CONSTRUCTING TASK: Developing Meaning by using Story Problems: Change Unknown

Approximately 2-3 days

STANDARDS FOR MATHEMATICAL CONTENT

MCC.1.OA.1. Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

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.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

The goal for this lesson is to revisit real world problems, using the level of understanding (concrete, representational, or abstract) that each student needs. (see CRA Table on page 15) Addition and subtraction can be divided into four categories: join problems, separate problems, part-whole problems, and compare problems (see Table 1 on page 8). Within these four types of problems, most educators focus on addition and subtract when the result is unknown, this leads to the understanding that addition is "put together" and subtraction means to "take away". This is a major misconception and limits the students' understanding. One way to prevent development of this misunderstanding is to provide problem based story problems in which the students are attempting to solve not only the result but also the change, and the initial.

Students should not complete a multitude of problems within one class period, rather they should work in depth with as few as one problem that they can know and understand completely. Students do not need to know the names of the different types of problems but they should have experience in solving all of the different types. This lesson should not be looked at to be completed in one session, these questions should be readdressed throughout this unit and continue throughout the mathematics curriculum across grade levels.

ESSENTIAL QUESTIONS

- What happens when we join two quantities or take one from another?
- How can we find the total when we join two quantities?
- How can we find what is left when we take one quantity from another?
- What happens when we change the order of numbers when we add (or subtract)? Why?

MATERIALS

- Paper
- Various Manipulatives (examples: counters, based ten blocks, arithmetic rack, etc.)
- Pencils and crayons
- Types of Problems (cut out)
- Twenty Game
- Dice
- Small counters

GROUPING

Flexible grouping based on student needs. Depending on the story problem, this task could be solved with students working as a whole-class, small groups, or independently.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
The teacher will tell a story similar to: Ten friends were playing outside together on a summer day. Some of the friends had to go home to eat lunch. Now there are six friends playing. How many friends went home to eat lunch?

After telling the story, suggested questions include:

- What is my story about?
- What happened first? What happened next?
- Were there more (or fewer) friends at beginning of the story or at the end of the story? How did you figure that out?
- How can we show/represent this? Can we act out the story?
- How many friends were there at the beginning of the story? (Feel free to let the students act out this situation if necessary)
- How many friends were taken away?
- How many friends were left at the end of the story? How do you know?

Continue questioning as needed until the students can answer the questions and understand what is happening in the story.

Part II
Sample problems have been provided. Copy the problems, cut them out to give to students and/or flexible groups. Each set can be done within small groups or within centers/work stations. The sample word problems are designed to give a conceptual understanding of addition and subtraction of two numbers. Students should explore these problems using the CRA model. Refer to the CRA table on page 15 for explanation and questioning.

- C- Concrete: Using Manipulatives (acting out)
- R- Representational: Drawing Pictures
- A- Abstract: Creating Number Sentences

"In the classroom, this approach is a facilitating framework for students to create meaningful connections between concrete, representational, and abstract levels of thinking and understanding. Students' learning starts out with visual, tangible, and kinesthetic experiences to establish basic understanding, and then students are able to extend their knowledge through pictorial representations (drawings, diagrams, or sketches) and then finally are able to move to the abstract level of thinking, where students are exclusively using mathematical symbols to represent and model problems." Hauser , Jane. *Concrete-representational-abstract instructional approach.* Retrieved April 9, 2009, from the Access Center: Improving Outcomes for all Students K-8. Web site: http://www.k8accesscenter.org/training_resources/CRA_Instructional_Approach.asp

The problems listed below are examples from the four types of addition/subtraction problems. The numbers and topics of each problem can be adjusted based on the interest and ability of your students. All four types of problems should be focused in a variety of ways.

Join Problems:
When joining two quantities, three different amounts are used: the initial amount, the change amount, and the result amount (or whole). (VDW)

Separate Problems:
Within separate problems, your initial amount is the whole. This differs from a joining problem because within a joining problem your result is your whole. (VDW)

Part-Part-Whole Problems:
Part-Part-Whole is the combing of two quantities to create a whole. The combination can take place physically, or it can be asked to be completed mentally.

Comparing Problems:
Comparing problems do not focus on the operation, but rather the relationship between two quantities. This relationship can be stated or it can be implied by using terms of greater than or less than. (VDW)

Comment: Teachers should expose students to a variety of separating problem types. Students do not need to know the names of the different types of problems but they should have experience in solving all of the different types.

Part III
Students will work in pairs to play the *Twenty* game. Each player rolls a die, places that number of counters onto his/her ten frame, then announces the total number of counters on the ten frames. Next, the player records the number sentence onto the chart below. Both players will use the same recording sheet. Example: Player one rolls a 5. He places 5 counters onto his ten frame and writes the number sentence 0+5=5. The 0 represents the number of counters on the ten frames before the roll, the 5 represents the number of counters added to the ten frames, and the 5 represents the total amount on the ten frames after the roll. Player 2 will then roll the die and do the same. On the next turn, player one rolls a 3. He place 3 counters on the tens frame and writes the number sentence 5+3=8. The 5 represents the number of counters before the roll, the 3 represents the number of counters added to the ten frames, and the 8 represents the total amount on the ten frames after the roll. Play continues until a player fills both ten frames and reaches a sum of 20.

FORMATIVE ASSESSMENT QUESTIONS

See suggested questioning located within task description and CRA Table on page 15.

