Adult — Count how many zeroes in THOUSAND.”

Child — “THREE”

At the same sitting, we give the 2nd activity.

● **‘Arranging the Cards’**

Presentation :

Ask the child to arrange the cards one to thousand like, TH-H-T-U.

Show the child card ‘one’ and ask the child, “What is this?”

Child — “ONE”

Adult — Look there are more cards in the box. So we arrange all the cards in a vertical line.

We keeps the card one after another each card touching the other. Child will arrange all the cards upto 9. Adult ask the child, “What comes after 9?”

Child — “TEN” and child will show the card 10. Then adult says, “So this is one ten”.

“Look there are so many tens in the box. We put them one after another and says, one ten, two ten, three ten etc.

Adult — “What comes after 9 tens?”

Child — “Ten tens”.

Adult — Ten tens means one hundred. “Show me one hundred.”

Look there are so many hundred in the box. We arrange it like 1 hundred, 2 hundred upto 9 hundred.”

Then ask the child, “What comes after 9 hundred?”

Child says, “10 hundred”.

Adult — “So ten hundred is one thousand.

Ask the child to put back the cards in order in a stack but first show him how you put card 8 before 9 and so on. Then child can talk over.

● **Name of the Activity : (3rd Activity) : “Formation”**

Presentation : (I.A. – I.P.)

Ask the child to arrange all the cards on the working mat. Then asks the child to bring a tray and give me 400. But child brings four cards of hundred from top like golden bead materials.

Adult — “I ask you to bring 400, but you bring so many cards.”

Adult takes 100 card and hide two zeros of hundred and ask the child, “What is this?”

Child says, “This is ONE.”

Adult asks the child “Look, two zeroes are there. So this is one hundred, 2 with two zeroes i.e. 200. So 4 with two zeroes i.e. 400. So you keep this card only on the tray and put back other cards.

Then adult ask the child to bring the cards like combination of two hierarchies; then combination of three hierarchies and last combination of four hierarchies.

Then ask the child now look how I arrange the cards, — take thousand card first, then on top of it keep hundred card then ten card and then unit card, after that tape all the cards against zero and helps the child to say the numbers by showing the cards.

Lastly ask the child to bring 1 thousand, 9 hundred, 9 tens and 9 unit and then ask the child how many cards on the mat?

Child says — “So many”.

● **Control of error :**

Same as golden head materials.

Direct Aim : To help the child to enjoy handling graphic representation of quantities within the frame work of decimal system of numbers.

Indirect Aim : To help the child become aware of the laws governing the decimal system.

● “Bead and Cards”

1st Type : “Bring cards for quantities.

Adult asks the child to arrange the beads and cards on separate working mats.

The adult tells the child, “Bring a tray with green bowl and then I will give you same beads on the tray and you will count it and bring that amount of cards. Then adult check it and repeat the activity.

2nd Type : “Bring quantities for Cards”

Now adult gives the child some cards and child will read it and then bring that amount of Beads.

3rd type : “Bringing both for oral commands”

Adult ask the child, “Listen carefully, I will ask you some number, you will bring that number from both cards and beads.”

Suppose, adult ask the child to bring one thousand, three hundred, one ten and four.

The child bring that number from both beads and cards, then adult check the number and says “One thousand three hundred and fourteen.”

Child — “Why fourteen?” It is one ten and four.

Adult — “Yes, fourteen is the another name of one ten and four.” From this activity on words we use the Traditional *Names of Numbers* when we check the materials.

● Control of error :

Adult will inspect that both beads and cards are coincide or not.

Direct Aim :

To help the child in counting to enjoy handling large quantities and their graphic representation within the frame work of decimal system.

Indirect Aim :

- (1) Same as that of other activity of decimal system.
- (2) To help the child to get interested in the traditional names of combination of one ten and one to nine units, various groups of tens and combination of various groups of tens and one to nine units.

