

Describing the Ideal School

Blue Ribbon Algebraic Learning Communities

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Blue Ribbon Algebraic Learning Communities Lesson Plan

Introduction:

Students will follow an activity from their text book to create equations that describe relationships about their ideal school. The lesson was taken from the standards based text Mathscape Course 2-The Language of Algebra.

Lesson Objectives - Students will:

- Use variables to write expressions.
- Write equations that relate two or more variables.
- Interpret equations that relate two or more variables.
- Generate a table of values that satisfy an equation.

West Virginia Content Standards and Objectives:

Standard 2: Algebra (MA.S.2)

Students will:

- represent and analyze mathematical situations and structures using algebraic symbols;

Objectives:

Students will:

MA.7.2.2 simplify and evaluate numerical and algebraic expressions with whole numbers, integers, absolute value and exponents using the order of operations and exponential rules.

MA.7.2.9 solve one-step linear equations containing whole numbers, fractions, decimals and integers with integer solutions.

MA.7.2.13 represent and solve real world problems appropriate for 7th grade using multiple strategies.

Materials:

- Chart paper (optional)
- Marking pens (optional)
- Tape (optional)
- Copy of Pgs 184-185, 212 Mathscape 7th Grade
- Overhead
- Transparency

Time required: 45 minutes

Prior Knowledge:

Students should have some knowledge of variables.

Students should be able to read, listen, and follow a set given directions.

Procedures:

- 1) Review with the students what a variable is. Have them give you the definition and some examples. Ask the students why variables are used in mathematics.
- 2) Lead the students in making a list of variables relating to schools. For example: c = custodians, n = books, etc...
- 3) Have the students read the list of school related variables on pg 184. Explain that when you combine variables with operation signs you create expressions. Combine some of the variables from the created list for the students as an example.
- 4) Pair the students up.
- 5) Have the students work together on item 1 to state what each expressions stands for. Discuss as a class.
- 6) Move on to item 2 and have the students use variables to make expressions that correspond with the words. Discuss as a group.
- 7) The pairs will then work on item 3. They will develop expressions of their own using the variables in the book and the class generated list. Encourage them to use all operations.
- 8) Ask the students to volunteer their written expressions.
- 9) Write each expression on an overhead and have the other pairs tell you what the expressions stand for.
- 10) Lead the students to talk about equations and what they are. Discuss how algebra using two expressions combined together to form equations.
- 11) Discuss the sample equations on pg 185 with the students.
- 12) Have the students come up with five equations to describe their ideal school.
- 13) Have them write what the equations represent on another sheet of paper.
- 14) The students will then trade equations and write the translations of the equations in words.
- 15) Bring the class together and ask for volunteers to share some of the equations. Write a few of the equations on the board.
- 16) Use the equations you gathered as a group to make a table showing some sample values to fit the equation.
- 17) Wrap up with a class discussion of what was learned.
- 18) Assign homework pg 212.

Assessment:

- Students will be observed as they are working through the investigation to assess level of understanding.
- Student's homework will be assessed for accuracy.

Performance Descriptors (MA.PD.7.2)

- **Distinguished**

The student demonstrates exceptional and exemplary performance with distinctive and sophisticated application of knowledge and skills that exceeds the standard in algebra. The student solves one-step linear equations to show sample data. The student evaluates and justifies solutions in a clear and concise manner.

■ **Above Mastery**

The student demonstrates competent and proficient performance and shows a thorough and effective application of knowledge and skills that exceeds the standard in algebra. The student solves and graphs one-step linear equations. The student evaluates solutions.

■ **Mastery**

The student demonstrates fundamental course or grade level knowledge and skills by showing consistent and accurate academic performance that meets the standard in algebra. The student writes, simplifies and evaluates algebraic expressions with no more than two variables, and solves one-step linear equations.

■ **Partial Mastery**

The student demonstrates basic but inconsistent performance of fundamental knowledge and skills characterized by errors and/or omissions in algebra. Performance needs further development. The student writes expressions for word phrases.

■ **Novice**

The student demonstrates substantial need for the development of fundamental knowledge and skills, characterized by fragmented and incomplete performance in algebra. Performance needs considerable development.

Accommodations:

- Provide oral and written instructions.
- Allow students to work in pairs.
- Visual/Spatial learner: Provide examples of what variables represent on board (example $c = \text{custodians}$), write expressions and what they represent on overhead, and as a class drawing the table on the board during the class discussion.
- Bodily/ Kinesthetic learner: Being able to make tables showing sample values to fit their equations that describe their ideal school, on the board or at their seat, compared to just watching someone else develop the tables.
- Interpersonal learner: Provide an opportunity for these students to discuss their work with one or more classmates.

Associated Web Sites and Links:

Expressions and Equations Worksheet

- May be used to offer practice writing expressions and equations, and it could be a follow up to this activity.

http://www.mathgoodies.com/worksheets/exp_eqns_wks.html

Self Check Quiz

- Interactive site from Glencoe giving students practice with expressions and equations. Self-Check Quizzes randomly generate a self-grading quiz correlated to each phase in your textbook. Hints are available if you need extra help. Immediate feedback that includes specific page references allows you to review skills.

