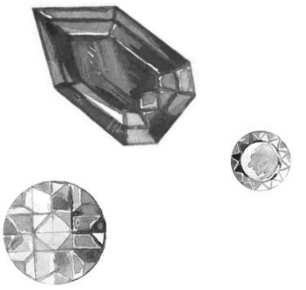
1



Frumps' Fashions

OVERVIEW

Derived from "Frumps' Fashions" in *Navigating through Number and Operations in Prekindergarten–Grade 2*, pp. 41–45.

This activity is designed for students in prekindergarten–kindergarten to begin an understanding of addition and subtraction, so it is most appropriate that it is based on contextual stories to which students can connect their experience. This experience is where learning begins, with physical objects, and it next gradually moves to modeling and pictures, then to language, and finally to symbolic representation. This progression, however, occurs repeatedly for children, and it is more a back-and-forth process than a steady movement. Symbolic representation happens later in the learning process—for some students by kindergarten, and for others perhaps not until grades 1 or 2. There is no rush to arrive at symbolic representation. It is much more important at this level to build the conceptual understanding of addition and subtraction, so that when students move to symbols, they have ideas on which to base the symbols. One help for this is to always have both concrete objects and physical mathematical models available to all students, so they have ready access to whatever connections they need.

> ***"Often children who were able to solve the problems presented with reference to real-world quantities were initially confused by the same problem presented in a purely numerical problem."*** (Sophian 1999, p. 14)

Young students at this stage participate in learning activities at constantly changing levels of understanding. The understanding flows back and forth, from clear to more confused, from primitive to more sophisticated. The same student who had a great insight one day may revert to very elemental practice a week later. A student's actions may not match his or her verbal explanation. Thus, multiple experiences should be provided over time to allow for steady growth, albeit often in fits and starts, providing a basis for understanding mathematics as a sense-making activity.

Copyright © 2019 by the National Council of Teachers of Mathematics, Inc. **www.nctm.org**. All rights reserved.
This material may not be copied or distributed electronically or in other formats without written permission from NCTM.

GOALS

- Use chips to represent objects.
- Explore addition as the joining of groups.
- Explore subtraction as separating or comparing groups.
- Learn the language of addition (*in all, altogether*) and of subtraction (*How many are left? How many more?*).

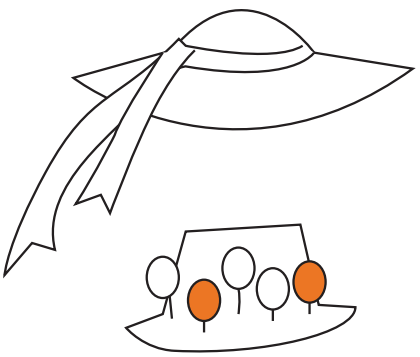
MATERIALS NEEDED

Collection of hats in different colors and styles

Mats with markers or chips for each student

Engage

Discuss and show some hats that you have collected. As a class, describe each hat, allowing the students to contribute. (If you wish, items other than hats may be used, with the following story adapted as needed. In any case, it is important to begin with physical objects.)



After everyone has had an opportunity to examine and discuss the hats, have each student use a mat and chips or other counters. Use your own set to model for students how you can use chips to represent hats. Tell the story of Mrs. Frump's hats, using chips to indicate hats on your mats. Your story might go like this:

> **Mrs. Frump loves hats. She loves to wear hats to parties. Mrs. Frump wonders, "How many hats do I have in all?" Let's help her figure out her total number of hats.**
>
> **Mrs. Frump has a red hat with a bow. [You can vary the descriptions in the stories depending on your classroom collection of hats.] [*Put one chip on your mat to indicate the red hat.*]**
>
> **Mrs. Frump has a pink hat with a feather. [*Put another chip on the mat.*]**
>
> **She also has a blue hat with beads. [*Place another chip on the mat.*]**

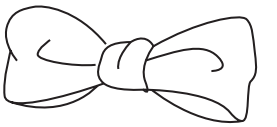
She has a purple hat with flowers. [*Place another chip*.]

And she has a green hat with stars. [*Put a chip on the mat*.]

How many hats does Mrs. Frump have altogether?

Allow students to determine a way to answer the question of how many hats Mrs. Frump has. Some students will use counting of the chips. Some might actually count the real hats. Be alert to other thinking that students might share. Do their explanations match their observable actions? While students will have had experience counting objects, and they may have solved problems using their own drawings, this lesson will move them to using counters to represent objects.

Explore



The next story in "Frumps' Fashions," Mr. Frump's Bow Ties, allows students to use the modeling done with Mrs. Frump's Hats independently to understand addition as adding to or joining. That story might go as follows:

Mr. Frump loves bow ties. He loves to wear bow ties to parties with Mrs. Frump. He wonders how many bow ties he has in all. Let's help him figure it out. Mr. Frump has two striped bow ties. [*Allow students to place their chips on the mat, assisting any who are having difficulty*.]

Mr. Frump has four bow ties with polka dots. [*Give students time to represent the polka-dot ties, making sure they have two separate groups of chips*.]

How many bow ties does Mr. Frump have in all? How can we figure it out?

When students propose joining or putting together the two groups and counting—suggest pushing the two groups together if a student does not—have the students count to determine the total number of bow ties. This approach may come out when students comment on the strategies others have shared.

