

Unfolding Solids: Nets and Surface Area

Grade 6 math · Lesson · Standards: 6.G.A.4

Quick answer: Surface area is the total area of all the faces of a solid. Draw its net, find the area of every piece, and add. For a rectangular prism, $SA = 2lw + 2lh + 2wh$. A triangular prism adds two triangles and three rectangles, and a square pyramid adds four triangles to its square base.

Standards: 6.G.A.4 · **Level:** Grade 6

What is a net, and how does it show surface area?

Cut along some edges of a box and unfold it flat: the flat pattern is a net. Every face of the solid appears in the net exactly once, so adding the areas of all the pieces gives the total surface area.

Vocabulary

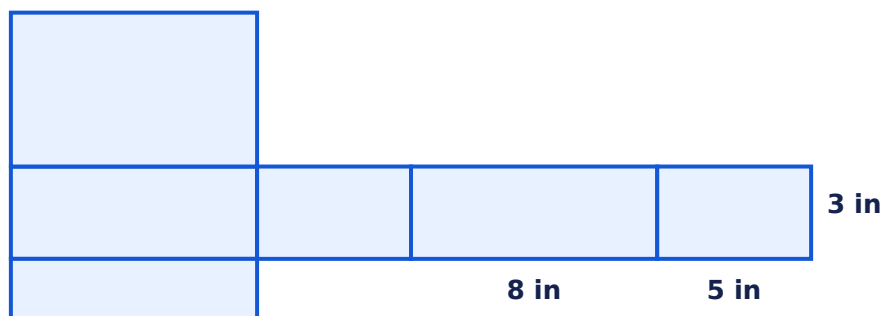
A **net** is a flat pattern that folds into a solid without gaps or overlaps. The **surface area** of the solid is the sum of the areas of all its faces. It is measured in square units.

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

A rectangular prism has three pairs of matching faces. Find one area from each pair, double it, and add.

Rectangular prism

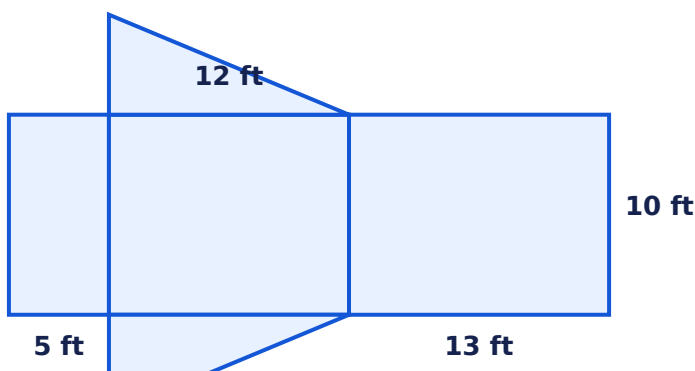
$$SA = 2lw + 2lh + 2wh$$



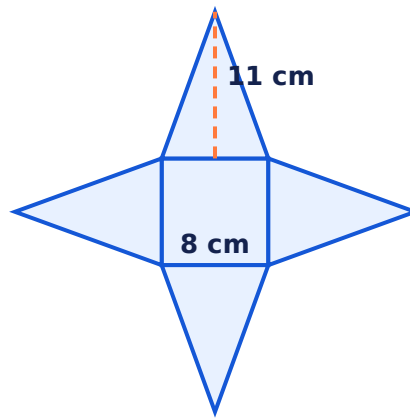
Net of a gift box: six rectangles.

How do you find the surface area of a triangular prism or a pyramid?

List the shapes in the net, find each area with its own formula, and add them. A triangular prism has two triangles and three rectangles. A square pyramid has one square base and four identical triangles whose height is the *slant height*.



Net of a triangular prism: three rectangles and two triangles.



Net of a square pyramid: one square and four triangles.

Method: surface area from a net

1. Sketch the net and list every face.
2. Find the area of each face, using $A = bh$ for rectangles and $A = \frac{1}{2}bh$ for triangles.
3. Add all the areas.
4. Write the total in square units.

Worked example

Find the surface area of a gift box that is 8 in long, 5 in wide and 3 in tall.

Top and bottom: $2 \times (8 \times 5) = 80$. Front and back: $2 \times (8 \times 3) = 48$. Two sides: $2 \times (5 \times 3) = 30$. Total: $80 + 48 + 30 = \mathbf{158 \text{ square inches}}$.

Common mistake

Leaving out a face, or using the slanted edge of a pyramid where the triangle's slant height belongs. Count the faces in the net before adding.

Mathbot's tip

Tick each face on the net as you add it. If the count of ticks equals the count of faces, nothing was missed.

Key points to remember

- A net is a flat pattern that folds into a solid.
- Surface area is the sum of the areas of all faces, in square units.
- A rectangular prism has 6 faces: $SA = 2lw + 2lh + 2wh$.

- A triangular prism has 2 triangles and 3 rectangles; a square pyramid has 1 square and 4 triangles.

Unfolding Solids: Nets and Surface Area: frequently asked questions

What is the difference between surface area and volume?

Surface area measures the outside covering of a solid in square units. Volume measures the space inside in cubic units.

How many faces does a triangular prism have?

A triangular prism has 5 faces: 2 triangles and 3 rectangles. Its net shows all five.

What is slant height?

Slant height is the height of one triangular face of a pyramid, measured from the middle of the base edge up to the top. It is not the height of the whole pyramid.

Can the same solid have different nets?

Yes. A cube has eleven different nets. Every net has the same faces, so the surface area does not change.

Why is surface area in square units?

Each face is flat and its area counts unit squares. Adding areas of flat faces gives a total in square units.