Algebra Made Easy

Grade Level: 6th
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Length of Unit: Five math lessons (10 days)

I. ABSTRACT

As we enter the 21st century, the level at which middle school students comprehend concepts in Algebra is decreasing. Why? Either they do not like Algebra because they do not understand it, or they understand it with a lack of appreciation. Math teachers know that you have to appreciate Algebra in order to excel in it fully. This workshop is designed specifically to aid students with difficult concepts in Algebra and to enable them to enjoy Algebra concepts with a major focus on engaging the student in hands-on experimentation with Integers. These lessons are great for inclusion of special education students in the regular classroom.

II OVERVIEW

A. Concept Objectives
   1. Students will understand relationships between positive and negative numbers.
   2. Students will appreciate the application and use of integers in day-to-day transactions.

B. Core Knowledge Sequence
   1. Locate positive and negative numbers on a number line.
   2. Compare integers using <, >, =.
   3. Know that the sum of an integer and its opposite is zero.
   4. Add and subtract positive and negative numbers.

C. Skill Objectives
   1. Comparing integers
   2. Recognizing integers
   3. Critical thinking
   4. Adding integers
   5. Subtracting integers
   6. Multiplying integers
   7. Dividing integers
   8. Understanding absolute value
   9. Defining vocabulary
   10. Expressing ideas in oral and written form

D. Standardized and State Objectives
   1. The students select the higher integer between two given integers.
   2. The student will multiply and divide positive and negative numbers.
   3. The student will compare and order whole numbers, integers, fractions, decimals, and percents.
   4. The student will identify different names for numbers including number words (whole numbers, integers, fractions, decimals, and percents).
   5. The student will perform computation with whole numbers, integers, fractions, and decimals.
   6. The student will write a given positive integer as the product of a unique set of prime factors (The Fundamental Theorem of Arithmetic).

III BACKGROUND KNOWLEDGE

A. For Teachers
   1. Pre-Algebra: A Transition to Algebra. Merrill
   2. Exploring Algebra & Pre-Algebra with Manipulatives. Don Balka

3. Pre-Algebra. Kelly Wingate Publication

B. For Students
   1. Number sense
   2. Basic operations
   3. Writing skills
   4. Critical thinking skills

IV RESOURCES

A. CD-ROM
   1. Pre-Algebra. Davidson
   2. Alge-Blaster 3. Davidson
   3. Astro Algebra. Edmark

B. Books
   1. Pre-Algebra: A Transition to Algebra. Merrill
   2. Exploring Algebra & Pre-Algebra with Manipulatives. Don Balka
   3. Pre-Algebra. Kelly Wingate Publication

V LESSONS

Lesson One: Introduce Integers

A. Objectives:
   1. Lesson Content: Introducing Integers
   2. Concept Objective: Students will appreciate the application and use of integers in day-to-day transactions.
   3. Skill Objectives:
      a. Recognizing positive and negative numbers
      b. Locating points on a number line

B. Materials
   1. Chart paper
   2. Markers
   3. Vocabulary sheet

C. Background Notes

D. Vocabulary:
   1. Integers
   2. Absolute value
   3. Coordinate

E. Procedures/Activities
   1. Prior to beginning the lesson on integers, teacher distributes a copy of the vocabulary sheet and instructs students to keep a vocabulary log.
   2. Teacher shows examples of positive and negative numbers.
   3. Using chart paper and markers, the students are instructed (groups of four) to illustrate an example in which positive and negative numbers are used in the real world.
   4. Upon completion, each group will post its illustrations on the wall and explain the drawing to the class.
   5. Teacher draws a number line on the chalkboard and identifies the parts of it.
   6. Homework: Students locate the integer points on a number line (coordinate).

F. Evaluation/Assessment: Students products and discussion.

Lesson Two: Absolute Value

A. Objectives:
   1. Lesson Content: Absolute value

2. Concept Objective: Students will understand the relationship between positive and negative numbers.
3. Skill Objectives:
    a. Identify numbers and their opposites.
    b. Determine absolute value of integers.
    c. Narrative writing.

