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TE 801
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Math Unit

Math Unit: Using Numbers and Organizing Data

Stage 1: Desired Results

A. MCF Mathematics Standards/ Benchmarks and Mathematics Grade Level Content Expectations addressed

Mathematics Content Standard:

Students collect and explore data, organize data into a useful form, and develop skill in representing and reading data displayed in different formats. (Collection, Organization and Presentation of Data)

Benchmark:

III. 1.E.2. Organize data using concrete objects, pictures, tallies, tables, charts, diagrams, and graphs.

Grade Level Content Expectation:

D.RE.04.01. Order a given set of data, find the median, and specify the range of values.

Mathematics Content Standard:

Students experience counting and measuring activities to develop intuitive sense about numbers, develop understanding about properties of numbers, understand the need for and existence of different sets of numbers, and investigate properties of special numbers. (Concepts and Properties of Numbers)

Benchmark:

IV.1.E.2. Investigate and develop an understanding of the base-10 place-value system.

Grade Level Content Expectation:

None.

Benchmark:

IV.1.E.3. Develop an understanding of the properties of numbers (e.g. order) and the properties of the special numbers 0 and 1.

Grade Level Content Expectation:

N.ME.04.02 Compare and decompose numbers using place value to 1,000,000's, e.g. 25,068 is 2 ten thousands, 5 thousands, 0 hundreds, 6 tens and 8 ones.

Benchmark:

IV.1.E.1. Develop an understanding of whole numbers and read, write and count using whole numbers; investigate basic concepts of fractions and decimals.

Grade Level Content Expectation:

N.ME.04.03 Understand the magnitude of numbers up to 1,000,000; recognize the place value of numbers and the relationship of each place value to the place to its right, e.g. 1,000 is 10 hundreds.

Mathematics Content Standard:

Students investigate relationships such as equality, inequality, inverses, factors and multiples, and represent and compare very large and very small numbers. (Number Relationships)

Benchmark:

IV.2.E.2. Explore and recognize different representations for the same number and explain why they are the same.

Grade Level Content Expectation:

N.ME.04.01 Read and write numbers to 1,000,000; relate them to the quantities they represent; compare and order.

B. Understandings:

Students will understand that:

- Whole numbers are expressed as sums of ones, tens, hundreds and so on
- Counting numbers (1, 2, 3, 4...) as well as the number 0 are called whole numbers
- Every counting number is also a whole number
- Digits take on different values depending on their positions (or place) in a number
- Numbers can be written in more than one way
- Data can be organized and displayed using a tally chart
- Data can be organized and displayed using a line plot

C. Essential Questions:

- How do you express written numbers as digits?
- What would happen if you did not write the zero in the number 5,704?
- How does a place value chart work?
- How do digits take on different values depending on their positions in a number?
- How can data be represented using a tally chart? Using a line graph?
- How do you find the median, maximum, minimum, mode and range for a set of data?

D. Students will know...

- How to express whole numbers as sums of ones, tens, hundreds and so on
- How to write multi-digit numbers in word form

- How to make the smallest or largest number using a determined set of digits
- How to use a place value chart
- How to display data using a tally chart
- How to display data using a line plot
- How to find the maximum, minimum, range, mode and median for a set of data

Students will be able to...

- Name values of digits in numbers up to hundred-millions
- Write numbers up to hundred-millions
- State the value of the digit (place value) in a number
- Display data using a tally chart
- Display data using a line plot
- Determine the maximum, minimum, mode, median, range of a set of data

E. Prior Knowledge:

- Understanding of the definition of place value
- Basic number operations
- Understanding of the definition of tally charts and line graphs
- Understanding of the terms ones, tens, hundreds, thousands, etc.

F. Misconceptions:

- Students may have the misconception that zeros are not needed in writing numbers. For example, the number 5,074. Without the 0, the number would be 574 (and the digit 5 would be worth 500 instead of 5,000).
- Students may have misconceptions about how to correctly say certain large numbers (i.e. 2,564,984)
- Students may have a misconception about the difference between mean, median and mode

Stage 2: Assessment Evidence

A. Culminating Performance Task:

- What understandings and goals will be assessed through this task?

