Operations and Algebraic Thinking

In Kindergarten, children use numbers to solve quantitative problems. They choose, combine, and apply effective strategies for answering quantitative questions. Children represent addition and subtraction with objects in many ways–by using fingers, drawings, rhythms, role-play situations, and equations–to learn that objects can be joined (addition) and separated (subtraction). At this stage, they focus on the concepts of joining and separating, not on reading and solving addition and subtraction equations with related symbols (+, –, =).

More specifically, Kindergarteners decompose numbers less than or equal to 10 into pairs in more than one way. They develop an understanding of part-whole relationships as they recognize that a set of objects can be broken into smaller subsets and remain the same total amount. Breaking apart a set (decomposing), children use the understanding that a smaller set of objects exists within that larger set (inclusion).

Kindergarteners solve addition and subtraction word problems to add and subtract within 10. For any number from 1 to 9, children find the number that makes 10 when added to the given number. They build upon the understanding that a number less than or equal to 10 can be decomposed into parts to find a missing part of 10. They use four types of problem-solving strategies to solve such problems: add to result unknown, take from result unknown, put together/take apart total unknown, and put together/take apart addend unknown.

The Kindergarten Common Core State Standards for Operations and Algebraic Thinking specify that children should–

- Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

The following hands-on activities give children opportunities to model simple joining and separating situations and to begin to develop fluency in addition and subtraction within 5. Children develop fluency when they internalize the relationships between and among numbers and children demonstrate fluency when they show accuracy, efficiency, and flexibility.

Operations and Algebraic Thinking

Contents

LESSON 1

Objective

Solve joining problems by combining two groups to make a larger group (part-part-whole addition).

Common Core State Standards

- **K.OA.1** Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
- **K.OA.2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

Operations and Algebraic Thinking

Joining Problems

Being able to join, or put together, two sets of objects and recognize that the sum of the combined set is greater than either of the sets alone is one of the most important concepts children will learn. In the future, subtraction will be introduced as the opposite of addition, and multiplication will be introduced as repeated addition.

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

Talk About It

Discuss the Try It! activity.

- Make sure children understand that joining is the same as putting together or adding two groups. While discussing the activity, emphasize the following terms: *join, put together, add, in all,* and *all together.*
- **Ask:** *When you join or add two groups, how do you find the number in all?*
- **Ask:** *When you join or add two groups, are there more or fewer in the number in all?* **Say:** *Explain how you know.*

Solve It

With children, reread the problem. Have children draw a picture showing 2 children on the swings and 1 child on the slide. Have children number the children in the picture to show that there are a total of 3 children. **Ask:** *How did you find the number of children in all on the playground?*

More Ideas

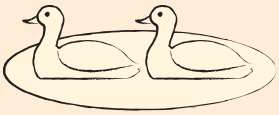
For other ways to teach about joining problems—

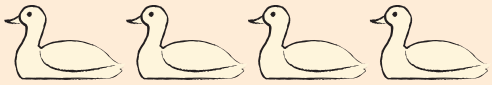
- Have children make chains of 3 blue Link 'N' Learn® Links. Then have them add 3 red links to the chain. Ask children how they can find the number in all. Repeat with different numbers of links.
- Have children work with a partner. Have one partner make a train of 3 green Snap Cubes®. Have the other partner make a train of 2 yellow cubes. Instruct children to join their trains and tell how many cubes they used to build their trains in all. Repeat with different numbers of cubes.

Formative Assessment

Have children try the following problem.

There are 2 ducks inside the pond. There are 4 ducks outside the pond. How many ducks are there in all?





Try It! 15 minutes | Independent

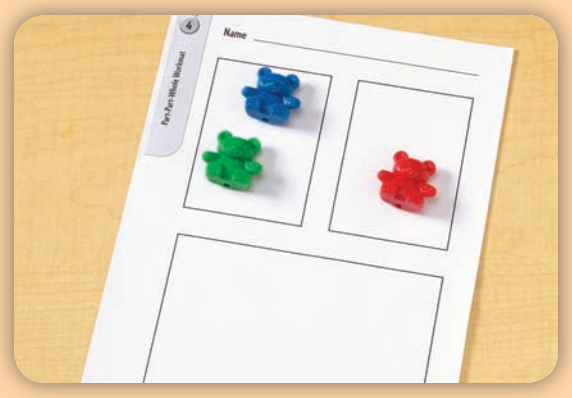
Here is a problem about joining two groups together.

There were 2 children playing on the swings at recess. There was 1 child playing on the slide. How many children were on the playground in all?

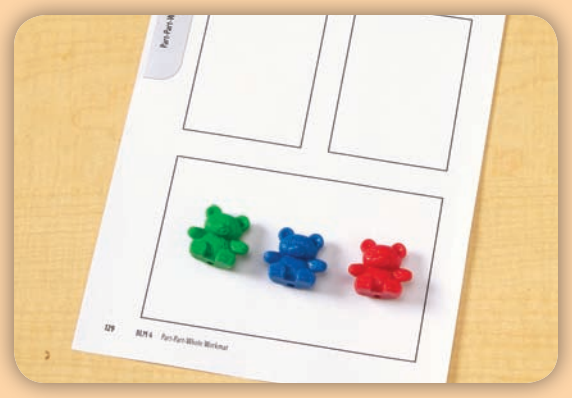
Introduce the problem. Then have children do the activity to solve the problem. Distribute 5 Three Bear Family Counters and one copy of the Part-Part-Whole Workmat (BLM 5) to each child.

Materials

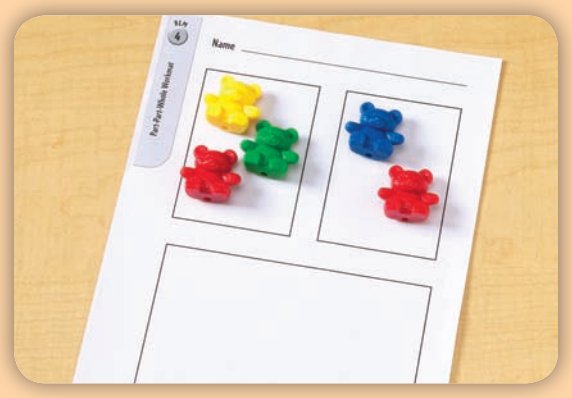
- Three Bear Family® Counters (5 assorted counters per child)
- Part-Part-Whole Workmat (BLM 5; 1 per child)



1. Have children put 2 Bear Counters in one of the small parts on their workmats. Then have children put 1 bear in the other small part on their workmats. Have children count the number of bears in each small part on their workmats.



2. Instruct children to move all of the counters from the small parts on their workmats to the large, or whole, area. Invite children to count all of the bears together in the whole area aloud with you. **Ask:** *How many bears are there in all?*



3. Have children put 3 Bear Counters in one of the small parts on their workmats and 2 bears in the other small part. Then have children move all of the bears together into the whole area on their workmats and count to find the number of Bear Counters in all.

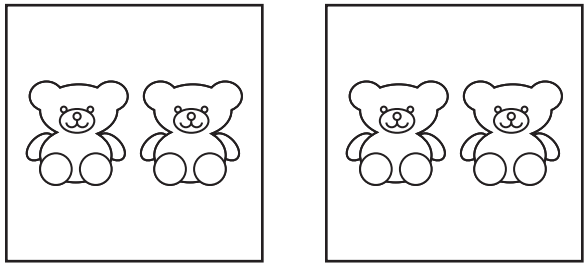
⚠ Look Out!

