SCHOLASTIC

Math Place

Grade 1
Ontario

Number Sense and Numeration

Sample Lesson Plans

- Counting Back from 20
- Comparing Problems: Differences

Sample Lesson

Counting Back from 20

Math Curriculum Expectations

- Count backwards from 20 by 1's, 2's, and 5's, using a variety of tools

Possible Learning Goal

- Solves problems using a variety of counting strategies

Teacher Look-Fors

- Selects an appropriate strategy to represent the problem
- Identifies some ways that shoes can be taken away to be left with 0
- Accurately counts backwards from 20 by 1's, 2's, 5's, and 10's
- Explains what is happening to the number of shoes with each count (e.g., the quantity is being reduced by an equal amount)
- Offers a non-example of a number that would not work and explains why

Previous Experience with Concepts:
Students have composed and decomposed quantities to 20 and have counted backwards by 1's from 20.

Mathematical Processes:
Problem solving, representing, reasoning and proving, selecting tools and strategies, communicating, reflecting

Math Vocabulary:
equal number, take away, pair, "buy 1, get 1 free"

About the Math

As Marian Small points out, counting backwards is often overlooked when teaching or assessing counting skills. This ability plays a significant role in preparing students for understanding the operation of subtraction (Small, 2009, p. 86). It also helps students consolidate their understanding of number relationships, since they are 'undoing' the process of counting forward, either by 1's or when skip counting.

About the Lesson

In this lesson, students problem solve to find ways to remove items in equal groups from a total of 20 to end up with no items left over. Through this visual activity, they are discovering the various ways to count backwards from 20 (by 1's, 2's, 5's, 10's, and 20), and the concept that equal groups are being removed each time, resulting in the quantity continually getting smaller by the same amount.

Minds On (15 minutes)

- Show students the "Shoe Spot" picture (page 10 in the *Number Sense* big book). Draw attention to the six shoes on the "Buy 1 Pair, Get 1 Pair Free!" table. Ask why they think there is only one of each kind of shoe on display.
- Use six of the students' shoes to serve as a model for the following problem. Tell students that they are to think of ways to take the same number of shoes away each time until there are none left. Ask how they could do it if they took one shoe away at a time. Have students model this scenario. Explain that one shoe was taken away each time so the number of shoes was the

Materials:

"Shoe Spot" (page 10 of the *Number Sense* big book), BLM 19: *Shoe Spot*, chart paper, markers, connecting cubes or counters

Time: 50 minutes

same. Have students count backwards from 6 as the shoes are taken away. Ask if there is another way to do this.

- If students do not have a suggestion, have them try taking 4 shoes away at a time. Ask why this way will not meet the challenge in the problem (e.g., you can't take 4 shoes away every time and have 0 left). Have students suggest other numbers that may work.
- Try students' different suggestions until all ways have been found (by 1's, 2's, 3's, and 6's). Have them count backwards to match the number of shoes being taken away each time (e.g., 6, 4, 2, 0; 6, 3, 0).
- Ask whether a group of 6 can be taken away all at once and still follow the rules. Students can count backwards: 6, 0.

Working On It (20 minutes)

- Direct students' attention to the flip-flops at the bottom part of page 10 in the big book. Tell them they are going to solve a similar problem, but with 20 flip-flops. Ask, "How many ways can you take the same number of flip-flops away each time and get to 0, with no flip-flops left over? How can you count them being taken away?"
- Have students work in pairs and provide copies of BLM 19: *Shoe Spot*. Encourage students to use counters or connecting cubes to represent the flip-flops, and have them record their counting sequences from 20 to 0.
- Students can draw how the set reduces with each count, and put the skip-counting numbers beside the corresponding pictures.

Differentiation

- Change the number of shoes in the problem according to the individual needs of your class (e.g., it can be based on the 8 slippers or the 12 rollerblades shown in the "Shoe Spot" image).

Assessment Opportunities

Observations: Observe students' problem-solving strategies. Can they select concrete materials or tools to model their thinking? Do they know where to start? Do they understand that there must be none left when the final group is taken away?

Conversations: If students are struggling, pose some prompts:

- What are you supposed to do?
- What were we doing with the 6 shoes?
- Why could we take 2 shoes away each time, yet 4 did not work?
- Let's try working with 8 shoes. What number could you try? (Have students act out the problem, keeping each group taken away in a separate pile.) Did it work? Why? What do you notice about all of the piles? Did you end up with none left? Then this way works.
- What number do you think won't work? Why?
- What is another number that you think will work?

