CCGPS
Frameworks
Student Edition

Mathematics

Third Grade Unit One
Number and Operations in Base Ten

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"Making Education Work for All Georgians"

TABLE OF CONTENTS

OVERVIEW

In this unit, students will:

- Investigate, understand, and use place value to manipulate numbers.
- Build on understanding of place value to round whole numbers.
- Continue to develop understanding of addition and subtraction and use strategies and properties to do so proficiently and fluently.
- Draw picture graphs with symbols that represent more than one object.
- Create bar graphs with intervals greater than one.
- Use graphs and information from data to ask questions that require students to compare quantities and use mathematical concepts and skills.

Number and Operations…

Prior to implementing rules for rounding**,** students need to have opportunities to investigate place value. A strong understanding of place value is essential for the developed number sense and the subsequent work that involves rounding numbers.

Building on previous understandings of the place value of digits in multi-digit numbers, place value is used to round whole numbers. Dependence on learning rules or mnemonics can be eliminated with strategies such as the use of a number line to determine which multiple of 10 or of 100 a number is closer. (5 or more rounds up, less than 5 rounds down). As students' understanding of place value increases, the strategies for rounding are valuable for estimating, justifying, and predicting the reasonableness of solutions in problem-solving.

Continue to use manipulatives such as hundreds charts and place-value charts. Have students use a number line or a roller coaster example to block off the numbers in different colors.

For example, this chart shows which numbers will round to the tens place.
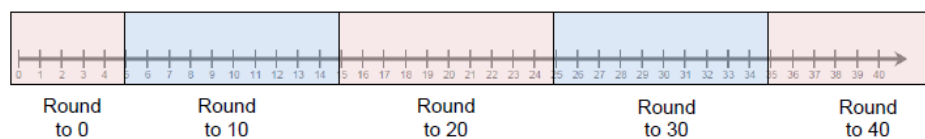
Rounding can be expanded by having students identify all the numbers that will round to 30 or round to 200.

Strategies used to add and subtract two-digit numbers are now applied to fluently add and subtract whole numbers within 1000. These strategies should be discussed so that students can make comparisons and move toward efficient methods.

Number sense and computational understanding is built on a firm understanding of place value.

*Table 1: Common Addition and Subtraction Situations*

	Result Unknown	**Change Unknown**	**Start Unknown**
Add to	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? $2 + 3 = ?$	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? $2 + ? = 5$	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? $? + 3 = 5$
Take from	Five apples were on the table. I ate two apples. How many apples are on the table now? $5 - 2 = ?$	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? $5 - ? = 3$	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? $? - 2 = 3$
	Total Unknown	**Addend Unknown**	**Both Addends Unknown**[1]
Put together/ Take apart	Three red apples and two green apples are on the table. How many apples are on the table? $3 + 2 = ?$	Five apples are on the table. Three are red and the rest are green. How many apples are green? $3 + ? = 5, 5 - 3 = ?$	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? $5 = 0 + 5, 5 = 5 + 0$ $5 = 1 + 4, 5 = 4 + 1$ $5 = 2 + 3, 5 = 3 + 2$
	Difference Unknown	**Bigger Unknown**	**Smaller Unknown**
Compare	("How many more?" version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? ("How many fewer?" version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? $2 + ? = 5, 5 - 2 = ?$	(Version with "more"): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? (Version with "fewer"): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? $2 + 3 = ?, 3 + 2 = ?$	(Version with "more"): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have? (Version with "fewer"): Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have? $5 - 3 = ?, ? + 3 = 5$

Adapted from Box 2-4 of Mathematics Learning in Early Childhood, National Research Council (2009, pp. 32,33

Understanding what each number in a multiplication expression represents is important. Multiplication problems need to be modeled with pictures, diagrams or concrete materials to help students understand what the factors and products represent. The effect of multiplying numbers needs to be examined and understood.

The use of area models is important in understanding the properties of operations of multiplication and the relationship of the factors and its product. Composing and decomposing area models is useful in the development and understanding of the distributive property in multiplication.

Graphing and Data…
Representation of a data set is extended from picture graphs and bar graphs with single-unit scales to scaled picture graphs and scaled bar graphs. Intervals for the graphs should relate to multiplication and division with 100 (product is 100 or less and numbers used in division are 100 or less). In picture graphs, use values for the icons in which students are having difficulty with multiplication facts. For example,   represents 7 people. If there are three   , students should use known facts to determine that the three icons represent 21 people. The intervals on the vertical scale in bar graphs should not exceed 100.

Students are to draw picture graphs in which a symbol or picture represents more than one object. Bar graphs are drawn with intervals greater than one. Ask questions that require students to compare quantities and use mathematical concepts and skills. Use symbols on picture graphs that student can easily represent half of, or know how many half of the symbol represents.

Examples of Common Graphing Situations

- **Pose a question:** Student should come up with a question. What is the typical genre read in our class?

- **Collect and organize data:** student survey

- **Pictographs:** Scaled pictographs include symbols that represent multiple units. Below is an example of a pictograph with symbols that represent multiple units. Graphs should include a title, categories, category label, key, and data. How many more books did Juan read than Nancy?

Number of Books Read	
Nancy	
Juan	
= 5 books	
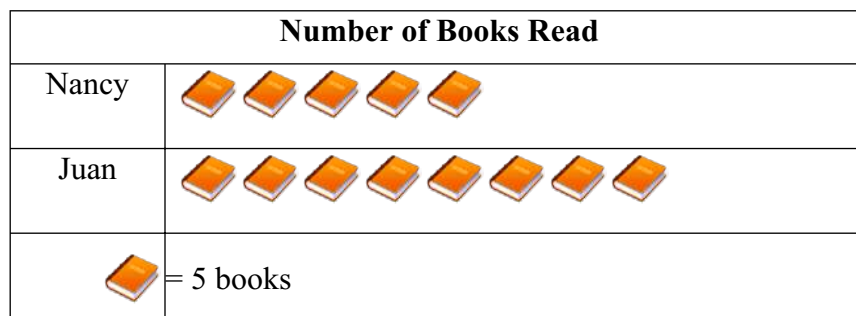
- **Single Bar Graphs:** Students use both horizontal and vertical bar graphs. Bar graphs include a title, scale, scale label, categories, category label, and data.

Types of Books Read
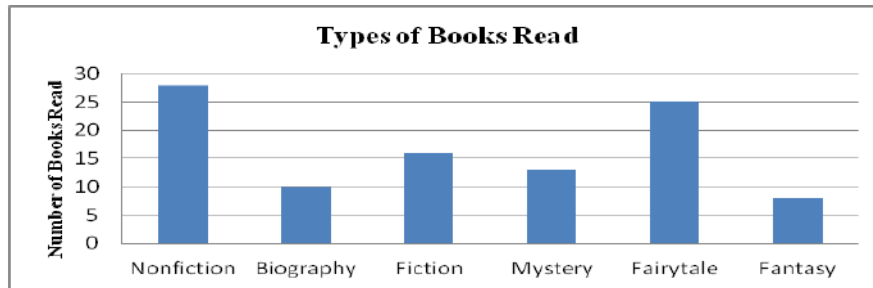
- **Analyze and Interpret data:**
  - How many more nonfiction books were read than fantasy books?
  - Did more people read biography and mystery books or fiction and fantasy books?
  - About how many books in all genres were read?
  - Using the data from the graphs, what type of book was read more often than a mystery but less often than a fairytale?
  - What interval was used for this scale?
  - What can we say about types of books read? What is a typical type of book read?
  - If you were to purchase a book for the class library which would be the best genre? Why?

STANDARDS FOR MATHEMATICAL CONTENT

Content 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.

MCC.3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

MCC.3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

MCC.3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.

MCC.3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units – whole numbers, halves, or quarters.

STANDARDS FOR MATHEMATICAL PRACTICE

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Students are expected to:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

*Mathematical Practices 1 and 6 should be evident in EVERY lesson!

ENDURING UNDERSTANDINGS

Numbers and Operations In Base 10
Place Value and Rounding…
- Place value is crucial when operating with numbers.
- Estimation helps us see whether or not our answers are reasonable.
- Using rounding is an appropriate estimation strategy for solving problems and estimating.
- Rounded numbers are approximate and not exact.

Addition and Subtraction…
- Addition and subtraction are inverse operations; one undoes the other.
- We can verify the results of our computation by using the inverse operation.
- Adding zero to a number or subtracting zero from a number does not change the original amount.
- Addition means the joining of two or more sets that may or may not be the same size. There are several types of addition problems, see the chart above.
- The counting up strategy can be used to make change.
- Subtraction has more than one meaning. It not only means the typical "take away" operation, but also can denote finding the difference between sets. Different subtraction situations are described in the chart above.

Multiples of Ten…
- Multiplication may be used to find the total number of objects when objects are arranged in equal groups.

- One of the factors in multiplication indicates the number of objects in a group and the other factor indicates the number of groups.
- Products may be calculated using invented strategies.

Data and Graphing

- Charts, tables, line plot graphs, pictographs, Venn diagrams, and bar graphs may be used to display data.
- One way to compare data is through the use of graphs.
- The scale increments used when making a bar graph is determined by the scale intervals being graphed.

ESSENTIAL QUESTIONS

- Does rounding a number change its value relative to other numbers?
- How are addition and subtraction alike?
- How are addition and subtraction different?
- How are digits in a number related?
- How are tables, bar graphs, and line plot graphs useful ways to display data?
- How can data be used to make decisions?
- How can data displayed in tables and graphs be used to inform?
- How can data displays be used to describe events?
- How can estimation strategies help us build our addition skills?
- How can graphs be used to compare related data?
- How can graphs be used to display data gathered from a survey?
- How can I learn to quickly calculate sums in my head?
- How can I model multiplication by ten?
- How can I show what I know about addition and subtraction, problem solving, and estimation?
- How can I use addition and subtraction to help me solve real world problems?
- How can I use what I understand about addition and subtraction in word problems?
- How can I use what I understand about money to solve word problems?
- How can I verify the results of an addition or subtraction word problem?
- How can surveys be used to answer a question?
- How can surveys be used to collect data?
- How can we select among the most useful mental math strategies for the task we are trying to solve?
- How can we verify the results of an addition problem?
- How can you prove to your parents you do not spend too much time watching television?
- How can you use data to describe a typical third grader's smile?
- How can you use graphs to answer a question?
- How do I decide what increments to use for my scale?
- How do properties work in subtraction problems?

- How do we round numbers to the nearest ten or hundred?
- How do we use addition and subtraction to tell number stories?
- How does knowing the associative property help us add numbers easily and quickly?
- How does knowing the commutative property help us add numbers easily and quickly?
- How does knowing the identity property help us add numbers easily and quickly?
- How does mental math help us calculate more quickly and develop an internal sense of numbers?
- How is multiplication helpful in solving problems?
- How is place value related to multiples of ten?
- How is rounding used in everyday life?
- How is zero different from any other whole number you might add or subtract?
- In what situations might a person want to round a number to the nearest ten?
- In what type of situations do we add?
- In what type of situations do we subtract?
- What are the properties that relate to addition and subtraction?
- What can we learn about the value of a number by examining its digits?
- What does it mean to round numbers to the nearest ten?
- What estimation and mental math strategies can I use to help me solve real world problems?
- What happens to a number when it is multiplied by ten?
- What is a number sentence and how can I use it to solve word problems?
- What is an effective way to estimate numbers?
- What is mental math?
- What is the most efficient way to give change?
- What mental math strategies are available to us?
- What patterns do I notice when I am multiplying by ten?
- What strategies are helpful when estimating sums in the hundreds?
- What strategies can I use to help me subtract more quickly and accurately?
- What strategies can I use to multiply single digit numbers by multiples of ten?
- What strategies can we use to efficiently solve multiplication problems?
- What strategies will help me add multiple numbers quickly and accurately?
- When will estimating be helpful to us?
- Why is place value important?

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.
- place value
- standard and expanded forms of numbers
- addition
- subtraction
- addition and subtraction properties

- conceptual understanding of multiplication
- interpreting pictographs and bar graphs
- organizing and recording data using objects, pictures, pictographs, bar graphs, and simple charts/tables
- data analysis
- graphing

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, teachers should pay particular attention to them and how their students are able to explain and apply them.

The terms 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.

- add
- addend
- addition
  - associative property of addition
  - commutative property of addition
  - identity property of addition
- bar graph
- chart
- difference
- expanded form
- graph
- increment
- interval
- inverses
- line plot graph
- multiple
- pictograph
- place value
- product
- properties
- round
- scale
- standard form
- strategies
- subtract

- subtraction
- sum
- table

STRATEGIES FOR TEACHING AND LEARNING

(Information adapted from North Carolina DPI Instructional Support Tools)

Prior to implementing rules for rounding, students need to have opportunities to investigate place value. A strong understanding of place value is essential for the developed number sense and the subsequent work that involves rounding numbers.

