CONSTRUCTIVE TEXT-BOOK OF PRACTICAL MATHEMATICS, VOLUME III. TECHNICAL GEOMETRY

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Trieste

TECHNICAL GEOMETRY

THE WORK-BOOK

1. Description. The constructive form of this text requires that each student shall prepare the work daily in accordance with the suggestions, questions, and directions in numerous developing exercises. These exercises force a student not only to do his own thinking but to express his thought in written form.

For this purpose the mathematics work-book is used, which both in size and form is the result of seventeen years of experiment with over 2000 students. It consists of twelve daily record sheets, described in a subsequent paragraph, and 250 removable sheets of 16-pound, unruled, linen paper measuring $5\frac{1}{2} \times 8\frac{1}{2}$ inches, with fasteners for attaching the sheets to the back cover and the student's written work to the front cover.

2. Instruments. In order to prepare the work in a satisfactory manner and to secure the greatest educational benefit, each student will require the following equipment:

> blotter,
> 12-inch triangular scale with U. S. and metric graduations,
> medium lead pencil,
> ink and pencil erasers,
> fountain pen,
> ruling pen,
> compasses,
> red, black, and India inks.

3. Value of Careful Work. It is obvious that skill is never acquired by careless, indifferent effort. Therefore, as in shop-work, the desideratum in this text is perfection in the finished work.

The instructions in the subsequent paragraphs and throughout the text, have accordingly been written to inspire each student with an enlarging ideal and to develop an increasing ability and enthusiasm for its realization.

4. Special Instructions for Work-Book Entries. Enter the date when work is done, in the upper right corner of the page.

Number the pages of the work-book successively as completed, in the lower right corner.

Write the work in straight lines uniformly spaced. Do not spread it either in the line or between lines.

If unable to write in a straight line, rule a sheet of the work-book in India ink, with lines from three-sixteenths to one-quarter of an inch apart and place this sheet under the page which is in preparation.

Center all headings with reference to margins, and keep them properly proportioned and spaced.

The work will look better and be more easily read if additional space is left between the conclusion and the demonstration, and between the demonstration and the theorem following the demonstration.

Make parentheses, equality signs, and other symbols carefully.

Letter title-pages in India ink without punctuation, for the subject and for each book, corresponding to the titles in the text. Insert these in the work-book preceded by a blank sheet.

Drawings in the development exercises should be drawn lightly and carefully with pencil and straight-edge, and

after measurement, should be inked in with India ink and a ruling pen. Other drawings may be done directly in India ink.

As soon as possible learn to draw a light, smooth, draftsman's line.

5. Instructions for the Record Sheet. One dozen daily record sheets are furnished with the work-book. These have columns for the instructor's stamp and for the daily entry by the student, of date, paragraph and theorem numbers, and number of hours spent in outside preparation of studies.

Submit work for inspection as follows: On the first day prepare a record sheet by filling in the blanks as indicated. At the top of the time columns letter the names of the studies in which outside preparation is required, as Math, Phys, C L (chemistry laboratory), etc.

Observe that while the record sheet is for mathematics only, it is a time sheet for all studies.

Whenever work is submitted, attach it to the record sheet on which fill in the entries denoted by the column headings, making no entries in the remarks column.

When an additional record sheet is needed, place it on top of those already filled.

6. Excuse for Non-Performance and Absence. If unable to do assigned work, give to the instructor at the beginning of the period, a written excuse with

       date,

       exact reason for failure, and

       signature.

Make the usual record sheet entries and write the word " Excuse " in the remarks column.

In case of absence enter the date of each day's absence and write " Absent " in the remarks column.

7. Collection and Distribution of Work-Books. (*a*) **Collection.** On the stroke of the bell at the beginning of the period, each student will pass his work-book along the row in reverse order from which the chairs or desks are numbered, being sure to place it on top of the books passed to him.

The student receiving the books in the last row, will collect each row's books and will place them in the file.

Work-books may be taken from the classroom only when permission is noted on the record sheet by the instructor.

(*b*) **Distribution.** At the beginning of the mathematics period, the collector will place the books at the end of the rows so that each student may receive his book from the pile as it is passed.

Books of absentees will be reported directly to the instructor's desk by the collector. In the collector's absence, the next student in the row will attend to the books.

8. Inspection. The remarks column on the record sheet is for the instructor's stamp. When the dater is used instead of the "accepted" stamp, it signifies that the work is incomplete, or unsatisfactory, or incorrect. Changes in such work, unless obvious or indicated in the book, must be arranged with the instructor before the close of the period.

