LESSONS IN GEOMETRY: FOR THE USE OF BEGINNERS

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649630110

Lessons in Geometry: For the Use of Beginners by G. A. Hill

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

G. A. HILL

LESSONS IN GEOMETRY: FOR THE USE OF BEGINNERS

Trieste

LESSONS

IN

GEOMETRY.

FOR THE USE OF BEGINNERS.

BY

G. A. HILL, A.M.,

AUTHOR OF A GEOMETRY FOR BEGINNERS.

BOSTON, U.S.A.:
PUBLISHED BY GINN & COMPANY.
1889.

624595

Entered, according to Act of Congress, in the year 1887, by
G. A. HILL,
in the office of the Librarian of Congress, at Washington

ELECTROTYPED BY J. S. CUSHING & Co., BOSTON.

PRESSWORK BY GINN & Co., BOSTON.

PREFACE.

THIS book has been prepared to meet the wishes of those who prefer a shorter and easier introductory course in Geometry than that given in the "Geometry for Beginners."

The metric system of units is explained; but all exercises in metric units are confined to lessons placed at the ends of the chapters, and may be omitted if desired.

The method of instruction is that best adapted to the mental condition of pupils between the ages of twelve and sixteen. The training in consecutive reasoning is introduced very gradually, and is confined mainly to the laws of equal triangles and a few of their simple applications.

To one feature of the method the author desires to call special attention; namely, the numerous exercises which involve the use of instruments and drawing to scale. It is assumed that every pupil is provided with ruler, divided scale, pencil compasses, triangle, and protractor. Any objection on the ground of expense has been met by the publishers, who are prepared to supply, at a very low price, these instruments enclosed in a strong wooden box.

Experience shows that for the beginner of Geometry the careful execution of easy constructions is the most useful as well as the most interesting part of the daily lesson. This work calls into action the eye, the hand, and the judgment. It holds the attention. It is attended with the pleasing sense of the successful exercise of new-found power. Under these conditions progress in knowledge is sure to be rapid. The precept, "Do that you may know," finds here a pertinent application.

No teacher, however, can expect to obtain the best results from this kind of work, unless he insists strenuously upon neatness and a reasonable degree of accuracy. Every teacher should lay down a standard of neatness and accuracy, — remembering that his pupils are only beginners working with cheap instruments, — and then should criticise unsparingly every drawing which, tried by his standard, is a slovenly or inaccurate piece of work.

The contents of the book are so arranged that the course may be considerably abridged, if so desired. There are, in all, ninety-six lessons and fifteen drawing exercises. This makes abundant material for a course of three hours per week for a year, or, what is better for the pupil, a course of one hour per week for a year, and a course of two hours per week for the year following. The last two chapters, however, may be omitted, and likewise the lessons in which metric units are used; there will then be left sixty-five lessons and the drawing exercises, or a course of two hours per week for one year.

Geometry, as here presented, should be studied before Algebra. If this is done, pupils, while learning the properties of figures and the measurement of areas and volumes, will see for themselves the great advantage of using letters to represent quantities. Thus the chief stumbling-block to every beginner of Algebra will be removed.

The author takes this opportunity to express his warm thanks to the teachers who have had the kindness to read and correct the proof-sheets. A special acknowledgment of obligation for this assistance is due to Prof. G. A. Wentworth, of Exeter, N.H.; Prof. H. D. Wood, of Trenton, Ga.; Mr. J. E. Clarke, of Chelsea, Mass.; and Mr. E. H. Nichols, of Cambridge, Mass.

G. A. HILL.

Cambridge, Feb. 29, 1888.

CONTENTS.

CHAPTER I. — INTRODUCTION.

Lesson		Page
1.	Observation of a cube and a cylinder	1
2.	Questions about prisms, pyramids, etc.	4
3.	Body, surface, line, point	5
4.	Different kinds of lines, surfaces, and bodies	8

CHAPTER II. — STRAIGHT LINES.

