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early mathematics education
INNOVATIONS

Learning Lab #4

Afternoon Handouts
Pre-K

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Who lives here?

Grandpa is a funny guy. He says that at his house there are 14 feet and 2 tails. Who might live at Grandpa's house?

Show all your work. Explain in words how you found your answer. Tell why you took the steps you did to solve the problem.

Make sure you
— show all your work in solving the problem,
— clearly label your answer,
— write in words how you solved the problem,
— write in words why you took the steps you did to solve the problem, and
— write as clearly as you can.

Exemplars Math preK-K Sample (www.exemplars.com)
Apples

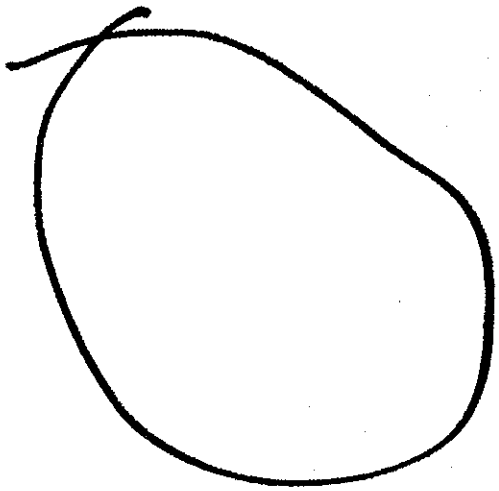
Nick and Josh pick apples off an apple tree. Nick picks 3 apples. Josh picks 1 apple. Nick and Josh put all the apples in a basket. How many apples are in the basket? Show and tell how you know.

You have four samples of student solutions to this problem.

- Examine them and discuss them with others at your table.
- Put them in order of mathematical complexity – novice, apprentice, practitioner, expert.
- What evidence of student thinking can you see that helps you assign the samples to different levels of complexity?

Level	*What you notice about student work sample*
Novice	
Apprentice	
Practitioner	
Expert	

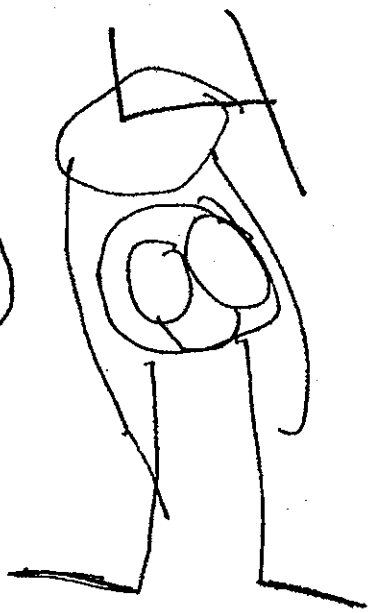
[Is there anything else you want to say?]
"If you picked the other apples you would have more."
– Scribed by Teacher



Note: Child colored the shape orange.

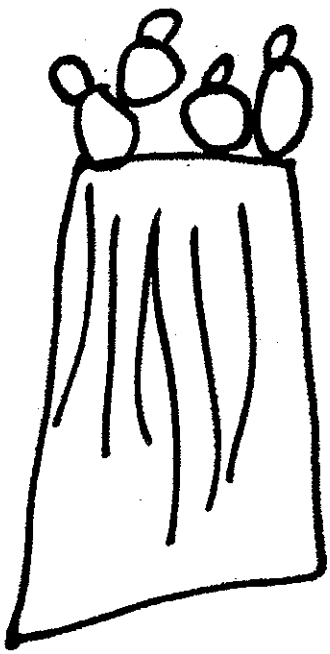
"I like oranges better. This is my orange."
[reread the task]
"I told you, I like oranges."
– Scribed by Teacher