Building on previous understandings of the place value of digits in multi-digit numbers, place value is used to round whole numbers. Dependence on learning rules can be eliminated with strategies such as the use of a number line to determine which multiple of 10 or of100, a number is nearest (5 or more rounds up, less than 5 rounds down). As students' understanding of place value increases, the strategies for rounding are valuable for estimating, justifying and predicting the reasonableness of solutions in problem-solving.

Strategies used to add and subtract two-digit numbers are now applied to fluently add and subtract whole numbers within 1000. These strategies should be discussed so that students can make comparisons and move toward efficient methods.

Number sense and computational understanding is built on a firm understanding of place value.

Understanding what each number in a multiplication expression represents is important. Multiplication problems need to be modeled with pictures, diagrams or concrete materials to help students understand what the factors and products represent. The effect of multiplying numbers needs to be examined and understood.

The use of area models is important in understanding the properties of operations of multiplication and the relationship of the factors and its product. Composing and decomposing area models is useful in the development and understanding of the distributive property in multiplication.

EVIDENCE OF LEARNING

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

Place Value and Rounding…
- Use mental math to add and subtract.
- Demonstrate place value understanding beyond algorithms or procedure for rounding.
- Round numbers to the nearest 10s and 100s
- Estimate sum and/or difference of numbers
- Apply estimation to solve problems, and determine when it is necessary or appropriate to apply estimation strategies
- Demonstrate a deep understanding of place value and number sense
- Explain and reason about the answers which are the result of rounding.
- Utilize a number line and a hundreds chart as tools to support their work with rounding.

Addition and Subtraction…
- Add and subtract numbers within 1000 fluently, accurately, efficiently (using a reasonable amount of steps and time), and flexibly using a variety of strategies BEYOND the standard algorithm
- Add and subtract both vertically and horizontally and apply the commutative and associative properties.
- Understand how to use an inverse operation to verify computation accuracy.

Multiples of Ten…
- Explain and reason about products when multiplying by 10 and 100.

Data and Graphing…
- Read and solve problems using scaled graphs using different intervals.
- Use understanding of number facts to create graphs and analyze data.
- Use the PCAI model to **P**ose a question, **C**ollect data, **A**nalyze data, and **I**nterpret data and graph data that is relevant to their lives.

TASKS

The following tasks represent the level of depth, rigor, and complexity expected of all students. These tasks or a task of similar depth and rigor should be used to demonstrate evidence of learning. It is important that all standards of a task be addressed throughout the learning process so that students understand what is expected of them. While some tasks are identified as performance tasks, they may also be used for teaching and learning (constructing task).

Scaffolding Task	Constructing Task	Practice Task	Performance Task
Tasks that build up to the constructing task.	Constructing understanding through deep/rich contextualized problem solving tasks	Games/activities	Summative assessment for the unit

Task Name	Task Type *Grouping Strategy*	Content Addressed
Island Hop	Constructing Task *Whole/Small Group*	Rounding numbers to the nearest 10
Shake, Rattle, and Roll	Constructing Task *Partner/Small Group Task*	Rounding, Using estimation and mental math with addition
The Great Round Up!	Practice Task *Small Group Task*	Place Value, Rounding

Mental Mathematics	Constructing Task *Whole Class Task*	Using and sharing mental math strategies
Perfect 500!	Constructing Task *Small Group/Partner Task*	Mental Math with sums of 100
Take 1,000	Constructing Task *Partner/Small Group Task*	Mental Math with combinations of 100
Let's Learn About Addition and Subtraction!	Scaffolding Tasks *Individually, Pairs, or Small Groups*	Addition, Subtraction
The Power of Properties	Constructing Task *Individual/Partner Task*	Commutative, Identity and Associative Properties
Take Down!	Practice Task *Partner Task*	Subtraction
Happy to Eat Healthy	Constructing Task *Individual/Partner Task*	Addition/Subtraction Problem Solving
Field Day Fun	Constructing Task *Individual/Partner Task*	Addition/Subtraction Problem Solving
I Have a Story, You Have a Story	Constructing Task *Individual/Partner Task*	Understanding and writing addition and subtraction word problems
Watch How Numbers Grow!	Scaffolding Tasks *Individually, Pairs, or Small Groups*	Place Value, Multiples of 10
Multiples of Ten	Constructing Task *Partner/Small Group Task*	Multiples of Ten
How Many Tens?	Constructing Task *Small Group Task*	Multiplying 1 digit numbers by multiples of 10
The Information Station!	Scaffolding Tasks *Individually, Pairs, or Small Groups*	Data and Graphing
It's a Data Party!	Constructing Task *Individual/Partner Task*	Data, graphing, problem solving
What's Your Favorite?	Constructing Task *Individual/Partner Task*	Data, graphing, problem solving
Culminating Task: What's the Story Here?	Performance Task *Individual/Partner Task*	Addition, Subtraction, Multiples of 10, Rounding

SCAFFOLDING TASK: "THE ISLAND HOP!"

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

"To round a number simply means to substitute a nice number that is close, so that some computation can be done more easily." Rounding is used to simplify computation in a story, chart or conversation. For example, if you are talking about the amount of time it takes you to do homework, most people will not say 57 minutes, they will say about an hour. The first number is a precise amount of time. The second number refers to an approximate amount of time for better communication. (Van de Walle p. 47)

ESSENTIAL QUESTIONS

- How are digits in a number related?
- What can we learn about the value of a number by examining its digits?
- What is an effective way to estimate numbers?

MATERIALS

- Sidewalk Chalk
- Number line, or 0-99 chart

GROUPING

Students should work in groups of 3 or 4.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

The teacher will begin the lesson outside on the sidewalk. S/he will introduce the decade numbers. The teacher may have the students count by 10s to 100. As the students are counting the teacher will use sidewalk chalk to draw "islands" on the side walk. Be sure to leave enough room in between each decade number to make the tick marks for the numbers in between.

Next, the class will discuss what can go in between the decade numbers. Have the groups of students, using sidewalk chalk, record the numbers that are in between the decade numbers. *Please note that the measurement between the numbers will probably not be equal. As long as they do not skip any numbers it should be fine.*

The teacher will now set the stage for rounding. You can start by asking a series of questions:

- What is estimating?
- Does anyone know why we estimate?

Explain to the students that today they will learn a new estimation strategy. They are going to round to the nearest 10. "Let's look at the islands with the decade numbers, what do you notice?" Students may respond with things like, the islands count by 10s, or they are decade numbers.

When rounding, you are looking for nice numbers like the decade numbers. Ask a student to stand on a number such as 43. The student will locate 43 on the number line and stand there. The teacher will lead the students into a discussion about the nearest decade number. They can even walk/hop to the closest island by counting the steps. Continue this with other students allowing them gain an understanding of the nearest "nice number". Please avoid teaching such things as, "5 or higher, and 4 or lower". We want students to conceptualize the rounding and not memorize rules. Allow students to grapple with and discuss this in order to develop a deeper understanding.

Part II

Students will use the "Island Hop" Scavenger Hunt task sheet to answer questions about rounding. Students should use a number line (cut the attached 0-99 chart to create) or use the 0-99 chart to complete the task.

FORMATIVE ASSESSMENT QUESTIONS

- How do you determine the closest 10?
- Have you found all of the possible answers? Explain.
- When might rounding be useful?
- Can you create an additional number clue?

DIFFERENTIATION

Extension
- Have students practice rounding to the nearest ten using three-digit numbers.

Intervention

- Students can work with only 2 decade numbers at a time. They could use counters to mark their spots.

0-99 Chart

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

Name_____ Date_____

THE ISLAND HOP SCAVENGER HUNT

1. I am a number that rounds to 40. What can I be? Could I be another number? Justify your thinking.

2. I am a number that rounds to 90. What can I be? Could I be another number? Justify your thinking.

3. I am a number that rounds to thirty. One of my digits is 2. What number am I? Could I be another number? Justify your thinking.

4. I am a number that rounds to 60. What can I be? Could I be another number? Justify your thinking.

5. Jalynn told Tameka that she has about 50 stickers. Tameka has 48 stickers. Knowing that Jaylynn rounded her total, is it possible that Tameka has more stickers than Jalynn? Justify your thinking using words, pictures and numbers.

6. Jay has **about** 70 baseball cards. Mark has 72 baseball cards. Is it possible for Jay to have more baseball cards than Mark? Justify your thinking using words, pictures, and numbers.

CONSTRUCTING TASK: SHAKE, RATTLE, AND ROLL

CONTENT STANDARDS ADDRESSED

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and
algorithms based on place value, properties of operations, and/or the relationship
between addition and subtraction.

**MCC.3.NBT.1** Use place value understanding to round whole numbers to the nearest 10 or 100.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

This task is designed to develop addition practice, mental math, and estimation skills. It
will also provide exposure to rounding concepts. You may want to use a book similar to *Mental
Math in the Primary Grades* by Jack Hope, R. Reys, Larry Leutizinger, Barbara Reys, and
Robert Reys to practice mental math with the class as a whole group.

Use all available opportunities during the day to incorporate the use of estimation and
rounding, for example, determining to which multiple of 10 or 100 a given number is nearest.
This skill can be supported with the use of a number line 0-99 chart and/or a hundreds chart.
Students should have these tools available for this task. Alternatively, students can create a
number line to determine the closest multiple of ten. A student sheet with open number lines
could be provided. An example of an open number line is shown below.
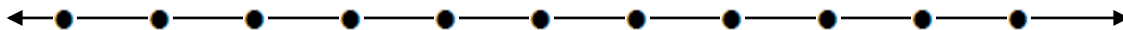
For the number 536, students can fill in the numbers around 536, including the two
closest multiples of ten as shown below. Then looking at the number line, students can determine
the nearest multiple of ten that is the closest to 536. In this case, 540 is 4 away, but 530 is 6
away, so 540 is the closest multiple of ten.
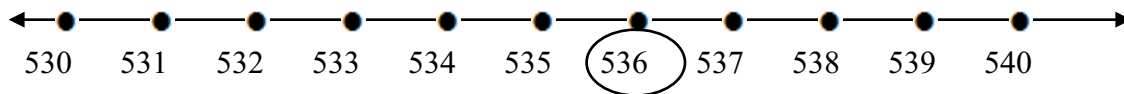
For the number 163, students can follow a similar procedure to round to the nearest hundred. Students will need to determine the multiple of one hundred that is the closest to 163. In this case 100 is more than 60 away, but 200 is less than 40 away, so 200 is the closest multiple of one hundred.
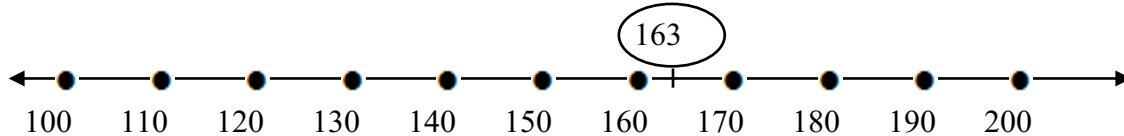
Rounding skills will help students determine reasonableness of answers, a vital skill for standardized tests, as well as everyday living. If you incorporate calendar activities into your instruction, many opportunities present themselves for activities with rounding. Also, be sure students make connections between the following:

- Counting by multiples of ten and hundred
- Multiplying by multiples of ten.
- Estimating to the nearest ten and hundred before adding or multiplying.

Students should be proficient in determining to which multiple of ten or hundred any given number is nearest. They should also be comfortable adding multiples of ten, hundred, and thousand (For example, 200 + 600 = 800).

ESSENTIAL QUESTIONS

- What strategies can I use to help me add in my mind more quickly and efficiently?
- What is an effective way to round numbers to the nearest hundred?
- How can estimation strategies help us build our addition skills?
- When can estimating be helpful to us?

MATERIALS

- Two six-sided dice
- Calculator
- "Shake, Rattle, and Roll" Recording Sheet

GROUPING

Partner/Small Group Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students play a game with dice that enables them to build estimation and mental math concepts as they practice addition skills and strategies and determine to which multiple of one hundred a given number is nearest.

Task Directions

Students will follow the directions below from the "Shake, Rattle and Roll" Recording Sheet.

This is a two player game that will help you practice your estimation and addition skills. The goal of the game is to be the person with the most points at the end of ten turns.

Directions:

1. Play with a partner. You will need 3 dice, a recording sheet for each player, and a calculator.
2. Player one rolls the three dice and forms two numbers, the largest possible number and the smallest possible number, as shown below.

| 5 | 4 | 4 | | 4 | 4 | 5 |

Using the digits 5, 4, and 4 make the numbers 544 and 445. Find the nearest multiple of 100 for each number, and then using mental math, add to find an estimate.

Estimated sum = 500 + 400 = 900

3. Player one records the estimate on the game recording sheet to end round 1. Your partner must agree with your estimation, using a calculator to check if needed.
4. Player two takes a turn, following steps 2 and 3 above.
5. Players take turns for a total of six rounds.
6. After six rounds, each player finds the sum of their estimates. The player with the higher sum wins the game.

