REPORT ON THE NCTM SUMMER CONVENTION, by H. L. Larson

Editor's Note: Mr. Larson was lecturer for the three Edmonton Seminars sponsored by the MCATA last July. Subsequently he represented the Mathematics Council at the NCTM held in August at Eugene, Oregon. Over 800 mathematicians attended this convention, of which 25 were from Canada and several from Western Europe. Mr. Larson has divided his report into four sub-topics, of which this - his interpretation of Dr. Max Beberman's lesson - is the first. Mr. Larson expresses the hope that some of Dr. Beberman's inspiration may shine through and he makes apologies for that which is lost in this transmission.

A Mathematics Lecture, by Dr. Max Beberman - "Functions and Geometry"

"Much of what we call mathematics teaching is taken up with the mechanical manipulation of algebraic symbols. There is far too little effort given to ideas and concepts," says this great mathematician who heads up UICSM study group. "For example: Is the weight of man a function of his height?" he asked. Being a rather rotund figure in contrast to the tall, lean chairman beside him, he quickly conceded, "Clearly this is not so!" The following rationale was then developed, showing how geometry can be used to broaden and clarify our mathematics concepts.

I

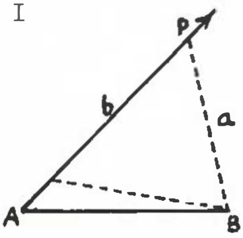

FIG. I

Given: Points A, B fixed, angle A fixed, AP or a "b" variable.

Question: Is "a" a function of "b"?

Answer: Yes. See Fig. II.

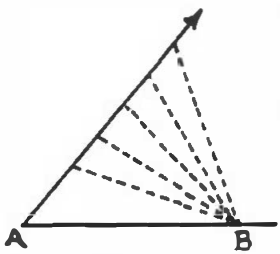

Fig. II

Note: As b varies within its domain, f(b) or a has a range which is numerically related. See Fig. III.

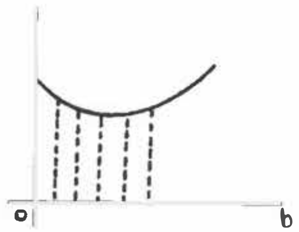

Fig. III $f(b) = a$

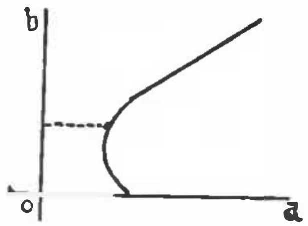

Fig. IV $f(a) \neq b$

Note: We must depict the variables with a minimum of symbolism. The dotted lines roughly indicate some range values.

Question: Is "b" a function of "a"?
Answer: No. See Fig. IV and definition 2.

Note: One value of "a" has two values for its function. See this also in Figs. I or II.

It would appear from the discussion thus far that some definitions are required:

1- A variable quantity is a function whose Domain consists of objects and Range consists of numbers. (Examine this carefully. We are developing the roots of this concept in elementary grades.)
2- Given two variable quantities with a common domain - "a" is a function of "b" if and only if to each value "b" there is one and only one value of "a".

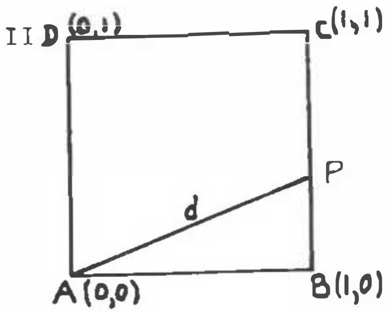

Fig V

Let domain of S be (o . . . 4).
P proceeds from A to B . . . to A.
Question: Is "d" a function of "s"?
Answer: Yes.
Why: Note Fig. VI.

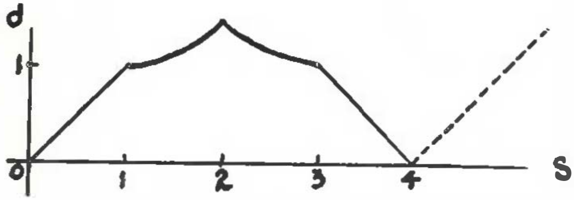

Fig. VI

<u>Note</u>: Every value of "s" has a distinct "d". f(s) is periodic.
<u>Question</u>: Is "s" a function of "d"?
<u>Answer</u>: No.
<u>Why</u>: Let the student draw the inverse graph.

Here is an opportunity for the student to "discover" for himself a quick way of determining the converse of the original question as true or false.

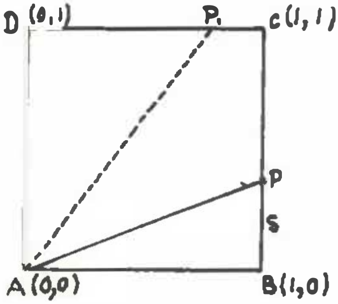

Fig. VII

Let P proceed in counter-clockwise motion as in Fig. V. Plot the Area APB (k) against "s".

<u>Question</u>: Is "k" a function of "s"?

<u>Answer</u>: Check its graph Fig. VIII.

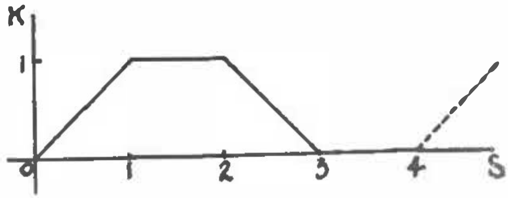

Fig. VIII

<u>Note</u>: "s" is not always the perpendicular to AB. Its length is the distance P has traversed along the perimeter.

III

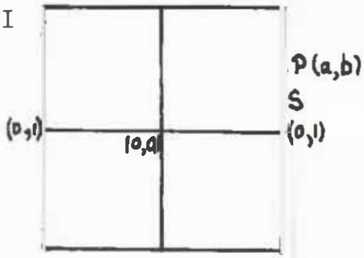

Fig. IX

Is "s" a function of "k"? ?

Let P proceed as in Fig. VII.

Question: Is Is "a" a function of " "s"? Is "b"?

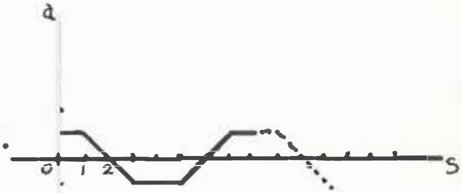

Fig. X f(s) = a

Is "s" a function of "a" or "b"?

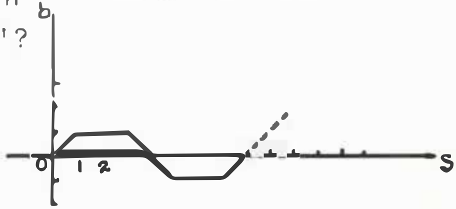

Fig. XI f(s) = b

Answer: You're on your own.

IV. If by now, some student does not "see" wave motion coming up in Figs. X and XI, cut the corners in Fig. IX and graph "a" against "s" from the octagon -- then n-sides and the circle as n----.

The above rationale may take a couple of periods plus a take-home assignment, but the algebraic symbolism will carry some meaning.

Another stimulating article by Mr. Larson will be published in the January edition of the newsletter. - Editor