5.	Determination of straight lines. Use of the ruler	10
6.	Vertical, horizontal, and inclined lines	12
7.	The circle. Use of the compasses	15
8.	Parallel lines, and their construction	18
9.	Equal and unequal lines. Axioms of Geometry	21
10.	Addition, subtraction, etc., of lines	24
11.	Units of lengths	27
12.	Measurement of straight lines	29
13.	Drawing to scale	30
14.	The metric units of length	32
15.	Drawing and measuring with metric units	34
16.	Review of Chapter II. begun	35
17.	Review of Chapter II. concluded	36

CHAPTER III. — ANGLES.

18.	Definitions. The magnitude of an angle	37
19.	Erecting perpendiculars	40
20.	Dropping perpendiculars	42
21.	Measurement of angles. Use of the protractor	43
22.	Construction of angles. Bisecting an angle	46
23.	Adjacent angles and vertical angles	48
24.	Two parallel lines cut by a third line	50

LESSON PAGE
25. Review of Chapter III. begun 52
26. Review of Chapter III. continued 53
27. Review of Chapter III. concluded (metric units) 54

CHAPTER IV.—TRIANGLES.

28. Definitions. Dimensions of a triangle. 55
29. Construction of triangles. Practical applications 58
30. Construction of triangles. Practical applications 60
31. Sum of the angles of a triangle 62
32. Equivalence, similarity, and equality 64
33. Theorems. Method of equal triangles 67
34. Theorems 70
35. Theorems 72
36. Review of Chapter IV. begun 74
37. Review of Chapter IV. continued 75
38. Review of Chapter IV. continued 76
39. Review of Chapter IV. continued (metric units) 77
40. Review of Chapter IV. concluded (metric units) 78

CHAPTER V.—POLYGONS.

41. Definitions. Sum of the angles of a polygon 79
42. Dimensions of quadrilaterals. Constructions 82
43. Parallelograms. Theorems and constructions 84
44. Parallelograms. Theorems and constructions 86
45. Polygons. Miscellaneous constructions 88
46. Regular polygons 90
47. Review of Chapter V. begun 92
48. Review of Chapter V. continued 93
49. Review of Chapter V. concluded (metric units) 94

CHAPTER VI.—THE CIRCLE.

50. Definitions. Chords, arcs, and angles at the centre 96
51. Radius perpendicular to a chord. Constructions 98
52. Inscribed angles 100
53. Tangents 102
54. Two circles. Circumscribed and inscribed figures 104

Lesson		Page
55.	Centre of a regular polygon. Constructions	106
56.	Circumference of a circle. Meaning of π	108
57.	Review of Chapter VI. begun	110
58.	Review of Chapter VI. continued	111
59.	Review of Chapter VI. concluded (metric units)	112

CHAPTER VII.—AREAS.

60.	Units of area. Area of a square	113
61.	Area of a rectangle	116
62.	Area of a parallelogram	118
63.	Area of a triangle	120
64.	Area of a polygon	122
65.	Area of a circle	124
66.	Theorem of Pythagoras	126
67.	Mean proportional. Transformation of figures	128
68.	Transformation of figures	130
69.	Review of Chapter VII. begun	132
70.	Review of Chapter VII. continued	133
71.	Review of Chapter VII. continued	134
72.	Review of Chapter VII. continued	135
73.	Review of Chapter VII. continued (metric units)	136
74.	Review of Chapter VII. concluded (metric units)	138

CHAPTER VIII.—RATIOS.

75.	Definitions. Triangles and parallelograms compared	139
76.	Division of figures into parts	142
77.	Proportions. Application to the circle	144
78.	Similar triangles. Ratio of similitude	146
79.	Applications. Areas of two similar triangles	148
80.	Numerical relations in right triangles	150
81.	Review of Chapter VIII. begun	152
82.	Review of Chapter VIII. continued	153
83.	Review of Chapter VIII. concluded (metric units)	154

CHAPTER IX.—SOLIDS.

84.	Planes and dihedral angles	155
85.	The cube	158
86.	The rectangular solid	160