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## Vocabulary and Symbols

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*The following material was taken from a publication entitled Reading the Language of Mathematics, put out by the Florida Department of Education.*

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### Reading Mathematical Symbols

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#### SAMPLE ACTIVITY:

Make a set of cards with phrases of mathematical symbols. Have a student come to the front of the class and give him one of these cards. Don't allow the rest of the class to see what is on the card. The student then reads out loud (in words) what is on the card. The other students write the symbols for what they hear, and then compare their answers.

$$3 + 2$$

$$\frac{1}{7}$$

$$\frac{2}{3} + 4$$

$$\frac{2 + 1}{7} + (1 \times 4)$$

$$\frac{(x + y)^2}{(x + y)}$$

$$\text{LOG}_3 X = 2$$

NOTE: Parentheses should not have to be silent. For greater clarification, have the student actually say, "Three minus, parenthesis two plus seven parenthesis," for " $3 - (2 + 7)$ ."

SAMPLE ACTIVITY:

Have students rewrite or read orally mathematical expressions.

Example:  $7 \times 2$  "seven times two" or "seven multiplied by two"

$$3 \times 5$$

$$4 \sqrt{8}$$

$$16 \div 2$$

$$4 - 3$$

$$5 \cdot 3$$

$$\sqrt{25} + 2$$

$$\sqrt[3]{27}$$

$$33/11 \times 3$$

$$3^3$$

SAMPLE ACTIVITY: "Find your Partner"

The teacher makes two sets of cards - one set with mathematical abbreviations and the other with the unabbreviated words. The class can be divided into two equal groups. One group will take the unabbreviated words and the other group will take the abbreviations. After a signal from the teacher, all the students will "scramble" to find their "partners." A person's partner is a person who has a matching card.

SAMPLE ACTIVITY:

Pictures can be drawn to interpret mathematical symbols. Along with the pictures, words can be used for a symbol. This idea can be expressed via the following exercise:

Complete:

<i>Symbol</i>	<i>Word</i>	<i>Picture</i>
3	three	
$\overleftrightarrow{AB}$	line	
$\frac{1}{2}$	one half	
4	four	
$\sphericalangle$	angle	

NOTE: In order to use this activity, the teacher would fill in only one of the columns. For variation, only one item from each column could be filled in, and have the students supply the missing information.

SAMPLE ACTIVITY:

Have students describe orally the situation or object expressed by each of the following:

1.  $72^\circ$
2.  $-20^\circ$
3.  $+35$
4. 0
5.  $6'$
6.  $5' 3''$
7.  $\triangle$
8.  $\sin 30^\circ$
9.  $f(x)$

SAMPLE ACTIVITY:

Have students write a division sentence and a short story to represent the drawing:



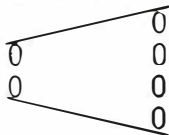
SAMPLE ACTIVITY: (For elementary-aged students.)

Have students work with a pictorial development of the meanings of  $=$ ,  $<$ , and  $>$ , as well as the words.



$3 = 3$

"is equal to"



$2 < 4$

"is less than"



$3 > 1$

"is greater than"

SAMPLE ACTIVITY:

Have the students discuss the meaning of "\_\_\_\_\_" in each of the following:

1.  $\overline{AB}$

3.  $\overline{4}$

2.  $8 - 2$

4.  $3.\overline{3}$

## Directionality of Reading Mathematical Symbols

### SAMPLE ACTIVITY:

Make a wall chart that contains some symbols that may create a problem in reading. Guide the students through a discussion of the directions they take in reading them. With a colored pen, draw arrows to indicate the directions taken. In addition to drawing arrows, write out, in English, the expression. Discuss this chart and leave it up for further reference.

- Examples:
1.  $5^2$  "the square of five"
  2.  $5^2$  "five squared"
  3.  $3x$  "three times x"
  4.  $\overset{\rightarrow}{5} : \overset{\rightarrow}{2}$  "five is to two"
  5.  $\overset{\leftarrow}{4} \overline{\overset{\leftarrow}{12}}$  "twelve divided by four"
  6.  $\downarrow \frac{1}{2} + \downarrow 1$  "one-half plus one"
  7.  $\downarrow 6$   
 $\downarrow \frac{-2 \ 1/3}{\phantom{0000}}$   
 $\downarrow \square$  "six minus two and one-third is equal to what number"
  8.  $\begin{array}{c} \leftarrow \\ 7 - \square = 3 \\ \downarrow \uparrow \leftarrow \leftarrow \leftarrow \downarrow \uparrow \\ \downarrow \rightarrow \rightarrow \rightarrow \rightarrow \uparrow \end{array}$  "what number subtracted from seven leaves three"

### SAMPLE ACTIVITY:

Match each word on the left with the meaning of a prefix on the right which could help with identifying the meaning of the word.

- |                  |       |             |
|------------------|-------|-------------|
| 1. quadrilateral | _____ | (a) five    |
| 2. exterior      | _____ | (b) around  |
| 3. semicircle    | _____ | (c) eight   |
| 4. pentagon      | _____ | (d) two     |
| 5. circumference | _____ | (e) four    |
| 6. octagon       | _____ | (f) equal   |
| 7. triangle      | _____ | (g) half    |
| 8. bisect        | _____ | (h) three   |
| 9. equilateral   | _____ | (i) outside |

SAMPLE ACTIVITY:

Write a sentence using each of these words in a mathematical way:

- |           |             |
|-----------|-------------|
| 1. angle  | 6. square   |
| 2. degree | 7. set      |
| 3. plane  | 8. volume   |
| 4. odd    | 9. solution |
| 5. base   | 10. power   |

## Reading Mathematical Words \_\_\_\_\_

SAMPLE ACTIVITY:

The following is a list of definitions taken from your reading. See if you can solve the puzzle by filling in the correct words.