Children may try to tell the number of bears in only one of the groups. Remind children that they must join, or put together, the groups in the large section and count all of the bears to find how many there are in all.

Answer Key

Check children's work.

1.



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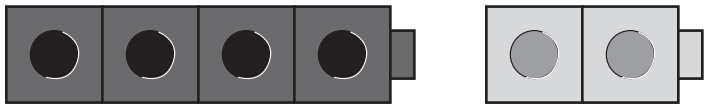

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Directions

1. Two bears are making lunch. Two bears are setting the table for lunch. How many bears are there in all? Use Bear Counters. Model the groups. Write the number of bears in all. **2.** Use Snap Cubes®. Build the trains. Join the trains. How many cubes in all? Write the number.

Answer Key

Check children's work.

Challenge

Two bears are playing in a sandbox. Three bears join them. How many bears in all are playing in the sandbox? Use Bear Counters. Model the groups. Draw the groups. Write the number of bears in all.

LESSON 2

Objective

Identify the plus sign and use it to show addition.

Common Core State Standards

- **K.OA.1** Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
- **K.OA.2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.
- **K.OA.5** Fluently add and subtract within 5.

Operations and Algebraic Thinking

Using the Plus Sign

Children must learn to recognize the plus sign and recall that it indicates addition. When children solve word problems, the plus sign might not be present. Because of this, children need to learn that words and phrases, such as *join, put together, add, in all,* and *all together,* are clues to addition.

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

Talk About It

Discuss the Try It! activity.

- During your discussion, emphasize the following terms that indicate addition: *join, put together, add, in all,* and *all together.*
- Display a plus sign. **Ask:** *What do we call this sign? What does the plus sign tell you to do? How do you know when to use the plus sign?*
- **Say:** *Martin has four blocks. Tina has two blocks.* **Ask:** *How many blocks do they have in all? What do the words "in all" tell you to do? What numbers would you use to show this problem?* Have children write the addition sentence.

Solve It

With children, reread the problem. Give each child a new copy of the Part-Part-Whole Workmat (BLM 5). Tell children to draw 3 green books in one "part" and 2 yellow books in the other "part." Have children draw a plus sign between the two groups. Then have children draw 3 green and 2 yellow books in the "whole" section and count to find the number in all.

More Ideas

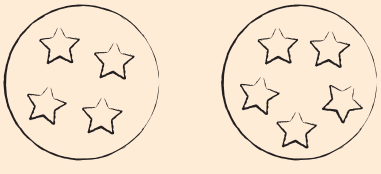
For other ways to teach about using the plus sign—

- Draw two large squares with a plus sign between them on a piece of construction paper. Have children use this as a workmat to solve addition problems with Frog Counters. Introduce a simple problem such as "Tony found 3 yellow frogs and 1 red frog. How many frogs did he find in all?"
- Using the above workmat, two colors of Snap Cubes®, and one set of Number Cards (BLM 2; Cards 0–5) per pair, have children make up and solve addition problems. Each child will pick a Number Card and place that number of their color of cubes in one of the squares on the mat. Together, they will join the groups to make a train and count the total number of cubes.

Formative Assessment

Have children try the following problem.

Draw a plus sign between the two circles. Write the number of stars in all.



Try It! 15 minutes | Independent

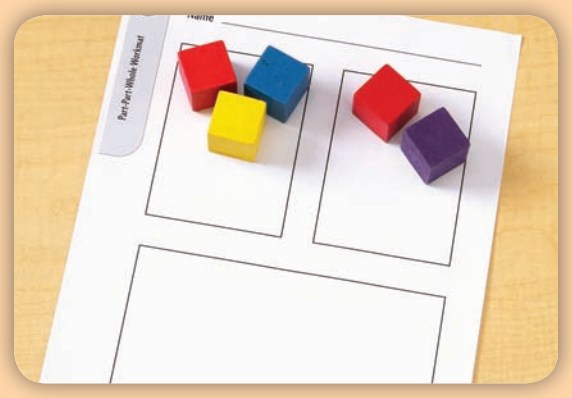
Here is a problem involving addition using the plus sign.

Makayla's teacher read 3 stories to the class before snack time. After recess, her teacher read 2 stories. How can Makayla find the number of stories her teacher read in all?

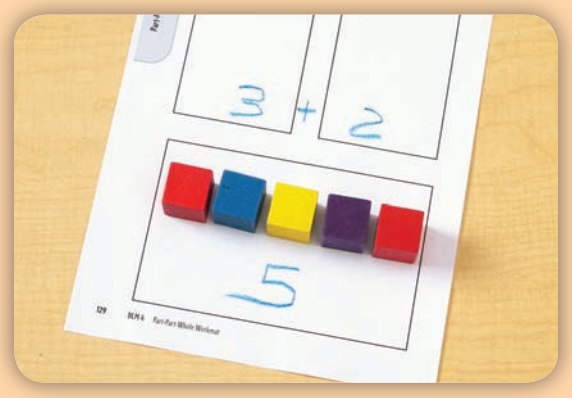
Materials

- 1" Color Cubes (10 assorted cubes per child)
- Part-Part-Whole Workmat (BLM 5; 1 per child)

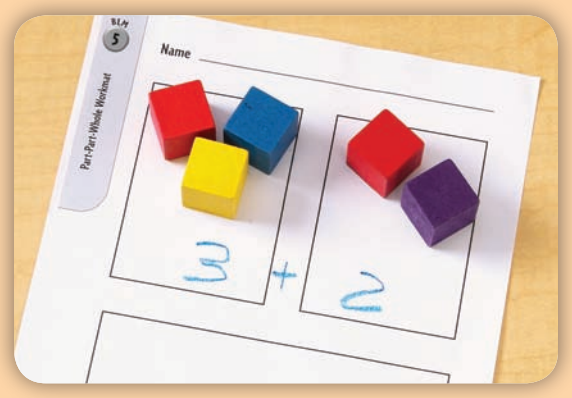
Introduce the problem. Then have children do the activity to solve the problem. First, have children stand up and hold their arms out to the sides to form a plus sign with their bodies. Draw a plus sign on the board and encourage children to practice drawing the plus sign. Explain that the plus sign shows us when to join things, or add. Make sure to introduce and discuss the many words and phrases used to indicate addition. Next, distribute 1" Color Cubes and Part-Part-Whole Workmats (BLM 5) to children.



1. Say: *Listen to this problem. I had 3 cubes. Then I found 2 cubes.* **Ask:** *How many cubes do I have in all?* Have children place 3 cubes in one of the small part sections of the workmat. Then have children place 2 cubes in the other small part section.



3. Instruct children to move all of the cubes into the large, whole section. Then have children count to find the number in all. Have children write this number in the whole section. **Say:** *This is the number in all.* Repeat the activity with other addition problems.



2. After children have placed the cubes in the small part sections, have them write the number for each group in each of the sections. **Ask:** *What do the words "in all" in the problem tell us to do? What does the plus sign tell us to do?* Have children draw a plus sign between the two part sections on their workmats.

