Arithmetic

preschool Kids

Dear parents, family, caregivers and friends

Engaging preschoolers only with playbooks, apps, and games to learn numbers is not the right way, as they simply memorize the numbers at a young age, rather than understand them. It is the ambition of some parents who think that their children can and must be able to start to code between the ages of 3 to 7.

Instead, children need a solid mathematical foundation from the beginning to be able to independently master all their future tasks at school. This motivation, when success occurs in learning and later in school, is the guarantor and engine for further, self-driven motivation. Knowledge seeks knowledge.

Logically comprehending numbers is the basis for all later calculation tasks.

Counting on fingers is widespread, but it is not helpful for logical understanding of numbers and their meaning. No more than memorizing.

A number means a lot, it stands for more, less or equal.

As simple as it sounds, this seemingly banal connection between number and quantity makes the big difference between being able to think and combine sustainably with numbers and the short-term enumeration of number chains from small to large.

Through the logical comparison of sets, basic computing such as addition, subtraction, multiplication, or division, can be conveyed and trained in a playful manner. This logical understanding of numbers and quantities already in preschool age is the basis for opportunities or advantage in later school life.

Do something good, teach and train the children well to think from on their own from an early age.

Mental arithmetic

When children learn numbers, pronunciation and images are equally important (so-called mental arithmetic).

Children's involvement in learning numbers through games using both hands can assist in the development of both left and right brains alike.

In practice, this can be achieved through the group representation of numbers by objects and pronunciation. It is very important that the child pronounces what he sees and does.

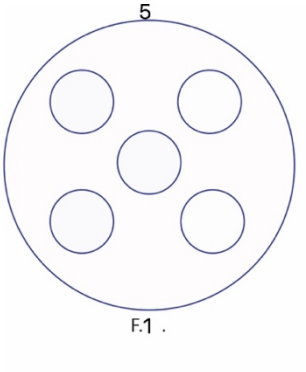
For example: Paint an apple and pronounce "an apple"; two apples + (picture) etc. Please put a number mark (1, 2, ... ,10). For example: one apple, two apples, three apples – put number 3 under three apples. Make sure that the child always pronounces the numbers, counting each time, until he/she arrives at the particular number that is being learned. And vice versa: For example, paint a picture with 4 bears that child should be able to count without saying how many bears are in the picture.

It is very important that the child hears himself! (please, do not teach them "numb" i.e. silent mathematics.)

Basics of addition and subtraction/partition of the number

Example:

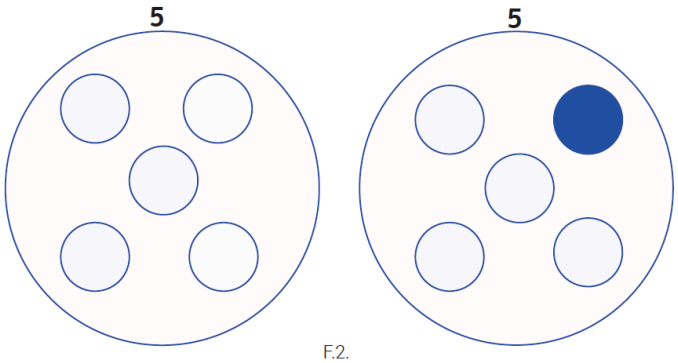
Draw five (5) marbles as shown (See F.1.)



F.1 .

Tell the child to paint two (2) of them blue, then ask him: “How many white marbles are there?”

(Look at the picture and answers immediately (without counting)).



F.2.

Paint one (1) out of five (5) marbles blue.

Ask the question: “How many white marbles are there now?

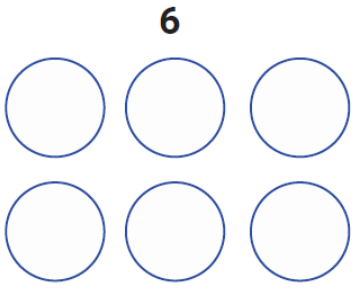
Paint again five (5) marbles, by coloring the three (3) of them blue.

Pose the question: “How many white marbles do we have now?”

This is the so-called partition of the number, which will later help with the addition.

Partition of number six (6):

Present number six (6) as:



F.3.

