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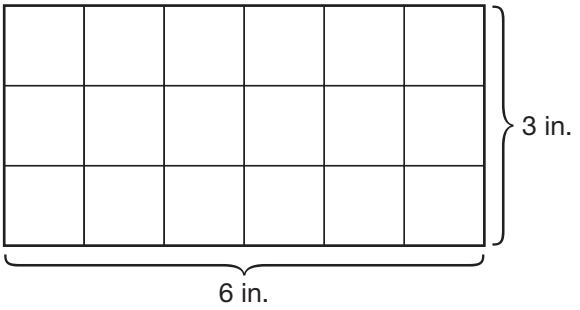
Lesson 23: Area of Figures

Area (*A*) is the measure of the region inside a two-dimensional figure. Area is measured in square units (units^2). You can find the area of a figure by counting the squares inside it. You can also find the area of a rectangle by multiplying its length by its width.

Example

This rectangle has a length of 6 in. and a width of 3 in. What is its area?

First, break up the length and width into 1-in. pieces. There are six 1-in. pieces in the length. There are three 1-in. pieces in the width. In total, there are eighteen 1-in. squares inside the rectangle, so the area of the rectangle is 18 in.^{2}. However, you can also find the area by multiplying its length by its width.



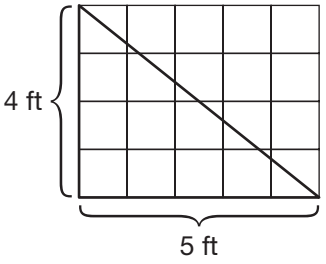
The length of the rectangle is 6 in. The width is 3 in. The area of the rectangle is equal to 6 in. $\times$ 3 in., which is 18 in.^{2}. The product matches the number of squares inside the rectangle. The area is 18 square inches or 18 in.^{2}.

The area of a triangle is one-half the area of a rectangle with the same height and length.

Example

This right triangle has a length of 5 ft and a height of 4 ft. What is its area?

The triangle cuts the 1-ft squares into irregular pieces, so you cannot count the squares inside the figure. However, the triangle has half the area of the rectangle. Therefore, to find the area of a triangle, you can divide the area of the rectangle by 2.



The area of the rectangle is the length times the width: 5 ft $\times$ 4 ft $=$ 20 ft^2. Divide by 2 to find the area of the triangle: 20 ft^2 $\div$ 2 $=$ 10 ft^2. The area of the right triangle is 10 square units.

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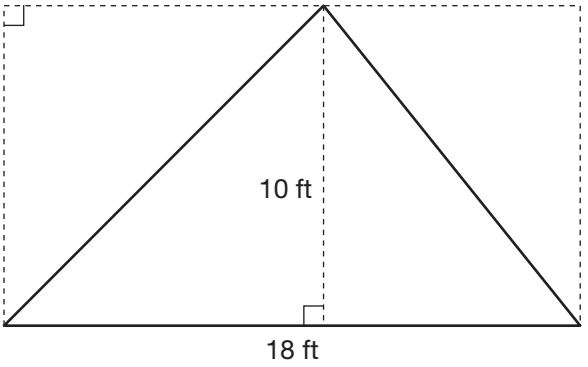
It does not matter whether a triangle is a right triangle. The area of any triangle is one-half the area of a rectangle with the same height and length.

Example

What is the area of the following obtuse triangle?

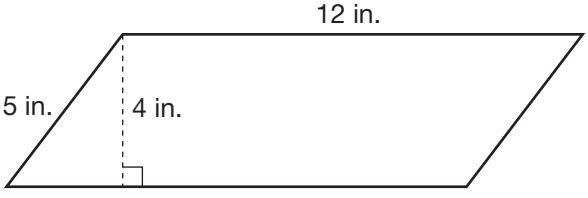


The area of the triangle is equal to half the area of a rectangle with the same length and height. The area of a rectangle with a length of 18 ft and a height of 10 ft would be 18 ft $\times$ 10 ft $=$ 180 ft^2. The area of the triangle is equal to 180 ft^2 $\div$ 2, or 90 ft^2.