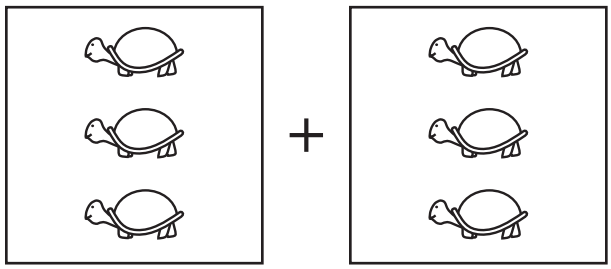
⚠ Look Out!

Watch for children who are having trouble understanding the connection between the plus sign and addition. Demonstrate additional joining problems using the plus sign for these children.

Answer Key

Check children's work.

1.



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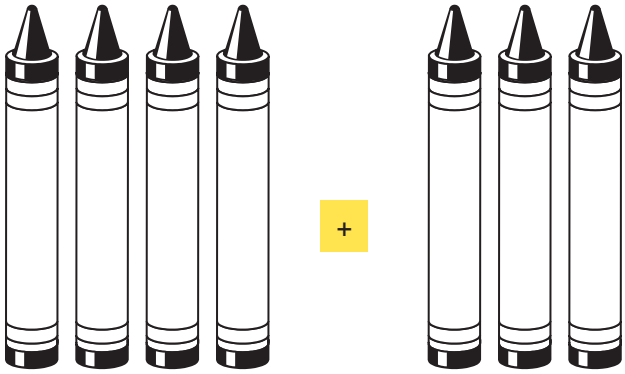

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Directions

1. Jack sees 3 turtles in the pond. He sees 3 turtles on the rocks. How many turtles does Jack see in all? Use cubes. Model the groups. Write the number of turtles in all. **2.** What symbol do we use to show that we want to join the groups? Write that symbol. Write the total number of crayons.

Answer Key

Check children's work.

Challenge

There are 4 oranges in a bowl. Mom adds 4 apples to the bowl. How many pieces of fruit are there in all? Draw 4 orange circles for the oranges. Draw 4 red circles for the apples. Write an addition sentence. Write the total number of pieces of fruit.

LESSON 3

Objective

Solve separating problems by taking away one group from a larger group and counting what is left.

Common Core State Standards

- **K.OA.1** Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
- **K.OA.2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

Operations and Algebraic Thinking

Separating Problems

When we begin with a group and separate, or take away, a portion of that group and count up what is left, we are subtracting. The separating method of subtraction is an important beginning strategy that will help children as they develop fluency with single-digit number combinations.

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

Talk About It

Discuss the Try It! activity.

- **Ask:** *After you take away from a number, is the number you are left with more or fewer? How do you know?*
- **Say:** *Look at your Take-Away Workmat (BLM 6). Think about how you use your workmat to solve a take-away problem.* **Ask:** *What do you put in the big circle? What do you put in the small circle? How do you find the number that is left?*

Solve It

With children, reread the problem. Have children reuse the Take-Away Workmat from the Try It! activity. Have children make a drawing to show the number of Three Bear Family® Counters the teacher took away (2 bears) from the 5 bears on the shelf in the small (take-away) circle. Then have children draw the bears that were left on the shelf in the big circle. Encourage children to use their drawings to explain how they solved the problem.

More Ideas

For other ways to teach about subtraction—

- Have the class work together to use Frog Counters or other counters to compose and then solve a separating story problem.
- Have pairs of children place 5 Frog Counters in a paper bag. Instruct one child to take away some of the frogs from the bag. Have children count to find the number of frogs that were taken away. Then encourage children to work together to figure out how many frogs are left in the bag. Finally, have children check to see if they were correct by counting the frogs left inside the bag. Encourage children to complete the following sentence: [number] frogs take away [number] frogs is [number] frogs. For example, 5 frogs take away 3 frogs is 2 frogs. Repeat the activity with different numbers of frogs.

Formative Assessment

Have children try the following problem.

Jamal brought 3 stickers to school to share with his friend Mark. Jamal gave 1 sticker to Mark. Draw a picture to show how many stickers Jamal had left.

Try It! 20 minutes | Independent

Here is a separating problem.

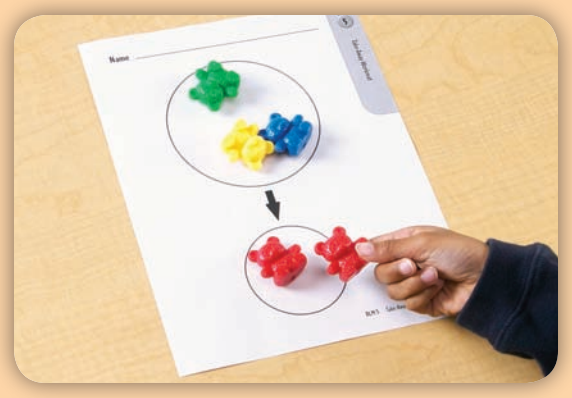
Rico's teacher put 5 teddy bears on the shelf. Then she took 2 teddy bears away and put them in a basket. How many teddy bears were left on the shelf?

Introduce the problem. Then have children do the activity to solve the problem. Distribute 1 copy of the Take-Away Workmat (BLM 6) and 5 Three Bear Family Counters to each child.

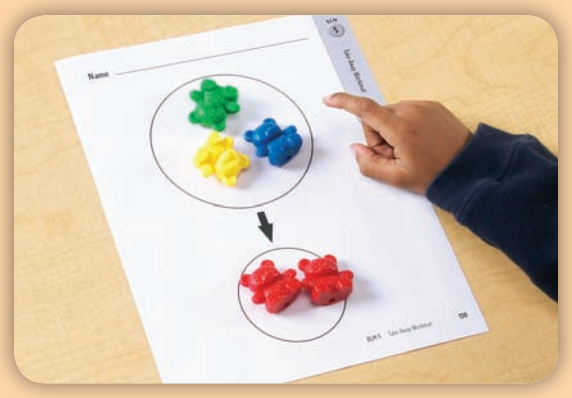
Materials

- Three Bear Family® Counters (5 per child)
- Take-Away Workmat (BLM 6; 1 per child)

1. Instruct children to place all of their bears in the big circle on the Take-Away Workmat. Have children count the bears aloud with you one at a time and identify that there are 5 bears in all in the big circle.



2. Have children take 2 bears away from the big circle and follow the arrow to move them into the small circle.



3. Instruct children to count the bears that are left in the big circle aloud with you. Then help children to understand that 5 take away 2 is 3.

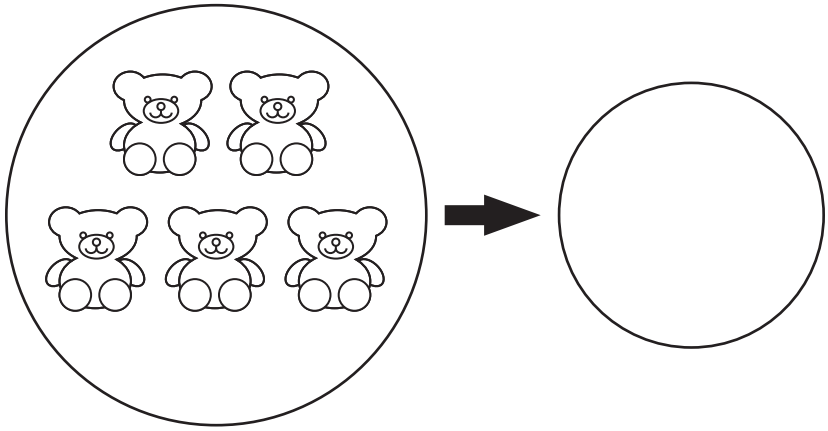
⚠ Look Out!