Consolidation (15 minutes – 5 minutes for meeting with another pair and 10 minutes for class discussion)

- Have two pairs of students meet to discuss and compare their solutions.
- Choose two or three solutions to be explained to the whole class, with each focusing on a different way of counting back (e.g., by 1's, 2's, 5's, 10's, and 20's).
- Have students give examples of what wouldn't work (e.g., taking away 3 or 6 flip-flops at a time). Ask why they think the examples don't work.
- After each sharing, have the class count backwards according to the strategy identified in the solution.
- Have a student show how the counting sequence looks on the class number line, as the class counts backwards. Connect this representation to the drawings of counting backwards.
- If all the different ways are not found, ask students to justify how they know that there are no other ways. For example, they may overlook taking 20 flip-flops away all at once.
- Have students compare the ways of counting (e.g., counting by 10's is faster than counting by 2's).

Further Practice

- **Independent Problem Solving in Math Journals:** Draw attention to the slippers in the "Shoe Spot" picture. Ask students how they could take an equal amount of slippers away each time and end up with zero. Have students show at least one solution in their journals.

Materials:

"Number Crunch" (page 9 in the *Number Sense* big book and little books), class number line to 50

Math Talk:

Math Focus: Counting back by 1's from 20 and any number less than 20

Let's Talk

Select the prompts that best meet the needs of your students.

- *How many pieces of fruit are on each plate? How can you count them?* (e.g., 1, 2, 3, 4, 5) *Visualize that the fruit on the first plate is eaten, one piece at a time. How would you count the fruit as it disappears?* (e.g., 5..., 4, 3, 2, 1, 0)
- *How many oranges are there altogether? How do you know? How could you count them if they were eaten one at a time?* (e.g., 10..., 9, 8, 7, 6, 5, 4, 3, 2, 1, 0)
- *How would you count back from all the oranges so there are 6 oranges left?* (e.g., 10…, 9, 8, 7, 6) *How many oranges did you take away? How do you know?* (e.g., I counted backwards and then counted the oranges I took away; I put a finger up for every count backwards.) *Where are these two numbers on the number line? How can you prove that you took 4 oranges away?*

Teaching Tip

Integrate the math talk moves (see page 6) throughout Math Talks to maximize student participation and active listening.

- *How many pieces of fruit are in the first row? How did you count that? How could you count backwards until there are none left? Who can show the fruit disappearing while Mia counts? How can you count backwards until you are left with 7 pieces of fruit?*
- Repeat this type of questioning for counting back all the apples in the first two rows.
- *How is counting backwards the same as, and different from, counting forward?*

Materials:

"Number Crunch" (page 9 in the *Number Sense* big book and little books), class number line to 50

Math Talk:

Math Focus: Counting back by 5's and 2's from 20

Let's Talk

Select the prompts that best meet the needs of your students.

- *Visualize the 10 oranges being eaten one at a time. How would you count that? How did you know what number came next when you were counting?*
- *Where do you see 10 bananas? Visualize that the 10 bananas are being eaten two at a time. How would you count that?* (e.g., I whisper counted and said every second number: **10**, 9, **8**, 7, **6**, 5, **4**, 3, **2**, 1, **0**; I looked at the numbers on the number line; I counted backwards on my fingers by putting 2 fingers down every time.)
- *How can we use these strategies to count back from 20 bananas? What would this counting look like on the number line? How is it the same as and different from counting forward by 2's?*
- *What other ways can you count back from 20?* (e.g., 20, 19, 18…) *What is happening to the fruit when you count this way?* (e.g., they are being eaten one at a time) *Are there any other ways?* (e.g., count backwards by 5's: 20, 15, 10, 5, 0; count backwards by 10's) *What is happening when you count backwards by 5's?* (e.g., A whole plate of fruit is being eaten, so 5 pieces are taken away at a time.) *Show me what this counting looks like on the number line. How does it look different from counting backwards by 2's or 1's?*
- *How is counting backwards the same as and different from counting forward?*

