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# Objective:

The goal of Math box 4 is to teach children aged 3-7 how to play and work with 2 important developmental goals:

- Knowledge of concepts related to size.
- > Ordering objects on the basis of one such concept.

These goals have important practical applications both at home and school, but they can also support children who are learning about mathematics.

## Contents Math box 4:

- A box with a lid.
- 4 Sequences of objects increasing in length, thickness, height, or width. Every sequence consists of 12 objects, of which the largest and smallest object are included twice:
  - length: 12 rods: longest and shortest rods included twice. Colour: red.
  - thickness: 12 cylinders: thickest and thinnest cylinder included twice. Colour: green.
  - height: 12 blocks: highest and lowest block included twice. Colour: blue.
  - width: 12 boards: widest and narrowest board included twice. Colour: yellow.
- A box with 8 cards: 1 x long-short, 1 x short-long; 1 x thick-thin, 1 x thin-thick; 1 x high-low, 1 x low-high; 1 x wide-narrow, and 1 x narrow-wide.

## Methods:

The goal of Math box 4 is clear, yet it can be reached in many different ways. Math box 4 can be used as playing materials, developmental materials, and learning materials. In fact, there is no fixed order. There is a balance between the extent to which children can make their own choices and the support from the teacher. Make sure that the children always respect the materials. The materials should remain appealing and last a long time.

Tip: When you present Math box 4 to a group of children, you can wrap the box in gift wrapping paper or put it in a suitcase.







# Playing materials

With these materials, the child can experiment freely and in his or her own way. The idea behind Math box 4 is to create sequences of 1-10 that differ in size: thickness, length, height, and width. This allows children to gain insight into concepts related to size and sequences of 1-10. Young children like to create sequences and repetitions. The sequences of Math box 4 are well-suited for such games. Additionally, children can stack objects to create sequences and build ever higher or wider structures. There are endless possibilities.

**Support** the children by playing together with them, showing them how to play, or by setting a good example. The teacher can also introduce his or her own creative ideas in the game.



## Developmental materials

The children can take the materials out of the cupboard and start playing by themselves. Try to limit your advice to a minimum.

**Support** the child when necessary or when he or she asks for it. You can point out the characteristics related to size, such as equally large, equally small, larger, smaller, largest, smallest, and quantity. Later on, you can also point out the patterns behind sequences. Every sequence from large to small, or vice versa, contains ten elements. Note the "equally large, equally small" system in Math box 4: the blocks belong next to each other, because they gradually become larger (or smaller). The other objects can be used to make a sequence based on length, thickness, and width. Articulate and check what the child did. Also ask the child to say out loud what he or she does or did.

- Let the child check whether the blocks are in the correct order, namely whether the differences remain constant. When playing with the objects for length, height, and width, the child can use a "buddy". This buddy is the smallest object. That is, when the objects are ordered incorrectly, then the buddy won't fit in the sequence.
- Ask the child to look for other objects that look similar, such as wooden blocks, Lego, geometrical shapes, et cetera. You can also use everyday objects, such as shoes and gloves.
- Let the child search for objects that differ in size, such as a large, medium-sized, and small stones. The same goes for other objects, such as acorns, chestnuts, oranges, potatoes, branches, shoes, boxes, and pencils.
- If the child is interested, he or she can also order objects from large to small. What's special about the Math box 4 objects, is that the differences between them remain constant. It is therefore easy to see which are larger, smaller, higher, or lower. This can be much harder for other objects. For example, look at the photo with the shoes and the blocks.







### Size concepts

Learn about the following concepts: long-short, equally long-equally short, longer-longest, shorter-shortest, thick-thin, equally thick-equally thin, thicker-thickest, thinner-thinnest, high-low, equally high-equally low, higher-highest, lower-lowest, wide-narrow, equally wide-equally narrow, wider-widest, and narrower-narrowest.

#### Long-short

- > Give the longest and shortest rods to the child and mention that they are long and short.
- > Place the long rod here and the short rod there. Ask the child to give you either the long or the short rod.
- > Ask the child to repeat and articulate the concepts.

#### Equally long-equally short

- Give the two longest and two shortest rods to the child.
- > Place one rod that is equally long and one that is equally short.
- > Ask the child to use the concepts long, short, equally long, and equally short.

#### Longer-longest

- Place 5, 7, or 10 rods in front of the child. Take the shortest and allow the child to discover that the other rods are longer. Now take a longer rod, allow the child to experiment again, then take an even longer rod, et cetera.
- > Make sure to use the concepts. If there is no rod that is longer, then that is the longest rod.
- > Ask the child to repeat and articulate the concepts.
- Remove the longest rod. Which rod is the longest now? Repeat this game a number of times. You can play the same game with the shortest rod.

#### Shorter-shortest

Idem, but start with the longest rod.

#### Emphasize relations between concepts

- When you introduce concepts such as longer-longest and shorter-shortest, then it becomes clear that these concepts are relative to one another. You can emphasize comparisons by removing a longer rod and replacing it by another longer rod: is the latter also longer? You can do the same with the shorter rods and the longest rod. Now remove the longest rod. One such experience is insufficient for a child. For the children to practice with the concepts and be able to actively name them, try to repeat these games and introduce variations.
- > The same goes for the cylinders, blocks, and boards.

