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Georgia Performance Standards Framework for Mathematics – Grade 2

Unit 6 Organizer: “NUMERATION WITH COMPUTATION” **(6 weeks)**

OVERVIEW:

In this unit students will:

- correctly add and subtract two whole numbers two- and three-digits each with regrouping;
- solve problems and check solutions by using the inverse relation between addition and subtraction with two- and three- digit numbers;
- solve problems using mental math strategies with one- and two-digit numbers; and
- use the commutative, associative, and identity properties to simplify problems involving one- and two-digit numbers.
- solve problems and check solutions by using the inverse relation between addition and subtraction with numbers less than 10,000;
- solve problems using mental math strategies with numbers less than 10,000;
- use the commutative, associative and identity properties to simplify problems involving numbers less than 10,000;
- use estimation to determine the reasonableness of addition and subtraction problems involving numbers less than 10,000;

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 calendar centers (tubs) and games. It is important that routines be established allowing students to gradually understand and build on the concepts of number and time.

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.

Georgia Performance Standards Framework for Mathematics – Grade 2

ENDURING UNDERSTANDINGS:

- When one *quantity is joined with another quantity, the result is greater than or equal to the initial quantity.
- When one *quantity is separated from another quantity, the result is less than or equal to the initial quantity.
- When one *quantity is compared to another quantity, the initial quantity is either equal to, greater than, or less than the second quantity.
- The sum of the parts is equal to the whole.
- Joining, separating, part-part-whole, and comparing problems can be modeled.
- The order of addends may be changed and the result will not change.
- The grouping of addends may be changed and the result will not change.
- Addends can be decomposed and “re”composed differently to simplify adding.
- Regrouping may be used to add and subtract two whole numbers up to four digits each.
- Solutions may be solved and checked by using the inverse relation between addition and subtraction of numbers less than 10,000.
- Mental math strategies may be used to solve problems involving numbers less than 10,000.
- Problems involving numbers less than 10,000 may be simplified by using the commutative, associative and identity properties.
- Reasonableness of addition and subtraction problems may be determined by using estimation.

*(Quantities discussed at this level are non-negative)

ESSENTIAL QUESTIONS:

- How can subtraction help me to know if I added two numbers correctly?
- How can addition help me know if I subtracted two numbers correctly?
- When one set of objects is compared to another, what are the possible outcomes?
- Can I change the order of numbers when I add (or subtract)? Why or why not?
- How can I solve problems mentally?

Georgia Performance Standards Framework for Mathematics – Grade 2

STANDARDS ADDRESSED IN THIS UNIT

Mathematical standards are interwoven and should be addressed throughout the year in as many different units and activities as possible in order to emphasize the natural connections that exist among mathematical topics.

KEY STANDARDS:

M2N2. Students will build fluency with multi-digit addition and subtraction.

- a. Correctly add and subtract two whole numbers up to three digits each with regrouping.
- b. Understand and use the inverse relation between addition and subtraction to solve problems and check solutions.
- c. Use mental math strategies such as benchmark numbers to solve problems.
- d. Use basic properties of addition (commutative, associative, and identity) to simplify problems (e.g. $98 + 17$ by taking two from 17 and adding it to the 98 to make 100 and replacing the original problem by the sum $100 + 15$).

RELATED STANDARDS:

M2N1. Students will use multiple representation of numbers to connect symbols to quantities.

- a. Represent numbers using a variety of models, diagrams, and number sentences (e.g., 4703 represented as $4,000 + 700 + 3$, and units, 47 hundreds + 3, or $4,500 + 203$).
- b. Understand the relative magnitudes of numbers using 10 as a unit, 100 as a unit, or 1000 as a unit. Represent 2-digit numbers with drawings of tens and ones and 3-digit numbers with drawings of hundreds, tens, and ones.
- c. Use money as a medium of exchange. Count back change and use decimal notation and the dollar and cent symbols to represent a collection of coins and currency.

M2D1. Students will create simple tables and graphs and interpret their meaning.

- a. Organize and display data using picture graphs, Venn diagrams, bar graphs, and simple charts/tables to record results.
- b. Know how to interpret picture graphs, Venn diagrams, and bar graphs.

Georgia Performance Standards Framework for Mathematics – Grade 2

M2P1. 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.
- c. Apply and adapt a variety of appropriate strategies to solve problems.
- d. Monitor and reflect on the process of mathematical problem solving.

M2P2. 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.

M2P3. 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.

M2P4. 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.

M2P5. 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.

Georgia Performance Standards Framework for Mathematics – Grade 2

CONCEPTS/SKILLS TO MAINTAIN:

It is expected that students will have prior knowledge/experience related to the concepts and skills identified below. It may be necessary to pre-assess in order to determine if time needs to be spent on conceptual activities that help students develop a deeper understanding of these ideas.

