

Surface area

Topic cliff notes / objectives, key ideas and examples

Learning objectives

- Add the exposed areas of a solid using its net.
- Adapt a closed-solid calculation for an open box or a hidden join.

Key ideas

- Surface area measures the exposed surfaces; use square units, not cubic units.
- For a closed cuboid, count each of the three rectangular face types twice.

$$S = 2(lw + lh + wh)$$

- For a closed cylinder, add two circles and the wrapped rectangle.

$$S = 2\pi r^2 + 2\pi rh$$

- Omit missing faces. For a joined face, remove both touching areas from the sum of the separate solids.

Worked example

Find the surface area of a closed 5 cm by 3 cm by 2 cm cuboid.

$$S = 2(5 \times 3 + 5 \times 2 + 3 \times 2)$$

$$S = 2(15 + 10 + 6) = 62$$

Answer

$$62 \text{ cm}^2$$

Quick example

Remove the 5 cm by 3 cm top to make an open box. Find its surface area. Subtract the missing lid once; keep the base.

$$S_{\text{open}} = 62 - 5 \times 3 = 47$$

Answer

$$47 \text{ cm}^2$$

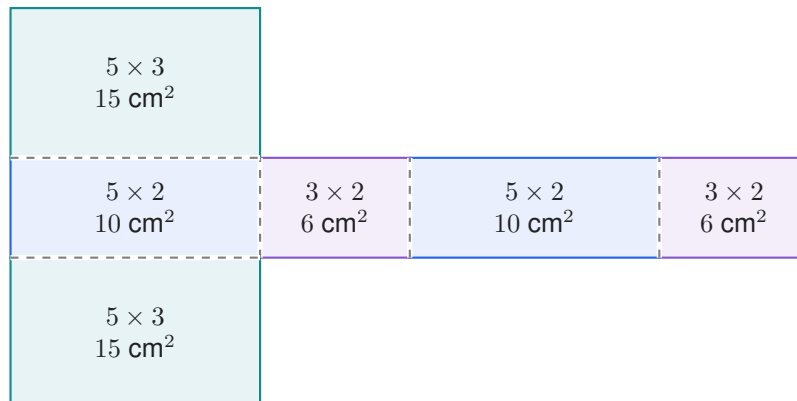
Watch out

Count surfaces, not edges or interior space. Do not count an absent lid or a face hidden inside a join.



Visual guide: add every exposed face once

For a closed cuboid measuring $5\text{ cm} \times 3\text{ cm} \times 2\text{ cm}$, unfold the six faces. Equal colours identify the equal opposite pairs.



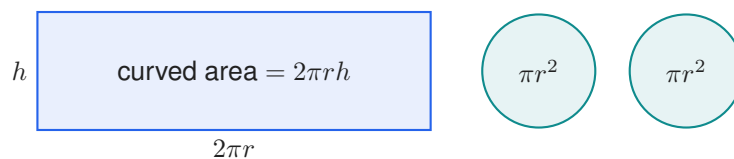
$$S = 2(15) + 2(10) + 2(6) = 62\text{ cm}^2$$

Open-top box: remove the top 5×3 face only. The equal base remains.

$$S_{\text{open}} = 62 - 15 = 47\text{ cm}^2$$

Cylinder: circles plus a wrapped rectangle

The rectangle has width $2\pi r$ and height h . The circle areas are πr^2 each. Include both circles for a closed cylinder.



The cylinder pieces above are schematic, not to a common scale. They show which areas are included, not where the circles must attach.

$$r = 3, h = 5 : S = 2\pi(3)^2 + 2\pi(3)(5) = 48\pi\text{ cm}^2$$

Joined solids: shared faces are hidden. Two cubes of side 2 cm joined along a whole face have exposed area $24 + 24 - 4 - 4 = 40\text{ cm}^2$.