Then repeat the same exercise:

Paint two (2); Ask: „How many white marbles do we have?“

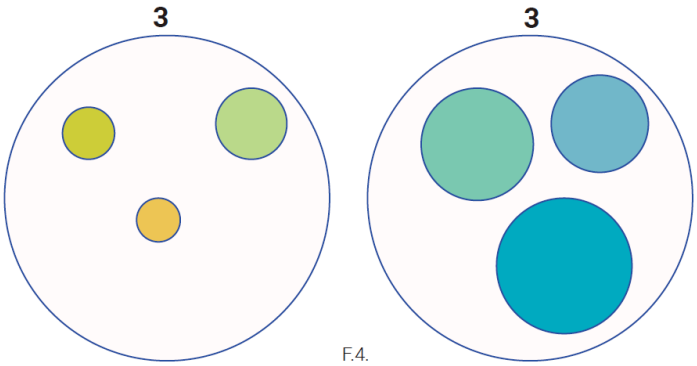
Paint three (3); Ask: „How many are white?“

Paint four (4); Ask: „How many white marbles do we have?“

Paint five (5); Ask again:: „How many are white?“

It is important that the child understands that it is only about the amount and not about the properties of the group elements.

For this purpose draw two sets: one with three (3) different size but small marbles and the second with three (3) different sizes, but large marbles (F.4.).

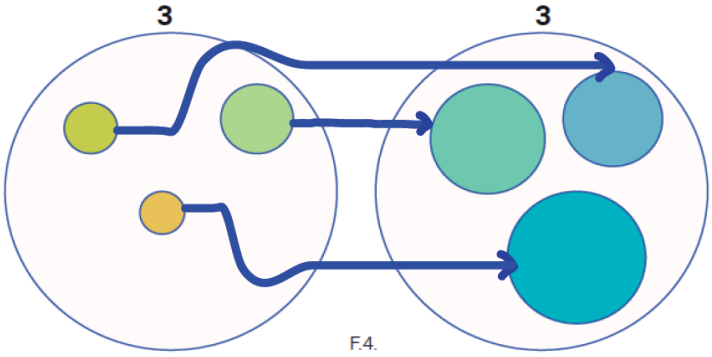


F.4.

Ask: „Where do we have more marbles?“

„Are there the same, equal number of marbles?“

Without counting, we want to determine where there are more, or whether there is the same number of marbles. For this purpose, you tell the child to connect each marble from set 1 with one from the set 2.(See F.4.) In this way, the child will find that the two sets have the same, equal number.



F.4.

Please always exercise with a picture. No way just rhetorical.

Example:

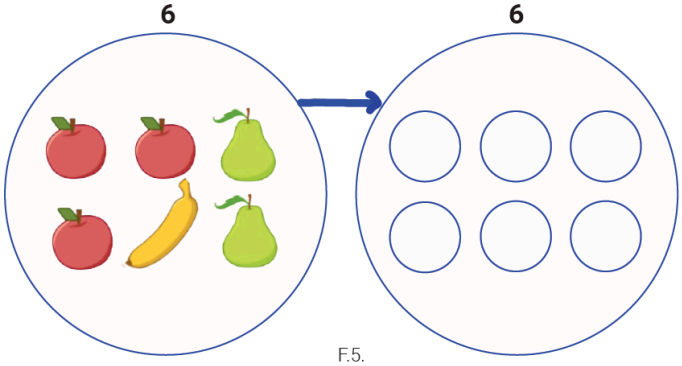
There are 10 boys and girls in one room. How can we use music to determine whether there are more boys or girls?

Answer: We play music, every boy takes a girl to dance. If each boy has his partner, then there are the same number of boys and girls. If a boy is left without a partner, it means that there are more boys, and similar, when a girl is left without dancing partner it implicate that there are fewer boys than girls.

Elements of a group, i.e. "quantity", do not need to be homogeneous.

Example:

Present the fruits in the set in the same arrangement as the number six (6) in the same order as already practiced with number six (6) (F.5.).



F.5.

This way the child will be able to see the number six (6) without counting.

Partition Exercise – Preparation for Subtraction and Division

Use the same e.g. exercise (F.5.) : And ask the questions:

"How many apples are there in the set?"

"How many pears?"