FORMATIVE ASSESSMENT QUESTIONS

*   Explain how you found the closest multiple of one hundred.
*   Do you think your estimated sum is higher or lower than the actual sum? Why? How could you check?
*   What kinds of situations in life might be easier if you knew how to estimate and add numbers like this?

DIFFERENTIATION

Extension

- Ask students to play the game again, estimating to the tens place. Does that change the game? If so, how?
- Play the game with four dice. Students get to choose three of the numbers rolled (or two as an intervention) and players have to get closest to 3000. Whoever is closest (over or under 3000) wins the game. This changes the strategy and allows opportunities for teachers to ask students what they hope to roll on the last roll based on what they have so far.

Intervention
- Use number lines, number charts, and models to help students who are having difficulty determining to which multiple of hundred their number is nearest. Use counting up/counting back to the nearest multiple of hundred and compare the results to determine which multiple of hundred a number is closest.
- Students can play the game using fewer dice, adjusting the game accordingly. Once students become comfortable with fewer dice, they can challenge themselves by playing the game with the required three dice.

TECHNOLOGY CONNECTION

- http://www.shodor.org/interactivate/activities/EstimatorFour/?version=1.6.0_02&browser=MSIE&vendor=Sun_Microsystems_Inc. A "Four in a Row" game where players get checkers when they quickly and efficiently estimate a sum to two numbers.
- http://www.oswego.org/ocsd-web/games/Estimate/estimate.html Students estimate the number indicated on a number line.

Name _____ Date _____

Shake, Rattle, and Roll
Game Directions

This is a two player game that will help you build your estimation and mental math concepts as you practice addition skills and strategies. The goal of the game is to be the person with the most points at the end of ten turns.

Directions:
1. Play with a partner. You will need 3 dice, a recording sheet for each player, and a calculator.

2. Player one rolls the three dice and forms two numbers, the largest possible number and the smallest possible number, as shown below.

Example:

| 5 | 4 | 4 | | 4 | 4 | 5 |

Using the digits 5, 4, and 4 make the numbers 544 and 144. Find the nearest multiple of 100 for each number, and then using mental math, add to find an estimate.

Estimated sum = 500 + 400 = 900

3. Player one records the estimate on the game recording sheet to end round 1. Your partner must agree with your estimation, using a calculator to check if needed.

4. Player two takes a turn, following steps 2 and 3 above.

5. Players take turns for a total of six rounds.

6. After six rounds, each player finds the sum of their estimates. The player with the higher sum wins the game.

Shake, Rattle, and Roll Game
Player 1 _____

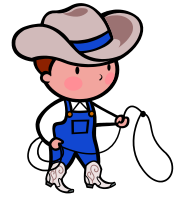| Round	Dice Numbers			Smallest Number		Largest Number		Estimated Sum
	Die 1	Die 2	Die 3	Actual	Nearest Multiple of 100	Actual	Nearest Multiple of 100	
1								
2								
3								
4								
5								
6								
							Total	

- -

Shake, Rattle, and Roll Game

Player 2 _____

Round	Dice Numbers			Smallest Number		Largest Number		Estimated Sum
	Die 1	Die 2	Die 3	Actual	Nearest Multiple of 100	Actual	Nearest Multiple of 100	
1								
2								
3								
4								
5								
6								
							Total	

PRACTICE TASK: "THE GREAT ROUND UP!"
Adapted from North Carolina's Core Essentials Mathematics Program

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.

STANDARDS FOR MATHEMATCAL PRACTICE

1. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

"To round a number simply means to substitute a nice number that is close so that some computation can be done more easily." Rounding is used to simplify computation in a story, chart or conversation. For example, if you are talking about the amount of time it takes you to do homework, most people will not say 57 minutes, they will say about an hour. The first number is a precise amount of time, the second number refers to an approximate amount of time for better communication. (Van de Walle p. 47)

ESSENTIAL QUESTIONS

- How are digits in a number related?
- What can we learn about the value of a number by examining its digits?
- What is an effective way to estimate numbers?

MATERIALS

- Three Number Cubes
- "The Great Round Up" Recording Sheet

GROUPING

Students should work in groups of 3 or 4.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Game Instructions

1. Player 1 will toss all three number cubes and make the GREATEST possible 3-digit number with those digits.

2. Player 1 will write his or her number on his or her recording sheet.
3. The player with the GREATEST number in that round will round his or her number to the nearest hundred and record the rounded number in the total column on their recording sheet.
4. All other players will not record a number in the total column for this round.
5. Play will continue for ten rounds.
6. The winner is the player with the greatest total.
7. At the end of the game, students should share their efficient rounding strategies with one another.

DIFFERENTIATION

Extension
- Have students create anchor charts for efficient rounding strategies.
- Have students practice rounding to the nearest ten with three dice.
- Have students try rounding to the nearest thousand with four dice.

Intervention
- Students can use number lines or hundreds charts to help them.
- Students can play with two cubes instead of three, rounding to the nearest ten.
- Students can complete the task with a teacher or peer assistant.

"The Great Round Up!"

Game Instructions and Recording Sheet

1. Player 1 will toss all three number cubes and make the GREATEST possible 3-digit number with those digits.
2. Player 1 will write his or her number on his or her recording sheet.
3. The player with the GREATEST number in that round will round his or her number to the nearest hundred and record the rounded number in the total column on their recording sheet.
4. All other players will not record a number in the total column for this round.
5. Play will continue for ten rounds.
6. The winner is the player with the greatest total.
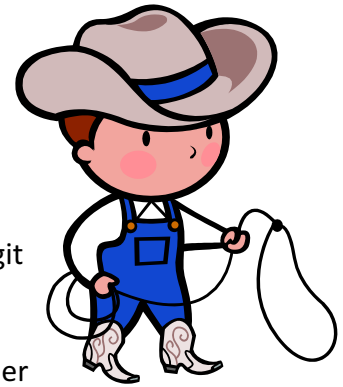7. At the end of the game, students should share their efficient rounding strategies with one another.

ROUND	GREATEST 3 DIGIT NUMBER	ROUNDED NUMBER
example round	432	400
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
		TOTAL

ROUND	GREATEST 3 DIGIT NUMBER	ROUNDED NUMBER
example round	432	400
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
		TOTAL

CONSTRUCTING TASK: MENTAL MATHEMATICS

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Discussions should move beyond whether or not the answers are correct. The goal here is to develop efficient ways to group numbers and/or develop compensation strategies for mental addition and subtraction. The value of group discussions and modeling is evident when students gather insights from their classmates that will reinforce basic number sense and develop strategies that will help them become better at mental computation.

Throughout the year, this type of task is a valuable opening activity and should be revisited frequently. When using mental math problems as an opening activity, focus on the strategies students use to find the solution.
Students should be encouraged to solve problems in ways that make sense to them. If students have never been encouraged to solve problems mentally and share their own strategies with others, they may be reluctant to share or may feel that their strategy is inappropriate. Establish ground rules in your classroom about sharing ideas and how students can appropriately respond to each other.

Students should have some prior experiences with basic computation strategies allowing them to calculate quickly and reliably. Examples include counting on, doubling, making tens, making hundreds, and using benchmark numbers.

ESSENTIAL QUESTIONS

- What is mental math?
- How does mental math help us calculate more quickly and develop deeper understanding of numbers?
- What mental math strategies are available to us?
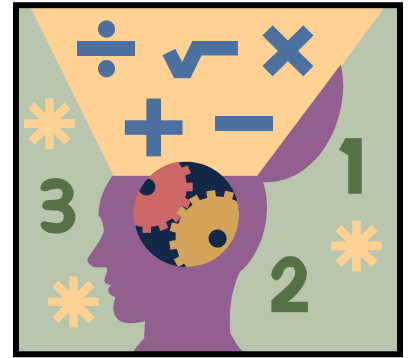
- How can we select among the most useful mental math strategies for the task we are trying to solve?

MATERIALS

- Chalkboard, whiteboard, overhead projector, or Interactive Whiteboard
- "Mental Mathematics" Recording Sheet

GROUPING

Whole Class/Small Group Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students will engage in mental math activities and rich group discussions about various strategies used to find the answers to addition and subtraction problems without paper and pencil.

Task Directions
Part I
Begin this activity by placing one problem at a time on the board, preferably horizontally. Be aware that students may initially need individual time to solve these problems mentally, so encourage students to be patient and quiet during this time. Below is a number string that encourages leaps of 10:

Leaps of 10 forward	Leaps of 10 backwards
26+10	36-10
26+12	36-20
26+22	36-24
44+30	43-30
44+39	43-39
58+21	57-21
63+29	65-39

After allowing enough time for students to consider the problem, lead a discussion by asking several students to share their solution and/or strategy. Simply stating an answer is not enough to make this a rich activity. Encourage students to share different strategies, asking them to try to make sense of each solution as it is presented. Remind students that the goal is to become **efficient** and **flexible** in their thinking and strategies.

Part II
Solve the following problems as they are placed on the board using no paper or manipulatives. Use your mental math strategies. Be prepared to share your solutions and strategies.

- 150 + 70

Students may solve this problem in a variety of ways. Examples are:
- ❖ 150 + 50 is 200 and 20 more is 220.
- ❖ 50 + 70 is 120 and 100 more is 220.
- ❖ 100 + 70 is 170, 30 more is 200 and 20 more is 220.
- 240 + 160
  Students may solve this problem in a variety of ways. Examples are:
  - ❖ 200 + 100 is 300 and 40 + 60 is 100, so 300 + 100 is 400.
  - ❖ 40 + 60 is 100 and 200 + 100 is 300, so 100 + 300 is 400.
  - ❖ 240 + 60 is 300 and 100 more is 400.
- 990 + 170
  Students may solve this problem in a variety of ways. Examples are:
  - ❖ 990 and 10 more is 1,000, 1,000 + 170 is 1,170, but take 10 away that was added to the 990 to get 1,000, so the answer is 1,160.
  - ❖ Some may attempt a traditional algorithm, but should notice that this is more cumbersome that examining the numbers and using the ideas above to compute.
- 500 - 120
  Students may solve this problem in a variety of ways. Examples are:
  - ❖ 500 – 100 is 400, then 400 – 20 is 380.
  - ❖ 500 – 20 is 480, them 480 – 100 is 380.
  - ❖ You need 80 more to get to 200 from 120, then 300 more to get to 500, so the answer is 80 + 300 or 380. Note: Students who use this method are actually finding the *difference* between the two numbers and not simply "taking away." This is a wonderful opportunity to discuss different approaches to subtraction.

If students are struggling with this task, encourage the use of an empty number line until they are able to visualize the leaps of ten.

FORMATIVE ASSESSMENT QUESTIONS

- What is one strategy you could use to solve the problem quickly?
- How can you verify your solution?
- Could this problem be solved another way? How?
- Which problem solving strategy works best for you?

DIFFERENTIATION

Extension
- When you are presenting problems to students, vary the problems you use. Include various operations and numbers.
- Have students develop their own mental math problems, solve them, and explain their solution strategies.

Intervention
- Have students work with smaller, single-digit numbers initially.

- Have students use Rekenreks or other tools to help them conceptualize their mental math strategies.
- Have students work with a partner to develop strategies.
- Students who struggle with math reasoning often have difficulty communicating their thinking. Extra sensitivity and encouragement must be shown for these students as they develop and strengthen these sets of process skills. Questioning can scaffold students who are challenged by discussing their math thinking.

TECHNOLOGY CONNECTION

- http://olc.spsd.sk.ca/de/math1-3/p-mentalmath.html Teacher background information as well as student practice materials on the topic of elementary mental math strategies
- http://www.curriculumsupport.education.nsw.gov.au/primary/mathematics/numeracy/mental/index.htm Mental computation strategies with some fun graphics to demonstrate the strategies.
- http://www.oswego.org/ocsd-web/games/SpeedGrid/Addition/urikaadd2res.html A fun race against time using mental addition skills.

Name _____ Date _____

Mental Mathematics

When your teacher gives you mathematics problem, solve it using mental mathematics and then record your thinking in the correct box below. During student sharing, if you like a strategy used by another student, record it in the same box.

Problem #1	Problem #2
Problem #3	**Problem # 4**

CONSTRUCTING TASK: PERFECT 500!

STANDARDS OF MATHEMATICAL CONTENT

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students should have addition skills clearly in place, and strategies for larger numbers, including counting up, counting back, pairs that make ten, pairs that make 100, and compensation strategies.

Students may find this game challenging, particularly at the beginning of the year. When introducing this game, you may choose to use one of the variations of the game from the list below.
- Play just one round, the students with the sum closest to 100 wins.
- Play just one round as a class. Put the digits on the board and let students create the sum that is closet to 100.
- Discuss the relationship between pairs of 10 and pairs of 100. (i.e. 4 + 6 = 10, so 40 + 60 = 100 What about 42 + 68? Why doesn't that equal 100?