Check your Progress :

Q.1. Why in decimal system of Golden bead, material is called static? And Dynamic box — called Dynamic?

Ans. In Golden bead material box, each compartment we have 9 unit. So we cannot change them from one hierarchy to another. That’s why this Box is called static.

In Dynamic Box, each compartment we have 45 units. So we can change them from one hierarchy to another. That's why this box we called Dynamic.

Q.2. What are the Laws of Decimal System?

Ans. See the Indirect aim of Decimal System of Golden Material.

● **Name of the Activity :**

The decimal system. (Dynamic Part). Bead Materials & Card Materials.

Material description : There is a container with 45 golden beads. To the left of that container there are 45 tens in another container. In another container, there are 45 hundreds. They are symbolic hundred— on a square wooden plaque the 100 beads are printed in blue and orange coloured paper.

We also have symbolic 9 thousands— 9 wooden cues whose 6 faces are covered, with imprints of hundreds.

We also have card material just as the Cards of Static part only there are thousand Cards up to 9 thousands instead of 1 thousand.

We also have 3 sets of small cards. The figures printed on them are smaller and there are thousand cards up to 3 thousands.

We also have 3 independent natural coloured trays for the dynamic part with 3 green bowls. We also have a larger size green bowl.

Name of the Activity : The Change Game.

Material needs : All the golden bead material— 9 thousands, 45 hundreds 45 tens & 45 units (loose beads).

Presentation : (I.A.— I.P.) :

Invitation : “You have been worked with large quantity. I am sure that you also like to work with still larger quantity— Won't you ?”

Ask him to showing the hundred that, “Now we have going to use this material as hundred. There are hundred heads are printed here. These are symbolic hundred.”

If he ask that,— “But I like the beads.”

Then say him that— “There are so many hundreds you see. But here is no space to keep all the bead hundreds.”

Now take out 3-4 thousands, & some hundreds, tens & units in a bowl. Mix-up all the thousands, hundreds & tens in a heap.

Ask the child— “Look what a huge quantity ! Do you have any idea that how much are there ?

Child say— “No”.

“Let’s find out how much we have, Now we are going to count all these quantities.”

“Which do you want to count first ?”

Child— “Thousand”

So you count thousands and put one on top of the other.

Again ask the child what he wants to count now ? If he says “Hundred”, Then short out all the hundreds from the heap.

Then count upto to ten hundred keeping them one top of the other. Ask the child— “We call 10 hundreds— one thousand.”

So you put these ten hundreds in the box back and take a thousand cube from the original box and put it on the top of the thousands cubes.

Ask the child, “Every time when we have ten hundreds, we have to change them into one thousand.”

Ask the child to count the remaining hundreds. There are 9 hundreds, so he can’t change it.

Ask the child what does he want to count now.

Child says— “Ten.”

Ask the child to count them. When he count upto ten, ask him, “Ten tens means—”

Child says— “One hundred.”

So ask him to change them to one hundred and keep it on the hundred stack. Then there are 10 hundred. So ask The child to change them into thousand. “Ask the child to count the other tens. There are seven tens. So we can’t change them.

Then ask the child to take the smaller bowl. Ask the child to count units & put then in the smaller bowl.

When he count upto ten then ask him to change then into + one ten :

After the child has done all the necessary counting and changing then ask him.

“How many quantity are there ?” Child count the quantity (i.e. thousand hundreds, tens and units).

Ask him to take the tray and bring the quantity in cards. When Chaking you say: e.g. forty five instead of four tens and five.

If child asks you, say to the child, “We also call four tens and five in the same of fortyfive.”

Ask the child to put back the materials in the box and make another heap & find out how much are there.

N.B. : Always keep some thousand, hundreds tens, in the box, so that the child can change whenever he wants to change.

Control of error : No need for control of error.

Direct Aim : To help the child enjoy handling still longer quantity and their graphic representation within the frame-work of decimal system.