- Fluency with single digit addition/subtraction facts to 18
- Fair trades with coins or bills
- Duration and sequence of events
- Number patterns-skip count, odd/even
- Fact families
- Fractions: halves, fourths
- Tally marks
- Picture graphs
- Estimation: rounding to nearest ten
- Commutative Property

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.

Thousands Place: in place value, the place that represents the number of thousands; the place to the left of the hundreds place

Associative Property: in addition and multiplication, no matter how the numbers are grouped, the answer will always be the same

$$\text{ex. } (2 \times 3) \times 5 = 2 \times (3 \times 5) \quad \text{or} \quad (6 + 1) + 2 = 6 + (1 + 2)$$

Georgia Performance Standards Framework for Mathematics – Grade 2

Identity Property for addition: when zero is added to a number the result is the number itself

Identity Property for multiplication: when a number is multiplied by one the result is the number itself

Join: to put together (ex. adding)

Separate: to take apart (ex. subtracting)

Difference: the amount that remains after one quantity is subtracted from another

+: symbol that represents addition

-: symbol that represents subtraction

EVIDENCE OF LEARNING:

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

- Add and subtract two whole numbers up to three digits each with regrouping.
- Use inverse operations to solve problems.
- Solve problems using mental math strategies.
- Simplify problems using the commutative, associative, and identity properties.

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

- Sale Flyer Shopping
- Menu Math
- A Piggy Snack
- Number Partners
- Counting Mice
- The Missing Problem
- Every Picture Tells a Story
- How Many Buses?

Georgia Performance Standards Framework for Mathematics – Grade 2

Culminating Activity: “How Many Buses?”

Students must first calculate the number of students in a grade (or several grades or a school). They must then determine the number of 30-person and 12-person buses needed to take a field trip and determine the most cost effective combination of 30-person buses at a cost of \$10.00 per bus and 12-person buses at a cost of \$5.00 per bus.

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 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 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.

Georgia Performance Standards Framework for Mathematics – Grade 2

TASKS:

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

- **Sale Flyer Shopping**

Sale Flyer Shopping

- Create a shopping book with one large piece of construction paper for the cover and 5 pages of blank paper for the book pages. You may decorate the cover of the book however you wish. Make sure you have the title Shopping With _____(your name) on the book.
- Choose two items with their prices from the sale flyers for each shopping page. Glue these on the page.
- Add each item price for that page together. Be sure to line up the numbers according to place value and double check your regrouping. Use appropriate “\$” and “.” signs in your answer.
- Write a word problem for each page of your shopping book.
- When you are finished have a partner check your work.

Discussion, Suggestions, Possible Solutions

A week or two before you want to do this project ask students to begin bringing in sale flyers from the newspaper. It is a particularly good time during any of the holidays because there are fun things for the children to buy. You may allow them to shop from whatever flyers you feel are appropriate (toy shops, clothes, food, etc.).

Have children make a book called Shopping with _____. They may decorate the cover however they wish. Inside the books will contain shopping pages. You may vary the amount of pages to differentiate for your students. On each page, students will glue pictures and prices of two items they wish to purchase. They will then

Georgia Performance Standards Framework for Mathematics – Grade 2

write an addition problem adding the two prices together. They will need to show all of their work. At the bottom of the page they will write a story problem about their purchase.

Shopping page:

Items I bought: *(glue pictures and prices here)*

Addition problem:

\$ _____

+ \$ _____

Word problem:

You may allow partners or groups to check each others work as they finish.

Extensions:

- *Students that work faster may do more shopping pages.*
- *To make it more rigorous, you may give them a set amount that they may spend and then require students to add their total amounts spent to see if their purchases were within their budget.*
- *Have students plan a holiday dinner using grocery store flyers.*

Georgia Performance Standards Framework for Mathematics – Grade 2

- **Menu Math**

Menu Math

- As a class think of a name for our class restaurant. We will vote to determine the class' favorite name.
- List menu items and prices for our restaurant.
- Work with your partner to play restaurant.
- Customer will order 2 or 3 items and estimate the cost.
- Waiter / waitress will take the order and determine the true cost using addition with regrouping.
- Customer will pay using \$5, \$10, or \$20 bills.
- Customer figures out how much change they should receive and waiter / waitress does as well.
- All math is checked on the calculator (register) for accuracy.
- Switch roles and play again.

Discussion, Suggestions, Possible Solutions

As a class, decide what kind of restaurant you would like to create. Brainstorm a creative name for your restaurant. Vote and take tally marks to determine the class' favorite name. Have students list the types of drinks, appetizers, entrees, sides, and desserts they would like to serve at their restaurant. This list will serve as the class menu (you may make paper menus if desired). Assign prices to each of the items available on the menu.

