Number Theory for 3rd & 4th Graders
Written By:
Kari Heppner & Erica Uttermark
Highland Elementary
Crookston Public Schools
kariheppner@isd593.org & Ericauttermark@isd593.org
Executive Summary:

The following pages include lessons that are centered on the mastery of number sense, which includes place value, fractions and factors. We have created these lessons to supplement our 3rd and 4th grade Everyday Math curriculum. These lessons have been established based on the needs of our students. They learn most effectively through the use of flexible grouping, which promotes valuable discussion opportunities for individuals, groups and as a whole class. Many of the activities have multiple solution paths. Assessments are included to continue to guide our teaching and to assess the effectiveness of our instruction. After teaching the lessons, we will analyze, reflect and modify.
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Factors.....................................................................................Pages 14-21

Fractions (Rational Numbers)..............................................Pages 22-26

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Overview:

Day 1 – Pretest Place Value/ Lose a Block in Base 4 directions- Explore and play as a class

Day 2- Review Directions & Play Lose a Block Base 4 Game- Discuss, Review and Analyze

Day 3- Introduce Base 10.. what are the rules? Play Lose a block with Base 10 blocks- Discuss, Review and Analyze- Compare to Base 4

Day 4- Place Value Matching Game, Roll It Expand it , Place Value accordion- Share what students realized and noticed, record in math journals

Day 5- Guess a number Game /Use 100 chart groups in our room, play with partner, Heppner Vs. Uttermark towards the end
Place Value Post Test

Day 6 & 7- Factors Pre-test & Post-test

Day 8- Fractions- Pretest

Days 9- 15- Fractions Rational Number Project Lessons 1-6

Day 16- Fraction Post test/ Fraction Ice Cream Choice Celebration
Objective: Students will be able to work with and understand place value in whole numbers through the hundred-thousands place.

Overview: Through a variety of hands on experiences, students will be able to read and write numbers up to the hundred-thousands place.

MN Math Standards:
3.1.1.1- Read, write and represent whole numbers up to 100,000. Representations may include numerals, expressions with operations, words, pictures, number lines, and manipulatives such as bundles of sticks and base 10 blocks.

3.1.1.2- Use place value to describe whole numbers between 1,000 and 100,000 in terms of ten thousands, thousands, hundreds, tens and ones.

3.1.1.3- Find 10,000 more or 10,000 less than a given 5 digit number. Find 1000 more or 1000 less than a given 4 or 5 digit. Find 100 more or 100 less than a given 4 or 5 digit.

3.1.1.4 – Compare and represent whole numbers up to 100,000 with an emphasis on place value and equality.

3.1.3.1- Read and write fractions with words and symbols. Recognize that fractions can be used to represent parts of a whole, parts of a set, points on a number line, or distances on a number line.

3.1.3.2- Understand that the size of a fractional part is relative to the whole.

3.1.3.3- Order and compare unit fractions and fractions with like denominators by using models, and an understanding of the concept of the numerator and denominator.

4.1.2.3- Represent and compare fractions and decimals in real-world and mathematical situations; use place value to understand how decimals represent quantities.

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Vocabulary: digits, place value, standard form, number line, factors, multiple, factor tree, prime, composite, fraction, numerator, denominator

Materials Needed: Base 4 blocks, unifix cubes, whiteboards, document camera, hundreds chart, Base 10 blocks, fraction circles,
Day 1- Hand out Place Value pretest, have students complete and introduce Lose a Block.

Launch/Focus: In this game the objective is for you to give away a block and everyone at your table to gives away a block. Once you finish, assist others at your table to give away their block. When everyone is finished, get kiddos excited about a game that we are going to play called Lose a Block. Go through directions:

1. All students start with a block.
2. One student will roll the dice and make a trade with the bank in order to lose the number the student has rolled
3. Once proper trades, have been made the next player rolls the dice makes proper trades with the bank.
4. Each player continues to roll the dice and trade until each player in the group has made trades so they don’t have any units left.