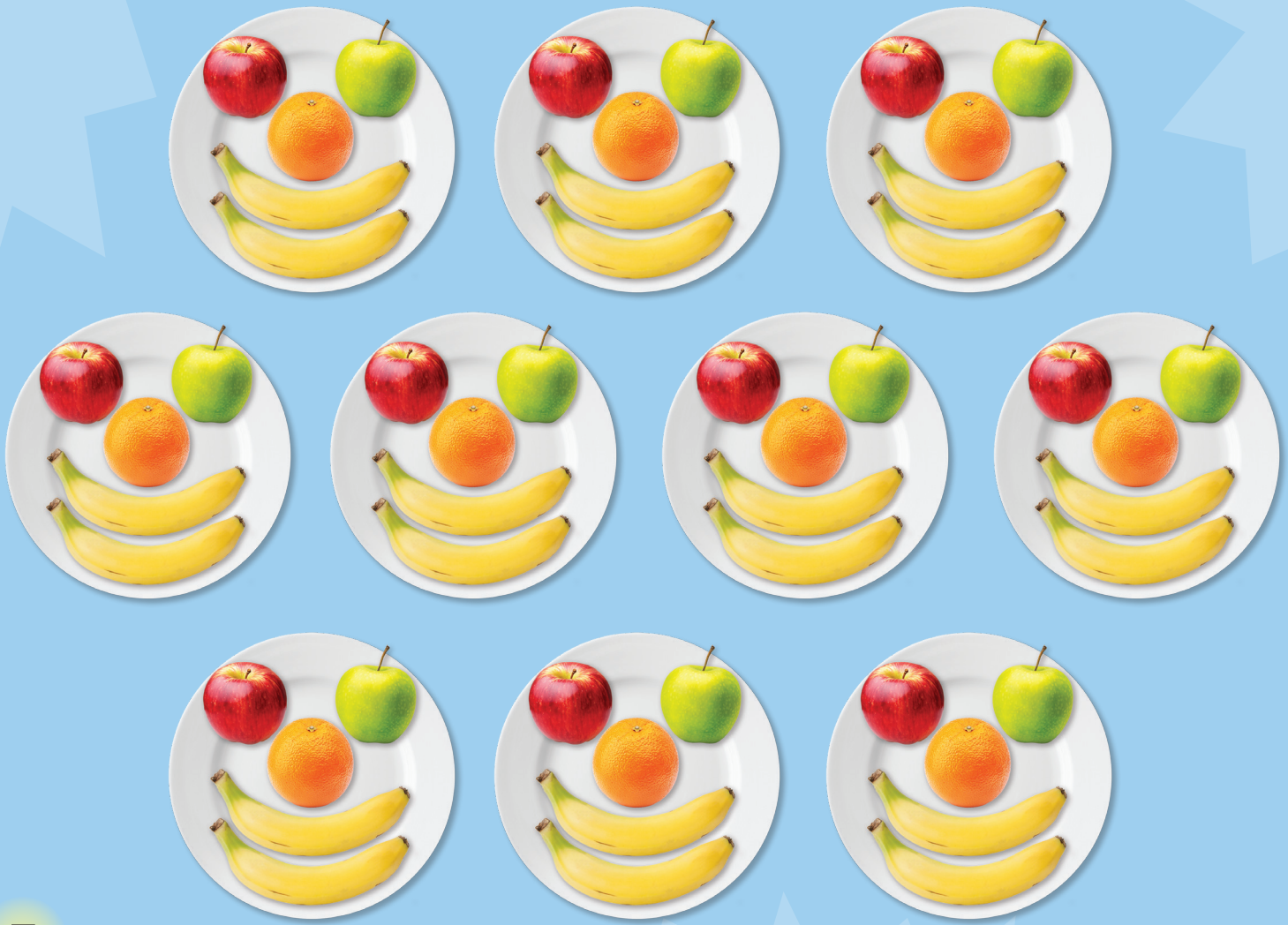
BLM 19: Shoe Spot

 GRADE 1 ON: NUMBER SENSE & NUMERATION ISBN 978-1-4430-5389-1

Number Crunch

Fruit and more fruit
picked from trees.

You can count them
as you please!



Sample from Number Sense and Numeration Big Book.