9. Corrected Work. Incorrect or rejected work is due in correct form at the beginning of the next mathematics' period.

Make corrections in red ink, on the same page with the incorrect work. If numerous mistakes have been made prepare a new page and insert it following the incorrect one, on which write in red ink " Corrected on next page," with date of correction.

10. Index and Label. At the end of the school year arrange all the work-books of the year in order, make an **alphabetic index** for your combined book, cut the work-book cover in two through the back, if necessary, and bind all together with one pair of fasteners.

On the front cover, attach a **label** about 4×5, with a line border and lettered title, enumerating the subjects covered, as suggested in the following model:
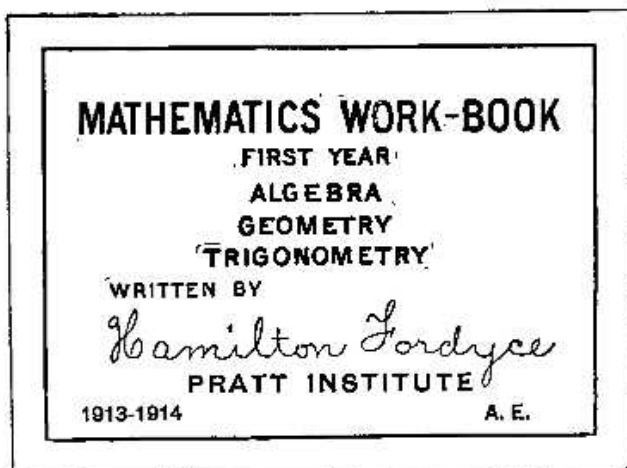
11. Development. In writing the development, use no rippled lines or authorities.

Paragraph each statement.

For accuracy of measurement, do all drawing in development exercises in hair-lines and make the parts sufficiently large to permit the ready use of scale and protractor.

Lines can be measured with greatest certainty by taking their lengths in the dividers and by applying the dividers to the scale.

Drawings must be measured before being inked in.

In every development exercise, *state exactly what the drawing represents and enter all measurements on the drawing.*

Do not letter the drawing unless absolutely necessary for clearness of statement in the development.

12. Hypothesis. Begin an hypothesis with the word **given.** Then specify the first thing named in the theorem, followed by the remaining conditions in the same order as in the theorem.

Following each condition, write the name of its linear representative in the figure. Omit no conditions expressed in the theorem and specify no others.

Take great pains that hypotheses are correctly expressed. A common fault is to name conditions in the hypothesis without regard to their order in the theorem. This leads to loose thinking and sometimes to omissions. That this may not occur, write hypotheses as follows:

(1) The word Given.

(2) The *theorem* name of the first specified thing in the theorem.

(3) The *figure* name of the first thing specified in the theorem.

(4) The theorem name of any other conditions of the theorem, in their order, each followed by its figure name.

13. Demonstration. Write the demonstration immediately following the conclusion, *separated* from it *by a double space.* It should begin about half or three-quarters of an inch from the left margin.

Number every statement of a demonstration at the left consecutively, in Arabic notation without punctuation, inclosing the number in a small parenthesis.

Number each successive statement of the demonstration, at the same distance from the margin.

After each statement, make a short rippled line, followed by the mathematical authority for the statement.

Designate authorities by abbreviations and symbols, and not by numbers.

Close each demonstration by the word therefore, followed by the *exact words of the theorem.*

Leave an extra space both before and after the demonstration.

No statement of the demonstration should occupy more than about two-thirds the width of the page. If greater space is needed, use an extra line.

Use abbreviations and symbols whenever possible.

Do not inclose authorities in parenthesis.

Do not make rippled lines shorter than three-fourths of an inch long. Longer lines will sometimes be desirable.

14. Authorities. Each statement of a demonstration must be followed by the mathematical authority on which the statement is based. Of these there are *four* only:

Hypothesis,

Axioms,

Definitions,

Theorems previously demonstrated.

No statement which is not based on one or more of these authorities, can be regarded as a part of the demonstration.

Indicate authorities invariably by symbols and abbreviations, written on the same line as the statement which they substantiate. To avoid confusion separate them from the statements of demonstration, by space or a rippled line as shown in the model demonstration.

Statements with space or rippled lines following, should not occupy more than two-thirds of the width of the page, the *remaining third being reserved for authorities.*