

Counting and Cardinality

During their preschool years, children are exposed to numbers and counting as songs, such as “Five Little Pumpkins,” chant rhymes, such as “One, two, buckle my shoe,” and games, such as “find how many.” Through repetition, children begin to understand concepts of counting and cardinality.

When **counting** objects, we say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. **Cardinality** refers to the number of objects in a set—when counting, children emphasize or repeat the last word said to mean the total value of a set of objects.

In Kindergarten, children focus on knowing number names and the counting sequence. They count by rote from 1 to 100 by tens and count forward beginning from a given number within the known sequence. Children also write numbers from 0 to 20 and use the written numerals to stand for an amount within a set and show the objects in a set to match a written numeral.

Children use higher-level thinking skills to analyze relationships between numbers and sets of objects. They understand that each successive number name refers to a quantity that is one larger. They use matching strategies, counting strategies, or equal shares to determine whether the number of objects (between 0 and 10) in one group is greater than, less than, or equal to the number of objects in another group.

The Kindergarten Common Core State Standards for Counting and Cardinality specify that children should—

- Know number names and the count sequence.
- Count to tell the number of objects.
- Compare numbers.

The following hands-on activities present opportunities for children to develop their understanding of the relationship between counting and cardinality. Mathematically proficient Kindergarteners use numerals to represent a specific amount and reason about quantities as they develop a sense of the “conservation” of number—the understanding that the number of objects remains the same when they are rearranged spatially.

Counting and Cardinality

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LESSON 1

Objective

Explore “counting on” using a number line.

Common Core State Standards

- **K.CC.2** Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

Counting and Cardinality

Counting On

“Counting on” is an important skill for young children to master because it is a prerequisite for understanding addition. Children need to understand that if they begin with a certain number and count on a given number of places, they will reach a larger number.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- Display the 0–10 Number Line (BLM 1). **Ask:** *If we start at zero and count to the right (point to zero and move your finger to the right), are the numbers getting bigger or smaller? How do you know?*
- **Ask:** *If we start at zero and count up two steps (point to zero and move your finger to the right until you end up on the number 2), where do we end up? How do you know?* (Continue this type of questioning with other numbers.)

Solve It

With children, reread the problem. Have children reuse the 0–10 Number Line from the activity to show the eight number jumps that Maya made, starting from zero. Then have them draw a picture next to the number where Maya ended up.

More Ideas

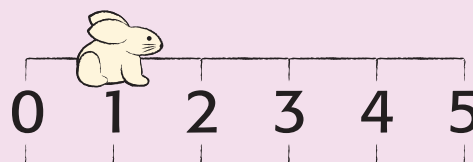
For other ways to teach about “counting on” using a number line—

- Children use 0–10 Number Lines (BLM 1) and Three Bear Family® Counters to demonstrate stories about the bear with at least two sets of steps. For example, **say:** *The bear started at three and took two steps. Then the bear took one more step.* **Ask:** *Where did it end up?*
- After children have mastered the skill of counting on using a number line, give each child two Frog Counters and one 0–10 Number Line. Then tell children where the frog started and where it ended up. Have children find out how many numbers the frog jumped.

Formative Assessment

Have children try the following problem.

The rabbit is on the number 1. If the rabbit hops four numbers, where will it land? Draw an X on the number line to show where the rabbit will land.



Try It! 10 minutes | Pairs

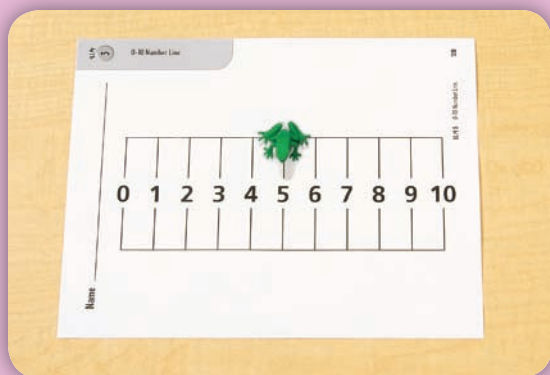
Here is a problem demonstrating counting on.

Maya's class is playing a game with a giant number line. They start at zero, a classmate tells them how many numbers to jump, and then they jump and tell where they ended up. Ken told Maya to jump 8 numbers. Where did Maya end up?

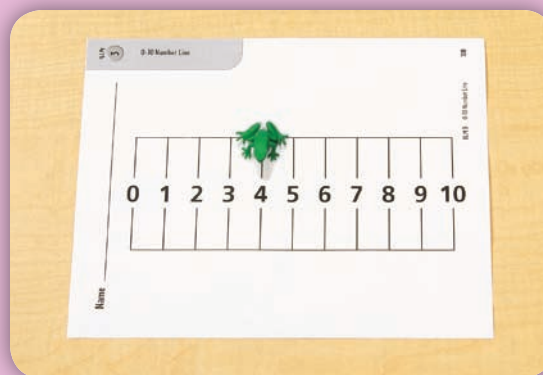
Introduce the problem. Then have children do the activity to solve the problem. Distribute Frog Counters and 0–10 Number Line (BLM 1) to children.

Materials

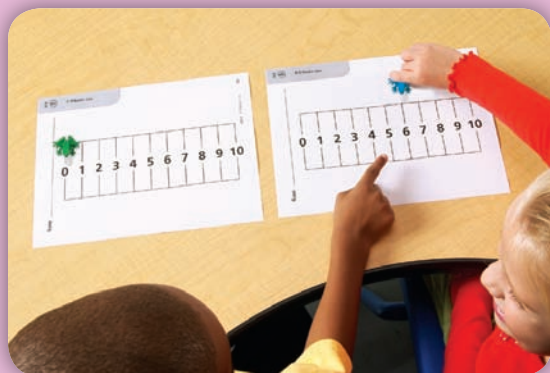
- Frog Counters (1 frog per child)
- 0–10 Number Line (BLM 1; 1 per child)



1. Have children place their frog on zero on their number line. Then have them show how their frog jumps five numbers. **Say:** *Count as your frog jumps.* **Ask:** *Where did the frog end up after jumping five numbers?*



2. Have children place their frog on number 1 on their number line. Then have them show how their frog jumps three numbers. **Say:** *Count as your frog jumps.* **Ask:** *Where did the frog end up after jumping three numbers from number 1?*



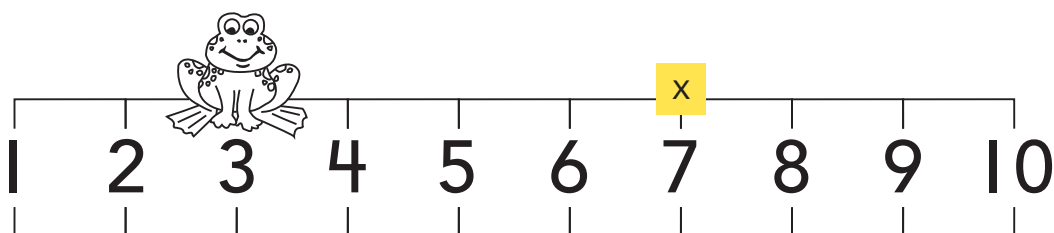
3. Instruct children to work with their partners and take turns telling where the frog should start and how many numbers it should jump. Then have children use the number line to show how many numbers the frog jumped and where it ended up.

! Look Out!

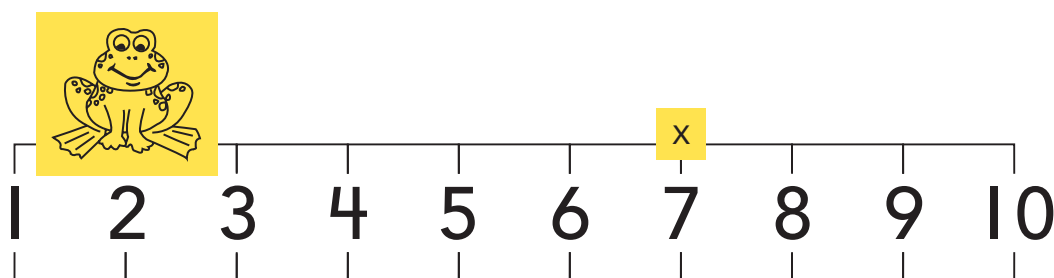
Watch out for children who start their frogs on the number 1 regardless of instructions because they are used to counting by starting with one. Remind children that they must start their frogs on the number you or their partners say and begin counting from that number.



1.



2.

**Directions**

1. The frog is on number 3. If the frog jumps four numbers, where will it land? Draw an X on the number line to show where the frog will land. 2. Place a frog on number 2. If the frog jumps five numbers, where will it land? Draw an X on the number line to show where the frog will land.



Answer Key

Check children's work.

Challenge

Draw a number line from 1 to 10. A ladybug started on number 5 and ended on number 8. Draw the ladybug's path on the number line. How many numbers did the ladybug fly?



LESSON 2

Objective

Identify a number for a group of 0 to 20 objects.

Common Core State Standards

- **K.CC.3** Write numbers from 0 to 20. Represent a number of objects with a written numeral 0–20 (with 0 representing a count of no objects). Count to tell the number of objects.
- **K.CC.5** Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects. Compare numbers.