The goal of this task is for students to demonstrate their knowledge of number relations by participating in a centers lesson in which they will perform different tasks to assess their understanding. Through these tasks, students will have the opportunity to explore their knowledge of number relationships and review the information they have learned during the unit.

- Through what authentic performance task will students demonstrate understanding?

Students will be working in small groups of four to five students during this centers lesson. Groups will be predetermined by the teacher, and will be chosen based on both reading and math ability. Groups will work at each center for approximately ten minutes. Students will be given instructions for each station of the centers (in addition, there will be specific directions written out at each center). The centers will consist of the following:

- i. Station 1: Students will be given a worksheet on place value to complete individually.
- ii. Station 2: Students will first be required to complete worksheet #2. Once this is completed, each student will write the number 3,768,941 on a whiteboard. Next, they will
 - Circle the number in the ten-thousands place
 - Put a square around the number in the millions place
 - Put a triangle around the number in the hundreds place
 - Put a star around the number in the ones place
- iii. Station 3: Students will complete worksheet #3.
- iv. Station 4: Students will have five envelopes at this station with cut-out numbers enclosed. Each student will use the numbers in the envelopes to complete the following problems:
 - Using the cut-outs, make the number 56,753,903.
 - Using the cut-outs, make the number 6,408.
 - Using the cut-outs, make the number 734,546,400.
 - Using the whiteboard, write “ten million, two hundred sixteen thousand, five hundred two” in digits.
 - Using a whiteboard, write “three million, seventy five thousand, three hundred eighty nine” in digits.
- v. Station 5: Students will play the game *High Number Toss* (they have played this game in previous lesson 2.4). Students will get with a partner from their group and complete as many rounds as possible.
- vi. Whole group discussion following the lesson. The teacher will ask students the following questions:
 1. Did you think the center lesson went well? Would you like to do centers more often?
 2. Do you think this lesson helped you understand place value better? Do you feel more confident with this material?
 3. Are there any remaining questions about any of the material we talked about today?

During the Lesson:

During this centers lesson, I will be circulating the room, answering questions and monitoring student behavior and work.

All worksheets will be turned in to me at the end of the lesson.

After the Lesson:

As a form of assessment, students will be given a Re-Take Quiz on Tuesday. This quiz will be similar to the quiz they took on Friday. I will use their results from this Re-Take Quiz as assessment for their understanding and knowledge.

Students will write in their journals a response to the following question:

- Describe something that didn't make sense to you but now does, and what made you understand it better (what made it click?)
- By what criteria will student products and performances be evaluated? Students will be evaluated based on the rubric provided (*see attached*). Their student pages will be evaluated on completion (meaning they answered the questions completely), knowledge must be demonstrated (meaning understanding of concepts is evident), and math mechanics (meaning errors in math reasoning). Each child's student pages must be completed and effort must be shown. During the lesson, I expect students to be working collaboratively with their group members and stay on task at all times.

B. Culminating Performance Task Rubric: (*see attached*)

C. Other Evidence:

- Through what other evidence will students demonstrate achievement of the desired results?

In addition to the culminating performance task, students will be assessed using the following criteria:

Lesson 1:

- Class discussions which informally evaluate student progress and understanding of the names for numbers. Teacher will be looking for correct responses to asked questions, effort shown when doing math journal pages (or additional activities) as a whole class, and participation in group discussion and activities (raising hand often, visibly on task and paying attention).
- Student Journal Page 29, equivalent names for numbers.
- Homework: Study Link 2.2 (*see attached*). Assessed for topic understanding. Homework will be counted for completion and effort shown. There will be no letter grade given for homework.
- GLCE addressed: **N.ME.04.01**

Lesson 2:

- Journal page 32, place value.

