Lesson Summary:
In this lesson, the Commutative Property of Addition is introduced using models such as students, counters, balances and dominoes. Students discover the order of the numbers in an addition sentence does not change the result of the sum. The element of discovery at this age is very powerful.

Estimated Duration: 120 minutes over several days

Commentary:
Algebra is commonly thought of as “generalized arithmetic.” In this lesson, students use addition facts to develop the Commutative Property of Addition. As young children use objects to represent quantities, they begin to use symbols to describe the relationship of quantities. Through the exploration of addition facts, students recognize equivalent representation and communicate these relationships of quantities. By concluding that order is not important in addition, students develop a definition for commutative property. This property of order in arithmetic becomes a powerful algebra property and tool.

Pre-Assessment:
• In a small-group setting, give 10 red cubes and 10 blue cubes to each student.
• Have students represent the number sentence 2 + 6 with cubes and explain the representation. Have each student represent 6 + 2 using the cubes and explain the representation. Some students may use only one color of cubes. Other students may use a combination of colors; e.g., represent each addend with a different color.
• Ask students,
  a. Are the answers the same?
  b. Why are they the same?
• Have each student represent 4 + 3 with cubes and explain the chosen arrangement of cubes. Have each student represent 3 + 4 using cubes and explain the chosen arrangement.
• Ask the student,
  a. Are the answers the same?
  b. Why are the answers the same?
Ohio Standards Connection

Benchmark K
Demonstrate fluency in addition facts with addends through 9 and corresponding subtractions.

Indicator 16
Develop strategies for basic addition facts, such as:
  a. counting all;
  b. counting on;
  c. one more, two more;
  d. doubles;
  e. doubles plus or minus one;
  f. make ten;
  g. using tens frames;
  h. identity property (adding zero).

Mathematical Processes

Benchmark A
Use a variety of strategies to understand problem situations; e.g., discussing with peers, stating problems in own words, modeling problems with diagrams or physical materials, identifying a pattern.

Scoring Guidelines:
Observe students creating representations of the number sentence. Record anecdotal notes or complete a checklist of skills needed to complete the task. Observe:
  • Does this student count the blocks correctly?
  • Does the student count the correct number of blocks?
  • Does the student understand addition as combining the sets?
  • Does the student find the two sums to be equivalent?

Post-Assessment:
Assess students as they work in a small-group. Each student works independently to complete the tasks.
  • Have each student select an addition fact card (2 + 3, 6 + 1, 4 + 5, 7 + 3, 1 + 4, 5 + 2, 3 + 4).
  • Tell students to represent that number sentence using cubes.
  • Ask students to explain the method used.
  • Have students write a fact using the commutative property on a piece of paper and represent it using cubes. Sample questions include
    a. Are the answers the same?
    b. Why are the answers the same?

Instructional Tip:
If addition fact cards are not available, they can be made by writing addition facts on index cards or construction paper.

Scoring Guidelines:
Use Attachment B, Post-Assessment Checklist, to record the results of this assessment. Use + to indicate that the child performed the activity satisfactorily and use – to indicate that the child is unable to perform the activity satisfactorily. Brief anecdotal records also may be helpful.

Instructional Procedures:
Part One
1. Have two girl students and three boy students from the class stand in front of the room. Ask students questions to describe the group of students.
   • How many girls are there?
   • How many boys are there?
   • How many students are there altogether?
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2. Have a student write the number sentence $2 + 3 = 5$ on the board to represent the group of students.
3. Call another group of three boy students and two girl students to the front of the class.
   - How many girls are there?
   - How many boys are there?
   - How many students are there altogether?
4. Have a student write the number sentence $3 + 2 = 5$ on the board to represent the group of students. Ask students:
   - What do you notice about the number sentences?
   - Are the answers the same?
   - Select students to tell how the number sentences are the same and different.
5. Write the term **commutative property** on the board. Say,
   *Mathematicians call this the commutative property. When adding, it does not make a difference which number comes first, 2 + 3 or 3 + 2. The answer is still the same, 5.*
6. Select a group of four girl students and three boy students to come to the front of the classroom. Ask questions about the group of students.
   - How many girl students are there?
   - How many boy students are there?
   - How many students are there altogether?
7. Have a student write the number sentence, $4 + 3 = 7$, on the board to represent the group of students.
8. Select a group of three boy students and four girl students to the front of the class. Ask questions about the group of students.
   - How many girl students are there?
   - How many boy students are there?
   - How many students are there altogether?
9. Have a student write the number sentence, $3 + 4 = 7$, on the board to represent the group of students. Ask questions comparing the number sentences.
   - What do you notice about the number sentences?
   - Are the answers the same?
   - Select students to tell how the number sentences are the same and different.
10. Say,
    *We call this the commutative property. When combining sets or adding, does it make a difference which number comes first, 4 + 3 or 3 + 4? (No, it is the same answer.*)
11. Ask students to create pairs of number sentences that represent the commutative property of addition. Have students share their pairs of number statements. As students name examples such as $2 + 7$ and $7 + 2$ use classroom items such as books, markers, rulers, to represent each pair of number sentences.

