

*Montessori Primary*

# MONTESSORI PRIMARY

Mathematics Lesson 7



*Adda Montessori*

Calculations 1

## An Introduction.

Depending on what your children know and how old they are you may find that you will need to go back and start with part of the 3 to 6 curriculum so that there are no gaps in the children's knowledge.

After Place Values the next important foundation to understanding Mathematics equations and being able to handle whatever algebraic problem the child has to handle lies in their ability to calculate correctly and to do number operations.

Getting the time right, calculating the area or perimeter of a given item, knowing what to do with fractions beyond recognising a whole, half quarter etc. will depend entirely on the child ability to calculate.

The child will need a lot of practice, with Mathematics the child makes a big leap from concrete to abstract. The journey to abstraction in the Montessori setting is colourful and joyful if we let the children learn at their pace do not rush or overwhelm them.

They will get to the point of abstraction but that will be in the latter years. Right now the child will be introduced to many beautiful and interesting materials to help them along the journey to abstraction.

So as I said at the beginning if your Primary 1 students are 4 plus years then please take them through the sequence in the 3 to 6 Maths curriculum finding out the gaps and giving them time to work through all these. There is no need to rush.

You will find that activity cards rather than textbooks would work better.

# Mathematics Lesson 7

Here is a list of some of the lessons you would need to teach or review.

1. Number Sentences
2. Simple word problems
3. Addition with Number Rods
4. Subtraction with Number Rods
5. Addition with Short Bead Stair
6. Addition Table with Bead Stair
7. Subtraction with Short Bead Stair
8. Black and White Stair (Introduction to Addition with Change)
9. Addition Snake Game
10. Subtraction Snake Game
11. Multiplication Tables using Decanomial Bead Material
12. Addition Strip Board
13. Subtraction Strip Board
14. Bank Game (Addition, multiplication, subtraction (static and dynamic), and division)
15. Stamp Game (An Introduction)
16. Stamp Game (Addition and Subtractions)

I would like us to start here:

## Addition Chart A

The reason is that all the preceding lessons are based on concrete materials though with the stamp Game we have begun the long journey to abstraction. Added to abstraction with the charts is the aim to get the child more practice which will lead to memorization of number combinations (in this case the addition tables)

## Materials

## The Addition Chart A with the results filled in

The Addition Chart A

The addition box, of the combinations from  $1 + 1$  to  $9 + 9$  written on strips of paper separated and kept in a box or basket.

## Objectives

To enable the child to get more practice with number combinations and help them to memorise the addition tables.

## Presentation

Place the materials on the work station and introduce the Chart to the child, get the child to choose a slip from the box or basket and read out the equation out loud, e.g.

$$4 + 5$$

Show the child how to place the finger on the red tile 4 and another finger on the blue 5. Now slide your fingers until they meet. This will give the answer, say it out aloud '4 plus 5 is 9'

Now get the child to do a couple of slips and once she gets a hang of it, get her to start writing down the sums in her workbook.

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0	1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9	10
2	3	4	5	6	7	8	9	10	11
3	4	5	6	7	8	9	10	11	12
4	5	6	7	8	9	10	11	12	13
5	6	7	8	9	10	11	12	13	14
6	7	8	9	10	11	12	13	14	15
7	8	9	10	11	12	13	14	15	16
8	9	10	11	12	13	14	15	16	17
9	10	11	12	13	14	15	16	17	18

## The Addition Chart B with the results not filled in

### Materials

Addition chart B

The addition box, of the combinations from  $1 + 1$  to  $9 + 9$  written on strips of paper separately and kept in a box including answer tiles.

### Objectives

To give the child practice with simple additions, to help foster memorization of the addition table.

### Presentation

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Place the materials on the work station with the answer tiles arranged in order and placed to the left of the chart. Ask the child to pick an equation slip from the box and read out.

Place the fingers as done in the previous presentation and slid the fingers until they meet the child should know the answer and place the tile where the fingers meet. He can check his work by using Chart A as the control of error after he has done some of the exercises.

You want to get the child working on this until they eventually can fill in a blank chart without checking for answers.