Practice playing together as a class using the following game board. (4 students per game)

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<tr>
<th>Lose a Block</th>
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<td>Blocks</td>
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<td>Flats</td>
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<td>Longs</td>
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<td>Units</td>
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<table>
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<th>Blocks</th>
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Day 2
Launch: Oh man, it is so frustrating to me when I can’t find something. This morning, I couldn’t find my fit bit anywhere. I went and asked both of my girls since they like to rack up steps for me. Both of the girls said they didn’t see it anywhere and haven’t worn it. I am still racking my brain to see if I can figure out where it went. How many of you have lost something? Did you find it? Today, we are going to play a game but in this game we do want to lose our block.

Explore: Divide students up into groups of 4. Revisit the directions and rules of the game Lose a Block. Have students play the game Lose a Block. Game Board to use is in the appendix. If a group finishes one game, they should start a another one. Members of the group could switch with others in the rooms that have finished as well. After 35-45 minutes of playing the game, have students open up their Math notebooks and summarize their findings/thoughts about the Lose a Block game.

Day 3- Introduce Base 10 blocks- Blocks, flats, longs and units(cubes)
Discussion Questions:
1. What do we notice about the base 10 blocks?
2. Can we make any trades when using these blocks?
3. Compare a unit to a long. What do you notice?
4. Compare a long to a flat. What do you notice?
5. Compare a flat to a block. What do you notice?
6. How does this relate to place value?
7. How is this similar to the Lose a block game we played yesterday?

Introduce the Place Value Anchor chart and place in student’s Math Notebook.
7 Digit Place-Value Chart  
Source: 4th Grade Everyday Mathematics, Lesson 1-1, pg.2

Revisit the directions and rules of the game Lose a Block. Have students play the game Lose a block using the Base 10 blocks. When using Base 10 blocks, players can play using 2 dice and add their digits up. Game Board to use is in the appendix. If a group finishes one game, they should start another one. Members of the group could switch with others in the rooms that have finished as well.

Summarize-
After 35-45 minutes of playing the game, have students open up their Math notebooks and summarize their findings/thoughts about the Lose a Block Base 10 game.
As a whole group, compare Base 10 game vs. the Base 4 game.

Day 4-
Launch: Yesterday, I was writing a check and I had to write the amount of the check in written form. As I was leaving the store I saw the speed limit sign and the number was written 35 mph. Numbers in our world are written many different ways. How many ways can we write the number 33. Today, in the student’s Math Notebooks, you will fill out the following to review the 4 different ways to write a number. Above number, write standard form.
Once students finish filling out the notes, practice writing numbers out in word form such as 42 4 tens 2 ones or forty-two. Have volunteers write the word form come up to the board and share their answers.

**Explore:** Students will work with a partner to roll 2 dice. Once they 2 dice have been rolled, they will decide what number they would like.
Ex. Roll a 6 and 8. Number could either be a 68 or an 86. Demonstrate and fill out the roll it portion, use base 10 blocks to make it and draw on the worksheet and write it in expanded form. Demonstrate 3-4 and than roll the 2 dice and have students complete the form on their own.

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<table>
<thead>
<tr>
<th>Number</th>
<th>Words</th>
<th>Expanded Form</th>
<th>Picture</th>
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<tbody>
<tr>
<td>42</td>
<td>____ tens</td>
<td>____ + ____ = ____</td>
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<tr>
<td></td>
<td>____ ones</td>
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<td>42</td>
<td>____ tens</td>
<td>____ + ____ = ____</td>
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<td>____ ones</td>
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<tr>
<td>42</td>
<td>____ tens</td>
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<td>50</td>
<td>2 tens</td>
<td>____ + ____ = ____</td>
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<td>4 ones</td>
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<td>____ tens</td>
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<td>50</td>
<td>8 tens</td>
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<td></td>
<td>3 ones</td>
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Roll It! Make it! Expand it! was taken from [http://petersonspad.blogspot.com/2012/03/more-place-value.html](http://petersonspad.blogspot.com/2012/03/more-place-value.html)
**Summarize/Independent Practice:** Students will complete the following on their own. Base 10 blocks will be provided for those who need them.
### Roll It! Make It! Expand It!

Roll three dice. Write down each number. Draw the hundreds, tens and ones. Write the expanded notation equation.