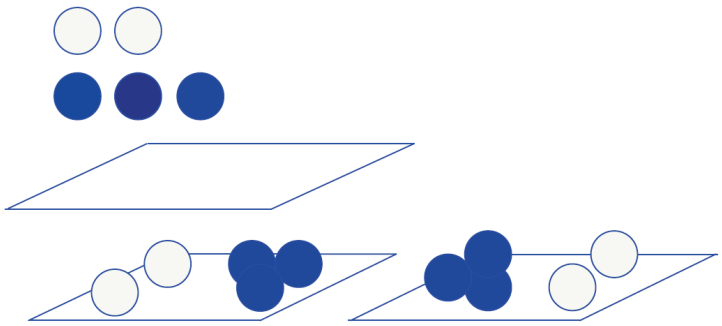
And: “How many bananas?”

Example of equation (commutative principle)

Take two objects of the same color and three in another (in the example we have selected white and blue marbles). Child should first put two white marbles and then three blue ones on the table. (See F. 6) Ask: “How many marbles are there?”

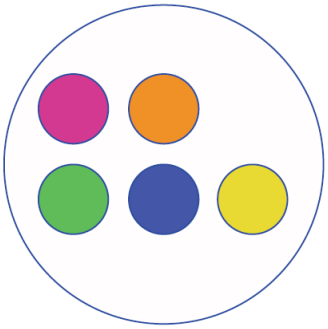
Then please, repeat the exercise by telling the child to put first the three blue marbles and then two white marbles on the table. Ask again: “How many are there?” “Have we got the same number as before?”

It would be good if you use objects that you have double of for this execirse, so that the young student can visualize the process more easily.(F.6.).



F.6.

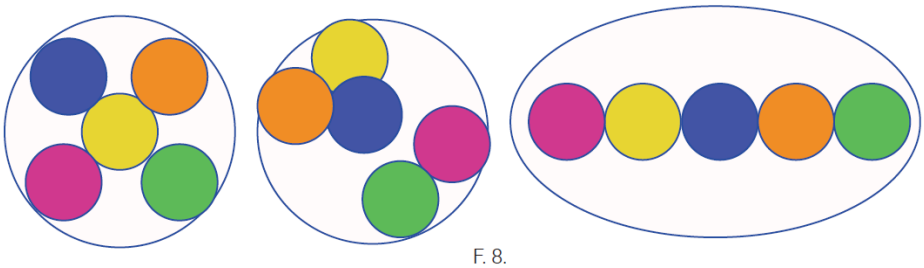
Draw five (5) marbles as shown:



F. 7.

And then ask the question: How can we classify marbles in other ways?

Plot all possibilities of display



F. 8.

(This is a partition exercise – preparation for subtraction and division).

You may exercise grouping using smaller objects, images or other matching suitable items you have.

Binary Division & Basics of Addition

Example: Take five (5) favorite sweets of the child as a set.

Let the child give you some candy and keep others to himself.

How could sweets be shared?

(For example: one (1) for Mama – the rest for you; two (2) for Mama – three (3) for you and so on). This is the so-called disjunct division for the preparation of addition and subtraction.

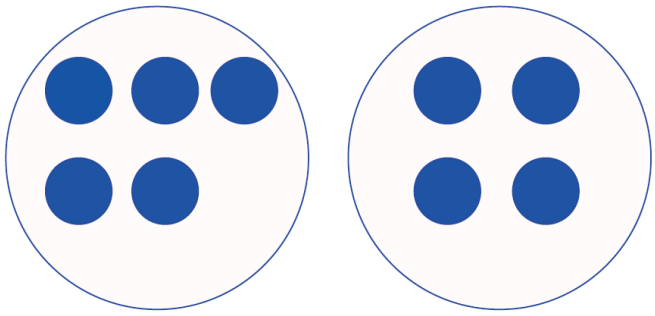
Please repeat this exercise with all numbers up to ten (10).

Use colors! Paint in two colors (so-called binary divisions) because in the future the child will add or subtract two (2) numbers when he goes to school later.

Division into two (2) parts, i.e. split of the group into two disjunct parts (quantitative division).

Addition principle example:

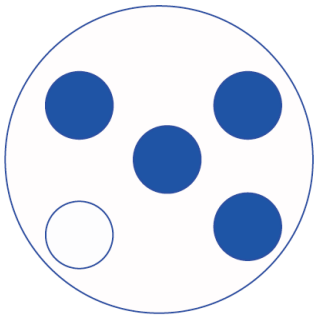
How much more marbles are there in Figure 1 than in Figure 2?



