

Number Sense, Computation and operations
Pat Greendahl and Jeff Smith
Grade 5 and 6

Day1-2: Order of Operations

State Standard: Number Sense: Students will use addition, subtraction, multiplication and division to solve multi-step, mathematical problems.

Key Objectives:

1. Students will be able to use the 3 step order of operations
2. Students will be able to solve 10 out of 12 problems using the numbers 1-4 to get sums of 1-12.
3. Students working in pairs will be able to solve 7 out of 10 problems using four 4's to get the sums 1-10. Answers will be placed on the board for a class project.

Lesson procedure:

1. On the board I will have a problem written on the board that deals with order of operations. Ex. $3+7*4/2+5-6= A$. I will ask the students to do their best to solve this problem. I will then survey the results and will probably find that very few got the correct answer.
2. I will then explain to the students that in order to solve this problem that we need to follow some rules. These rules are called the order of operations.
 1. Do what's in parenthesis first.
 2. From left to right we then multiply and divide.
 3. From left to right we then add and subtract.
3. I will then have the students work on some sample problems on the board and model the procedures for them.

- Assignments:
1. 1-2-3-4 challenge(use the numbers 1-4 to make answers of 1-12.)
eg $1+(4-3)+2=4$ $1+2+3-4=2$
 2. Four 4's (Use four 4's to get a total of 1-10)
 $(4*4)/(4*4)=1$ or $(4+4+4)/4=3$
 3. Worksheet created from accelerated math or from Houghton-Mifflin.

Reinforcement: The game of CONTIG-----Students will get into groups of 3 and will receive a gameboard, 3 dice, and a pile of chips. Each player will then roll the dice. Following the order of operations, students will use the 3 numbers from the dice to get a number on the board. They will then put their chip on that number, unless it's already covered. The student then can look to see if there are other numbers he/she can make from the 3 numbers. If the student can't make a number on the board, his opponents in order get a chance to use the numbers but always keeping in mind who's turn it is. A student scores a point(s) by choosing squares that are adjacent vertically, horizontally, or diagonally to other covered squares. One point is scored for each adjacent number. You are eliminated from the game after 3 consecutive tries of getting nothing. When everyone is eliminated, the highest score wins.

Name _____

Directions: Use the numbers 1,2,3,4 to create a problem that has a solution of 1 to 12. In order to come up with these solutions you will need to use the orders of operations.

1. _____ = 1

2. _____ = 2

3. _____ = 3

4. _____ = 4

5. _____ = 5

6. _____ = 6

7. _____ = 7

8. _____ = 8

9. _____ = 9

10. _____ = 10

11. _____ = 11

12. _____ = 12

13. _____ = 13

14. _____ = 14

Name _____

Directions: Use four 4's to create a problem that has a solution that equals the numbers 1-10. You may use the order of operations to help you

1. _____ = 1

2. _____ = 2

3. _____ = 3

4. _____ = 4

5. _____ = 5

6. _____ = 6

7. _____ = 7

8. _____ = 8

9. _____ = 9

10. _____ = 10

Contig

1. 2 to 5 players can play
2. To begin each player rolls the dice and the smallest sum goes first.
3. The first player rolls the three dice. Students then must use one or two operations with the numbers on the dice and get an answer that is on the game board. When the student has an answer they put a chip on the board. It is then the next players turn.
4. To score in Contig, you must cover a number on the board which is adjacent, horizontally, vertically, or diagonally to another covered number. One point is scored for each adjacent covered number.
5. When a player is unable to produce a number that already isn't covered the player passes the dice to the next player to see if that student can find a combination that will work for a number on the board. If that player can get a number on the board he/she can place a chip and score. This step does not affect the order of play.
6. A cumulative score is kept for each player. A player is eliminated when they can't produce a number for 3 consecutive rolls. The game is done when all players are eliminated. The highest score wins.

Tips: Use a one minute timer and limit the turns to 5 per player.

Game board:

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	44	45	48	50	54	55
60	64	66	72	75	80	90	96
100	108	120	125	144	150	180	216

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Grade 5/6

Day1

State Standard: Compute fluently and make reasonable estimates using whole numbers, in real world problems. Students will use addition, subtraction, and multiplication to solve multi-step, real world problems.

Objectives: Students will come up with all the combinations of change for 100 whole dollars. Students will place money inside an envelope that will allow them to give the correct amount of change each time without opening an envelope. The goal of this activity is to come up with the smallest amount of envelopes that will allow them to give me the perfect amount of change each time no matter what amount I give them.

Lesson Procedure:

1. On the board or overhead I will review with my students how to give change using whole numbers(no decimals).
2. I will then place them in groups of 2-3 students.
3. I will then explain to them that they are owners of a store and that nothing costs more than 100 dollars. I will then pass out envelopes and calculators(optional) and fake money. I will then purchase something and they will give me the correct change.
4. I will then explain to the students that they are to place money in envelopes that will allow them to give me the perfect amount of change each time so that they don't need to count or add or subtract money from envelopes.

