

*Putting It All Together: Number Composition and Decomposition*  
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**Definition:** Essentially, number composition and decomposition involve the breaking apart of a number into subsets. For example, 5 can be thought of as 3 and 2, 4 and 1, etc.

**Why this is important:** In early math, when a primary goal is the development of sound understanding of the number system, students should spend much of their math time putting together and pulling apart different numbers as they explore the relationships among them. This builds a sense of number, flexibility with number, and quick mental math strategies.

**Suggestions for Teaching:** Activities should be concrete, pictorial, and finally abstract. Give students many meaningful opportunities with hands-on materials, exploration, and concept building before introducing the number sentence or purely symbolic representations.

**Some Helpful Vocabulary:**

- Number sense—big idea in math that includes estimation, place value, basic facts, relative size of numbers, counting strategies, and number composition/decomposition
- Compose/Decompose—break apart a number to find the numbers “hiding” inside, to move back and forth between the total and its composing addends: “I see 3. I see 2 and 1 make 3.”
- Partitions (**multiple addends**) of number 5—  
5 + 0    4 + 1    3 + 2    3+1+1    2+2+1    2+1+1+1    1+1+1+1+1
- Break-apart partners—**pairs** of numbers that combine to form a target number
- Number bonds—similar to break-apart numbers
- Whole number—not in the sense of non-fraction, rather the idea of part-part-whole

**Classroom Activities**

**Break-Apart Stick**

**Materials:** craft stick, counters or dots on a page

**Instructions:** Craft stick separates the line of counters into break-apart partners.

**Break-Apart Baggies**

**Materials:** baggies, counters

**Instructions:** Draw line down middle of ziplock bag. Place counters inside. Shake then record the break-apart partners.

**Part-Part-Whole Linking Cubes**

**Materials:** linking cubes, index cards with numbers written on them (1-10), paper

**Instructions:** First have students explore with the cubes. Have them make a stick of cubes and tell what they have. For example, “I have two and six” may represent a stick with 8 cubes. After ample exploration, have a student choose 2 colors of linking cubes. Then have them pick a card. Have them make a stick to represent the number. Remind them that the colors must be placed together. (They’ll be very tempted to make a pattern). Give students a half a sheet of paper and have them trace the whole on their paper and then put a line where the part should be. Have them trace the whole again, and then write in the numbers for each part and whole. They can “see” how the part-part-whole relates to actual numbers.

**Part-Part-Whole Paper Plates**

**Materials:** paper plates divided into three sections (one large section and two smaller), counters, index cards with numbers written on them (1-10), recording sheet

**Instructions:** Students pick a card and put the corresponding number of counters in the large section of the plate. Students explore different ways to move the counters from the large section to the two smaller sections. This shows how the number may be decomposed. It is not unreasonable to expect students to find six or more ways to break apart a number. After lots of exploration, have students record the break-apart partners.

**Missing Part Cards**

**Materials:** tagboard strips, dot stickers

**Instructions:** Each strip has a numeral for the whole and two dot sets with one set covered by a flap. Students tell how many dots are under the flap.

**Part-Part-Whole Doors**

**Materials:** paper, stickers or stamps, counters, Firefly Partition Cards (attached and available online at [http://web.sd71.bc.ca/math/uploads/lessons\\_activities/aKindergarten/Firefly%20partition%20cards.pdf](http://web.sd71.bc.ca/math/uploads/lessons_activities/aKindergarten/Firefly%20partition%20cards.pdf)),

**Instructions:** Prepare the Firefly Partition Cards by removing the top corners from each page. Fold the cards so that students see only one break-apart partner of the number at a time. Students explore with the cards using counters to find the missing break-apart partner for the target number. Extension: Have students create their own Partition Cards using stickers or stamps.

