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Georgia Performance Standards Framework for Mathematics – Grade 1

Unit 6 Organizer: “REVISITING OPERATIONS” **(5 weeks)**

OVERVIEW:

In this unit students will:

- cultivate an understanding of how addition and subtraction affect quantities and are related to each other;
- be introduced to multiplication and division situations and operations; and
- develop informal strategies for sharing quantities fairly between two to five people.

As students in first grade begin to count larger amounts, they should group concrete materials into tens and ones to keep track of what they have counted. This is the introduction of our place value system where students must learn that digits have different values depending on their position in numbers. Although the units in this instructional framework emphasize key standards and big ideas at specific times of the year, routine topics such as counting, time, money, positional words, patterns and tallying should be addressed on an ongoing basis through the use of calendars, centers, and games.

To assure that this unit is taught with the appropriate emphasis, depth, and rigor, it is important that the tasks listed under “Evidence of Learning” be reviewed early in the planning process. A variety of resources should be utilized to supplement, but not completely replace, the textbook. Textbooks not only provide much needed content information, but excellent learning activities as well. The tasks in these units illustrate the types of learning activities that should be utilized from a variety of sources.

ENDURING UNDERSTANDINGS:

- Addition and subtraction are inverse operations.
- Quantities can be shared fairly between two or more people or sets.
- Problems can be solved in a variety of ways such as using as modeling, counting strategies, or numbers facts.
- Problems and solutions can use various representations, including concrete objects, pictures, number sentences, and words.

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- Various combinations of numbers and operations can be used to represent the same quantity.
- When adding, the order of numbers does not change the answer, but the order of the numbers does change the answer when subtracting.

ESSENTIAL QUESTIONS:

- How are problem-solving strategies alike and different?
- How can problem situations and problem-solving strategies be represented?
- How can different combinations of numbers and operations be used to represent the same quantity?
- How can an appropriate quantity be equally shared among two to five people?
- How are the operations of addition, subtraction, multiplication, and division alike and different?

STANDARDS ADDRESSED IN THIS UNIT

KEY STANDARDS:

M1N1. Students will estimate, model, compare, order, and represent whole numbers up to 100.

- a. Represent numbers less than 100 using a variety of models, diagrams, and number sentences. Represent numbers larger than 10 in terms of tens and ones using counters and pictures.
- b. Correctly count and represent the number of objects in a set using numerals.

M1N3. Students will add and subtract numbers less than 100 as well as understand and use the inverse relationship between addition and subtraction.

- a. Identify one more than, one less than, 10 more than, and 10 less than a given number.
- b. Skip-count by 2's, 5's, and 10's forward and backwards – to and from numbers up to 100.
- f. Know the single-digit addition facts to 18 and corresponding subtraction facts with understanding and fluency. (Use strategies such as relating to facts already known, applying the commutative property, and grouping facts into families.)
- g. Apply addition and subtraction to 2 digit numbers without regrouping (e.g. $15 + 4$, $80-60$, $56 + 10$, $100-30$, $52 + 5$).

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- h. Solve and create word problems involving addition and subtraction to 100 without regrouping. Use words, pictures, and concrete models to interpret story problems and reflect the combining of sets as addition and taking away or comparing elements of sets as subtraction.

M1N4. Students will count collections of up to 100 objects by dividing them into equal parts and represent the results using words, pictures, or diagrams.

- a. Use informal strategies to share objects equally between two to five people.
c. Identify, label, and relate fractions (halves, fourths) as equal parts of a whole using pictures and models.

RELATED STANDARDS:

M1N2. Understand place value notation for the numbers between 1 and 100. (Discussions may allude to 3-digit numbers to assist in understanding place value.)

- a. Determine to which multiple of ten a given number is nearest using tools such as a sequential number line or hundreds chart to assist in estimating.
b. Represent collections of less than 30 objects with 2-digit numbers and understand the meaning of place value.
c. Decompose numbers between 11 and 19 as one ten and the appropriate numbers of one.

M1N3. Students will add and subtract numbers less than 100 as well as understand and use the inverse relationship between addition and subtraction.