ESSENTIAL QUESTIONS

- How can I learn to quickly calculate sums in my head?
- What strategies will help me add numbers quickly and accurately?
- What strategies are helpful when estimating sums in the hundreds?

MATERIALS

- Deck of game cards, (2 copies of the cards provided for a deck of 40 cards)
- "Perfect 500" Directions Sheet
- "Perfect 500" Student Recording Sheet

GROUPING

Partner/Small Group Game

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION
This game allows students to look for combinations of numbers that equal 100.

Task Directions
The goal of the game is to have a sum as close to, but not over, 500 at the end of five rounds. To begin, each student is dealt 5 cards. The player uses four of the cards to make 2, two-digit numbers, saving the unused card for the next round. Each player tries to get as close as possible to 100. Students record their addition problem on the recording sheet, keeping a running total as they play.

For the second round, each player gets four cards to which they add the unused card from the first round. The student, who is closest to 500 without going over, after five rounds, is the winner.

Perfect 500!

Player 1 _____ Date _____

					Running Total
1		+		=		
2		+		=		
3		+		=		
4		+		=		
5		+		=		
				Total	

Questions/Prompts for Formative Student Assessment
- What is one way to quickly find the answer? Can you think of another way?
- How do you know you will not go over 500?
- How do you decide which numbers to use? How do you choose which cards to use?

Questions for Teacher Reflection
- What strategies are students using successfully?

- Are there strategies that would be helpful to model for students?

DIFFERENTIATION

Extension
- Students can play "Perfect 5,000" during which each player draws 7 cards and uses 6 to make 2, three-digit numbers whose sum is close to 1,000. After 5 rounds, the player with the sum closest to 5,000 without going over is the winner.

Intervention
- Plan for students with like abilities to play against each other.
- Students can play "Perfect 100" during which each player draws 4 cards and adds the numbers on three cards to find a sum as close as possible to 20. After 5 rounds, the player with the sum closest to 100 without going over is the winner.

1	1	2	2
3	3	4	4
5	5	6	6

| 7 | 7 | 8 | 8 |
| 9 | 9 | 0 | 0 |

Name _____ Date _____

Perfect 500

Number of Players: 2 or 3

Materials: One deck of 40 cards (4 each of the numbers 0-9)

Directions:
1. The goal of the game is to have a sum as close to but not over 500 at the end of five rounds.

2. To begin, shuffle the deck of cards.

3. Deal 5 cards to each player. Use four of the cards to make 2, two-digit numbers, saving the fifth card for the next round.

4. Try to get as close as possible to 100. Record your addition problem and sum on the recording sheet, keeping a running total as you play.

5. For the second round, each player gets four cards to which they add the unused card from the first round.

6. After five rounds, the winner is the player who is closest to 500 without going over.

Perfect 500!

Player 1 _____ **Date** _____

Round					Running Total
1		+		=	
2		+		=	
3		+		=	
4		+		=	
5		+		=	
			Total		

- -

Perfect 500!

Player 2 _____ **Date** _____

Round					Running Total
1		+		=	
2		+		=	
3		+		=	
4		+		=	
5		+		=	
			Total		

CONSTRUCTING TASK: TAKE 1,000

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

ESSENTIAL QUESTIONS

- How can I learn to quickly calculate sums in my head?
- What strategies will help me add multiple numbers quickly and accurately?

MATERIALS

- A deck of cards containing two of each of the following numbers: 100, 200, 300, 400, 500, 600, 700, 800, 900, 500, 50, 950, 150, 850, 250, 750, 350, 650, 450, 550. (Copy 2 game cards sheets for each deck of cards)
- "Take 1,000 Game, Student Directions" Student Sheet

GROUPING

Partner/Small Group.

BACKGROUND KNOWLEDGE

Students should have had practice developing strategies to make combinations of ten and one hundred using mental math. They can apply those strategies to finding sums to one thousand.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

This is a card game during which students must be the first to spot combinations of one thousand. This game can be adapted to eliminate the speed aspect to the game. Students can take turns turning over a card and placing it face up next to the other cards that are face up. If there is a sum of the numbers on any pair of cards that equals 1,000 the student gets to take those cards. If there is not a sum of 1,000, then the cards are left face up and the student's turn ends. Play

continues until all of the cards have been turned over. The player with the most cards at the end of the game wins. As students play, ask them to record their pairs of 1,000 as an addition number sentence. This gives students an opportunity to focus on the pairs that make 1,000 and provides a record of the game.

Task Directions
Students follow the directions below from the "Take 1,000 Game, Student Directions" Student Sheet.
Number of Players: 2
Materials: Deck of 40 Cards
Directions:
1. Your goal in this game is to make sets of one thousand.
2. Shuffle the cards well and lay them face down in a pile on the desk.
3. Turn the top card over and set it to the side where both partners can see it. Now turn the next card over and set it to the side of the first overturned card.
4. If the first two overturned cards equal one thousand when added together, try to be the first one to say, "One Thousand!" loudly enough for your partner to hear you. If you are first to notice, you may take the cards that equal one thousand. If your partner is the first to notice, he or she gets to take the cards.
5. If the first two cards do not make a set of one thousand, keep turning cards over and setting them next to the first overturned cards. When someone spots a combination of one thousand, they call out "One Thousand!" and take the cards that total one thousand. Keep playing this way until all cards have been claimed or the overturned cards do not make a set of one thousand.
6. The player with the most cards at the end of the game is the winner.

FORMATIVE ASSESSMENT QUESTIONS

- What do you know about pairs of numbers that add to 1,000?
- What strategies are you using? How are they working for you?
- What can you do to find the answer quicker than your partner?
- Does 630 + 470 equal 1,000? How do you know?

DIFFERENTIATION

Extension
- Ask students to make cards to add to the deck of cards. Provide blank card outlines and allow students to either create their own pairs of 1,000 cards to the deck or to create their own deck of cards with which to play the game.

Intervention
- If two struggling students are going to play this game together, it may help to model the game during small group instruction first. While modeling the game, use the think-aloud strategy to model ways students can think about pairs to one thousand.

- Play a "Pairs to 100" game. Cards and directions can be found in Unit 6, Grade 2 frameworks. Or play a "Pairs to 20" game using two of each of the following cards: 1, 19, 2, 18, 3, 17, 4, 16, 5, 15, 6, 14, 7, 13, 8, 12, 9, 11, 10, 10.

TECHNOLOGY

- http://letsplaymath.wordpress.com/tag/mental-math/ Offers ideas for other games and links to additional math sites.

200	150	100	50
400	350	300	250
600	550	500	450

650	700	750	800
850	900	950	500

Name _____ Date _____

Take 1,000 Game
Student Directions

Number of Players: 2

Materials: Deck of 40 Cards

Directions:

1. Shuffle the cards well and lay them face down in a pile on the desk.

2. Turn the top card over and set it to the side where both partners can see it. Now turn the next card over and set it to the side of the first overturned card.

3. Your goal in this game is to make sets of one thousand.

4. If the first two overturned cards equal one thousand when added together, try to be the first one to say, "One Thousand!" loudly enough for your partner to hear you. If you are first to notice, you may take the cards that equal one thousand. If your partner is the first to notice, he or she gets to take the cards.

5. If the first two cards do not make a set of one thousand, keep turning cards over and setting them next to the first overturned cards. When someone spots a combination of one thousand, they call out "One Thousand!" and take the cards that total one thousand. Keep playing this way until all cards have been claimed or the overturned cards do not make a set of one thousand.

6. The player with the most cards at the end of the game is the winner.

SCAFFOLDING TASKS: "LET'S THINK ABOUT ADDITION AND SUBTRACTION"
Adapted from North Carolina's Core Essentials Mathematics Program

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning**.**

BACKGROUND

According to research, students will develop many different strategies for addition and subtraction. As a teacher, you will want to make sure that students have at least 2 efficient, mathematically correct, and useful strategies that can be used with various numbers. Number Talks are a great way to develop these strategies and is a forum for sharing these amongst their peers.
It is not unreasonable for third grade students to mentally add and subtract two digit numbers, however you must not push **all** students to pure mental computation. (Van De Walle, Teaching Student Centered Mathematics, Vol. I, p. 108)

ESSENTIAL QUESTIONS

- How can I use addition and subtraction to help me solve real world problems?
- How can I show what I know about addition and subtraction and problem solving?
- How do we use addition and subtraction to tell number stories?
- How are addition and subtraction alike and different?
- How can I use what I understand about addition and subtraction in word problems?
- What is a number sentence and how can I use it to solve word problems?
- How can I use what I understand about money to solve word problems?

MATERIALS

- Math Journals (or paper)

- Manipulatives/cut outs (to help students create models for their problems)
- Chart Paper
- "Let's Learn About Addition and Subtraction" recording sheet

GROUPING

Students may be grouped individually, in pairs, or in small groups at the teacher's discretion.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Although addition and subtraction were covered in 2nd grade, students can still benefit from acting the stories out. Students should use pictures, words and numbers to solve the word problems.

Part I
The teacher will begin by asking students to respond to the following questions in their math journals:
- There is a tree with five branches. On each branch there are three nests. In each nest there are four eggs. How many eggs are there in all?

Once students are finished, the class will discuss the strategies they used to add. There should also be discussion about using subtraction to verify results. This information may also be used to create an anchor chart.

Part II
In small groups, students will complete the "Figuring Out Addition and Subtraction" recording sheet. Students should be encouraged to solve their problems in multiple ways, using pictures, numbers, and words.
- Your school cafeteria sells popsicles for twenty five cents, nutty buddies for forty cents, and ice cream cones for thirty cents. If a student spends five dollars in the month of October for these treats, what could the student have bought? List as many combinations as you can find.
- Roberto is saving for a pair of tennis shoes that costs $55. He has $15 now. If he saves $3 a week, for how many weeks will Roberto need to save in order to buy the shoes?

Part III
In partner groups, allow students to answer the following question on chart paper:

Make a list of your favorite TV shows and the duration of each. If you watched all these shows in one week, how much time did you spend watching television?

QUESTIONS FOR FORMATIVE ASSESSMENT

- How would you explain addition and subtraction?
- In what situations should you add? Subtract?

- How can you use addition and subtraction to help solve real world problems?
- What strategies can you use to help you add and subtract accurately?
- How are addition and subtraction alike and different?
- What is a number sentence and how can I use it to solve word problems?

DIFFERENTIATION

Extension
- In basketball, a player can score only three-point baskets and two-point baskets. **If a player scored 37 points, what combinations of baskets could he have made?**
- Draw a bullseye or target. Label each circular area with the following values: 6, 7, 8, 9. Imagine this situation and solve the problem below.

Five darts were thrown at the target and it was hit each time. One number was hit twice and another was hit three times. The total score was 41. Which numbers were hit? What scores other than 41 were possible?

Intervention
- Students may use manipulatives such as counters, and a calculator
- Work with students in a guided group and assist with thoughtful questioning

Name_____Date_____

Let's Think Addition and Subtraction!

*Try to solve each problem in more than one way using pictures, numbers, and words.

Your school cafeteria sells popsicles for twenty five cents, nutty buddies for forty cents, and ice cream cones for thirty cents. If a student spends five dollars in the month of October for these treats, what could the student have bought? List as many combinations as you can find.

Roberto is saving for a pair of tennis shoes that costs $55. He has $15 now. If he saves $3 a week, how many weeks will Roberto need to save in order to buy the shoes?

CONSTRUCTING TASK: THE POWER OF PROPERTIES

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction**.**

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

"Property" is just one of many words in the English language that has more than one meaning. While mathematical meanings may seem obvious to adults, children may not be able to understand "mathematical properties" and "difference" without some explanation and discussion. Also, the word "sum" and its homophone "some" may require clarification. This is particularly true for students who are not yet proficient in the English language.

Most children find it easy to understand the commutative property of addition and the identity property of addition, especially if they have seen them modeled and tried them themselves many times with manipulatives. Some areas where students may have more difficulty are listed below.
- For subtraction there is <u>no</u> commutative property and <u>no</u> associative property.
- The number "zero" should not be referred to as (the letter) "O" since this will cause confusion when working with variables.
- It is important that students first simplify what is inside the parentheses when using the associative property.

Be careful about making an inaccurate statement such as, "You cannot subtract a greater number from a smaller number." It is possible to subtract a greater number from a smaller number; however, the result is a negative number. You want students to have access to correct mathematical information, even though they will not study positive and negative numbers until middle school. Therefore, you might say, "You cannot take away 12 pennies when you only have 8 pennies." Or use a similar example with concrete materials.

ESSENTIAL QUESTIONS

- What are the properties that relate to addition and subtraction?
- How can we verify the results of an addition problem?

- How does knowing the commutative property help us add numbers easily and quickly?
- How does knowing the identity property help us add numbers easily and quickly?
- How is zero different from any other whole number you might add or subtract?
- How does knowing the associative property help us add numbers easily and quickly?
- How do properties work in subtraction problems?