- Students will be assessed informally during class discussions which evaluate understanding of place value in multi-digit numbers. Teacher will be looking for correct responses to asked questions, effort shown when doing math journal pages (or additional activities) as a whole class, and participation in group discussion and activities (raising hand often, visibly on task and paying attention).
- Homework: Study Link 2.3 (*see attached*). Assessed for topic understanding. Homework will be counted for completion and effort shown. There will be no letter grade given for homework.
- Math Journal page 32, place value.
- GLCE addressed: **N.ME.04.02**

Lesson 3:

- Informal assessment: Class discussion and student response. Teacher will make mental note of responses and ask more/less questions about topic if necessary. Teacher will be looking for correct responses to asked questions, effort shown when doing math journal pages (or additional activities) as a whole class, and participation in group discussion and activities (raising hand often, visibly on task and paying attention).
- Homework: Study Link 2.4 (*see attached*). Homework is assessed for student understanding and comprehension. Homework will be counted for completion and effort shown. There will be no letter grade given for homework.
- GLCE addressed: **N.ME.04.02**

Lesson 4:

- Math Journal page 35, estimation and tally charts.
- Group discussion and student responses will be assessed informally by the teacher. Teacher will be looking for correct responses to asked questions, effort shown when doing math journal pages (or additional activities) as a whole class, and participation in group discussion and activities (raising hand often, visibly on task and paying attention).
- Homework: Study Link 2.5 (*see attached*). Homework will be assessed for topic understanding and comprehension. Homework will be counted for completion and effort shown. There will be no letter grade given for homework.
- Journal Reflection, following the lesson. This writing assignment will be assessed for student understanding, and teacher will make changes in plans according to responses and possible remaining misconceptions.
- GLCE addressed: **N.ME.04.03**

Lesson 5:

- Math Journal page 37, finding the median.
- Whole group discussion and student response to questions will be assessed by the teacher informally. Teacher will be looking for correct responses to asked questions, effort shown when

- doing math journal pages (or additional activities) as a whole class, and participation in group discussion and activities (raising hand often, visibly on task and paying attention).
- Homework: Study Link 2.6 (*see attached*). Homework will be assessed for topic understanding and comprehension. Homework will be counted for completion and effort shown. There will be no letter grade given for homework.
 - GLCE addressed: **D.RE.04.01.**
- During the unit, students will demonstrate achievement through the following:
 - Quiz: Quiz 1 (*see attached*). This quiz will cover the information covered thus far in the unit and will reflect discussions and activities that have occurred during class. This quiz will be scored for a letter grade based on correct answers. If students get lower than a C on this quiz, they will be required to take a re-take quiz to attempt to get a better grade. Additionally, this quiz will let the teacher know what needs to be reviewed (if anything).
 - Test: Unit 2 Test (*see attached*). This test will cover the information learned in class during this unit. The test will be scored for a letter grade based on correct answers. It will assess overall student understanding and application of unit concepts. It will also tell the teacher if there are any remaining misconceptions that need to be re-taught.
 - How will students reflect upon and self-assess their learning?

During the unit, students will have several opportunities to self-assess their own learning:

 - Lesson 1: Students will reflect in their notebooks about what they learned during the lesson that day.
 - Lesson 4: Students will write about and explain the activity we did in class.
 - Culminating Activity: Students will write a response to the following prompt in their notebooks; Describe something that didn't make sense to you but now does, and what made you understand it better (what made it click?)

