METHOD IN GEOMETRY

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649197545

Method in geometry by John C. Stone

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

JOHN C. STONE

METHOD IN GEOMETRY

Trieste

METHOD IN GEOMETRY

BY

JOHN C. STONE, A.M.

ASSOCIATE PROFESSOR OF MATHEMATICS
STATE NORMAL COLLEGE, YPSILANTI, MICHIGAN

BOSTON, U.S.A.
D. C. HEATH & CO., PUBLISHERS
1904

PREFACE.

THE author offers in this little monograph a brief outline of the method used in his class room. While many teachers no doubt have followed much the same course, it is offered with the hope that to some young teacher it may be a suggestion that will lead to more effective teaching. The monograph is a revision of a paper read before the Michigan Schoolmasters' Club, in April, 1902.

METHOD IN GEOMETRY.

Early Geometry.

The oldest traces of geometry are found among the early Egyptians and Babylonians. Their knowledge was, however, empirical and made simply to serve practical purposes. Many of their rules were simple approximations; the ratio of the circumference of a circle to its diameter was known to be a little greater than 3, but in practical measurements the circumference was taken to be three times the diameter.

A recent discovery of the papyrus written by Ahmes perhaps as early as 2000 B.C., gives us the earliest knowledge that we have of Egyptian geometry. There is no attempt in the writings of Ahmes at a science of the subject; there are no theorems or even general lines of procedure — the subject consists of a few special rules discovered by experimenting and induction. Neither were all the rules accurate; for example, the area of an isosceles triangle was found by taking half the product of the base by one of the equal sides.

The geometry of the Egyptians and Babylonians, such as it was, was sought after and studied by the philosophers of Greece, and by the Greeks finally worked into a science. Thales (640 B.C. to 548 B.C.) and his pupil Pythagoras traveled and studied in Egypt and gave a valuable contribution to the subject of geometry, the latter giving us the theorem known by his name; but it remained for Euclid, about 300 B.C., to give to the world the science of geometry. For clearness of thought, exactness of truths, and excellence of logic Euclid is a model. With but slight change it has been used as a textbook for twenty-two hundred years. In England to-day his work holds almost universal sway.

Just how much of Euclid's work was his own and how much was compiled from former discoveries, is uncertain. It is known, however, that geometry did not come from the mind of Euclid "almost as perfect as Minerva from the head of Jove," but that a great deal of his material was drawn from Thales, Pythagoras and his school, and from Eudoxus. What Euclid did was to systematize the known knowledge of geometry and from it to discover new; that is, he began with definite ideas and self-evident truths, and, through a process of deduction, established the truth of such theorems as were handed down to him, and discovered some new ones. Whether he gave us much that was new or not, for the work he did he deserves to be ranked with the world's great educators and philosophers. "Geometry is the perfection of logic, Euclid is as classic as Homer."

The Educational Value of Geometry.

Most studies are taught for two purposes: (1) for the facts which may be of practical value in daily life, or that one needs in order to be really intelligent; (2) for the mental discipline to be obtained from acquiring these facts. In the broad sense this is true of geometry; the practical side of geometry, however, *i.e.* the measurement of surfaces and volumes, is usually taken up in arithmetic under the head of Mensuration, before the formal study of geometry is begun.

The study, then, of deductive geometry is almost entirely a disciplinary study, a lesson in logic. While each new fact discovered must be remembered as a basis for the discovery of other facts, yet geometry should be studied chiefly not for the facts it teaches but for the discipline it affords in apprehending the relations existing between these facts. When Euclid's followers were criticised for teaching that "any two sides of a triangle are together greater than the third side," as teaching that which even the beasts of the field know, the reply was, "We are not seeking to teach facts as much as the power to discover facts." Euclid recognized the truth that knowledge for its own sake is worth while, even if it cannot be used for practical ends. The story goes that he was once asked by a pupil who had just begun the study of geometry, "What do you gain by learning all this?" Euclid ordered his servant to give him some coppers, "since he must have gain out of what he learns."

Suggestions on teaching Geometry.

Since the study of geometry is primarily a lesson in logic, it follows that the demonstrated propositions are not put there simply to be memorized and reproduced upon the blackboard when called for, but that they serve as models of logical deductive reasoning; and that the student must see them as such — see that they follow from definitions, axioms, or previously proved propositions. He must not only see the logic of the proof given in the text, but must discover other proofs, if there be such, by making use of other previously studied propositions. He must also see that, had a different definition been given, or some other proposition been known, a different proof might have followed; and thus he should comprehend clearly the complete dependence of each proposition upon the others or upon the fundamental definitions, axioms, and postulates.

But this is not the only end to be sought in geometry. Even though the student may have proved a proposition in various ways, it may never have dawned upon him that each proposition is the natural deduction from some proposition, definition, or axiom already known, and that it might have been discovered by him himself. He is more likely