F. 9

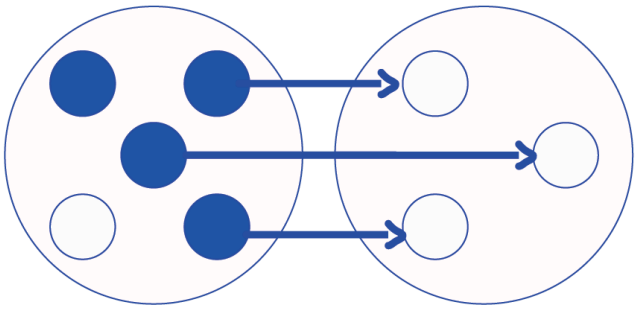
Ask: “How many are more?”

Example: Paint blue as many marbles as in Figure 2 (F.9.).



F. 10.

After the child does this, draw a set of three marbles next to it, and please let the child connect the blue ones (F.10.) with the white ones iin the second set as shown at (F.11.).



F. 11.

Ask the child:

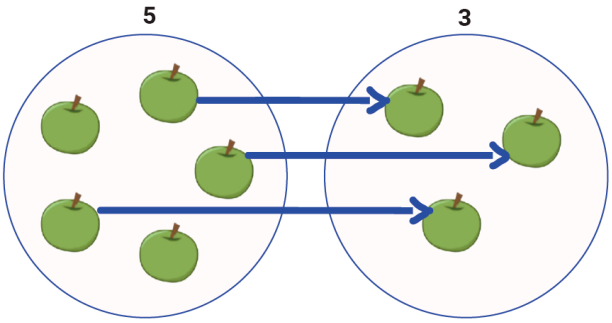
“How many white marbles do we have in first set (1)?”

“How much more marbles are there in Figure 1 than in Figure 2?”

“How many marbles are there in Figure 2 less than in Figure 1?”

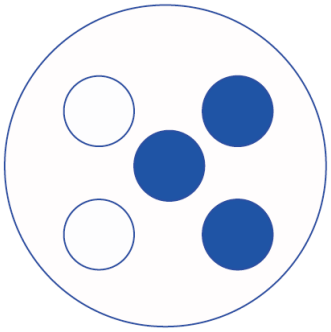
(Explanation of the meaning of the terms: MORE and LESS).

MORE => Ask the child to connect each apple from a first set with one from the second. In this way, it sees clearly where there is more.



F. 12.

LESS => Please, draw the same set of five (5) marbles as before, where three (3) marbles should be blue (F.13).



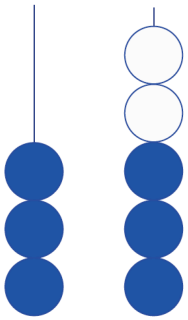
F. 13.

Pose the question:

“How many blue marbles are there?”

Is it three (3) less than five (5).

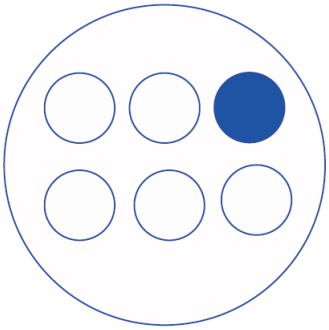
You can also present this (F.13.) in following way:



F. 14..

Repeat these exercises with all numbers from 1 to 10 by displaying the numbers in colour (in two colors or subsets). It is very important that the child sees different ways of representation (pictures).

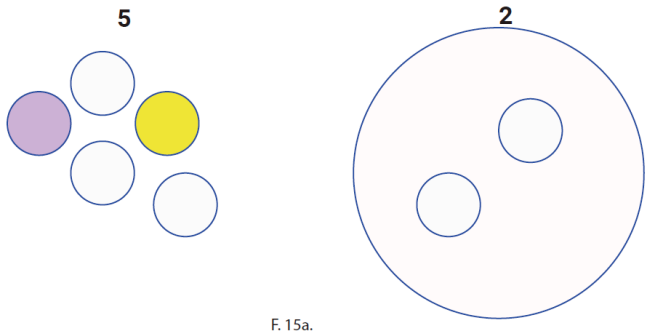
Example:



F. 15.

To see that the number six (6) can be composed of other numbers, e.g. 6 = five (5) + one (1) (two colors/two subgroups), for example, you can also represent 6 = 4 + 2 as four (4) white and two (2) blue spheres (marbles) and so on. The number-spliting method is later helpful in addition and subtraction. This exercise is the foundation for the later basic calculations and should be practiced well and with patience.