MATERIALS

- Counters (i.e., connecting cubes, cardboard cutouts, beans, or paper clips)
- "The Power of Properties" Student Recording Sheet

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students will use counters to demonstrate various addition properties and explore these properties with subtraction. They will do this by working through the recording sheet.

FORMATIVE ASSESSMENT QUESTIONS

- Explain how you represented the property.
- What do you notice about the sum of an addition problem if you switch the order of the digits?
- What do you notice about the difference of a subtraction problem if you switch the order of the digits?
- How is understanding the commutative property helpful?
- What happens to a number when you add zero to it?
- What happens to a number when you subtract zero from it?
- How is understanding the identity property helpful?
- What do you notice about the sum of three addends if you change the pair of numbers you add first?
- What do you notice about the difference of three numbers if you change the pair of numbers you subtract first?
- How is understanding the associative property helpful?

DIFFERENTIATION

Extension
- Have students create story problems that include use of the properties of addition and subtraction.

- Have students compute addition problems that involve larger numbers of addends and prove in more than one way, using parenthesis, that the sums are the same.
- Have students model the properties with larger numbers.

Intervention
- Have students draw a picture to go along with their number sentences that will also demonstrate what happened. Pay close attention to how students model the problem. Have them explain their thinking.
- Pose a story problem to students and have them use counters or other manipulatives to model the problem.

An example is:

> Rashad gave his two sisters some of his chewing gum. He gave Samantha 2 pieces in the morning and 5 pieces after lunch. In the evening, he gave Samantha 8 more pieces of gum.
> Rashad gave his other sister, Tina, 8 pieces in the morning and 5 pieces after lunch. Tina said he did not give her as much gum as he gave Samantha because he only gave her 2 pieces that evening.
>
> Is Tina correct? Use your mathematical skills to explain whether or not Rashad gave both sisters the same amount of gum.

TEC
HN
OLO GY
CON NEC
TIO N

- arithmetic properties

Name _____ Date _____

The Power of Properties

Use the boxes below to model and correctly identify the properties of addition. For this task, you may use connecting cubes, paper clips or any other small objects your teacher has provided. For each property, decide on the numbers you will use and the correct symbols to use in each number sentence.
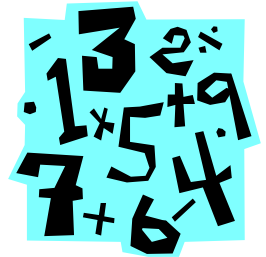
Commutative Property of Addition

1. Choose two different numbers for addends. Write a number sentence to show the sum.

2. Now change the order of the addends and write a new number sentence to show the sum.

3. Draw a picture to illustrate your two number sentences and explain how they are alike and how they are different.

4. Explain the commutative property of addition in your own words.

Identity Property of Addition

1. Write an addition number sentence with zero as one of the addends.

2. Explain the identity property of addition in your own words.

Associative Property of Addition

1. Decide on three different numbers to use as addends. Write two number sentences following the given format. Keep the order of the addends the same in both equations. Remember to add what is in the parenthesis first.

     1. (___ + ___) + ___ = ___

     2. ___ + (___ + ___) = ___

2. Draw a picture to illustrate your two number sentences and explain how they are alike and how they are different.

3. Explain the associative property of addition in your own words.

What about Subtraction?

Use counters to model each property again, this time with subtraction.

Do the properties for addition also work for subtraction? Use words, pictures and numbers to explain what happens for each property.

   1. Commutative Property

   2. Identity Property

   3. Associative Property

PRACTICE TASK: "TAKE DOWN!"
Adapted from North Carolina's Core Essentials Math Program

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

This task begins to develop subtraction using mental math, which is simply an invented strategy that the students do mentally. Not all students will be able to subtract mentally and are still in the concrete stage of development. Do not force students to compute mentally, it may weaken the developing understanding of those who have not invented strategies or are still in the direct modeling stage. (Van De Walle, p. 103-104)

ESSENTIAL QUESTIONS

- What strategies can I use to help me subtract more quickly and accurately?

MATERIALS

- Deck of Cards
- "Take Down" Recording Sheet

GROUPING

Students should work with a partner.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Game Instructions
1. Remove aces and face cards from a regular deck of cards.
2. Shuffle cards.
3. Players will draw one card and subtract from the target number given on their game sheet.
4. Record the answers on the game sheet.

5. The winner is the player who has the <u>lowest</u> score after ten rounds.
6. At the end of the game, students should share their subtraction strategies with one another.

DIFFERENTIATION

Extension
- Teacher may increase the target number.
- Students may play the game with a timer to "beat the clock."

Intervention
- Teacher may reduce the target number.
- Students may play in a non–competitive fashion, where the focus is primarily subtracting to find a difference.

"TAKE DOWN!"
Adapted from North Carolina's Core Essentials Math Program

Game Instructions and Recording Sheet
1. Remove aces and face cards from a regular deck of cards.
2. Shuffle cards.
3. Players will draw one card and subtract from the target number given on their game sheet.
4. Record the answers on the game sheet.
5. The winner is the player who has the <u>lowest</u> score after ten rounds.
6. At the end of the game, students should share their subtraction strategies with one another.

29 GAME	PLAYER #1	PLAYER #2
1		
2		
4		
5		
6		
7		
8		
9		
10		

53 GAME	PLAYER #1	PLAYER #2
1		
2		
4		
5		
6		
7		
8		
9		
10		

CONSTRUCTING TASK: HAPPY TO EAT HEALTHY

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

MCC.3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students will need to be able to use the associative property and other estimating strategies for flexibility with estimating, and using fact families to check their work.

This task reinforces important skills beyond just calculating amounts of money. Students will use reasoning, problem solving, checking, and organizing information to find several different solutions.

ESSENTIAL QUESTIONS

- How can I use addition and subtraction to help me solve real world problems?
- What estimation and mental math strategies can I use to help me solve real world problems?
- How can I verify the results of an addition or subtraction word problem?

MATERIALS

- Healthy Snack Pictures
- Healthy Snack Recording Sheets (3 versions)
- Calculators

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Students use a menu to decide which items to purchase given a specific amount of money to spend. This task requires students to estimate and subtract in order to figure out what to buy as they get closer to the target amount.

Task Directions
1. Begin by asking students what a healthy snack might consist of.
2. Pass out Student Work Sheet, Healthy Snack List, and Grading Rubric.
3. Go over directions with students.
4. Answer any questions.
5. Allow ample work time.
6. Select groups to share their results, explaining the steps they took to reach their answer.

FORMATIVE ASSESSMENT QUESTIONS

- What is your plan for solving this problem?
- Do you think it's best to start out with less expensive or more expensive items? Why?
- Do you think you can spend exactly $4?
- How are you keeping track of the different combinations you are trying out?
- What strategies have you discovered while trying to solve this problem?
- Which of your three solutions would you probably select in real life? Why?

DIFFERENTIATION
Extension
- Have students choose the designated amount they "found" in their pocket to spend on lunch.
- Have students explain how to "best" spend their money in terms of a balanced lunch.
- Give students the price list and task requirements alone and have them create their own graphic organizer to solve the problem.

Intervention
- Make several copies of the Healthy Snack List for the students to cut apart. This may help students better visualize the amounts they are estimating, adding, and subtracting. (Use task version 3 if students will cut and glue their choices on to the recording sheet.)
- Students who struggle with math problem solving will benefit from the teacher modeling an example of how an answer could be derived.
- Consider providing money for some students to check their work after they determine their combinations. Remember that this task reinforces important skills including reasoning, checking, and organizing information to find several different solutions.http://insidemathematics.org/pdfs/third-grade/the-pet-shop/coreideas.pdf

TECHNOLOGY CONNECTION
- http://www.cdli.ca/CITE/math_problems.htm A source for teachers to get ideas for additional word problems for students
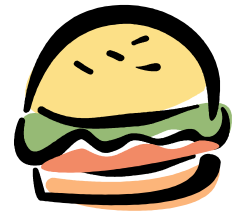
Name _____ Date _____

Happy to Eat Healthy
(Version 1)

You walk up to the snack counter and dig in your pockets for the change you stuffed in them this morning before heading to the arcade. After carefully counting your change, you discover you have exactly $3.55. Is this enough to buy yourself a healthy lunch?

Find at least three different ways to buy a healthy lunch. Choose your food items, estimate the cost, and see what other items you can still afford. Try to spend as much of your money as you can. Don't worry about sales tax for this activity.

MENU

Baked chips 45¢	Milk 86¢
Hot chocolate 67¢	Frozen yogurt bar 39¢
Apple 52¢	Raisins 56¢
Low-fat hot dog 75¢	Veggie burger 99¢
Popcorn 49¢	Orange 62¢

Combination #1	Cost of item	Estimated Cost (running total)	Actual Cost (running total)
1.			
2.			
3.			
4.			
5.			
6.			

Combination #2	Cost of item	Estimated Cost (running total)	Actual Cost (running total)
1.			
2.			
3.			
4.			
5.			
6.			

Combination #3	Cost of item	Estimated Cost (running total)	Actual Cost (running total)
1.			
2.			
3.			
4.			
5.			
6.			

Name _____ Date _____

Happy to Eat Healthy
(Version 2)

Your mother gave you $3 for lunch. Use the Healthy Snack List to create three different combinations of items that you could purchase. Snack items can be used more than once. Use scratch paper or your journal for math thinking. Then, show your results in the tables below.
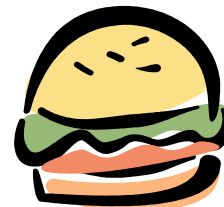
Combination 1

Items	Price
Total	
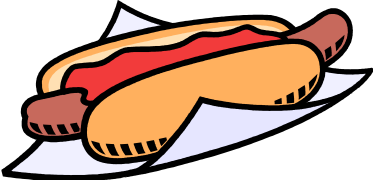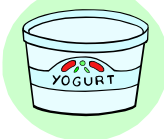
Combination 2

Items	Price
Total	

Combination 3

Items	Price
Total	

Healthy Snack List

Baked Chips 45¢	**Milk 86¢**	**Hot Chocolate 67¢**
Apple 52¢	**Low-fat Hot Dog 75¢**	**Veggie Burger 99¢**
Popcorn 49¢	**Orange 62¢**	**Banana 87¢**
Bottle Water 99¢	**Frozen Yogurt Bar 39¢**	**Raisins 56¢**

Name _____Date _____

Happy to Eat Healthy
(Version 3)
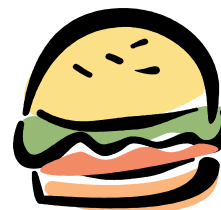
1. Cut out the snack items from the Healthy Snack List.
2. Find a combination of 3 or more items that you can purchase with $4.
3. Glue the snack items you chose to the bottom or back of this page. Snack items can be used more than once.
4. Show all of your work.
5. Show your answer in the table below. Be ready to explain how you arrived at your answer.

Items	Price
Total	

Healthy Snack Shopping Rubric

Elements	Meets Expectations	Progressing Toward Expectations	Does Not Meet Expectations
Completed Lists	Three completed lists	Two completed lists	One completed list
Calculations	All lists are calculated with accuracy	Two lists are calculated with accuracy	One list is calculated with accuracy
Presentation	Communicates clearly and mathematically with numbers, symbols, and words	Communicates somewhat clearly and mathematically with some numbers, symbols, and words	Does not communicate clearly and mathematically with numbers, symbols, and words

CONSTRUCTING TASK: FIELD DAY FUN

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

ESSENTIAL QUESTIONS

- How can I use what I understand about addition and subtraction in word problems?
- What is a number sentence and how can I use it to solve word problems?
- How can I use what I understand about money to solve word problems?

MATERIALS

- Chart paper, overhead projector, or interactive white board for whole group instruction
- "Field Day Fun" Student Task Sheets

GROUPING

Whole/Small Group/Partner Task

BACKGROUND KNOWLEDGE

Using contextual problems that students can identify with is significant in the development in students' operation sense. However, teachers need to think about it as more than just giving word problems. We need to give them opportunities to connect these operations to real world settings. Furthermore, Van De Walle cautions us against the use of key words to problem solve. Research states that key words often suggest operations that are incorrect, many problems do not contain key words, and the key word strategy sends the wrong message about mathematics. Van De Walle states, "A student who has been taught to rely on key words is left with no strategy." (Van De Walle, p. 70)

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

The teacher will begin with a discussion about a Field Day. The students will talk about the math that they might see through guiding questions such as:

- How do you determine the grade level winners?
- How do you determine who wins a race?
- What do you consider when putting together a relay team?
- How does the egg toss use measurement?

This discussion might lead to other sports and how math is incorporated into them as well. Have students provide examples. This conversation will allow students to think about math outside of "math class".

