**The Chicken Coop**

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| **By the end of this lesson, students should be able to solve a**  **“*put together*, *take apart*” word problem by decomposing 8 in a variety of ways.** |

**NC Mathematics Standards:**

**Understand Addition and Subtraction.**

**NC. K.OA.3** Decompose numbers less than or equal to 10 into pairs in more than one way using objects or drawings, and record each decomposition by a drawing or expression.

**NC.K.OA.2** Solve addition and subtraction word problems, within 10, using objects or drawings to represent the problem, when solving:

* ~~Add to/Take From-Result Unknown~~
* Put Together/ Take Apart (~~Total Unknown and~~ Two Addends Unknown)

**Standards for Mathematical Practice:**

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

**Student Outcomes:**

* I can decompose numbers using objects and drawings
* I can record my decompositions by a drawing or expression.
* I can solve word problems with two missing numbers.

**Math Language:**

* decompose (break apart)
* combination
* word problem

**Materials:**

* *Launching Picture – Chicken Coop*
* Student math journals for recording thinking
* A familiar manipulative for modeling the problem (e.g., cubes, chips, buttons) 8 per student

**Advance Preparation**:

* Print or prepare a way to project the *Launching Picture – Chicken Coop*.
* Have manipulatives available for easy distribution.
* Decide if students will work on the problem independently or with a partner. If students work with partners, create heterogeneous pairs.

**Launch:**

1. Ask:  *Has anyone ever had a pet chicken? Could you tell us about them?*  Allow a few students to share. Possible prompts:
   * Where do pet chickens live? (in a coop)
   * Why do chickens live in a coop? (to stay safe and to keep from getting away)
   * Do chickens usually live alone or with friends? (in groups)
2. Show students the picture of the chicken coop.
3. Ask: *What do you notice about this picture of the chicken coop?* As students share their thinking, record what they notice about the picture. Be sure students mention:
   * I notice chickens can be in ‘run’ (grassy area where chickens can eat bugs and seeds)
   * I notice chickens can be in the house (where they sleep and lay eggs)
4. Ask: *What do you wonder about this picture?* As students share their thinking, record what they wonder about the picture. Be sure students mention:
   * I wonder where the chickens are.
   * I wonder how many chickens live in the coop.
5. Focus student’s thinking on the question: *If 8 chickens live in the coop, how many chickens could be in in run (grass) and how many chickens could be in the chicken house?*
6. Say: *Discuss the important details of this problem with your shoulder buddy.*
   * 8 chickens
   * Some are in the coop and some are in the run (grass)
7. Call on a few students to share details with the whole group. Make certain all students have made sense of the problem.
8. Say: *Today you’re going to be working with a partner (or alone) to solve this problem. You may use manipulatives to help solve the problem if you need it. You should record your thinking in your math journal.*
9. Provide each student with the 8 manipulatives of the same color and size. (If students will be working in pairs, place them with their partners at this time.)

**Explore:**

1. Allow 7-12 minutes for the students to solve the problem.
2. This exploration time is useful for observing and collecting formative data on students’ current level of understanding.
   * If students are productively grappling, walk around asking questions to elicit thinking (see chart below).
   * If the class shows unproductive frustration, pull students back together. Redirect the entire class by asking questions to elicit thinking.

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| **Observation** | **Questions to Advance Student Thinking** |
| Student has found a 1-2 combinations. | * What other ways could the 8 chickens be in the coop? (It is common for students to find the doubles combination and stop there) * What if one chicken ran out of the house? How many chickens would be in the house and run now? * Have you found all the combinations? How do you know? |
| Student has found all combinations except those with zero. | * Is it possible that all the chickens are in the chicken house? * How could you record that? |
| The student has found all the combinations but hasn’t used a systematic approach. | * How could you organize your thinking? Would a chart or table help you determine if you’ve found all the combinations. |
| Student has difficulty recording decompositions | * How could you show me what you’ve done with your objects using pictures or numbers? (Children should not be required to use expressions at this time.) |

1. As students work, select a few to share their thinking during the “Discuss” section of the lesson. Determine the sequence in which students will share (e.g., begin with students who have a more difficult time finding combinations and then move to students who have found many more combinations). Be sure to select a student that used the 0, 8 combination.

**Discuss:**

1. Bring students together on the carpet. Students should bring their written work.
   * Call students’ attention to the visual again
   * Say:  *\_\_\_\_\_\_ will you share the problem with us again?*
2. Have pre-selected students to share their combinations.
   * As each student shares, direct attention to the combination they’ve found.
     + Ask: *What combination of 8 did you find?*
     + Highlight vocabulary: *You’ve decomposed, or broken up, 8 into \_\_\_ and \_\_\_.*
     + Display student-recording, or teacher can record combination in a chart, number bond, or expression (if students are ready).
     + Ask: *What strategy did you use to find that combination?* (objects, pictures, counting on/back, or known facts).
   * Be sure to call on a student who found the 0, 8 combination as this is often the most difficult for students to find.
3. Ask: *Through today’s word problem we’ve found that 8 can be decomposed or broken apart in many different ways. Numbers are made up of other numbers and you’ve shown all the ways you can make 8. I’m very proud of your perseverance today as you worked together to find all the combinations.*

**Evaluation of Student Understanding:**

**Informal Evaluation:**

* How many combinations were students able to find on their own?
* What strategies are students using to find combinations:
  + Direct modeling with objects
  + Direct modeling with drawings
  + Counting strategies (mental math while keeping track on fingers)
  + Using known facts (Knowing facts to 8 is not expected in Kindergarten.)
* How are students transitioning from one combination to another:
  + Are students guessing on number and then counting to find the other?
  + Are students using the commutative property (4+ 3 is the same as 3 +4)?
  + Are students strategically finding each combination (0+8, 1+7, 2+6, 3+5, etc…)?

**Meeting the Needs of the Range of Learners:**

**Interventions:**

* Work mats may be used for students who need concrete experiences. Small chicken cutouts may be placed on top of the chicken coop picture for a direct model of the word problem.
* Students who are not proficient at counting to 8 could use a smaller number for this task.
* Use observational data from the “Explore” portion of today’s lesson to plan differentiated, small group instruction, as well as to guide planning for future lessons.

**Extensions:**

* This task can be easily adapted to working with different numbers based on student needs.
* Other possible contexts for similar put together/take apart problems with both addends that could be used to practice decomposing might be:
  + The chickens from today’s problem could lay brown and white eggs
  + Two colors of candy in a bowl
  + Two types of vegetables in a garden
  + Red fish and blue fish in a bowl
  + Children on the swings and on the slides
  + Ducks in the pond and on the grass

**Special Notes:**

* Children should not be expected to use expressions to represent their combinations for this problem type until the end of Kindergarten.

**Launching Picture – Chicken Coop**