**Instructional Tip:**
For students who need assistance, provide other examples as needed, (1 + 5 and 5 + 1, 6 + 3 and 3 + 6, 0 + 2 and 2 + 0) or give one number sentence and ask them to write or say the number sentence which shows the commutative property.
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12. Have students show what they know about the commutative property in math journals. Some possible options include drawing pictures, writing number sentences showing commutative property, using given number sentences, or creating pairs of number sentences showing the commutative property. Some students may be able to write sentences or give oral explanations describing their understanding.

Part 2

Instructional Tip:
In this lesson, use balances to practice identifying pairs of addition facts which represent the commutative property. Make sure the balances work correctly before beginning Part Two. Also be sure that cubes used weigh the same amount.

13. Demonstrate the activity with the whole class and then have the students model the activity in small groups. For the demonstration, use a balance and 10 cubes of one color (red) and 10 cubes of another color (blue). Put three red cubes and two blue cubes on one side of a balance. Have a student write on the board the number sentence that represents the number of cubes on the balance (3 + 2 = 5). Put two blue cubes and three red cubes on the other side of the balance. Have another student write on the board the number sentence that represents the number of cubes on the balance (2 + 3 = 5).
- Is the balance level?
- Why is the balance level?

14. Give each group of students an addition fact card. Have one student put cubes on the left side of the balance to represent the numbers on the addition fact card. Have another student put cubes on the right side of the balance to represent the commutative property. Have another student record the facts.

15. Have the groups repeat this activity using different addition fact cards. Ask students,
- What did you learn in mathematics today? (Possible answers may include that it does not make any difference which number comes first when adding because the answers are the same. Examples of the commutative property may be given such as 6 + 2 = 2 + 6.

16. Have students write or illustrate how to show two number sentences are equal using a balance in math journals. Some students create original number sentences, while others may need to be given a number sentence to start. Additionally, some students can manipulate a balance and explain their understanding in an interview format.

Part 3

Instructional Tip:
If dominos are not available, they can be made by drawing dots on divided construction paper.

17. In a whole-class format, demonstrate how to draw the dots (pips) on the Attachment C, *Flipping Dominos*. The left side of the domino on your paper should match the left side of the domino. Describe exactly where the dots are on the domino. (For example, there is one dot in the top left corner and one dot in the bottom right corner of the left side of this domino.)

18. Distribute Attachment C, *Flipping Dominoes*, to each student. Have the student describe where the dot(s) are on the left side of their dominoes and then draw those dots on the paper.
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19. Repeat this demonstration for right side of the dominoes, again describing the placement of the dots. For example, there is one dot in each corner and a dot in the center.

20. Have the students describe the dots on the right side of their dominoes and draw the dots on their papers.

21. Write a number sentence below the domino to represent the number of dots on each side of the domino and the total number of dots, i.e., $2 + 5 = 7$.

22. Have each student write the number sentence which represents the number of dots on each side of the domino and the total number of dots.

23. Demonstrate how to rotate the domino so the dots are in reverse order. Have each student rotate their domino. Demonstrate how to draw the dots on the left side of the domino describing exactly where the dots are on the domino (one dot in each corner and one dot in the center). Have the students draw the dots on the left side of their dominoes describing exactly where the dots are on the dominoes.

24. Demonstrate how to draw the dots on the right side of the domino describing exactly where the dots are on the domino (one dot in the top left corner and one dot in the bottom right corner). Have each student draw the dots on the right side of the domino describing exactly where the dots are on the domino.

25. Write a number sentence below the domino to represent how many dots are on each side of the domino ($5 + 2 = 7$). Have each student write a number sentence to represent how many dots are on each side of the domino.

26. Have each student pass their domino to the right and repeat this process using a different domino.

27. Ask students,

- What do you know about commutative property of addition? (Possible answers may include that it does not make any difference which number comes first when adding, the answers will be the same. Possible examples are $4 + 5 = 5 + 4$.)

- What questions do you have about commutative property of addition?

Write the students responses on chart paper or have them write in the math journals.

Differentiated Instructional Support:
Instruction is differentiated according to learner needs, to help all learners either meet the intent of the specified indicator(s) or, if the indicator is already met, to advance beyond the specified indicator(s).

- In a learning center, have students make necklaces showing that 2 + 3 beads, is the same as 3 + 2 beads. This can be done by using two different colored beads on string or two different colors of cereal (for the beads) and licorice (for the string).

- Have students make balances or mobiles using large drinking straws with pieces of string through them. Put a paper clip on each end. Make sure it is balanced. Put 3 blue paper clips on one end and 2 yellow paper clips on the other end. Notice that it doesn’t balance any more. Add 2 yellow paper clips to the 3 blue paper clips and 3 blue paper clips to the 2 yellow paper clips. Now it balances again. Allow the students to experiment and record their findings.