Counting and Cardinality

Groups of 0 to 5

Representing numbers with various physical materials and relating them to number words and numerals is a major part of mathematics instruction in the early elementary grades. As children gain understanding of numbers and how to represent them, they build a foundation for understanding relationships among numbers.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- Hold up Number Card 3 (BLM 2). **Ask:** *What number is this?* **Say:** *Show me 3 fingers.* **Ask:** *How do you know how many fingers to hold up?* Repeat for the other numbers.
- **Ask:** *What does a group of zero look like?* **Say:** *Show me with your hands.*

Solve It

With children, reread the problem. Then have children pretend that they are going on a field trip. Ask them to arrange themselves in groups of 5. Have them draw a picture showing all the children in their group and label it using numerals.

More Ideas

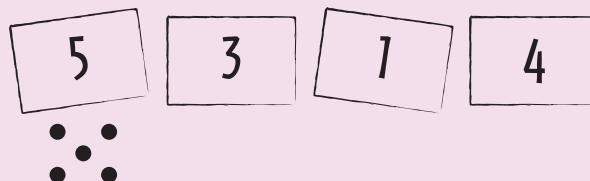
For other ways to teach about identifying and representing numbers—

- Give children instructions for making groups using specific numbers and colors of Snap Cubes®; for example, **say:** *Make a group of 14 blue cubes. Make a group of red cubes that is the same as the group of blue cubes. Make a group of 0 green cubes.*
- For children needing extra help with 0, have them count out 5 counters into a paper cup, then count backward to 0 as they remove each counter from the cup. Guide children to understand that now that there are 0 counters in the cup, the cup is empty.

Formative Assessment

Have children try the following problem.

Draw dots to match each number card. The first one has been done for you.



Try It!

30 minutes | Pairs

Here is a problem that relates to groups of 0 to 20.

The children are going to see a musical at another school. Before boarding the bus for their trip, their teacher holds up a card with the number 5 and says, "Yesterday we learned about the number 5. Before we go, I need everyone to line up in groups of 5." How will the children know what to do?

Introduce the problem. Then have children do the activity to solve the problem.

Give Snap Cubes, crayons, Number Cards (BLM 1), and 20 blank index cards to each pair of children.

Materials

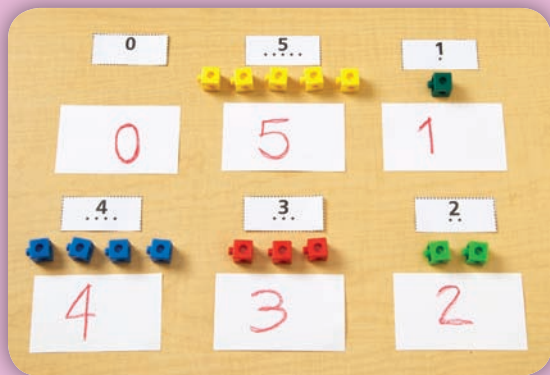
- Snap Cubes® ($\frac{1}{2}$ set per pair)
- Number Cards (BLM 2; 1 set per pair)
- index cards (20 per pair)
- crayons (1 per child)



1. Help children place the Number Cards facedown on the table. To begin, have a child from each group pick a card and make a group of cubes to represent that number.



2. Now ask the other children to check their partner's work by counting the cubes again. Have them write the corresponding numeral on a blank index card.



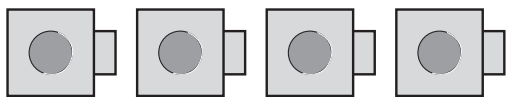
3. Have children switch roles. Encourage children to continue working until all Number Cards have been used.

Look Out!

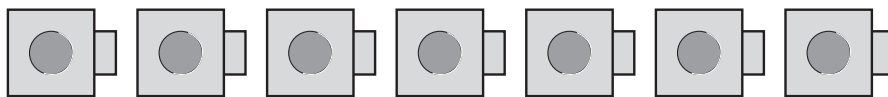
Watch for children who cannot create a group for a specific number. Have them count forward from 1 as they touch each cube. Also, watch for children who count the same cube twice. Have them line up the cubes in one row and count them from left to right.



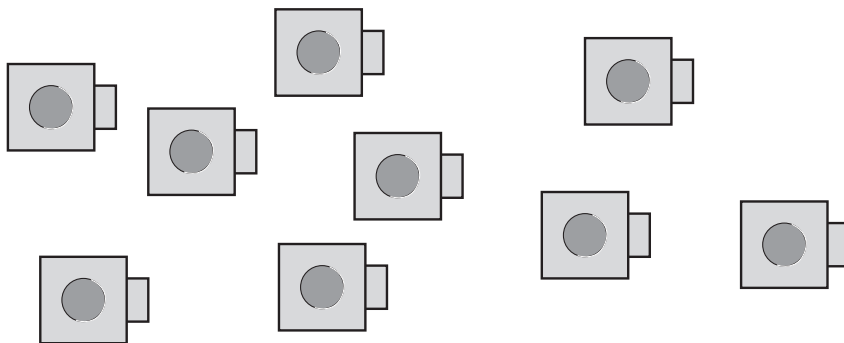
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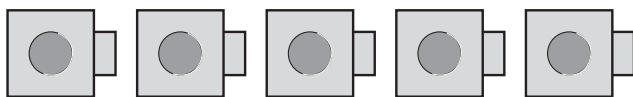
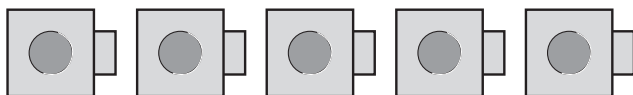
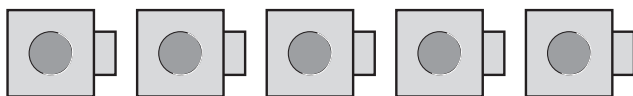


7



9

2.



15

Directions

1. Write the number for each group of cubes.
2. How many cubes are there? Write the number.

Answer Key

Check children's work.

Challenge

Draw a group of 6 yellow cubes. Draw a group of 11 green cubes. Draw a group of 0 red cubes. Write the number of yellow cubes. Write the number of green cubes. Write the number of red cubes.

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LESSON 3

Objective

Explore different arrangements of the same number.

Common Core State Standards

- **K.CC.3** Write numbers from 0 to 20. Represent a number of objects with a written numeral 0–20 (with 0 representing a count of no objects). Count to tell the number of objects.
- **K.CC.5** Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects. Compare numbers.

Counting and Cardinality

Number Shapes

In this lesson, children develop their number sense by investigating numbers in different arrangements. This kind of work provides children with an opportunity to practice their counting skills, helps children develop some visual sense about quantity as they see same-number groups arranged in different ways, and helps children to expand their number sense as they begin to realize that a group of 7, for example, is always 7 no matter how the group is arranged.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- Have children refer to one of the Number Shapes Worksheet (BLM 3) exercises.
- **Ask:** *What does Bryan's shape look like to you? How many Snap Cubes® is it made of? How do you know?* (Repeat for Tina's shape.)
- **Ask:** *How are the shapes alike? How are they different?*
- Guide children to understand that a number can be arranged in many different ways and still be the same number.

Solve It

With children, reread the problem. Then have children rebuild the shapes described in the problem with cubes and explain if Bryan's logic was correct. For enrichment, have children find several shapes for the number 5.

More Ideas

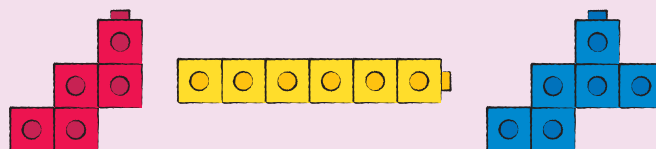
For other ways to teach about number arrangements—

- Have children build number shapes with Pattern Blocks. First, assign each child a number from 4 to 6. Then ask children to build 6 different shapes with their number of blocks. Each shape should be made with a different block shape.
- Assign pairs of children a number from 4 to 10. Give each pair a corresponding number of 1" Color Cubes. Challenge children to build as many different cube shapes as possible for their number.

Formative Assessment

Have children try the following problem.

Which two shapes have 6 cubes? Circle them.



Try It! 30 minutes | Independent

Here is a problem about number arrangements.

Mrs. Kim gave each child some Snap Cubes® to build with. Bryan connected his cubes in a line to build a long stick shape. Tina connected her cubes in the shape of the letter T. Bryan says that his shape has more cubes because it is longer than Tina's shape. Is Bryan correct?

Introduce the problem. Then have children do the activity to solve the problem.

Give 24 Snap Cubes and a Number Shapes Worksheet (BLM 3) to each child.

Materials

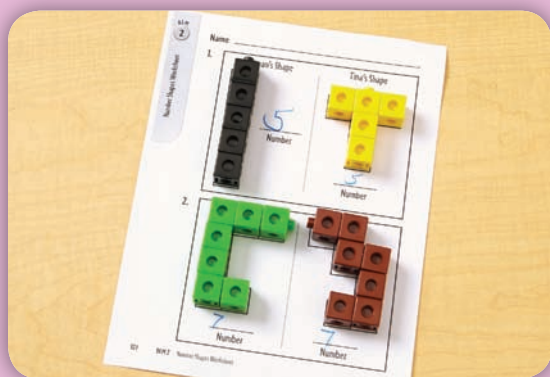
- Snap Cubes® (24 per child)
- Number Shapes Worksheet (BLM 3; 1 per child)



1. Have children build Bryan's shape in Exercise 1 on the worksheet. Ask them to count the cubes and write the number.



2. Now have children build Tina's shape in Exercise 1 on the worksheet. Ask them to count the cubes and write the number. **Ask:** Do the shapes have the same number of cubes? How can you tell?