Watch for children who are having a difficult time figuring out which number of bears to move into the take-away (small) circle on the workmat. Remind children that the number of bears that should be placed in the small circle is the number that should be taken away from the group they started with.

Answer Key

Check children's work.

1.



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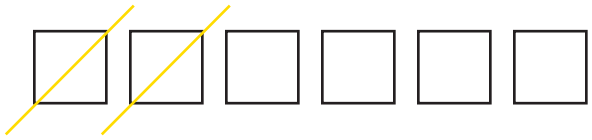

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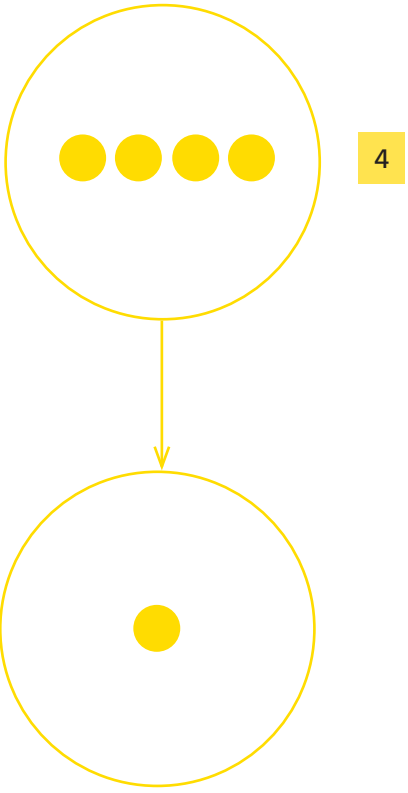
Directions

1. Five bears are playing on the swings. Three go home. How many bears are left playing on the swings? Use Bear Counters. Model the groups. Write how many are left. **2.** Maya had 6 crackers. She ate 2 crackers. Cross out the crackers Maya ate. Write the number of crackers Maya had left.

Answer Key

Check children's work.



Challenge

There were 5 balls in a box in the gym. The children took 1 ball to play a game. How many balls were left in the box? Draw circles for the balls. Take 1 away. Write how many balls are left in the box.

LESSON 4

Objective

Identify the minus sign and use it to show subtraction.

Common Core State Standards

- **K.OA.1** Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
- **K.OA.2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.
- **K.OA.5** Fluently add and subtract within 5.

Operations and Algebraic Thinking

Using the Minus Sign

The minus sign is used to show subtraction. Children must learn how to recognize the minus sign. They also must learn to remember what operation it signifies. Often, word problems will not use the minus sign. Because of this, it is important that children learn that words like *less, fewer, take away,* and *minus* indicate subtraction.

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

Talk About It

Discuss the Try It! activity.

- During the activity discussion, emphasize that the words *fewer, less,* and *take away* all tell about using the minus sign.
- **Ask:** *When we take away from a group, does the new group have more or less? How do you know?*
- Instruct children to look at their Take-Away Workmat (BLM 6). Point to the minus sign on a workmat. **Ask:** *What do we call this sign? What does the minus sign show? What should you do when you see the minus sign? When you use the minus sign, are you left with more or fewer than you started with?*

Solve It

With children, reread the problem. Have children make a drawing to show the number of frogs that Maria saw at first (5). Then have children draw the frogs that hopped away (3). Ask children to draw the minus sign between the two groups. Then have them draw how many frogs were left underneath.

More Ideas

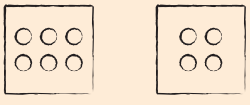
For other ways to teach about using the minus sign—

- Write simple subtraction problems using the minus sign on the board, on large sheets of paper, or on note cards. Then have children act out the problems with Three Bear Family® Counters.
- Create a workmat by drawing two large squares with a minus sign between them on a piece of construction paper. Give children a problem such as, "Dana had four crayons on her desk. She put one back in the box. How many crayons were left on Dana's desk?" Have children practice using Snap Cubes®, or crayons, to show the problem on the workmat.

Formative Assessment

Have children try the following problem.

Tanya had 6 circles. She gave 4 circles to Chris. How many circles does Tanya have left? Draw a minus sign between the two groups. Draw the number of circles left.



Try It! 20 minutes | Independent

Here is a problem that demonstrates using the minus sign.

During recess, Maria found 5 frogs on the playground. Then 3 of the frogs hopped away. How many frogs were left on the playground?

Introduce the problem. Then have children do the activity to solve the problem. Distribute one copy of the Take-Away Workmat (BLM 6) and five Frog Counters to each child.

Materials

- Frog Counters (5 per child)
- Take-Away Workmat (BLM 6; 1 per child)
- paper (1 sheet per child)

1. Say: *I had five frogs. I took away three frogs.* **Ask:** *How many frogs were left?* Instruct children to place all of their frogs in the big circle on the Take-Away Workmat. Have children take three frogs away from the big circle and follow the arrow to move them into the small circle.

3. On the board or on a sheet of paper, draw the problem using five frogs, a minus sign, and three frogs. Then write *5 – 3*. Explain that this is how we would write the problem children just did. Make sure children understand that the two expressions show the same problem. Have children practice drawing and writing the corresponding expression.

2. Introduce the minus sign. Draw a minus sign on the board or on a sheet of paper and display it for children. Tell children that the minus sign describes what they did when they took three frogs away from the five frogs in the large circle. Have children write a minus sign between the two circles on their workmats. Tell children that when we use the minus sign we are taking away. This means that we will have *fewer* or *less* than we started out with.

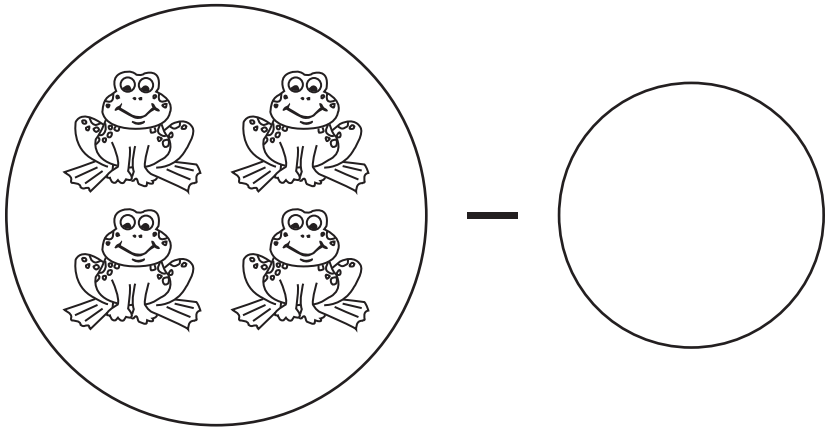
⚠ Look Out!

Watch for children who have trouble understanding the connection between the minus sign and the following vocabulary terms: *fewer, less,* and *take away.* Emphasize these words for children as you provide additional examples of subtraction problems. Also, watch for children who confuse the plus sign with the minus sign. Remind children that the minus sign tells us to take away and the plus sign tells us to put together.

Answer Key

Check children's work.

1.



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2.

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Directions

1. Four frogs sit by the pond. Two hop away. How many frogs are left by the pond? Use counters. Model the groups. Write how many frogs are left. **2.** Six presents were on the table. Hugo opened 3 of them. How many presents were left on the table? Use counters. Model the groups. Draw a minus sign between the two groups. Write the number of presents that were left.