<table>
<thead>
<tr>
<th>Roll It</th>
<th>Make It</th>
<th>Expand It</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 3 6</td>
<td></td>
<td>200 + 30 + 6 = 236</td>
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<tr>
<td>H T O</td>
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<tr>
<td>H T O</td>
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<tr>
<td>H T O</td>
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</tr>
</tbody>
</table>

### Roll It! Make It! Expand It!

Roll four dice. Write down each number. Draw the thousands, hundreds, tens and ones. Write the expanded notation equation.

<table>
<thead>
<tr>
<th>Roll It</th>
<th>Make It</th>
<th>Expand It</th>
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</thead>
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</tbody>
</table>

June 2016 taken from: [http://petersons-pad.blogspot.com/2012/03/more-place-value.html](http://petersons-pad.blogspot.com/2012/03/more-place-value.html)
Day 5 -
Launch: Since I have seen you all crack codes, I know that you are all detectives. Today, I am going to challenge you by having you solve a mystery numbers task cards. We are going to have a mystery number hangout at the end of the class period.

Finding the Mystery Number Task Cards – Students will complete the following task cards and fill out the answer sheet. https://www.teacherspayteachers.com/Product/Place-Value-Mystery-Number-Cards-310766

Give Place Vale Post Test. (In Appendix)

3rd Grade Everyday Math Lesson 1-2 Extra Practice- Finding the Mystery Number-Number Grid TA3
Heppner Vs. Uttermark

Have a mystery number hangout with another classroom. https://plus.google.com/communities/110369120141935358658

Reflection
Thoughts regarding the Lesson(s)

A reflection is a detailed analysis of the strengths and weaknesses of a lesson. To get the most from the process, it should be done within an hour of the teaching of the lesson, while the teaching experience is still fresh in your mind. Include the following in your reflection:

1. Provide a brief, but thorough synopsis of the lesson. What happened?

2. What went well and what did not go as you expected?

3. What surprised you?
4. What do you believe your students learned and how does that connect to your goals for them?

5. What would you do differently if you taught the lesson again?

6. Briefly describe to follow up lessons. What should happen next? (Remediation? Enrichment?)

**Suggestions for Revision**

Complete after teaching your lesson.

Planning Ahead/Get Ready:
Launch: How many of you enjoy working in partners in the classroom? How many of you enjoy playing games with a partner? Today we are going to review factors. Remember, factors like to work in pairs/partners. What are some facts that you know about a factor? Create a list.

Explore: As a class, we will review how to figure out factors of a number. Remember, factors are numbers multiplied together to get a product. Review the factor rules:

- Any number that ends in a 0, 2, 4, 6, or 8 are always divisible by 2.
- If a number ends with a zero, it is divisible by 5 & 10.
- If a number ends with a 0 or a 6, it is divisible by 5.
- If the sum of the digits can be divided by 3, the number is divisible by 3 and 9.

Whole Group look at some numbers and figure out what they are divisible by and than figure out the factors of the number. Use set definition method to ensure that you don’t miss any factors.
Ex. Factors of 36 (1, 2, 3, 4, 6, 9, 12, 18, 36)

Have students practice writing factors by using one of the following:
Instructions: 1) Draw factor rainbows. 2) To check your answers, scan the QR code. 3) If you're correct, color in the bird. If not, leave it blank.

1. \[ \text{Factor rainbow for 12} \]
2. \[ \text{Factor rainbow for 20} \]
3. \[ \text{Factor rainbow for 25} \]
4. \[ \text{Factor rainbow for 30} \]
5. \[ \text{Factor rainbow for 36} \]
6. \[ \text{Factor rainbow for 45} \]

Or
https://www.teacherspayteachers.com/Product/FREEBIE-Rainbow-Factors-of-a-Number-Worksheet-4OA4-664656
Day 7:

Launch: How many of you have played capture the flag? I know when I was young, I really enjoyed it. We have been learning about the factors of numbers and how when you take 2 factors and multiply them, you end up with a product. Today we are going to play the game Factor Captor where you are capturing factors while wanting to earn the most points.

Explore: Introduce Game and go through rules.
Have students Play Factor Captor Game. After playing for about 20 minutes, ask students if they see a pattern or have figured out what their best moves may be?