"This is Nick. He has three apples. 1, 2, 3."
– Scribed by Teacher



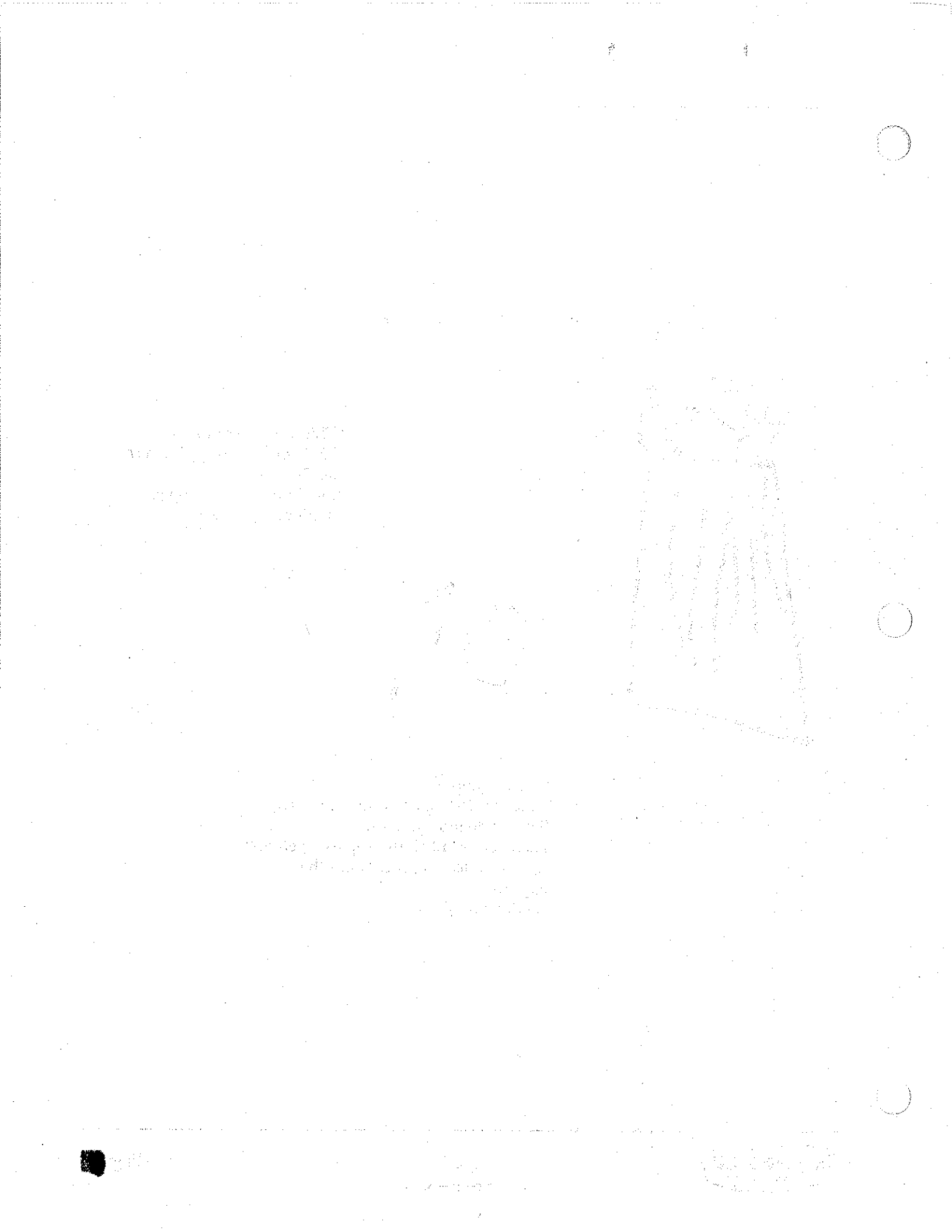
"This is Josh. He only got one apple."
"1, 2, 3, 4. They got four apples off that tree. Give Josh one of his (points to Nick) so they both get a pair of 'em."
– Scribed by Teacher

"This is me. I have five apples 'cause it comes after four and I want more than 'em. But I only got two pairs of apples and one left 'cause five is odd."
– Scribed by Teacher



"This is 10. I like 10."
[Did you put 10 apples in the tree?]
"No, I put 1, 2, 3, 1 apples."
– Scribed by Teacher

"1, 2, 3, 1 apples."
"I like apples. I made apples in a tree."
"I could do more apples."
[Can you count all the apples together?]
"1, 2, 3 apples. 1 apple. That's the apples."
– Scribed by Teacher



0•4 Bear Stories: Joining

Objective To introduce the concept of joining (addition) number stories.

Key Mathematics Concepts and Skills

- Count objects to solve simple problems. [Number and Numeration Goal 2]
- Solve joining (addition) number stories using concrete objects and modeling. [Operations and Computation Goal 1]
- Recognize that a collection of objects can be made larger by adding objects to it. [Operations and Computation Goal 1]

Other Skills Listening and Speaking, Pretending and Role Play

Terms to Use number story, all together, in all, how many

Materials bear counters; small blocks

Core Activity

Planning Tip This activity is best done in an area away from the Block Center to minimize distractions from general block play.