Part II

After the discussion about the use of math on field day, introduce students to the "Field Day Fun" task sheet. Students may complete this task with a partner/small group/or individually. Students should use words, pictures, and numbers to justify their results and thinking. When they have completed all four field day mathematical situations, have students create one of their own field day stories. It may be helpful for students to base their stories on the classroom discussion in Part I. Students may exchange stories and solve.

FORMATIVE ASSESSMENT QUESTIONS

- How did you determine the amount of students who were not in the 3rd grade? Could you have done it another way?
- How did you know that #3 and # 4 still need to run in the relay?
- How did you determine the amount of meters that the relay team still needed to run? Could you have solved it a different way?
- How did you know the amount of money that you needed to borrow from your friend? Can you draw a picture explaining your thinking?

DIFFERENTIATION

Extension
- Students could use their knowledge of other sports to create additional math stories.

Intervention
- Allow students to use number lines or other tools to help them to conceptualize and act out the field day situations.

TECHNOLOGY CONNECTION

http://www.cdli.ca/CITE/math_problems.htm provides teachers with resources for a variety of word problems.

Name _____ Date _____

Field Day Fun

1. 678 students are participating in field day.   There are 98 third graders. How many of them are not third graders?

Show how you know your answer is correct.

2. Each person in the relay race is going to run 200 meters. If there are 4 runners on a team and the third grade team has already run 300 meters, how many meters do they have left to run? Are they on runner #1, #2, #3, or # 4?

Show how you know your answer is correct.

3. Molly wants to buy some cotton candy from the concession stand. She has 27¢, but the cotton candy costs 95¢. How much money does she need to borrow from her friend?

Show how you know your answer is correct.

_____ ¢

4. Time for the award ceremony! There are 476 students there. How many students are they waiting for?

Show how you know your answer is correct.

_____ students

CONSTRUCTING TASK: I HAVE A STORY, YOU HAVE A STORY

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students should be familiar with the concept of solving word problems in math and with seeing symbols for unknowns, such as squares or triangles.

Some students will have difficulty with ____ + 8 = 85 simply because they are so accustomed to seeing a number first. Students need to understand that they may subtract the given number from 85 or count up from 8 to 85 using an empty number line to find the value of the missing number. We also want students to recognize that ___ + 8 yields the same sum as 8 + ___ due to the commutative property of addition.

Students need experiences with many different addition problem types. See the examples in the table on page 4 of this unit. Provide students with opportunities to solve a variety of problems presented in varying contexts. Then allow students to write similar stories providing experiences in both creating and solving many types of problems.

ESSENTIAL QUESTIONS

- How can I use what I understand about addition and subtraction in word problems?
- What is a number sentence and how can I use it to solve word problems?

MATERIALS

- White board, overhead projector, or interactive white board for whole group instruction
- "I Have a Story, You Have a Story" recording sheets for small group or cooperative learning groups

GROUPING

Whole/Small Group/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

When students make up their own number stories, teachers gain insight into the students' understanding of the problem solving process. Simplify or extend these situations to help students grasp how to solve addition problems with the use of subtraction.

Before students solve the problems in partners or small groups, model the process of solving and writing a similar story problem with the whole class (or rotating with small groups). Use a missing addend problem similar to those on the student sheet.

Task Description

Students will solve two story problems and write two similar story problems.
Here is my story:

- The video game store is stocking up on the hottest new game. They already had 127 on the shelf. They just received a new shipment today and now they have 384 copies of the game. How many copies of the game came in today's shipment?

- Now write a similar story about having quarters in your pocket and later finding a hole in your pocket.
  How much money fell through the hole in your pocket? How do you know?

- Here is another story:
  > I have 137 marbles in a jar. My brother was playing football in the house and knocked the jar off of the table. I was only able to find 119 marbles. How many are still missing?

  $$\square + 119 = 137$$
  What number goes in the box? How do you know?

- Write a story for this number sentence:
  $$56 + \square = 190.$$
  What number goes in the box? How do you know?

FORMATIVE ASSESSMENT QUESTIONS

- How much money was there at the beginning?
- What do you know? What do you need to find out? How can you find it out?
- What is a number sentence and what must it include?

- What information will you give in your story? What information needs to be found?
- What strategies did you use to solve the problem?
- How do you know your answer is correct?

DIFFERENTIATION

Extension
- For the first problem on the student sheet, have students determine the value of the money that fell through the pocket. Also, the stories students create can be extended in a similar manner.
- Have students create their own subtraction stories where the minuend is unknown. (In the subtraction problem $5 - 3 = 2$, 5 is the minuend, 3 is the subtrahend, and 2 is the difference.)

Intervention
- Provide a story frame to assist students in organizing and writing a number story.
- Some students may have difficulty with ____ $+ 8 = 85$ simply because they are accustomed to seeing a number first, rather than an unknown quantity. They may need additional experiences with this format to understand that subtracting an addend from the sum will give the remaining addend. Students also should understand that ___ $+ 8$ yields the same sum as $8 +$ ___ due to the commutative property of addition.

TECHNOLOGY CONNECTION

- http://www.cdli.ca/CITE/math_problems.htm Provides teachers with resources for a variety of word problems at different levels

Name _____Date _____

I Have a Story, You Have a Story

1. Here is my story: The video game store is stocking up on the hottest new game. They already have 127 on the shelf, but they are selling quickly. They just received a new shipment today and now they have 384 copies of the game. How many copies of the game came in today's shipment?	2. Now write a similar story about having a large shipment come into a store.

3. Here is another story:
I have 137 marbles in a jar. My brother was playing football in the house and knocked the jar off of the table. I was only able to find 119 marbles. How many are still missing?

What number goes in the box? How do you know?

$$\square + 119 = 137$$

4. Write a story for this number sentence:

$$56 + \square = 190$$

What number goes in the box? How do you know?

SCAFFOLDING TASKS: "WATCH HOW NUMBERS GROW!"

Adapted from North Carolina's Core Essentials Mathematics Program

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9×80, 5×60) using strategies based on place value and properties of operations.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning**.**

BACKGROUND KNOWLEDGE

Students and teachers must understand this unit's inclusion of multiplying numbers by multiples of 10 is based more on place value than the algorithm of multiplication. This standard expects that students go beyond tricks that hinder understanding such as "just adding zeros" and explain and reason about their products. Students should also understand that products can be calculated using other strategies than the algorithm.

ESSENTIAL QUESTIONS

- How is place value related to multiples of ten?
- What happens to a number when it is multiplied by ten?
- How can I model multiplication by ten?

MATERIALS

- Math Journals (or paper)
- Manipulatives/cut outs (to help students create models for their problems)
- "Watching How Numbers Grow" task sheet

GROUPING

Students may be grouped individually, in pairs, or in small groups at the teacher's discretion.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
The teacher will begin by asking students to respond to the following questions in their math journals:

- Why is ten such an important number in our number system?
- Make a list of things that come in tens in the world around you. Why are these grouped in tens? Tell what happens to the amount of these objects when there is more than one group of ten.

Part II
After responding in their math journals, the students will complete the "Watching How Numbers Grow" task sheet.

- If you made a line with $4 worth of dimes, how long would your line be? What if you made your line with pennies? How would your two lines be different?
  All of the keys except the **1**, the **0**, and the **+**, on your calculator are broken. How can you reach the following numbers by pressing the fewest number of keys? Check your work using a real calculator.
    - 60
    - 20
    - 90
    - 80
- If you start with a dime and get double the number of dimes each day for two weeks, how much money would you have on the fourteenth day? If this pattern continues, on what day would you receive $1000?
- Ryan has 35 dimes in his pocket. Half an hour later, Ryan arrived at the store and realized that he had a hole in his pocket. If three dimes dropped through his pocket every five minutes, how much money did Ryan have left?

FORMATIVE ASSESSMENT QUESTIONS

- What did you notice about the patterns in the numbers?
- What happens when quantities grow by multiples of ten?
- How does this relate to addition/multiplication?

DIFERENTIATION
Extension

- Think of items that come in groups of ten. Draw several groups of your items. Determine your total number of items. Describe your representation with pictures, numbers, and words. Explain your groups to a friend!

Intervention

- Students may use manipulatives such as counters, and a calculator
- Work with students in a guided group and assist with thoughtful questioning

Name_____Date_____

Watch How Numbers Grow

If you made a line with $4 worth of dimes, how long would your line be? What if you made your line with pennies? How would your two lines be different?

All of the keys except the 1, the 0, and the +, on your calculator are broken. How can you reach the following numbers by pressing the fewest number of keys? Check your work using a real calculator.
- o 60
- o 20
- o 90
- o 80

If you start with a dime and get double the number of dimes each day for two weeks, how much money would you have on the fourteenth day? If this pattern continues, on what day would you receive $1000?

Ryan has 35 dimes in his pocket. Half an hour later, Ryan arrived at the store and realized that he had a hole in his pocket. If three dimes dropped through his pocket every five minutes, how much money did Ryan have left?

CONSTRUCTING TASK: "MULTIPLES OF TEN"
A*dapted from ETA Cuisenaire*

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE
(adapted from North Carolina's DPI resources)

This task allows students to work in multiplication by having them apply their understanding of place value. In this task, students will go beyond tricks that hinder understanding such as "just adding zeros" and explain and reason about their products. For example, for the problem 50 x 4, students should think of this as 4 groups of 5 tens or 20 tens.

ESSENTIAL QUESTIONS

- What happens to a number when it is multiplied by ten?
- How can I model multiplication by ten?
- How is place value related to multiples of ten?

MATERIALS

- Base Ten Blocks
- Multiples of Ten Slips one set 10-100, and one set over 100 (teacher created- these are cards/slips with decade numbers on them)
- Paper bag or container (to hold multiples of ten slips)
- Large Index Cards (10) each with a decade 10-90 on it (teacher created)
- Blank index cards.

GROUPING

Students should work with a partner, or small group.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Students will build snap cube structures using multiples of 10 and order the structures according to the number of cubes from which they were built. In this learning task, students should have the opportunity to:
- Count out large and small quantities of objects
- Work with multiples of 10
- Develop number sense about the relative magnitude of a number
- Work with conservation of number

Part I
To begin, present 10 large cards displaying the decade numbers (10, 20, 30, 40, etc.) Place the 50 in the middle of a chalkboard tray, or in the middle of the floor if you are in a circle on the rug. Hand a large card to a student and ask where it belongs on the chalkboard tray. Have them explain their reasoning. Repeat this process again. When the students have decided where to place the second card and have explained their reasoning, ask them to decide which numbers are missing and where they might go. Allow students to complete the number line. Discuss how many tens are in each number as they are placed on the number line, and the magnitude of each number.

Part II

Each pair of students will:
- Draw a Multiple of Ten slip from a bag. It should be a decade number 10-90
- Provide students with Base Ten blocks. Ask them to make an array that will match their number. Ideally, one of the students will realize that they can use the 10 rods to make the arrays instead of the unit cubes.
- Have students create a T-Chart that looks similar to the one below. Students should record the number drawn and write an addition sentence to match their array. (Students have not been formally introduced to multiplication yet)

Number Chosen	Addition Sentence
40	10+10+10+10
30	10+10+10
50	10+10+10+10+10

- Students may pull several numbers to have a good comparison of their arrays.
- Once students have had many opportunities to draw from the bag and create arrays, bring them back to the carpet for a discussion.

- o How did you form your arrays?
- o Which blocks did you use?
- o Look at your number sentences. What do you notice about them?
- o How are the number chosen and the number sentence related?
- At this point you may introduce the multiplication symbol, and ask students if they know how to write a multiplication number sentence that means the same as the addition number sentence. Some students may know. If not, you should model this for them.

Part III

Once students complete their arrays, and have recognized the relationship between multiplying and addition, lead a discussion about the arrays using the following:
- Knowing what you know about tens, can you make an array for the number 120? Explain your thinking.
- Have each group choose one additional number from Multiples of Ten (numbers over 100).
- They will add on to the previous T-Chart with the new number. Encourage them to make an addition sentence, then a multiplication sentence.
- Discuss the patterns that they notice.

FORMATIVE ASSESSMENT QUESTIONS:

- How are you forming your arrays?
- How can you write a number sentence to match your array?
- What do you notice about the number pulled and your addition sentence?
- What happens to a number when it is multiplied by ten?
- How can we model multiples of ten with objects and numbers?

DIFFERENTIATION

Extension
- Students should investigate multiplying numbers larger than 200 by building arrays using a variety of manipulatives (tiles, connecting cubes, base ten materials, and graph paper are some suggestions).

Intervention
- Students needing intervention should continue to build arrays, but with teacher support in a small group setting. These students should begin with decade numbers that match multiplication fact strategies that the student is comfortably using. For example, a student may know the x2 facts because he/she relates them to doubles facts for addition. The teacher structures problems for this student around x20, gradually allowing the student to make sense of the relationship between what he/she already knows (x2) and the new strategy (x20).

