Using Model-Based Representation to Improve Addition and Subtraction Problem Solving in the First Grade

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Introduction

I have worked with students in 8th-12th grade and 4th-6th. This year, I am teaching first grade. One pattern that I've noticed in all of the grades I've taught, is that a large portion of students in the upper grades struggle with word problems. Some lack foundational math facts (addition, subtraction, multiplication, or division); however, even many who have mastered their math facts, struggle to deconstruct a word problem and plan how and when to apply those math facts to solve multi-step word problems. In our fourth-grade curriculum, Unit 4 was Operations and Algebraic Thinking, and involved addition, subtraction, multiplication, and division word problems (single and multi-step). Even students who did well in *every other Unit*, at least half of my class, scored "yellow" or "red" on the Unit 4 Summative Assessment, which met they were either progressing toward the standard or not demonstrating progress, but were not in "green," or demonstrating mastery of the associated standards. After multiple Professional Learning Community (PLC) discussions with my teammates, we found that Unit 4 was most difficult across most of the fourth grades, not just in my class. We worked very hard to reteach, model, and continue to work through word problems throughout the other units, in an attempt to strengthen students' problem-solving skills. In addition, identifying the appropriate equation(s) needed to solve a problem is difficult, even for many students who perform well with on-level Math content. Representing the problem with pictures or diagrams is also difficult for many.

After switching to first grade, I have a strong desire to help my young learners develop a sense of problem-solving that becomes a strong foundation to support them with the more challenging word problems they will face throughout the rest of their education. When students are able to figure out, not just how to solve "this" problem, but to break problems down to determine how to solve all similar problems, they develop the type of analytical thinking that will help them solve problems throughout all subjects, in and out of school and later at work.

In this Unit, I develop a model-based representation to improve addition and subtraction problem solving in the first grade. That is, to use models to present

relationships involved in addition and subtraction problems. Through such representations, students are able to understand and communicate the relationships, and then solve the problems.

Demographics

I am a teacher in the Red Clay School District, which services over 17,000 students in New Castle County, Delaware. This year, I began teaching first grade at Forest Oak Elementary School. There are approximately 550 students enrolled at Forest Oak (K-5th grade). This does not include the population of students in the Meadowood Program, who join Forest Oak classrooms at different points throughout the day. Schoolwide, our students are somewhat diverse- with 52% of students of Hispanic/Latino origin, 35% Caucasian, 7% African American, 1.5% Asian, and 4% Multi-racial. Our student population includes 41.7% English Language Learners, 46.4% Low Income, and 7.6% Special Education. Average class sizes are between 21-25 students. Compared to district and state averages, Forest Oak has very few reported behavioral issues (reported offenses, suspensions, and expulsions). During the 2016-2017 school year, in third through fifth grade, 25-42% of students met state standards on standardized Math testing.

For the 2018-2019 school year, I currently have 22 students in my first-grade class. The class is comprised of 10 females and 12 males. I have 3 students with IEPs- one is speech only. Of the remaining two, one has a goal to focus on addition and subtraction word problems (within 20); the other has a goal to focus on identifying and representing numbers within 25. Three of my students receive Occupational Therapy (OT) services and 3 receive Speech services. I have 9 students who are EL (English Language) learners, and 5 students in a Tier 2 Math RTI Group. My students' ethnicity closely mirrors that of the school's: 11/22 or 50% are Hispanic, 4/22 or 18% African American, and 7/22 or 32% Caucasian.

Looking at beginning of the year data, I do have a group that is relatively strong in Math, compared to the other first grade classes. We took two assessments, the Math Expressions Pre-test, which is actually an assessment of first grade standards, taken to be compared to the post-test at the end of the year (students haven't learned these concepts yet). The second assessment is the Math Expressions beginning of year inventory, which is an assessment of Kindergarten standards. On the pre-test, scores ranged from 19% to 70%, with an average score of 45% (First grade standards). On the beginning of year inventory, scores ranged from 50-92%; the average score was 82.6% (Kindergarten standards). While this unit centers around Math, it is important to also note the reading levels of some of my students, because reading comprehension often times affects students' ability to solve math word problems. On a beginning of the year Oral Reading Fluency check, 8 students were able to read less than 10 words correct per minute (wcpm), 3 students read 11-20 wcpm, 6 read 21-35 wcpm, and 2 read above 60 wcpm

(two students joined my class later in the first marking period, so they are not included in this data). That being said, this is first grade and it is not yet developmentally appropriate for students to be able to read math story problems or directions in their entirety, so for now, math story problems are read to them.