This takes time and repetition. There are actually different charts that you can employ to vary this work.

## Subtraction Chart A and B

### Materials

Subtraction Chart A

Slips on which are written all the subtraction combinations 1 to 18

### Objective

To help the child learn and remember the subtraction tables up to 18

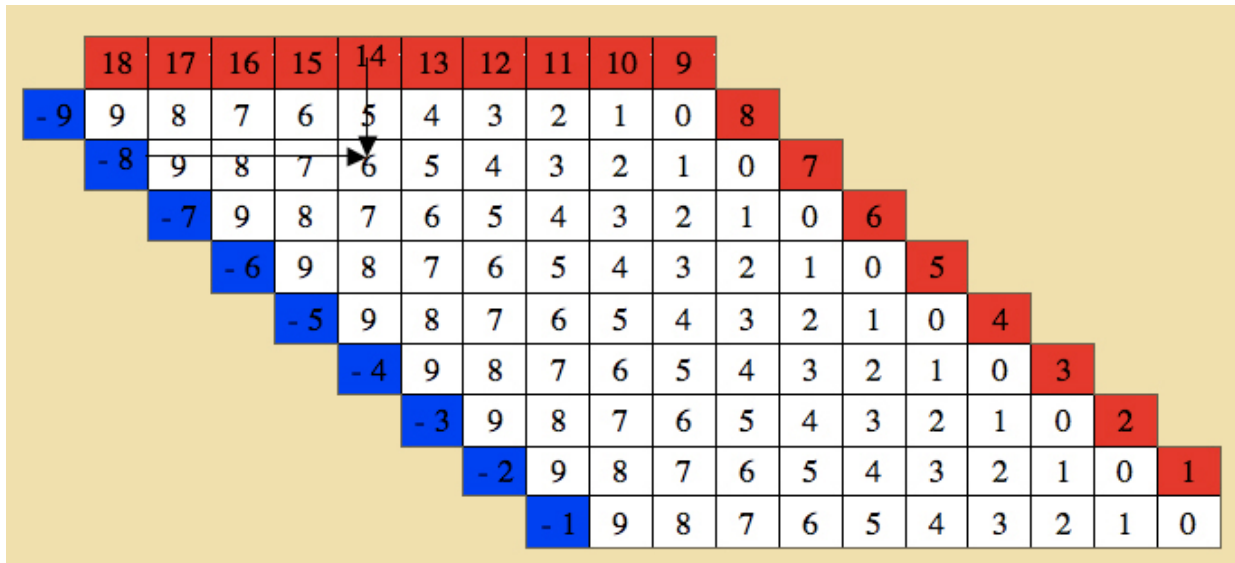
Presentation

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Bring the materials to the workstation and ask the child to pick an equation from the box e.g.  $12 - 4$

Place your right index finger on the red 12 and your left index finger on the 4, then slice your right finger down and your left finger to the right across until they meet.

Then say 12 minus 4 is 8



Subtraction Chart B

## Materials

Subtraction Chart B

Subtraction Chart A

Slips on which are written all the subtraction combinations 1 to 18

Small cards to fill in the blank chart or answer tiles

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(You can also duplicate the blank charts for the children to fill in.)

## Objective

To help the child learn and remember the subtraction tables up to 18

## Presentation

This is an individual exercise, the child takes the slips and fills in the blank chart with the answers.

There is a pattern to the table. With practise comes memorization and sometimes the pattern help.

## **Small Bead Frame – Static Addition – Addition without change.**

The children would have used the Golden Beads and Bank game to do this kind of sums, now we are working towards abstraction.

## Materials

The Small bead Frame

Calculation Cards with different exercises (1348 + 4331) in coloured numbers

Workbook or prepared pages to record the sum and answers

Pencil and ruler



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## Objectives

To use the Bead Frame to derive and record addition number sentences

To practise mental recall of addition facts to 10 in solving problems involving large numbers.

## Presentation

Bring the materials to the work station and ensure that all the beads are to the left of the frame.

Introduce the Bead Frame and the place value of each string of beads.

Ask the child to take a problem card and read it out aloud.