*Across*

1. The result one gets when one adds.
2. The number one takes from another number.
3. A number to be added to another number or to itself.
5. The result one gets when one divides.
6. {..., -3, -2, -1, 0, +1, +2, +3, ...}

*Down*

1. To take away.
4. 6  $\overline{12}$  the number six in this problem.

SAMPLE ACTIVITY:

Allow the students to make up their own definitions, either silly or serious, for new mathematical words.

common denominator: unexciting number  
parallelogram: the unit of weight for parallel lines •

SAMPLE ACTIVITY:

Have the students name as many words as they can that begin with the following:

tri	poly
mid	sub
in	sum
ex	un
bi	circum

then have them identify the ones that are mathematical.

## Comprehension \_\_\_\_\_

### SAMPLE ACTIVITY:

Students can turn to a page in the math book and answer specific questions asked by the teacher, or the teacher can write a passage and questions about it like the following:

1. What is the main idea?
2. Name several supporting details.
3. How are the main idea and details related?

### SAMPLE ACTIVITY:

In addition to "walking students through a direction," a teacher can help the students learn to follow directions by having them rewrite step-by-step directions in their own words.

### SAMPLE ACTIVITY:

Have the students follow the directions to add these numbers written with decimals:  $1.701 + 20.03$ . Use this to add:  $2.022 + 1.4$ ;  $13.002 + 7.0$ . First, rewrite them so that the decimals are lined up as shown:

$$\begin{array}{r} 1.701 \\ +20.03 \\ \hline \end{array}$$

This allows those digits to be added that have the same place value. The 20.03 can be rewritten with a "0" in the thousandths' place because there are no thousandths there.

$$\begin{array}{r} 1.701 \\ +20.030 \\ \hline \end{array}$$

Then add like digits and remember to put the decimal units in proper place in the answer, keeping it lined up with the others.

Now do the other two addition exercises.

### SAMPLE ACTIVITY:

Have students make their own graphs. Small groups can graph different characteristics of the class. The following characteristics could be used:

1. Students' heights
2. Students' weights
3. Color of eyes
4. Types of books liked
5. Types of movies liked
6. Favorite school subjects

SAMPLE ACTIVITY: (For secondary-aged students.)

Some graphs use a symbol that represents a larger number. Pick your own axis for whatever labelling you want, but you must pick an axis for the names John, Pat, and Henry, in that order, either left to right or top to bottom.

1. Who has the most snowballs if names are labelled on the vertical?
2. Who has the most snowballs if names are labelled on the horizontal?
3. Who has three snowballs if names are labelled on the vertical?



Key: 0 = 3 snowballs

SAMPLE ACTIVITY:

Have students read some verbal problems and supply the information asked for in the following chart:

	What information is needed?	What terms need defining?	What operation is needed?	What is the order of operations?	What variables are given?
<i>Problem 1</i>					
<i>Problem 2</i>					
<i>Problem 3</i>					
<i>Problem 4</i>					

SAMPLE ACTIVITY:

The teacher can select a word problem that requires the students to think in sequence. Each sentence should be written on a separate cardboard strip and put in an envelope. The students can then open the envelope, take out the strips, and arrange them in order. If the teacher places numbers on the back of the strips, the students can check their own work. These strips can be made to use with a flannel board or they can be pinned on a cork board. If all students in a class are having problems in this area, the teacher can give each one an envelope, and when a student is finished, he can swap his envelope with someone else.

Suggested problem: Carmen worked as a cashier in a department store one summer. One week she worked long hours. On Monday, Tuesday, and Wednesday, she worked 9 hours per day. On Thursday, she worked 8 hours. On the other two days she worked 5 hours each. At \$2.25 per hour, how much money did she earn that week?



SAMPLE ACTIVITY:

List the symbol and the word for each operation.

	<i>Symbol for Operation</i>	<i>Word for Operation</i>
1. less 7	-	subtract
2. the difference		
3. a number increased by 8		
4. seven percent of sixty		
5. twice the amount		
6. sum of their ages		
7. decreased by		
8. 80-foot board cut in half		
9. seven hours are more than Fred worked		
10. how many dollars per day?		

SAMPLE ACTIVITY:

Have students take some verbal sentences and translate them into mathematical sentences. This activity shows how the translation from English into the language of mathematics involves ordering.

<i>Words</i>	<i>First Translation</i>	<i>Math</i>
1. John is two years older than Mary.	John's age is Mary's age plus two.	$J = M + 2$
2. For two hours, he went many miles at a particular speed.	Number of miles is found by multiplying his speed by two.	$M = 2 \times S$

SAMPLE ACTIVITY:

Give some word problems and ask students whether there is enough information to answer the questions.

SAMPLE ACTIVITY:

Have students indicate, by crossing out, underlining, or circling, the extraneous information in word problems.



SAMPLE ACTIVITY:

When the students have read a passage, involve them in a contest to find all the mathematics words they can in a certain time limit. Then give them a time limit to find additional information. Finally, have them close their books and see how much they remember. As the students orally recall information, the teacher writes this information on the board. Now, have the students go back to their books and check to see how much information was not remembered from the skimming activity.

SAMPLE ACTIVITY:

Assign a page in a mathematics book to be scanned by the students. After they scan it, have them summarize what they have learned. Next, have them read that same material carefully and summarize it. When this is finished, have them compare what they comprehended when they scanned to what they comprehended when they read carefully.

Since symbols hold such a quantity of information, students should be helped to see that it takes longer to read and understand them than it takes to read and understand non-symbolic terms.