**Do They Have the Same Number?**

**Commutative Property**

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| In this lesson, students explore the communitive property in the context of a word problem to determine if students have the same number of items.  |

**NC Mathematics Standard:**

**Understand and apply the properties of operations.NC.1.OA.3** Apply the commutative and associative properties as strategies for solving addition problems.

**Additional/Supporting Standard:**

**Analyze addition and subtraction equations within 20.**

 **NC.1.OA.7** Apply understanding of the equal sign to determine if equations involving addition and subtraction are true.

**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

4. Model with mathematics

6. Attend to precision

7. Look for and make use of structure

**Student Outcome:**

* I can solve a problem using ideas based on the properties of addition.
* I can determine if two equations have the same sum when the order of the addends change.
* I can explain the pattern of the addends and sums in equations.

**Math Language:**

equal order addends sum

total part equation addition

**Materials:**

* A basket of tools available for the teacher and students including materials such as unfix cubes, pop cubes, counters, balance scale, number line, 100 board, etc.
* Chart with the launch problem written so all can read
* A whiteboard and dry erase marker for each pair of students
* Math journals or activity sheets where students can show their work
* Exit tickets

**Advance Preparation**:

* Gather materials listed above for the baskets of tools
* Gather whiteboards and dry erase markers
* Create chart for launch word problem
* Copy and cut word problems to glue in math journals **or** copy activity sheets
* Copy exit tickets

**Launch:**

1. Introduce Problem (5 minutes)

Post the following problem for all to see (on chart paper, projector, or board). Read the problem aloud.

***Molly has 7 green crayons and 8 yellow crayons. Ben has 8 green crayons and 7 yellow crayons. Molly says they both have the same amount. Do you agree or disagree? Why? Explain your thinking with pictures, words, or numbers.***

Ask questions to guide students to discover the concept of the commutative property

(no matter the order of addends, the sum remains the same).

* *What is happening in this problem?*
* *Can you retell the problem to your partner?*
* *What do you know?*
* *What do you need to determine?*

**Explore:**

1. Partners Solve the Problem (10 minutes)

Once students understand the situation, organize students for problem solving and distribute tools (unfix cubes, pop cubes, counters, number balance, number line, 100 board, etc.) Students will solve the problem with tools and verbally explain strategies and reasoning to a partner.

Teachers should monitor and interact with students while deciding which representations to share with the class, and in what order. Some questions to pose might include:

* *What is the problem asking you to determine?*
* *What tool did you use for this problem? Why did you select it?*
* *Is your solution clear?*
* *What does your drawing represent?*
* *Can you write an equation or equations to represent and/or solve the problem?*
	+ *What do you notice about the equations for each set of crayons? How are the numbers in the problem related?*

**Discuss:**

1. Discussion of Solutions (10-15 minutes)

Gather student work samples that show a variety of strategies and thinking. Show examples under the document camera as students discuss strategies used as well as their thinking. Relate the strategies to the fact that the sum remains the same although the order of the addends changed.

Possible points to address and questions to ask:

* Discuss and relate various modeling strategies (unfix cubes, pop cubes, counters, balance scale, number line, 100 board, etc.)
* Use green and yellow unifix cubes to represent Molly’s crayons (7 green and 8 yellow).  *How can you write an equation to represent Molly’s crayons?* Record the equation on a board or chart. Then use green and yellow cubes to represent Ben’s crayons (8 green and 7 yellow). *How can you write an equation to represent Ben’s crayons?*
* Discuss how to use a balance scale to investigate the commutative property by placing 7 cubes and then 8 cubes on the left side. Ask students what the cubes represent and what should go on the other side and why. Then place 8 cubes and 7 cubes on the right side. *What do you notice? Why does that happen?*
* Make connections by using a student’s work who used two number lines to model the commutative property of addition. *If I add 7 + 8 on the one number line and 8 + 7 on another number line, will the sum remain the same? Why*?

Have partners to Think-Pair-Share questions such as:

* *What do you notice when you look at the addends and sums in both equations?*
* *What do you notice when the order of the addends change?*
* *How would you explain to a friend how to solve 8 + 2 = ? if you know that 2 + 8 = 10?*
* *What strategy did you use to explain your thinking? Why?*
* *How is your strategy alike or different from your friend?*
* *Does it matter what order the addends are in? Will the sums be the same?*

**Additional Activities (if needed)**

1. Practice Problems with Turn-Around Trains (10 minutes)
* Students will work with a partner.
* Partner A will build a two-color train by connecting up to 20 cubes (with like colors together). Partner A will record an addition equation on the whiteboard to match his or her train. Then Partner B will “turn around” the train and record the addition equation on the same whiteboard to match the new train.
* Partner B will then build a second two-color train and record an addition equation on the whiteboard to match it. Partner A will “turn around” the train and record the addition equation on the same whiteboard to match the new train.
* Then students will take turns discussing how the two equations are alike and how they are different using appropriate vocabulary (*addends* and *sum*). If time permits, both students can build another two-color train and repeat the process.