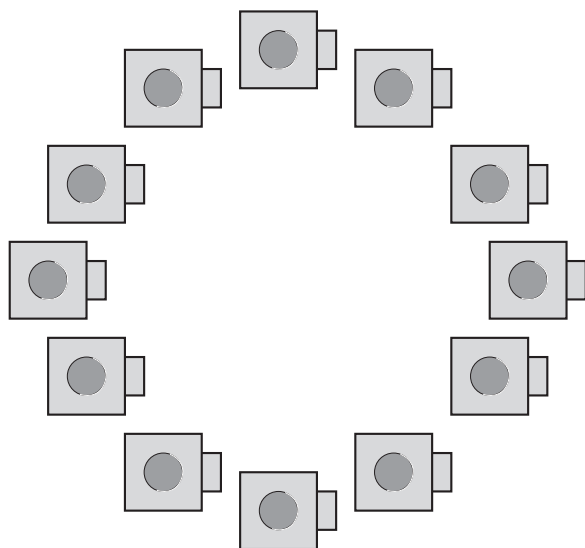
3. Have children tell how the shapes in Exercise 1 are the same and how they are different. Then have children repeat steps 2 and 3 for worksheet Exercise 2.

Look Out!

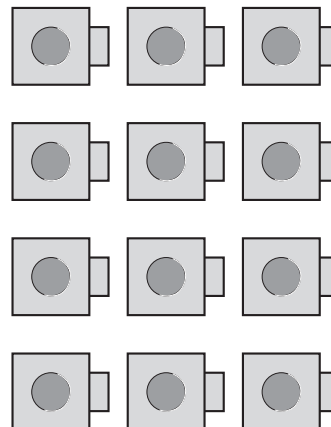
Watch for children who have difficulty understanding that the same number can "look" many different ways. Give these children 10 cubes. Have them arrange 5 cubes in 2 different ways. Then have children compare the shapes side-by-side and count the number of cubes in each shape.



1.

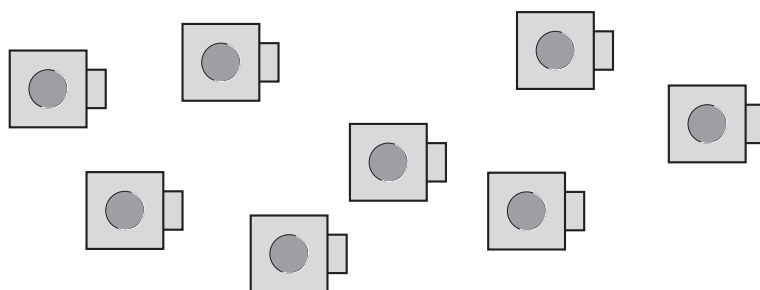


12



12

2.



8

Directions

1. Write the number of cubes in each group.
2. How many cubes are there? Write the number.

Answer Key

Check children's work.

Challenge

Count 16 cubes. Make a pattern with the 16 cubes. Draw the pattern. Write the number of cubes.

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Objective

Count forward from 0 to 5 and backward from 5 to 0.

Common Core State Standards

- **K.CC.4a** When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
- **K.CC.4b** Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
- **K.CC.4c** Understand that each successive number name refers to a quantity that is one larger.

Counting and Cardinality

Counting to 5 and Back

Counting is the foundation for children's early work with numbers. Young children can associate number words with small collections of objects and gradually learn to count and keep track of objects in larger groups. They can establish one-to-one correspondence by moving, touching, or pointing to objects as they say number words. Children should learn that the next whole number in the counting sequence is one more than the previous number, and that the last number named represents the last object as well as the total number of objects.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- Have children talk about the process of counting from 0 to 5 and back.
- **Say:** *Let's count forward from 0 to 5. Ask: What number comes after 0? What number comes next?* Continue this line of questioning until all children have repeated the counting-forward sequence.
- **Say:** *Now let's count backward from 5 to 0. Ask: What number comes before 5? What number comes before 4?* Continue this line of questioning until all children have repeated the counting-backward sequence.

Solve It

With children, reread the problem. Invite them to draw a picture of the reading corner in James's classroom. Have them draw 5 reading mats and label them with the numbers 1–5, counting as they go.

More Ideas

For other ways to teach about counting to 5 and back—

- Have children draw circles (or trace around circle Attribute Blocks) on a sheet of paper and number the circles 1–5 to represent the buttons in an elevator. Partners can take turns pressing one of the "elevator buttons" and counting forward to that number to "ride" the elevator up, then counting backward to ride down.
- Have children use three to five 1" Color Cubes to create a simple building. Then have children count the number of cubes used forward and backward.

Formative Assessment

Have children try the following problem.

Count the cubes, starting with 1. How many cubes in all?



Try It! 15 minutes | Pairs

Here is a problem that involves counting to 5 and back.

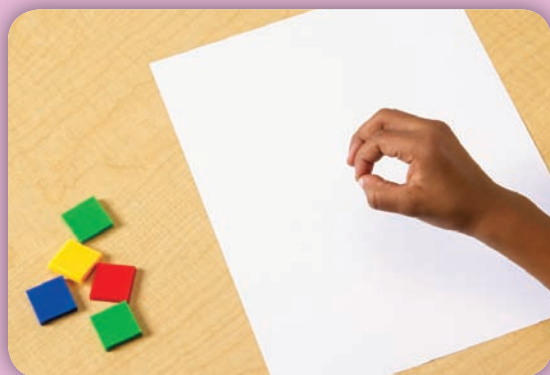
Today is James's day to put down and pick up the mats in the reading corner. There are 5 children in James's reading group. James will count forward as he puts the mats in the reading corner and count backward as he picks up the mats. Can you help James count forward to 5 and back?

Introduce the problem. Then have children do the activity to solve the problem.

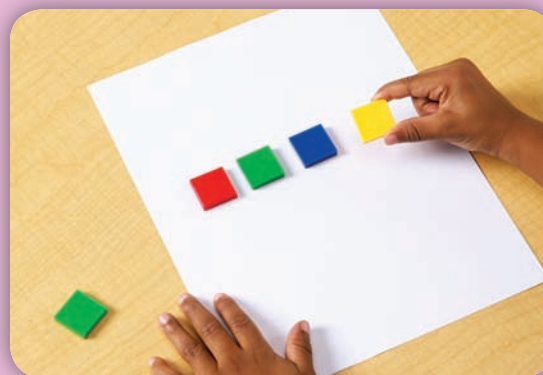
Give 5 Color Tiles to each pair of children. While displaying a tile, **say:** *Let's pretend that one of these tiles is a mat for the reading corner. The sheet of paper is the reading corner. We will place one tile on the sheet of paper for each child in James's reading group.*

Materials

- Color Tiles (5 per pair)
- paper (1 sheet per pair)



1. To begin, ask children to make a circle shape with their hands. Tell children to say "zero" to show that there are no tiles on the paper.



2. Have children say "one" as they place a tile on the paper. Then have them place the other tiles on the paper one at a time as they count: two . . . three . . . four . . . five. When children get to 5, tell them to stand up, hold up their hands, and shout "Five!"

Look Out!

Emphasize that zero means "empty" or "none." But don't expect children to understand zero right away. Out of context, it is difficult for children to think of zero as a number, but as the initial or final part of a counting-up or counting-down sequence, the idea of zero as a number makes more sense to children.



3. Now have children take the tiles off the paper one at a time as they count backward: five . . . four . . . three . . . two . . . one . . . zero. When children get to 0, ask them to stand up, hold up their hands, and shout "Blastoff!"



1.



4

2.



4

5

Directions

1. Count the tiles. Write the number of tiles. **2.** Count the tiles in each row. Write the number for each row. Which row has more tiles? How do you know?



Answer Key

Check children's work.

1

2

3

4

5

Challenge

Draw 5 boxes in a row. Count the boxes by writing the number under each.



LESSON 5

Objective

Identify a number for a group of 6 to 10 objects.

Common Core State Standards

- **K.CC.4** Understand the relationship between numbers and quantities; connect counting to cardinality.
- **K.CC.4a** When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
- **K.CC.4b** Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
- **K.CC.4c** Understand that each successive number name refers to a quantity that is one larger.
- **K.CC.5** Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects. Compare numbers.

Counting and Cardinality

Groups of 6 to 10

A key to mathematical understanding for young children is making the link between the concrete and the abstract—between physical models and written symbols. In this activity, children will represent numbers 6 to 10 by grouping objects and identifying the corresponding numerals.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- Have groups talk about their Frog Zoos. Hold up a Number Card (BLM 2). **Ask:** *How many frogs would you put in this cage?* **Say:** *Say the number. Now show me with your fingers.* Repeat for all numbers.
- Stress the words *most* and *fewest*. **Say:** *Point to the cage with the most frogs.* **Ask:** *How do you know it has the most frogs?* **Say:** *Point to the cage with the fewest frogs.* **Ask:** *How do you know it has the fewest frogs?*
- Point to a cage and hold up the Number Card. **Ask:** *What if I took one frog out of this cage? How many frogs would be left? How many would there be if I put one more in this cage?*

Solve It

With children, reread the problem. Then have children draw a picture showing 5 Frog Zoos, labeled 6 to 10. Have them draw the appropriate number of frogs in each zoo.

