Fluency of Basic Facts (+/-)

Student Probe

Ask the student, "What is 5 + 5?"
Most students will say "10."
Ask "How do you know?" Various answers will be given. Then say, "so if 5 + 5 is 10, what is 5 + 4?"

If the student begins counting on fingers to find the solution, that student needs to go back to the lesson, Relationships between the Numbers to 10. If the student successfully answers and explains a strategy built on relationships of numbers, (for example, one more, one less) but is slow to answer, he or she is ready to build fluency.

Lesson Description

This lesson is in three parts. In part one, students must prove they are proficient with naming the total and the expression associated with a given dot card or ten frame. In part 2, students connect the previous knowledge of dot cards and numerals to the more symbolic part/part/whole number bond cards. The student must prove proficiency with this model before moving to part 3. Finally in part 3, the student reads the traditional symbolic flashcards to 10 and becomes proficient with reading and interpreting this model of mathematics.

Rationale

Being able to recognize and understand immediately (literacy) written numerals and symbols of mathematics is essential. When students are fluent with facts, their attendance to understanding the problem becomes the focus not the computation. It is critical for students to have a facility with number at an early age in order to gain access to more and more mathematics.

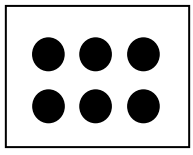
At a Glance

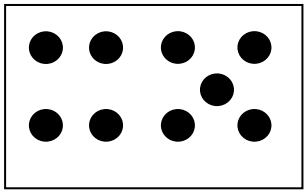
What: Gain fluency with basic facts.
Standard:
AR.Math.Content.1.OA.C.6
Add and subtract within 20, demonstrating *computational fluency* for addition and subtraction within 10. Use strategies such as *counting on*; making ten; decomposing a number leading to a ten; using the relationship between addition and subtraction; and creating equivalent but easier or known *sums*.
Note: *Computational fluency* is demonstrating the method of student choice. Students should understand the strategy he/she selected and be able to explain how it can efficiently produce accurate answers.
Mathematical Practices:
SMP6: Attend to precision.
SMP7: Look for and make use of structure.
Who: Students who need to gain automaticity or fluency but also have understanding of the relationships of numbers to ten.
Grade Level: 1
Prerequisite Vocabulary: sum, total, one, part, numeral
Prerequisite Skills: Rote sequence of counting numbers to 30, one-to-one correspondence, ability to orally match a numeral with a quantity to 10, knows and can explain all the combinations to 10, understands the relationships of the number to 10
Delivery Format: Individual, small group
Lesson Length: 15 minutes
Materials, Resources, Technology: Dot cards, stopwatch (optional), Part/part/whole flashcards, 10 frames,
Student Worksheets: Students will keep track of the facts they know on addition and subtraction fact charts.

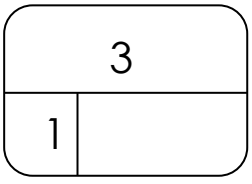
Preparation

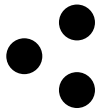
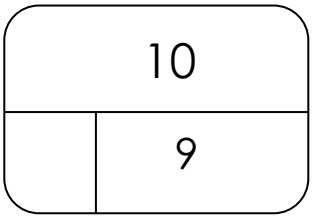
Part 1: Prepare a set of dot cards and number cards 1-10, paper, pencil, or white board and marker.
Part 2: Prepare a set of part/part/whole cards.
Part 3: Prepare a set of traditional flashcards.

Lesson

The teacher says or does…	Expect students to say or do…	If students do not, then the teacher says or does…
Part 1 : Connecting the numerical representation to the corresponding dot arrangement—(bridging semi-abstract to abstract) (Students who have been successful with subitizing are ready to go to the next step – fluency, but first you must make sure they are fluent with conceptual subitizing.)		
1. You have been working with dot cards successfully for awhile now, so let's see if we can go to the next level which means knowing your math facts fluently.		
2. In front of you are the numerals, 1-10. I would like for you to hold up the numeral that symbolizes how many dots are on the card I hold up. Let's try one. Are you ready? Hold up a dot card for 3 seconds; for example,  What math sentence might go with this card?	Student holds up the numeral, 6 3 + 3 or 2 + 2 + 2	Hold up the dot card again If student still can't hold up the numeral, the student is not ready for this lesson. How did you group the dots to know it was 6 without counting? The numbers you just said are the numbers to use to write the expression. (Write whatever numbers the student says.)

The teacher says or does…	Expect students to say or do…	If students do not, then the teacher says or does…
3. Hold up another one; for example  What expression can I write for this card?	 4 + 5	Show the student the card again.
4. Let's see how many of these we can do in a minute. Whenever I flash you a card, I want you to say the total number of dots and also say the expression that matches. You don't have to hold up the number this time or write it. Just say your answers orally. Ready? Go! Flash dot cards as quickly as the student is able to say the number of dots and the numbers to match. At the end of one minute, count how many cards. (Have at least 30 dot cards with 3 to 10 dots available.)	(The child should enjoy this challenge.) The child should say the total number of dots and a corresponding numerical expression before flashing the next card.	If the child is stressed, don't time this yet. Wait until the child is more comfortable. Prompt: How many total dots? What expression matches? Let the child see the card to help determine the corresponding numbers. Ask: How did you group the dots? Make sure the child doesn't feel too much pressure but sees this as fun!