- c. Compose/Decompose numbers up to 10---“break numbers apart” e.g., 8 is represented as $4+4$, $3+5$, $5+2+1$, or $10-2$.
d. Understand a variety of situations to which subtraction may apply: taking away from a set, comparing two sets, and determining how many more or how many less.
e. Understand addition and subtraction number combinations using strategies such as counting on, counting back, doubles, and making tens.

M1P1. Students will solve problems (using appropriate technology).

- a. Build new mathematical knowledge through problem solving.
b. Solve problems that arise in mathematics and in other contexts.

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- c. Apply and adapt a variety of appropriate strategies to solve problems.
- d. Monitor and reflect on the process of mathematical problem solving.

M1P2. Students will reason and evaluate mathematical arguments.

- a. Recognize reasoning and proof as fundamental aspects of mathematics.
- b. Make and investigate mathematical conjectures.
- c. Develop and evaluate mathematical arguments and proofs.
- d. Select and use various types of reasoning and methods of proof.

M1P3. Students will communicate mathematically.

- a. Organize and consolidate their mathematical thinking through communication.
- b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.
- c. Analyze and evaluate the mathematical thinking and strategies of others.
- d. Use the language of mathematics to express mathematical ideas precisely.

M1P4. Students will make connections among mathematical ideas and to other disciplines.

- a. Recognize and use connections among mathematical ideas.
- b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
- c. Recognize and apply mathematics in contexts outside of mathematics.

M1P5. Students will represent mathematics in multiple ways.

- a. Create and use representations to organize, record, and communicate mathematical ideas.
- b. Select, apply, and translate among mathematical representations to solve problems.
- c. Use representations to model and interpret physical, social, and mathematical phenomena.

CONCEPTS/SKILLS TO MAINTAIN:

- Counting to 30
- Patterning

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- Sorting
- Number words through 10
- Writing numbers through 20
- Ordinal numbers (1st – 10th)
- Comparing sets of 1-10 objects (equal to, more than, or less than)
- One to one correspondence
- Equivalence
- Basic geometric shapes
- Spatial relationships – positional words
- Estimation using five or ten as a benchmark
- Modeling addition and subtraction
- Estimating using 10 as a benchmark
- Name and value of coins
- Calendar time and daily schedule
- Measurement – comparing and ordering

SELECTED TERMS AND SYMBOLS:

The following terms and symbols are often misunderstood. These concepts are not an inclusive list and should not be taught in isolation. However, due to evidence of frequent difficulty and misunderstanding associated with these concepts, instructors should pay particular attention to them and how their students are able to explain and apply them.

The definitions below are for teacher reference only and are not to be memorized by the students. Teachers should present these concepts to students with models and real life examples. Students should understand the concepts involved and be able to recognize and/or demonstrate them with words, models, pictures, or numbers.

Combine: . Put together sets, join sets, add

Separating: Take away, remove, subtract

Comparing: Describe how sets relate to each other using terms like more, less, or equal, lighter/heavier

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Counting strategy: A strategy that uses the counting sequence, by counting on from an initial quantity. Objects (fingers, counters, tally marks) may be used to keep track of the counts rather than represent the quantities given in the problem.

Recalling facts: The exact fact needed to solve the problem is known. For example, to solve a problem by adding 6 and 7, a child might say, “I know that 6 and 7 is 13.”

Doubles plus one: A strategy using a known fact that is close to what is needed to determine the exact fact that is needed. For example, to solve a problem by adding 6 and 7 without remembering the fact for $6 + 7$, a child might say, “The answer is 13 because 6 and 6 is 12, and 7 is one more than 6, so I need to add one more to 12.”

Estimating: Determining an approximate number or measure.

Quantity: the amount of objects.

EVIDENCE OF LEARNING:

By the conclusion of this unit, students should be able to demonstrate the following competencies:

- Understand and use addition and subtraction in everyday situations.
- Relate the ideas of multiplication and division to the ideas of repeated addition and repeated subtraction in various situations.
- Use informal strategies for sharing quantities fairly between two to five people.

The following tasks represent the level of depth, rigor, and complexity expected of all first grade students. These tasks or a task of similar depth and rigor should be used to demonstrate evidence of learning.