Research Basis

Cognitively Guided Instruction, or CGI, is an inquiry-based approach to teaching mathematics that was developed at the Wisconsin Center for Education Research (Carpenter et al, 1999). This extensively researched approach provides teachers with knowledge about the developmental strategies of children's mathematical reasoning, enabling teachers to plan mathematics instruction based on their students' understanding and guide them toward greater mathematical reasoning and concept mastery (University of Wisconsin, 61). The CGI approach puts more of the responsibility to explore and explain mathematical reasoning on the students. A teacher presents a problem and asks students to try to solve on their own. The teacher then asks students to share and explain how they came to their answer. This method is used in place of trying to overload students with formulas to memorize, or associating "clue words" with specific operations. Knowing when to apply the formulas can get confusing, and semantics can cause clue words to be misleading. Instead, students must learn to analyze a word/story problem and identify the start, the change, and the result. If they can identify the three parts of a problem, they can determine which is missing, and then work to solve for the unknown.

University of Wisconsin has identified four types of problems that involve addition and subtraction: joining problems, separating problems, part-part-whole problems, and comparing problems. Within each category are 2-3 problem-types, based on which part of the problem is unknown (the start, the change, the result, the difference, the quantity, or the referent).

Joining Problems

Result Unknown- Grandmother had 5 strawberries. Grandfather gave her 5 more strawberries. How many strawberries does Grandmother have now? 5 + 8 = ___
Change Unknown- Grandmother had 5 strawberries. Grandfather gave her some more. Then grandmother had 13 strawberries. How many strawberries did Grandfather give Grandmother? 5 + ____ = 13
Start Unknown- Grandmother had some strawberries. Grandmother gave her 8 more. Then she had 13 strawberries. How many strawberries did Grandmother have before Grandfather gave her any? ___ + 8 = 13

Separating Problems

Result Unknown- Grandfather had 13 strawberries. He gave 5 strawberries to Grandmother. How many strawberries does Grandfather have left? 13 - 5 = ___

Change Unknown- Grandfather had 13 strawberries. He gave some to Grandmother. Now he has 5 strawberries. How many strawberries did Grandfather give to Grandmother? 13 - ____ = 5

Start Unknown- Grandfather had some strawberries. He gave 5 to Grandmother. Now he has 8 strawberries left. How many strawberries did Grandfather have before he gave any to Grandmother? ____ - 5 = 8

Part-Part-Whole Problems

Whole Unknown- Grandfather has 5 big strawberries and 8 small strawberries. How many strawberries does Grandfather have altogether? 5 + 8 = ___

Part Unknown- Grandmother has 13 strawberries. Five are big and the rest are small. How many small strawberries does Grandmother have? 13 - 5 = ___ or 5 + ____ = 13

Compare Problems

Difference Unknown- Grandfather has 8 strawberries. Grandmother has 5 strawberries. How many more berries does Grandfather have than Grandmother? 8 - 5 = ___ or 5 + ___ = 8

Quantity Unknown- Grandmother has 5 strawberries. Grandfather has 3 more strawberries than Grandmother. How many strawberries does Grandfather have? 5 + 3 = ___

Referent Unknown- Grandfather has 8 strawberries. He has 3 more strawberries than Grandmother. How many strawberries does Grandmother have? 8-3=___ or ____ + 3 = 8

Example problems were taken from Carpenter and Fenema's Cognitively Guided Instruction: Building on the Knowledge of Students and Teachers, 1992.

What does this mean for teaching math instruction? It means that, rather than forcing formulas and clue words onto our students to be memorized, we must allow our students to explore and analyze the relationship between the numbers in a word problem. What information do we have? What do we need to know? How did the numbers change (positively or negatively)? If we allow students to explore and reason in Math, the way that we are often times encouraged to allow them to do in Science, students would use the foundational math skills that they have learned throughout life to help guide their reasoning. When students are able to analyze the relationships in a word problem, they

will become stronger computational thinkers and better able to apply these concepts to any type of math problem.

