TEACHER'S GUIDE

MATH SERIES

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

12 Minutes

Distributed by BENCHMARK MEDIA

FOR USE IN: Mathematics

LEVEL: Grades 7-9, Advanced Grade 6

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EDUCATIONAL OBJECTIVES:
To help students understand:

- **the multiplication and division 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 content of Integer Operations, Into the Negative Zone, Part 1, Adding and Subtracting, might be reviewed. In particular, students might be asked to add -2+(-2), -2+(-2)+(-2), -2+(-2)+(-2)+(-2). After this, the teacher might ask how the multiplication of positive integers can be described in terms of addition. The teacher may explain that the product -2 times 4 can in fact be seen as the sum of 4 copies of -2. The teacher may then ask: how can we find the products of integers in other cases? The role of division as a reverse operation for multiplication may be discussed. In particular, students may be reminded that 2x3=6 means that 6÷3=2, and that 3x4=12 means that 12÷4=3, etc. This leads to the conclusion that multiplication is the key operation that must be defined, and that it will be possible to use multiplication while working with division.

CONTENT OF THE VIDEO:

The key concepts explained are the multiplication and division of integers. The narrator makes use of patterns observed while constructing a multiplication table for finding the product of: two negative numbers; a negative and positive number, and two positive numbers. The order of the integers in a multiplication calculation is irrelevant, that is, ab=ba for any integers a and b. The sign for the result of the division is determined by the fact that division is the reverse operation for multiplication.

AFTER SHOWING THE VIDEO:

A few other models for defining the products of integers may be suggested:

1. Each day John writes a check for $25 and his checking account balance shrinks by $25 (this situation can be represented as adding of -$25 to his checking account each day). In four days, it will be (-25) x4=-100. Compare John's account now and 4 days ago. How much larger was the balance in John's account 4 days ago? Answer:(-25) x(-4)=100."

Every minute a point moves 3 units to the left on the number line (addition of -3). In 5 minutes it will move (-3) x5=-15 units. Describe its position 5 minutes ago. Was it to the right or to the left of its current position? Answer: (-3) x(-5)=15, the point was 15 units to the right of its current position.

When discussing division, it should be pointed out that the result of the division of two integers may be an integer, but may also not be an integer.
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. The product of two negative numbers is equal to the product of their absolute values. The product of a negative and a positive number is equal to the product of their absolute values, but with the opposite sign. Some practice exercises should be offered. For example, find: a) (-5) x2, b) (-6) x(-4), c) (-18) ÷3, etc.

<u>EXPLORING AND INVESTIGATING:</u>
The following questions may be used to draw students into a deeper discussion:
Read the following:

a)
$(-3)\cdot 2+3\cdot 2=\big((-3)+3\big)\cdot 2=0\cdot 2=0$ **. Is the reasoning correct?**
Use it to explain that $(-3)\cdot 2=-6$ **.**

b)
$(-3)\cdot(-2)+(-3)\cdot 2=(-3)\cdot\big((-2)+2\big)=(-3)\cdot 0=0$ **. Is the reasoning correct?**
Use it to explain that $(-3)\cdot(-2)=6$ **.**

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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
FACTORING IS FANTASTIC Part 2: Quadratic Trinomials

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