- Skip-Count Hopscotch
- Order of the Day
- Are You Sharing Fairly?
- What’s my number?
- Story Problems
- Creature Fraction Feature
- Cereal Arrays
- Rectangle Multiplication
- We Are Family

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Culminating Activity: “We Are Family”

This task requires students to recall members of addition and subtraction fact families and write story problems about them.

STRATEGIES FOR TEACHING AND LEARNING:

- Students should be actively engaged by developing their own understanding.
- Mathematics should be represented in as many ways as possible by using graphs, tables, pictures, symbols, and words.
- Appropriate manipulatives and technology should be used to enhance student learning.
- Students should be given opportunities to revise their work based on teacher feedback, peer feedback, and metacognition which includes self-assessment and reflection.

Classroom Routines

The importance of continuing the established classroom routines cannot be overstated. Daily routines must include such obvious activities such as taking attendance, doing a lunch count, determining how many items are needed for snack, lining up in a variety of ways (by height, age, type of shoe, hair color, eye color, etc.), daily questions, 100s chart, and calendar activities. They should also include less obvious routines such as how to select materials, how to use materials in a productive manner, how to put materials away, how to open and close a door, how to do just about everything! An additional routine is to allow plenty of time for children to explore new materials before attempting any directed activity with these new materials. The regular use of the routines are important to the development of students’ number sense, flexibility, and fluency which will support students’ performances on the tasks in this unit. See unit 1 for suggestions concerning specific ideas for classroom routines.

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TASKS:

The collection of the following tasks represents the level of depth, rigor and complexity expected of all first grade students to demonstrate evidence of learning.

- **Skip-Count Hopscotch**

Skip-Count Hopscotch

We are going to play Skip-Count Hopscotch today to show how well you are able to skip-count. You will be put into one of three groups. Stand in line with your group behind one of the hopscotch surfaces. I will call out a number and the first person in each line will begin jumping and skip-counting by that number. If you finish the entire hopscotch surface and counted correctly, you will earn a point for your team. The first person to reach the end will have the chance to earn a bonus point for their team. They will have to hop back through the hopscotch surface skip-counting backwards by the number that they just skip-counted with.

Discussion, Suggestions, Possible Solutions

Create 3 hopscotch game surfaces out of chalk on a sidewalk, masking tape on rug, or butcher paper taped to the floor. 10 squares for each game surface should be enough. Leave the inside of each square blank, but make the squares big enough for your students to jump in and out of easily. Divide your class into 3 groups. Have the students line up behind the game surface with their group. The children will go three at a time (one for each game surface) and have to skip-count by whatever number you announce. For example, if you say to count by 3's the student will count, "Three, six, nine, twelve, fifteen, eighteen, twenty-one, twenty-four, twenty-seven, thirty." Each child that is able to correctly skip-count through the entire hopscotch game surface earns

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a point for their team (no matter how slowly they may need to go). The first person to reach the end of the game surface counting correctly gets to try to jump the hopscotch backward using the same number to earn a bonus point for their team. For example, “Thirty, twenty-seven, twenty-four, twenty-one, eighteen, fifteen, twelve, nine, six, three.” It is much harder backwards both jumping and counting, so allow them a reasonable amount of time. Developmentally jumping backwards may be hard for 1st grade children. If this is the case they may turn around and jump forward but count backward. After each round a different multiple is called, (1’s, 2’s, 5’s, 10’s) and the hopping and counting continues. .

- **Order of the Day**

Order of the Day

Today you will determine if the order of the numbers affects the solution for addition and subtraction. Each student has a set of Unifix cubes. Use your cubes to represent the numbers 12 and 3 (12 first then 3). This shows up powerfully when you use 2 different colors of cubes for the numbers. Find the sum by linking the cubes and discuss your solution with the class. Watch as your teacher writes a number sentence to represent the sum you found. Now arrange your cubes so that they represent 3 and 12 (3 first then 12). Find the sum by linking the cubes and discuss your solution with the class. Watch as your teacher writes a number sentence to represent the sum you found. Did you get the same result both times? Participate in the class discussion about what happens to the sum of two numbers when you change the order of the numbers. Now, represent the number 12 using the cubes. Remove three of the cubes and discuss your result with the class. Watch as your teacher writes a number sentence to represent the difference you found. Now arrange your cubes so that they represent the number 3. Can you remove 12 cubes? Discuss your answer with the class. Did you get the same result both times? Participate in the class discussion about what happens to the difference between two numbers when you change the order of the numbers.