Summarize: Write their finding in their math journal.
Students play the game again for 20 minutes and turn and talk to a partner after about what each others strategy was.

Factor Captor Game- Paper Form
https://emccss.everydaymathonline.com/em-crosswalk/pdf/5/g5_tlg_Lesson_1_4.pdf

Other games:

Online Game: Can be used on Ipads or Computers
https://illuminations.nctm.org/Activity.aspx?id=4134

Give Post Test:
Source: https://www.teacherspayteachers.com/Product/Factoring-Numbers-Rainbow-Style-Practice-Worksheet-1479248
Day 7: if there is time, review rules and play Factor Bingo or have students continue to play on their factors and multiples cootie catchers.

Factor Bingo
3rd and 4th Grade Everyday Mathematics - Student Reference Book pgs. 285-286

Cootie Catchers: May 2016 Taken From:
https://www.teacherspayteachers.com/Product/Math-Review-Cootie-Catchers-133621

Can also use the following free template:
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Suggestions for Revision

Complete after teaching your lesson.

Planning Ahead/Get Ready:
Fractions

Objectives: Students can read, write and say fractions using words and symbols. correctly while understanding that a fraction is a part of a whole.

Overview: Students can represent and compare fractions in real- world situations.

MN Math Standards:
3.1.3.1 - Read and write fractions with words and symbols. Recognize that fractions can be used to represent parts of a whole, parts of a set, points on a number line, or distances on a number line.

3.1.3.2 - Understand that the size of a fractional part is relative to the whole.

3.1.3.3 - Order and compare unit fractions and fractions with like denominators by using models, and an understanding of the concept of the numerator and denominator.

4.1.2.3 - Represent and compare fractions and decimals in real-world and mathematical situations; use place value to understand how decimals represent quantities.

4.1.2.4 - Represent and compare fractions and decimals in real-world and mathematical situations; use place value to understand how decimals represent quantities.

Vocabulary: digits, place value, standard form, number line, factors, multiple, factor tree, prime, composite, fraction, numerator, denominator

Materials Needed: Unifix cubes, whiteboards, document camera, and fraction circles.

Days 8- 15- Introduction of Fractions- Pre/Post test in the appendix

Source: Rational Number Project Lessons 1-6
http://www.cehd.umn.edu/ci/rationalnumberproject/rnp2.html


Day 16- Fraction Post test/ Fraction Ice Cream Choice Celebration
Day 8- Fraction Pre-test

**Launch/Focus:** Read Fraction Fun by David Adler. Preview the book here: https://www.youtube.com/watch?v=2jMCV_9ZAzQ

When finished, brainstorm a list of how students use fractions in their life.

**Explore/Summarize/Independent Practice:** Embedded in Lessons 1-6 of the Rational Number Project Interactive Math Notebook pages that students will fill out and place in Interactive Notebooks at the end of Day 1.

Pages used were taken from the following source: Taken from Teachers Pay Teachers, June 2016
https://www.teacherspayteachers.com/Product/Fraction-Printables-CCSS-Aligned-1016354

Days Days 9-14-
Source: Rational Number Project Lessons 1-6, Taken from:
http://www.cehd.umn.edu/cl/rationalnumberproject/rnp2.html

Day 15-

**Launch:** Read Wholey Cow as review. Fill out Ways to represent a fraction and place in Interactive Math Notebooks. Links for the book:
https://www.youtube.com/watch?v=J3kfHVHh2VU

Ways to Represent a Fraction work page taken from the source: Taken from Teachers Pay Teachers, June 2016
https://www.teacherspayteachers.com/Product/Fraction-Printables-CCSS-Aligned-1016354

Source: Taken from Teachers Pay Teachers in June 2016
https://www.teacherspayteachers.com/Product/Fraction-Printables-CCSS-Aligned-1016354

Discuss what students learned about fractions and what they remember most? What are you going to use fractions for in the future?
How are fractions useful during our every day lives?