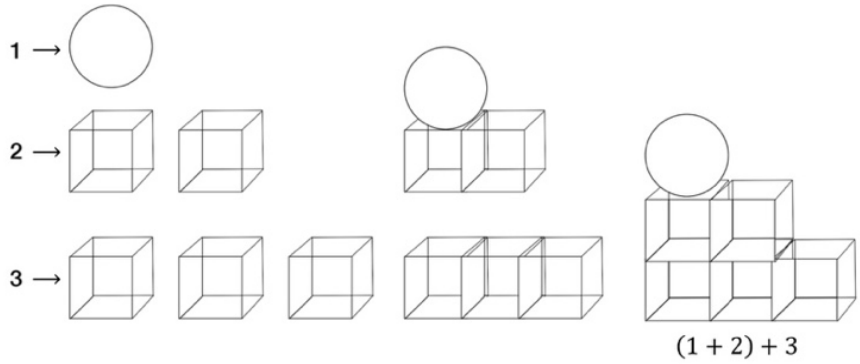
Let's remember: For the exercise, draw the two groups of numbers e.g. as shown in Figure F.15a. Tell the child to paint the five marbles into the group of two marbles. Repeat this exercise several times with different numbers, this way you practice the subtraction and the child will understand what is possible and what isnt. Students do not learn the negative numbers until later. It is important that they first logically understand numbers and their quantitative characteristics.



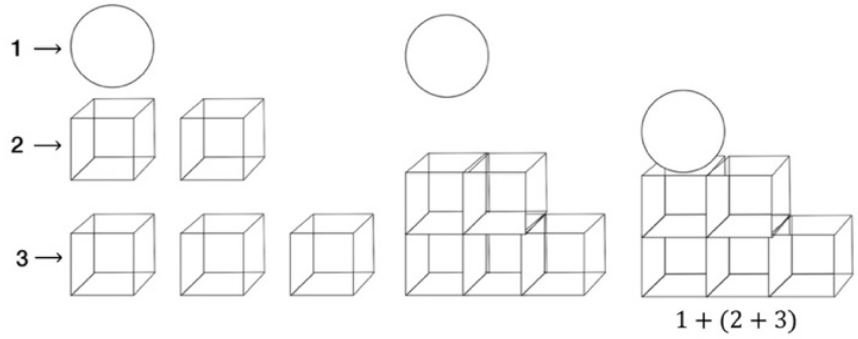
F. 15a.

Commutative principle example:

You may draw this exercise, like pictured (F.16., F. 17.) or exercise this using objects like Lego and other suitable toys for it.



F. 16

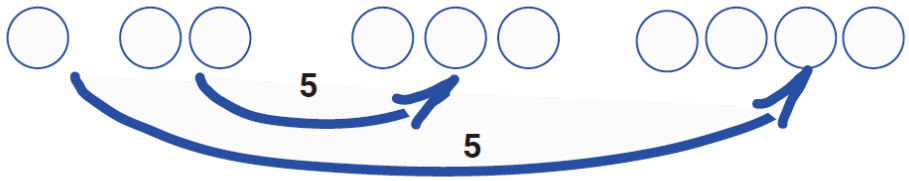


F. 17

$$(1 + 2) + 3 = 1 + (2 + 3)$$

Ask the child to explain (in the way that is expression appropriate for his age) that no matter how we group the objects, the same number comes out.

Another commutative principle example : Draw marbles or any other objects, as shown in picture F.18. Show in the example that adding the numbers 1 + 2 + 3 + 4 can also be grouped in pairs without affecting the result of equation.



