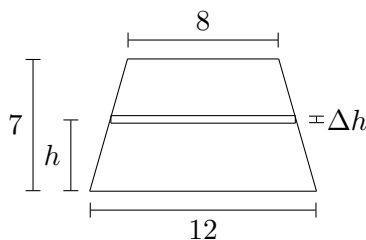


4. [5 points] A trapezoid has bases of length 12 and 8, and has height 7, as shown in the diagram below.



- a. [3 points] Write an expression which approximates the area of a rectangular slice of this trapezoid with small thickness Δh at a height h from the larger base. (See the above diagram.) Your expression should not involve any integrals.

Solution: Let's call the length of slice ℓ . We can find ℓ by modeling it as a linear function of h since the sides of this object are straight.

When $h = 0$, $\ell = 12$, and when $h = 7$, $\ell = 8$. So the slope is $-4/7$, which means

$$\ell = -\frac{4}{7}h + 12,$$

and the area of the slice is $(-\frac{4}{7}h + 12)\Delta h$.

- b. [2 points] Using your expression from (a) to write an integral which, when evaluated, gives the total area of the trapezoid. Do not evaluate the integral.

Solution: The area is the integral of the area of the slice from (a) as $\Delta h \rightarrow 0$, from $h = 0$ to $h = 7$:

$$\int_0^7 \left(-\frac{4}{7}h + 12 \right) dh.$$