More Ideas

For other ways to teach about identifying and representing numbers—

- Display a Number Card (BLM 2) and have children count out a group of Snap Cubes®, Link ‘N’ Learn® Links, Three Bear Family® Counters, or other small items to match the number.
- Write the numbers 6, 7, 8, 9, and 10 in order on the board. Have children build Snap Cube towers to match the numbers. Then have them push their towers together to recreate a city skyline! Point out how the towers in the skyline get taller from left to right.

Formative Assessment

Have children try the following problem.

Count the stars. Write that number.



Try It! 30 minutes | Groups of 5

Here is a problem about identifying, reading, and representing numbers.

Tara's class is putting Frog Counters in cages to make a Frog Zoo. Each cage has a number on it to tell how many frogs to put in the cage. How will Tara know if she put the correct number of frogs in each cage?

Introduce the problem. Then have children do the activity to solve the problem.

Give Frog Counters, paper, crayons, and Number Card (BLM 2; Cards 6–10) to each group of children.

Materials

- Frog Counters (1 set per group)
- Number Cards (BLM 2; 1 set of Cards 6–10 per group)
- half-sheets of paper (5 per group)
- crayons (at least 4 per group)



1. Invite members of the group to create a "Frog Zoo" that has 5 "cages" (half-sheets of paper), each containing from 6 to 10 frogs. (One cage should have 6 frogs, one cage should have 7 frogs, and so on.)



2. Have group members count the frogs in each cage to verify that they contain only 6, 7, 8, 9, or 10 frogs.



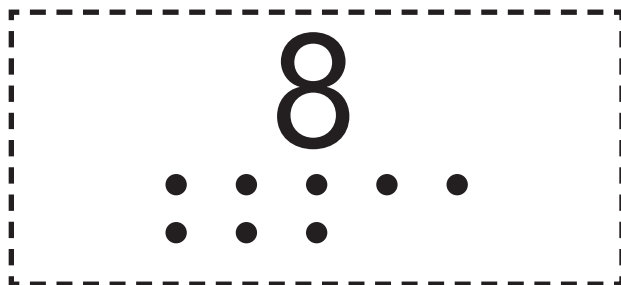
3. Have children find the number card that matches each cage. Extend the activity to include all the number cards.

! Look Out!

Watch for children who cannot create a group for a specific number. Have them count forward from 1 as they touch each item.



1.



Check children's work.

2.



9



10

Directions

1. A spider has 8 legs. Draw a spider with 8 legs. 2. Count the boxes in each row. Write the number. Which row has more boxes? How do you know?



Answer Key

Check children's work.

Challenge

Turn your paper sideways. Draw 7 flowers in a row. Count the flowers by writing the number under each.

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Objective

Estimate and count groups of objects to 10.

Common Core State Standards

- **K.CC.4** Understand the relationship between numbers and quantities; connect counting to cardinality.
- **K.CC.4a** When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
- **K.CC.4b** Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
- **K.CC.4c** Understand that each successive number name refers to a quantity that is one larger.
- **K.CC.5** Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects. Compare numbers.

Counting and Cardinality

Estimate and Count

Young children must have varied opportunities to continue to develop, use, and practice counting groups of objects. Children often use different strategies for dealing with smaller versus larger groups. For example, some children may look at a small group of objects and recognize “how many,” but they may need to physically count larger sets to find the total number of objects. The ability to recognize small groups within a larger group supports the development of visually grouping objects as a strategy for estimating quantities.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- Have children talk about how they made their estimates. **Ask:** *How can you tell when there are a lot of Link ‘N’ Learn® Links in the bag? How can you tell when there are only a few links in the bag?*
- Pass a bag containing 5 links around to the children. Let them feel the bag, shake it, and listen for sounds. **Ask:** *Do you think this bag has more than 5 links, less than 5 links, or about 5 links? What is your estimate?*
- **Ask:** *Which numbers do you think would be easy to estimate? Which numbers would be harder to estimate? Why do you think so?*

Solve It

With children, reread the problem. Have children talk about the things they would do to estimate the number of links in the bag if they were John.

More Ideas

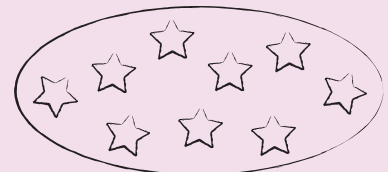
For other ways to teach about estimating and counting—

- Have children make bracelets using Link ‘N’ Learn Links. Before children start, have them get a feel for the size of 1 link. Then have them estimate how many links they think they will need to make a bracelet. Finally, have children build the bracelets and count the links. How close were their estimates?
- Have children make “estimation cups” by filling paper cups with up to 5 small objects, such as Snap Cubes® or Link ‘N’ Learn Links. Children can trade cups with other classmates and try to estimate the number of objects.

Formative Assessment

Have children try the following problem.

*How many stars do you see in the circle?
Make an estimate and then count.
How close was your estimate?*



Try It! 15 minutes | Pairs

Here is a problem about estimating and counting.

John's school is having a carnival. One stall has an estimating game. Children play by estimating how many Link 'N' Learn Links are in a paper bag without looking in the bag. How can John estimate how many links are in the bag?

Introduce the problem. Then have children do the activity to solve the problem.

Discuss the term *estimate* with children. Then give each pair a paper bag and 10 links. Pick one child in each pair to be the "Counter." The other child will be the "Estimator."

Materials

- Link 'N' Learn® Links (10 per pair)
- paper bags (1 per pair)



1. Invite the "Counters" to count out a number of links and place them in a bag. Tell these children that the number of links in the bag is a secret and they should not tell the "Estimators."



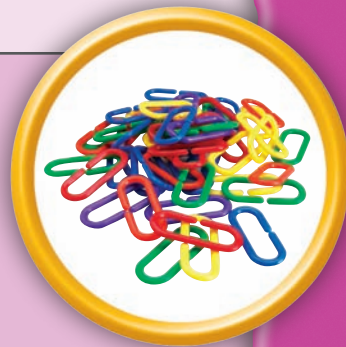
3. Have children talk about the reasons for their guesses. **Ask:** *Why did you guess that number?* Then ask the "Estimators" to empty the bag of links onto the table and count them. How close were children's estimates? Have children switch roles and repeat the activity with a different number of links.



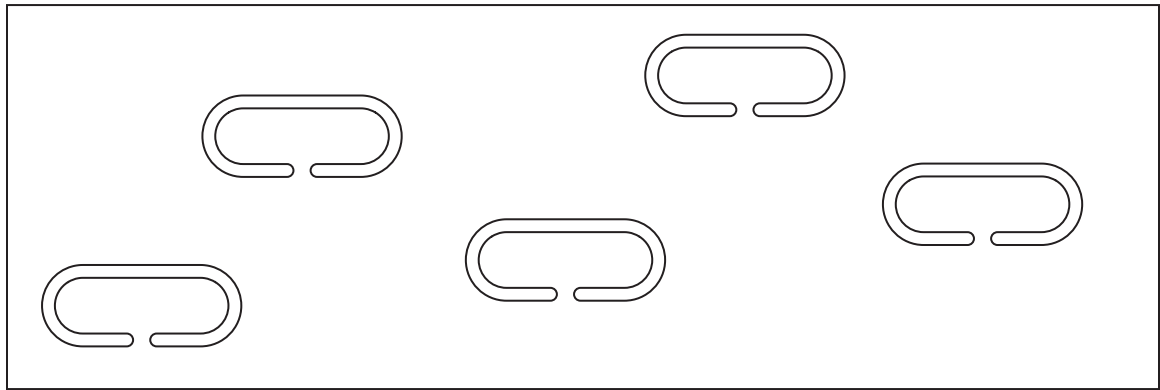
2. Ask the "Estimators" to estimate how many links are in the bag. (Have some links available for these children to use as reference.) Tell them that they can feel the bag and shake it, but not open it. **Ask:** *Can you tell how many are in the bag by quickly feeling, shaking, and listening?* **Say:** *When you think you know the number, say the number out loud.*

⚠ Look Out!

Watch for children who make unreasonable estimates. Remind these children to use the loose links as reference for their estimates.



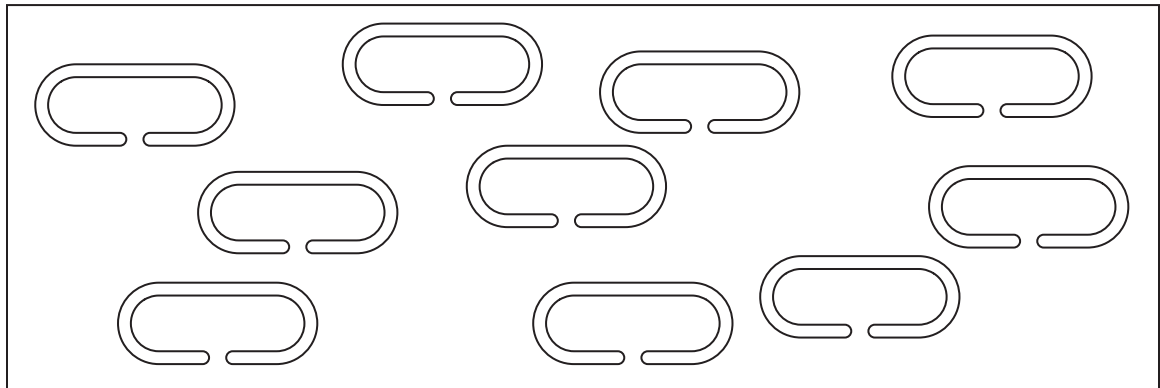
1.