▶ Main Activity

☐ Whole Group ☑ Small Group ☐ Partners ☑ Center

Build, or have children build, a simple enclosure with blocks. Leave it open on top so children can easily see inside. Put two bear counters in the enclosure and tell children it is the bears' house. Using additional bear counters, tell and act out a simple joining (addition) number story, such as: *Two bears were playing in their house. They invited a friend to come inside and play. How many bears are in the house now?* After children have had a chance to answer, continue modeling and telling the story: *The three bears called for another friend to come over, so one more bear comes in the house. How many are in the house now?*

Invite children to make simple constructions with the blocks. Use their structures as the basis for additional joining number stories. For example, if a child makes a car, put one bear in the car, have another bear join the first bear, then ask: *How many bears are in the car now?* Or if a child builds a rocket, say, *Three bears are about to blast off in the rocket. Two more bears get in the rocket. How many are blasting off now?*

If any children seem ready, invite them to tell stories for others to solve using the bears. Initially, they can become involved by helping you tell number stories. It may take time and quite a bit of modeling for children to independently create their own number stories. Use small numbers (0–3) at first, and encourage children to do the same. Gradually, numbers can be increased. Put the bears and blocks in a Center and encourage children to use them to tell and act out number stories with friends.

Developing Oral Language ELL

It is helpful for children to distinguish between number stories and other stories. Explain that *number stories* always have numbers and a problem to solve.

NOTE Bear Stories: Taking Away, page 148, focuses on taking-away (subtraction) number stories. Animal Number Stories, page 150, includes both joining and taking-away stories.

Ongoing Assessment: Kid Watching

Over time, you can use this activity to observe whether children can use manipulatives to model and solve number stories. Do they understand that adding objects to a collection results in a change in the number of objects? Do they understand that the number of objects increases?

▶ Connections

Literacy Connection Read *The Relatives Came* by Cynthia Rylant (Atheneum/Richard Jackson Books, 2001) and discuss children's experiences planning for visitors. You might use the book and illustrations as the basis for some number stories.

Art Connection Invite children to draw a room in their house and include people in their pictures. Ask them to use numbers to describe what is happening in their pictures. For example: *In my kitchen, two people are eating and one is cooking.* You might write children's words as captions for their pictures.

MOUSE COLLECTIONS

Big Idea Focus: A collection can be made larger by adding items to it and made smaller by taking some away from it.

In this lesson, children:

- Model joining and separating situations with their bodies and with concrete objects
- Describe changes to a collection as objects are added or taken away
- Count objects with one-to-one correspondence
- Count on to solve simple problems (KG goal)

Materials

- *Mouse Count* by Ellen Stoll Walsh
- Yarn or masking tape
- Tube sock or snake puppet
- Clear, wide container
- 5 to 10 "mice" (stones, pompoms, or other small objects)

PART 1: DRAMATIZATION

1. Review *Mouse Count* and Introduce Large Group Activity

Gather at least 10 children in a circle on the rug. Review *Mouse Count* and explain to children that they will act out the story and help count the mice.

Tell children that you will be the "snake" and put a tube sock or puppet on your hand. (Children can have turns as the snake in subsequent retellings.) Create a "jar" in the middle of the rug using a long length of yarn or making tape. This defined space should be sized to snugly fit 10 seated children. Tell children they are "mice"—and the snake is hungry!

2. Model the Joining and Separating Situation

Read or retell the story, pausing each time the number of mice in the jar changes. Collect the number of children to be the mice and put them in the jar.

Ask questions that focus children's attention on how the collection of mice changes.

- *What is happening to the jar? Can we add any more?*
- *How many mice are in the jar? Is this more or less than before?*
- *What does the snake mean when it says,* "Ten mice are enough?"

Planning Tips

Read *Mouse Count* at least once prior to this lesson.

This lesson has two parts, and can be done several times over multiple days.

Part 1 is for a large group of at least 10 children.

Part 2 is for small groups, and once introduced, the materials can be in the Math Center for continued exploration.

Instructional Decisions

Are children ready to work with 10 objects? Modify to suit children's needs.

What materials will you select to emphasize the container filling up like the jar of mice in the book?

Facilitation Tip

If children have little experience with dramatization, you may want to spend time establishing behavioral expectations for actors and audience.