Now build the first addend on the bead frame by moving the beads from left to right, start with the units at the top and build the tens and then hundreds and thousands.

Now ask the child to read the number from bottom to top.

Then the child can add on the second addend the same way starting from the top to the bottom.

Now ask the child to read the final number from bottom to top.

Now say, 'When we add one thousand three hundred and forty eight to four thousand three hundred and thirty one we get five thousand six hundred and seventy nine'.

Practice a few more sums and then get the child to work through the work cards, checking the answers with those at the back of the cards. The child can record the work in their workbooks.

## Subtraction without change – static subtraction

### Materials

Small Bead Frame

Calculation cards

Workbook or prepared pages for recording

Pencil and ruler

### Objectives

To understand that subtraction is the inverse of addition

To use this to derive subtraction number sentences

To practise mental recall of subtraction facts to 10 in solving problems involving larger numbers.

### Presentation

Take the materials to the work station and explain to the child that you will be showing them how to use the frame for subtraction calculations. Take a calculation card and ask the child to build the number on the frame as before. Then tell them you are going to subtract (take away) the second number. Now show the child how to move the beads from right to left starting from the units to take away. The child then reads the answer from bottom to top and records the work in the book checking the answer with the one at the back of the card.

## Multiplication without change – Static Multiplication

### Materials

Small bead frame

Calculation cards

Workbook or prepared pages for recording

Pencil and ruler

### Objectives

To prepare the child for compound multiplication using the Large Bead Frame

To reinforce the concept that multiplication is repeated addition

To practise mental recall of simple multiplication facts.

To extend mental methods for progressive multiplication.

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## Presentation

Take the materials to the work station and tell the child you are going to use the Bead frame for multiplication exercises. Remind the child that this is repeated addition, (adding the same number several times)

Take a card and get the child to build the minuend on the Frame. Say the number (1231)

You have built 'one thousand two hundred and thirty one and the cards wants you to calculate it 3 times.'

Ask: 'How many more times do we need to build the number?'

Answer from the child should be: 'Two more times.'

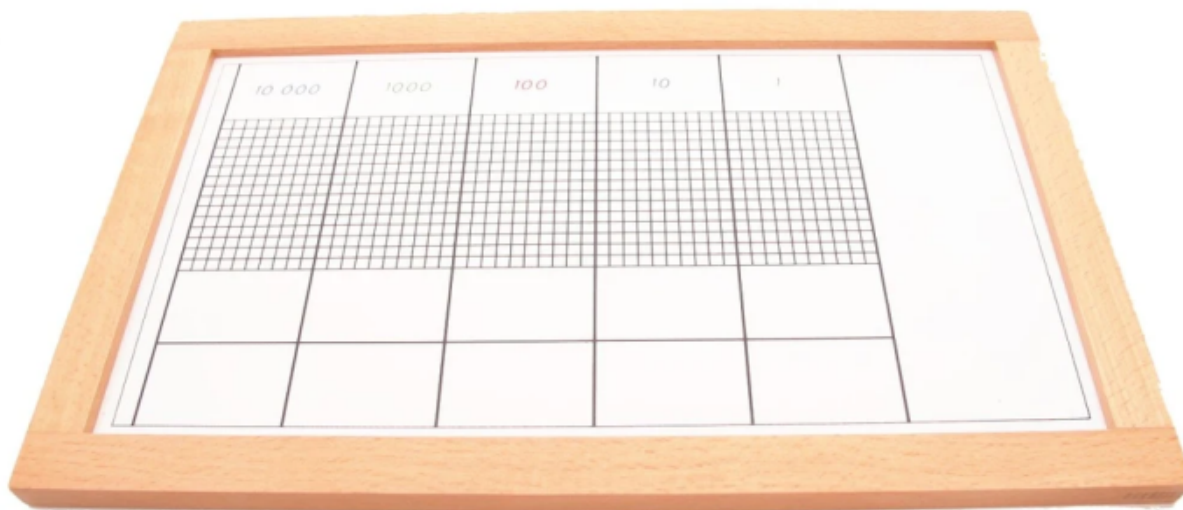
Now show the child how to make two more groups of one on the frame, then ask the child to move the beads to the right of the frame.