Check children's work.

5

2.



Check children's work.

10

Directions

1. How many links do you see in the box? Make an estimate and write the number. Now count and write the number. How close was your estimate? 2. How many links do you see in the box? Make an estimate and write the number. Now count and write the number. How close was your estimate?



Answer Key

Check children's work.

Challenge

Place a handful of links on the table. Estimate how many links you grabbed and write the number. Then count and write the number. How close was your estimate?

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LESSON 7

Objective

Explain how the same number of objects can be arranged in different ways.

Common Core State Standards

- **K.CC.4** Understand the relationship between numbers and quantities; connect counting to cardinality.
- **K.CC.4a** When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
- **K.CC.4b** Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
- **K.CC.5** Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects. Compare numbers.

Counting and Cardinality

Arranging Sets of Objects

In this lesson, children will learn that sets of objects with the same number of items can be arranged in different ways. A set of 8 items, for example, can be arranged in rows of 3 and 5 or 2 and 6. Children also will begin to understand simple addition and number families.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- **Ask:** Did you find two different ways to arrange your Three Bear Family® counters? Have children look at one of the ten-frame arrangements.
Ask: How many counters do you have in the first row? In the second row? Have children look at the second ten-frame arrangement and answer the same questions.
- Have children compare the two arrangements. **Say:** You should have the same number of counters in both ten frames.
- Make sure children understand that no matter how the 6 counters are arranged, there are still the same number. **Say:** A number can be arranged in many ways. (For example, 5 and 1, 3 and 3, and 4 and 2.)

Solve It

With children, reread the problem. On the Ten-Frame Worksheet (BLM 4), have children draw 3 chairs on one side and 3 chairs on the other side of the first ten frame and draw 4 chairs on one side and 2 chairs on the other side of the second ten frame. Have them count the number of chairs on each ten frame. Make sure that they understand that both ten frames have 6 colored chairs and show a set of 6 items.

More Ideas

For other ways to teach about arranging sets of objects—

- Have groups of children use 1" Color Cubes to make four-cube towers. Then have children rearrange the cubes so the cubes are in a line or in a square. Point out that the different arrangements show the same number.
- Give each group a train of 9 green Snap Cubes® and an assortment of green and yellow cubes. Have children make a train of green and yellow cubes that also shows the number 9. Then have them line up the trains to reinforce the idea that the different arrangements are equal sets.

Formative Assessment

Have children try the following problem.

Circle the groups that show the same number.



Try It! 15 minutes | Pairs

Here is a problem demonstrating how to arrange sets of objects.

One of the tables in Anthony's classroom has 3 chairs on one side and 3 chairs on the other side. Another table has 2 chairs on one side and 4 on the other. How can Anthony figure out whether each table has the same number of chairs?

Introduce the problem. Then have children do the activity to solve the problem.

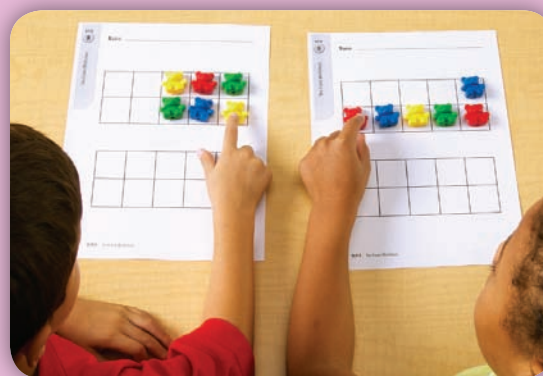
Arrange children in pairs, distribute Three Bear Family Counters (6 per child) and give each child a Ten-Frame Worksheet (BLM 4).

Materials

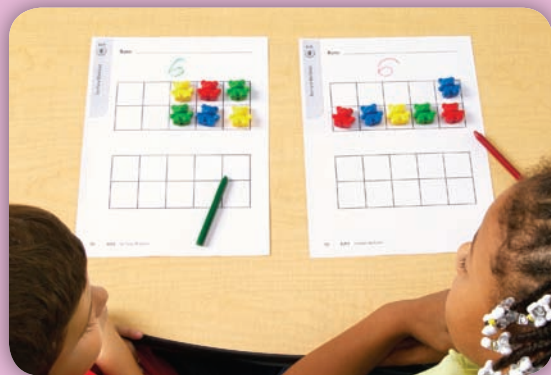
- Three Bear Family® Counters (6 per child)
- Ten-Frame Worksheet (BLM 4; 1 per child)



1. Have children count out 6 bears. Tell children that they will be showing the number 6 on their worksheets.



2. Invite children to place the bears on their worksheets. Each child should try to arrange the bears in a different way than their partner.



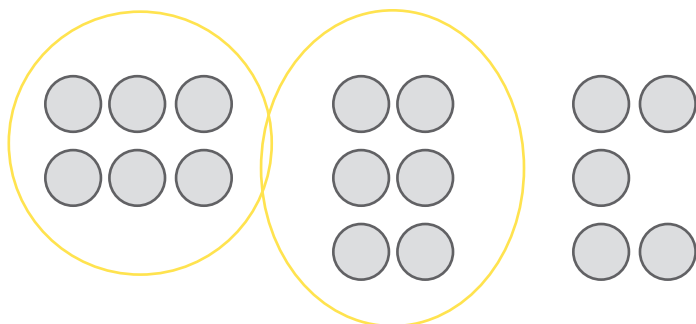
3. Ask children to write the number of bears (6) at the top of their worksheets. Have children count the bears to make sure everyone has the same number. Discuss the difference in how partners placed the bears (4 and 2, 3 and 3, or 5 and 1), but conclude that each still shows 6 bears. Repeat the activity with other numbers as time allows.

! Look Out!

Children may believe that counters arranged in a different manner represent different numbers. Be sure to count the total in each set to show that the sets contain the same number of items, despite their difference in appearance. Have children act out the concept by asking a group of 6 children to sit at a table. With the class, count the children. Then rearrange the group of 6 and count again to compare.



1.



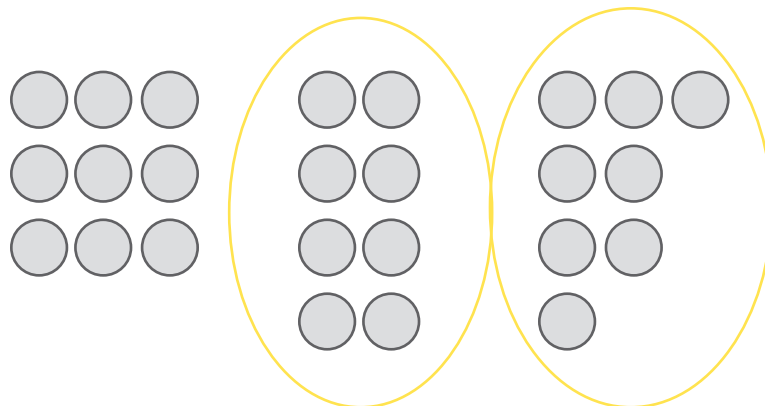
Check children's work.
(due to circling)

6

6

5

2.



9

8

8

Directions

1. Circle the groups that show the same number. Write the number of counters in each group. **2.** Circle the groups that show the same number. Write the number of counters in each group.



Answer Key

Check children's work.

Challenge

Draw 7 circles. Draw 7 circles again. This time find a different way to arrange your circles.

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Objective

Use sets of concrete objects to represent quantities given in verbal or written form through the number 9.

Common Core State Standards

- **K.CC.4** Understand the relationship between numbers and quantities; connect counting to cardinality.
- **K.CC.4a** When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
- **K.CC.4b** Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
- **K.CC.4c** Understand that each successive number name refers to a quantity that is one larger.
- **K.CC.5** Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects. Compare numbers.

Counting and Cardinality

Representing Numbers with Objects

Numbers can be represented in multiple ways. The value of the number may be represented visually by sets of objects or symbols. The number may be expressed in its verbal or written form. These forms are more abstract representations. In order for children to develop number sense and progress to more complex representations of number, such as simple equations, they must first connect these three distinct representations (sets of objects, verbal form, and written form) and understand their shared meaning.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- Have children look at their completed trays and compare to other children’s trays.
- **Ask:** *Do you know how many houses there are? How many houses did you place in each compartment?*
- **Say:** *Count the houses in your carton.*

Solve It

Ask children to draw a picture of their families. When they finish, they should write the number of people in their family, then share their pictures with the class, telling the class how many people there are.

More Ideas

For other ways to teach about representing numbers with objects—

- Have children roll a dot die, count the dots, and name the number. Have children record answers by writing the number.
- Have children play “Go Fish” with cards that have object representations. Children should count the objects, name the number, and then ask for that number from other players.

Formative Assessment

Have children complete the following activity.

Janie has 4 dogs. Draw pictures of Janie’s dogs to show how many she has, and then write the number of dogs on your picture.

Try It!

30 minutes | Pairs

Here is a problem about representing numbers.

Julio and his father counted 6 houses on their street. Julio wants to set up his toy houses to look like the houses on his street. Show how many houses he should use.

Introduce the problem. Then have children do the activity to solve the problem.

Follow the steps below to show Julio how many houses he should use.

