

# NUMBER SENSE UNIT

## Middle Level Lesson Plans

### **NCTM Standards:**

Students should –

- Develop meaning for integers and represent and compare quantities with them.
- Develop and use strategies to estimate the results of rational-number computations and judge the reasonableness of the results
- 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

These lessons were inspired taken from the MathScape curriculum. Specifically, these lessons are from the Generalizing About Numbers book. They can also be used to enhance the CMP curriculum.

### **LESSON ONE: Day 1**

This is an activity to get students thinking about number operations and different ways to complete the same algorithm.

Students will play the game, “What MUST Be True.” In this game, students will come up with four problems that are difficult to solve quickly. Each problem will use a different operation. They will also write three statements they know are true and one that is false. After writing these problems, each student will exchange papers with someone else to see if he/she can figure out the false statement.

Next, students will be given four different problems. They need to figure out two different ways to figure out each problem.

## **LESSON TWO: Day 2**

In this activity, students will use a calculator to find order of operation patterns.

Students will be given an algorithm using multiple operations to complete on the calculator. (example:  $14/2 - 4 + 1 \times 6 / 3 \times 2 + 10$ ) The students will then have to decide what order the calculator completed the problem to get the answer. When they find patterns, they will be given a number of other problems to answer on their own.

## **LESSON THREE: Day 3**

In this activity students will use colored cubes to represent positive and negative numbers.

The students will be given a number of two different colored cubes. One color will represent positive numbers and the other will represent negative numbers. The students will come up with different ways to represent various positive and negative numbers. Some concepts covered will be all positive cubes, all negative cubes, and zero pairs.

## **LESSON FOUR: Day 4-5**

In this activity students will come up with rules for adding and subtracting positive and negative numbers using the cubes.

The students will be given several addition and subtraction problems using positive and negative numbers. They will come up with ways to represent these algorithms using the cubes.

Next, the students will come up with a rule for adding and subtracting positive and negative numbers. They will need to write the rules in their own words.

They should see that a:

- Positive + Positive = Positive
- Positive + Negative = Positive, Negative, or Zero
- Negative + Positive = Positive, Negative, or Zero
- Negative + Negative = Negative
- Positive - Positive = Positive, Negative, or Zero
- Positive - Negative = Positive
- Negative - Positive = Negative
- Negative - Negative = Positive, Negative, or Zero

## **LESSON FIVE: Day 6**

In this activity students will use cubes to model multiplying different combinations of positive and negative numbers.

Students will list all the different combinations of two signed numbers that can be multiplied. For each combination listed, they will write down some sample problems. Then, they will find a way to use the cubes to model the examples of the problems. They will also draw pictures of these examples. The students will then come up with any conclusions about the problems.

## **LESSON SIX: Day 7**

Now that the students know some rules for multiplying positive and negative numbers, in this activity they will find rules for dividing positive and negative numbers.

The students will again list all the different combinations of two signed numbers that can be divided. They will write down several examples of these problems and using the cubes, they will find solutions to the problems. After completing the problems, the students will find a rule to represent patterns that they find in the answers.

## **LESSON SEVEN: Day 8**

In this activity, students will come up with examples and counter examples of all the rules they have come up with so far. This activity will be used as an assessment.

Students will be given a different set of numbers. For example, they will have 3, -3, 5, and -5. Using these numbers they will have to come up with as many examples as they can, using addition and subtraction to have the answer of 2 or -2.

Students will again do this for multiplication and division with different numbers.

Questions for the students: Can you write a general rule for problems that have positive answers? Can you write a general rule for problems with negative answers?

Students will then be given a series of algorithms. They will estimate if the answer will be positive or negative without completing the problem.

## **ASSESSMENT CRITERIA:**

Does student work show that he/she can...

- Understand how subtracting a negative number and adding a positive number are related?
- Find counterexamples?
- Describe the rule for multiplying and dividing several signed numbers together?
- Understand the meaning of the term rule in mathematics?
- Show important information about an answer to a whole-number addition, subtraction, multiplication, or division problem without doing the calculation?
- Show calculations of exact answers to whole-number problems using different approaches including mental math?
- Show when it is better to estimate and when an exact answer is needed?