After identifying and analyzing the relationships among numbers in word problems, it is important that students learn to represent those relationships. Representation for word problems can be done with equations, tables, circle drawings, or pictures. Jennifer Lee Krawec, in her University of Miami dissertation, *Problem Representation and Mathematical Problem Solving of Students of Varying Math Ability*, describes visual representation of math problems as "the construction and formation of internal images (e.g., mental images) and/or external images." Krawec goes on to explain that, "Research has further divided visual representation into two categories: pictorial representations, which are primarily drawings of objects, and schematic representations, which are diagrams representing the spatial relationships 10 among problem parts. Analyses of students' visual representations have shown that successful problem solvers generally produce more schematic representations and thus have greater success solving problems."

Applied in the classroom, this research means that pictorial representations are helpful, but representations that incorporate understanding of the relationships within the problems more often leads to correct answers. I believe that pictorial representations are a developmentally-appropriate step for first grade; one that, could serve as a strong foundation for future schematic representations.

Teaching Strategies

This unit covers the following Common Core Standards in the Domain of Operations & Algebraic Thinking- Represent and solve problems involving addition and subtraction:

CCSS.1.0A.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, by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

CCSS.1.OA.2: Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

CCSS.1.OA.6 Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 - 4 = 13 - 3 - 1 = 10 - 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 - 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).

CC.SS.1.OA.8 Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = _ - 3, 6 + 6 = _.

The specific Mathematical Practices that will be interspersed throughout this unit are:

MP.1 Make sense of the problem & MP.2 Reason abstractly and quantitatively- both related to understanding the problem situation.

MP.4 Model with Mathematics & MP.7 Look for and make use of structure- used to represent the problem situation.

MP.5 Use appropriate tools & MP.8 Use repeated reasoning- used when finding the answer

MP.3 Critique the reasoning of others & MP.6 Attend to precision- used when checking the answer in the context of the problem.

The Math Expressions ME) curriculum spirals Operations and Algebraic thinking throughout the grades, building each year on what was taught the year(s) before. Also, ME presents word problems in a way that always involves the steps listed above- incorporating the eight mathematical practices with the common core standards for each grade level. In first grade, ME Units flow as follows:

Unit 1: Partners and Number Patterns Through 10.
Unit 2: Addition and Subtraction Strategies
Unit 3: Unknown Numbers in Addition and Subtraction
Unit 4: Place Value Concepts
Unit 5: Place Value Situations
Unit 6: Comparisons and Data
Unit 7: Geometry, Measurement, and Equal Shares
Unit 8: Two-Digit Addition

My curriculum unit will fit in with Units 2/3- Addition and Subtraction Strategies, as this is when we begin to teach students to recognize addition and subtraction problem types, write equations to represent addition and subtraction situations, discuss different types of equations, decide if they are true or false, and develop strategies for adding and subtracting within 10., including equation with unknown partners.

Lessons/Activities

Lesson one will serve as an introduction to the different types of problems, focusing on joining and separating problems. After introducing the different problem types, students will do a sorting activity, identifying problems as joining or separating. The next lesson will require students to represent (not solve) joining and separating problems. The third lesson involves solving problems, sharing and discussing strategies and visual representations. In the fourth lesson, I will present a story. Students will be asked to name word problems that could be asked and solved, given the information provided.

Learning Objectives - used in our district in place of essential questions, and posed as "I Can" statements.

Students will be able to/I Can

- represent a situation or numerical problem with groups of objects, a drawing, fingers, or equations.
- model the situation by composing two addend groups or decomposing a total group.
- Use addition and subtraction within 10 to solve story problems.
- Determine the unknown whole number in an addition or subtraction equation relating three whole numbers.

Unit Activities

Activities/lessons will begin with whole group instruction, discussion, and modeling. This will include some collaborative discussions with peers. Each lesson then incorporates small group or partner practice- including time to analyze and provide explanations for mathematical reasoning. Lessons then move to independent practice/formative assessment, so that I can determine who needs small group re-teaching before moving on to the next lesson.

Pre-assessment

Pre- and post- assessments will be identical, and will be used to measure student growth throughout this unit. The assessment will include 6 word problems- 1 each of joining and separating with start, change, and results unknown.

Activity 1 -To take place over two 45-minute Math blocks.