- Have students play the memory game using addition fact cards ($3 + 1, 1 + 3, 2 + 0, 0 + 2, 3 + 2, 2 + 3, 4 + 2, 2 + 4, 6 + 1, 1 + 6$). A pair of students puts all of the cards face down, spread out between them. The first student turns two cards, one at a time, face up. If the two cards
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match the student keeps the cards and has another turn. If the cards do not match, the student replaces the cards face down. The second student repeats the process. The game is played until all of the cards have been matched. The student with the most cards at the end of the game wins the game.

Extensions:
- Demonstrate the commutative property using food coloring. Add drops of food coloring together to see that 3 drops of blue and 2 drops of yellow make the same color as 2 drops of yellow and 3 drops of blue. It does not make a difference which color is put in the glass first. The students could experiment mixing drops of food coloring with a partners.
- Extend the commutative property to three or four addends. Challenge students to make conjectures about the number of addends and the commutative property. Have students develop lists of possible sequences the numbers can be added. For example, $1 + 2 + 3 = 6$, $2 + 1 + 3 = 6$, $2 + 3 + 1 = 6$, $3 + 1 + 2 = 6$, $3 + 2 + 1 = 6$. This skill can assist students when given several addends and finding addends that add to 10. For example, $4 + 7 + 6 = 4 + 6 + 7$. Knowing the commutative property, students can find compatible numbers for 10.
- Explore commutative property with two-digit addition using base-ten blocks or other appropriate manipulatives. Students should conjecture that the commutative property works for large numbers as well.

Home Connections:
Inform the parents that the children have been learning about the commutative property of addition. For homework, on one half of a blank sheet of paper, students draw a picture of their family, showing the number of girls and the number of boys. On the other half of the paper, the students draw a picture of the family showing the number of boys and the number of girls. Each student writes a number sentence under each picture, using the commutative property. Students return the papers and share with the class. Create a class book of the students’ pictures.

Interdisciplinary Connections:
Content Area: Science
Standard: Physical Science
Benchmark: A. Discover that many objects are made of parts that have different characteristics. Describe these characteristics and recognize ways an object may change.

The students could use watercolors to paint 2 green leaves and 4 yellow leaves on one side of the paper and 4 green leaves and 2 yellow leaves on the other side of their paper.

Content Area: Fine Arts – Visual Art
Standard: Creative Expression and Communication
Benchmark: A. Demonstrate knowledge of visual art materials, tools, techniques and processes by using them expressively and skillfully.

See extension section for color combinations.
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Materials and Resources:
The inclusion of a specific resource in any lesson formulated by the Ohio Department of Education should not be interpreted as an endorsement of that particular resource, or any of its contents, by the Ohio Department of Education. The Ohio Department of Education does not endorse any particular resource. The Web addresses listed are for a given site’s main page, therefore, it may be necessary to search within that site to find the specific information required for a given lesson. Please note that information published on the Internet changes over time, therefore the links provided may no longer contain the specific information related to a given lesson. Teachers are advised to preview all sites before using them with students.

For the teacher: white board, marker, balance, 10 cubes of one color, 10 cubes of another color, a copy of the checklist for the Pre-Assessment and the Post-Assessment, a pen, a class set of copies of the attachment, food coloring, 2 clear plastic cups, a large drinking straw, string, colored paper clips, beads, watercolors, watercolor paper, addition fact cards.

For the student: balance and a set of 10 cubes of one color and 10 cubes of another color for every set of 4 students, a copy of the attachment, pencil, food coloring, 6 clear plastic cups, a large drinking straw, string, colored paper clips for each group of 4 students, beads, water colors, watercolor paper, addition fact cards.

Vocabulary:
- altogether
- balance
- commutative property
- cubes

Technology Connections:
Have pairs of students work together, each student has a calculator. One student keys the problem 2 + 3 = ____. The other student keys the problem 3 + 2 = ____. Students compare the answers. There are several software programs that would give the students practice with the concept of the commutative property of addition.

Research Connections:

General Tips:
- Provide general information regarding classroom set-up or safety issues here.
- Summarize extensive lesson preparations, if needed.

Attachments:
Attachment A, Pre-assessment Checklist
Attachment B, Post-assessment Checklist
Attachment C, Flipping Dominoes
## Commutative Property – Grade One

### Attachment A

**Pre-Assessment Checklist**

<table>
<thead>
<tr>
<th>Student Name</th>
<th>Solves open sentences.</th>
<th>Explains how sentences were solved.</th>
<th>States that it does not make any difference which number comes first.</th>
<th>Comments</th>
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Attachment B
Post-Assessment Checklist

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<th>Student Name</th>
<th>Solves open sentences.</th>
<th>Explains how sentences were solved.</th>
<th>States that it does not make any difference which number comes first.</th>
<th>Given one fact, student can write the fact in reverse order.</th>
<th>Comments</th>
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Attachment C
Flipping Dominoes

1.  
   \[3 + 2 = 5\]

2.  
   \[\quad + \quad = \_\]

3.  
   \[\quad + \quad = \_\]

4.  
   \[\quad + \quad = \_\]