Separate the children into groups of two. One of the two children in each group will be the customer and the other student in each group will be the waiter / waitress. The waiter / waitress takes the order and tallies the bill. Students should not order more than 2 or 3 items (depending upon the difficulty of the prices on the menu). The customer should estimate their own individual bill and round that cost to the nearest \$5. The waiter / waitress tallies the bill and gives the bill to the customer (using addition with regrouping). Using the estimation amount, the customer should decide if the bill seems correct. The

Georgia Performance Standards Framework for Mathematics – Grade 2

customer then pays with either a \$5, \$10, or \$20 bill (or combination of) depending on the bill and then figures out how much change they should get (using subtraction with regrouping). After they write down the total and the change, they may check their math on a calculator (serves as the register). All work should be saved and turned in to be double checked by the teacher. Students may then switch roles and play again.

Extensions:

- have children actually pay with play money and make the change*
- write orders in journals and write story problems about what they ordered.*

- **A Piggy Snack**

A Piggy Snack

- Listen to a story such as Pigs Will Be Pigs.
- With your partner, list all of the money that the pig family found.
- Use your list to add the money together. Be sure to use your mental math or addition strategies when possible.
- Come up with a total for the amount of money found.
- Extension (if used) Use the menu to buy a snack for the Pig family. What did they buy? How much did it cost? How much change did they get back? Write about all of these in your math journal.
- Be prepared to share with the class.

Discussion, Suggestions, Possible Solutions

Read a story like Pigs Will Be Pigs by Amy Axelrod. Give each child or partners of children scratch paper. As you read

Georgia Performance Standards Framework for Mathematics – Grade 2

the story have the children record (each amount on a separate line) the amounts of money that the pigs find.

Children then work in partners to add up the total amount of money using regrouping.

Below is the beginning of a possible example.

Piggy Money	
\$2	= \$2.00
2 nickels	= .10
5 pennies	= .05
1 quarter	= + .25
<hr/>	
	\$2.40
6 dimes	= .60

Once the amounts are totaled and the partners have checked their work, list the amounts that the groups found. The total should be \$34.67.

Extension:

Have children write a math story in their math journal about the type of snack the pigs went and bought and how much it cost. You may copy the menu at the back of the story. Did they have enough money? Show the problems with the addition with regrouping and the change they got back using subtraction with regrouping. They may illustrate their problems. Allow time for the children to share their journals with the class.

Georgia Performance Standards Framework for Mathematics – Grade 2

- **Number Partners**

Number Partners

- Look at the numbers on the board.
- In your head, try to use “mental math” to find the sum.
- Be prepared to share your math thinking with the class.

Discussion, Suggestions, Possible Solutions

Begin by writing a simple set of three numbers on the board (65, 20, 15). Then ask students to try to find the sum in their heads using mental math or addition strategies they have learned. Allow time for them to come up with their strategies and then allow them to share with the class. Encourage students to share their thinking and to demonstrate their number combinations (number partners) that helped them arrive at their sum.

Discuss strategies for 65, 20, and 15.

Possible options: Possible options: (a) $65 + 20 = 85$, $85 + 15 = 100$; (b) $65 + 15 = 80$, $80 + 20 = 100$

Next list the following numbers in a vertical column on the board (18, 15, 17, 15, 12, 13). Ask the students to study the numbers and to try to add them in their head. For some, this may be too many numbers so you may allow them to use a white board or scratch paper to show their work (number combinations). Ask for volunteers to come up to the board to share their strategies with the class. Children should notice that three pairs of numbers equal 30 for a total of 90.

Encourage using the commutative property (which allows you to change the order in addition) and in this case using sums to thirty to see relationships (12 and $18 = 30$, 15 and $15 = 30$, etc.).

Georgia Performance Standards Framework for Mathematics – Grade 2

• Counting Mice

Counting Mice

- Listen to the story.
- Think of ways to determine how many mice are in the jar now.
- Find a way to show your answer and to tell how you figured it out. You may use pictures, symbols, words, or numbers sentences.
- Be prepared to share your thinking with your group.

Discussion, Suggestions, Possible Solutions

*Read a book like *Mouse Count* by Ellen Stoll Walsh to the class (Harcourt, 1991). After reading the story, explain to the children that Snake was very hungry one day and put 25 mice in the jar before he took a nap and then put 12 more in after the nap. Their job is to figure out how many mice are in the jar all together.*

Have various materials, paper and pencil, crayons, etc available for the children to use to help them solve their problem. Have them work alone, but sitting in groups to observe and discuss each others strategies. After students have come up with their answers, let several children share the strategies they used.

Reading the book helps the children visualize this combination situation as they try to solve the problem. The actual numbers in the problem (25+12) can be adjusted to meet the needs of your children or to differentiate instruction within the class. Following is an example of how you might keep a record of the strategies your students used.