Answer Key

Check children's work.

Challenge

There were 7 flowers in the yard. The children picked 4 flowers to give to their grandma. How many flowers were left in the yard? Draw the 7 flowers in the yard. Draw a minus sign. Draw the 4 flowers that were picked. Write how many flowers were left in the yard.

LESSON 5

Objective

Find sums to 10.

Common Core State Standards

- **K.OA.1** Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
- **K.OA.2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

Operations and Algebraic Thinking

Addition: Sums to 10

Addition, typically the simplest mathematical operation for young learners to comprehend, is defined as the act of combining numbers. The two (or more) numbers being combined are addends, and their total is the sum. Because the operation of addition describes sets of numbers being combined to form a new set, the order of the addends will not affect the sum.

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 groups' trays.
- **Ask:** *How many people did you put in the tray first? How many people did you add to the tray?*
- **Say:** *Look at your tray. Look at another group's tray.*
- **Ask:** *How many people are on the bus? Explain how you know.*

Solve It

Ask children to draw pictures to show the people on the bus and write the corresponding number next to each group of people. Children should then circle the two groups and write the total number to show the sum.

More Ideas

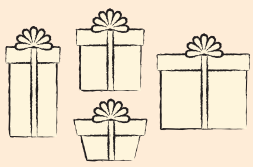
For other ways to teach about addition with sums to 10—

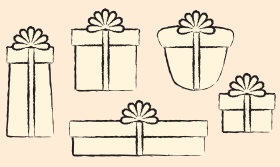
- Have children make "addition boxes" by placing a cardboard divider in a shoe box (or other similar box). They can then put counters on each side, pull the divider out to combine them, and find the total number in the box.
- Have children make trains with Snap Cubes® and then add to the length of the trains with a different color to model addition.

Formative Assessment

Have children complete the following activity.

Samuel received 4 birthday presents from his family and 5 more presents from his friends. How many presents did he receive in all?





Try It! 30 minutes | Pairs

Here is a problem for introducing addition.

Shayna wants to know how many children are riding on the bus. There are 4 children near the back of the bus and 3 children near the front of the bus. How many children are on the bus?

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

Say: *Let's follow the steps to determine how many children are on the bus.*

Materials

- CounTEN® Sorting Tray (1 per pair)
- Classifying Counters (7 people counters per pair)

1. Have children use their sorting trays and people counters to show the number of children near the back of the bus.

2. Ask children to leave the people counters in their tray and add the number of children near the front of the bus to the tray.

3. Encourage children to count aloud how many people are in their tray.

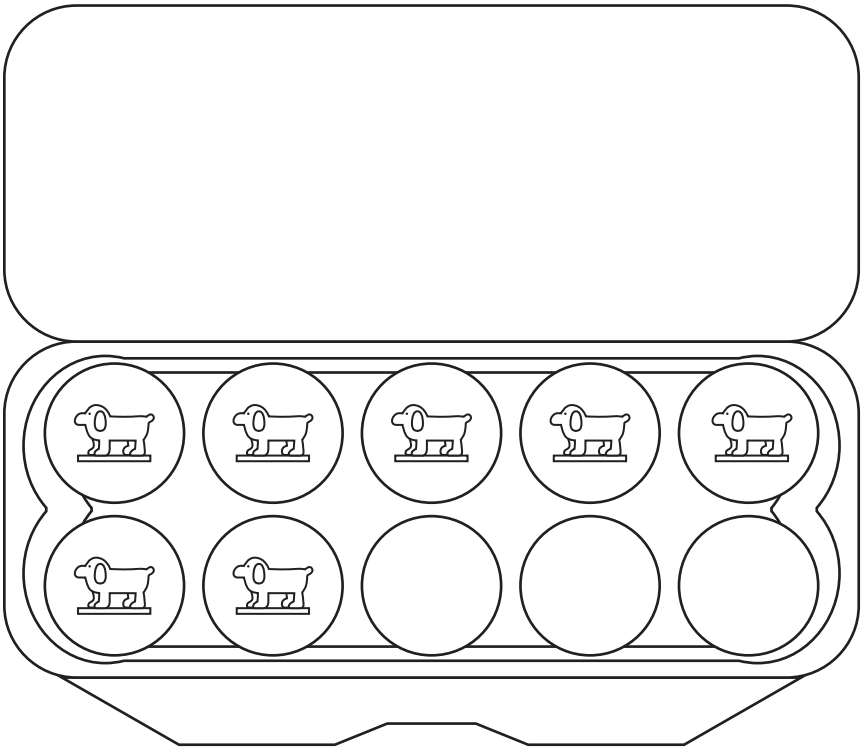
⚠ Look Out!

Watch for children who separate the two groups on opposite sides or ends of the tray and then fail to combine the two groups to count the total. Have children combine the two groups into one recognizable group in the tray and recount the whole new set.

Answer Key

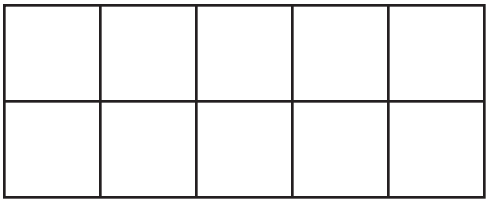
Check children's work.

1.



7

2.



8

Directions

1. Four dogs are at the dog park. Three more dogs come to the park. How many dogs in all are at the park? Use dog counters and the sorting tray to model the groups. Write how many total dogs there are. **2.** Three books were on the shelf. Five more books were put on the shelf. How many total books are on the shelf? Use counters to model the groups. Write the total number of books.

Answer Key

Check children's work.

Challenge

Alex had 5 fish in a tank. She bought 4 more fish for her tank. How many fish does she have in all? Draw the first group of fish. Draw a plus sign. Draw the second group of fish. Write the total number of fish.

LESSON 6

Objective

Find differences from 10.

Common Core State Standards

- **K.OA.1** Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
- **K.OA.2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

Operations and Algebraic Thinking

Subtraction: Differences from 10

Subtraction is the act of finding the difference in value between two numbers. Subtraction is the inverse, or opposite, operation of addition. It is represented by a smaller number being taken away from a larger number, resulting in the difference. The order of the numbers being subtracted affects the difference.

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 groups' trays.
- **Ask:** *How many trees were put in the tray first? How many trees were taken out of the tray?*
- **Say:** *Look at your tray. Look at another group's tray.*
- **Ask:** *How many trees are left in Brent's yard?* **Say:** *Explain how you know.*

Solve It

Ask children to draw pictures to show all the trees that were in Brent's yard, and then mark X's on those trees that were cut down. Children should circle the remaining trees and write the number to show the difference.

More Ideas

For other ways to teach about subtraction with differences from 10—

- Have children use magnets on a magnetic surface to represent objects in a subtraction problem. Children then remove the appropriate number and count remaining magnets to find the difference.
- Have children sit in a circle to act out subtraction problems. Begin by counting the number of children in the circle, and then have a specified number of children leave the circle. Count the remaining children to find the difference.
- Have children make trains with Snap Cubes®, and then have them take away cubes and count the number of cubes that remain.

Formative Assessment

Have children complete the following activity.

Draw pictures (or use counters) to solve this problem. Anna has 7 erasers. She gave 5 erasers away to her friends. How many erasers did Anna keep?