If some students have difficulty with the joining-together approach to the ties, you could rephrase the problem so that Mr. Frump has two bow ties and Mrs. Frump gives him four more. This more active posing of the problem is easier for some young students to grasp.

The stories in the remainder of the Frumps' Fashions activity illustrate various meanings of addition and subtraction. In Mrs. Frump's T-Shirts, she has two types of shirts that she

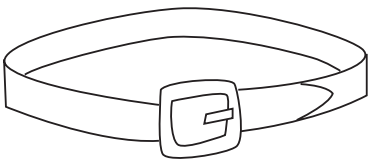
likes to wear while gardening, five with pictures of bees and three with pictures of flowers. She wonders how many she has in all. This problem is similar to Mr. Frump's Bow Ties, and students should be able to solve it in a similar way.

> ***"Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies."*** (NCTM 2014, p. 10)

In Mrs. Frump's Pants, she has three pairs of plaid pants and six pairs of red pants, and she likes to wear these with her T-shirts while she gardens. This also is a *joining* in an addition problem, like the previous problems. Students should be showing more confidence as you progress through such stories, both in connecting to real objects and in using models such as chips for the idea.

Later in the school year, subtraction can be introduced by using Mr. Frump's Pajamas, a story in which he has ten pairs of red pajamas but gives six pairs to Mrs. Frump to help her sleep. The question *How many pairs does he have left?* introduces subtraction as taking or giving away.

Still later, after multiple experiences with joining and separating, Mr. Frump's Belts can be introduced. Mr. Frump has four green belts and six yellow belts, and he wonders which color he has more of, and how many more. This story shows subtraction as *comparing* two groups. This last idea is the most conceptually difficult for young students.



> ***"All students should … understand various meanings of addition and subtraction of whole numbers."*** (NCTM 2000, p. 78)

These story problems should be spread out over multiple lessons, and students should have numerous opportunities to work with each type of problem over time. *Joining* in addition stories is the easiest for students, and using pictures or chips and counting for the result is the easiest procedure. *Removing* or *taking away* stories are usually next easiest, followed by stories where the starting and ending amounts are known, but not how much is added to or subtracted from the starting amount.

Comparing is often more difficult. Thinking about what amount is the same in each part and then figuring the difference may help students understand. The most difficult concept is finding a result when the starting number is not known. For strategies, usually counting without models follows using models and counting. Eventually, students begin to "think" their strategies, knowing some number facts well, such as doubles, or skip counting, or using simple

sums. For example, initially students solving a problem with 5 red hats and 4 blue hats will set out 5, then 4 counters, put them together, and count them. Later, they may count on from 4 or 5, saying 4-5-6-7-8-9. Eventually they will think or say such things as 4 and 4 is 8, and one more is 9, or 5 and 5 is 10, and one less is 9. Continue to allow all students to work, represent, answer, and explain in whatever way they are comfortable. Have students listen for how the strategies being shared are similar to or different from theirs.

Listening to fellow students supports literacy skills, and it allows for appreciation of other students' explanations. As students become more comfortable, stories will become simpler. For example: Dawn has four stones in her pocket and Alonzo gives her three more. How many does she have now? Many students will likely be able to construct their own stories at some point.

> ***"Students can learn mathematics through exploring and solving contextual and mathematical problems."*** (NCTM 2014, p. 11)

Extend

This activity gives a basis for many lessons throughout the year using similar stories, various problem types, and number sets that grow with student understanding. It also gives options for varying stories and numbers for different students, depending on their level of development and understanding. By the end of kindergarten, students should be comfortable with numbers up to 19 in addition and subtraction stories, in which any one of the numbers in the problem might be the one to figure out.

SUMMARY

At the end of each story lesson, ask children to describe what you have done. Elicit the ideas of bringing together, taking apart, putting parts together into a whole, comparing, figuring out what was done to a number to give a resulting number, or whatever the day's emphasis has been. It is not necessary to name the concepts as *addition* or *subtraction* immediately, though some students may offer that as one way to describe what is being done. Since the focus is on student thinking and reasoning, validate the thinking of each student. Even the youngest students can come to see themselves as mathematicians!

As you reflect and plan for future lessons, it is a good idea to make notes about student progress, noting which students used which approach to solving story problems, whether strategies vary with problem type or number size, and what insights and comments students shared. This process will help you design suitable problems for future lessons and create possible arrangements of pairs or groups for students. These are invaluable for giving students opportunities to discuss and listen to fellow students.

The rich tasks of the Frumps' stories promote reasoning and problem solving, offering students opportunities to use and connect mathematical representations as they begin to progress from conceptual understanding to eventual procedural fluency.

The lessons illustrated in Frumps' Fashions give templates for creating your own stories—possibly silly ones—to use throughout the school year. Audiotaping various stories for different groups is another excellent means of individualizing opportunities. As some students, especially in kindergarten, use more sophisticated representations and possibly symbols, accept this as one way to show relationships but not the only way. Students can solve mathematical problems in context even when they cannot solve symbolic problems. For these youngest students, representing addition and subtraction equations symbolically, with numbers and symbols such as + and =, should remain an option but not a requirement. The most important goal is to understand the ideas of the operations and their connections.