

---

# **Geometry for Grammar Schools**

**Hunt Ephraim**

---

**Title: Geometry for Grammar Schools**

**Author: Hunt Ephraim**

**This is an exact replica of a book. The book reprint was manually improved by a team of professionals, as opposed to automatic/OCR processes used by some companies. However, the book may still have imperfections such as missing pages, poor pictures, errant marks, etc. that were a part of the original text. We appreciate your understanding of the imperfections which can not be improved, and hope you will enjoy reading this book.**



Educ. T 148.94.465

✓

HARVARD COLLEGE LIBRARY  
GIFT OF  
GEORGE ARTHUR PLIMPTON  
JANUARY 25, 1924

COPYRIGHT, 1894,  
By E. HUNT.

Northwood Press :  
J. S. Cushing & Co. — Berwick & Smith.  
Boston, Mass., U.S.A.

## PREFACE.

---

A GREAT lover of geometry used to remark, “without the geometrical faculty we should be idiots”; that is, unable to differentiate the forms of objects, we could not tell one from another.

In the kindergarten and the lowest primary grade the child is introduced to geometry in art, and there seems to be no good reason why in the sixth, seventh, and eighth grades he should not be introduced to the science of geometry, in its elementary concepts, definitions, and methods.

Traditional methods of studying geometry, and the difficulty of selection from the ordinary text-book, stand in the way of its introduction into the grammar school.

Teaching by dictation has been carried to excess in all branches, and the Socratic method, originally used to refute erroneous opinions, may easily degenerate with pupils who have no opinions of the subject, correct or erroneous, into —

“Letting down buckets into empty wells  
And growing old in drawing nothing up.”

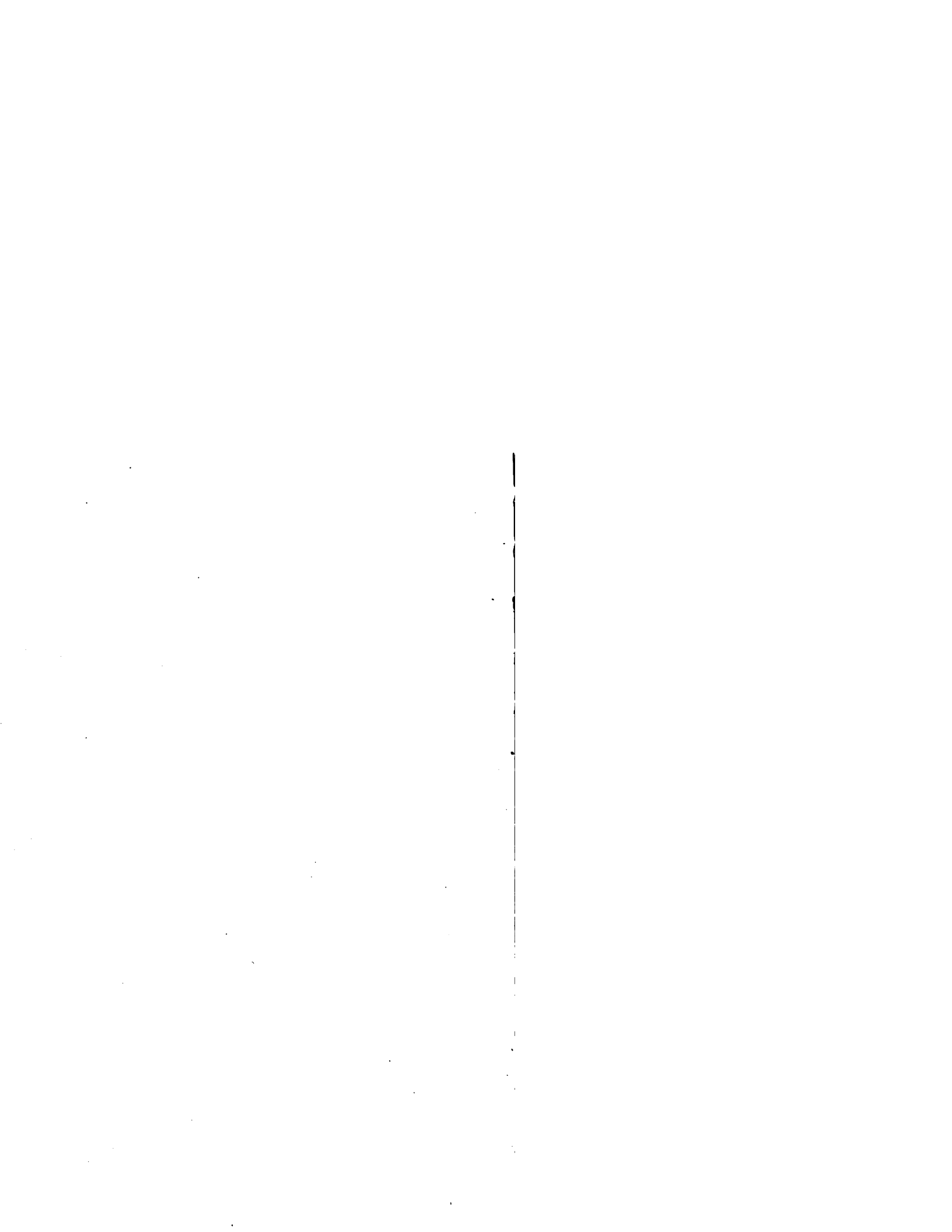
To learn from the printed page is a most valuable part of the pupil's education. For this reason the pupil is expected to make the diagrams for the text, unaided by the teacher.