Solution: The individual envelopes they create should have these amounts in them.

<u>Envelope</u>	<u>Amount</u>
1	\$1
2	\$2
3	\$4
4	\$8
5	\$16
6	\$32
7	\$64

The least # of envelopes is 7 containing the amounts above.

The teacher may take this time look at the pattern squares.

Example: Teacher buys something for \$13 dollars and will need \$87 in change.

Students should be able to give me these amounts $64+16+4+3=87$

Variations: Teachers can limit this to \$1.00 or any amount they feel their students can handle

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Grade 5 and

Day 1: Magic Squares

State Standard: Students will use all addition, subtraction, multiplication and division to solve multi-step mathematical problems.

Lesson procedure: This lesson has 3 different levels of learning. Students will use the numbers 1-9 on a 3 by 3 grid to try to get each row in column to add up to the same number(sum). This will be done as guided practice and put on the board. To take the lesson further I will then have students or small groups try to get each row and column add up to the same sum. Students who need a challenge will be assigned to get each row, column, and diagonal add up to the same number.

Solution: This lesson can be found at www.illuminatins.nctm.org

2	9	4
7	5	3
6	1	8

$$1+2+3+4+5+6+7+8+9=45$$

$$45/9=15 \text{ Each row} = 15$$

Friday Activities or Problem of the Week (Days 1-5)

1. The Games of NIM---- These games are played with two players and can be modified to work with any combination. These games are played for fun first keeping in mind the number sense theme. Once they've played several games I will ask them some key questions.

1. Is there a way to guarantee that you will win every time? If so what is your strategy?
2. Is there a pattern to what numbers you choose?

Daisy--- A daisy has 27 petals. Each player can choose 1,2,3,4,or 5 petals. The person who chooses the last petal is the winner.

21--- Add the numbers 1,2,3, or 4 on each turn. The person who reaches 21 wins.

2005---- With a calculator subtract any number 1-99. The first person to 0 is the winner.

7-up--- Take turns adding 1 or 2. The first person to 7 is the winner.

2. Pig----- This is a game that has to do with probability. It also reinforces adding. The game is played with two dice and the object of the game is to get to a total of 100. A player will roll 2 dice and add keep track of his sum. The player can go as many times as he wants keeping track of the sum the whole time. Then, the next player rolls. When the opponent is done, that is the end of round 1. During that round if a player gets a one he loses whatever score he had during that round. If a player rolls two 1's, he loses his total for the game and has to start over. A player may stop anytime he wants giving his opponent a chance to go again.

A good question for this is what is the probability of getting a one? How many times should you roll before you should stop?

3. Hangmath----- The teacher will create a 2 to 4 digit multiplication, addition or subtraction problem. The teacher will present the problem on the board without showing the numbers. The students will try to guess what number goes in each place. If the students are wrong, the teacher will add a piece to the hangman. The game ends either when the guesser has completed the problem or the hangman is complete.

Ex. 642 _ _ _
 X 12 X _ _
 7604 _ _ _ _

4. Newspaper Scavenger Hunt

Objective: Students will use numbers in real world setting.

Materials: Newspaper and Scavenger hunt w.s.(nctm addenda series p. 34)

Lesson: Students will use a newspaper to find numbers to answer the questions that are on the sheet. Once the students find the correct numbers, they are to paste them on their worksheet.

5. The Flashlight problem

The Beatles have only 17 minutes to get to their van so they can make the next concert. To get to the van they have to cross a bridge big enough for only two to cross at a time. To make matters even worse its dark and they have use a single flashlight. Any party of two, who crosses the bridge, must have a flashlight. It can't be thrown across. It takes the Beatles different amount of times to cross the bridge as noted:

Paul	1 minute
John	2 minute
Ringo	5 minutes
George	10 minutes

Any pair of Beatles who cross must walk at the slower one's pace. What is the fastest time they can cross the bridge? Can they do it in 17 minutes?

The following project I found on www.illuminations.org

Mathematics and Football: Unit Overview

Proceed to Lessons (5 total lessons)

In the following lessons, students participate in activities in which they analyze information represented graphically. Students are asked to discuss, describe, read, and write about the graphs and the information they contain. The emphasis on using components of language is natural for students and helps them clarify the information depicted. This lesson includes an individual activity for four different levels plus one for parents to complete with their child at home. The grade levels for the four activities are: K-1, 2-4, 4-6, and 7-8. The fifth activity is appropriate for grades K thru 8 and is to be done at home with the help of the family. This NCTM Publication-Based Lesson Plan is taken from an article entitled "Ideas: Football," by J. David Keller, Daniel J. Brahier, and William R. Speer, appeared in [*The Arithmetic Teacher*](#), January 1993, 264-77.

The ideas in these activities focus on connections between mathematics and football by using the Super Bowl. Students are asked to look at the Super Bowl not just as "the big game" but as an opportunity to apply mathematics to some interesting problems. The activities involve number sense, geometry, measurement, statistics, estimations, and problem solving. The activities are designed to be used in multiple grad levels. They can be used by individual students, small groups, or the entire class. Also included is an activity sheet to be used as a school-home connection. Students are to be encouraged to complete this activity sheet as a family project.

