

Grade 6 · Area of Triangles, Quadrilaterals and Polygons · Lesson

Common Core 6.G.A.1 · mathovore.fr

The area of a polygon is the number of square units that cover its inside. For a triangle use half of base times height, for a parallelogram use base times height, and for a trapezoid use half of the sum of the bases times the height. Cut any other polygon into these shapes and add.

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Key facts:

- Triangle: $A = \frac{1}{2}bh$; parallelogram: $A = bh$.
- Trapezoid: $A = \frac{1}{2}(b_1 + b_2)h$.
- The height is always perpendicular to the base, never a slanted side.
- Composite polygons are cut into rectangles and triangles, or a piece is subtracted.
- Area is measured in square units such as ft^2 or m^2 .

What does the area of a polygon measure?

Area is the amount of flat surface inside a closed shape. It is counted in square units, such as square inches, square feet, or square meters. A polygon is a closed shape with straight sides, and every polygon in this chapter can be cut into rectangles and triangles.

Area formulas

Shape	Formula	Letters
Rectangle	$A = \ell w$	length and width
Parallelogram	$A = bh$	base and height
Triangle	$A = \frac{1}{2}bh$	base and height
Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$	two parallel bases and height

How do you find the area of a triangle?

Two copies of any triangle fit together to make a parallelogram with the same base and

height, so one triangle is half of it. The height must be perpendicular to the base. A slanted side is never the height.

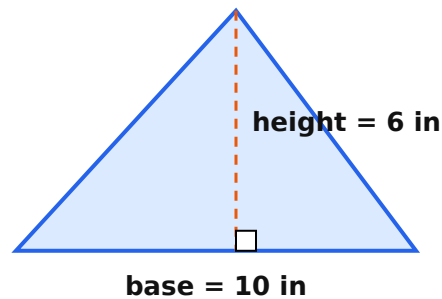


Figure 1. The height is the perpendicular distance from the base to the opposite vertex.

For the triangle above, $A = \frac{1}{2} \times 10 \times 6 = 30 \text{ in}^2$. A right triangle is the easy case: its two legs are already perpendicular, so one leg is the base and the other is the height.

How do you find the area of a parallelogram or a trapezoid?

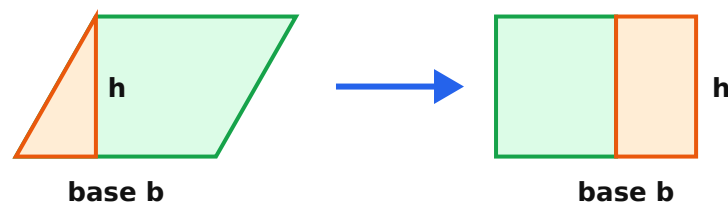


Figure 2. Cut and slide a right triangle to turn a parallelogram into a rectangle.

Cut a right triangle off one end of a parallelogram and slide it to the other end. The result is a rectangle with the same base and height, so $A = bh$. A diagonal splits a trapezoid into two triangles that share the trapezoid height, which gives $A = \frac{1}{2}b_1h + \frac{1}{2}b_2h = \frac{1}{2}(b_1 + b_2)h$. For bases of 6 ft and 10 ft and a height of 4 ft, $A = \frac{1}{2}(6 + 10)(4) = 32 \text{ ft}^2$.

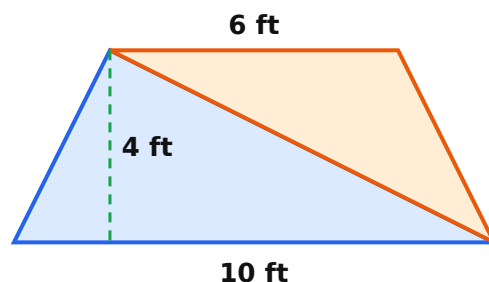


Figure 3. A diagonal splits a trapezoid into two triangles with the same height.

How do you find the area of a composite polygon?

1. Draw dashed lines that cut the polygon into rectangles and triangles.
2. Label each piece with the lengths needed for its formula.
3. Find the area of each piece.
4. Add the areas. If a piece was cut out of a larger rectangle, subtract instead.

Example. The L-shaped floor in Figure 4 splits into a 7×3 rectangle and a 12×5 rectangle. The areas are 21 ft^2 and 60 ft^2 , so the total is 81 ft^2 . Check by subtracting:
 $12 \times 8 - 5 \times 3 = 96 - 15 = 81 \text{ ft}^2$.

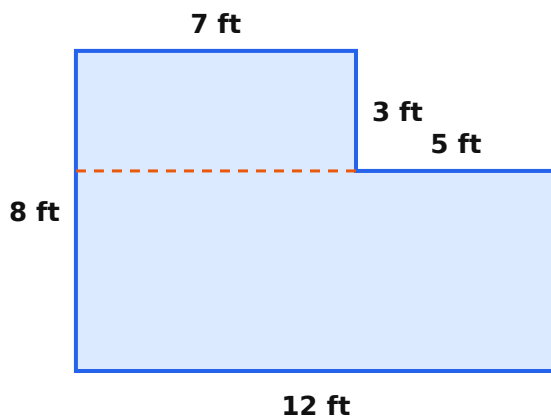


Figure 4. Cutting the L-shape along the dashed line gives two rectangles.

Area of Triangles, Quadrilaterals and Polygons: frequently asked questions

Why is the area of a triangle half of base times height?

Two identical triangles fit together to make a parallelogram whose area is base times height. One triangle is half of that parallelogram, so its area is $\frac{1}{2}bh$.

Which measurement is the height of a triangle?

The height is the perpendicular distance from the base to the opposite vertex. In an obtuse triangle it can lie outside the shape, and in a right triangle it is one of the legs.

How do you find the area of a trapezoid?

Add the two parallel sides, multiply by the height, and take half. You can also split the trapezoid into two triangles and add their areas.

How do you find the area of an irregular polygon?

Divide it into rectangles and triangles, find each area, and add. If the shape is a large rectangle with a piece removed, subtract the removed piece.

Why is area measured in square units?

Area counts how many unit squares fit inside a shape. A shape that holds 30 squares with 1-foot sides has an area of 30 square feet.