In geometry, as in other branches, the pupil will learn only what he wants to know. To implant this want in the pupil's mind skilfully, and at the same time not to tell him what with proper effort he can find out for himself, distinguishes superior teaching.

I wish to thank the publishers for the great pains they have taken to have errors in the copy and proof corrected, and also all who have kindly read the proof, and made valuable suggestions and corrections.

E. H.

**PART I.**



## LESSON I.

To go from one place or point, *A*, to another place or point, *B*, we start from *A*, and move all the time towards *B*, without changing our direction, if possible. All animals, including insects, will do the same thing. They seem to know as well as we do, that a line that does not change its direction — that is, a straight line — is the shortest distance between two points.

What is a straight line?

A **straight line** is a line that never changes its direction, or, It is the shortest distance between two points.

Only one straight line can be drawn between two points.

The ends of a line are called **points**, and the length of a line is the distance between these two points. *3 dimensional length.*

A **line** has only length; no breadth, no thickness. *breadth & thick-ness ill. 1 dim.*

A **point** has no length, no breadth, no thickness. — no "

Points are only places where lines begin or end, or cross each other. *emphasize. Points everywhere. Space may be filled with points.*

The points and lines that we make with the pencil and crayon are not the real points and lines we talk about in geometry: they only show us where the real points and lines are; that is, right in the middle or the center of the dots and lines that we can see. *Indicate what we may find a point's kind or check by a pencil when no line visible.*



## LESSON II.

2 dimensions) A **surface** has length and breadth, but no thickness.  
It is simply the outside of bodies.

When the surface is flat or level, like the black-board, top of the table, or the side of a slate, it is called a **plane surface**.

In geometry, we mean by a **plane**, a surface so even that a straight line drawn from any point in it to any other point in it will be wholly in the plane; that is, will touch it at every point.

The word *line*, used alone, means a straight line.

We can imagine a line made by a point moving in a plane. All the lines we shall talk about in the first part of this geometry are supposed to be drawn in the same plane.

only 2 dimensions in plane geometry. Two or more lines having the same direction are called **parallel lines**.

Two lines drawn so as to make a square corner, or angle, are **perpendicular** to each other.

Two lines, having different directions not perpendicular, are **oblique** to each other.

If a line be drawn in a plane, any other line, drawn in the same plane, must be oblique, perpendicular, or parallel to the line first drawn.

A line parallel with the horizon or bottom of the page we call a **horizontal line**.

A vertical line is the direction of a plumb line.

Draw several kinds of lines. Test straightness with ruler.

Place two points; measure the distance between them. Draw a short line; another; one equal to both.



### LESSON III.

Draw the different kinds of lines, 2 inches long; 3 inches; 4 inches. (Freehand.) Name them.

Draw three short lines; one equal to the three.

Draw four lines, 2 feet long,  $\frac{1}{2}$  inch apart;  $\frac{1}{4}$  inch;  $\frac{1}{8}$  inch.

Draw four parallels on the blackboard, 3 feet long, 2 inches apart; 3, 4, 5, 6 inches apart.

To draw parallel lines on slate and paper, use the ruler and the graduated right angle or square, 3 inches by 4 inches. At the same time the pupil learns that two points determine the direction of a line.

To draw parallels on the blackboard, use a square, 2 feet by 3 feet.

The right angle and ruler should be graduated to sixteenths of an inch on one side, and to millimeters on the other.

[Draw lines as above, using decimeters, centimeters, millimeters, until the pupil is familiar with the names and the distances they represent.]

Give a card, having lines of different lengths, to each pupil. Let him measure them by each scale. Compare results.

#### LESSON IV.

To read a line, we use two letters.

Name the starting-point or origin first, as  $AB$  or  $BA$ .

In comparing lines as to length, say one is so many times the other, or that they are to each other, as 2 to 3, 5 to 7, as the case may be.

We do not write an inch as the fraction  $\frac{1}{12}$  of a foot, but as a whole number, the unit of measure. So, in measuring short lines, we can use the  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ,  $\frac{1}{16}$  inch as the unit of measure.

Draw a line  $\frac{7}{8}$  of an inch long. What distance would the line represent, if  $\frac{1}{8}$  represent 10 feet? 20 rods? 5 miles?

Draw a line  $1\frac{1}{2}$  inches long. What distance will it represent on a scale of 20 feet to an inch? 10 rods to  $\frac{1}{2}$  inch?

Draw a line to represent 60 rods on a scale of 10 rods to  $\frac{1}{2}$  inch.

Draw a line 100 feet long, scale 10 feet to the  $\frac{1}{4}$  inch.

Draw a line 100 meters long, scale 10 meters to a centimeter.

Draw two lines; measure and compare them.

✓

## LESSON V.

Estimate, and then measure: length of lines drawn on the blackboard, horizontal, vertical, and oblique.

(1) Short lines in inches, centimeters, etc.

(2) Longer lines in feet and decimeters.

Each pupil makes careful record of estimate, or guess, before testing.

Estimate and test: length and width of slate, desk, pane of glass; width of aisle, door, schoolroom; height of, and other objects. Average estimates of class.

Also, estimate distances in yards, meters, rods, and miles.

Let each pupil find his own height; distance he can span with arms outstretched; span of thumb and forefinger; width of hand and length of forefinger; especially, length of step in natural gait, taking the average of several steps.

A line composed of two or more straight lines is called a **broken line**. Draw one from *A* to *B*; also a straight one.

Measure them; see which is the shorter.

What is a straight line?

Make and name the different kinds of lines.

No time will be lost, if two or three weeks are put upon this important lesson.