Surface Area of Three-Dimensional Objects

Explore ideas and representations

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.

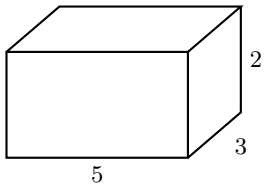
1. One of each face pair has areas $4(3) = 12$, $4(2) = 8$, $3(2) = 6$.
2. Pair total $= 12 + 8 + 6 = 26$ cm^2.
3. Double for opposite faces: $2(26) = 52$ cm^2.

Answer: 52 cm^2.

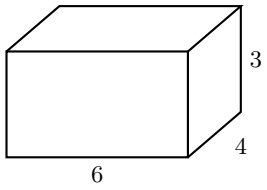
Practice Problems

Show your thinking.

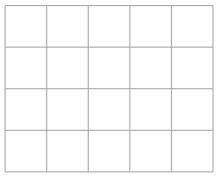
1. Find total surface area of a closed 5 by 3 by 2 cm rectangular box.



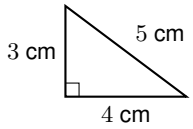
2. Find material area for an open-top 6 by 4 by 3 cm box. Include the base but not a lid.



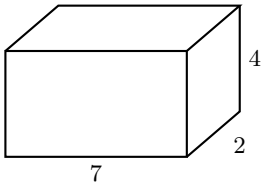
3. A cube has edge 4 cm. Draw a six-square net on the grid and find total surface area.



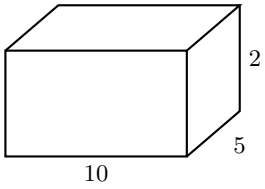
4. A closed triangular prism has a 3-4-5 cm right-triangle base and length 8 cm. Find total surface area.



5. A rectangular box has base 7 by 2 cm and height 4 cm. Find lateral area, excluding top and bottom.



6. For a 10 by 5 by 2 cm closed box, find total surface area and volume. Explain the different units.



Answer Key

1. Area 62 cm^2.
2. Area 84 cm^2.
3. Area 96 cm^2. See the net below.
4. Area 108 cm^2.
5. Area 72 cm^2.
6. Area 160 cm^2. Volume 100 cm^3.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

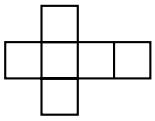
1. Top and bottom: $2(5)(3) = 30$ cm^2.
2. Front/back: $2(5)(2) = 20$; ends: $2(3)(2) = 12$ cm^2.
3. Total $= 30 + 20 + 12 = 62$ cm^2.

Problem 2

1. Base: $6(4) = 24$ cm^2.
2. Four walls: $2(6)(3) + 2(4)(3) = 60$ cm^2.
3. Total $= 24 + 60 = 84$ cm^2; no top is counted.

Problem 3

1. One square face: $4^2 = 16$ cm^2.
2. Six faces: $6(16) = 96$ cm^2.
3. One valid net has four squares in a row, plus one above and one below the second square.



Problem 4

1. Two triangular ends: $2(1/2)(3)(4) = 12$ cm^2.
2. Three rectangles: $(3 + 4 + 5)(8) = 12(8) = 96$ cm^2.
3. Total $= 12 + 96 = 108$ cm^2.

Problem 5

1. Base perimeter $= 2(7 + 2) = 18$ cm.
2. Four walls have area $18(4) = 72$ cm^2.
3. The excluded faces would add $2(7)(2) = 28$ cm^2; do not count them.

Problem 6

1. Closed area $= 2(50 + 20 + 10) = 160$ cm^2.
2. Volume $= 10(5)(2) = 100$ cm^3.
3. Face areas use 2 length factors (square units); volume uses 3 (cubic units).

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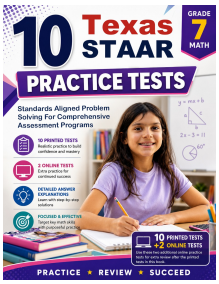

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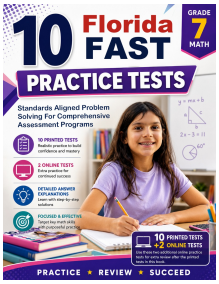

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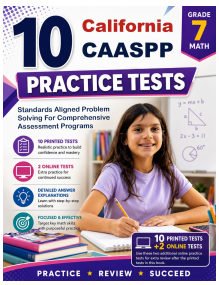

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