PERFORMANCE TASK: "HOW MANY TENS?"
(Adapted from Sarah Marshall, Henry County Schools, and NZ Maths)

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

This task is designed to develop the concept of what happens to a number when multiplied by a multiple of ten. To help build context, the teacher may read *100 Hungry Ants* by J. Pinzces. Students need to know that 10 tens make 100 and 10 hundreds make one thousand.

ESSENTIAL QUESTIONS

- What happens to a number when it is multiplied by ten?
- How can I model multiplication by ten?
- What strategies can I use to multiply single digit numbers by multiples of ten?

MATERIALS

- Money Manipulatives
- "How many 10s" recording sheet

GROUPING

Students should work in groups of 3 to 4 members.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

Read the book, *100 Hungry Ants* by J. Pinzces to your students. During strategic points throughout the book, stop to discuss how the number 100 can be built or created from different groups of ten. (This is a perfect "anchor chart" opportunity!) Facilitate a classroom discussion about tens and hundreds to assess prior knowledge, and use this as a platform for a brief mini-lesson (if needed). Have the students work with their small groups to investigate, model (very important), and figure out the following problems:

1. What are all of the possible ways the ants could have lined up (by multiples of 10) to reach the picnic?
2. What would have been the QUICKEST way for the ants to march to the picnic so they could have gotten there before all of the food was gone?

Part II
Read the scenario to the students.

> *Problem: The Bank of Mathematics has run out of $100 bills. Alison wants to withdraw $300 in $10 dollar bills. How many $10 dollar bills does she get? Can you figure out how many $10 bills she will need with different amounts such as $600 or $900?*

Students will record answers in the "How Many Tens" table.

Repeat the same concept using the scenario below and $10 and $1 bills.

> *Problem: The Bank of Mathematics has run out of $100 bills. Alison wants to withdraw $256 in $10 and $1 bills. How many of each bill will she receive?*

Students will record answers in "How Many Tens" table.

FORMATIVE ASSESSMENT QUESTIONS

- How did you determine how many tens to give?
- What if you didn't have any tens, what could you use?
- How does Multiplication help you determine the amount of tens needed to withdraw?

DIFFERENTIATION

Extension
- Students can determine the number of ones, then tens, then hundreds it would take to reach various student-suggested amounts. Organize the information into a student-created table, look for patterns, and explain what you see.

Intervention
- Students can complete this activity with smaller amounts of money.
- Students can complete only the first part of the recording sheet.
- Students can complete the second part of the recording sheet with amounts rounded to the nearest hundred.
- If needed, students can complete this task with teacher guidance.

Recording Sheet: How Many Tens?

Problem#1: The Bank of Mathematics has run out of $100 bills. Alison wants to withdraw $300 in $10 dollar bills. How many $10 dollar bills does she get? Can you figure out how many $10 bills she will need with different amounts such as $600 or $900?

How Many Tens?

Withdraw	How many $10.00 bills?
$300.00	
$600.00	
$900.00	
$700.00	
$500.00	
$200.00	
$800.00	

Question for reflection:
 How did you determine the amount of $10.00 bills needed?

_____

_____

Problem#2: The Bank of Mathematics has run out of $100 bills. Alison wants to withdraw $256 in $10 bills. How many of each bill will she receive?

How Many Tens and Ones?

Withdraw	$10.00	$1.00
$256.00		
$352.00		
$468.00		
$853.00		
$523.00		
$631.00		
$750.00		

Question for reflection:
How did you determine the amount of $1.00 and $10.00 bills needed?

_____

_____

Extension Problem:

Tickets to a concert cost $100 each. How many tickets could you buy if you have $3215?

SCAFFOLDING TASKS: "THE INFORMATION STATION!"
Adapted from North Carolina's Core Essentials Mathematics Program

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets*.*
MCC.3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units – whole numbers, halves, or quarters.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning**.**

BACKGROUND

Data and graphing are not isolated concepts. They can and should be integrated with the majority of mathematics.

ESSENTIAL QUESTIONS

- How can data displayed in tables and graphs be used to inform?
- How can graphs be used to compare related data?
- How can data displays be used to describe observations?
- When is it appropriate to use a line plot graph?

MATERIALS

- MATH Journals (or paper)
- Lima Beans
- Magazines and Newspapers

GROUPING
Students may be grouped individually, in pairs, or in small groups, at the teacher's discretion.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
The teacher will begin by asking students to complete the following investigation using their math journals:

Survey your classmates, measure, and record the length of their shoes.

The teacher will call the students back together. Collectively, the class will create a table to display the data. This would be an excellent opportunity for the class to discover that many students have the same length of their shoe, and since this data is quantitative, it would make the perfect line plot graph. The group will work together to turn this data into a line plot graph.

Part II
In small groups students will complete the following investigation:

How many lima beans can you pick up in one handful? What about two other classmates?

Students will collect their data in their individual math journals. After the experiment, students will collectively organize their data into a group table on chart paper. They will use their data to create a bar graph.

Part III (may take a few days)

The teacher and students will visit the school parking lot each day for a few days.
- Students should collect information regarding the types or colors of vehicles seen each day in math journals. (This would be a valuable opportunity for the teacher to take his or her own math journal to the parking lot and model using a "think aloud.")
- After a few days, the class will organize the data into a table.
- As a class, the students and teacher will create a pictograph with a scale of 2.
- In small groups, the students will create different pictographs with different scales.
- At the completion of this activity, students will compare their graphs and ask/answer questions about the graphs.

QUESTIONS FOR FORMATIVE ASSESSMENT

- When should you use a line plot to display your data?
- What questions can you answer using your data?
- Was one type of graph easier to create than the other? Why?

- What types of one and two step story problems can you create using your data?
- How can graphs describe observations?

DIFERENTIATION

Extension
- Try this!
  - Using the weather data in your local newspaper, compare the high and low temperatures in your town/city to the city of your choice. Collect these data for two weeks. Make two line plots to compare the temperatures. What statements can you make about these data?
- Have students create bar graphs and pictographs using alternate scales.
- Challenge students to develop a survey question to collect data in which a line plot would be appropriate. Have them to create line plots of their own.

Intervention
- Try This!
  - Cut out examples of graphs from magazines or newspapers.
    - What information is being shown?
    - How would you classify these data displays?
    - Can you determine where the data came from?
- Students may use manipulatives such as counters, and a calculator
- Work with students in a guided group and assist with thoughtful questioning

PERFORMANCE TASK: IT'S A DATA PARTY!

STANDARDS FOR MATHEMATICAL CONTENT:

MCC.3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.

MCC.3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units – whole numbers, halves, or quarters.

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

MCC.3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

MCC.3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Examples of the survey data are shown below.

Drink	Number
Sprite	6
Coke	3
Fruit Punch	8
Orange Drink	4
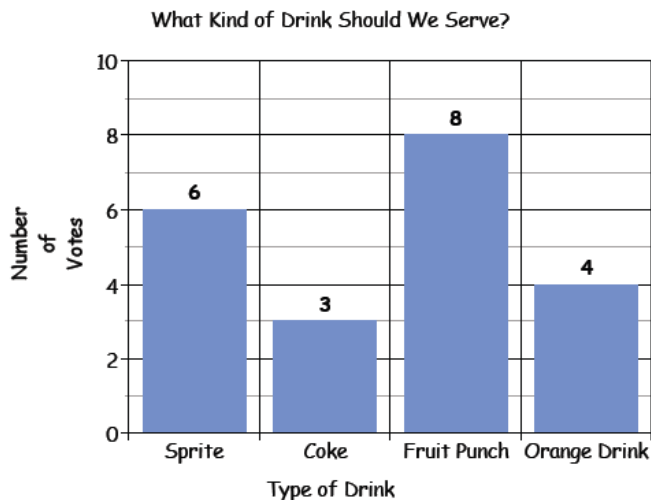
What Kind of Drink Should We Serve?

Dessert	Number
Brownies	5
Cupcakes	2
Strawberries & Grapes	7
Chocolate Chip Cookies	7

Each ⭐ indicates one vote

Snack	Number
Chips	10
Nuts	1
Popcorn	7
Pretzels	3
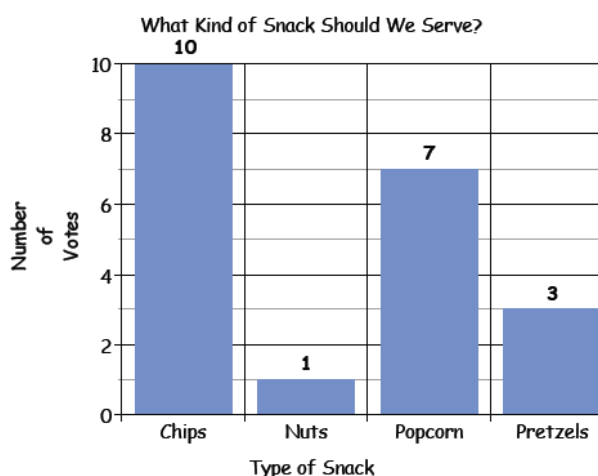
*Note: Line plot graphs would not be appropriate for this type of data, because it is categorical.

ESSENTIAL QUESTIONS

- How can data be used to make decisions?
- How can data displays be used to describe events?
- How can I analyze data and use what I've learned to answer mathematical questions about it?

MATERIALS

- Paper, markers, crayons, rulers, and other supplies needed to collect data and create graphs
- Yellow hexagon pattern block, about 3
- Straw, one for each student
- Stopwatch (2-4) or classroom clock with a second hand
- Chart paper on which to record student data, one for each party challenge (at least 3)

<u>**GROUPING**</u>

Individual/Small Group Task

<u>**TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION**</u>

Students survey the class to determine what could be served during a class party. They then **create** data displays and write a letter to the teacher describing what should be served at the party and how the data supports the menu items.

Student directions:
It's up to the students in your class to figure out what the menu will be. You will need to survey the class to find out what kind of refreshments to serve. Don't forget to find out about drinks, snacks, and dessert.
You'll also need to write a letter to the teacher with the menu and how you decided what to serve. Be sure to use tables and graphs to support your decisions.

Complete the following steps to determine what should be served at the party.
- *Survey the class to find out what should be served. Create your own method for recording your data.*
- *Organize your data in tables and create graphs. Use at least one bar graph and one pictograph to display your data.*

Using this information, write the letter to your teacher, including the tables and graphs to support the recommendations you make.

Create a line plot, bar graph, and pictograph to display the data collected for each challenge.
Create a bar graph for the Challenge #1: "Name Mixer": Record the number of letters in classmates' names and create a graph from their data.
Create a line plot graph for Challenge #2: How far can you blow a Pattern Block?
Create a pictograph for Challenge #3: "School Supply Scavenger Hunt": Record and graph the number of scissors, pencils, pens, markers, and bottles of glue they can find in the classroom. The graph should have a scale of 2 or 5.

Choose one to summarize in a paragraph. Describe what the data tells you about the challenge. Be sure to include how you know.

Analyze and ask questions about your data
> *Use your data and graphs to create questions that can be asked about your findings. At least one of the questions should be multistep. Then, exchange your questions with another group member and answer them. Ask at least one question about each of the following:*
> ☐ *Joining and Combining (Addition)*
> ☐ *Separating and Comparing (Subtraction)*
> ☐ *Multiplying by Ten*

☐ *Rounding to the Nearest Ten and Hundred*

While students will need to work in small groups of 3-4 students, each student is expected to create the required recording sheets, graphs, and write a letter to the teacher.

Part I – Collect and display survey data
Begin this task by engaging the students in a brainstorming session of ideas for what to serve at the data party. Develop choices for three categories, drinks, snacks, and desserts. Narrow the lists down to 4 choices for each category. Students can then create a survey table on which to record the data collected regarding what to serve.

If there is a tie (with what to serve at the party) ask students to survey the class regarding what they "like" instead of choosing a "favorite." Record the data collected in a Venn diagram to choose the item more students like. (See the example in the "Background Knowledge" section.)

Part II – Collect and display "challenges" data
Students will collect, record, and display data during the party (but maybe before the food is served) by participating in several "challenges."
   Challenge #1: "Name Mixer": Students will record the number of letters in classmates' names and create a graph from their data.
   Challenge #2: How far can you blow a Pattern Block using a straw?
   Challenge #3: "School Supply Scavenger Hunt": Students will record and graph the number of scissors, pencils, pens, markers, and bottles of glue they can find in the classroom. The graph should have a scale of 2 or 5.

For challenge #1, students should work individually, or with a partner. Students will begin by going around and surveying their classmates. They will use their data to create a bar graph.

For challenge #2, secure a tape measure to a long table with the zero end of the tape measure at the edge of the table. Have students place the pattern block at the edge of the table and blow the pattern block, using a straw. As a class, students can choose how many practice tries they can have or if they would like to use the longest distance out of three tries.