Teachers should monitor and interact with students. Some questions to pose might include:

* *How were you able to solve the second equation so quickly?*
* *What patterns do you notice in your equations?*

**Evaluation of Student Understanding**

**Informal Evaluation:**

* Observation of students’ work and interactions (noticing patterns of addends and sums)
* Evidence of students recognizing patterns during the Think-Pair-Share discussion and Turn-Around Trains activities.

**Formal Evaluation:** Exit Ticket (10 minutes)

 Pose the following problem for students to solve independently.

***Bill had 9 green balloons and 6 red balloons. Lisa has 6 green balloons and 9 red balloons. Lisa is upset because she thinks Bill has more balloons. Is she right? How do you know? Explain your thinking with pictures, numbers, or words.***

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

**Intervention:**

* Ask the student to place double colored counters on a sheet of paper or a whiteboard to represent the quantities in a word problem and then “turn around” the board to represent the commutative property of addition. This will help students notice that the addends “turn around,” but the sum remains the same.
* Use two number lines to model the commutative property of addition. Use two dice to determine the addends. For example, if a student rolls 3 and 5, the student would start at 3 and count on five to land on the sum of 8. Then the student can change the order of the addends by starting at 5 and counting on 3 to land on the sum of 8.



* Students can continue to experiment with the balance scale and cubes to discover how the commutative property works. A number balance could also be used.
* Domino Deal 1 - “Deal” a domino from your stack. Students then write an equation to add the left number of dots to the right number of dots on the domino. For example, if the domino’s left number is 4 and the right number is 2, the students will write and add 4 + 2 = 6. All players should write the equation on a piece of paper or whiteboard. Next, the teacher will turn the domino around to change the order of the addends and represent the commutative property, so the left number is now 2 and the right number is 4. The students will write and equation 2 + 4 = 6. All players should write the equation on a piece of paper or whiteboard. The teacher can “deal” as many dominos as needed to practice the commutative property of addition.
* Commutative Concentration - Use this game to practice the commutative property of addition, or "turn around facts." Place cards face down in an array. Students take turns flipping over two cards and try to make a match. Students are looking to match basic math facts with their turn around facts in order to increase understanding of the commutative property and basic fact fluency. Students need to also find the sum before they are able to keep the cards.
	+ If it seems to be too much for the students to flip over the cards to find a match, then students can keep the cards face up in the array and find the matching cards.

**Extension:**

* Domino Deal 2 - The teacher begins by “dealing” a domino out from his or her stack. Students would then use the number of dots on the domino to write a complete fact family.



 5 + 2 = 7

 2 + 5 = 7

 7 – 2 = 5

 7 – 5 = 2

* Create problems that include three addends instead of two, providing students with the opportunity to add the addends in any order while looking for the relationship between numbers (doubles, doubles plus one, making 5, making 10, etc.)

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| Student cannot organize the information in order to solve | Ask the student to reread and unpack the problem.Have the student represent items in the problem with manipulatives or models. Ask the student to tell what the problem is asking us to find out. |
| Student adds two numbers together incorrectly so they believe the sum of the other side is the same number  | Have student use manipulatives or models to act out the problem. |
| Student tries to add all numbers together when an equation is written as 3 + 5 = 5 + 3 | Have student draw a picture to represent each set of objects on EACH side of the equation. |
| Student may get confused and try to apply the commutative property to subtraction.  It is important to remind him or her that the commutative property does not work for subtraction.  For example:  8 + 3 and 3 + 8 are related, however 8 - 3 and 3 - 8 are not related.   | Use manipulatives and part-part-whole models so student can visually see relationships when working with related facts. Point out that the same three numbers are used, but the facts must be true (not just moved around the operation sign).  |

**Special Notes:**

* Students in first grade do not need to know the name of the Commutative Property of Addition, but they should know that addends can be added in any order and the sum remains the same.
* Students should also be exposed to the Commutative Property as follows:

 2 + 5 = 7

5 + 2 = 7 AND 2 + 5 = 5 + 2

**Possible Solutions:**

* Student solutions will be the same, but strategies and reasoning for finding the sums will be varied. Help students see the connection between the strategies and reasoning discussed.

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Do They Have the Same Number of Crayons?**

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| --- |
| **Molly has 7 green crayons and 8 yellow crayons. Ben has 8 green crayons and 7 yellow crayons. Molly says they both have the same amount. Do you agree or disagree? Why?**  |
| **Explain your thinking with pictures, words, or numbers.**  |

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Exit Ticket**

**Do They Have the Same Number of Balloons?**

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| --- |
| **Bill had 9 green balloons and 6 red balloons. Lisa has 6 green balloons and 9 red balloons. Lisa is upset because she thinks Bill has more balloons. Is she right? How do you know?**  |
| **Explain your thinking with pictures, numbers, or words*.*** |

**Commutative Concentration**





