Learning Unit 5: Operations

Particular attention is paid in the early years to ensure that learners develop a sound understanding of numbers and operations. Conceptual understanding of addition and subtraction is built on the ideas of part-whole number relationships and place value. The development of addition and subtraction in early grades progresses from concrete, hands-on experiences to abstract mental math. Based on a sound understanding of numbers and operations, students develop confidence in understanding and performing various arithmetic methods (e.g., for mental and written arithmetic). This lays the foundation for further mathematical learning at school and for a lifelong engagement with the mathematical challenges of everyday life.

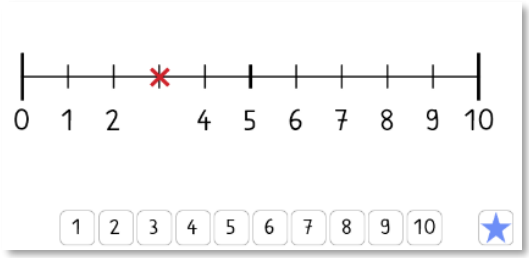
Development of Addition and Subtraction Skills

The following section briefly explains how children can develop their addition and subtraction skills and what support measures they can use.

Manipulatives and Counters: Children begin by using physical objects (blocks, counters, fingers, etc.) to model the actions of joining groups (addition) or taking away (subtraction). This makes the abstract concepts tangible.

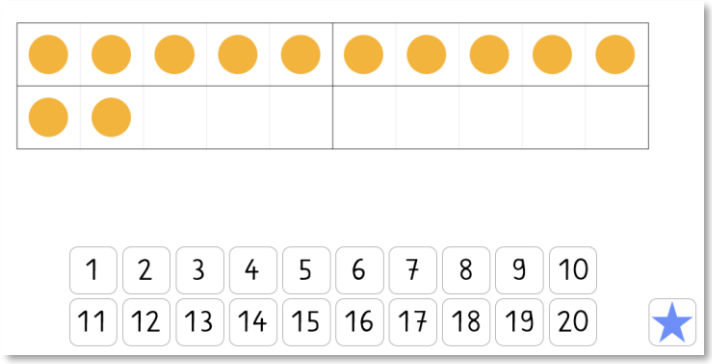
Drawings and Diagrams: Students transition to representing problems visually through drawings, dots, or tally marks before moving solely to numbers. This helps bridge the gap between concrete objects and abstract symbols.

Number Lines: Using a number line (first marked, then "empty" or open) helps students visualize the sequence of numbers and operations, such as hopping forward for addition and backward for subtraction (see example 1).



Example 1

Ten Frames and Number Bonds: These visual tools (often used with counters) help students see numbers as parts of a whole and develop a strong understanding of combinations that make 5, 10, and 20 (see example 2). This is crucial for developing later strategies like "making a ten".



Example 2

Story Problems: Introducing addition and subtraction through relatable, everyday story problems helps children connect the mathematical concepts to real-life situations and language (see example 5).

Basic Mental Strategies

Various mental strategies can be distinguished regarding operations. Three strategies according to Kullberg et al. (2024) are presented below.

- **Counting On and Counting Back:** Students learn to start counting from one of the numbers in the problem (preferably the larger number) rather than recounting every single unit.
- **Doubles and Near Doubles:** Knowing "doubles" facts (e.g., $4+4=8$, $5+5=10$) helps students derive "near doubles" (e.g., $4+5$ is one more than $4+4$).
- **Inverse Relationship:** Students are taught to understand that addition and subtraction are inverse operations (e.g., if they know $5+6=11$, then they also know $11-6=5$).

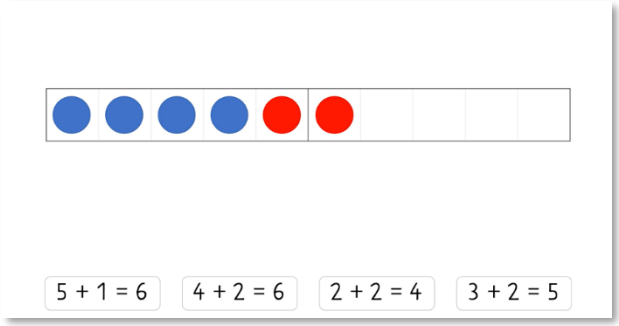
Kullberg et al. (2024)

Promoting Addition and Subtraction Skills

There are various ways to practice addition and subtraction with children. Here are some sample types of exercises that can serve as inspiration. First, examples relating to addition, then to subtraction.

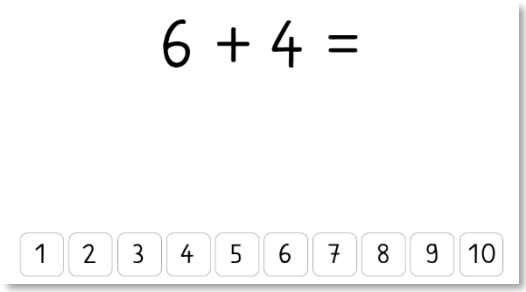
Addition

First of all, children can learn to find the correct addition sentence for dot fields and organized pictures (see example 3).