Class lists or data tables can be created and posted next to the stations for each challenge on which students can record their challenge data. There can be two or three stations for the same challenge, allowing all students to be participating at the same time. Once all students have completed all three challenges, the data can be summarized on one class list or data table that is large enough for all students to see. Students can use this class data to create three different types of graphs, one graph for each challenge. Students should write a summary of the data for one of the line plot graphs, telling classmates what the data tells them about the challenges and justifying their conclusions.

*Note: "How far can you blow a pattern block?" was adapted from the Investigations in Number, Data, and Space third grade curriculum unit, *From Paces to Feet: Measuring and Data*, by Karen Economopoulos, Jan Mokros, and Susan Jo Russell, 2004, Glenview, IL: Pearson Education, Inc.

Part III – Analyze and ask questions about your data
Students will use their data and graphs to create questions that can be asked about their findings. At least one of the questions should be multistep. They will then exchange their questions with another group member and answer them. Questions should cover the following concepts:
- Joining and Combining (Addition)
- Separating and Comparing (Subtraction)
- Multiplying by Ten
- Rounding to the Nearest Ten and Hundred

QUESTIONS FOR FORMATIVE ASSESSMENT

- What are the ways you can appropriately display categorical data? (i.e. data in categories such as the choices for foods and drink to serve at the party)
- What is an appropriate way to display numerical data?
- Did you include all necessary information in your graph? (i.e. title, labels, scale increments)
- What does the data tell you about your classmates' favorites? Your classmates' ability to jump or blow a pattern block? How do you know?
- According to the data, what should be served at the data party? How do you know?
- What comparisons can you make using your data using numbers?
- What is the difference between the actual choices for the party and the estimates?
- On your shopping trip to get the party supplies, would you think that is best to get the actual amounts or the estimates? Why?

DIFFERENTIATION

Extension
- Instead of creating a line plot graph for the challenges, ask students to create two line plot graphs for each challenge, one for the boys' data, and one for the girls' data. Then ask students to summarize and compare the boys' and girls' data for one of the challenges.
- http://illuminations.nctm.org/LessonDetail.aspx?ID=L243 Replace one of the challenges with this task.

Intervention
- Some students may require scaffolding for creating graphs. See the links below for some possible ways to scaffold the creation of graphs.

TECHNOLOGY CONNECTION

- Graphs can be created using templates such as the pictograph template below:
  http://www.beaconlearningcenter.com/documents/2351_5255.pdf
- Pictographs can be created using excel following the directions below:
  http://faculty.kutztown.edu/schaeffe/Excel/Vallone/Vallone_Excel.pdf
- Pictographs can be created using a website such as:
  http://gwydir.demon.co.uk/jo/numbers/pictogram/pictogram.htm
- Bar graphs can be created using a website such as:
  - http://nces.ed.gov/nceskids/createagraph/ or
  - http://illuminations.nctm.org/ActivityDetail.aspx?ID=63

CONSTRUCTING TASK: WHAT'S YOUR FAVORITE?

STANDARDS FOR MATHEMATICAL CONTENT:

MCC.3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

MCC.3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

MCC.3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students were introduced to Venn diagrams in first grade; however, they focused on two-circle diagrams. This task requires students to create a Venn diagram with three circles. It is important for students to have some experiences with Venn diagrams with three circles before working on this task.

ESSENTIAL QUESTIONS

- How can surveys be used to collect data?
- How can surveys be used to answer a question?
- How can graphs be used to display data gathered from a survey?
- How can I analyze data and use what I've learned to answer mathematical questions about it?

MATERIALS

- "What's Your Favorite?, Directions" student sheet
- Paper, markers, crayons, rulers, and other supplies needed to create graphs
- *The Great Graph Contest* by Loreen Leedy or similar book
- "What's Your Favorite? Data Collection – Favorites" student recording sheet (optional)
- "What's Your Favorite? Data Collection – Preferences" student recording sheet (optional)

GROUPING

Partner/Small Group Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Students survey their classmates to collect data and then display the data using pictographs and Venn diagrams.

This task could be introduced by reading *The Great Graph Contest* by Loreen Leedy or a similar book that uses Venn diagrams and pictographs. (Note: Circle graphs are used in *The Great Graph Contest*, but they are not formally introduced in third grade.) To begin this task, ask the students in the class to brainstorm ideas for categories of student favorites. Some possible ideas are: pet, shoe, color, movie type, animal, dessert, school subject, or sport.

Students should record respondents' names when collecting data for favorites in order to ensure every student in the class is asked the survey question. Alternatively, a student's name can be checked off when they answer the survey question.

As a part of the summarizing for this task, each pair (or selected pairs) of students can share the results of their research, presenting their graphs, and explaining the conclusions they drew from the data.

Students will follow the directions below from the "What's Your Favorite?" directions student sheet. This is your chance to get to know your classmates better! You will work with a partner to research favorites of your classmates and then display the results in pictographs.

Pictograph

☐ Choose from the list your class brainstormed, a topic on which you would like to survey your classmates.
☐ Write a question for your survey. (Example: What is your favorite pet, bird, cat, or dog?)
☐ Create a data collection sheet for **favorites** of your classmates.

☐ Ask each student in your class the survey question and record their responses. Students can only have one favorite.
☐ Organize the data in a table.
☐ Display the data in a pictograph.
☐ Write a paragraph to share conclusions you can draw about your classmates' favorites. Justify each conclusion with evidence from your pictograph.

Data Analysis
Use your data and graphs to create questions that can be asked about your findings. At least one of the questions should be multistep. Then, exchange your questions with another group member and answer them. Ask at least one question about each of the following:
☐ Joining and Combining (Addition)
☐ Separating and Comparing (Subtraction)
☐ Multiplying by Ten
☐ Rounding to the Nearest Ten and Hundred

FORMATIVE ASSESSMENT QUESTIONS

- How many students chose _____ as their favorite? How is that displayed in your graph?
- How did you choose the number of students represented by each symbol on your pictograph?
- What does the pictograph tell you about your classmates' favorites?
- How would your data look if it were a bar graph?
- What comparisons can you make using your data using numbers?
- What is the difference between the actual favorites and estimates?

DIFFERENTIATION

Extension
- Create a book of Class Favorites. Share it on Family Math Night, during parent conferences, etc.
- Create another pictograph. Make your symbol represent a different number than the one you originally chose. Discuss how your pictograph changed.
- Use your data to create a line plot graph.
- Use your data to create a bar graph.

Intervention
- Some students may require some support in a small group setting to be successful with this task. For example, provide some guidance in narrowing a topic, choosing a graphic representation, and/or scaffolding for creating graphs.
- Allow students to create their graphs using web-based programs. See the links below.
  - http://www.beaconlearningcenter.com/documents/2351_5255.pdf Template that can be printed and used to create a pictograph

- http://gwydir.demon.co.uk/jo/numbers/pictogram/pictogram.htm Web-based program that allows students to create pictographs
- http://faculty.kutztown.edu/schaeffe/Excel/Vallone/Vallone_Excel.pdf Directions to create a pictograph using excel

TECHNOLOGY CONNECTION

- If students are having difficulty thinking of a question, these websites have many ideas:
  - http://www.canteach.ca/elementary/numbers13.html
  - http://www.uen.org/lessonplan/upload/10867-2-14587-graphing_ideas.pdf
- http://www.shodor.org/interactivate/activities/BarGraphSorter/ Create bar graphs based on random sets of shapes.

Name _____ Date _____

What's Your Favorite?
Directions

This is your chance to get to know your classmates better! You will work with a partner to research favorites of your classmates and then display the results in a pictograph.

Pictograph

1. Choose from the list your class brainstormed, a topic on which you would like to survey your classmates.
2. Write a question for your survey. (Example: What is your favorite pet, bird, cat, or dog?)
3. Create a data collection sheet for **favorites** of your classmates.
4. Ask each student in your class the survey question and record their responses. Students can only have one favorite.
5. Organize the data in a table.
6. Display the data in a pictograph.
7. Write a paragraph to share conclusions you can draw about your classmates' favorites. Justify each conclusion with evidence from your pictograph.

Venn Diagram

☐ Choose from the list your class brainstormed, a topic on which you would like to survey your classmates.
☐ Write a question for your survey. (Example: What types of pets do you like: bird, cat, and/or dog?)
☐ Create a data collection sheet for **preferences** of your classmates.
☐ Ask each student in your class the survey question and record their responses. Students can like more than one of the choices.
☐ Display the data in a Venn diagram.
☐ Write a paragraph to share conclusions you can draw about your classmates' preferences. Justify each conclusion with evidence from your Venn diagram.

Name_____ Date _____

What's Your Favorite?
Data Collection – Favorites
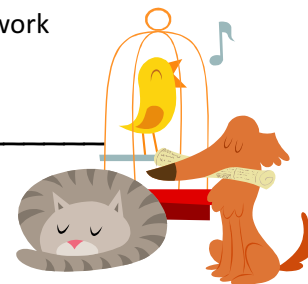
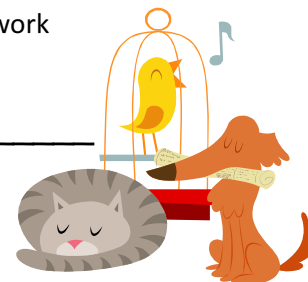What is your favorite _____?

What is your favorite _____? (Choose One)	Student Names
1.	
2.	
3.	

Name _____ Date _____

What's Your Favorite?
Data Collection - Preferences

Do you like _____, _____, and/or_____?

Do you like _____, _____, and /or _____? (May choose more than one.)	Student Names
1.	
2.	
3.	

UNIT ONE CULMINATING TASK

PERFORMANCE TASK: What's the Story Here?

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

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

MCC.3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Thorough and in-depth experiences with the concepts contained in this unit, such as addition and subtraction, place value, rounding, multiples of ten, and arithmetic properties is necessary prior to asking students to complete this assessment independently.

ESSENTIAL QUESTIONS

- How can I show what I know about addition, subtraction, problem solving, and estimation?
- What happens to a number when it is multiplied by ten?

MATERIALS

- Large paper (11"x 17") – one sheet per student
- Scissors
- Markers, crayons, or colored pencils

GROUPING

Independent Performance Assessment

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

While this task is intended to serve as a summative assessment, it also may be used for teaching and learning. If used as an assessment, it is important that all elements of the task be addressed throughout the unit so that students understand what is expected of them. Also, if using a rubric, students should be given a copy of the rubric as part of the teacher introduction of the assessment, so that they are aware of the expected rigor and quality for their work. A sample rubric is provided below.

Students make a book following given guidelines that demonstrate many of the concepts learned in this unit.

Encourage students to write all of their word problems based on one topic or theme. For example, students could choose to write all problems about soccer or a favorite hobby.
Below are the student directions for this task.
Your task is to make a book to demonstrate what you have learned in this unit.
While there are many ways to make a simple 8-page book, the directions for one foldable are at the following link: http://www.shininghours.com/creating/one_sheet_8_pages!.htm
Your book will need 8 pages. Use the following directions to complete your book.
- ☐ Page 1 – title, author, publishing date
- ☐ Page 2 – addition story showing the commutative, associative, and identity properties
- ☐ Page 3 –addition story (multi step) using three or four digit numbers
- ☐ Page 4 – addition story showing rounding to the nearest ten
- ☐ Page 5 – subtraction story (multistep) showing take-away using three or four digit numbers
- ☐ Page 6 – subtraction story showing comparison
- ☐ Page 7 – subtraction story showing rounding to the nearest hundred
- ☐ Page 8 – a multiplication story that shows what happens when a number is multiplied by multiples of ten

Make sure each page contains the following:
- Use at least one two-digit and one three-digit number in each story
- Model each story with an illustration or drawing using base ten blocks,
- Put the correct solution on the back of each page or in a separate answer key
- Show how you checked your work by using the inverse operation.

Make sure your book is clearly written, that your math stories are correctly spelled, capitalized, and punctuated, and that you follow the steps above when making your book. Put page numbers on the bottom right hand corner of your book pages and if desired, decorate the title page.

FORMATIVE ASSESSMENT QUESTIONS

- What is your plan for completing this assessment?
- Do you have a draft of your project?
- How will you prove that your answers are correct?

DIFFERENTIATION

Extension
- Rather than having a separate page for each of the properties, ask students to identify the use of each property within other pages of the book. In this way, students can create their own problem and solution for the three open pages.

Intervention
- Provide story frames or other supportive structures to allow students to be successful in completing each page of their book.
- Break the task into related, manageable chunks, eliminating unnecessary steps or combining steps (for example, estimation could replace one of the addition or subtraction pages).

TECHNOLOGY

An alternative to creating a book would be to use PowerPoint, Prezi, or a similar program, and have some (or all) students make slides, video, etc. instead of a book. Photographs of the students and their work can be inserted into Powerpoint or Prezi for a presentation for parents for the current year or to show benchmark work to students next year.

Name _____ Date _____

WHAT'S THE STORY HERE?

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