You continue to build in this way with the tens, hundreds and thousands until all the calculation has been built on the right of the frame.

Ask the child to now read the answer starting from the bottom up. Check the answer gotten to that at the back of the card. Record the work and get the child to continue on with the exercise.

## **The Dot Board.- Addition without changing- Static Addition**

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## Materials

The Dot exercise Board or a pdf file you can print out

Green, red, blue and black pens/pencils (use water soluble pens for the boards)

Addition problem cards

Eraser for working with the board

## Objectives

To further extend vocabulary related to addition

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To reinforce the decimal hierarchy number system

To extend addition experience to numbers involving 10,000

To experience adding numbers with several addends.

## Presentation

Make sure that the child has a concept of 10,000's (usually the presentation of the Geometric Hierarchy of numbers is needed)

You can use the colours corresponding to the decimal hierarchy or a black pen.

Take the materials to the work station, explain the dot board to the children and show them an addition problems with several addends

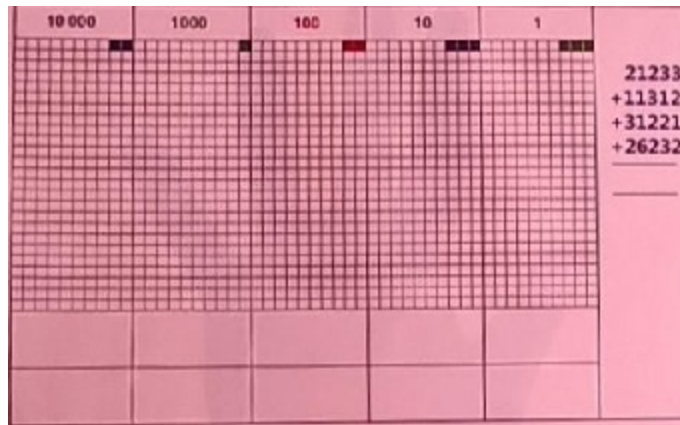
Tell the children that you are going to add several large numbers together.

Write the problem with a black pen to the right hand margin of the board.

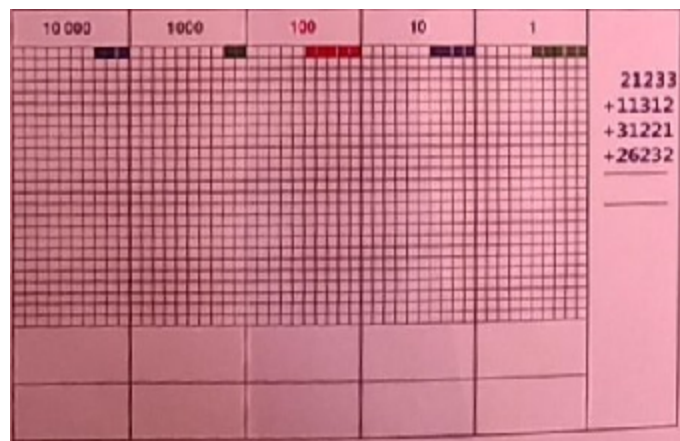
Then tell the child, 'We are going to represent these numbers with dots on the board'.

Now show the child how to make the first addend on the board using the corresponding coloured pens and starting from the right.

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Ask the child to add the next set of addends, continuing on the same line as the first addend, following through from units to tens of thousands.