F. 18.

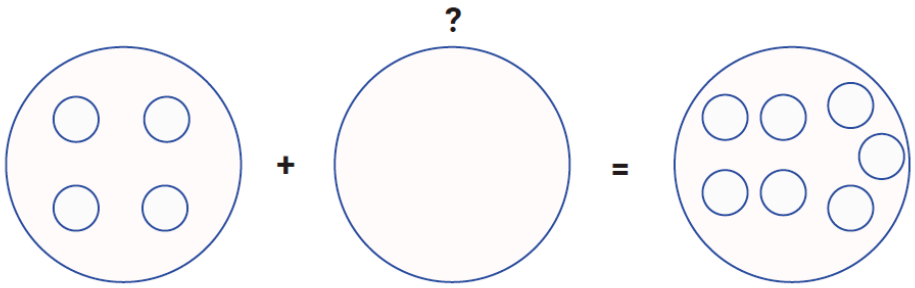
You can also exercise this as in previously mentioned example F.6. above, in which you find a bowl or something suitable for the child in which he can puts two (2) identical or different counterparts in the first step, and afterwards three (3) of his choice.(2+ 3)=5. Ask it: "How many items are in the bowl?

Repeat the exercise by asking the child to place three (3) equal or different items in the bowl first, and then two (2).(3+ 2)=5. Ask it again: "How many are these?" "Is that the same amount or result as before? Thus it will learn that we get the same result unrespected of the sequence order and degree (first two (2) and then three (3) and the other way around). The child will remember the pre-playful learning example from F.6. and will link the previously learned about the group approach of the equation.

Group application in equation

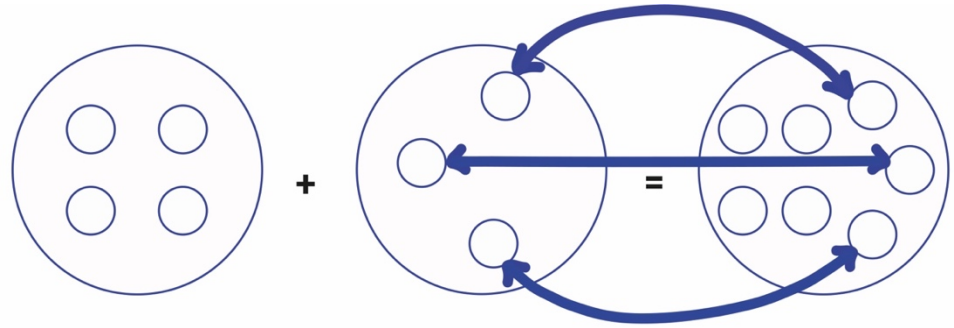
Present the equation as shown on Figure (F.19.)

Ask: How many marbles are missing in the second set as to get the sentence on the right? Provide the the figure F.20. as solution to the child.



F. 19.

The arrows show the missing marbles needed to get the same result for the number set to the right. Demand child to provide the epxplanation on how many marbles he had put into the empty set as to get the correct equation.



F. 20.

Please, practice similar number combinations up to ten (10) (sum 10).

In this way, the children learn the quantitative features the numbers and will not make any mistakes in addition and substrate later.

Combinatorics

Playfully learning

Take three (3) identical objects of different colors e.g. blue (1), green (2) and pink (3) (F.21.)

On how many possibilities can we put them next to each other as a sequence (b, g, p)?

F. 21.

Solution:

b, g, p

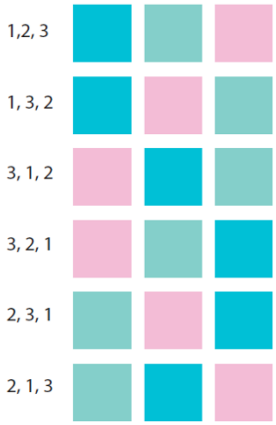
b, p, g

p, b, g

p, g, b,

g, b, p

g, p, b



You can also practice this by involving other children (or family members) to play with for example. Place three chairs (1.2,3) next to one another and let three (3) friends (X, Y, Z) sit on it. The children should repeat exactly the previous exercise by swapping the seats and trying out all possible combinations.

The knowledge acquired by learning with understanding is permanent and the only right way. The children, who have understood the logic behind the numbers and basic computations from the principal here will have it in the long term easier to cope with the impending schular material.

Learning wise thinking is permanent application of knowledge. Memorising, on the other hand, is not transferable and quickly leads to perplexity, as soon as the tasks are only changed slightly.

Let's go! Do the children good for lasting success in the upcoming school years. Enjoy playful learning with a logical numeric foundation!