Indirect Aim : (1) To help the child become familiar with the mechanism of changing and thereby experiencing the dynamism within the frame-work of decimal system.

(2) To help the child experiencing the ordering effect of the application of laws of decimal system in clarity.

Age of presentation : About 4 years after he has enough experience working with decimal system static part.

● **Parallel Exercise over Addition**

Name of the Material : “Addition strip board.”

Material description : It is a rectangular wooden board grayish white in colour. On the board there is a frame-work of squares ; colour of the lines is blue. There are 12 horizontal rows and 18 squares in each rows. Over there 18 vertical rows of squares numbers are printed upto 18. 1 to 10 numbers written in red colour and 11 to 18 are in blue colour. After 10, there is a red line along the width of the board.

There are also 2 sets of wooden strips blue & red in colour. Width of the strips are corresponding to the width of the squares. There are 9 strips in each set. Their length correspond to the 1 to 9 squares of the board.

At the right end of the strips, number are printed in red on blue strips. The increasing of strips are seen from 1 to 9 and from left to right.

Other strips are red in colour. They are squared— number correspond to the strip of the square are printed on the right most square in blue.

Both are arranged in this manner so that blue strips are at the left of the red.

Presentation : (I.A.—I.P.) To the child who has experience asking with decimal system dynamic part golden head material.

Take the child to the material & introduce him with the material. Ask him to take out blue & red strips and tell him how to arrange 1 to 9 strips.

Tell the child— “This is addition strip board, so let’s do addition. We add 6 with 7.

The first number are always take from blue.

Put the strip on the first row of the board. It goes upto the 6th square.

Tell the child,— “We take the second number always with the red strips.”

Put it at the side of the blue strip.

Ask the child— “It goes to the square of—”

The child says— “Thirteen” “So 6+7 is thirteen.”

Ask the child to keep back the strips and make another addition.

You should think for some time to stimulate the child., so that he himself ask numbers for addition.

If the child wants to keep the record of his activity then he can use the squared papers to write you also ask him to read out the activity like this— “Six plus seven is thirteen.”

Largest number in blue strip that is the strip of 9. e.g. to make 13.

The child should use—

$$\begin{array}{l} 9+4=13 \\ 8+5=13 \\ 7+6=13 \\ 6+7=13 \\ 5+8=13 \\ 4+9=13 \end{array}$$

to make 15.

Now the child observe that certain combination repeats but in a reverse manner. It also helps to discover the commulative law of addition. He also reads the combination. So make some space between the numbers and draw the child’s attention to where the numbers are in a reverse manner.

Direct Aim : To help the child to concentrate on addition of two quantities from 1 to 9.

Indirect Aim : (1) To help the child get to know all the basic addition by heart.

(2) To help the child discover by personal experience the commulative law as it refers to addition and these realise that real basic additions are very limited in number (45 addition).

Age of Presentation : When he have had plenty of experience of working addition with decimal system dynamic part bead material and realistic the nature of operation by heart.

Control of error ! : When child work with addition strip board, then there is no need for any control of error.

Later when the child fills the sheets without any material help, at that stage he needs central of error.

Then there are various control which we use called CONTROL CHART.

Exercise 1 : Ask the child to take anyone number from the blue strip. Ask him to keep it on the board and ask him to add every red strip (from 1 to 9) with it, one at a time. e.g. he adds : $8+1=9$, $8+2=10$, $8+9=17$.

When the child to performing his first exercise, we draw his attention to **The printed addition table.**

Name of the activity : The printed addition table.

Material description : A tray with 9 compartments. There are printed tables of numbers from 1 to 9. On those printed tables there. are green compartments horizontally from 1 to 9. The first numbers are in green & the second numbers are in brown as black.

Suggest the child to do addition on this printed table. When he filled all the compartments of the printed table, then make a book of his own by punching than together.

