

**PRINCIPLES OF GEOMETRY,
VOL. II. PLANE GEOMETRY:
CONICS, CIRCLES, NON-
EUCLIDEAN GEOMETRY**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649091027

Principles of geometry, Vol. II. Plane geometry: conics, circles, non-euclidean geometry by H. F. Baker

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

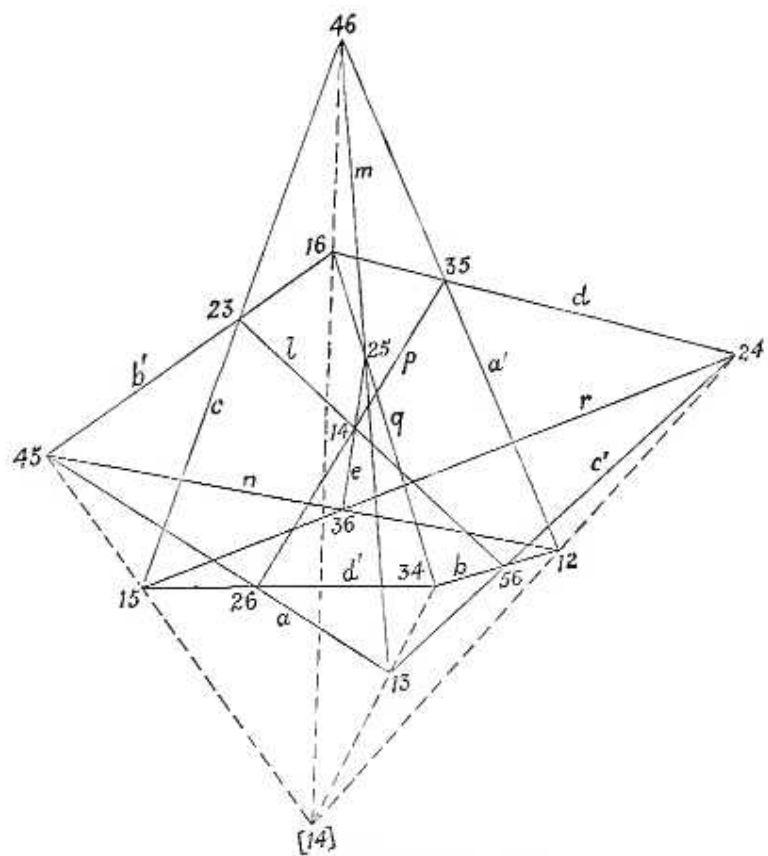
www.triestepublishing.com

H. F. BAKER

**PRINCIPLES OF GEOMETRY,
VOL. II. PLANE GEOMETRY:
CONICS, CIRCLES, NON-
EUCLIDEAN GEOMETRY**

Cambridge University Press
Fetter Lane, London
New York
Bombay, Calcutta, Madras
Toronto
Macmillan
Tokyo
Maruzen Company, Ltd

All rights reserved



HEXAGRAMMUM MYSTICUM
(see p. 219)

PRINCIPLES OF GEOMETRY

BY

H. F. BAKER, Sc.D., F.R.S.,

LOWNDEAN PROFESSOR OF ASTRONOMY AND GEOMETRY, AND FELLOW OF
ST JOHN'S COLLEGE, IN THE UNIVERSITY OF CAMBRIDGE

VOLUME II

PLANE GEOMETRY

CONICS, CIRCLES, NON-EUCLIDEAN GEOMETRY

In minimis maxima

CAMBRIDGE
AT THE UNIVERSITY PRESS

1930

First Edition 1922

Second Edition 1930

PRINTED IN GREAT BRITAIN.

PREFACE

THE present volume has in effect two aims: In the first place, in pursuance of the general purpose of the book, it seeks to put the reader in touch with the main preliminary theorems of plane geometry. Chapter I is devoted to a deduction, with synthetic methods, of the fundamental properties of conic sections; it is an introduction to what is usually called Projective Geometry, in the plane, in which, however, the notions of distance and congruence are not assumed. Chapter II, also without help of these notions, develops results that arise by considering conics in relation to two Absolute points, including, for instance, the properties of circles, and of confocal conics; the matter here contained is usually found in sequels to Euclid, books on Pure Geometry, and books on Geometrical Conics. Chapter III is designed to explain the application of the algebraic symbols to plane geometry; it contains methods and formulæ found in works on Analytical Geometry of the Plane. Chapter IV is a brief consideration of some logical questions, and marks the recognition of a limitation in the symbols employed; it deals with the sense in which the words real and imaginary are used, and calls attention to the elements of Analysis assumed in the following chapter. Chapter V deals with the theory of measurement, of length and angle, with the help of an Absolute conic, shewing how the so-called non-Euclidean geometries may be regarded as included in our general formulation. It considers the metrical plane also as deduced from the geometry of a quadric surface, incidentally dealing with the fundamental properties of this surface and, in particular, with Spherical Trigonometry. As a corollary from this point of view, Riemann's space of constant curvature is seen not to require the assumption of absolute coordinates; and further, that form of the hyperbolic geometry in which lines are replaced by circles cutting a fixed circle at right angles (which, for instance, was an inspiration to Poincaré in his development of the theory of automorphic functions) is seen to arise naturally. Notes I and II deal with the theorems of incidence which were developed very gradually for the complete Pascal figure and appeared very intricate; from the point of view here explained they are natural, if particular, properties of a figure which arises otherwise, and will much concern us in a later volume. Note III gives some indications of the literature of non-Euclidean geometry. Note IV contains remarks and corrections for Volume I, for many of which I am indebted to friends. There is also an Index; but it is possible that the extensive Table of Contents

may be more useful. No attempt is made to give a general Bibliography for the contents of the volume.

It will be seen that the volume deals with a wide range of theory; in other conditions than the present, a less condensed treatment might have been desirable. The order in which the ideas are taken has been chosen largely in view of the second aim of the volume; it will not be difficult, with the help of the Table of Contents, for the reader to modify this order. It is believed, however, that a large amount of the time usually spent, at present, in learning geometry, could be saved by following, from the beginning, after an extensive study of diagrams and models, the order of development here adopted; and such a plan would make much less demand upon the memory.

But the second aim of the volume may, I hope, appeal to attentive readers. It is an attempt, tempered indeed by practical considerations, to test the application in detail of the logical principles explained in Volume I. It seeks to bring to light the assumptions which underlie an extensive literature in which coordinates are freely used without attempt at justification. It suggests the question whether, in the case of distance, as in many other cases, we may not have derived from familiarity with physical experiences, a confidence which a more careful scrutiny can only regard as an illusion. When this view, which seems sure, shall win acceptance, the change in scientific thought will be rapid and momentous. As the first step in this sense was made in the development of the theory of our geometrical conceptions, it is proper that the matter should be dealt with here. It will be of importance if the reader come to see how deep lying are the questions involved in the use of coordinates, and the assumption of distance as a fundamental idea.

As in the case of the first volume, I desire to express my thanks to the Staff of the University Press for their care and courtesy, and to Mr J. B. Peace, M.A., for the great trouble he has taken with the numerous diagrams.

H. F. B.

2 September 1922

To the present Reprint are added, at the end of the Volume, various remarks and examples; these are referred to in the text by the abbreviation [Add.]. To many friends who have made suggestions I offer my best thanks.

H. F. B.

24 January 1930