**Part-Part-Whole Hearts**

**Materials:** precut shapes that have a line of symmetry, markers, counters

**Instructions:** Prepare the shapes by writing a target number on the back of the shape. Fold the shape along the line of symmetry and write one break-apart partner on one side of the shape. Students use counters to find the missing break-apart partner then write the missing number on the shape.

Extension: Have students make their own Part-Part-Whole Hearts (or any symmetrical shape). Students can leave off any part or whole. For instance, they may write 8 for the whole number on the back of the shape and write 3 on one of the front sections. Or they may write both parts and leave the whole blank. Store student-made shapes in a math center.

### Balance Scale Exploration

**Materials:** pan balance, counters

**Instructions:** Have students explore how the pan balance works. After ample exploration, place 3 counters on one side of the scale. Place 7 counters on the other side. Ask students, "How many counters need to be removed (or added) to make them equal?" Continue exploring and discussing the results of adding and removing counters.

### Domino Parking Lot

**Materials:** work mat with section for each focus number (ie. 0-10)

**Instructions:** Place dominoes face down on table. Students take turns drawing a domino, adding the number of dots on both sides of the domino and placing it in the correct "parking spot" on the mat. For example, if the domino has three dots and five dots, the domino is placed on the EIGHT parking spot. If a domino is already placed on the EIGHT parking spot, the new domino is stacked on top of it. Each person takes ten turns. At the end of ten turns, the person with the tallest stack on any parking spot is the winner.

### In and Out

**Materials:** manipulatives, paper with circle

**Instructions:** Drop manipulatives on the paper. Some may fall in the circle and some out of the circle. Students record how many are in and how many are out.

### Bears in a Cave

**Materials:** 10 bear counters, Styrofoam bowl

**Instructions:** Each pair of students needs a bowl with 10 bears in it. The bowl is the cave. Player A covers his eyes while Player B turns the cup over and hides bears under the cup. Player A uncovers his eyes and counts how many bears are "out" of the cave. He then determines how many bears must be in the cave. Player B checks the amount by revealing the bears in the cave. Trade jobs and play again.

### I Wish I Had

**Materials:** connecting cubes, dot strip or dot plate

**Instructions:** Hold out a bar of connecting cubes, a dot strip or a dot plate showing 6 or less. Say, "I wish I had six." Students respond with the part that is needed.

### Ten Frame Fill

**Materials:** ten-frame cards, counters

**Instructions:** Roll a die. Put this number of counters on your ten frame. How many more counters would you need to fill your ten frame? Draw a picture and/or write a number sentence to show what you did. Repeat five times.

### Number Sentence Match

**Materials:** set of ten-frame cards, set of number sentences to match the ten frames

**Instructions:** Work with a partner. Shuffle cards. Place number sentence cards facedown in a row. Place the ten-frame cards facedown below the number sentence cards. Player A turns over a number sentence card and completes the following sentence:

"\_\_\_ + \_\_\_ = 10 so I am looking for a ten frame card with \_\_\_ dots." Try to find the match. Player B repeats the process. The winner has the most sets after all cards have been matched.

### Ten Frame Flash

**Materials:** ten-frame cards

**Instructions:** Flash ten-frame cards and see how fast the children can tell how many dots are shown. This is fast-paced and can be done in minutes at any time.

### Double War with Ten Frames

**Materials:** 2 or 3 sets of ten-frame cards

**Instructions:** Both players turn over two ten-frame cards. The winner is the one with the larger total number. Children can use many different number relationships to determine the winner without actually finding the total number of dots.

### Difference War

**Materials:** 2 or 3 sets of ten-frame cards, 50 counters

**Instructions:** Players each turn over one card as in War. The player with the greater number of dots wins as many counters from the pile as the difference between the two cards. The players keep their cards. The game is over when the counter pile runs out. The player with the most counters wins.

### More and Less Extended

**Materials:** counters, ten-frame cards

**Instructions:** Show a set number of counters. Ask what is 2 more or 1 less, etc. Add a filled ten-frame and repeat the questions. Add more filled ten-frames or take some away.

