Relationship of Addition and Subtraction

Student Probe

Michael had 8 baseball cards. At his birthday party he received 5 more baseball cards. How many baseball cards does Michael have now?
Ask the student to write a number sentence to show the solution to this problem.
Then ask the student to write the corresponding subtraction problem and to explain his/her thinking. (If the student is unable to do this easily, this lesson is needed.)

Lesson Description

This lesson expects the student to take any addition problem and change it into a subtraction problem and vice versa. The student must also create word problems to match the equations and explain what the numbers mean in each problem. This lesson should follow Operations of Addition and Subtraction.

Rationale

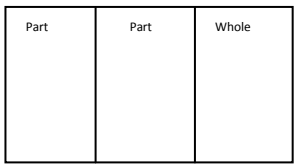
Students need to understand the relationship between addition and subtraction. This relationship is a fundamental mathematical understanding needed for operating within base ten. In third grade students will see this relationship again between multiplication and division. Also, when students understand this relationship, they can use addition facts to learn their subtraction facts. In later algebra courses, students will generalize this concept to solve equations.

At a Glance

What: Relationship of addition and subtraction
Common Core Standards: CC.2.NBT.5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.
Mathematical Practices:
Reason abstractly and quantitatively.
Look for and make use of structure.
Who: Students who do not understand that addition and subtraction are inverse operations
Grade Level: 2
Prerequisite Vocabulary: addition is joining sets of objects; subtraction is separating sets of objects, part, whole
Prerequisite Skills: Problem-type: Joining and separating result unknown problems, counting on
Delivery Format: Individual, small group
Lesson Length: 20-30 minutes
Materials, Resources, Technology: Prepared part/part/whole chart, baseball cards, or other concrete items,

Preparation

Have baseball cards available for student use. Prepare part/part/whole cards. Create a part/part/whole mat by folding and labeling a piece of paper (see diagram).



Lesson

<table>
<tr><th>The teacher says or does…</th><th>Expect students to say or do…</th><th>If students do not, then the teacher says or does…</th></tr>
<tr><td>1. Michael had 8 baseball cards. At his birthday party he received 5 more baseball cards. How many baseball cards does Michael have now?

Write a number sentence that shows the solution to this problem.

What does each number mean in the problem?

How could you rewrite this number sentence as a subtraction problem?</td><td>

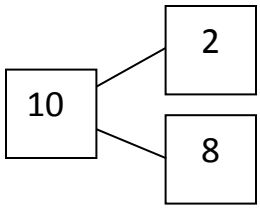
8 + 5 = 13

13 is total number of cards
8 is the number of baseball cards he had in the beginning
5 is the number he got for his birthday

13 – 8 = 5 or
13 – 5 = 8</td><td>Have the student act out the problem with baseball cards. Have the student notice what each number means in the equation.

Use the part/part/whole mat to look at the parts.

<table><tr><td>Part
8
(started with)</td><td>Part
5
(received)</td><td>Whole
13
(total cards)</td></tr></table></td></tr>
<tr><td>2. How could you change the baseball card problem into a subtraction word problem?</td><td>Michael received 5 baseball cards for his birthday. Now he has 13 baseball cards. How many baseball cards did he have before his birthday?</td><td>Have the student act out the problem with the baseball cards. First have the student act out the original problem and then help the student make a subtraction problem. Use the part/part/whole mat. Say, “Instead of having the whole missing, we have a part missing. How could you write the problem with one of the parts missing?”</td></tr>
</table>

The teacher says or does…	Expect students to say or do…	If students do not, then the teacher says or does…
3. Write one equation under the other so the student to can make observations. 8 + 5 = 13 13 – 5 = 8 What do you notice about the two equations? What's different?	They both have the same numbers. One is addition; the other is subtraction. The numbers are in a different order.	Use the part/part/whole mat to see how all three numbers can be used to make addition or subtraction problems.
4. Let's try some other numbers using the part/part/whole model so we can see if that works for all numbers. If I give you the 3 numbers 10, 2, and 8, what problem could you make with the baseball cards? Which is the whole and which are the parts? How do you know? 	10 is the whole and 2 and 8 are the parts. I know because 8 and 2 make 10. Michael had 2 cards. He received 8 more for his birthday. How many cards does he have now? Accept other stories that work for the numbers.	Use the part/part/whole mat and put the numbers. Part 8 | Part 2 | Whole 10
5. Write the equation that matches. What does the "2" mean? What does the "8" mean? What does the "10" mean?	2+8=10 (Accept equations that match the student's story.) Number of cards Michael started with Number of cards he received for his birthday Total number of cards	Have the student act out the problem.

The teacher says or does…	Expect students to say or do…	If students do not, then the teacher says or does…
6. Now try to write a subtraction story. (Or addition story, if the first story is a subtraction story.)	Michael had 2 baseball cards. He received some more for his birthday. Now he has 10. How many cards did he receive on his birthday? (Accept other variations that work.)	Have the student act out the problem with the baseball cards. Use the part/part/whole mat.
7. What equations could you write?	2 + ? = 10 or 2 + 8 = 10 10 – 2 = ? or 8 = 10 – 2	Have the student act out the corresponding problem and write the number for each action.
8. What do the numbers mean in the equation?	2 means the number of cards Michael had in the beginning. 10 is the total number of cards at the end.	Student acts out the problem and explains the number that goes with each action.
9. What do you notice about the two equations?	They both have the same numbers. One is addition and one is subtraction. They are written differently but have the same answer.	
10. How could I solve this subtraction problem using addition: 20 – 18 = ?	18 + 2 = 20	Give a word problem: I had 18 baseball cards. My friend gave me some more and now I have 20. How many cards did my friend give me? Have the student write the equation and explain the parts.
11. Continue working with the student using other story problems and following the same steps.		

Teacher Notes:

1. This lesson is appropriate once students are fluent with the basic addition and subtraction facts. That concept is addressed in Operations of Addition and Subtraction.
2. The context of the problems can differ according to the student's interest.
3. The focus of the conversation needs to be on how addition and subtraction are related. The student needs to continue creating story problems demonstrating the inverse operation and writing the equations that correspond.
4. The part/part/whole mat is a very explicit model that can help students see how the numbers remain as the part or whole of an equation no matter if the operation used is addition or subtraction.
5. Each time the student creates a story problem and writes the equation, have the student change the problem and write the equation using the opposite or inverse operation.
6. Use smaller numbers in the beginning so students can focus on the concept and not the computation.
7. After using word problems to build the inverse operation concept of addition and subtraction, begin using "naked" equations with numbers that are close together like 18-17 and ask the student to solve using addition.
8. Once students become fluent with smaller numbers, begin using larger numbers.

Variations

Use 10 frame cards as a part/part/whole model. The student should write word problems and equations for both addition and subtraction.

Formative Assessment

Give the student a set of numbers such as: 7, 5, 12 or 3, 8, 11. Have the student create inverse story problems and equations just as in the lesson.
The student should be able to explain the relationship between the two equations.

References

Russell Gersten, P. (n.d.). *RTI and Mathematics IES Practice Guide - Response to Intervention in Mathematics*. Retrieved Feb. 25, 2011, from rti4sucess Marjorie Montague, P. (2005, 4 19). *Math Problem Solving for Primary Elementary Students With Disabilities*. Retrieved Feb. 24, 2011, from The Iris Center

John Van de Walle, *Elementary and Middle School Mathematics: Teaching Developmentally*