

Surface Area Changes

Halve or double one dimension and explain the changing faces

GRADE 7 • 7.MG.1.e

7.MG.1.e "Describe how the surface area of a rectangular prism is affected when one measured attribute is multiplied by a factor of 12 or 2, including those in contextual situations."

NAME _____

DATE _____

BUILD UNDERSTANDING

Use factors $\frac{1}{2}$ (one half) or 2. The quoted standard lost a fraction bar. For a closed prism, $SA = 2(lw + lh + wh)$. Changing one dimension affects two face pairs; the third pair stays fixed. Compare the original and new totals using the given dimensions.

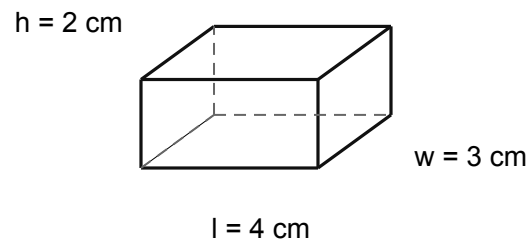
WORKED EXAMPLE

The shown prism has $l = 4$, $w = 3$, $h = 2$ cm. Double only its height. Describe the face-pair changes and compare surface areas.

1. Original: $2(4 \times 3 + 4 \times 2 + 3 \times 2) = 52$.

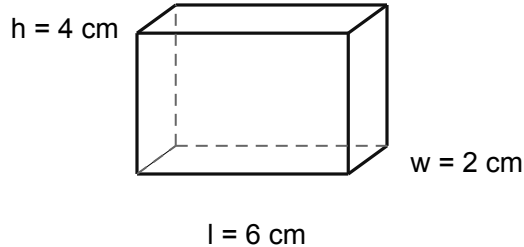
2. New $h = 4$: $2(12 + 16 + 12) = 80$.

Answer: The lw faces stay 12 each. The lh and wh faces double. Surface area rises from 52 to 80 square cm, an increase of 28.

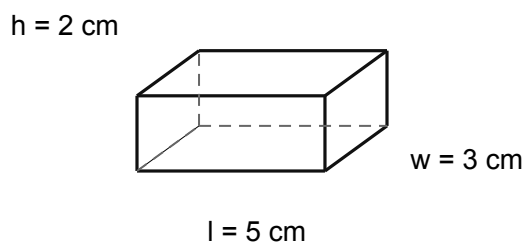


PRACTICE 4 problems

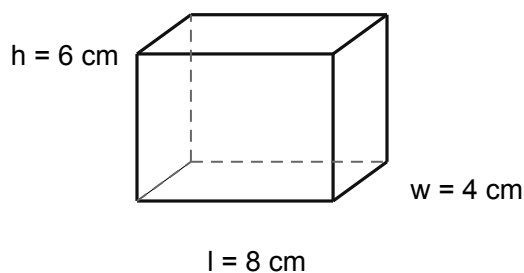
- 1** Halve only the length of this prism. State which pair of faces stays unchanged, then compare the original and new surface areas.



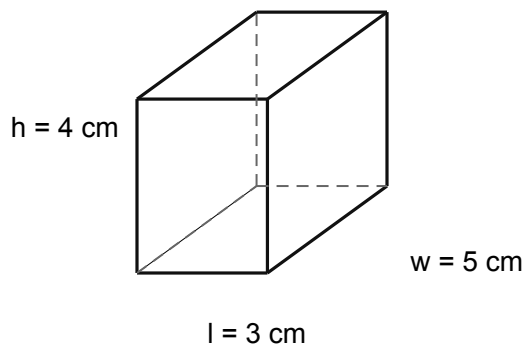
- 2** Double only the width of this prism. Identify the two face pairs that double and the unchanged pair. Compare original and new surface areas.



- 3** Halve only the height. Explain why the total surface area is greater than half the original. Calculate both totals.

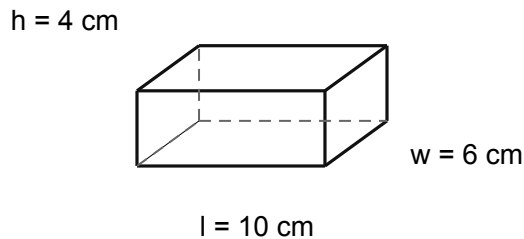


- 4** Double only the length. Calculate the original and new surface areas, then describe the increase using the changed face pairs.



APPLY IT Show your work

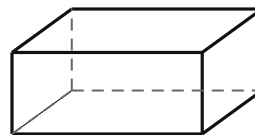
- 1** A closed gift box has these dimensions. Halve only its width. Ignoring tabs and overlap, how much less paper covers all six outside faces? Explain which faces change.



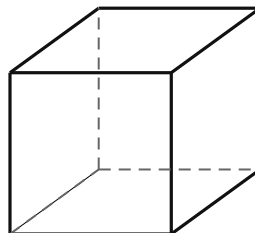
2

A closed display case has these dimensions.

Double only its height. Find the added outside surface area and explain which face pair stays fixed.

 $h = 3 \text{ cm}$  $w = 4 \text{ cm}$ $l = 7 \text{ cm}$ **CHALLENGE** One step up

A student says doubling only the length of this cube doubles its surface area from 96 to 192 square cm. Test the claim with all three face pairs and correct the total.

 $h = 4 \text{ cm}$  $w = 4 \text{ cm}$ $l = 4 \text{ cm}$

Source: Virginia Mathematics SOL Overview of Revisions (2023), page 137: factors are one half or two. The imported quotation joins $\frac{1}{2}$ as 12. All boxes are closed six-face rectangular prisms. Diagrams show perspective; use stated dimensions, not ruler measurements. Require face-pair reasoning and square units as well as totals.

PRACTICE 1

Original 88; new 52 square cm. Decrease: 36. The wh pair stays fixed; the lw and lh pairs halve.

PRACTICE 2

Original 62; new 104 square cm. Increase: 42. The lh pair stays fixed; the lw and wh pairs double.

PRACTICE 3

Original 208; new 136 square cm. Decrease: 72. The lw pair stays fixed; the lh and wh pairs halve.

PRACTICE 4

Original 94; new 148 square cm. Increase: 54. The wh pair stays fixed; the lw and lh pairs double.

APPLY IT 1

Original 248; new 164 square cm. Decrease: 84. The lh pair stays fixed; the lw and wh pairs halve.
Original: $2(60 + 40 + 24) = 248$. New: $2(30 + 40 + 12) = 164$. Difference: 84 square cm.

APPLY IT 2

Original 122; new 188 square cm. Increase: 66. The lw pair stays fixed; the lh and wh pairs double.
Original: $2(28 + 21 + 12) = 122$. New: $2(28 + 42 + 24) = 188$. Difference: 66 square cm.

CHALLENGE

The claim is false. Two 4×4 faces stay fixed (32 total); four faces double from 64 to 128 total. New surface area: $32 + 128 = 160$ square cm.