### All Red Number Game

**Materials:** 10 two-color counters for each player, die, recording sheet

**Instructions:** Play with a partner. Each player has ten counters. Turn all of the counters over so that the yellow side is showing. Each player will roll the die and turn over that number of counters to the RED side. When you roll, record the number sentence that matches. For instance, if you roll a 5, you will write:  $5 + 5 = 10$ . Continue until each person has all of their RED sides showing. Then start the game over again.

### Dots and Numbers Addition Memory

**Materials:** dot cards (some show number combinations, some show visual representations of those number combinations)

**Instructions:** Play with a partner. Mix up the cards. Put them face down on the table. Take turns turning over two cards. If the cards show a match of numbers to dots, tell the addition sentence and keep the cards. If a match cannot be made, turn the cards facedown and the next player goes. The player with more cards at the end of play wins.

### Snappo

**Materials:** Uno cards (numbers only: 0-10)

**Instructions:** Play with a partner. Divide cards evenly among players. Players lay their cards face down in a pile. Players simultaneously flip over their top card and try to make 10, grab the two cards, and say "Snappo!" Keep flipping cards, trying to make 10. A new card that is turned over can be matched with any card to make 10. Game ends when there are no matches left. The player who captured the most cards wins.

### Go Fish for Sums of Ten

**Materials:** Uno cards or playing cards with face cards removed

**Instructions:** Follow regular rules for "Go Fish" game but make sets by finding two cards that sum to 10.

### The Disappearing Train

**Materials:** 20 cubes, die

**Instructions:** With a partner build a train 20 cubes long. One partner rolls the die and removes exactly that number of cubes from the train until there are no cubes left. The other partner keeps a record of how many rolls of the die it takes to make the train disappear. He/she writes a number sentence to show what happens after each roll. Switch rolls and repeat the activity several times.

### How Many Ways Number Bracelets

**Materials:** pony beads, pipe cleaners

**Instructions:** Students make a bracelet with a target number of beads. You may wish to limit the bracelets to just one color of beads so that color does not become a sorting rule and interfere with children's abilities to "see" the break-apart partners. Then have the students slide the beads to see the break-apart partners for the target number. You may wish to record the partitions on a chart. During the discussion, challenge the children to come up with some systematic way of ensuring that they find all of the partitions. Optional recording sheet

<http://tunstalltimes.blogspot.com/2011/08/number-bracelets.html>

### Build It In Parts

**Materials:** toothpicks, pattern blocks, unifix cubes, felt pieces to lay materials on (optional)

**Instructions:** Have students choose a material. Students make at least three different designs for the target number. If desired, help students to record the break-apart partners that match each design. If using this task early in number composition/decomposition experience, avoid using the number sentence and focus on a simple list instead. Repeat the process with a new material/target number.

### Looks and Talks

- Are language based
- Develop part-whole thinking
- Offer an avenue for communication (learning math out loud)
- Help students mentally count all, on, and down

### Move! to Make Sense of Number Composition

**Leaping Lambs:** children jump over a "fence" (a piece of masking tape or yardstick) one at a time to reveal the partners of any particular total.

**Melon Monster:** one child pretends to be a monster that eats melons when the other children's eyes are closed.

### **Additional Resource:**

Singapore Math's Part-Part-Whole Proportional Cards (do not use these until concept is built concretely)

<http://hampsteadstars.wikispaces.com/Proportionate+Part-Part+Whole+Mats>

### **Online Games:**

*How Many Under the Shell* <http://illuminations.nctm.org/ActivityDetail.aspx?ID=198>

*Number Bonds to 10* [http://www.mathplayground.com/number\\_bonds\\_10.html](http://www.mathplayground.com/number_bonds_10.html)

*Number Twins* <http://www.coolmath-games.com/0-number-twins/>

*Beaver Catch Ten* <http://www.ictgames.com/beaver.html>