Add Table of 1	Add table of 2	Add table of 9
$1+1=2$	$2+1=3$		$9+1=10$
$1+2=$	$2+2=$		$9+2=$
.....
$1+9=$	$2+9=$		$9+9=$

Exercise 2 : Ask the child— “There is something we do with addition strip board.”

Ask the child to bring the board. Ask him— “Let us try and find out that how many ways we can make any number using two numbers at a time— one from blue & one from red strip. e.g. “Take the number 15.”

Child can do the activity all by himself. He first take any are strip from blue then he try to find out the number from red strip which make 15.

Ask him not to put back the strips and ask him to take another number from blue strip and find out with which number of red strip it can make 15.

He sees that he can do it in 4 ways.

$6+9=15$, $7+8=15$, $9+6=15$, $8+7=15$.

Suggest another number and ask the child to find out how many ways we can make the number.

Later suggest the child to start the activity by using the.

Name of the Material : “The Multiplication Board.”

Material description : On this Multiplication Board we are 100 of such pits. There are 10 horizontal rows of pits and 10 vertical rows. Over this 10 vertical rows, numbers are written from 1 to 10 in black colour.

Along the middle of the left side of the board, there is a rectangular pit. It looks like a window. This is made for number cards, so that number can be visible.

Over the left top corner of the pit, there is a large circular pit also red in colour. Over it there is a red skittle.

There is a box in it, there are 100 red beads. In the lid of the box there are 10 number cards 1 to 10. The numbers are painted in red. These numbers are painted at the right hand side of the card. The background of the card is white.

We use this number card to show the **Multiplicant**.

Numbers on the board are **Multiplier** & by the red beads, we show **product**.

Presentation : Invite the child and ask— “Look this is Multiplication with it.” We bring the board and box with lid.”

Tell the child, “See this is the multiplication board. (Pointing to the Board) and I show the cards and say, “See these numbers— you can multiply with these numbers on the board.”

Then I show the skittle is used to remember how many times you have to multiply?”

I keep the skittle over the red circle.

Now I ask the child to choose one of the cards to serve as multiplicants.

Suppose the child takes out the card of 3. “Let’s put the card on the window. (The rectangular pit on the left hand side of the board.).

“Let’s multiply 3 with 2.”

So we have to take 3 two times. We take the skittle and put it over 2. Now we take 3 red beads & arrange them below 1. and again take 3 beads & arrange them below 2 in vertical way. Then ask the child to count how many beads are all together. “Child counts & tell,” There are 6 beads.” So 3 taken two is 6.

In this way child may be multiplication at random like 3×4 , 3×5 , So on.

Then we suggest to multiply in a linear manner. I ask the child to chose any number, suppose 5. Child puts the card of 5 in the window then ask the child, “Now we multiply 5 with all the numbers of the board written on top.

So we keep the skittle over No. 1 That means time on (5) multiply are time. So put 5 beads below 1 and count and see 5 multiply by 1 is 5. Then he slips the skittle to the No. 2, that means he has to multiply 5. two times. So he put 5 more beads below the No. 2. The ask the child to count all the beads together. Child count and say 10. So 5×2 is 10.

Again I move the skittle over 3 means 5 to multiply by 3. So the child puts 5 more beads below number 3— and comit and find it is 15. So 5×3 is 15. Thus he continues doing this way upto 10.

When child wants to keep the record of multiplication, he has done, he use a printed tape like this (e.g. Multiplication tape of 2).

The frame work of this table surrounded by red line.

The multiplicand is written in red and other numbers in black. To the right blank place for the product to be filled up by the child.

Multiplication Table of 2

- $2 \times 1 = 2$
- $2 \times 2 =$
- $2 \times 3 =$
- $2 \times 4 =$
- $2 \times 5 =$
- $2 \times 6 =$
- $2 \times 7 =$
- $2 \times 8 =$
- $2 \times 9 =$
- $2 \times 10 =$

Control of error : Lie in the counting as long as the child is working with the Multiplication Board. When he starts to record the Multiplication without any material help— then we, give him the first control chart. Where he can see the 2 numbers and the product of them.