B. Materials
1. Material: journal notebook

C. Background Notes

D. Key Vocabulary
1. Absolute value

E. Procedures/Activities
1. Teacher defines absolute value by using a number line.
2. Students are given a number and its opposite. They are asked to draw a number line illustrating their number and its opposite.
3. Teacher asks the students to count in units the distance of a number and its opposite are from zero.
4. Students discover the distance from zero is the same, and that distance is measured in positive numbers.
5. Homework: Students will determine the absolute value of integers.

F. Evaluation/Assessment
1. Students will write a narrative in their journal that indicates an understanding of integers.

Lesson Three: Comparing and Ordering

A. Objectives:
1. Lesson Content: Comparing and Ordering Integers
2. Concept Objective:
    a. Students will understand relationships between positive and negative numbers.
    b. Students will appreciate the application and use of integers in day-to-day transactions.
3. Skill Objectives:
    a. Plot points on a number line
    b. Use a number line to compare and order integers

B. Materials
1. pattern of a frog
2. chart paper
3. markers
4. journal

C. Background Notes

D. Vocabulary
1. compare
2. order
3. inequalities

E. Procedures/Activities
1. Introductory Activity: Brainstorm positive integer words and their opposites. Write them in two columns on the board. Examples: credit, debit.
2. Students are instructed to make a list in their journal (pair and share).
3. Teacher will use a number line with two graphed points and write two inequalities.
4. Students will model what the teacher is doing.
5. Teacher encourages the students to use a number line when comparing and ordering integers.

6. Reteaching Activity: A frog is trying to jump out of a hole ten feet deep. After each three-foot jump, he slides back one foot. Have students draw a number line or a frog in a hole with –10 being his starting point and 0 being ground level. Have students plot each jump and slide and tell whether each new location is < or > the previous position.

F. Evaluation/Assessment
   1. Students will write a word problem using integers in their journal and explain the solution using a number line.

Lesson Four: Adding Integers

A. Objectives:
   1. Lesson Content: Adding Integers
   2. Concept Objective: Students will understand relationships between positive and negative numbers.
   3. Skill Objectives:
      a. Students will use counters to model addition with integers.
      b. Students will add integers with the same signs.
      c. Students will add integers with different signs.

B. Materials
   1. counters
   2. mat
   3. overhead projector

C. Background Notes

D. Key Vocabulary
   1. zero pair

E. Procedures/Activities
   1. The teacher will motivate exploration by leading a discussion on adding integers in relation to everyday life activities. For example: checkbook, football, shopping, etc.
   2. The teacher models each example for the entire class using manipulatives (transparent counters in red and yellow on overhead projector).
   3. Divide the class into small groups. Use two different colored counters to represent the positive and negative integers. Each group will need a packet of ten positive and ten negative counters.
   4. With the counters, the students will model addition sentences using integers. They will record and share their results with the class.
   5. The teacher will use the counters to model addition and solve. For example, -4+(-3) means to combine a set of two negative counters with a set of three negative counters, the result is –2. In this case, three zero pairs (pair positive and negative) must be removed to obtain a negative two. *Remember that as many zero pairs as possible may be removed or added because removing or adding zero does not change the value of the set or problem.
   6. The students will model and give the results of ten addition sentences.
   7. Homework: Adding integers by drawing models

F. Evaluation/Assessment
   1. Check student addition sentences

Lesson Five: Subtracting Integers

A. Objectives:
   1. Lesson Content: Subtracting Integers
   2. Concept Objective: Students will understand relationships between positive and negative numbers.

3. Skill Objectives:
    a. Students will be able to model integer subtraction.
    b. Students will begin to understand the connection between addition and subtraction.
    c. Students will be able to subtract integers.

B. Materials
1. counters
2. mat
3. overhead projector

C. Background Notes

D. Key Vocabulary

E. Procedures/Activities
1. The teacher will motivate exploration by using manipulatives. Encourage students to model operations, for example, +6-(+4). Have them make notes about what occurs in each operation.
2. The teacher will model an operation for the students. Let the students hypothesize and justify the steps of solving before revealing the solution.
3. Divide the students into small groups. Each one receives a packet of ten positive and ten negative counters(identified by color).
4. The teacher reads the following: "Kathy owes you $20, but she only has $13. So you want to take $20 from her $13. Therefore, the operation to perform is 13-20. How is this possible?" The teacher accepts all possible answers before revealing the solution. Answer: she still owes you $7.
5. Class exercise: What does –10-4 mean? Model this operation. Explain how zero pairs are used in subtraction.
6. Homework: Students subtract integers by converting operations to addition.