Try It! 30 minutes | Pairs

Here is a problem for introducing subtraction.

Brent's yard had 9 trees. He had to cut down 2 of the trees. How many trees are in Brent's yard now?

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

Say: *Let's follow the steps to determine how many trees are left.*

Materials

- CounTEN® Sorting Tray (1 per pair)
- Classifying Counters (9 tree counters per pair)

1. To begin, have children use their sorting trays and tree counters to show the number of trees in Brent's yard by placing 1 tree in each compartment.

2. Have children show how many trees Brent cut down by taking that number of tree counters out of the tray.

3. Now have children determine how many trees are left by counting the remaining tree counters in their tray.

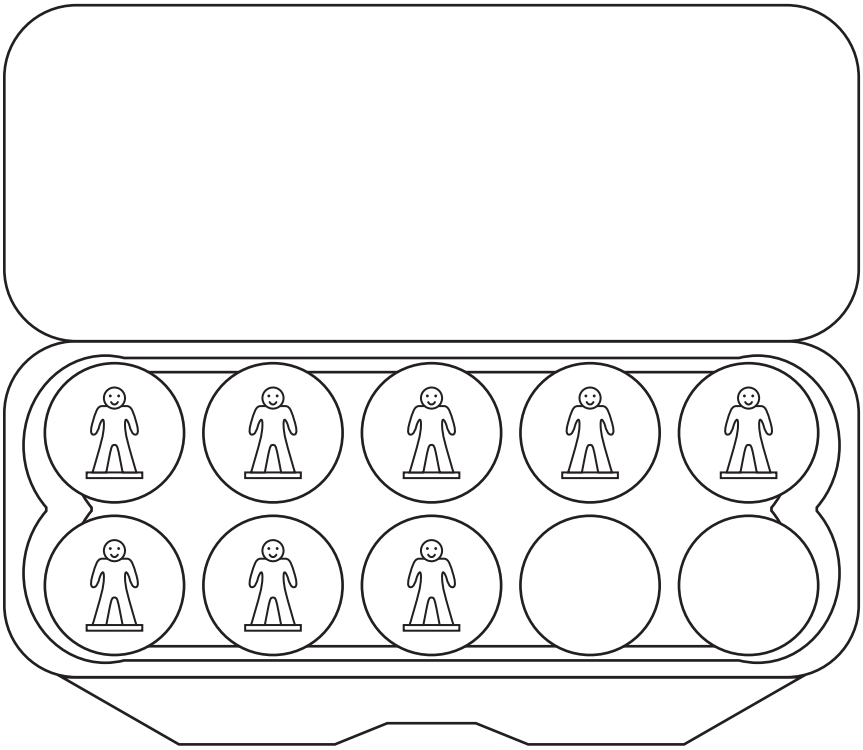
⚠ Look Out!

Watch for children who try to add to the original group. Restate that the trees are being cut down and taken away from the yard, so they must be taken out of the tray. Have children remove the appropriate number from the tray and recount the remaining set.

Answer Key

Check children's work.

1.



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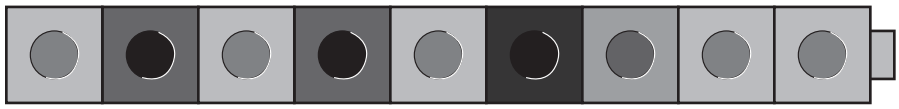
2.



2

Directions

1. Eight children were painting in the art center. Four cleaned up and left. How many children are left in the art center? Use the people counters and sorting tray to model the groups. Write how many children are left in the art center. **2.** There are 9 backpacks hung on hooks. Children took 7 of the backpacks home. Use Snap Cubes® to model the groups. Write how many backpacks are left on the hooks.

Answer Key

Check children's work.

Challenge

Seven bananas were in a bowl. The children ate 6 of them. How many bananas are left? Draw the first group of bananas. Draw a minus sign. Draw how many bananas were eaten. Write how many bananas are left.

LESSON 7

Objective

Identify a whole number as a combination of two parts.

Common Core State Standards

- **K.OA.3** Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).

Operations and Algebraic Thinking

Part-Part-Whole

One highly effective model for introducing addition is the part-part-whole model. Classroom research has shown that when children are provided with experiences identifying and discussing parts and wholes of quantities, they make fewer errors in deciding when to add in problem situations.

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

Talk About It

Discuss the Try It! activity.

- **Ask:** *How many Snap Cubes® are there all together in the train you made? How do you know?*
- **Ask:** *How many cubes of each color are there?* Repeat this question for different combinations of colors. Make sure that children understand that the different combinations all show the number 5.
- After children have mastered the concept of part-part-whole, encourage them to work with cubes to discover other smaller parts that make up numbers 2 to 10.

Solve It

With children, reread the problem. Have each child build and draw one way that David and Lisa could put together their cubes to make a train of five with two different colors. Ask volunteers to share their solutions with the class.

More Ideas

For other ways to teach about part-part-whole—

- Have children write a number from 1 to 10 on a sheet of paper. Ask them to use combinations of Frog Counters in two different colors to show this number. For example, children could use two yellow frogs and two red frogs to show the number 4. Then have children draw and color the combinations of frogs that show each number.
- Display a chain of 5 blue Link 'N' Learn® Links and ask children how many there are. Replace one blue link with a red link. Ask children how the group has changed and if there are still 5 links. Continue showing other combinations for 5, replacing one more link each time. Repeat this activity with other combinations of links to show numbers 1 through 10.

Formative Assessment

Have children try the following problem.

Draw a picture of 4 fish. Make some of the fish red and some of the fish blue.

Try It! 15 minutes | Pairs

Here is a problem involving the concept of part-part-whole.

David and Lisa want to make a train of 5 Snap Cubes using 2 different colors. What is one way they can do this?

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

Distribute Snap Cubes to children.

Materials

- Snap Cubes® (5 each of 2 different colors per pair)

1. Have children build a train of five cubes. The cubes should all be the same color. **Ask:** *How many cubes are in your train?*

2. Say: *You have made a train of five cubes that are all the same color. Now let's make a train of five cubes using two different colors.* Instruct children to remove one cube from the train they have made and replace it with a cube of a different color.

3. Have children vary the makeup of their trains by using three of one color and two of the other. Help children understand that all these different combinations make up a total of five.

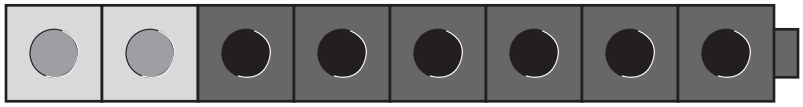
⚠ Look Out!

Watch for children who don't recognize that the whole group can be made up of different parts. Have children do similar activities using different kinds of manipulatives, such as two sizes of Three Bear Family® Counters or two colors of Frog Counters.

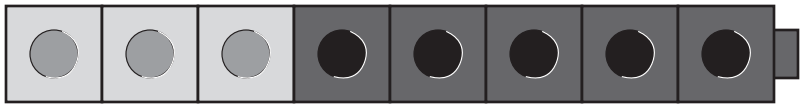
Answer Key

Check children's work.