Direct Aim : To help the child concentrate as the product of numbers from 1 to 10.

Indirect Aim : (1) To help the child to realise that he knows the multiplication tables from 1 to 10 by heart.

(2) To help the child became familiar with the mechanism of Multiplying numbers by 10.

(When we multiply a number by 10, we actually don't do the multiplication— we just put a zero at the right side of the number. In other words we promote each digit of the number to the next higher hierarchy.

e.g. $426 \times 10 = 4260$.

Age of Presentation : After the decimal system of dynamic part.

Name of the Material : “Subtraction Strip Board.”

Material Description : The board is of same shape ; dimension ; colour & squarer with Addition Strip board. There are also 18 vertical and 12 rows of squares. Numbers are written on 18 vertical rows— Number from 1 to 9 is in blue & number 10 to 18 is red in colour.

The line along the width of the board is after 9 and colour of the transversal live is blue. There are an set of blue strip from 1 to 9 and another 17 strips correspond to the 1 to 17 squares of the board. They are of same colour as the surface of the board.

No numbers are written on 17 strips because they do not represents any quantity at all.

They are used to short the board according to quantity from which you subtract.

Presentation : (I.A.—I.P.) : Invite the child & say “Come, to-day I am introduce you with a new material with which you can do subtraction all by yourself.”

Presentation should be an working mat.

Ask the child, “Look, this is a subtraction Strip board.”

Then you bring the material and suggest the child to arrange the strips.

Blue strips arrange same as addition stripboard & (1-17) strips are arrange at the left side of the blue strips.

Then ask the child—

“Let's do subtraction. We subtract 4 from 18. So we take 4 from blue strip & put it below 18.”

It covers the numbers from right to left and difference are shown at the left.

Ask the child— “What is the number here ? (indicating the square of left of blue strip).”

Child see the number of the square which is at the left of the blue strip and said it is 14.”

“So the difference, is 14.”

After same subtractions done from 18. ask the child— “Let’s us subtract 8 from 15.

So you cover the numbers, 18, 17 & 16 with this strips (indicating to the natural coloured strips) & then put 8 from blue strip below 16.” Ask the child— “What is the difference ?” Child can see the board and say “7”.

Do save another subtractions with other numbers also and when he understand ask him to put back the material.

If he wants to keep the record ofhis activity he should use square sheet of paper— 5 square horizontally & vertically more than five.

Exercise : After he has done all the subtractions for some days, we ask him to concentrate an only those subtractions where the difference is only 9 or less than 9.

Ask the child— “You have been doing many subtraction, with subtraction Strip board. But we don’t need them all. So come, we shall do those subtractions which are need really.” “We subtract from 14. So we first prepare the board upto 14 using the natural colour strip. Cover 15, 16, 17, 18.” “We need only those subtraction where the difference is 9 or less than 9. When the difference goes only upto the blue line, then you will stop.”

“So you should begin to subtract with the largest strip 9 and then go on. When the difference is 9 & touch the blue line then we stop.”

“We don’t need the difference that goes after the blue line i.e. move than 9.

After he understand the nature of the activity, ask him to go on subtraction with any number but remind him to do only those subtraction where the difference are only 9 or less.

If the child want to keep the record of his activity, he has to use printed table. Tables upto 18. They are kept in a tray, like addition strip board but twice as broad as that board. Each of this table has a frame-work, numbers are in black & blue.

There are only 1 subtraction in 18. i.e. 18-9 ; in 17, 17-9 ; 17-9 ; in 16 ; — 16— 9 ; 16—8; 16—7 etc. When the child does the subtraction without the help of the board & on the table ; he needs control of error. Then we offer him control chart.

Direct Aim : To help the child concentrate on basic subtraction.

Indirect Aim : To help the child get to know subtraction by heart without having done so deliberately.