F. Evaluation/Assessment
1. Students will explain how to subtract integers in their journals.

Lesson Six: Multiplying and Dividing Integers

A. Objectives:
1. Lesson Content: Multiplying and Dividing Integers
2. Concept Objective: Students will understand relationships between positive and negative numbers.
3. Skill Objectives:
    a. Students will develop and apply rules for multiplying integers.
    b. Students will develop and apply rules for dividing integers.
    c. Students will work cooperatively in a group.

B. Materials
1. chart paper
2. markers

C. Background Notes

D. Key Vocabulary: commutative property

E. Procedures/Activities
1. The teacher will recall basic multiplication and division facts. For example, multiplication is a repeated addition.
2. Students will model multiplication and division using the commutative property.
3. The teacher will introduce the rules for multiplying and dividing integers. Students copy the rules and examples provided by the teacher.
    a. The product of two integers with different signs is negative.
    b. The product of two integers with the same signs is positive.
    c. The quotient of two integers with different signs is negative.

d. The quotient of two integers with the same signs is positive.

4. The students will provide example operations for each rule that the teacher writes on the board.
5. Have students get in small groups. Each group will receive markers and a piece of chart paper. Have students write a descriptive phrase for what the expression −6x5 could mean. Students may illustrate this expression.
6. On the same chart paper, have students write or illustrate a word problem using multiplication or division of integers. The students will share their writings and drawings.
7. Homework: Multiplying and dividing integers

F. Evaluation/Assessment
1. Assess word problems and drawings

VI. CULMINATING ACTIVITY

A. The teacher will have students write a story in their journal related to integers
1. Indicate rules/procedures
2. Must be problem-solving
3. Be creative

B. The teacher will have students write four word problems in their journal
1. Adding integers
2. Subtracting integers
3. Multiplying integers
4. Dividing integers

C. The teacher will have students draw a picture in which integers are used in the real world or make a collage.

D. The teacher will have students participate in several review activities using integers

VII. HANDOUTS/WORKSHEETS

Adding and Subtracting Integers from Kelley Wingate Publications, Pre-Alegbra, 1995, CD-3731, p. 45

Problem Solving with Integers from Kelley Wingate Publications, Pre-Alegbra, 1995, CD-3731, p. 51

Exploring Algebra, 3m Didax Educational Resources, Inc., 1995

Exploring Algebra, 4, Didax Educational Resources, Inc., 1995

VIII. BIBLIOGRAPHY

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Davidson, Alge-Blaster 3. (CD-ROM)

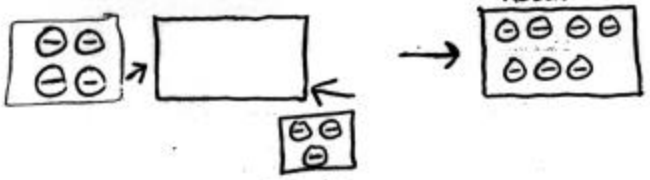
Edmark, Astro Algebra. (CD-ROM)

Merrill, Pre-Algebra: A Transition to Algebra.

Pre-Algebra. Kelly Wingate Publication

Adding Integers

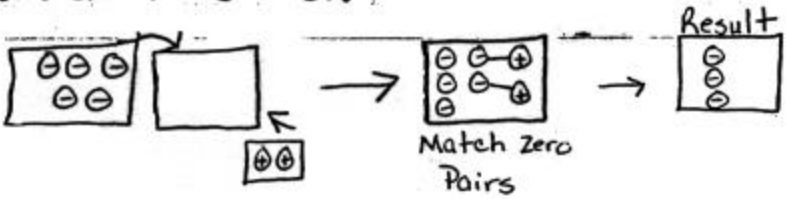
* Consider: $-4 + (-3)$.



$-4 + (-3) = -7$

Combine a set of four negative counters with a set of three negative counters.

* Consider: $-5 + 2$.



$-5 + 2 = -3$

Subtracting Integers

* Consider: $-6 - (-2)$

Subtract two negative counters from six negative counters

$-6 - (-2)$

$-6 + 2 = -4$