Materials

- CounTEN® Sorting Tray (1 per pair)
- Classifying Counters (6 house counters per pair)



1. Guide children to put one house in their sorting trays. Tell children to say “one” to show there is one house.



2. Have children say “two” as they place another house in their trays.



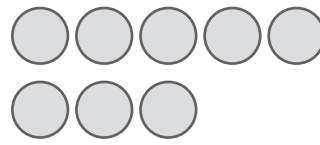
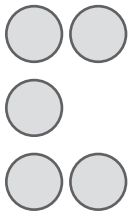
3. Have children keep putting houses in their trays until they reach six because Julio and his father counted six houses on their street.

! Look Out!

Watch for children who are not counting with a one-to-one ratio. Help these children by explaining again that one number is said for one house, then the next number for the next house, etc.



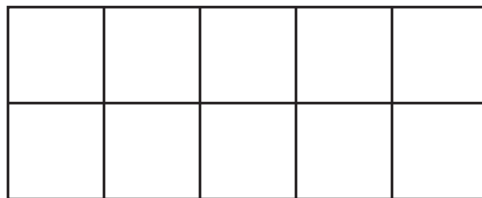
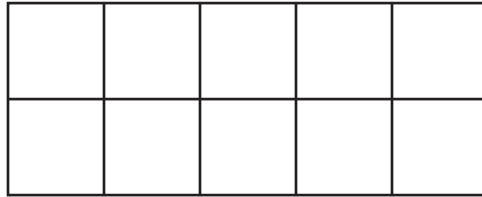
1.



5

8

2.



Check children's work.

Directions

1. Write the number for each group of counters. 2. Draw 8 counters in the first ten frame. Draw 8 counters in a different way in the second ten frame.



Answer Key

Check children's work.

Challenge

Dan has 6 toy cars. Draw a picture of Dan's cars. Then write the number of cars on your picture.

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LESSON 9

Objective

Compare groups of 1 to 10 objects.

Common Core State Standards

- **K.CC.6** Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.

Counting and Cardinality

Comparing Groups

This lesson extends children's investigations of numbers to 10 and takes on the additional focus of comparison. Children will count but will also be engaged in comparing two groups. Children will find that there are lots of ways to talk about how two groups compare.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- Have two volunteers come to the front of the class to demonstrate the game they played during the Try It! activity.
- After the pair picks their cards, have them display to the class the card showing the number of blankets and the card showing the number of Three Bear Family® Counters to the class. **Say:** *Make a guess.* **Ask:** *Do you think the number of blankets is less than the number of bears? More than the number of bears? The same as the number of bears? Why did you make that guess?*
- Then have volunteers set up the actual number of blankets and seat the bears. **Ask:** *Is the number of blankets less than the number of bears? More than the number of bears? The same as the number of bears? Was your guess correct?*

Solve It

With children, reread the problem. Tell children that they are the bears and that they will be using sheets of construction paper for blankets. Invite two volunteers to be in charge of picking the cards. Encourage children to make a guess about the number of blankets and the number of bears. Select the number of volunteers required by the "bears" card. Have children set up the correct number of blankets and seat themselves to check their guesses.

More Ideas

For other ways to teach about comparing groups—

- Have children use Link 'N' Learn® Links to create two chains of different sizes. Have them compare the two chains using the terms *more than* or *less than*.
- Have each child in a pair pull a handful of Snap Cubes® from a paper bag filled with cubes. Then have children count the cubes, compare the groups, and describe the groups using the terms *less than*, *more than*, or *same number*.

Formative Assessment

Have children try the following problem.

Is the number of squares less than, more than, or the same as the number of bears?



Try It!

30 minutes | Pairs

Here is a problem about counting and comparing groups.

Tara's class is playing a game. They pick a number to show how many blankets and a number to show how many Three Bear Family Counters. Then they seat the bears on the blankets. Sometimes there will be enough blankets, and sometimes there won't. Do you think the number of blankets is less than the number of bears? Do you think the number of blankets is more than the number of bears? Do you think the number of blankets is the same as the number of bears?

Introduce the problem. Then have children do the activity to solve the problem. Tell children to pretend that the Color Tiles are blankets. Distribute bears, tiles, and Number Cards (BLM 2; cards 1–10) to each pair.

Materials

- Three Bear Family® Counters (10 per pair)
- Color Tiles (10 per pair)
- Number Cards (BLM 2; 2 sets of cards 1–10 per pair)



1. Instruct children to mix up the cards and place them facedown in a stack. Have partners decide who will set up the blankets (tiles) and who will seat the bears on the blankets. Ask each child to draw a card (one for blankets and one for bears).



2. Have children identify the number of blankets and bears and make a guess about whether the number of blankets is less than, more than, or the same as the number of bears. Then have children count out the number of blankets and bears to show each group.



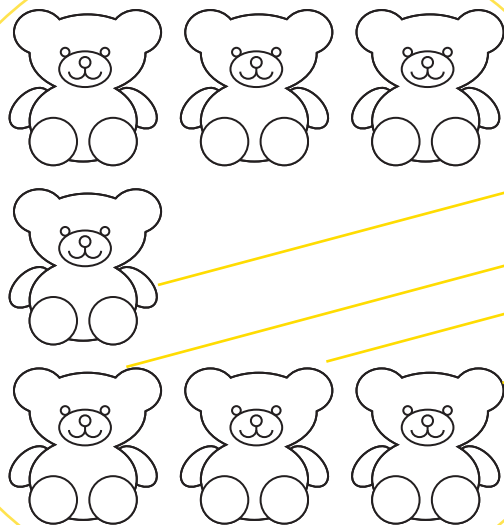
3. Instruct partners to set up the blankets and seat the bears. Ask children to compare the groups and decide whether the number of blankets is less than, more than, or the same as the number of bears.

Look Out!

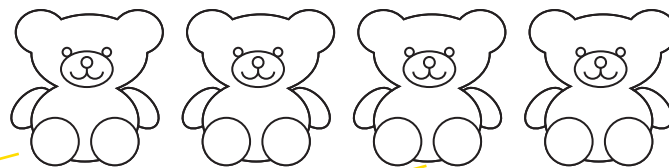
Some children may be more focused on seating bears and making sure that all bears have a blanket instead of comparing groups. Have these children line up the bears in front of the blankets to show the one-to-one correspondence. This way, children will more easily identify whether the number of blankets is less than, more than, or the same as the number of bears.



1.



7



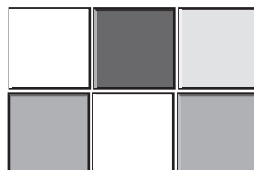
Check children's work.

4

2.



5



6

Directions

1. Write the number for each group of counters. Draw a line matching a bear from one group to the other group. Circle the group that has the greater number of bears. **2.** Write the number for each group of tiles. Circle the group that is less than the other group.



Answer Key

Check children's work.

Challenge

Draw a group of bears that is greater than 4. Write the number of bears you drew.

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LESSON 10

Objective

Match objects using one-to-one correspondence to demonstrate equal groups.

Common Core State Standards

- **K.CC.6** Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.

Counting and Cardinality

Equal Groups

Having had a certain amount of rote-counting practice, children should be ready to develop an understanding of the relative magnitude of whole numbers. They practice this skill by matching and comparing groups of objects using one-to-one correspondence.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- **Say:** Remember, we use the math word *equal* to describe two groups that have the same number.
- **Ask:** How can you tell when two chains have the same, or an equal, number of Link 'N' Learn® Links?
- **Say:** Here are two chains that have different numbers of links. (Display two chains, one made of 3 links and the other made of 4 links.) **Ask:** What could you do to make these two the same or equal?

Solve It

With children, reread the problem. Have children draw a picture showing the players on the two kickball teams. Have children draw lines to match the children in the picture, using one-to-one correspondence.

More Ideas

For other ways to teach about equal groups—

- Have children draw a straight line across a sheet of paper to create two workspaces. Have them make a line of 5 Snap Cubes® in each workspace. Ask children to draw lines to match one-to-one the cubes in each group.
- Have children arrange three 1" Color Cubes of one color in a line, then place three cubes of another color on top of the first ones. Have children confirm that the second group has the same number of cubes as the first.

Formative Assessment

Have children try the following problem.

Draw a chain that has an equal number of links as this one.



Try It! 15 minutes | Pairs

Here is a problem about equal groups.

Children in Mr. Smith's class are playing kickball at recess. Josh, Tara, Stacey, Juan, and Brian are on Team 1. Phil, Marcia, Ivette, Billy, and Ling are on Team 2. Do the teams have an equal number of children?

Introduce the problem. Then have children do the activity to solve the problem.

Discuss the term *equal*. Tell children that two groups that have the same number of objects are *equal*. Point out specific examples of equal groups of objects or people. Distribute Link 'N' Learn Links to each pair.

Materials

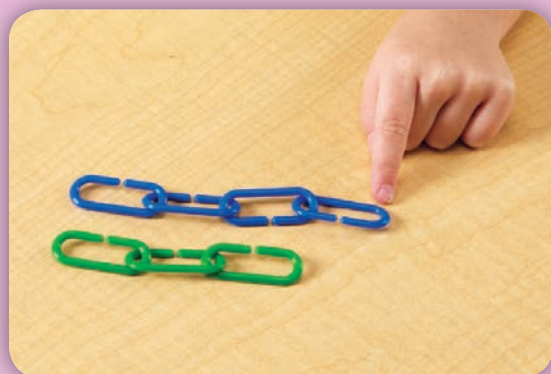
- Link 'N' Learn® Links (10 per pair in 2 colors)



1. Ask children to pretend that the links are children on the kickball teams. Have one child in each pair make a chain of up to 5 links, using one color of link.