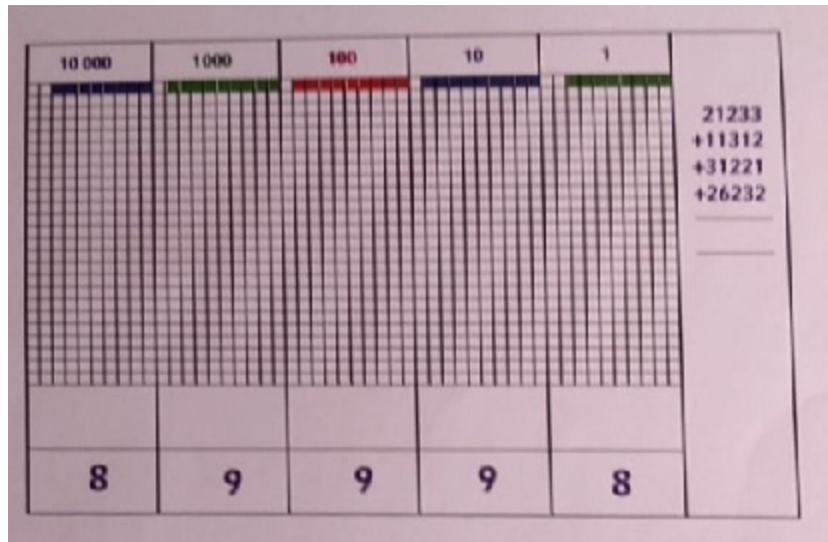


Continue the same way until all addends are shown on the dot board.



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Now the child can add the dots in each column and write the numbers in the second box below. Starting at the unit column and working right through.



The first box is not used at this point, it is used for the carrying number we will look at this a bit later.

The child can record the bottom box of the numbers if they wish and transfer their work into the exercise book.

### **Division by quotation (how many parts) using the Decanomial Bead material**

#### **Materials**

Decanomial bead box or 10 Golden Bead bars and 10 bead stairs

Small felt mat

Note book and pencil



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Division tables (for control of error)

Objectives

To give the child concrete experience of solving problems of dividing into groups

To show the child how to represent grouping as division

To reinforce that division is the inverse of multiplication

To use practical and written methods and related vocabulary to support division

To be able to derive and recall division facts for 2, 5, and 10

To be able to derive different groups of factors from a single number such as 12.

Presentation 1

Place the materials on the work station and lay them out. Tell the child that you are going to be looking at how many groups of two we can make from the quantity of 20.

Take out the quantity of twenty with the green bars and say: 'This is the quantity of twenty'

Then ask, 'How many groups of 2's can we make from the quantity twenty?'

Take one of the two bead bars (green) and lay it on the mat and say: 'This is one group of two.' Take another green and say: 'Now we have another group of two.'

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Continue counting on until the child is ready to take over.

They will end up with 10 groups of 2.

Now take the quantity 20 in blue.

Then take the quantity 20 in the golden bars.

Tell the child we can see that the quantity 20 can be divided up in several different ways and so can many other numbers.

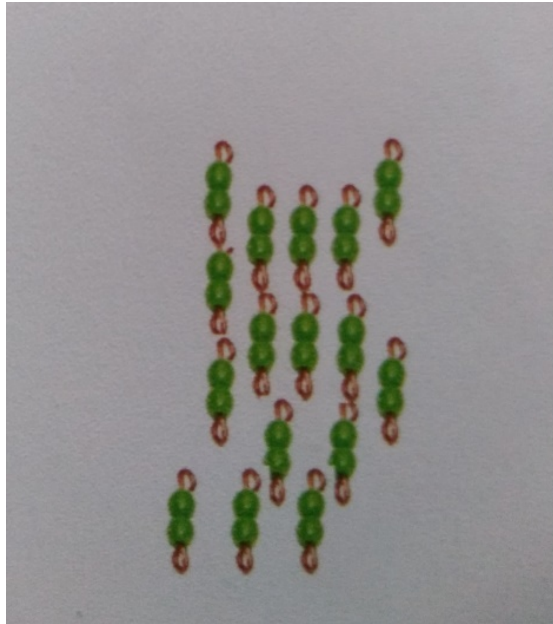
Point out to the child the connection between 20 which can be divided into 2 groups of 10 and 10 groups of 2.

Now take out quantities of 12 using green (2), pink (3), yellow (4) and purple (6) beads.

