Surface Area of Three-Dimensional Objects

Apply the skill to decisions and designs

Name _____ **Date** _____ **Score** _____ / 6

QUICK REVIEW

Surface area adds areas of exposed faces. A closed rectangular prism has $SA = 2(lw + lh + wh)$. For $4, 3, 2$ cm this is $2(12 + 8 + 6) = 52$ cm^2. An open-top box omits one lw face; a triangular prism has two triangular ends and three rectangular walls.

Worked example

Find area of a closed 4 by 3 by 2 cm box.

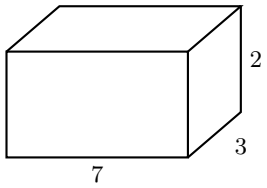
1. One of each face pair has areas $4(3) = 12$, $4(2) = 8$, $3(2) = 6$.
2. Pair total $= 12 + 8 + 6 = 26$ cm^2.
3. Double for opposite faces: $2(26) = 52$ cm^2.

Answer: 52 cm^2.

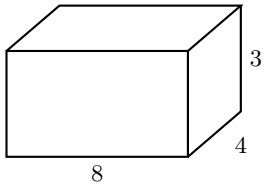
Practice Problems

Show your thinking.

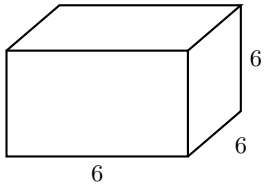
1. A closed 7 by 3 by 2 cm gift box needs wrapping without overlap or waste. Find the required area.



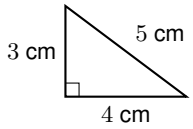
2. An open-top planter is 8 by 4 by 3 cm. Find the lining area for its inside base and four walls, ignoring thickness.



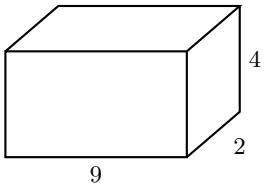
3. Paint all six faces of an edge-6 cm cube. Find paint area and the area saved if its bottom is left unpainted.



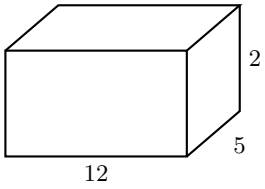
4. A closed triangular package is 10 cm long with a 3-4-5 cm right-triangle end. Find cardboard area, including both ends.



5. A label covers only the four walls of a 9 by 2 by 4 cm box. Find label area and compare with total surface area.



6. A closed 12 by 5 by 2 cm box needs material. A sheet has area 183 cm^2. Find the surface area and area shortage, ignoring cutting layout.



Answer Key

1. Area 82 cm^2.
2. Area 104 cm^2.
3. Area 216 cm^2. Saved 36 cm^2.
4. Area 132 cm^2.
5. Label 88 cm^2; total 124 cm^2; difference 36 cm^2.
6. Area 188 cm^2. Shortage 5 cm^2.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Top and bottom: $2(7)(3) = 42$ cm^2.
2. Front/back: $2(7)(2) = 28$; ends: $2(3)(2) = 12$ cm^2.
3. Total $= 42 + 28 + 12 = 82$ cm^2.

Problem 2

1. Base: $8(4) = 32$ cm^2.
2. Four walls: $2(8)(3) + 2(4)(3) = 72$ cm^2.
3. Total $= 32 + 72 = 104$ cm^2; no top is counted.

Problem 3

1. One square face: $6^2 = 36$ cm^2.
2. Six faces: $6(36) = 216$ cm^2.
3. Leaving the bottom unpainted saves one face, 36 cm^2.

Problem 4

1. Two triangular ends: $2(1/2)(3)(4) = 12$ cm^2.
2. Three rectangles: $(3 + 4 + 5)(10) = 12(10) = 120$ cm^2.
3. Total $= 12 + 120 = 132$ cm^2.

Problem 5

1. Base perimeter $= 2(9 + 2) = 22$ cm.
2. Four walls have area $22(4) = 88$ cm^2.
3. Total is $88 + 2(9)(2) = 124$ cm^2, so the label covers 36 cm^2 less.

Problem 6

1. The three face areas are 60, 24, and 10 cm^2.
2. Closed area $= 2(60 + 24 + 10) = 188$ cm^2.
3. Shortage $188 - (183) = 5$ cm^2.

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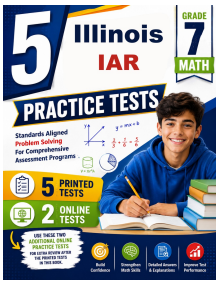

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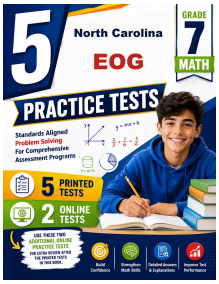

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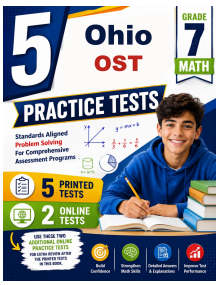

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