Stage 3: Learning Plan

Day 1: Many Names for Numbers

Lesson Goal(s):

- Students will be able to find equivalent names for numbers
1. Put Math Message 2.2 on the overhead, to be done individually. Students will get approximately five minutes for this task.
 2. *Math Message*: Write as many names as you can for the number 10.
 3. Share students' results as a whole group. The teacher will ask the students what they came up with for the number 10, and they will raise their hands to answer. The teacher will write their conclusions on the overhead. When responding, the teacher will ask students to explain their thinking to the class.
 4. The teacher will ask students what the word 'equivalent' means. Then she will ask students if they remember doing name-collection boxes last year (they should have done these in third grade). The teacher will explain that names for the same number are called *equivalent names*.
 5. Students will work with a pre-determined (by the teacher) partner to complete Journal page 29. Although students are working together, each student will be responsible for writing their answers in their own workbook. (The instructor will give students approximately 10 minutes for this exercise).
 6. Whole group discussion to discuss their findings.
 7. Students will turn to page 203 in their Student Reference Books and we will read the directions for *Name that Number* as a whole group. The teacher will ask if there is any confusion regarding the instructions.
 8. Students will get out a plain sheet of lined paper.
 9. Students will work with a partner and play the number game *Name that Number*. (Approximately 15 minutes)
 10. *CLOSURE*: Team leaders collect the cards and hand them in to me. The teacher will then ask students how the game went and some specific things they learned about numbers and how to write numbers in different ways.
 11. *Journal Reflection*: What did you learn today?
Students will write in their math notebooks for approximately five minutes.
 12. Students to put all their books and materials away.
 13. *Homework*: Study Link 2.2 to be completed and turned in the following day.

Day 2: Place Value in Whole Numbers

Lesson Goal(s):

- Students will be able to name values of digits in numbers up to hundred-millions
- Students will be able to read and write numbers up to hundred-millions

1. Review the previous day's homework. The teacher will try and ensure that any remaining misconceptions are eliminated, and that the homework was understood.
2. Math Message 2.3 will be put on the overhead.
Math Message: Write the largest number you can using the digits 0, 3, 7, and 9. Use each digit only once.
3. The teacher will initiate a whole group discussion about how students found their answers. The teacher will first ask for volunteers, but may have to call on individuals to keep them focused on the lesson. Students will be asked what "place" each digit was in. As an additional point, the teacher will ask students what is the smallest possible number that can be made from these numbers (hinting that the number will be smaller than 1)
4. Explanation of the difference between counting numbers and whole numbers.
5. A place-value chart will be placed on the overhead (students will follow along in their books on page 31). The teacher will remind students that any number in our numeration system can be written by using one or more of the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. I will explain that what makes this possible is that the digits take on different values, depending on their positions, or places, in a number. The overhead will illustrate this.
6. Write the number 5,607,481 in the place value chart. Students will copy the teacher by writing in their journals on page 31. Ask questions about the number including: how do you say this number? What is the value of digit 6? What is the value of the digit in the millions place?
7. The teacher will write the number 853 on the overhead and ask what each digit is worth. Record these numbers in a vertical sum. Students will copy this in their notebooks.
8. Students will complete page 32 of their journal individually.
9. *CLOSURE:* The teacher will make up a number and ask students to tell me what each number "is worth". Students will respond when called on.
10. *Homework:* Study Link 2.3 to be completed and turned in the following day.
11. *Additional Activity:* Students navigate through student website, <http://www.funbrain.com/tens/index.htm>, for additional practice with learning place value. If time and school resources allow, students will get the opportunity to play "Place Value Puzzler" individually or with a partner. Students will have approximately thirty minutes to accomplish this task.

Day 3: Place Value with a Calculator

Lesson Goal(s):

- Students will practice place value skills through using a calculator
- Students will be able to read and write large numbers

1. Review of the previous day's homework, Study Link 2.3.
2. Math Message 2.4 will be on the overhead.
Math Message: Write 7,490,613 on the board (teacher).
 - Which digit is in the ten thousands place? How much is that digit worth?
 - Which digit is in the millions place? How much is that digit worth?
 - Which digit is in the thousands place? How much is that digit worth?

The teacher will ask for volunteers to answer these questions (whole group).

3. The teacher will put a chart on the overhead. The columns will be "Start with", "Place of digit", "change to" and "operation". We will do 5 examples: 570, 409, 54463, 760837, and 52,036,458. Students will solve each problem on their calculators.

