Book Two

Developing Number Concepts

Addition and Subtraction

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Math Perspectives

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Developing Number Concepts—the Series

Developing Number Concepts is a series of books designed to help young children develop important foundational mathematics concepts.

Each of the three books in the series includes cohesive and organized sets of experiences focused on particular mathematical ideas. Every concept is developed both through teacher-directed and independent activities. Because children learn at different rates the activities are "expandable" and, therefore, meet a range of needs. Questions that guide teachers' observations of children as they work and learn help in the assessment of children's ongoing progress.

Book One

Chapter 1: ***Beginning Number Concepts***
Chapter 2: ***Pattern***
Chapter 3: ***The Concepts of More and Less***

Book Two

Chapter 1: ***Interpreting and Symbolizing Addition and Subtraction***
Chapter 2: ***Internalizing Number Combinations to 10***
Chapter 3: ***Developing Strategies for Adding and Subtracting***

Book Three

Chapter 1: ***Place Value***
Chapter 2: ***Beginning Multiplication***
Chapter 3: ***Beginning Division***

The Planning Guide for Developing Number Concepts accompanies the series. It is for the use of teachers of kindergarten through grade three and teachers of multigrade classes. It includes comprehensive year-long teaching plans along with classroom management ideas.

How the Books Are Organized

Each chapter of *Books One, Two,* and *Three* includes the following.

■ **What You Need to Know About...**

This section provides the teacher with background information on the featured math concept and a summary of ways in which to teach the concept.

■ **Chapter Overview**

A brief overview of the chapter follows. It offers pertinent information on how the math concept should be taught to children at each grade level, kindergarten through grade three, and to children with special needs.

■ **Goals for Children's Learning**

This section lists the mathematics concepts, ideas, and skills that the children will learn as they work with the activities.

■ **Analyzing and Assessing Children's Needs**

Questions to guide teachers' observations and a discussion of how the activities can be used to meet a range of needs are included. The questions are geared to help teachers determine if the tasks that children are working with are appropriate and are meeting their needs.

■ **Classroom Scenes**

Realistic classroom scenes that deal with the major math concepts covered in the chapter help bring the activities to life as they model ways in which the teacher can work.

■ **About the Activities**

Included here is a brief discussion about the purpose of the activities along with information about materials preparation.

■ **Teacher-Directed Activities and Independent Activities**

A great variety of both teacher-directed and independent and/or partner activities are included for each math concept. This gives teachers many different ways to meet children's needs while it gives children many different ways to learn about a particular concept.

■ **Blackline Masters**

Blackline masters, used both for materials preparation and as children's worksheets, appear at the end of each book.

Teaching and Learning Addition and Subtraction

It is important that children's early work with addition and subtraction be meaningful in order to prepare them for solving problems with confidence and efficiency. The activities in this book help children see addition and subtraction as processes that occur in the real world. Through their work with the activities, children develop a strong sense of quantity, number combinations, and number relationships. Symbols are introduced as tools for recording children's experiences with these processes and relationships.

The activities are organized into three chapters, each dealing with important concepts that children must internalize if they are to be successful with the increasingly complex problems they will work with throughout their school years. All three chapters offer both teacher-directed and independent activities to support the development of these concepts.

Chapter 1: Interpreting and Symbolizing Addition and Subtraction

Addition and subtraction are introduced through story problems. Children act out the problems in various ways and learn to record their actions with conventional symbols. Also included are activities that focus on the difference between the plus and minus signs and the processes they represent.

Chapter 2: Internalizing Number Combinations to 10

Children work on developing facility with number combinations. The activities direct the children to explore, create, describe, and label number combinations as they occur in a variety of real-world situations.

Chapter 3: Developing Strategies for Adding and Subtracting

Children work with addition and subtraction problems in order to develop confidence, flexibility, and efficiency. The children practice applying various strategies as they develop ease and confidence in adding and subtracting.

Using the Book

Your use of this book will vary according to the needs of your children. The *Planning Guide* that accompanies this series offers specific information that can help you plan how to use this book's activities. The following are general suggestions for using the activities with different groups of children.

Kindergarten By the end of the kindergarten year, some children will be ready to begin acting out addition and subtraction story problems (Chapter 1) and to describe a number according to its parts (Chapter 2). For these children, de-emphasize the use of symbols and emphasize work with concrete objects.

Teacher-Directed Activities

About Acting Out Addition and Subtraction Stories

In the following three activities, children act out the stories in a variety of ways. They sometimes actually perform the action described, such as stacking books or lining up. They might pretend to be the subjects of the story, such as frogs hopping or ladybugs crawling. They sometimes use counters, such as connecting cubes or Color Tiles, to represent the people, animals, or other objects in the story. Notice that by using counters, all the children can be actively engaged in interpreting the actions of the story.

Be sure to present the children with a mixture of addition and subtraction stories, sometimes using mathematical terms, sometimes not.

Whenever children are asked to act out a story in front of other children, always have the group direct them so that no individuals are "put on the spot."

TIP: ***Using Both Mathematical and Natural Language in Story Problems***

One of your goals should be to acquaint your children with the language used in describing the actions of adding and subtracting: words like *altogether, total, in all, minus,* and *how many left*. However, it is very important that the children are always trying to make sense of the story and not just listening for "key" words. Therefore, you will sometimes want to use mathematical terms and other times non-mathematical terms. The following is a story told both ways.

- **Using mathematical terms:** Linda stacked three books on the table. She *added* one more book to the stack. How many books are in the stack *altogether*?
- **Using natural language:** Linda stacked three books on the table. She piled one more book on the stack of books. How many books are in the stack now?

