

# Prisms: Surface Area, Volume and Composite Figures

Grade 7 math · Lesson · Standards: 7.G.B.6

**Quick answer:** To find the area of a composite figure, split it into rectangles, triangles and other simple shapes and add their areas. The volume of a right prism is  $V = Bh$ , the base area times the height. Surface area is  $SA = 2B + Ph$ , which adds both bases and the lateral faces.

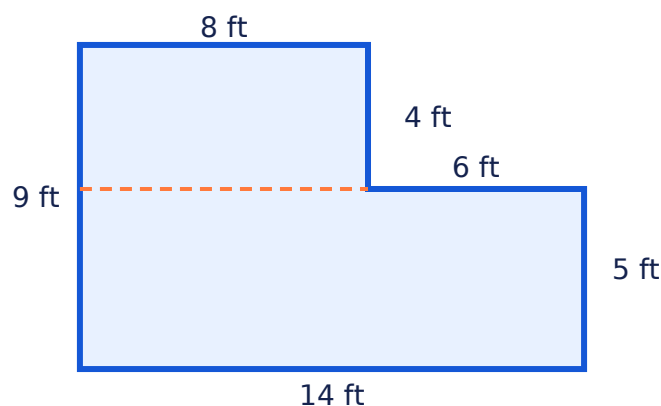
**Standards:** 7.G.B.6 · **Level:** Grade 7

## How do you find the area of a composite figure?

A composite figure is built from simple shapes. Split it into rectangles, triangles, parallelograms or trapezoids, find each area, and combine them. Sometimes it is easier to subtract a missing piece from a larger rectangle.

### Area formulas to use

- Rectangle:  $A = l \times w$
- Triangle:  $A = \frac{1}{2}bh$
- Parallelogram:  $A = bh$
- Trapezoid:  $A = \frac{1}{2}(b_1 + b_2)h$



*Split the L-shape with the dashed line into two rectangles.*

The dashed line makes a rectangle 8 ft by 4 ft and another 14 ft by 5 ft.  $\text{Area} = 32 + 70 = 102 \text{ ft}^2$ .  
Check by subtraction:  $14 \times 9 - 6 \times 4 = 126 - 24 = 102$ .

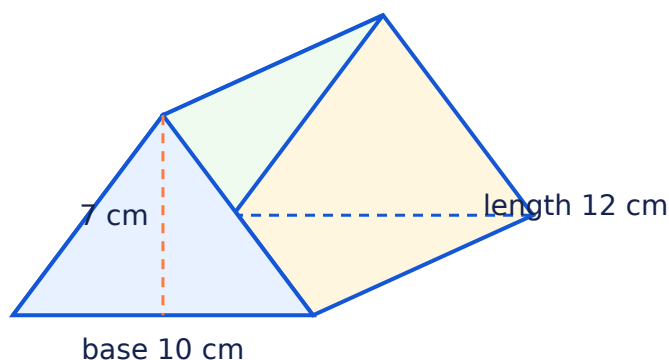
## How do you find the volume of a right prism?

A right prism has two parallel, identical bases joined by rectangles. Volume counts the cubic units that fit inside. Multiply the area of the base by the height of the prism, which is the distance between the bases.

### Volume of a prism

$$V = Bh$$

$B$  is the area of one base and  $h$  is the distance between the bases.



Triangular prism: base area  $B = 35 \text{ cm}^2$ , length 12 cm.

## How do you find the surface area of a prism?

Surface area is the total area of all faces, measured in square units. Picture the net: two bases plus a long rectangle that wraps around, whose width is the perimeter of the base.

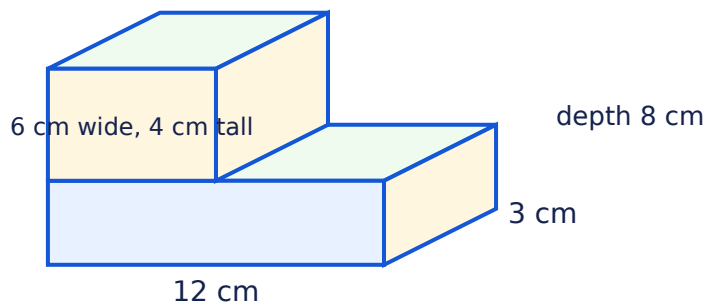
### Surface area of a prism

$$SA = 2B + Ph$$

$P$  is the perimeter of the base. For a rectangular prism this equals  $2(lw + lh + wh)$ .

## How do you handle composite solids?

For volume, add the volumes of the pieces. For surface area, add the faces you can see and skip any faces that are glued together.



*A composite solid: add the volumes of the two blocks.*

### Worked example

Find the volume of the triangular prism in the first diagram: base 10 cm, triangle height 7 cm, length 12 cm.

1. Base area:  $B = \frac{1}{2} \times 10 \times 7 = 35 \text{ cm}^2$ .
2. Volume:  $V = 35 \times 12 = 420 \text{ cm}^3$ .

### Common mistake

Using the slanted side of the triangle as its height, or leaving out the  $\frac{1}{2}$  when the base is a triangle.

### Mathbot's tip

Label every answer with the right unit: square units for area and surface area, cubic units for volume. If you see  $\text{cm}^3$ , ask whether the problem wanted a flat or a solid measurement.

### Key points to remember

- Composite area: split into simple shapes, then add or subtract.
- Prism volume:  $V = Bh$ , in cubic units.
- Prism surface area:  $SA = 2B + Ph$ , in square units.
- The base of a triangular prism is a triangle, so  $B = \frac{1}{2}bh$ .
- Composite solids: add volumes; for surface area ignore the faces that touch.

## Prisms: Surface Area, Volume and Composite Figures: frequently asked questions

### What is the difference between surface area and volume?

Surface area is the total area of the outside faces, measured in square units, like wrapping paper.

Volume is the amount of space inside, measured in cubic units, like water filling a tank.

**How do I know which face is the base of a prism?**

The bases are the two identical parallel faces that give the prism its name. In a triangular prism they are the triangles. The height of the prism is the distance between them.

**Do I always add when I find a composite area?**

No. Add when the shape is split into parts that fit together. Subtract when a piece is cut out of a larger shape, such as a notch removed from a rectangle.

**How do I find the height of a prism if I know the volume?**

Divide the volume by the base area:  $h = V \div B$ . For example, a prism with volume  $360 \text{ cm}^3$  and base area  $45 \text{ cm}^2$  has height 8 cm.

**What happens to the surface area when two solids are glued together?**

The glued faces are no longer on the outside. Add the surface areas of both solids and subtract the area of the glued region twice, once from each solid.