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Discussion, Suggestions, Possible Solutions

Each student should have access to at least 15 connecting cubes with 2 different colors.

While observing students find each sum or difference, focus on the following: Do students understand why the sum is not affected by the order of the numbers? Do they understand why the difference is affected by the order of the numbers? Repeat this task as a class until students are able to answer these questions and explain their reasoning.

Suggestion:

The website http://nlvm.usu.edu/en/nav/frames_asid_156_g_1_t_1.html, gives practice with addition and subtraction. The students may work as a large group or with partners as the number of computers allows. Begin with addition problems, then move to subtraction problems. The students should draw what they think the number lines will look like and discuss their number lines and their answers. Then have the computer show the correct answer. This could even be used as a game or competition with prizes appropriate for your class. The game could be repeated on multiple days to reinforce this concept. This website requires the use of Java.

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• Are You Sharing Fairly?

Are You Sharing Fairly?

- Listen as your teacher reads a story.
- Participate in the class discussion about ways to share quantities fairly.
- Visit each of the stations that have been set up around the room and consider the set of objects at each station. Count the number of objects at each station and decide if you can share the items fairly among 2, 3, 4, or 5 people.
- Think about how you know if the objects can be shared fairly or not.
- Draw a picture to show how the items can be shared fairly among 2, 3, 4, or 5 people.
- Share your representations and problem solving strategies with the class.

Discussion, Suggestions, Possible Solutions

Read a book like The Doorbell Rang by Pat Hutchins.

Prepare different investigation stations for the children using a variety of objects (a collection of coins or bills, basic shapes, pretzels, counting bears, etc.). While students are investigating, observe the strategies used to determine whether the objects can be shared fairly among 2, 3, 4, or 5 people.

Things to look for:

- *Do children sort the items in a given set into piles containing the same number of items?*
- *Do they determine if the number of items in the given set is spoken as they skip count?*
- *Do they place one object in a group at a time until all of the objects have been passed out?*
- *You may need to remind students that sharing fairly means that there can be nothing left over and each person has an equal amount.*

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When the students are sharing their strategies, allow them to go to the board/overhead and share the pictures they drew to show their representation for sharing fairly.

Extension:

Have students say which numbers can not be shared equally.

- **What's My Number?**

What's My Number?

- Play a game using the clues your teacher gives you to find the secret number on a hundreds chart. Someone will give clues like, "My number is 10 more than _____. My number is 10 less than _____. My number is even." Use your finger and your hundreds chart to try to keep track of the clues. You may ask for a clue to be repeated.
- Raise your hand when you think you have figured out the secret number. Your teacher will let you know if you are correct.
- Pick your own secret number and write clues about it. Once everyone has written clues, you will have a chance to swap your clues with a partner. Each of you will try to correctly guess the secret number of your partner.

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Discussion, Suggestions, Possible Solutions

Have a copy of the hundreds chart for each student. Think of a number. Do not tell the class what it is but write it on a Post-it note. Begin saying clues about your number, one at a time.

Some examples of clues are:

- *My number is even / odd.*
- *My number is 10 less than _____.*
- *My number is 10 more than _____.*
- *My number is 1 less than _____.*
- *My number is 1 greater than _____.*

More challenging examples of clues are:

- *If you subtract 3 from my number, you get _____.*
- *If you count by 5's, you will say my number.*

Continue saying clues until one of your students is able to guess your number. Ask the children to write their own clues on a Post-it note about the number that they chose. Once the children have written their clues, allow them to share. The child that guesses correctly gets to share their clues. Observe the children to see if they are using their fingers on the chart to track the clues that are being said. If it is tough for the students to come up with clues on their own, you may write the examples from above to give them some assistance. They could also work with a partner to come up with clues together. They should be using the vocabulary more than and less than.

