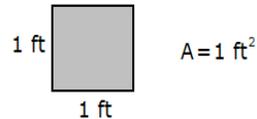


The **area** of a geometric object is a measurement of its surface.

Understanding and remembering area formulas are easier if we know how they were derived. While we could think about perimeter as a fencing problem, area can be thought of as follows. Suppose a geometric object is a room. How many tiles do we need to buy to cover the entire room? Of course, we have to first agree on the size of the tiles we use to measure area.

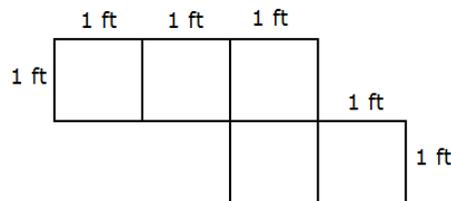
Definition: The **area** of a 1 ft by 1 ft square (shown on the picture below) is defined to be 1 ft^2 . (Similar definitions can be formulated with mi^2 , cm^2 , in^2 , etc.)



The area of any object, measured in ft^2 , is the number of 1 ft by 1 ft square needed to cover the object, cutting and pasting allowed.

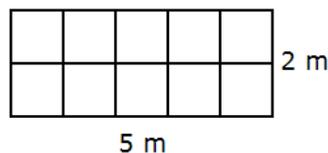
Area is not a length like perimeter. Area is always measured in ft^2 , mi^2 , cm^2 , in^2 , etc., and is usually denoted by A .

Example 1: Find the area of the figure shown on the picture below.



Solution: We simply count the tiles we need to cover this object. Since the figure can be covered by 5 1 ft by 1 ft squares, its area is $A = 5 \text{ ft}^2$.

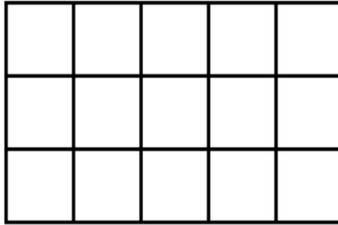
Example 2: Find the area of the figure shown on the picture below.



Solution: Since the figure can be covered using 10 1 m by 1 m squares, its area is $A = 10 \text{ m}^2$.

Theorem: The area of a rectangle with sides x and y is $A = xy$.

Proof. Consider a rectangle with sides 3 m and 5 m. The area of this rectangle will be as many m^2 as many 1 m by 1 m square is needed to cover it. Once we place this grid on the rectangle, it is easy to see, just how many squares we need.



We used exactly 15 squares to cover the rectangle, and so the area is 15 m^2 .

Mathematicians also proved that this formula is true even if the sides of the rectangle are not integers. It is interesting to see that we basically counted how many meter^2 we have. A computation for the area, including the units is slightly different. Instead of counting meter^2 , we literally multiply meter by meter.

$$A = xy = 3 \text{ m} (5 \text{ m}) = 15 \text{ m}^2$$

Area computation will always yield for the right unit.

Example 3: Find the area of a rectangle with sides 13 in and 7 in.

Solution: We apply the formula.

$$A = xy = 13 \text{ in} (7 \text{ in}) = 91 \text{ in}^2$$

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