

TEACHER'S GUIDE

MATH SERIES

**INTEGER OPERATIONS:
Into the Negative Zone, Part 1
Adding and Subtracting**
18 Minutes

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FOR USE IN: Mathematics

LEVEL: Grades 7-9, Advanced Grade 6

EDUCATIONAL ADVISOR: Richard Albero, Math Instructor, Briarcliff Manor High School, MS Educational Psychology, MS Physics

GUIDE WRITTEN BY: Dr. Alexander Karp, Assistant Professor of Mathematics Education
Teachers College, Columbia University

EDUCATIONAL OBJECTIVES:

To help students understand:

- **negative numbers**
- **integers**
- **addition and subtraction of integers.**

BACKGROUND INFORMATION:

Negative numbers are widely used in everyday life. They are also necessary for mathematical theory. Acquaintance with negative numbers, and the ability to perform operations that employ negative numbers, is necessary both for further studies in mathematics and for solving everyday problems. It is worth mentioning that some of the concepts to which students are introduced in the course of this lesson are generalized in other mathematical applications (for instance, the notion of the inverse operation and the additive inverse).

BEFORE SHOWING THE VIDEO:

The video contains several optional pauses where the students are presented with calculations to complete, while the VCR may be placed on pause. After

the pause, correct answers are given. If the teacher plans to use these pauses, the students may be requested to have paper and pens available before starting the video. For a more intensive interaction between students and parts of the video, the teacher may wish to pause the tape after the presentation of a particular concept to inquire if the students have understood it; and/or ask the students before starting the video to signal the teacher to stop at any point for clarification. The video may also be shown in its entirety without pause either as an introduction or a review of the subject. It is always helpful if teachers are able to view the video before showing it to the class.

The concept of zero may be discussed. Situations that involve amounts that are less than zero -- temperatures, for instance -- may be mentioned. Students may also be reminded that subtraction is not always possible within the set of positive numbers. For instance, there is no positive number x such that $x+5=3$. Using only positive numbers we cannot answer questions such as: "what balance will be left on John's credit card if he owes \$5,000 and all that he has now to pay with is \$3,000?" The teacher can point out that in order to answer questions like this one, new types of numbers must be introduced. This leads to a discussion of the operations that involve these new numbers (negative), as well as operations that involve both the new and the old (positive) numbers.

CONTENT OF THE VIDEO:

The key concepts explained are: negative numbers, integers, addition and subtraction of integers. Several examples of the use of negative numbers are offered. The notation for negative numbers is explained. Addition and subtraction are illustrated with a block of wood in which the smooth surface represents zero, holes drilled represent negative numbers, and wooden pegs removed represent positive numbers, so that the sum of a positive peg and a negative hole is zero (a wooden peg fits into a hole leaving a smooth surface - zero). The video explains by visualizing that subtracting say, negative 3 (removing 3 holes) is the same as adding positive 3 (inserting 3 positive plugs into 3 holes). Addition and subtraction can also be visualized by using the number line. The addition of a positive number (say, 3) is represented as a movement to the right (by 3 units). Conversely, the addition of a negative number (-3) is represented as a movement to the left (by 3 units). Correspondingly, the subtraction of a positive number is represented as a movement to the left, and the subtraction of a negative number is represented as a movement to the right.

AFTER SHOWING THE VIDEO:

Students may be offered the following exercises and questions:

1. Calculate:

- a) $-3+(-7)$
- b) $-3+5$
- c) $7-9$
- d) $12-(-2)$
- e)

2. Mark on the number line:

- a) the number 5
- b) the number -3
- c) the distance between these marked points. That is what is the difference $5-(-3)$?

3. Can the sum of positive and negative numbers be positive? Negative?

4. Can the sum of positive numbers be positive? Negative?

5. Can the difference of two positive numbers be positive? Negative?

6. Can the difference of two negative numbers be positive? Negative?

The concept of absolute value may be introduced: the absolute value of a positive number is this number itself, and the absolute value of a negative number is its opposite; the absolute value of zero is zero. This gives us certain rules: to add two negative numbers, we have to add their absolute values and then change the sign from a plus to a minus; to add a positive number and a negative number, when the absolute value of the negative number is larger than the absolute value of the positive number, we have to subtract the absolute value of the positive number from the absolute value of the negative number and then change the sign from a plus to a minus. Other rules can be formulated by the students.

EXPLORING AND INVESTIGATING:

The following questions may be used to draw students into a deeper discussion:

Give an example of a situation in which one has to:

- a) add two positive integers
- b) add two negative integers
- c) subtract two negative numbers.

2. Write an essay about how inconvenient life would be without negative numbers.

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The Math Series consists of 10 videos:

ALGEBRA: A Piece of Cake Part 1

ALGEBRA: A Piece of Cake Part 2

SLOPES: That's a Bit Steep!

PERCENTAGES That Make Sense

LINEAR EQUATIONS and Their Graphs: Let's Get It Straight Part 1

LINEAR EQUATIONS and Their Graphs: Let's Get It Straight Part 2

INTEGER OPERATIONS: Into the Negative Zone Part 1 Adding and Subtracting

INTEGER OPERATIONS: Into the Negative Zone Part 2 Multiplying and Dividing

FACTORING IS FANTASTIC Part 1: Common Factors

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**BENCHMARK MEDIA 569 NORTH STATE ROAD, BRIARCLIFF MANOR, NY
10510 TEL: 914/762-3838, 1/800-438-5564 FAX: 914/762-3895 E-MAIL:
benchmedia@aol.com**