

11-3 Areas of Trapezoids

An **altitude** of a trapezoid is any segment perpendicular to a line containing a base from a point on the opposite base. Since the bases are parallel, all altitudes have the same length, called the **height** (h) of the trapezoid.

Theorem 11-5

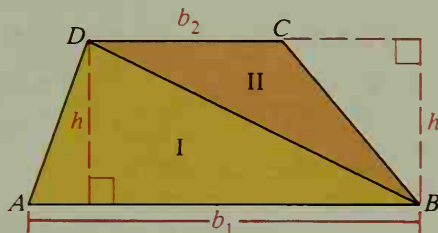
The area of a trapezoid equals half the product of the height and the sum of the bases. ($A = \frac{1}{2}h(b_1 + b_2)$)

Key steps of proof:

1. Draw diagonal \overline{BD} of trap. $ABCD$, forming two triangular regions, I and II, each with height h .
2. Area of trapezoid = Area I + Area II

$$= \frac{1}{2}b_1h + \frac{1}{2}b_2h$$

$$= \frac{1}{2}h(b_1 + b_2)$$



Example 1 Find the area of a trapezoid with height 7 and bases 12 and 8.

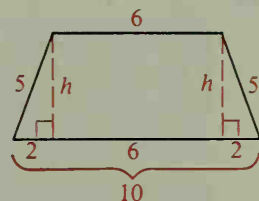
Solution $A = \frac{1}{2}h(b_1 + b_2) = \frac{1}{2} \cdot 7 \cdot (12 + 8) = 70$

Example 2 Find the area of an isosceles trapezoid with legs 5 and bases 6 and 10.

Solution When you draw the two altitudes shown, you get a rectangle and two congruent right triangles. The segments of the lower base must have lengths 2, 6, and 2. First find h :

$$\begin{aligned} h^2 + 2^2 &= 5^2 \\ h^2 &= 21 \\ h &= \sqrt{21} \end{aligned}$$

Then find the area: $A = \frac{1}{2}h(b_1 + b_2) = \frac{1}{2}\sqrt{21}(10 + 6) = 8\sqrt{21}$



Classroom Exercises

Find the area of each trapezoid and the length of the median.