EXAMPLE:

Enter 409.

Use the + key to change the digit in the hundreds place to 8.

How did you do that? Press + 400 =

What is the new number? 809.

- We will discuss these questions and answers as a whole group

4. Students will read the directions for the game High Number Toss in their Student Reference Book, page 201 individually and silently.
5. Teacher will ask if there are any remaining questions, then assign predetermined partners.
6. Students will play approximately 2-4 rounds of the game High Number Toss with their partner. Dice will be passed out for each group. This activity will take roughly 10-15 minutes.
7. *CLOSURE:* The teacher will have team leaders collect the dice and give them to me. Ask students what their results were and what they specifically learned about place value. The teacher will ask if there are any questions.
8. *Homework:* Study Link 2.4 to be completed and turned in the following day.

Day 4: Organizing and Displaying Data

Lesson Goal(s):

- Students will be able to gather data and organize their data in a tally chart
- Students will determine the maximum, minimum, range and mode of a set of data

1. Review math homework from the previous day, Study Link 2.4. The teacher will ask questions to gauge student understanding.
2. Students will be asked to get out all three of their math materials (math journal, math notebook and student reference book).

3. Math Message 2.5 will be put on the overhead for students to complete individually.
Math Message: Guess how many raisins are in the box. Write your guess in Problem 1a on page 35 in your math journal.
4. Pass out one box of raisins per pair of students. Students will also be asked to open to page 35 of their math journals.
5. We will discuss their estimations as a whole group. Students will be asked what their guesses were, and why they thought so. The teacher will ask at least 3-5 groups, to get an idea of their thinking and the different estimations the students have.
6. Students will be asked to open their box of raisins and look down at the raisins in the box. They will be required to count the number of raisins that they see when looking down into the box. Based on that number, students will give a second estimation to how many raisins are in the whole box. Students will record their estimation on page 35.
7. Bring whole group back together to discuss their estimation strategies.
8. Students will empty their boxes and count how many raisins are in their box. This data will be recorded on page 35. The teacher will ask,
 - Was there a good strategy for counting?
 - Was it difficult to count them one at a time?
 - Was there an easier way?
9. Each group will report their number of raisins, and the teacher will write these numbers on the overhead. Partners will then use the class data to complete the tally chart in Problem 2 of their journals.
10. To help get students started, the teacher will ask them to complete the first column of the chart by writing the numbers in order, beginning with the smallest number and ending with the largest number of raisins. Students will then make a tally mark on the appropriate line in the second column.
11. Whole group discussion: what is a landmark? We will discuss the definition and give examples of everyday landmarks.
12. Students will complete Problem 3 in their journals on page 35 individually. Students will look for the following:
 - The largest number of raisins found: the maximum
 - The smallest number of raisins found: the minimum
 - The difference between the maximum and minimum: the range
 - The most frequent number of raisins found: the mode
13. *CLOSURE:* Whole group discussion: The teacher will ask students what they think is the typical number of raisins in a box. The teacher should expect a variety of answers, such as the number that occurs most often or a number where the counts cluster most heavily. Remind students that these numbers are the maximum, minimum, range and mode for their set of data.
14. *Journal Reflection:* Write about the activity we did in class today.
15. *Homework:* Study Link 2.5 to be completed and turned in the following day.

Day 5: The Median

Lesson Goal(s):