Math Content

In Activity 1, "Figuring in Football" the student will

- * identify and visualize congruent and similar two-dimensional geometric figures, and
- * recognize that rotations, translations, and reflections do not change geometric figures.

In Activity 2, "Get the Picture--Get the Story," the student will

- * enhance problem-solving skills,
- * emphasize mathematics as communication, and
- * create written problems generated by pictures.

In Activity 3, "Super Bowl Scores," the student will

- * determine mathematical combinations, and
- * develop the concept of multiples and combinations of multiples.

In Activity 4, "Football Finances" the student will

- * estimate large numbers, and
- * make written predictions from pictures and other limited information.

In Activity 5, "Super Bowl Scavenger Hunt," the student will work with their parents to

- * use observation and listening skills as a means of collecting data, and
- * distinguish between relevant and irrelevant information to be used in problem solving.

In the following lessons, students participate in activities in which **Individual Lessons**

Lesson 1: Figuring In Football

they analyze information represented graphically. Students are asked to discuss, describe, read, and write about the graphs and the information they contain. The emphasis on using components of language is natural for students and helps them clarify the information depicted.

Lesson 2: Get the Picture--Get the Story

In the following lesson, students participate in activities in which they analyze information represented graphically. Students are asked to discuss, describe, read, and write about the graphs and the information they contain. The emphasis on using components of language is natural for students and helps them clarify the information depicted.

Lesson 3: Super Bowl Scores

In the following lessons, students participate in activities in which they analyze information represented graphically. Students are asked to discuss, describe, read, and write about the graphs and the information they contain. The emphasis on using components of language is natural for students and helps them clarify the information depicted.

Lesson 4: Football Finances

In the following lesson, students participate in activities in which they analyze information represented graphically. Students are asked to discuss, describe, read, and write about the graphs and the information they contain. The emphasis on using components of language is natural for students and helps them clarify the information depicted.

Lesson 5: Super Bowl Scavenger Hunt

In the following lessons, students participate in activities in which they analyze information represented graphically. Students are asked to discuss, describe, read, and write about the graphs and the information they contain. The emphasis on using components of language is natural for students and helps them clarify the information depicted.

Standards

Geometry for Grades Pre-K-2

- * recognize, name, build, draw, compare, and sort two- and three-dimensional shapes .
- * recognize and create shapes that have symmetry.
- * create mental images of geometric shapes using spatial memory and spatial visualization.

Number & Operations for Grades 3-5

- * recognize equivalent representations for the same number and generate them by decomposing and composing numbers.
- * develop fluency in adding, subtracting, multiplying, and dividing whole numbers;

Number & Operations for Grades 6-8

- * develop meaning for integers and represent and compare quantities with them.
- * understand the meaning and effects of arithmetic operations with fractions, decimals, and integers.
- * develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use.
- * develop and use strategies to estimate the results of rational-number computations and judge the reasonableness of the results.

Figuring In Football: Lesson 1 of 5

Overview | [1](#) | [2](#) | [3](#) | [4](#) | [5](#)

Length: 1 period(s)

In the following lessons, students participate in activities in which they analyze information represented graphically. Students are asked to discuss, describe, read, and write about the graphs and the information they contain. The emphasis on using components of language is natural for students and helps them clarify the information depicted.

Learning Objectives

Students will be able to:

- * identify and visualize congruent and similar two-dimensional geometric figures
- * recognize that rotations, translations, and reflections do not change geometric figures

Materials

- * One reproducible "[Figuring in Football](#)" activity sheet for each student
- * Colored markers

Instructional Plan

Background Information

Geometric figures are very much a part of our environment and help define the ways in which we view and interpret our world. Everywhere we look we see the influences of pattern, symmetry, and design. A football field has numerous figures that a young student can easily distinguish and others, which can be rotated or embedded, that may call on spatial skills of a more challenging nature.

Preparing the Investigation

Reproduce a copy of the Activity Sheet "[Figuring in Football](#)," for each student.

Structuring the Investigation

1. Discuss with the class the fact that geometric figures are common in the world in which we live. Sports often use items of both two- and three-dimensional shapes, from the equipment used, such as balls and nets, to the playing fields on which the sports take place. In particular, football fields often include many geometric figures.
2. Have each student locate the geometric figures in questions 1 through 3 on the Activity Sheet. Students might be asked to outline the figures with colored markers.
3. Have the students study the diagram of the football field to answer questions 4 through 6.

Extensions

1. Have students make the same type of drawings for different sports fields, such as those for baseball, soccer, basketball, and tennis.
2. Have students collect from newspapers and magazines information about the Super Bowl that includes references to geometry (e.g. "...the 10-yard *line*..." or "...the two teams *squared off*...").
3. The Activity Page can be enlarged and the figures that students are asked to locate can be cut out. These cutouts can then be used as "figure finders" by placing them on the activity