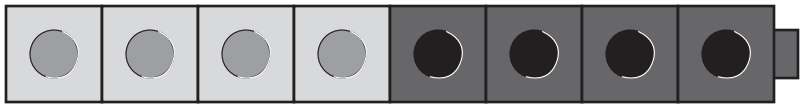
1. 8



8 = 2 + 6



8 = 3 + 5



8 = 4 + 4

2. 7

7 = 4 + 3

Directions

1. Use two different color Snap Cubes®. Make the trains shown. Fill in the number sentence for each row. **2.** Use Snap Cubes. Build the number 7 with yellow cubes and blue cubes. Color the stars to match your cubes. Fill in the number sentence.

Answer Key

Check children's work.

Challenge

Make as many two-color trains as you can with 9 Snap Cubes®. Draw each of your trains. Write a number sentence for each train.

LESSON 8

Objective

Decompose numbers to find different representations of the same number.

Common Core State Standards

- **K.OA.3** Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).

Operations and Algebraic Thinking

Decomposing Numbers

In order to become fluent in math and feel comfortable manipulating numbers, children must find flexible and creative ways to break apart, or decompose, numbers to form equivalent representations. For example, knowing that 4 can be represented as 3 + 1 or 2 + 2 enables children to think of 7 + 4 as 7 + 3 + 1 or 7 + 2 + 2.

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

Talk About It

Discuss the Try It! activity.

- Display the two complete trains used for the activity. **Ask:** *How many Snap Cubes® are in each train? How are the trains different?* **Say:** *Even though the trains are made up of different numbers of red and blue cubes, both trains have five cubes in all.*
- Display the train from Step 2. **Ask:** *How many red cubes? How many blue cubes?* (Point to the expression 1 + 4 as you ask children to repeat after you.) **Say:** *This train of five cubes is made of one red cube and four blue cubes. One plus four is five.*
- Display the train from Step 3. **Ask:** *How many red cubes? How many blue cubes?* (Point to the expression 2 + 3 as you ask children to repeat after you.) **Say:** *This train of five cubes is made of two red cubes and three blue cubes. Two plus three is five.*

Solve It

With children, reread the problem. Then have children draw pictures to show at least two ways the 5 games can be put into the two game drawers. Encourage children to share and discuss their drawings with their classmates.

More Ideas

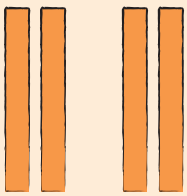
For other ways to teach about decomposing numbers—

- After children have mastered decomposing numbers from 2 through 5, have them complete the same Try It! activity with Snap Cubes using numbers from 6 through 10.
- Have children work in pairs. Instruct one child in each pair to use two different colors of Snap Cubes and put together a specific number of cubes in random order. Then tell the other child in each pair to separate the cubes and make one train for each color while completing this sentence:
  _____ plus _____ is _____ .

Formative Assessment

Have children try the following problem.

Carl has 4 carrot sticks. He piled them this way. Draw another way Carl can pile his carrot sticks.



Try It! 30 minutes | Pairs

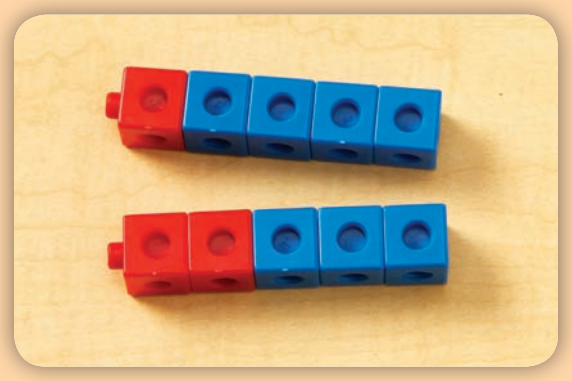
Here is a problem about decomposing the number 5.

During classroom cleanup time, it's Jodi's job to put the 5 classroom games in the 2 game drawers. How can Jodi find the number of different ways she can put the 5 games in the game drawers?

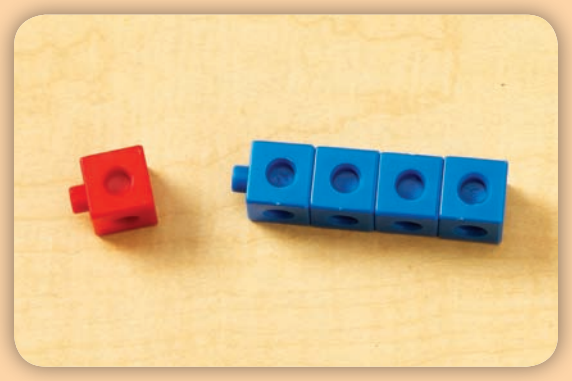
Introduce the problem. Then have children do the activity to solve the problem. Distribute 10 Snap Cubes to each pair of children.

Materials

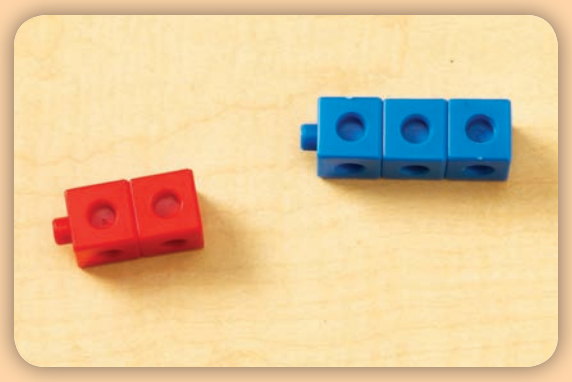
- Snap Cubes® (5 red and 5 blue per pair)



1. Instruct children to make two 5-cube trains (one is made of 1 red and 4 blue cubes and the other is made of 2 red and 3 blue cubes). Then have children compare the trains. Guide children to the conclusion that the trains have the same number of cubes (5), but each train has a different number of red and blue cubes. Write the number *5* on the board.



2. Display the train with 1 red cube and 4 blue cubes. Instruct children to break this train apart by removing the red cube. Help children to recognize that the train of 1 red cube and the train of 4 blue cubes together made up 5 cubes. Below the number 5 on the board, write *1 + 4*.



3. Display the train of 2 red cubes and 3 blue cubes. Have children break this train apart into two trains. Help children to recognize that the train of 2 red cubes and the train of 3 blue cubes together made up 5 cubes. Below 1 + 4 on the board, write *2 + 3*. Encourage children to see if they can find other ways to break 5 into groups.

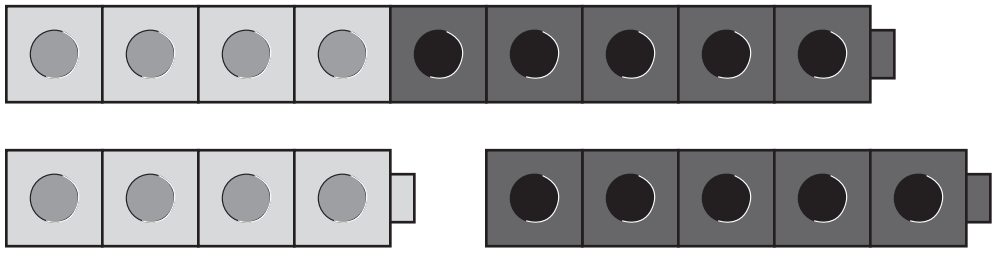
⚠ Look Out!

Watch for children who are having a difficult time understanding that a number can be made of and broken apart into two groups in different ways. Have these children work with a set of 5 cubes that are all the same color. This way, children will be able to see that no matter how they break their set of 5 cubes apart (1 + 4 or 2 + 3), they always make up a train of 5 cubes.

