Hence, if we put $S$ equal to $\frac{a+b+c}{2}$, half the sum of the sides, we shall have $\sqrt{S(S-a)(S-b)(S-c)}$, the area.

*Examples.*—(1.) Find the segments $AD$ and $DB$; and the perpendicular $CD$; and the area of the triangle $ABC$, $AB$ being 14, $CA$ 13, and $BC$ 15. Ans. $AD = 5$; $DB = 9$; $CD = 12$, and area 84.

(2.) Find the number of acres in a triangular field whose sides are 234, 289, and 345 rods.

(3.) Find the number of square rods in a field whose sides are 125, 173, and 216 rods; also find the perpendicular let fall on the base 216, and the length of each segment.

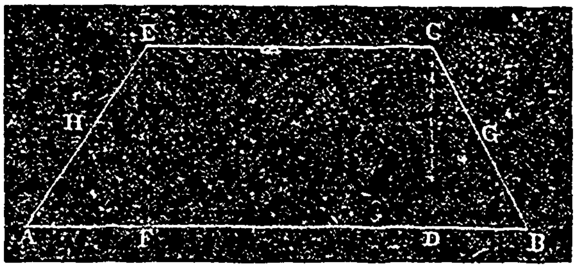
TRAPEZOID.

*To find the area of a trapezoid.*

(1.) The parallel sides may be given and their perpendicular distance, to find the area.

(2.) The parallel sides and the slant sides may be given to find the area.

Begin the lesson by giving the class two or three simple examples on finding the area of a rectangle, and two or three examples on finding the area of a triangle, the base and altitude being given, for Case I. of the trapezoid; and before beginning Case II., give an example or two on finding the area of a triangle when the three sides are given, and on finding the perpendicular let fall on the base.




Let $ABCE$ be a trapezoid, whose parallel sides $EC$ and $AB$ are given, also their perpendicular distance $CD$, is given. Mechanical proof:

Cut the trapezoid out of paper and pin it on the black board; through $E$ and $C$ cut off the parts $AFE$ and $CDB$, leaving $EFDC$ pinned on the board as a rectangle.

Have the class find the area of the rectangle $EFDC$. Then put the two pieces, $EAF$ and $CDB$ (which were cut off), together in the form of a triangle, so that $C$ will be on $E$, and $D$ on $F$, and $AF$ and $DB$ in the same straight line.

Now have the class find the area of the triangle. Its altitude is the altitude of the trapezoid or of the rectangle, and its base of course is the difference between the length of the parallel side $EC$ and the parallel side $AB$. The area of the triangle and the area of the rectangle can be added together for the area of the trapezoid.

CASE II.—*When the four sides are given.*

Cut the trapezoid out of paper as in Case I. Leave the rectangle $EFDC$ pinned on the board, and form the pieces into a triangle as before. $EC$ and $FD$ of the rectangle will be the same length as the short parallel side of the trapezoid. $EA$ and $CB$, two sides of the formed triangle, are given, and the base $AB$ of the triangle will be the difference between the parallel sides of the trapezoid.

Now find the area of the triangle, the three sides being known; also find the length of the perpendicular on the base $AB$, which will be the width of the rectangle. Then find the area of the rectangle, and add the two areas together.

The method of multiplying half the sum of the parallel sides into their perpendicular distance I would not recommend, as it will only answer for Case I., when the perpendicular distance is given. We are compelled to divide it into a triangle and rectangle when the four sides are given; and both cases can be worked in this way. And I consider that one good general method well impressed will be of more advantage to a pupil on examination day, or in six months or a year after the lesson is taught, than a dozen special methods partly impressed or half forgotten.

The principle of multiplying the half sum of the parallel sides by their perpendicular distance may be taught in the following manner. Through the middle points in $AE$ and $BC$ cut off parts by lines perpendicular to the base $AB$. Then the pieces can be put on $E$ and middle point of $EA$, and on $C$ and middle point in $CB$. The figure then formed will be a rectangle, and its length will be half the sum of $EC$ and $AB$.

Geometrical proof:—Pott's Euclid, Geometrical Exercise 51, Book II.

*Examples.* (1.) Find the area of a trapezoid whose parallel sides are 156 and 124, and the perpendicular distance between them 57 feet. Ans. 7980 feet.

(2.) Find the area of the trapezoid $ABCE$, $EC$ being 16 feet; $AB$, 30 feet; $AE$, 13 feet, and $CB$ 15 feet. Ans. 276 feet.

(3.) The parallel sides of a trapezoid are 20 and 12 feet, and the other sides are 15 and 17 feet. Required the area of the trapezoid. Ans. 240 square feet.

## ANSWERS TO QUERIES.

*1. What percentages are required to obtain a First Class A, B, and C?*

D. B., Rockton.

No percentages are fixed *absolutely*. It is necessary to obtain about 70, 60, and 50 per cent., respectively, of the total marks.

2. (*a*) *What percentages are required for 2nd A and B, respectively, at the Intermediate Examination?*

(*b*) *What is the minimum required in each subject?*

(*c*) *What is the programme in Euclid, Chemistry and Literature?*

R. A., Millbank.

(*a*) 40 per cent. on each group for a 2nd B., and 50 per cent. for a 2nd A.

(*b*) 20 per cent. for a B., and 30 for an A.

(*c*) Euclid, I. and II. Books with problems. Chemistry, Flame, Fuel, Atmosphere, Water, Hydrogen, Oxygen, Nitrogen, Carbon, Chlorine, Sulphur, Phosphorus, and their more important compounds. Combining numbers by weight and volume. Symbols and Nomenclature. Literature, Paradise Lost.

*3. If Intermediate and Second Class candidates take Latin, may they entirely omit N. Philosophy, Chemistry and Book-keeping?*

STUDENT, Castlederg.

Yes.

*4. May not those teachers who obtained 2nd Class Certificates, grade B., from County Boards previous to 1877 now obtain Second Class grade A., on passing the prescribed non-professional examination for that grade?*

STUDENT, Castlederg.

Yes.

*5. Must a person, after having obtained an Intermediate certificate, attend the County Model School before he can teach?*

SUBSCRIBER.

Yes, unless he has previously taught at least a year. If he has, he is eligible after passing the Intermediate to attend the Normal School to be trained for his professional 2nd.

*6. Please give, in the Journal, a List of the Authorized Text Books in English Grammar, Geography, History and Arithmetic for Public*