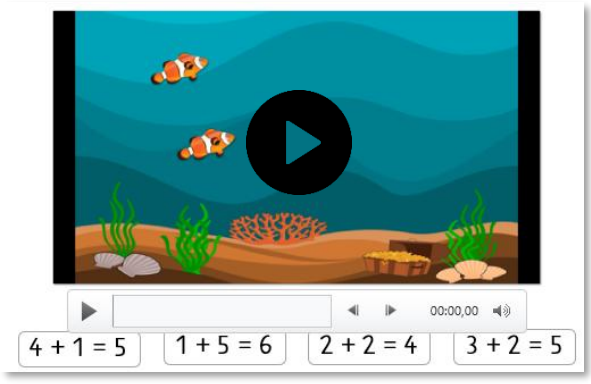
Example 3

Furthermore, they must learn the addition facts (see example 4). This is possible with or without pictures.



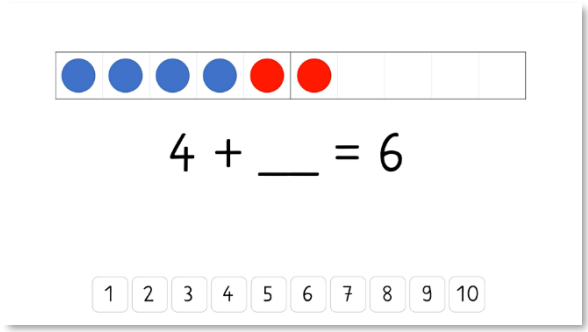
Example 4

Another possible task is that the children must choose the correct addition sentence that matches a story presented in a video (see example 5).



Example 5

Once the children become more confident with addition, they can also work on tasks such as: Complete the missing addend in addition sentences (see example 6). This is also possible with or without pictures.



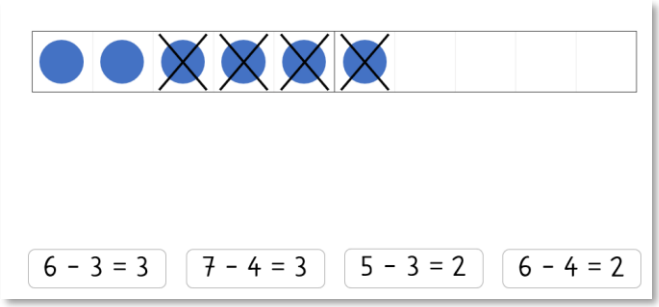
Example 6

Otherwise, the children can also model addition situations with appropriate mathematical sentences and find the solution.

Addition problems in early mathematics lessons usually involve numbers up to 10.

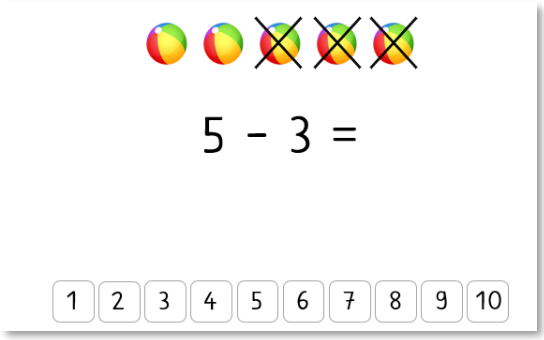
Subtraction

First, children can learn to find the correct subtraction sentence for dot fields and organized pictures (see example 7).



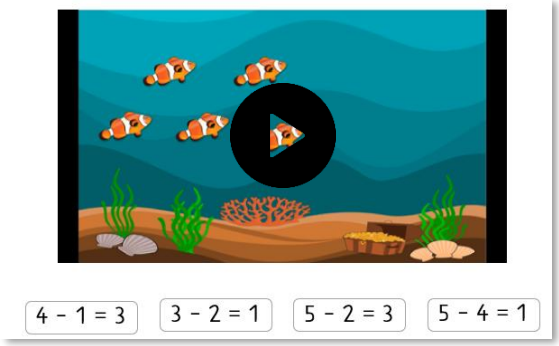
Example 7

In addition, they must learn the subtraction facts (see example 8). This is possible with or without pictures.



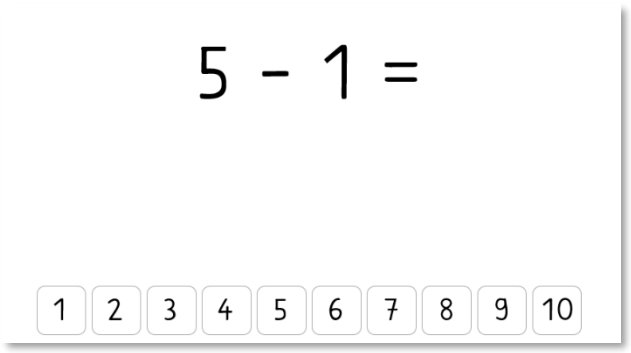
Example 8

Another possibility is that the children must choose the correct subtraction sentence that matches a story presented in a video (see example 9).



Example 9

Once the children become more confident with subtraction, they can also work on tasks such as: Complete the missing number in subtraction sentences (see example 10). This is also possible with or without pictures.



Example 10

Otherwise, the children can also model subtraction situations with appropriate mathematical sentences and find the solution.

Subtraction problems in early mathematics lessons usually involve numbers up to 10.

The next learning unit deals with the MADITA app.

Reference

Kullberg, A., Björklund, C., Runesson Kempe, U., Brkovic, I., Nord, M., & Maunula, T. (2024). Improvements in learning addition and subtraction when using a structural approach in first grade. *Educational Studies in Mathematics*, *117*(3), 399-417. https://doi.org/10.1007/s10649-024-10339-z