Answer Key

Check children's work.

1.



$9 = \underline{\quad 4 \quad} + \underline{\quad 5 \quad}$

2.

$9 = \underline{\qquad} + \underline{\qquad}$

Directions

1. Use 9 Snap Cubes®. Build the train shown. Break the train as shown. Fill in the number sentence to show the parts. **2.** Use Snap Cubes in two colors to make 9 in a different way. Draw your train. Fill in the number sentence to show the parts. Can you make 9 in other ways?

Answer Key

Check children's work.

Challenge

Draw a straight line across your paper. Draw 7 flowers in the top space. Color some yellow and some pink. Write the number of yellow flowers. Draw a plus sign. Write the number of pink flowers.

Now draw 7 flowers in the bottom space. Color these flowers to show a different way to make 7. Write the number of yellow flowers. Draw a plus sign. Write the number of pink flowers.

LESSON 9

Objective

Given a number from 1 to 9, find the number that makes 10.

Common Core State Standards

- **K.OA.4** For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

Operations and Algebraic Thinking

Make 10

To begin building a strong foundation for the base ten system and addition, children need to understand how two parts make up 10. By using concrete objects and a ten frame or tray, children can group items as 1 + 9, 2 + 8, 3 + 7, 4 + 6, 5 + 5, and so on. This will allow children to physically represent ways to make ten. Making tens is a foundation for implementing mental math strategies. Using concrete materials, for a given number from 1 to 9, allows children to visualize the number needed to make 10 when added to the given number. This strong number foundation will benefit children as they begin their study of arithmetic and other operations, and their study of Algebra in the later years.

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

Talk About It

Discuss the Try It! activity.

- **Ask:** *How are Ben's case and the sorting tray the same?* Discuss how both have 10 sections. **Ask:** *How many toy cars can each hold?*
- **Ask:** *How many toy cars does Ben have in his case? How many toy cars did you put in the tray? How many empty cups are left?*
- **Say:** *We can write a number sentence to show this problem.* As you write *7 + 3 = 10* on the board, **say:** *We write seven to show the number of cars in the case. We write a plus sign to show we're adding. We write three to show how many more cars can fit: seven plus three is equal to (or is the same as) ten.*

Solve It

With children, reread the problem. Give children the Ten-Frame Worksheet (BLM 4) and tell them to draw a blue circle in 7 of the boxes to show the 7 toy cars Ben has in his case. Have them draw a red circle in each empty box, and write the number sentence 7 + 3 = 10 under the frame.

More Ideas

For other ways to teach making 10—

- Have children use Two-Color Counters with the CounTEN® Sorting Tray. Give children a number from 1 to 9 and have them place that many counters of one color in the cups of the tray. Then have them fill the remaining cups with counters of the other color. Have children write the number sentence that the counters show.
- Repeat the previous activity using Two-Color Counters with the Ten-Frame Worksheet (BLM 4).

Formative Assessment

Have children try the following problem.

Draw more circles to make 10. Six and how many more circles make 10?

Try It! 10 minutes | Pairs

Here is a problem about making 10.

Ben has 7 toy cars in his case. The case can hold 10 toy cars. How many more toy cars can Ben put in his case?

Introduce the problem. Then have children do the activity to solve the problem. Distribute a CounTEN Sorting Tray, 10 car counters from the Classifying Counters, and a Ten-Frame Worksheet (BLM 4) to each pair.

Materials

- CounTEN® Sorting Tray (1 per pair)
- Classifying Counters (10 car counters per pair)
- Ten-Frame Worksheet (BLM 4; 1 per pair)

1. Have the children count the cups in the tray. **Say:** *The tray can hold the same number of toy cars as Ben's case.* **Ask:** *How many toy cars can the tray hold?*

2. Ask: *How many toy cars does Ben have in his case?* Have pairs put 7 car counters in the tray, one in each cup filling the top row from left to right before moving to the bottom row. **Say:** *Count the cars as you place them in the cups.*

3. Ask: *How many cups are empty? How many more toy cars can you put in the tray? How many more toy cars can Ben put in his case?*

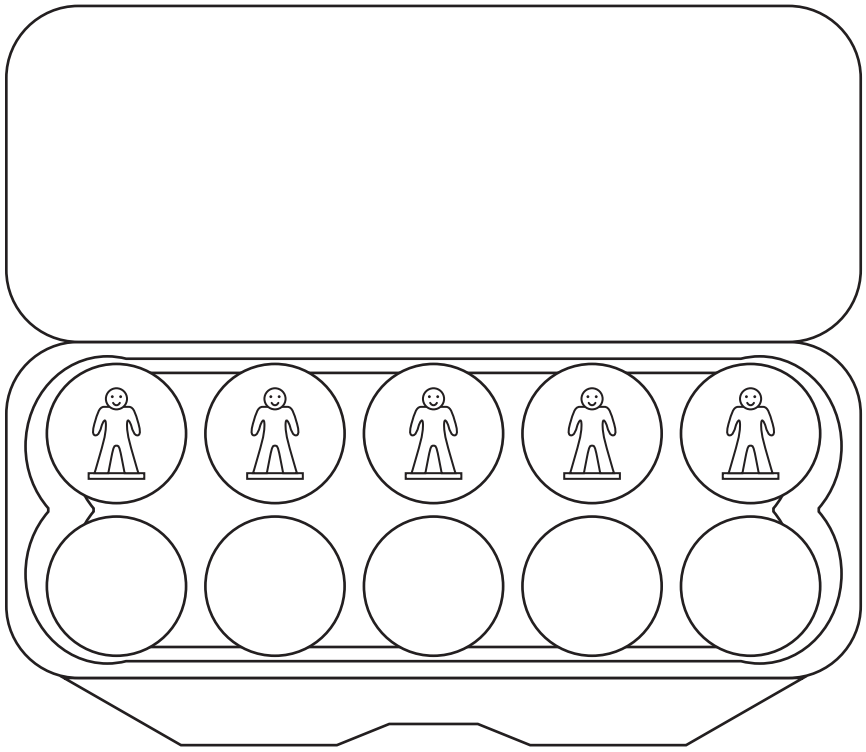
⚠ Look Out!

Children may be putting more than one counter in each cup, or may be scattering the counters in the cups. Make sure children are putting one counter in each cup, filling five cups in a row first, then working with the other row/column of five. This will help them visualize the two parts that make up 10 more clearly and will help children to make 5's.

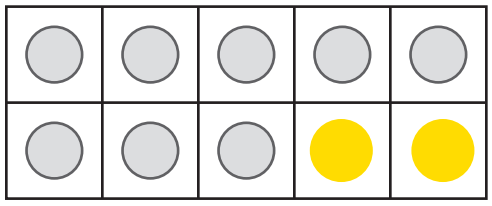
Answer Key

Check children's work.

1. $5 + \underline{\ 5\ } = 10$



2. $\underline{\ 8\ } + \underline{\ 2\ } = 10$



Directions

1. Five children are sitting at a table with 10 chairs. How many more children can sit at the table? Count the empty spots. Write the number to complete the number sentence. Draw a child in each empty spot. **2.** Count the circles. Write the number in the first blank. Then draw a circle in each empty spot. Write the number in the second blank to make 10.

Answer Key

Check children's work.

Challenge

There are 10 pieces of fruit. Nine are apples. How many are oranges? Draw the fruit and write a number sentence.