DIFFERENTIATION

Extension:
- Allow students to work with numbers larger than 20 without regrouping.
- Ask students to create and solve their own story problems.

  Note: Students typically create addition problems. Check students' problems to make sure they are creating subtraction problems too.

Intervention
- Allow students to work through the stages at a pace that is appropriate to their developmental level. This will provide students with the remediation they need to understand the concept of comparing numbers. Continue to allow them to work with manipulatives as much as needed. At times, partner them with students who are very articulate about their mathematical thinking so they can hear (through conversations) how these students have made sense of the problems.

Twenty

Directions:

- Each player rolls a die, places that number of counters on his/her ten frame, then announces the total number of counters on the ten frames.

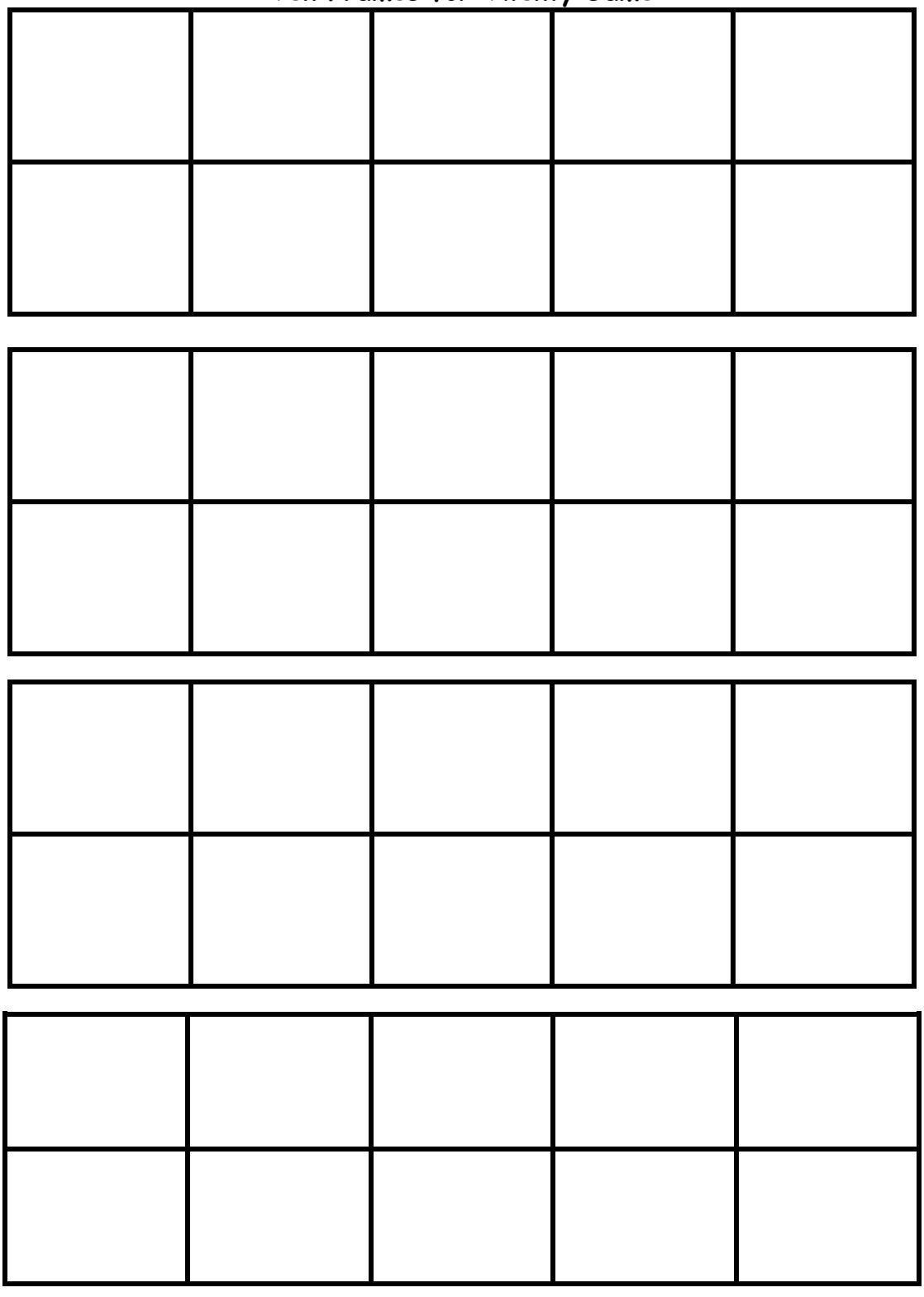
- Next, the player records the number sentence onto the chart below. Both players will use the same recording sheet. Example: Player one rolls a 5. He places 5 counters on his ten frame and writes the number sentence 0+5=5. The 0 represents the number of counters on the ten frames before the roll, the 5 represents the number of counters added to the ten frames, and the 5 represents the total amount on the ten frames after the roll.

- Player 2 will then roll the die and do the same.

- On the next turn, player one rolls a 3. He place 3 counters on the tens frame and writes the number sentence 5+3=8. The 5 represents the number of counters before the roll, the 3 represents the number of counters added to the ten frames, and the 8 represents the total amount on the ten frames after the roll.

- Play continues until a player fills both ten frames and reaches a sum of 20.

Ten Frames for Twenty Game



Twenty

Player 1	Player 2
1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	