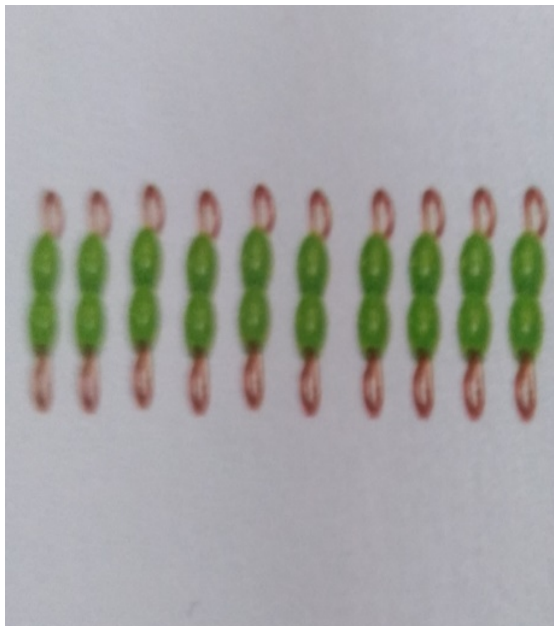
They will see that these can make 6 groups of 2 and 2 groups of 6, 4 groups of 3 and 3 groups of 4.

They can now try other quantities.

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First the group of 20 quantity in 2's and then the child find out how many groups of 2's are in 20.





## Division by quotation using The Multiplication Board

### Materials

Multiplication board

Box of Red beads

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## Objectives

To give the child concrete experience of solving problems involving dividing groups

To show how we represent grouping as division.

To reinforce that division is the inverse of multiplication

To use practical and written methods and related vocabulary to support division

To be able to derive and recall division facts for the 2, 5, and 10 times table

To be able to derive different groups of factors from a single number.

## Presentation

Take the materials to the workstation and tell the child that you are going to use the Multiplication board to make groups

Count out a number of beads into a pot or the box lid e.g. 18.

Say to the child, 'First we are going to see how many groups of ten we can make.'

Start under the '1' and in a vertical line place beads under the

'1' then you can proceed to do the same under the '2'.

The child will see that they have one group of 10 and that there are not enough beads to make a second group of 10 so there are 8 beads remaining.

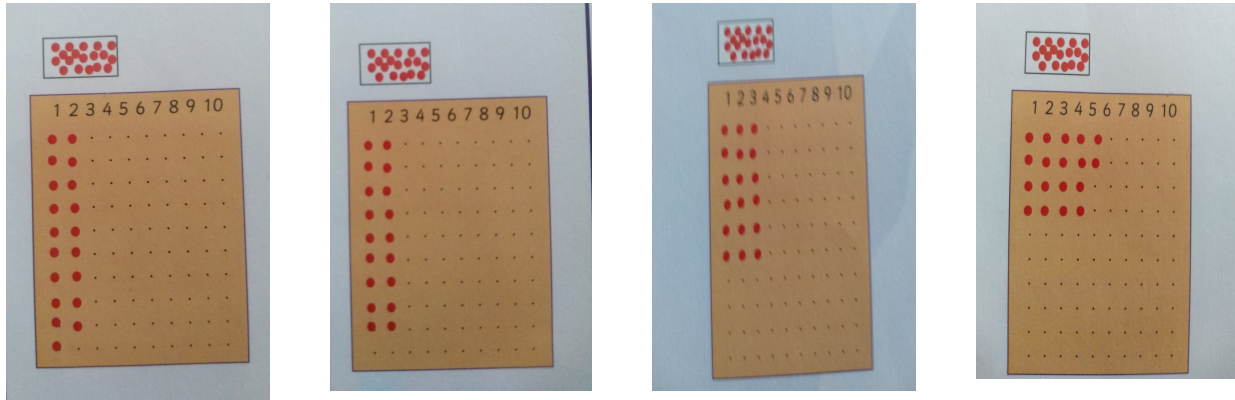
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Now say: 'Let's see how many groups of 9 we can make.'

They will see that they can make exactly two groups of 9.

Let them continue with the exercises and record the answers in their books.

Give lots of different exercises to help the child understand and get used to number facts of division and multiplication.



In the next Lesson we will look at the work you would usually do with children to move them on towards abstraction as the child learns to write out number sums in different ways working more addends and dynamic sums. (additions, subtracts etc. with changing).