<http://www.glencoe.com/sec/math/mathscape/2005/course2/phase/index.php/>

Algebra Flashcards

- Interactive site that allows the user to choose what type of equations (addition, subtraction, multiplication, division, one step, and/or two step) that they want to practice solving. After the answer is given, correct or incorrect, the steps to find the correct answer are given. This could be used as practice after completing standards based math activity.

<http://www.aplusmath.com/Flashcards/algebra.html>

Resources:

Seeing and Thinking Mathematically project at Education Development Center, Inc. (2005). *Mathscape seeing and thinking mathematically course 2*. Columbus, OH: Glencoe/McGraw Hill.

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Describing the Ideal School

WRITING
EXPRESSIONS AND
EQUATIONS

How can mathematics be used to help describe the ideal school? You will start by setting up some variables and using them to write expressions. Then you can write equations to describe relationships about the school.

Write Expressions About a School

How can you use variables to write expressions?

You can put variables together with numbers and operations (+, −, ×, and ÷) to write **expressions**. For example, the expression $b + g$ represents the number of boys plus the number of girls, or the total number of students.

1 Tell what each of the following expressions represents.

a. $t + b + g$

b. pl

c. $(b + g) \div t$

2 Use variables to write an expression for each of the following.

a. the total number of class periods per week

b. the number of teachers who do not teach math

c. the percentage of teachers who teach math

3 Write at least three new expressions that describe a school. You can use the variables listed above, the variables your class added, or completely new variables. If you use new variables, be sure to write down what they represent. Be prepared to share your expressions with the class.

Variables

A **variable** is a letter or symbol that represents a quantity. Here is some information about any school that can be represented by variables.

t = number of teachers at the school

m = number of math teachers at the school

b = number of boys at the school

g = number of girls at the school

p = number of class periods in one day

l = length of one class period, in minutes

Write Equations About the Ideal School

Imagine the school of your dreams. Work with a partner to describe the school using equations.

- Use the variables on page 184 or the variables your class added to write at least five equations that describe your ideal school. On a separate sheet of paper, make an answer key telling what the equations represent.

- $m = 0.35t$
-
-
-
-

- Trade your set of equations with another pair of students. (Hang onto the answer key!) For each of the equations you receive, write a translation of the equation into words.

- For each equation, make a table showing some sample values that fit the equation.

- Trade back papers and see if your equations were interpreted correctly. Is there anything you would do differently? Be prepared to discuss this with the class.

Translation	Table						
<p>1. $m = 0.35t$ 35% of all teachers are math teachers.</p>	<p>1. $m = 0.35t$ 35% of all teachers are math teachers.</p> <table border="1"> <thead> <tr> <th>t (teachers)</th> <th>m (math teachers)</th> </tr> </thead> <tbody> <tr> <td>100</td> <td>35</td> </tr> <tr> <td>60</td> <td>21</td> </tr> </tbody> </table>	t (teachers)	m (math teachers)	100	35	60	21
t (teachers)	m (math teachers)						
100	35						
60	21						

What equations can you write to help describe the ideal school?

Equations

An **equation** describes a relationship between two expressions. An equation tells you that two expressions are equal. Here are some examples.

$g = b + 43$ The number of girls equals the number of boys plus 43.

OR

There are 43 more girls than boys.

$m = \frac{1}{5}t$ The number of math teachers equals one-fifth of the total number of teachers.

OR

One-fifth of all teachers are math teachers.

hot words | expression
equation

Homework

page 212



Describing the Ideal School

Applying Skills

These variables represent information about a particular math class.

s = number of students in the class.

g = number of girls in the class.

r = number of students in the class with red hair.

b = number of students in the class with black hair.

t = number of textbooks given to each student.

h = number of hours of classes each day.

Tell what each of the following expressions represents.

1. $s - g$

2. $b + r$

3. $5h$

4. st

5. $s - b$

6. $(g \div s) \times 100$

Write an expression for each of the following:

- the number of students who do not have red hair
- the number of textbooks handed out to girls
- the number of minutes of classes each day
- the number of textbooks handed out to boys
- the percentage of students who have black hair

Write an equation that says ...

- there are 16 more students with black hair than students with red hair.
- there are twice as many students as girls.
- 40% of the students have black hair.

Translate each equation into words. Then make a table showing four pairs of sample values that fit the equation.

15. $s = b + 21$ 16. $b = 4r$ 17. $s = 2g + 5$

Extending Concepts

- Write an equation that says that y is equal to 25% of x . Then make a table of values that fit the equation. For x , pick whole numbers ranging from 1 to 10. Write y as a decimal.
 - Repeat part a. This time, use fractions instead of decimals.
- Does it make sense for any of the variables listed at the top of the page to take values that are not whole numbers? If so, which ones?

Making Connections

- The gravity on Jupiter is 2.64 times the gravity on Earth. This can be represented by the equation $J = 2.64E$. Make a table of values that fit the equation. If a person weighs 125 lbs on Earth, how much would the person weigh on Jupiter?