

**ELEMENTS OF DESCRIPTIVE GEOMETRY,
WITH APPLICATIONS TO ISOMETRIC
PROJECTION AND
OTHER FORMS OF ONE-PLANE
PROJECTION; A TEXT-BOOK FOR
COLLEGES AND ENGINEERING SCHOOLS**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649152179

Elements of descriptive geometry, with applications to isometric projection and other forms of one-plane projection; a text-book for colleges and engineering schools by O. E. Randall

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

O. E. RANDALL

**ELEMENTS OF DESCRIPTIVE GEOMETRY,
WITH APPLICATIONS TO ISOMETRIC
PROJECTION AND
OTHER FORMS OF ONE-PLANE
PROJECTION; A TEXT-BOOK FOR
COLLEGES AND ENGINEERING SCHOOLS**

ELEMENTS OF DESCRIPTIVE GEOMETRY

WITH APPLICATIONS TO
ISOMETRIC PROJECTION AND OTHER FORMS OF
ONE-PLANE PROJECTION

*A TEXT-BOOK FOR COLLEGES AND
ENGINEERING SCHOOLS*

BY

O. E. RANDALL, Ph.D.

PROFESSOR OF MECHANICAL DRAWING, BROWN UNIVERSITY

GINN & COMPANY

BOSTON · NEW YORK · CHICAGO · LONDON

COPYRIGHT, 1965
BY O. E. RANDALL

ALL RIGHTS RESERVED

55.9

The Athenaeum Press
GINN & COMPANY • PRO-
PRIETORS • BOSTON • U.S.A.

QASO
R3

PREFACE

The aim of this treatise is to make a clear presentation of the theory of projection, to show the application of this theory as a medium of expression, and by the discussion and proof of a great variety of problems to enable the student to make a ready and intelligent use of this medium in the representation of all forms of magnitudes.

As by far the greater part of practical drafting is done from the standpoint of the third quadrant, there seems to be no good reason why the principles of descriptive geometry, which are so directly and extensively applied in practice, should not also be presented from the standpoint of the same quadrant.

Therefore, while the student is called upon to work freely in all the four quadrants, the subject-matter is presented primarily from the third quadrant.

In the establishment of principles great effort is made to be explicit; but in the application of these principles, for which purpose a great many unsolved problems are assigned, the student is left largely to his own resources.

As the principles of projection are fundamental in all branches of drafting, it follows that no attempt at extensive application of these principles in such subjects as machine drawing, gearing, architectural drawing, etc., should be made until the principles themselves have been thoroughly established. For this reason the attention of this work is largely confined to theoretical considerations, although a number of simple practical applications such as the student can safely and intelligently make are introduced.

Free use is made of profile and other supplementary planes of projection.

Isometric projection and other forms of one-plane projection are treated as applications of descriptive geometry.

It is hoped that the system of notation which is introduced will be found both simple and expressive; and that the method of locating given parts which may be employed in the assignment of work in the recitation room and in the drafting room will be found useful.

CONTENTS

CHAPTER	PAGE
I. DEFINITIONS AND ASSUMPTIONS	1
II. REPRESENTATION OF THE POINT, LINE, AND PLANE	5
III. SUPPLEMENTARY PLANES OF PROJECTION	24
IV. NOTATION	32
V. METHOD OF LOCATING GIVEN PARTS	34
VI. PROBLEMS RELATING TO THE POINT, LINE, AND PLANE	36
VII. GENERATION AND CLASSIFICATION OF LINES	74
VIII. GENERATION AND CLASSIFICATION OF SURFACES	84
IX. REPRESENTATION OF SURFACES WITH PLANE FACES	89
X. REPRESENTATION OF SINGLE CURVED SURFACES	93
XI. REPRESENTATION OF WARPED SURFACES	103
XII. REPRESENTATION OF SURFACES OF REVOLUTION	115
XIII. DETERMINATION OF PLANES TANGENT TO SURFACES OF SINGLE CURVATURE	122
XIV. DETERMINATION OF PLANES TANGENT TO SURFACES OF DOUBLE CURVATURE	144
XV. INTERSECTION OF SURFACES BY LINES	153
XVI. INTERSECTION OF SURFACES BY PLANES	158
XVII. INTERSECTION OF SURFACES BY SURFACES	177
XVIII. ISOMETRIC PROJECTION AND OTHER FORMS OF ONE-PLANE PROJECTION	193

Subscription price: Five dollars per annum in advance. Single copies 15 cents. Entered as second-class matter, October 3, 1917. Postpaid.

Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917. Authorized by Act of October 3, 1917.

Copyright, 1938, by American Medical Association. All rights reserved.

Published by the American Medical Association, 535 North Dearborn Street, Chicago, Ill.

Second-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

Postmaster: Send address changes to JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 535 North Dearborn Street, Chicago, Ill.

Third-class postage paid at Chicago, Ill., and at additional mailing offices.

DESCRIPTIVE GEOMETRY

CHAPTER I

DEFINITIONS AND ASSUMPTIONS

1. The Subject defined. Descriptive geometry is that branch of mathematics which seeks, through the medium of an exact process of graphic expression, to represent geometrical magnitudes which occupy given positions in space, and also through the same medium of expression to solve such problems as relate to these magnitudes.

2. Representation of Magnitudes of Two Dimensions. A magnitude of two dimensions, such as a plane geometrical figure, may be easily and directly represented, graphically, upon a single plane, since every characteristic of such a magnitude may be determined from a single standpoint of observation, and the whole may be outlined upon the very plane in which the magnitude exists.

The diagrams connected with the statement and solution of problems in plane geometry furnish an illustration of this fact.

3. Representation of Magnitudes of Three Dimensions. A magnitude of three dimensions does not exist in a single plane, neither can its characteristics be completely determined from a single standpoint of observation; therefore the process of representation must necessarily be different from that employed in connection with magnitudes of two dimensions.

4. Projection. Since the points and lines of magnitudes of three dimensions do not exist in a single plane, as is the case with magnitudes of two dimensions, it will be necessary to determine some plane of representation and to establish some process by which reference to this plane may be made.