Using combinations of concepts

- Ask the child to sort the objects by length, thickness, height, and width. Then, ask him or her to articulate the concepts. Start with the rods and cylinders only. Later, you can also include the blocks and boards.
- Place a short rod on the table and ask the child to find longer objects in the classroom. Play the same game with long, equally long, and equally short.
- ▶ Let the child articulate the concepts: this one is... (longer), ... (shorter), ... (longest), ... (shortest).
- > Children try to find objects that differ in length. Can they use the correct concepts to compare the objects?
- > Play the same game with the cylinders, blocks, and boards.
- Now, the child can create objects him or herself. For example, the child can use long or short rods made from clay, pieces of thread, long and short strips (which can easily be made by the child him or herself), straws, et cetera.
- > Do the same with thick-thin, high-low, and wide-narrow.



MATH BOX 4

### 2 Cards

#### Short sequence with large differences

- > Place three rods in front of the child, namely 1, 5, and 9, and order them from short to long. Can the child do this too?
- > Place the shortest rod on the table and ask the child to complete the sequence. The same goes for the longest rod.
- > Let the child describe the sequence: from long to short or from short to long.
- Ask the child to place the cards next to the sequence and explain what he or she does. The first time, you can point the child in the right direction.

#### Smaller differences, with cards

- Place all of the rods in front of the child and ask him or her to create a sequence. First from short to long and later also long to short. Can the child place the cards next to the sequence correctly?
- > Put down the cards and create a sequence from short to long and from long to short, as indicated on the cards.
- > Can the child describe what he or she sees?

#### Creating incorrect sequences and correcting them

> Let the child identify the constant difference and correct the sequence.

#### Other sequences

> Play the same games with the cylinders, blocks, and boards. Try to place the correct card next to every sequence.

#### Using cards to create sequences

Put down the cards, such as long-short, wide-narrow, and thick-thin, and ask the child to create these sequences. Can he or she also make the sequences the other way around?

#### Combining sequences

Length and thickness: put down the rods and ask the child to place the matching cylinders in the same sequence. Start with the structured sequences, but later also mix the rods.

#### Combining three or four sequences

Instead of two sequences, you now play with three or four sequences.

#### Create vertical sequences

- Let the child stack the cylinders from thick to thin. (Can they also do so from thin to thick?) What other objects can be stacked?
- > Now stack the blocks based on their height.
- > Do the same with the boards.

#### **Application:**

- Find or create sequences with constant differences of long-short and short-long with other materials, such as pencils, straws, paper strips, thread, or rope.
- > The same goes for thick-thin and thin-thick. For example, you could use rods made from clay, branches, or pieces of rope.
- Play the same game with high-low and low-high. Materials you can use include Lego or other blocks.





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### 3 Variations

There are many additional variations. Below, we give some examples. The aforementioned games also provide inspiration.

#### Playing and learning together

Child 1 creates a sequence with the rods from short to long. Child 2 does the same, but with blocks from low to high. Child 2 can also use blocks from low to high, cylinders from thin to thick, and boards from narrow to wide. Are the sequences correct? Now let the children make changes to the sequences. For example, they can remove the longest objects and those in the middle of the sequences. Challenge the children to place the removed objects back in the sequences. When the children can comfortably create a sequence, then they can increase the speed of the game. Other children can even clap their hands every time an object is added to the sequence. When children are able to count, then they can also count while clapping. Finally, take the seventh block from the sequence. Ask the children to investigate what the largest and smallest objects are.

#### Competitions

Four children sit next to each other. Every child has 10 objects of the same shape. Who is the first to complete a sequence from large to small and vice versa? And who is the first to complete the reversed sequence? Now remove an object from every sequence. Which child can put it back quickest? You can also record the time, which can be a game in itself.

#### Combining the cards with Comparant 1

Place the long-short card on the table and add a card from Math box 6 with 6 dots. The child now puts down 6 rods from long to short. Children can also use these materials to play and learn together. One child puts down a thin-thick card and the number 7. Then, the other child carries out the assignment. You can play the same game with two objects (wide-narrow) and a number card (e.g., 10). The second child can then try to order 10 boards from wide to narrow. The children can check their answers together. First, child 1 'reads' the assignment. Then, they check together whether the assignment has been carried out correctly.

#### Verbalising

The cards are useful tools to verbalise the activities with. You can not only use them to give assignments to the children, but also to check whether their answers are correct. When children play and learn together, then they can support each other by checking and communicating with one another.

#### Challenging assignments

We have seen that children can create sequences with the cards, but can they also make sequences that are more creative? For example, children can create a sequence and then stack the objects in a different order. You can make an ordinary staircase from blocks, but you can also make a spiral staircase. This is what we call 'creative structuring', similar to how architects experiment with different shapes.



Place all the sequences from large to small on the table. Now take an object from a sequence, such as a cylinder. Can you find a block in the same position, and a board and rod? To which cylinder do they correspond? And to which rod? Play the same game, but now from small to large. Take the second and seventh object from every sequence. Make a sequence from the remaining objects. Again, try to find the second and seventh object. What should you pay attention to, the size of the objects or their place in the sequence? If the largest block is 10, then what number is the next block? The correct answer is 9, of course. Play this game with different sequences.



# Learning materials

The teacher teaches the child directly about the characteristics of the materials and how it is organized. For example, the teacher can discuss size concepts and sequences. The latter is especially important for children who find it difficult to work independently and take initiative.

**Support:** Show how an activity can be done, possibly even do it together with one of the children, and articulate what the child does and what you do yourself.

Place the materials in front of the child. Use the correct terms, although the child does not have to know these him or herself: 'This is a sequence from long to short. The sequence consists of 10 objects.' Make sure the child can see the same difference between all objects. 'Isn't this a pretty staircase? Can you count the objects?' Let the child copy you: 'Can you create this sequence?' Do not forget to verbalise what the child does: 'This one is high, this one is low, and this one is even lower. Let's see whether this is the correct answer. Do you think the objects are ordered correctly?'

There are many possibilities. Repeat the assignments and ensure variation.