Sample Lesson

Compare Problems: Differences

Math Place ON Grade 1: Number Sense and Numeration Sample Lesson

Math Curriculum Expectations

Number Sense and Numeration

- Solve a variety of problems involving the addition and subtraction of whole numbers to 20, using concrete materials and drawings
- Solve problems involving the addition and subtraction of single-digit whole numbers, using a variety of mental strategies
- Compose and decompose numbers up to 20 in a variety of ways, using concrete materials

Patterning and Algebra

- Determine, through investigation using a 'balance' model and whole numbers to 10, the number of identical objects that must be added or subtracted to establish equality

Possible Learning Goal

- Compares quantities using a variety of strategies

Teacher Look-Fors

- Accurately finds the difference between two quantities
- Explains or shows how they found the difference
- Explains how the problem can be solved with either addition or subtraction

Previous Experience with Concepts:
Students have had several experiences with adding and subtracting with concrete materials. Students can create matching equations for models that represent addition or subtraction.

Mathematical Processes:
Problem solving, representing, reasoning and proving, connecting, communicating

About the Math

In comparing problems, the quantities of two sets are being compared, yet they are not subsets of each other like in part-part-whole problems. Instead, the focus is on the difference between the quantities of the two sets. For example, the problem might be, "Jake has 6 cookies. Anna has 4 cookies. How many more does Jake have?" Students can use a variety of strategies using concrete materials to figure out the difference. They may:

- Create a set of 6 cubes and a set of 4 cubes, put them side by side, matching the cubes from each set using one-to-one correspondence, and then count the cubes that are left over.
- Create a set of 6 cubes and a set of 4 cubes, and then count on from 4 to 6, tracking the count on their fingers.
- Create a set of 4 cubes in one colour, add on different coloured cubes until a set of 6 is created, and count the cubes in the second colour.

continued on next page

Math Vocabulary:
equations, matching equations, balance, compare, difference, think addition

- Create a set of 6 cubes, remove cubes until a set of 4 is left, and count the cubes that were removed.

It is important to vary the problems. For example:

- Anna has 4 cookies. Jake has 2 more cookies than Anna. How many cookies does Jake have? (compare quantity unknown)
- Jake has 6 cookies. He has 2 more cookies than Anna. How many cookies does Anna have? (referent unknown)

Materials:
connecting cubes, chart paper, markers

Time: 45 minutes

Minds On (15 minutes)

- Have two students stand. Give one student a train made from 5 connecting cubes. Give the second student a train made from 9 connecting cubes.
- Ask which train has more cubes and how they know. Ask how they could figure out how many more cubes the second student has than the first student (the strategy is more important than the answer). Students can demonstrate their thinking using the connecting cubes. Through questioning, try to elicit at least two or three strategies.
- Pose another problem using a different pair of students. Give one student a train that is 4 cubes long. Give the second student a train that is 7 cubes long, but put it in a bag so the rest of the students cannot see it. Tell them that the second train is 3 cubes longer than the first train. Ask students how long the second train is.

Working On It (15 minutes)

- Students work in pairs and take turns creating trains and asking the questions. One student looks away, while the other student makes two trains that are different in length. He/she hides one of the trains. The second student looks at the train and the first student poses a question, such as, "The second train is 4 cubes longer. How long is it?" Students can check their answers by revealing the second train.

Differentiation

- For students who cannot mentally figure out the length of the second train, encourage them to use other cubes to build and support their thinking.
- For students who master the activity and need more of a challenge, pose some of the following problems:
  - The difference between 2 numbers is 7. What might the numbers be?
  - The difference between 2 numbers is at least 5. What might the numbers be?

Assessment Opportunities

Observations: Pay attention to how students are figuring out the length of the hidden train.

- If using mental strategies, are they subitizing the original amount of cubes in the train? Do they need to touch and count each cube?
- Can they provide a solution for 1 more/less than problems without counting the length of the train, but by knowing the number sequence?
- Are they mentally counting on or back? How do they track the size of the new train? (e.g., on their fingers, nodding their head for each count)
- Are they counting on when using concrete materials, or are they creating the original train, adding or removing the difference, and then counting the cubes in the train again? (Ask probing questions highlighted in earlier lessons to get students to count on.)

Conversations:

- To probe further, ask how students are finding out the difference. Ask what they are counting on their fingers.
- If students find 1 more/less than problems difficult, you can carry out some related Math Talks (e.g., 1 more/less than) with small groups or the entire class to reinforce how the differences are related to the number sequence.