2. Now ask the other child in each pair to make an equal chain using a different color. Have partners check each other's chains to verify that the chains have an equal number of links.



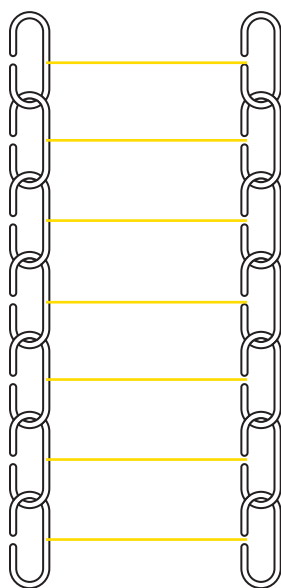
3. Extend the activity by having each partner independently make a new chain with up to 5 links. Have partners compare their chains and count the links to reinforce the concepts of *more*, *fewer*, and *equal*.

⚠ Look Out!

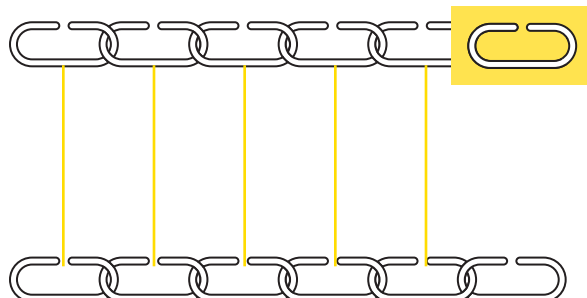
Watch for children who cannot determine whether the chains have an equal number of links. Have these children align the chains and match the links one-to-one.



1.



2.



Check children's work.

Directions

1. Draw lines to match each link in one group to a link in the other group. 2. Draw lines to match each link in the top group to one link in the bottom group. What could you do to make the groups equal?



Answer Key

Check children's work.

Challenge

Draw a chain of links in the top space. Draw a chain with the same number of links in the bottom space. Draw lines to match the links to show the groups are equal.

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Objective

Identify and create groups that have one more object than another group.

Common Core State Standards

- **K.CC.6** Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.

Counting and Cardinality

More and Fewer

Relative value is an important concept of number sense. By learning the concepts *more* and *fewer*, children begin to use the language of mathematics to compare quantities. This understanding lays the foundation for beginning addition and subtraction skills.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- **Say:** *I have two equal Snap Cube® trains. (Display two equal cube trains, 1 red and 1 yellow. Remind children that when two groups have the same number, they are equal.) I'm going to connect another cube to the red train. Ask:* Are the trains equal now? How do you know?
- **Say:** *Tell me about the red train. Ask:* Does it have more cubes, fewer cubes, or the same number of cubes as the yellow train? **Say:** Show me how you can tell.
- **Say:** *Now tell me about the yellow train. Ask:* Does it have more cubes, fewer cubes, or the same number of cubes as the red train? How do you know?

Solve It

With children, reread the problem. Have children draw a picture showing Maria's building blocks and Jordan's building blocks. Have them write the number of blocks next to each group. Ask children to explain their drawings, using the terms *more* and *fewer*.

More Ideas

For other ways to teach about *more* and *fewer*—

- Have each child in a pair pull a handful of Snap Cubes from a bag. Children can count the cubes and compare the groups to establish *more*, *fewer*, or *equal*.
- Let small groups of children build three long chains of Link 'N' Learn® Links. When groups are finished, they can compare the chains. Which chains are equal? Which chain has more links than the other two chains? Which chain has fewer links than the other two chains?

Formative Assessment

Have children try the following problem.

Draw a new train that has 1 more cube. Tell how you know the new train has 1 more.



Try It! 15 minutes | Pairs

Here is a problem about *more* and *fewer*.

The children in Mr. Byrd's class are having fun making buildings with the new building blocks. Each one wants to have more of the new blocks than anyone else. Maria says she has 4 new blocks. Jordan says he has one more block than Maria. How can Maria find out the number of blocks Jordan has?

Introduce the problem. Then have children do the activity to solve the problem.

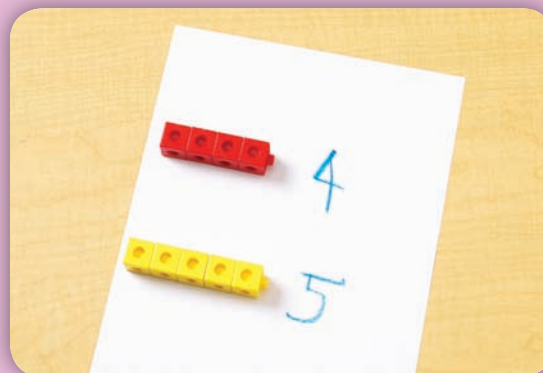
Give 5 Snap Cubes of one color and 5 cubes of another color to each pair of children.

Materials

- Snap Cubes® (10 per pair)



1. Have one child in each pair make a train of 4 cubes. Ask their partners to make an equal train using a different color. Have children line up the second train below the first.



2. Tell children to add a cube to the bottom train. Then have children count the cubes in each train and write the numbers. **Ask:** *Are the trains the same or different? Which train has one more cube than the other? How do you know? Which train has one fewer cube? How do you know?*



3. Say: *Now I want you to make the trains equal. Show me how to do this.* Children should add one cube to the top train so both trains have an equal number of cubes.

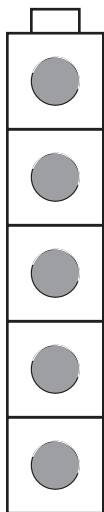
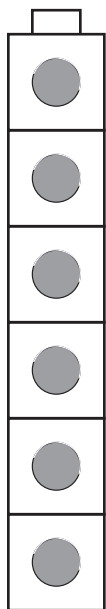
! Look Out!

Some children may confuse the terms *more*, *fewer*, and *equal*. Reinforce these terms throughout the day by pointing out that *more* children are in their chairs than are sitting on the floor, that there are *fewer* red cubes in the trains than yellow cubes, and that each child in the class gets an *equal* amount of food for a snack. Remind children that *equal* means *same*.

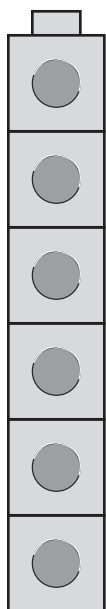


Check children's work.

1.



2.



Directions

1. Color the group that has 1 more cube. 2. Draw a new train that has 1 more cube. Draw lines to match the cubes in each group and show that your train has 1 more.

Answer Key

Check children's work.

Challenge

Pick a handful of cubes from a bag. Make a train and draw it in the top half of the work space. Draw a train with 1 less cube in the bottom space. Draw lines to match the cubes and show that the bottom train has 1 less cube.

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Objective

Use one-to-one correspondence and language such as *more than*, *less than*, or *same number as* to describe relative sizes of sets of concrete objects.

Common Core State Standards

- **K.CC.6** Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.

Counting and Cardinality

More Than, Less Than, Same As

One way to compare the value of two numbers is to represent each number as a set of objects and then line up the two sets and compare using one-to-one correspondence. This strategy makes the difference in value visible as a difference in size or length of the set. The relative value of the two numbers represented can then be described as one number being more than, the same number as, or less than the other number.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- Have children look at their completed trays.
- **Ask:** *How many houses did you put in the tray to show Daniel's block?*
- **Ask:** *How many houses did you put in the tray to show Maya's block?*
- **Ask:** *How do you know which block has more houses?*

Solve It

Have children take out the row showing the houses on Daniel's block, but leave the row showing the houses on Maya's block. Then, have children show a group of houses less than the number on Maya's block. Have children explain how they know their new group has less than the number on Maya's block.

More Ideas

For other ways to teach about relative value of objects—

- Have a pair of children each roll a dot die at the same time. Then they count the dots, compare the values, and name the number. Children could play a game in which the child rolling the greater number earns a point.
- Have children use Snap Cubes® to represent two different numbers, and line up the stacks to see which is more than or less than. Children should describe the relative size aloud.
- Have each child in a pair gather several 1" Color Cubes. Have them match up each to show a one-to-one correspondence. Children should determine if their partner has more than, less than, or the same number of cubes as they have.

Formative Assessment

Have children complete the following activity.

Chelsea has 4 dogs. Felipe has 4 dogs. Does Chelsea have more dogs, less dogs, or the same number of dogs as Felipe? Explain how you know.

Try It! 30 minutes | Pairs

Here is a problem about comparing number values.

Daniel has 5 houses on his block and Maya has 4 houses on her block. Whose block has more houses?

Introduce the problem. Then have children do the activity to solve the problem.

Say: *Follow the steps below to determine who has more houses on their block.*

Materials

- CountEN® Sorting Tray (1 per pair)
- Classifying Counters (9 house counters per pair)



1. To begin, have children show the number of houses on Daniel's block. Have children put 5 houses on one side of the sorting tray, counting each one as they place it in its position.



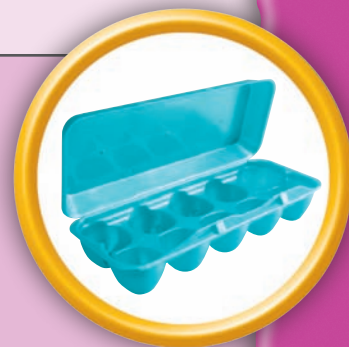
2. Have children show the number of houses on Maya's block. Children should put 4 houses on the other side of the tray, counting each one as it is placed in the correct position.



