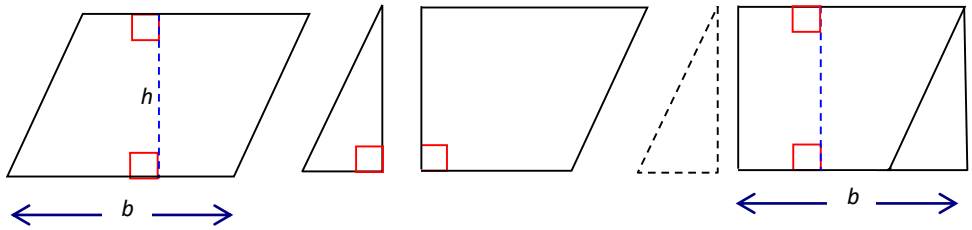
Area of Parallelograms and Trapezoids

The **base of a parallelogram** is the length of any of its sides.

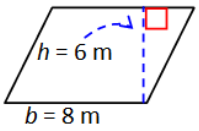
The **height of a parallelogram** is the perpendicular distance between the side whose length is the base and the opposite side. The diagrams below show how to change a parallelogram into a rectangle with the same base, height, and area as the parallelogram.



Notice that the area of the rectangle above is the product of the base b and the height h. The diagram suggests the formula below.

The area A of a parallelogram is the product of the base b and the height h.

Algebra $A = bh$ **Numbers** $A = 6 \bullet 8 = 48$ m^2



Example 1: The base of a parallelogram is 5 centimeters. The height is twice the base. Find the area of the parallelogram.

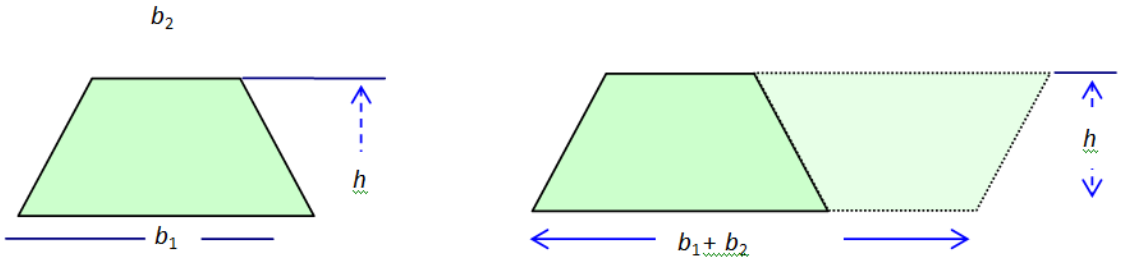
Find the height: $h = 2b = 2(\mathbf{5}) = 10$ cm

Find the area: $A = bh = 5(\mathbf{10}) = 50$ cm^2

The parallelogram has an area of 50 square centimeters.

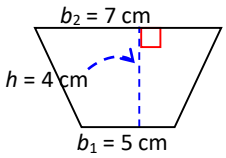
The **bases of a trapezoid** are the lengths of any of its parallel sides.

The **height of a trapezoid** is the perpendicular distance between the sides whose lengths are the bases. The diagram below shows how two congruent trapezoids with height h and bases b_1 and b_2 can be put together to form a parallelogram with base $b_1 + b_2$ and height h.



Notice that the area of the parallelogram is twice the area of either trapezoid. This suggests the formula below.

The area A of a trapezoid is one half the product of the sum of the bases, b_1 and b_2, and the height, h.



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

Numbers: $A = \frac{1}{2}(5 + 7)4 = 24 \text{ cm}^2$