Display word problems around the room on chart paper. Break students into groups of 3-4 and have them each go to a problem. After allowing time to read and analyze their problem, each group should come back to the carpet for a whole group discussion. Ask students to share what "type" of problem their team had. Most students will say addition/subtraction or plus/minus. Create a T-chart on the white board. Give one side

the heading “Joining Problems” and the other “Separating Problems.” Explain to students that joining problems are when two or more numbers, or objects, are being joined, or added, together. Separating problems are when an amount is being taken away from the starting amount. Review each group’s problem from the chart paper and place them on the correct side of the t-chart. Model one of each, and then call on students to decide where to put each of the remaining problems. Next, divide students back into groups. Give each group five problems on index cards or cardstock (each group has the same 5 problems). Have each group sort their problems into piles labeled “Joining” or “Separating.” Regroup and discuss each team’s results. Have students end with an independent sort activity (color joining problems red and separating problems blue), to serve as an exit ticket.

Activity 2- To complete in two 45 minute Math blocks.

In whole group, on carpet, display three similar joining problems- one with the result unknown, one with the change unknown, and one with the start unknown ,but with the same numbers and same general information. Call on student volunteers to represent each problem with a picture, math mountains, or circle drawings. After all three problems have been solved, discuss the what was different and similar about the three problems. Allow students to share their observations and, if needed, guide the conversation toward what the unknown was in each. Display three similar separating problems- one with the result unknown, one with the change unknown, and one with the start unknown, but with the same numbers and same general information. Call on student volunteers to represent each problem with a picture, math mountains, or circle drawings. After all three problems have been solved, discuss the what was different and similar about the three problems. Allow students to share their observations and, if needed, guide the conversation toward what the unknown was in each. Review the three types of joining problems and how each were solved. Send students back to work in partners on 3 problems- joining/result unknown, joining/change unknown, and joining/start unknown. Have students work in partners and represent (not solve). Regroup and discuss. Model multiple representation options for each problem (circle drawings, math mountains, pictures, equations, etc.). Have students go back into partners and work on 3 problems- separating/result unknown, separating/change unknown, and separating/start unknown. Students should represent each problem (not solve). Regroup, discuss, and compare representations. If one representation isn’t shared, call on a student to show that representation (for example, if no math mountain is shown, ask a student to come up to show the same problem with a math mountain). Give students a joining and a separating problem to represent independently as an exit ticket (not solve).

Activity 3-To complete in two 45 minute Math blocks.

In whole group, on carpet, display a joining/start unknown and a separating/change unknown problem. Call on students to represent the first problem. Call on a different

student to write the equation. Call on another student to solve the equation. Call on a fourth student to give the answer in number/label format. Repeat for the second problem. Send students back to work in partners on 2 problems (one joining and one separating; Each pair has the same 2 problems) After, have each pair of students join with another pair and "teach" the other pair how they represented and solved their problem. Exit ticket will be one joining and one separating problem for each student to independently represent and solve.

Activity 4- To take place in two 45 minute Math blocks.

In whole group, review the different types of joining and separating problems, as well as multiple ways to represent and solve each. Present students with a story. Give one word problem that could be solved with the information presented. Call on students to add more word problems to the list. Present a new story to the group. Send them back to work in groups of 4. Each group should make a list of the word problems they could write, based on the information presented. Each group should take turns sharing their equations in whole group, until all have been shared and listed on the board. Next, students should work in different groups of 4 to represent and solve the equations they listed. Exit ticket. Give a math story. Students should independently write 1 story problem that could be based on the information given.

Post-assessment

Pre- and post- assessments will be identical, and will be used to measure student growth throughout this unit. The assessment will include 6 word problems- 1 each of joining and separating with start, change, and results unknown. Compare the data from the pre- and post-assessments to measure student growth.

Data

I did not fully implement the unit this year, due to my district's pacing guide and where we were in our Math curriculum as I completed my unit. However, I did model my instruction based on what I learned in this seminar. I supplemented district curriculum by implicitly teaching the difference between adding and joining problems, and having students identify problems already included in our curriculum as either joining or separating. Next, I focused on representing problems, and had students spend time only representing (not solving) problems already included in our Math Expressions curriculum. Finally, I had them identify problems as joining or separating, identify the unknown, represent the problem, and solve the problem. We just finished our Unit 3 Summative Assessment, which was made up of 8 addition and subtraction equations with different unknowns (some start, some change, some result) and 12 addition and subtraction word problems (also with a mixture of start, change, and result unknown). Out of 22 students who took the assessment, 15 scored 40 or more out of 44 total points

(90% or better), 4 scored between 35-39 out of 44 points (80-89%), and 3 students scored below 35 points (61-70%). I believe that, when I fully implement this lesson next year, scores will increase. I also believe, had I not adapted my instruction based on what research related to this unit, some scores would not be as high as they were.