3. Children should look at the two rows. Have them determine which is longer. **Ask:** *Whose block does that row represent?*

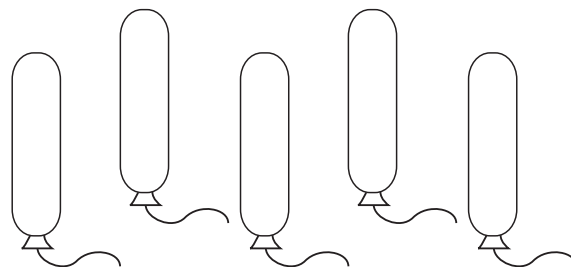
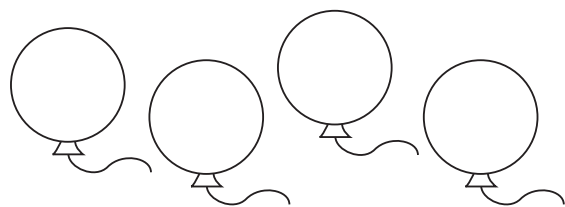
! Look Out!

Watch for children who are not placing objects in separate rows to distinguish between the sets of numbers. Help them by explaining that Daniel and Maya have different blocks, so the houses on Daniel's block are shown on one side, and the houses on Maya's block are shown on the other side.

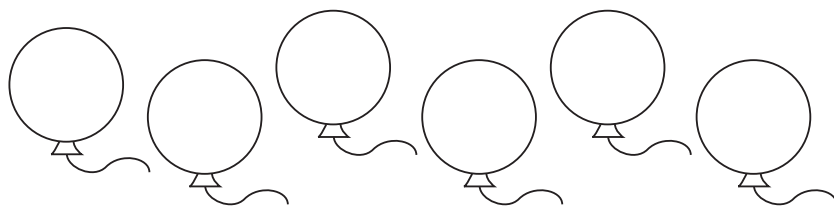


Check children's work.

1.



2.



Directions

1. Color the group that has 1 more balloon. 2. Draw a group of balloons that has 1 less balloon.



Answer Key

Check children's work.

Challenge

Pick a handful of cubes from a bag and count the cubes. Draw that many balloons in the top space. Draw the same number of balloons in the bottom space. Draw lines to match the balloons and show that the groups are equal.

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LESSON 13

Objective

Explore the order of numbers 1 to 5.

Common Core State Standards

- **K.CC.6** Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.
- **K.CC.7** Compare two numbers between 1 and 10 presented as written numerals.

Counting and Cardinality

Order of Numbers

Although many young children are able to count, often they have not yet developed an understanding of what the numbers mean. It is important that children develop a one-to-one correspondence between numbers and sets of objects. By learning and practicing this concept, children also learn the concept of sequencing, or order.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- **Say:** Let's count to 5. **Ask:** What number do we say first when we count? **Say:** Make a chain that shows 1. **Ask:** What number comes after 1? **Say:** Now make a chain that shows 2. **Ask:** How do you know that 2 comes after 1?
- Repeat this line of questioning for other numbers. Elicit from children that, when counting forward by ones, each number is one more than the number before it. Use the links to reinforce this concept.

Solve It

With children, reread the problem. Then take the class out to the playground. Divide children into pairs, and give each pair some chalk and Link 'N' Learn® Links. Help pairs draw hopscotch patterns. Have children solve the problem by numbering the boxes in order from 1 to 5. Then let children play hopscotch using the links as markers.

More Ideas

For other ways to teach about the order of numbers 1 through 5—

- Have children use Snap Cubes® to make one train for each number from 1 to 10. Have them use one color for each train. Then have them line up the trains in order from 1 to 5.
- Provide one set of Number Cards (BLM 2; cards 1–5) and counters at a center. Instruct children to make sets of objects to match each number. Children can place counters on the dots for self-checking and reinforcement. Extend the activity by providing a reverse order of numbers (5, 4, 3, 2, 1) and a mixed order of numbers (for example, 2, 1, 3, 5, 4).

Formative Assessment

Have children try the following problem.

Which set of dots is in order from 1 to 3? Circle it.

- A. ● ● ● ● ● ● B. ● ● ● ● ● ●

Try It! 15 minutes | Pairs

Here is a problem about number order.

At recess, Jenna's teacher drew a hopscotch pattern on the sidewalk. She asked Jenna to number the boxes from 1 to 5. This is how Jenna numbered the boxes. Jenna's teacher asked her why she ordered the numbers this way. Jenna said that 2 is one more than 3, so it comes after. Is Jenna correct?

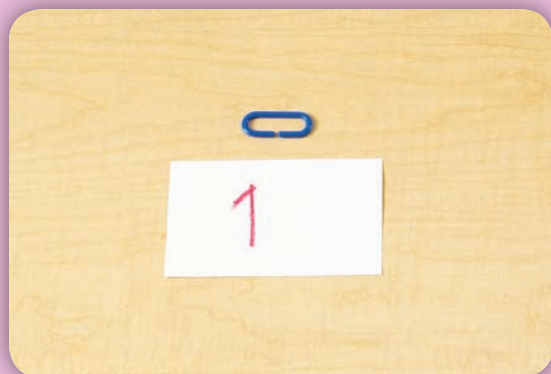
5
4
2
3
1

Introduce the problem. Then have children do the activity to solve the problem.

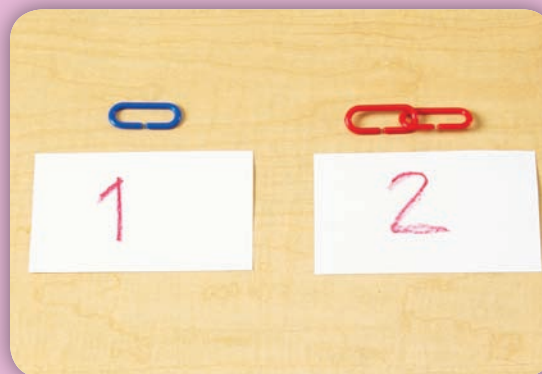
Give a set of index cards and 15 assorted Link 'N' Learn® Links to each child. Children will need enough of an assortment so that they can build chains using five different colors.

Materials

- Link 'N' Learn® Links (15 per pair)
- index cards (5 per pair)
- crayons



1. Have children make and place a card with the number 1 in front of them. Ask children to build a chain made of one link and place it above the card.



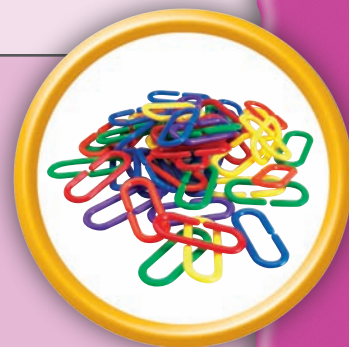
2. Now have children build a different-color chain that has one more link than the first chain. Have them place this second chain near the first chain for comparison. Ask children to make a number card that matches and place it below the new chain.



3. Using different colors for each chain, have children make cards and build chains for the numbers 3–5. Then guide children to order the numbers and chains like the vertical hopscotch pattern.

! Look Out!

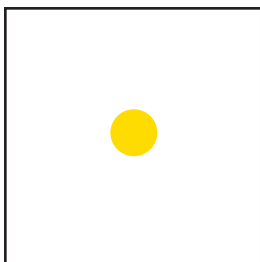
Children may have difficulty matching the numbers to the corresponding sets. Encourage children to count the items in the set, touching each item as it is counted. Remind them that the last number they say when counting is the name for that set. For children still struggling, provide "landing spots," such as small circles, in which children can place links before connecting them below number cards.



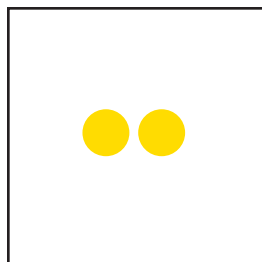
Check children's work.

1.

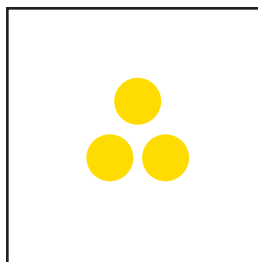
1



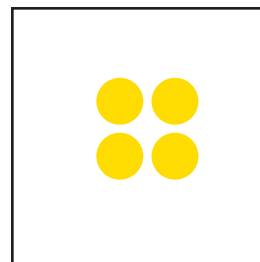
2



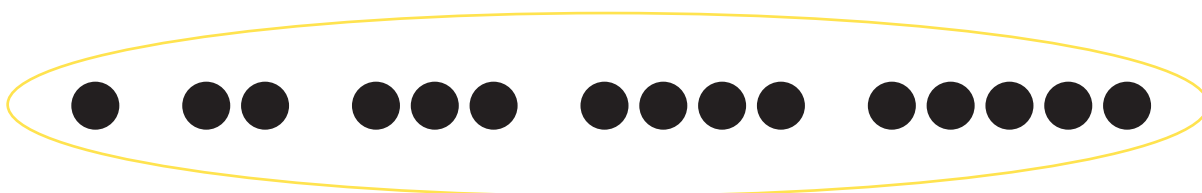
3



4



2.

**Directions**

1. Draw a set of dots in each box to match the number above the box. 2. Circle the set of dots that is in order from 1 to 5.



Answer Key

Check children's work.

Challenge

Write the number that comes after 4. Draw a set of dots for the number you wrote.

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