Consolidation (15 minutes)

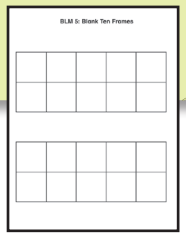
- **Inside/Outside Circles:** Have each student create two trains of different sizes. Split the class in half and make two circles, one within the other (the inside and outside circles). Students on the inside and outside face each other, with each person in front of a partner. The partners put one of their trains behind their backs so the other students cannot see. They take turns showing their one train, and then posing prompts that compare it to the train behind their backs. After a couple of minutes, have the students on the outside move one person to the right. (You can signal the time to change with a bell or by playing music.) Students now have a new partner and can pose the same or different questions. Repeat this for two or three rotations.
- Discuss the mental strategies that students used to figure out the differences between the two trains.
- Ask if these are addition or subtraction problems. Through discussion, students should realize that the problems can be solved with either operation.

Further Practice

- **Independent Problem Solving in Math Journals:** Verbally pose one of the following prompts:
  - The difference between 2 numbers is 3. What might the two numbers be?
  - Show that there are 4 more cookies on one plate than on another plate.

Materials:

large arithmetic rack, small arithmetic racks (or BLM 5: *Blank Ten Frames* and counters, or connecting cubes)



Math Talk:

Math Focus: Mental strategies for comparing problems

Let's Talk (10–15 minutes)

Select the prompts that best meet the needs of your students.

- *With your partner, solve this problem in more than one way on your arithmetic rack. There are 9 birds in the tree and 3 birds on the ground. How many more birds are in the tree?*
- Possible solutions to discuss:

Removal:

- Slide across 9 beads on the top row (either all at once or 5 red beads and then the 4 white beads);
- Slide back 6, one at a time, counting 1, 2, 3, 4, 5, 6, until they can see that there are only 3 left;
- Slide back all beads except the 3 (students can subitize this) and then count how many they slid back;
- Slide back one at a time counting back from 9, 8, 7, 6, 5, 4, 3, and then counting the beads they slid back.

Adding On:

- Slide across 3 beads to the right on the bottom row (or they can work on the top row);
- Slide across 2 more red beads on the bottom row to create a group of 5, and then 4 white beads all at once to make a group of 9 (2 moves). Then count the beads that they slid over 1, 2, 3, 4, 5, 6;
- Mentally count on from 3 to 9, tracking each number on their fingers, and then sliding across a group of 6 counters on the bottom row, since it is easy to subitize the 5 red beads and 1 white bead (1 move).

Comparing:

- Build 9 on the top and 3 on the bottom. Visually match corresponding beads on the top and bottom and count the 'extra' beads on the top, 1, 2, 3, 4, 5, 6.

Teaching Tip

Integrate the math talk moves (see page 6) throughout Math Talks to maximize student participation and active listening.

- Give students time to solve the problem. *How did you solve this problem? Put your thumb up if you solved it the same way. How did you start? What do those beads represent? What action are you doing? Who can explain in their own words how this strategy works? How is this strategy different from Jon's strategy?*