Conclusion

With Common Core Math Standards, math has become a spiraling curriculum; students are introduced to Numbers and Place Value, Operations, Algebraic Thinking, Measurement, Geometry, and Fractions- all beginning in Kindergarten. Each year, students revisit those same areas, but in greater depth and with increasingly more complex problems. Operations begins as addition and subtraction, but eventually includes multiplication and subtraction. Number sense begins with identifying numbers, moves on to Place Value (tens and ones) in first grade, and eventually builds up to place value to the billions and includes decimals. Algebraic thinking begins with addition and subtraction word problems, and later builds to multi-step word problems involving all four operations. Creating a strong foundation in the early grades is imperative- if students do not learn to break down, analyze, represent, and solve problems when they are young and the problems are as easy as they're going to be, they will not have the foundation needed to handle the more complex problems they will be presented with in later grades.

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Student Resources Used in Unit

Manipulatives
Dry-erase boards, markers, and erasers
Chart paper and markers
White board
Smart board

Appendices

Name _____ Date _____

Pre-Assessment

Directions: Read the problems below. Represent each story problem. Write the equation, solve, and give a label with your answer.

1. Darius has 3 books. The librarian gives him 2 more. How many books does Darius have now?

2. Ethan has 6 books. The librarian gives him some more. Now he has 9 books. How many books did the librarian give him?

3. Giovanni has some books. The librarian gives him 4 more. Now he has 7 books. How many books did Giovanni have, before the librarian gave him more?

4. Mia has 9 cookies. She gives 5 to her friends. How many cookies does Mia have left?

5. Olivia has some cookies. She gives 3 to her friend. Olivia has 7 cookies left. How many cookies did Olivia start with?

6. Kaylee has 8 cookies. She gives some to her friends. Now she has 3 cookies. How many cookies did Kaylee give to her friends?

Name _____ Date _____

Post Assessment

Directions: Read the problems below. Represent each story problem. Write the equation, solve, and give a label with your answer.

1. Darius has 3 books. The librarian gives him 2 more. How many books does Darius have now?

2. Ethan has 6 books. The librarian gives him some more. Now he has 9 books. How many books did the librarian give him?

3. Giovanni has some books. The librarian gives him 4 more. Now he has 7 books. How many books did Giovanni have, before the librarian gave him more?

4. Mia has 9 cookies. She gives 5 to her friends. How many cookies does Mia have left?

5. Olivia has some cookies. She gives 3 to her friend. Olivia has 7 cookies left. How many cookies did Olivia start with?

6. Kaylee has 8 cookies. She gives some to her friends. Now she has 3 cookies. How many cookies did Kaylee give to her friends?

Name _____Key_____ Date _____

Pre/Post Assessment

Directions: Read the problems below. Represent each story problem. Write the equation, solve, and give a label with your answer.

1. Darius has 3 books. The librarian gives him 2 more. How many books does Darius have now?

3 + 2 = 5 books ○○○ ○○ (Drawings may vary)

2. Ethan has 6 books. The librarian gives him some more. Now he has 9 books. How many books did the librarian give him?

6 + ___ = 9 ○○○○○○ ○○○ 3 books

3. Giovanni has some books. The librarian gives him 4 more. Now he has 7 books. How many books did Giovanni have, before the librarian gave him more?

___ + 4 = 7 ○○○○ ○○○ 3 books

4. Mia has 9 cookies. She gives 5 to her friends. How many cookies does Mia have left?

9-5=4 cookies ○○○○ ⃠⃠⃠⃠⃠

5. Olivia has some cookies. She gives 3 to her friend. Olivia has 7 cookies left. How many cookies did Olivia start with?

____ - 3 = 7 ○○○○○○○⃠⃠⃠ 10 cookies

6. Kaylee has 8 cookies. She gives some to her friends. Now she has 3 cookies. How many cookies did Kaylee give to her friends?