To find the area of a parallelogram, multiply the length by the height. The height is the distance from the bottom of the figure to the top.

Example

What is the area of the following parallelogram?



Remember that the *height and length* of a parallelogram are important—not the length of the sides. To find the area of the parallelogram, multiply the length by the height.

The length of the parallelogram is 12 in. Its height is 4 in. The area of the parallelogram is 12 in. $\times$ 4 in., or 48 in.^{2}.

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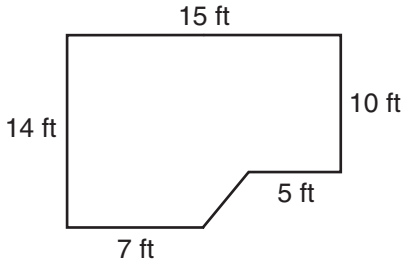
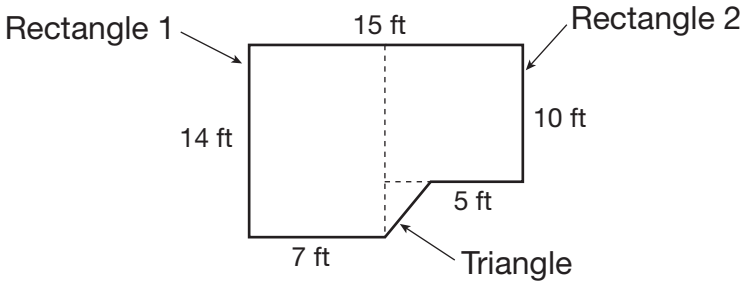
To find the area of an irregular polygon, you can often break it into triangles and rectangles. Then find the area of each part. Finally, add the areas together to find the total area of the polygon.

Example

What is the area of this polygon?



Step 1: **Divide the polygon into rectangles and/or triangles.**



You can divide the polygon into two rectangles and a triangle.

Step 2: **Find the height of the triangle.**

$14 \text{ ft} - 10 \text{ ft} = 4 \text{ ft}$

Step 3: **Find the base of the triangle.**

$15 \text{ ft} - (7 \text{ ft} + 5 \text{ ft}) = 3 \text{ ft}$

Step 4: **Now find the area of each figure, and add them together.**

Rectangle 1: $7 \text{ ft} \times 14 \text{ ft} = 98 \text{ ft}^2$

Rectangle 2: $10 \text{ ft} \times (5 \text{ ft} + 3 \text{ ft}) = 80 \text{ ft}^2$

Triangle: $\frac{1}{2}(3 \text{ ft} \times 4 \text{ ft}) = 6 \text{ ft}^2$

The total area is $98 \text{ ft}^2 + 80 \text{ ft}^2 + 6 \text{ ft}^2 = 184 \text{ ft}^2$.

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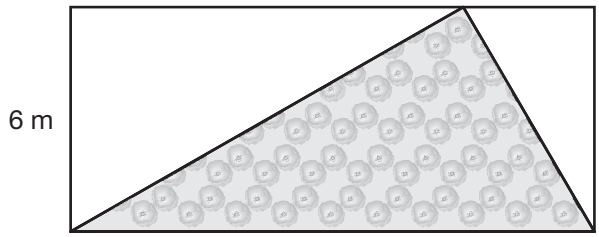
There are many situations where you'll need to find the area of a figure or shape.

Example

Patricia has a rectangular garden with a length of 14 m and a width of 6 m. Patricia plants petunias in the shaded area of the garden, shown below. How much area of her garden is covered by petunias?



The area of Patricia's garden is equal to its length times its height. That is 14 m $\times$ 6 m, or 84 m^2. The triangular part of the garden is equal to half that area: 84 $m^2 \div 2$, or 42 m^2.

The area of Patricia's garden covered by petunias is 42 m^2.

TIP: When a triangle is inscribed within a rectangle, the area of the triangle is equal to the area of the other parts outside the triangle. In the example above, the area of Patricia's petunias is half the area of the total rectangle.