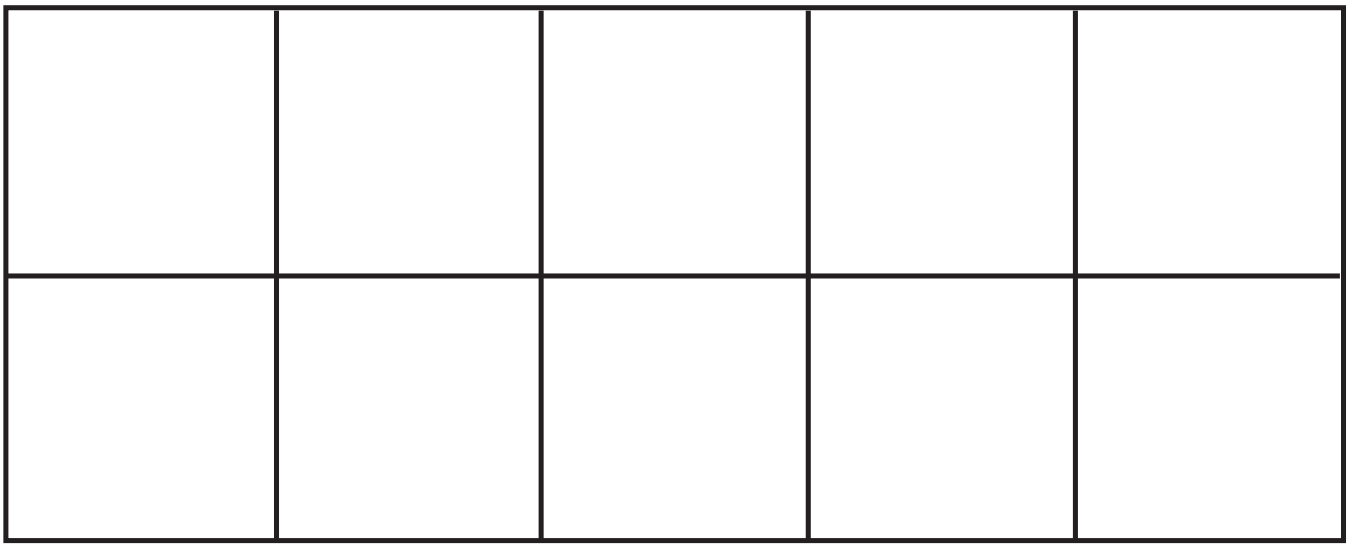
Partner Investigation

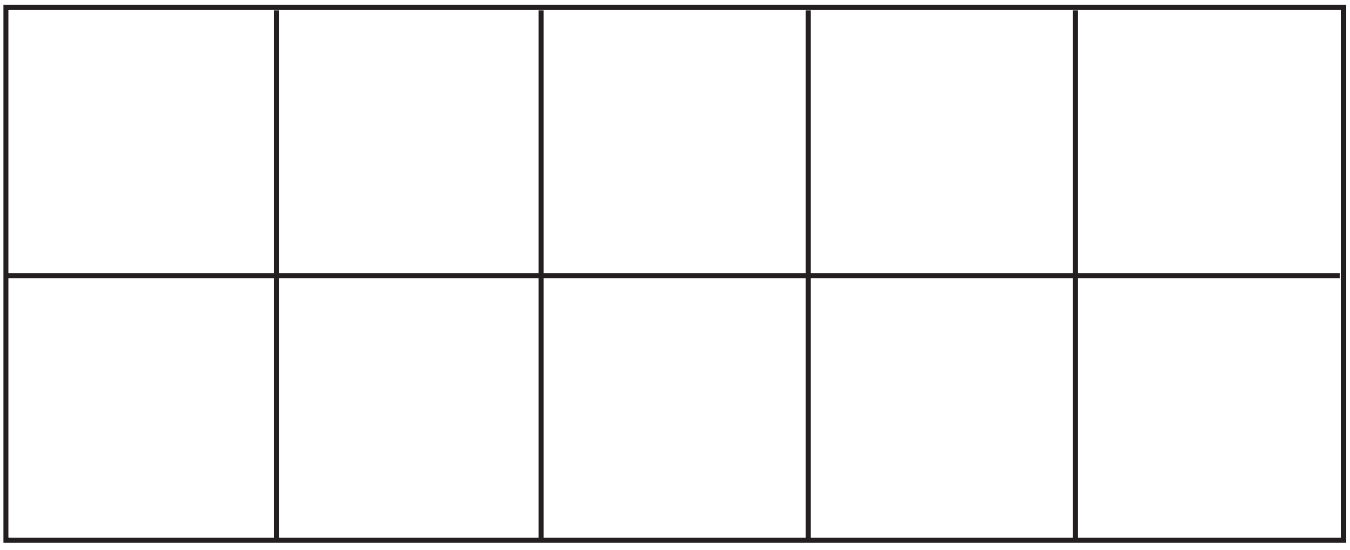
- Give students another problem to solve to try out some of the strategies that were discussed.

Further Talk

- Make an anchor chart of students' strategies, illustrating them with red and white dots for beads, and annotating the movement. You can name the strategies after the students who explained them.

BLM 5: Blank Ten Frames





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SCHOLASTIC

Math Place

Grade 1
Ontario

Grade 1 Modules:

- Number Sense & Numeration
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- Storage Box

Lead Author for *Math Place* and National Math Consultant

Diane Stang

Diane Stang has been an educator for over 40 years, working in various roles in the public and private sector. She began her career as a classroom and special education teacher in Ontario and British Columbia, and later, as a systems resource coach. Next, she became a student achievement officer for the Ontario Ministry of Education, supporting educators in all subject areas, especially in mathematics. She also developed several math video resources to assist teachers in adopting effective instructional pedagogy and increased math content knowledge. Diane has always advocated for equitable education and has devoted considerable time to supporting students with learning disabilities in math. Diane is now working as National Math Consultant for Scholastic Education.

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