8- ___ = 3

Activity 1

Word Problems to Display Around the Room on Chart Paper

1.Junior eats 2 pieces of pizza. Donovan eats 3 pieces of pizza. How many pieces of pizza did Junior and Donovan eat altogether? (2 + 3 = 5, joining)
2. Fatima brings 4 dolls to recess. Bridget brings 5 dolls. How many dolls do Fatima and Bridget have at recess? (4+5=9; joining)
3. Roy has 6 toy cars. His mom buys him 4 more toy cars. How many toy cars does he have now? (6+4=10; joining)
4. There are 9 teachers' cars in the parking lot. 3 teachers get in their cars and drive home. How many teachers' cars are still in the parking lot? (9-3=6; separating)
5. Four boys get in line. Then some girls get in line. Now there are 8 students in line. How many girls got in line? (4+ 4= 8; joining)
6. Jackson counts 10 leaves on the sidewalk. The wind blows 7 of the leaves away. How many leaves are still on the sidewalk? (10-7=3; separating)

Word Problems to Include In Sorting Activity - Key

1.There are 4 students in the writing center and 5 students in the technology center. How many students are in the writing and technology centers? (joining)
2. Jasmine has 7 pieces of candy. She gives 4 pieces to her friends. How many pieces of candy does Jasmine have left? (separating)
3. There are 5 birds on a tree branch. Some of the birds fly away. One bird is still on the tree branch. How many birds flew away? (separating)
4. There are some pictures hanging in the lobby. Ava hangs 5 more pictures up. Now there are 7 pictures. How many pictures were in the lobby before Ava hung more? (joining)
5. Rowan has 3 pieces of orange paper and 7 pieces of blue paper. How many pieces of paper does Rowan have? (joining)

Sorting Activity

Cut out the following story problems and place them under "Joining" or "Separating"

There are 4 students in the writing center and 5 students in the technology center. How many students are in the writing and technology centers?
Jasmine has 7 pieces of candy. She gives 4 pieces to her friends. How many pieces of candy does Jasmine have left?
There are 5 birds on a tree branch. Some of the birds fly away. One bird is still on the tree branch. How many birds flew away?
There are some pictures hanging in the lobby. Ava hangs 5 more pictures up. Now there are 7 pictures. How many pictures were in the lobby before Ava hung more?
Rowan has 3 pieces of orange paper and 7 pieces of blue paper. How many pieces of paper does Rowan have?

Joining	**Separating**

Name _____ Date _____

Activity 1 Exit Ticket

Directions: Read each of the following word problems- color the problem red if it is a joining problem. Color the problem blue if it is a separating problem.

1. The boy sees 7 fish in the pond. 5 fish swim away. How many fish are still in the pond?

2. The farmer has 3 ducks and 2 dogs. How many pets does the farmer have?

Name _____Key_____ Date _____

Activity 1 Exit Ticket

Directions: Read each of the following word problems- color the problem red if it is a joining problem. Color the problem blue if it is a separating problem.

1. The boy sees 7 fish in the pond. 5 fish swim away. How many fish are still in the pond? (blue/separating)

2. The farmer has 3 ducks and 2 dogs. How many pets does the farmer have? (red/joining)

Activity 2

Problems to Display on the Board

1. Ethan has 3 blue blocks. Ja'zhi has 6 blue blocks. How many blue blocks do Ethan and Ja'zhi have together? (Drawings may vary- circle drawings are shown)

2. Ethan has 3 blue blocks. Ja'zhi has some blue blocks. Together, they have 9 blue blocks. How many blue blocks does Ja'zhi have?

3. Ethan has some blue blocks. Ja'zhi has 6 blue blocks. Together, they have 9 blue blocks. How many blue blocks does Ethan have?

4. Christopher has 9 crayons. He lets Allie borrow 2 crayons. How many crayons does Christopher have left?

5. Christopher has 9 crayons. He lets Allie borrow some crayons. Christopher has 7 crayons left. How many crayons did Christopher let Allie borrow?

6. Christopher has some crayons. He lets Allie borrow 2 crayons. Christopher has 7 crayons left. How many crayons did Christopher have to start?

Partner Work (Activity 2)

Directions: With your partner, read and represent each of the following joining problems. <u>Do not solve the problems</u>. Draw a picture, use circle drawings, or math mountains.

1. Sherlyn has 6 bracelets. Keira has 3 bracelets. How many bracelets do Sherlyn and Keira have together?

2. Max has gifts to give to 3 friends. Dean has gifts to give to some friends. Together, they give gifts to 8 friends. How many friends did Dean give gifts to?

3. Damarcus colors some pictures in his new coloring book. Ermin colors 4 more pages in the same coloring book. 10 pages have been colored in. How many pages did Damarcus color?