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- **Story Problems**

Story Problems

Look at these stories and try to solve them. Picture the story in your mind including the objects and actions in the story. Think about what is happening in the story. What happened first? What happened next? What does each amount in the story represent? Paste each problem on the top of a sheet of paper. Solve the problems any way you can. Use any manipulative or tools you need. Record your strategy on your paper using words, pictures, or numbers. Your strategy should be clear enough for others to understand how you solved the problem by looking at your paper. Be ready to share your strategies and solutions with the class.

Discussion, Suggestions, Possible Solutions

If desired, word problems can be printed on sheets of paper (one problem per page) and provided to students as the problems are posed or cut into strips that can be pasted in math notebooks or at the top of blank paper.

Encourage students to invent their own strategies for solving these word problems.

Encourage students to represent these story problems and their solutions with words, pictures, or numbers.

Sample problems you could use:

- *Quinton has 3 boxes of markers with 5 markers in each box. He also has 4 extra markers. How many markers does Quinton have?*
- *Grandmother gave 2 children a total of \$10 to buy lunch. How much can each child spend if they each spend the same amount?*
- *Gumdrops cost 3 cents each. How much do 3 gumdrops cost?*

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- *Mom baked 12 cupcakes. She wants to put them in boxes of 4 cupcakes each. How many boxes does mom need?*
- *Tom planted 4 rows of tomato plants with 10 tomato plants in each row. How many tomato plants did he plant?*
- *3 boys bought a bag of licorice sticks that had 9 sticks in it. If the boys shared the licorice fairly, how many licorice sticks did each child get?*
- *16 children are going on a camping trip. If 4 children can ride safely in each car, how many cars are needed for this trip?*
- *Mr. Mason made a 4-story building with 3 rooms on each floor. How many rooms are there altogether?*
- *Mrs. Adams made a 3-story building with 4 rooms on each floor. How many rooms are there altogether? Whose building is bigger, Mr. Mason's or Mrs. Adams'?*
- *If you have 12 doughnuts, how many different ways could you share them with how many friends?*

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- **Creature Fraction Feature**

Creature Fraction Feature

- Follow the directions below to fold your large piece of construction paper into fourths.
 - Fold the top edge to the bottom edge.
 - Fold the left side over to the right side.
- Unfold your paper and check to see that you have four rectangles on your page formed by the folds.
- Label each area with one of the fractions like the ones that your teacher will write on the board.
- Pick your choice of small colored construction paper squares from the ones on your table to show each fraction. (If you are not sure if your squares represent your fraction, ask a friend at your table to check your picture.)
- Once you are sure your picture represents the fraction, glue it on one of the four sections of your large piece of construction paper.
- Use a marker or crayon to create a creature, face, animal, or insect out of the small squares that you glued on the section of your construction paper.
- Repeat these instructions for each of the other three sections of your large construction paper.
- When you are finished with all four of your Creature Fractions, your teacher will place it in a display for everyone to see.

Discussion, Suggestions, Possible Solutions

Cut a large supply of 1-inch construction paper squares of assorted colors, enough for each child to have a selection of colors. Help the children fold a whole piece of construction paper into fourths (2 quadrants on top and 2 quadrants on the bottom). Ask them to label each quadrant with a fraction. You may want to demonstrate this on the board by drawing the paper, marking off the quadrants, and then clearly labeling each with a fraction. For example

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any four of the following: one-fourth ($1/4$) blue, two-fourths ($2/4$) red, three-fourths ($3/4$) yellow, four-fourths ($4/4$) purple, one-half ($1/2$) green, two-halves ($2/2$) orange, or even allow them to pick their favorite fraction and color. The children will use the squares in each quadrant to show that fraction. If the first quadrant was labeled with $1/4$

blue then there should be 4 colored squares and 1 of the four should be blue. They glue their pieces in that quadrant and then try to create a creature, animal, person, face, etc. out of the shapes by connecting them with markers or crayons. Their pictures should clearly represent the fraction is labeled for the quadrant.