- Students will review how to display a set of data with a line plot
 - Students will review how to find the median of a set of data
1. Review math homework from the previous day, Study Link 2.5. Class discussion about answers.
 2. Students will be asked to get out all three of their math materials (math journal, math notebook and student reference book).
 3. Math Message 2.6 will be put on the overhead for students to complete individually.
Math Message: Read about line plots on page 63 of your Student Reference Book.
 4. Whole group: Ask students what the definition of a line plot is. Review the definition of line plot.
 5. Students will write the number of people living in their houses on the sticky note, and on page 37 of their journals.
 6. The teacher will draw a number line on the white board at the front of the room. Students will come up, team by team, and place their sticky note in the appropriate places above the number line (thus creating a line plot).
 7. Students will copy the line plot in their journal pages (they will use Xs to act as the sticky notes).
 8. Students will complete Problem 3 on journal page 37 individually.
 9. Whole group: Students will share their observations about the data. Some questions the teacher will ask:
 - How are the landmarks reflected in the shape and distribution of the data in the line plot? (The mode is the family size that occurs most frequently. The number with the most sticky notes is the mode).
 - Where are the “clusters”, “bumps”, “holes” and “far out numbers”?
(Far out= a number all by itself, clump= many numbers close together, holes= numbers with no representation).
 10. Review ways of finding a “middle value” for family size. Remind students that the middle number is called the median. Tell students that one way to find a median is to list all the data from smallest to largest, then count from each end to the number in the middle. If there are two middle numbers, the median number is the average of the two numbers.
 11. The teacher will line up the sticky notes in ascending order on the board. Then I will pick two students to remove the sticky notes at each end until only one or two notes are left on the board. Students will record the median on page 37.
 12. *CLOSURE:* Whole group: The teacher will ask the following questions

- Are the median and the mode for family size the same?
- How does your own family size compare with the median size? Is your family size equal to the median size? Less? Greater?

13. *Homework*: Study Link 2.6 to be completed and turned in the following day.

Unit Resources/References Needed:

A. Worksheets/ Handouts: *see attached*

B. Teacher website: <http://www.theteacherscorner.net/>

This website offers several pieces of valuable information for teachers. Among them, it offers ideas about lesson plans, unit plans, and thematic units. There is also a message board link which offers teacher support. The site includes several teacher resources including teacher forums and classroom management ideas.

Student website: <http://mathforum.org/students/>

This website is designed for helping students with math problems and homework. There are links for elementary, middle school and high school students. It also offers problems of the week for students to try. This site offers students math tools and tips for solving difficult or hard to understand concepts.

C. Student website/Student activity:

<http://www.funbrain.com/tens/index.html>

This site is used in lesson 2 (*see Day 2, above*). This student site is designed to help understand place value. The activity is entitled, “Place Value Puzzler” and requires students to click on the appropriate number in a multi-digit number. For instance, it will tell the student to click on the number which represents the thousands place. If a student does so correctly, they move on to the next question. If they answer incorrectly, it explains what the right answer is. Students can also choose different levels for this activity; easy, medium, hard and super brain.

D. *Everyday Mathematics, Fourth Grade Edition*
McGraw Hill, 2004.

Chapter 2: Using Numbers and Organizing Data

Lesson 1: page 29

Lesson 2: page 32

Lesson 3: page 201, Student Reference Book

Lesson 4: page 35

Lesson 5: page 37

E. Materials Needed for Lessons:

- Day 1:
-Student Reference Book, page 203

- Student Math Journal, page 29
- 1 deck of number cards for every pair of students
- Day 2:
 - Previous day's homework (Lesson 2.2 Study Link)
 - Math Journal page 32
 - Student Reference Book, pages 4, 258
- Day 3:
 - Previous day's homework (Lesson 2.3 Study Link)
 - Calculators (located in their math toolboxes)
 - 1 Die for each pair of students
 - Math Reference Book, page 201
- Day 4:
 - Previous day's homework (Lesson 2.4 Study Link)
 - Math Journal, page 35
 - Small box of raisins per pair of students
- Day 5:
 - Previous day's homework (Lesson 2.5 Study Link)
 - Math Journal, page 37
 - Student Reference Book, page 63
 - One Post-It note per student
- Culminating Performance Activity:
 - Dice for *High Number Toss* (station 5)
 - Worksheets #1, #2, #3
 - White boards- one per student (stations 2, 4)
 - Dry erase marker- one per student (stations 2, 4)
 - Envelopes with cut-out numbers enclosed (station 4)