Partner Work (Activity 2)

Directions: With your partner, read and represent each of the following separating problems. <u>Do not solve the problems</u>. Draw a picture, use circle drawings, or math mountains.

1. Jay orders 5 cupcakes. Daniel and Damien eat 2 of the cupcakes. How many cupcakes does Jay have now?

2. Allison takes a quiz. She answers 8 questions. She has 2 questions left. How many questions are on the quiz?

3. Kayla puts rings on all 10 of her fingers. She takes some rings off. She still has rings on 3 of her fingers. How many rings did Kayla take off?

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○○○○○○ ○○○ (Drawings may vary)

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○○○ ○○○○○

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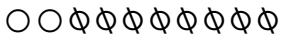
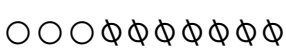
○○○◌◌ (Drawings may vary)

2. Allison takes a quiz. She answers 8 questions. She has 2 questions left. How many questions are on the quiz?



3. Kayla puts rings on all 10 of her fingers. She takes some rings off. She still has rings on 3 of her fingers. How many rings did Kayla take off?



Name _____ Date _____

Activity 2 Exit Ticket

Directions: Read each story problem. Represent each problem with a picture, circle drawing, or math mountain. <u>Do not solve the problems.</u>

1. Kelly has 8 papers in her folder. Her teacher gives her 1 more paper to put in her folder. How many papers are in Kelly's folder?

2. Kelly has 10 papers in her folder. She takes some papers out and turns them in. Now there are 3 papers in her folder. How many papers did Kelly turn in?

_____
_____

Name _____Key_____ Date _____

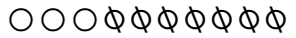
Activity 2 Exit Ticket

Directions: Read each story problem. Represent each problem with a picture, circle drawing, or math mountain. <u>Do not solve the problems.</u>

1. Kelly has 8 papers in her folder. Her teacher gives her 1 more paper to put in her folder. How many papers are in Kelly's folder?

(Drawings may vary)

2. Kelly has 10 papers in her folder. She takes some papers out and turns them in. Now there are 3 papers in her folder. How many papers did Kelly turn in?



Activity 3

Joining & Separating Problems for Whole Group

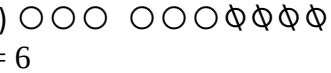
Joining/Start Unknown

Mckenzie has some friends with her at the park. 3 more friends come to the park to play with Mckenzie. Now there are 6 friends playing with Mckenzie at the park. How many friends were at the park with Mckenzie at first?

(KEY)
(Drawings may vary) 
Equation: ___ + 3 = 6
Solve 3 + 3 = 6
Answer 3 friends

Separating/Change Unknown

Louise has 10 apples. Louise's brothers eat some of the apples. Louise still has 6 apples. How many apples did Louise's brothers eat?

(KEY)
(Drawings may vary) 
Equation: 10 - ___ = 6
Solve: 10-4=6
Answer: 4 apples

Activity 3 Partner Work

Directions: For each story problem, represent the problem, write the equation, and solve. Write your answer with a label. When finished, your teacher will give you another pair of students, and you will teach them how you solved your problem.

1. Jamie has 7 pins on her shirt. She takes some pins off. Now there are 2 pins on her shirt. How many pins did Jamie take off of her shirt?

Drawing:

Equation:

Solve:

Answer with label:

2. Diana and Andy have some snacks. Bethany takes 3 of the snacks. Diana and Andy have 7 snacks left. How many snacks did Diana and Andy have to start?

Drawing:

Equation:

Solve:

Answer with label:

Activity 3 Partner Work KEY

Directions: For each story problem, represent the problem, write the equation, and solve. Write your answer with a label. When finished, your teacher will give you another pair of students, and you will teach them how you solved your problem.

1. Jamie has 7 pins on her shirt. She takes some pins off. Now there are 2 pins on her shirt. How many pins did Jamie take off of her shirt?

Drawing: ○○
⃠⃠⃠⃠⃠

Equation: 7 - ___= 2

Solve: 7-5 =2

Answer with label: 2 pins

2. Diana and Andy have some snacks. Bethany brings in 3 more snacks. Diana, Andy, and Bethany now have 7 snacks. How many snacks did Diana and Andy have to start?

Drawing: ○○○ ○○○○

Equation: ____ + 3 = 7

Solve: 4 + 3 = 7

Answer with label: 4 snacks

Name _____ Date _____

Activity 3 Exit Ticket

Directions: For each story problem below, represent the problem (picture, circle drawing, or math mountain), write the equation, solve, and write the answer with a label.