Age : After he has plenty of experience of doing subtraction with decimal system dynamic part & knows the nature of subtraction.

Name of the Material : The Division Board (Board of Unit)

Material Description : In a Box, there are 89 green beads and 9 green skittles on the lid on the box each of which represent an unit. On the board, there are 9 pits in each row and there are 9 such rows. There is green band over the board. Or it there are 9 larger pits where 1 to 9 are written.

At the side of the board No. 1 to 9 are printed vertically. The numbers represent the quotients and the horizontal numbers are the divisions. There is also a green bowl.

Presentation : Tell the child, "There is also a board where you can do division all by yourself. Let us do the division."

Ask the child, "Let us divide 36. So we take 36 beads in the green bowl." When he has taken the beads tell him, "Let us put 9 skittle on the larger pit." You can show him first by joining or putting the beads below the skittles. While putting the beads tell yourself are to you are to you etc.

Tell the child, "There is no more beads. So each skittle gets 4 beads." No—"Let us divide 36 beads among 8 skittles. So take away one skittle & the beads below it." Put the beads under the skittle once more.

There are only 4 beads. So tell the child, "I have only 4 beads. So I cannot give them to anybody." And take them away and keep them in the bowl.

Then remain only 4 beads. So 4 is remainder.

Again ask the child, "Let us divide 36 beads among 7 skittles. So take away the 8th skittle and the beads, below it."

Give the remaining beads to the skittles once more and there is only one left.

Tell the child, "So every skittle gets 5 and 1 in the remainder." "Let us divide 36 among 6". Child gives the remaining beads once more and say that on the board the beads look like a square. "Now let us divide 36 beads among 5". Here quotient is 7 and remainder is 1. "Let us divide 36 by 4."

The quotient is 9 and no remainder. "Now let us divide 36 among 3. Take one skittle is no place to give the beads once more. So we cannot divide 36 beads among 3 on this board.

If the child wants to keep the records of divisions, he can record them as the division table.

After a few days you suggest, “You do not need to record all the divisions. You need only those divisions which have no remainder.

e.g. in 36, we need only $(36 \div 9 = 4 ; 36 \div 4 = 9, 36 \div 6 = 6)$ 3 divisions to be recorded.

Then he also realizes that the multiplications i.e. $9 \times 4 = 36, 6 \times 6 = 36, 4 \times 9 = 36$

Control of error : We do not suggest any control of error but if the child requires any he may use the Multiplication chart.

Direct Aim : To help the child concentrate all basic division and also helps the child to realize the relation between basic division and basic multiplication.

Indirect Aim : To help the child prepare himself for the use of division board of 10's and board of 100 for doing long division.

Age of presentation : After the child has had plenty of experience with decimal system of dynamic part and also knows the nature of division.

● “Traditional Names in Arithmetic”

In arithmetic, when child shows interest about these traditional names, then we offer it. Actually we start to saying the names at the 9th activity of decimal system of static part when adult check the material at that time he says traditional names.

There are 3 groups in traditional names :

- (1) Combination of one Ten and one to nine units i.e. (11-19).
- (2) Various groups of Tens i.e. (10, 20, 30 ...)
- (3) Combination of various groups of tens and one to nine units i.e. (21-29, 31-39 ...).

Here we first helps the child to associate the names with quantities, then associate the names with symbols and after that associate the names both quantity and symbols.

1st Group : Combination of one ten and one to nine units.

Name of the activity : Name-Lesson (in English 11-19).

Material : 9 tens and 45 units of golden bead materials.

● Presentation :

1st Period : Ask the child to bring the materials. Showing one ten and ask the child,

“Look, this is one Ten.” Then adult takes one bead and keep it at the side of one ten and ask the child, “This is one bead and now we count all the beads together.” Touch the beads with finger and the child counts it like, one, two ten (child and adult together), Adult says ELEVEN.

“So one ten and one is also called ELEVEN.”

Again keep another ten and ask the child “What is this?”