Observation

Are children able to use the terms **more** *and* **less** *to describe the changing collection of mice? What other math language do you hear?*

Finally, have the children "uncount" themselves from the jar and return to the circle. Ask:

- *What happens when the jar tips over?*
- *How many mice are in the jar at the end?*

Repeat the dramatization with other children as actors and audience. Vary the numbers as appropriate.

PART 2: NUMBER STORIES WITH PROPS

1. Introduce Small Group Activity

Show children the snakes, mice, and jar props. Tell them that they will use the props to tell number stories like *Mouse Count.*

Demonstrate how to tell a number story using the props. For example:

> *One day a very hungry snake went looking for food. It found 3 mice and put them in the jar. Next, it found 2 mice and put them in the jar. Then, the snake found 1 more mouse and that was enough. But the mice tipped over the jar and ran out: 1, 2, 3, 4, 5, 6. All 6 mice got away. There were no mice left in the jar. The End*

2. Scaffold Children Telling Number Stories

Give each child a turn to tell a number story with the props.

Assist children, as needed, to describe with words the joining situation they are showing with their actions. Follow the child's lead, but **keep your narration focused on the joining situation and how the collection of mice in the jar changes.** (Counting on to find the total is <u>not</u> the primary goal of this activity, though some children may be ready to do so.)

Help children generalize in their own words what happens when the snake puts the mice in the jar and what happens when the jar tips over.

3. Close the Lesson

Remind children what makes a story a *number story,* and encourage them to listen for number stories at home and in other books.

Tell children that the *Mouse Count* book and materials will be in the Math Center to use during center time.

<u>Math Language Learning</u>

Help children distinguish between ***number stories*** and other kinds of stories. Explain that number stories always have numbers and a problem to solve.

<u>Instructional Decisions</u>

How will you group children? You will want to consider the math abilities of children as well as their language skills.

How can you support English Language Learners to tell number stories in their home language?

<u>Teacher as Learner</u>

Number stories are a common source of math anxiety for adults.

What is your comfort level in solving number stories? What kind of experiences did you have in the early grades with number stories?

Exemplars® Pre[illegible] Rubric

Level	Problem Solving/ Reasoning and Proof	Communication	Representation	Connections
Novice	• No strategy / reasoning is evident or • Strategy and reasoning would not work to solve any part of the task	• No awareness of audience or purpose is communicated • No communication of an approach is evident	• No attempt is made to construct mathematical representation (diagram, model, tally chart, etc.)	• No mathematical connection is possible because strategy and reasoning is not evident
Apprentice	• Partially correct strategy and reasoning is chosen that could solve part of the task • Evidence of drawing on some relevant previous mathematical knowledge is present	• Some awareness of audience or purpose is communicated • One mathematical term and / or number (oral or written) is used to communicate strategy and reasoning	• An attempt is made to construct mathematical representation (diagram, model, tally chart, etc.) to communicate strategy / reasoning	• No attempt to make a mathematical connection about partially correct strategy and reasoning or • Attempts to make an observation about the solution but it is not mathematically relevant
Practitioner	• Correct strategy and reasoning is chosen to support conceptual understanding of the mathematics of the task • Evidence of solidifying prior knowledge and applying it to the problem-solving situation is present • The answer must be correct	• A sense of audience or purpose is communicated • At least two mathematical terms and / or numbers (oral or written) are used to communicate strategy and reasoning	• Appropriate mathematical representation (diagram, model, tally chart, etc.) is constructed to communicate strategy and reasoning • All necessary labels are evident and data is accurate	• Mathematical observations are recognized. Some examples include stating and / or continuing a pattern, recreating the task to find a new answer, linking number to mathematical concepts (Seven days is one week, 12 apples is a dozen)
Expert	• Extends strategy and reasoning to show additional conceptual understanding of the mathematics of the task • Adjustments, analysis and alternative strategies may be considered • The answer must be correct	• A sense of audience and purpose is communicated • Uses precise mathematical language and symbolic notation beyond what is expected to communicate strategy and reasoning	• Appropriate mathematical representation(s) (diagram, model, tally chart, etc.) are constructed to communicate, verify, clarify or extend strategy and reasoning • All necessary labels are evident and data is accurate	• Mathematical observations are used to extend the solution. Some examples include verifying strategy and reasoning by solving task more than one way, relating one problem to another by their mathematical similarities, generalizing and extending the solution to other cases, testing and accepting or rejecting a hypothesis