Should some students have difficulty understanding the directions, you may want to practice with the first one. A possible example could be, “If you have $1/4$ blue, how many squares should you have? We should have a total of 4 construction paper squares, but only one can be blue. Why?”

Walk around and observe the children as they work. Try to check their work for the first few quadrants before they glue down their square. If a mistake is made, see if the child can tell you what fraction they did show.

- **Culminating Task**

This culminating task represents the level of depth, rigor and complexity expected of all first grade students to demonstrate evidence of learning.

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Unit Six Task: “WE ARE FAMILY”

- Create a house and story problem for at least four different fact families to make a book.
- Trace the pattern on your table to make a front and back page for your fact family house book.
- The title should be, “[Your name]’s Fact Family House.”
- After you write the title on the front cover, be creative in decorating it.
- Choose at least four numbers from 10-18. Write one of each of the four the numbers you chose at the top of the point on a house on each page.
- For each fact family, pick one number that is smaller than the number at the top of the page. Determine what the other number would be and place the two numbers in the bottom two corners of the triangle.
- List the two addition and two subtraction facts using those members in the section directly under the triangle.
- Select one of the four facts that you wrote in the rectangle and write a story problem in the bottom section of the house underneath the four facts.
- On the back of the page, write the math fact that is used in the story problem.

Suggestions for Classroom Use

While this task may serve as a summative assessment, it also may be used for teaching and learning. It is important that all elements of the task be addressed throughout the learning process so that students understand what is expected of them.

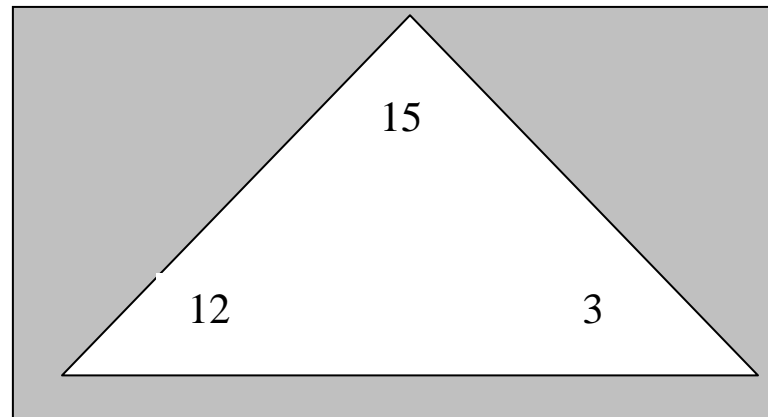
- Peer Review
- Display for parent night
- Place in portfolio
- Photographs

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Discussion, Suggestions and Possible Solutions

Make a simple pattern of a house (triangle on top of a square) for your students to trace and cut out of construction paper. They may choose whatever color they wish. They will need to have 2 copies that they have traced to serve as the front and back covers of their fact family book. They may design the cover of their book but will need to label it “[Student’s name]’s Fact Family House.” You may want to cut out white paper in the shape of the house for the pages inside of the book. Each student will need at least 5 white pages for the inside of their book. Have the students choose 4 or 5 numbers between 10 and 18 and write one of the numbers on the top of each “roof.” You may wish to demonstrate each of these steps as the children begin so they can see what you are doing. The number the children chose will serve as the largest member of each fact family, and there will be a different fact family on each page of the book.

For example, say you chose 15. You would write 15 at the top of your roof on one of your white pages of paper. In each of the other corners of the roof, you would write a number smaller than 15. If you chose 12, then 3 would be your other number and the roof would look like this.



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Next, your students will list the addition and subtraction fact family members. Then they will use one of the fact family members to write a story problem at the bottom of the page. The reader will have to decide which fact was used to write the story. Students should write the answer on the back of the page. They will continue doing this with the other numbers they have chosen until they have 4 – 5 pages with a different fact family on each page.

15

12 3

$12 + 3 = 15$	$15 - 12 = 3$
$3 + 12 = 15$	$15 - 3 = 12$

15 children went swimming in the ocean. 3 children had blue rafts. The rest had red rafts. How many children had red rafts?

Answer: back of the page