Child says — “One ten.”

Keeping 2 beads at the side of ten, ask the child, “What is this?”

Child — “Two.”

Ask him to count all the beads together. Child starts to count, join with him at eleven and say “TWELVE”, after eleven.

“So, one ten and two is also called TWELVE”.

2nd Period : Ask the child various question like this —

“Where is TWELVE”.

“Put ELEVEN here”.

“Count TWELVE”.

Then ask the child, “Put eleven here”, “Put twelve here” etc.

3rd period : Adult — “What is this?”

Child — “ELEVEN”

Adult — “Count this”.

Adult — “What is this? Count this”.

Child — “TWELVE”.

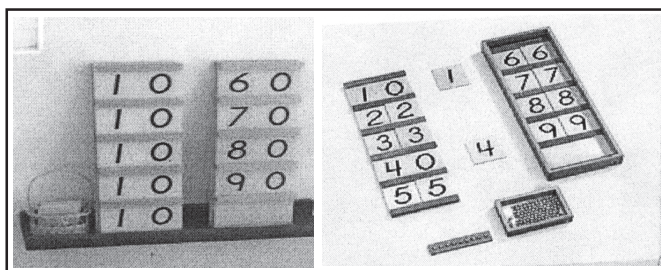
(N.B. — English (11, 12); (13,14), (15,16), (17,18,19).

● “Name-Lesson with Symbols”

Material : “First frame of SEGUIN”

Material Description : It is a narrow rectangular frame whose length is divided into 5 compartments and breadth is divided into 2 compartments.

‘1’ is printed on the left most 5 compartments with black colour on white base and on right most 5 compartments ‘0’ is written.



Compartments are divided by wooden strips.

On the right half of the frame there are grooves, so that we can insert other cards into this.

On the 2nd part of the frame '1' and '0' are written on the first 4 compartments and 5 compartment is black.

There are also number cards from 1 to 9.

The dimension of the number cards corresponds to the compartments of the frame, so that they can cover the '0' of the TEN.

Presentation : (I.A. – I.P.)

“Come today, I will show you how to write eleven, twelve etc. with the help of “Seguin Frame”.

1st Frame :

1st Period : Keep the 1st frame in front of the child and the box to the right side of adult. Ask the child, “What is written here?”

Child — “TEN”

Inserting card 1 into the groove of the 1st compartment and ask the child “What is this?”

Child — “ONE”.

Adult — “So one ten and one is called —

Child — “ELEVEN”

In this way show the child upto FIFTEEN.

2nd Period : Take out all the cards from the frame. Ask the child to make fifteen here (pointing any compartment) “Make twelve here”. etc.

Before winding up the 2nd period, ask the child to make the numbers 11 to 15 in succession.

3rd Period : In the 3rd period ask the child “What is this?” etc.

Ask him to say the names in succession.

● “Associating the Names both Quantities and Symbols”

Material : “Activity with first seguin frame. 9 tens and 45 golden beads.”

Presentation : Showing the frame tell the child, “Look, there are so many tens are written on the frame, so you keep 9 ten bead bars at the side of tens”.

Ask the child to insert '1' over '0' of the 1st frame. Then it is eleven. “So we put one bead near one ten bead bar at the top and make 11 and count all the beads”.

Then 2nd compartment and keeping 2 beads at the side of bar of ten, says, "TWELVE".

In this way he completes the 1st frame and then he works with 2nd frame.

After making 19, he sees that there is one ten bar and nine units then he can imagine if there is one more bead, then it will be two tens.

Exercise with First Sequin Frame

Mixed up all the cards and keep it up-side down. Ask the child to take one card from the top and make the number with it by inserting the cards over the '0' of the first compartment and makes the number with golden beads.

In the way child will done the activity with all the cards.

II Group

Names of Tens (i.e. 10, 20, 30 ... 90)

(a) Name associate with quantity.

● Name of the Activity : Name-Lesson

Material : A box 45 tens of golden beads.