The use of natural language, along with actual objects, reinforces the connection between the real world and the mathematics the children are learning. When children are introduced to the processes in this way, they will see them as everyday events and not just as tasks to be done in school.

Your children should be able to interpret both kinds of language with ease before you introduce them to any of the math symbols.

1–1 Acting Out Stories: Using Real Things* ..... Whole-Group Activity

Materials: Objects readily available in the room.

Present addition and subtraction stories based on classroom materials such as books, chairs, and pencils. Call on children to act out each story. Substitute your children's names for the names in the following example:

Alice put four rulers on the table. Jim put two more rulers on the table. How many rulers are on the table? (addition)

* Based on *Mathematics Their Way,* "Word Problems Using Children and Props," p. 204.

1–2 Acting Out Stories: Using Fantasies ..... Whole-Group Activity

Materials: None required.

Tell addition and subtraction stories in which the children can pretend to be a variety of people, animals, or objects. Remember to include mathematical terms in some of the stories. Because your goal is to relate the processes of addition and subtraction to the real world, you may think that having children pretend is inappropriate. Be assured, however, that the use of fantasy can provide children with more opportunities to experience addition and subtraction than the other, more usual, classroom activities. Present the following example:

Adam, Timmy, Garland, and Freda are candles on a birthday cake. Mina blows three of the candles out. How many are still burning? (subtraction)

Additional examples:

Cindy, Bill, Andy, and Casey are clowns at a circus. Judy, Steven, and Jeff are more clowns who come to join the circus. How many clowns in all are in the circus? (addition)

There are nine bees buzzing around the flowers—Shawna, Cara, Lindsay, Eleanor, Eduardo, Galen, Danielle, Becky, and Mike. Three of the bees—Danielle, Becky, and Mike—fly back to the beehive. How many bees are still buzzing around the flowers? (subtraction)

James, Michelle, David, and Tereza are sailboats on the lake. Joel and Ash are rowboats on the lake. How many boats are on the lake? (addition)

Sissy, Mark, and Nicky are birds sitting in a tree. Mark and Sissy fly away. How many birds are left in the tree? (subtraction)

1–3 Acting Out Stories: Using Counters*

Whole-Group or Small-Group Activity

Materials: Counters, sorted by color ▪ Counting boards (8 of the same board for each child) [BLMs #2–6] or Blank paper

Tell stories that children can model using counters to represent people, animals, or objects. Use a set of counting boards to represent a specific setting or use blank paper to represent any other setting. Make up a story to match each setting. Say, for example:

Today we are going to make up stories using corrals. What animals could be in our corrals?

Horses.

Cows.

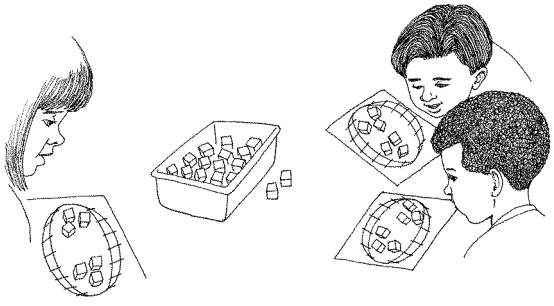
Pigs.

There could be cowboys in there, too.

There are five horses in the corral. Three of them are taken out to the pasture. How many horses are left in the corral? (subtraction)

Clear your boards so we can tell a different story.

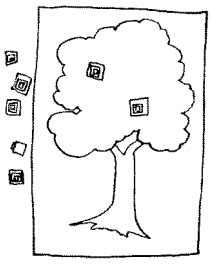
There were three pigs in the corral. The farmer went to the market and bought three more. How many pigs did he have altogether? (addition)



* Based on *Mathematics Their Way,* "Word Problems Using Blocks and Paper," p. 206.

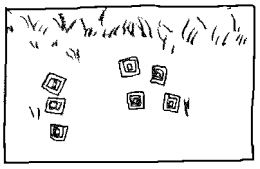
Additional examples:

There were seven apples on the tree. A farmer came along and picked five of the apples. How many apples are still on the tree? (subtraction)



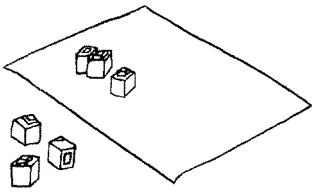
Counting board

Four ladybugs were crawling in the grass. Three more came to join them. How many ladybugs were there then? (addition)



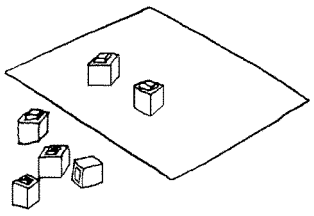
Counting board

There were six cars in the parking lot at Palace Market. Three of them were driven away. How many cars are left? (subtraction)



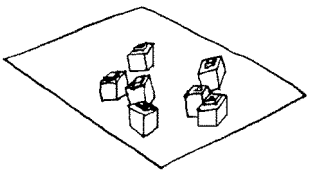
Blank paper

We gave our hamster, Tippy, six sunflower seeds. She ate four of them. How many seeds are left? (subtraction)



Blank paper

Four children were playing in the sandbox. Three more children came to play with them. How many children are in the sandbox? (addition)



Blank paper

1–4 Modeling Addition and Subtraction Equations

Small-Group Activity

Materials: None required.

Once the children are able to act out the stories you tell, begin modeling how to write equations to describe the stories. The children do not need to have had any previous experience reading and writing the plus, minus, and equals signs. The symbols will come to have meaning for the children when they watch you write the equations as they act out your stories.

Write some equations horizontally, others vertically, so that children become familiar with both.

Make sure you help the children connect the symbols with the story by having them tell how the numbers remind them of the story.