TEACHER'S GUIDE

MATH SERIES

ALGEBRA: A Piece of Cake, Part 1

19 Minutes

Distributed by BENCHMARK MEDIA

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 the students understand:

- **concept of a variable**
- **numerical substitution**
- **algebraic conventions such as the omission of the multiplication sign**
- **developing algebraic formulas from number patterns**

BACKGROUND INFORMATION:
Since the sixteenth century, variables and formulas have been the key concepts and instruments of algebra. Formulas offer an easy example of connected variables and therefore provide a helpful preparation for the further study of functions. In this video, mathematical formulas are represented through some real-life situations. Formulas -- together with the related concepts of introducing variables, solving equations, and so on -- are a cornerstone for the further study of mathematics.

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.

Some questions that may be used to stimulate discussion prior to viewing the video:
1. Assume that three pieces of candy are given to each student in this class. If there were only 2 students in the class, how many pieces of candy would each receive? How many pieces to each in a 3 student class? In a 15 student class?
2. John covered 18 miles during the first day of his journey, and then covered 15 miles every day after that. How many miles did he cover during the first two days? During the first three days? During the first six days?
3.The sales tax in one state is $8.25 on a $100 purchase. How much sales tax is paid on a $200 purchase? On a $500 purchase?
The teacher may point out that questions similar to the ones above are typical for many situations. Therefore, it is useful to develop some convenient mathematical instrument for dealing with them.

CONTENT OF THE VIDEO:
The concepts of variables and formulas are introduced using practical real-life examples: the narrator calculates the amounts of different ingredients called for by a cake recipe to cook and serve a large party.
She explains that variables are letters, which represent numbers. It is shown that any letter can be used. One can choose C for the number of cakes and E for the number of eggs, or D for the number of spoons of cocoa (because using C for cocoa would be confused with the C used for cakes) or any other letter. However, the letters x and y are the most commonly used variables in mathematics. Students are expected to be familiar with certain patterns. Formulas (equations) are usually more convenient and precise than words for explaining rules and patterns. Although no formal definition of a formula is given, the video explains how formulas work by producing an output from an input. A number of examples are presented. In particular, in certain cases a formula generalizes the relations between two values (say x and y) presented in a table; in other cases, it helps to find unknown values. The video explains how formulas should be written, to avoid confusion. For example, because the sign x if used for “multiplied by” can be confused with the letter X used as a variable, the expression, t multiplied by 3, should not be written as, t x 3, but rather by placing the number 3 in front of the t, as 3 t, which is understood to mean 3 times t. Similarly, because the 'divided by' sign can be mistaken for a 'minus' sign, .z divided by 3, should not be written as z÷3 but rather as $\frac{z}{3}$
The video also contains an example of how a linear equation is solved.

AFTER SHOWING THE VIDEO:

Some suggestions for further discussion:

1. Explain whether the following formulas are written in the preferable form. If not, rewrite them. p=t x 2, y=x3, S=4k-1, z=2x(y-4)-(1).
2. Here is a rule: output equals input times 3 and minus 1. Write this rule as a formula, using variables.
3. Here is a rule: to get the output, you must subtract 1 from the input and then multiply the difference by 4. Write this as a formula, using variables.

The questions suggested before the video can be discussed and the respective formulas can be deduced. These formulas can then be used to answer questions such as:

a) How many pieces of candy will be given to 12 students?
b) 48 pieces of candy were distributed. How many students received them?
c) The sales tax on a purchase was $33. How much was paid for the purchase?

EXPLORING AND INVESTIGATING:

Students may be involved in some deeper investigation using the following questions.

1. Suggest some situations that can be described using the formula y=4t. (For example, an athlete can do 4 exercises per minute. The number (y) of exercises performed in t minutes equals 4t; this implies y=4t, etc.)
2. Suggest a formula for the area (A) of a square whose side is equal to a. (This formula is more complicated than the one used before. The teacher may point out that sometimes really sophisticated formulas are used).
3. Mike decided to make up formulas for counting the numbers of legs of chickens (c) and horses (h) when the numbers of chickens and horses are given. He ended up with the following answer: c=2x, h=4x. Do you like these formulas? (The use of the same letter x can be confusing in situations that involve working with both formulas.)
4. Give some examples, in essay form, of specific ways in which formulas can be helpful.

The complete 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

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