Invitation : "Dear child, come with me, today I show you the another name of 2 tens, 3 tens ... etc.

Presentation : Keep one bar of ten in front of the child and asks him, "What is this?"

Child — "One ten".

Adult — Keep two bar of tens below the first bar of ten and asks the child "How many tens are there?"

Child — "Two tens"

Adult — "2 tens we called TWENTY. So this is TWENTY."

Then adult keep 3 tens of bar below the 2 tens of bar and ask the child, "How many tens are there?"

Child — "3 tens".

Adult — "So 3 tens is called THIRTY. So this is THIRTY."

2nd Period :

Asks various questions about these 3 names and then arrange the bar by commands like this, "Put 10 here, 20 here and 30 here."

3rd Period :

Adult — "What is this?"

Child — "10".

Adult — “What is this?”

Child — “TWENTY”.

Adult — Count how many tens in TWENTY etc.

Another day we give the other names i.e. (40, 50), (60, 70) and (80, 90).

● “Associate the names with Symbol”

Material : Box of cards from 10 to 90. Pointed with blue on white base.

Presentation : Name-Lesson

1st Period :

Put the card 10 in front of the child and ask “What is this?”

Child says “TEN”

Then adult keeps the card of twenty and ask the child, “What is this?”

Child says “TWO TENS.”

Adult — “TWO TENS we call TWENTY”. Similar way adult present upto 5 tens i.e. FIFTY.

2nd Period :

Asks various question about that 5 cards i.e. FIFTY.

3rd Period :

Adult asks the child and child confirm the 5 names.

(Next day Adult give the other names (i.e. 60 to 90) in same manner.

● “Associate the names both quantity and symbols”

Material : 45 bars of tens and cards 10 to 90.

Adult show the card of ten and ask the child, “What is this?”

Child — “TEN”

Adult ask the child, “So you keep this bar of ten at the left side of this card.” In this way child read all the cards & associate these with bar of tens and read the 2nd Group of tens in succession.

● Traditional Names III Group

Name of the Activity : Combination of various groups of tens and one to nine units.

Materials : First with twenty one to twentynine. Material needed 2 tens and one to nine units.

(a) Name associate with Quantity.

Presentation :

1st Period : Keep 2 bars of tens in front of the child, and ask him, “What is this?”

Child — “Twenty”.

Keep one bead at the side of twenty and ask “What is this?” (hide twenty with left hand’s palm).

Child — “ONE”.

Adult — “So twenty and one is twenty one”.

In this way child will read upto twenty nine.

2nd Period : Here give only two commands to the child like —

“Make 21, Count 21.”

“Make 25, count 25.” etc.

3rd Period : Adult makes the quantity and child confirm it.

(b) Associate the names with symbols.

Materials : With cards of twenty and one to nine unit cards.

Presentation : Same way : keep one to nine cards on the zero of the card twenty and make the numbers from 21 to 29.

Then do 2nd and 3rd period.

● Associate the names both quantity and symbols together

Material : Card of twenty and one to nine units and 2 tens golden bead bars and one to nine loose golden beads.

Presentation : Ask the child to make numbers with card and make the same quantity with beads at the side of he card.

After child knows the names 21 to 29, then we give the names 31 to 39. 41-49 and 91 to 99 in the same way.

When child knows the names upto 100, we should take the opportunity to count upto 100, whenever we get a chance.

● “Second Seguin Frame”

Material Description : 2nd Seguin frame same as 1st Seguin frame but here the numbers are pointed from 10 to 90.

There are also cards from 1 to9 with this material.

Along with this, there are 9 tens and 9 loose golden beads are need for the activity.

Presentation : Ask the child to watch the first compartment where 10 is painted — insert 1 to9 unit cards in the first compartment one by one and say the names and make the some quantity with beads on the mats.

Then ask the child to do the same with other compartments and ask him to make the same quantity with beads at the side of the compartment.