1. Felix and Autumn write some words on the board. Emily erases 4 of their words. There are 3 words left on the board. How many words did Felix and Autumn write on the board?

Drawing:

Equation:

Solve:

Answer with label:

2.

Drawing:

Equation:

Solve:

Answer with label:

Name _____KEY_____ Date _____

Activity 3 Exit Ticket

Directions: For each story problem below, represent the problem (picture, circle drawing, or math mountain), write the equation, solve, and write the answer with a label.

1. Felix and Autumn write some words on the board. Emily erases 4 of their words. There are 3 words left on the board. How many words did Felix and Autumn write on the board?

Drawing: ○○○ ⃠⃠⃠

Equation: ___ - 4 = 3

Solve: 7- 4 = 3

Answer with label: 3 words

2. Class A earns 3 compliments. Class B earns 6 compliments. How many compliments did Class A and Class B earn?

Drawing: ○○○ ○○○○○○

Equation: 3 + 6 = ____

Solve: 3 + 6 = 9

Answer with label: 9 compliments

Activity 4

Story for Whole Group

Jess has 3 stickers. John has 5 stickers. Amaya has 7 stickers. Alex has a sticker album and wants to put stickers in it.

Potential story problems:
How many stickers do Jesse and John have together?
How many stickers do Jesse and Amaya have altogether?
How many stickers do John and Amaya have ?
If Alex puts 1 of Jess' stickers in his album, how many stickers will Jess still have?
If Alex puts 3 of John's stickers in his album, how many stickers will John have left?
If Alex puts 4 of Amaya's stickers in his album, how many stickers will Amaya have?

Activity 4 Math Story

Directions: Read the story below. Write down as many story problems (joining or separating) as your group can think of.

Jodi has 4 cookies. Tay has 3 cookies. Jen has 5 cookies. Deb is hungry.

(potential problems)

How many cookies do Jodi and Tay have?
How many cookies do Jodi and Jen have together?
How many total cookies do Tay and Jen have ?
If Jodi gives 2 cookies to Deb, how many cookies will Jodi have?
Deb eats 1 of Tay's cookies. How many cookies does Tay still have?
Jen lets Deb eat 3 of her cookies. How many cookies does Jen have left?
How many cookies do Jodi, Tay, and Jen have?
If Jodi, Tay, and Jen each give 1 of their cookies to Deb, how many will each girl have left? How many would Deb have?

Name _____ Date _____

Activity 4 Exit Ticket

Directions: Read the story below. Write 1 story problem (joining or separating) that could be written to go with the story.

Luke has 3 tickets for the school store. Aubrey has 5 tickets for the school store. Ryan has 2 tickets for the school store. A toy at the school store costs 2 tickets.

Next, solve your problem. Represent it, write the equation, solve, and give the answer with a label.

Name _____KEY_____ Date _____

Activity 4 Exit Ticket

Directions: Read the story below. Write 1 story problem (joining or separating) that could be written to go with the story.

Luke has 3 tickets for the school store. Aubrey has 5 tickets for the school store. Ryan has 2 tickets for the school store. A toy at the school store costs 2 tickets.

Potential problems:
How many tickets do Luke and Aubrey have?
How many tickets do Luke and Ryan have ?
How many tickets do Aubrey and Ryan have?
How many tickets will Luke have left after buying a toy?
How many tickets will Aubrey have left after buying a toy?
How many tickets will Ryan still have if he buys a toy?

Next, solve your problem. Represent it, write the equation, solve, and give the answer with a label.

Solutions to potential problems:
How many tickets do Luke and Aubrey have?

○○○ ○○○○○
3 + 5 = ____
3 + 5 = 8
8 tickets

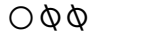
How many tickets do Luke and Ryan have ?

○○○ ○○
3 + 2 = ____
3 + 2 = 5
5 tickets

How many tickets do Aubrey and Ryan have?

○○○○○ ○○
5 + 2 = ____
5 + 2 = 7
7 tickets

How many tickets will Luke have left after buying a toy?



3 - 2 = ___

3-2=1

1 ticket

How many tickets will Aubrey have left after buying a toy?

5 - 2 = ___

5 - 2 = 3

3 tickets

How many tickets will Ryan still have if he buys a toy?

2-2=___

2-2=0

0 tickets