Students take the fraction post test & have a ice cream fraction celebration using topping choices.
A student will need to decide on which toppings they would like for their ice cream. They may choose up to 5 toppings.
In order to eat their ice cream, they will need to be able to express their amount of toppings as a fraction.
If a student chooses 3 toppings, the fraction would be 3/5.
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5. What would you do differently if you taught the lesson again?

6. Briefly describe to follow up lessons. What should happen next? (Remediation? Enrichment?)
Suggestions for Revision

Complete after teaching your lesson.

Planning Ahead/Get Ready:
### Appendix:

**Place Value Pre/Post Test:**

1. $563 = \underline{\hspace{2cm}}$ hundreds $+$ $\underline{\hspace{2cm}}$ tens $+$ $\underline{\hspace{2cm}}$ ones

2. Make a model and draw the following numbers using base ten pictures/blocks.

   - $72$
   - $138$
   - $1,586$

3. What is the value of the underlined digit?

   - $451, \: \underline{\hspace{1cm}}$
   - $603, \: \underline{\hspace{1cm}}$
   - $128,374, \: \underline{\hspace{1cm}}$
   - $547,923, \: \underline{\hspace{1cm}}$

4. $800 + 30 + 2 = \underline{\hspace{2cm}}$
6. Write the numbers your teacher shows you with base ten blocks.

_____________________

_____________________

Directions: Use unifix cubes to solve each problem.

7. Rita is planting 12 rose bushes in her garden. She has already planted 7 bushes. How many more bushes does she have to plant?

8. There were 4 fish swimming by the reef. 8 more came to swim. How many fish are swimming by the reef?

9. There are 9 boys on the bus. There are also 8 girls riding the bus. How many kids are on the bus?

Name the place in words of each underlined digit in the following numbers:

5,678,948 ________________

800,007 ________________

1,111,111 ________________
Name the value of each of the underlined digits in the following numbers:

897,009  ______________________
1,698,938 ______________________
5,890,005 ______________________

What is the relationship between 700 and 70?
   a. 70 is 10 times less than 700
   b. 700 is 10 times more than 70
   c. 700 is 100 times more than 70
   d. 700 is one place value more than 70

To change 800 to 80,000 multiply 800 by _________

**Fraction Pretest and Post Test:**

**Source:** Everyday Mathematics Gr. 4 Math Journal #1 pg. 67 Lesson 2-14

Songs to Use for teaching Mathematics:

[http://www.songsforteaching.com/mathsongs.htm](http://www.songsforteaching.com/mathsongs.htm)
### Lose a Block Game Board

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MN MCA SAMPLE QUESTIONS PERTAINING TO PLACE VALUE, FACTORS & FRACTIONS: Source: [http://www.stma.k12.mn.us/academics/testing/mca-practice-tests](http://www.stma.k12.mn.us/academics/testing/mca-practice-tests)

1. In the number 200.358, which digit is in the hundredths place?
   - A. 2
   - B. 3
   - C. 5
   - D. 8
Ellen has a vase of flowers.

- $\frac{1}{8}$ are red.
- $\frac{1}{3}$ are blue.
- $\frac{1}{6}$ are purple.
- $\frac{1}{4}$ are yellow.

Which is the greatest fraction?

A  $\frac{1}{8}$
B  $\frac{1}{3}$
C  $\frac{1}{6}$
D  $\frac{1}{4}$
1. What is another way to show 4,608?
   A. 46 + 8
   B. 4,000 + 60 + 8
   C. 4,000 + 600 + 8
   D. 4,000 + 600 + 80

17. Jason has 8 cupcakes.

He eats \( \frac{1}{8} \) of the cupcakes and gives \( \frac{2}{8} \) of the cupcakes to his friends. What fraction of the cupcakes are left?

A. \( \frac{1}{8} \)
B. \( \frac{3}{8} \)
C. \( \frac{5}{8} \)
D. \( \frac{3}{5} \)
Cory has 2 red crayons and 1 blue crayon. What fraction of Cory’s crayons is red?

A $\frac{1}{3}$  
B $\frac{1}{2}$  
C $\frac{2}{3}$  
D $\frac{3}{2}$

What is 153,924 rounded to the nearest thousand?

A 150,000  
B 153,000  
C 153,900  
D 154,000