The teacher says or does…	Expect students to say or do…	If students do not, then the teacher says or does…
5. Practice continues until the child is able to easily answer for all dot cards. This could take one session or several sessions. Let the child take a set home in order to practice, if needed. Once fluent (says with ease and little thinking), the child is ready for Part 2.		
Part 2 – Connecting numerically: part/part/whole Take out the number bond cards.		
6. I think we are ready for flashcards that just show the numerals. This will help you see how the numbers are decomposed using just the numerals. These flashcards are called, "Number Bonds". Instead of having dots, now you will just see numerals representing a number of dots. Here's how they work: The top half of the card or the top numeral represents the total or the whole. The other two numerals represent parts of the total, for example, look at this one."  	(Student is interested.)	

The teacher says or does…	Expect students to say or do…	If students do not, then the teacher says or does…
7. If "3" is the total and you already have "1", what numeral is missing? How do you know?	2 Because 3 = 1 + 2 or 3-1 is 2	For a total of 3 dots, I have 1 plus how many more dots do I need to make 3? Pull out a dot card that represents this 
8. Let's try another one. (Choose all the cards that are a difference of one from the total to build fluency with one more, one less facts.)  What is the total? What is the missing part? How do you know?	10 1 Because 10 = 9 + 1 or 9 + 1 is 10 or 10 -1 is 9	What numeral is in the top half? "10" The number that is in the top half is always the total. What plus 9 = 10? "1"
9. Continue in this fashion with all the number bonds that are one more, one less than the total.	See the number bond cards.	
10. Let's see how many of these we can do in a minute. Whenever I flash you a card, you say the missing part, it might be the part or it might be the whole. Ready? (Start stopwatch.)	Always watch for students who are stressed-out by the timing and disengage. Determine which ones they know easily and which ones they don't know.	

The teacher says or does…	Expect students to say or do…	If students do not, then the teacher says or does…
11. At the end of a minute, count how many cards the student was able to get. Keep it fun. Make sure the child doesn't feel too much pressure but sees fluency as achievable.	(Optional) Have the student predict how many cards in a minute. Test. Predict again. Test. etc	
12. Once the student becomes very fluent with this set of number bonds (one more, one less of the whole), go to Part 3.		
Part 3: connecting the part-part-whole model to the symbols for the operations.		
13. Have students make the connection of the part/part/whole model to the symbolic model: 10-1 10-9 9 + 1 9 – 1 9-8 8 + 1 8 – 1 8-7 7 + 1 7 – 1 7-6 6 + 1 6 – 1 6-5 5 + 1 5 – 1 5-4 4 + 1 4 – 1 4-3 3 + 1 3 – 1 3-2 2 +1 2 – 1 1 + 1 1- 1	Students should be able to move to the numeral cards with ease. They should see how the number bond with 9 as the sum and 8 as the part as 9-8 =1 or 8+?= 9	Keep working with the number bonds or dot cards as needed.

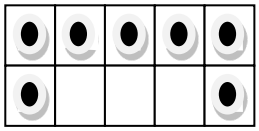
The teacher says or does…	Expect students to say or do…	If students do not, then the teacher says or does…
14. (Once the student is able to answer these facts accurately and easily, have them circle all the facts they know on the addition and subtraction charts.) Discuss which ones they already know. Are there any other facts you might know? Explore and identify other known facts with student.		
15. Once the student is fluent with one more, one less, begin introducing the cards that are 2 more, 2 less of the whole Repeat the three parts. Move as rapidly as you are able, making sure the child is fluent with each part and they are able to make connections from symbols to the semi-concrete dot cards, etc..		

Teacher Notes

1. Work with other relationships and combinations in the same manner as instructed in the 3 part lesson.
2. Do not try to do all combinations at once. Only add two or three cards at a time. For example, after learning all the facts for 1 more, 1 less, introduce two new facts, such as, 2, 2 and 4, and 3, 2 and 5. After looking at the part/part/whole model, add just these two additional cards to the ones already known. These will be added to the practice with the 1 more, 1 less cards when practicing.
3. Gradually add in all the 2 more 2 less facts until the student is fluent with all these combinations.
4. Next add facts to 10 using ten frames. Doubles and the rest of the facts are added. It is important to gradually add the cards to develop fluency.
5. Give the child a chart of all the number facts and let the child keep track of the known facts.
6. Have the child note that 3 + 1 and 1 + 3 are the same sum. This will resurface with the commutative property lesson.
7. Students should also explore the opposite relationship of addition and subtraction.

Variations

1. Number combinations that make 10. Use 10 frames and follow the same procedure. 10 frames can also be used for decomposing other numbers.
   For instance,



5 +1+ 1 or
5 + 2

2. Extension: Use double ten frames to learn facts to 20.

References

Elementary and Middle School Mathematics, Teaching Developmentally, Fifth Edition, John A. Van De Walle.

Coming to Know Number, by Grayson Wheatley, Second Edition, 2010.

An Emerging Model: Three-Tier Mathematics Intervention Model. (2005). Retrieved 1 13, 2011, from rti4success: http://www.rti4success.org/images/stories/pdfs/serp-math.dcairppt.pdf.

Mathematics Preparation for Algebra. (n.d.). Retrieved 1 13, 2011, from Doing What Works: http://dww.ed.gov/practice/?T_ID=20&P_ID=48.