LESSON MAKER PRO

Box Design Math

Use dimensions to plan space and materials.

HIGH SCHOOL · G.3D.1.1

G.3D.1.1 "Represent, use, and apply mathematical models and other tools (e.g., nets, measuring devices, formulas) to solve problems involving surface area and volume of three-dimensional figures (prisms, cylinders, pyramids, cones, spheres…"

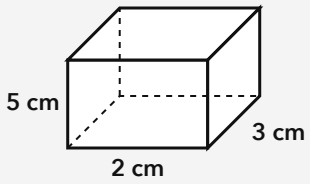
NAME _____ DATE _____

VOLUME OR SURFACE AREA?

For a rectangular prism, volume = length × width × height. Total surface area = 2(length × width + length × height + width × height). If a box has no top, leave the top face out of its surface area.

WORKED EXAMPLE

Find the volume and total surface area of the prism shown.



1. Volume = $2 \times 3 \times 5 = 30$ cm^3.
2. Face areas: $2 \times 3 = 6$, $2 \times 5 = 10$, and $3 \times 5 = 15$ cm^2.
3. Surface area = $2(6 + 10 + 15) = 62$ cm^2.

Answer: 30 cm^3; 62 cm^2

PRACTICE 4 problems

1 A prism is 8 cm long, 4 cm wide, and 6 cm high. Find its volume.

ANSWER _____

2 A prism is 10 cm long, 7 cm wide, and 4 cm high. Find its total surface area.

ANSWER _____

3 A cube has edges 9 cm long. Find its total surface area.

ANSWER _____

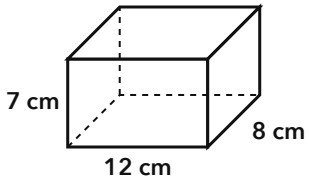
4 A prism is 12 cm long, 8 cm wide, and 4 cm high. Find its volume and total surface area.

ANSWER _____

_____

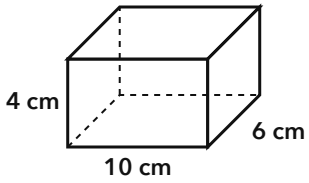
APPLY IT Show your work

1 A game controller ships in a box with the dimensions shown. How much space is inside the box?



ANSWER _____

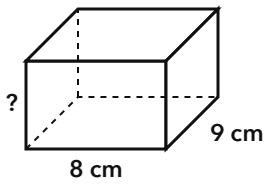
2 A maker builds an open-top bin with the dimensions shown. How much cardboard covers its bottom and four sides?



ANSWER _____

CHALLENGE One step up

A storage box has a volume of 288 cm^3. Find its missing height and total surface area.



WORK SPACE AND ANSWER

ANSWER KEY

Box Design Math

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A prism is 8 cm long, 4 cm wide, and 6 cm high. Find its volume.	**192 cm^3**
2	A prism is 10 cm long, 7 cm wide, and 4 cm high. Find its total surface area.	**276 cm^2**
3	A cube has edges 9 cm long. Find its total surface area.	**486 cm^2**
4	A prism is 12 cm long, 8 cm wide, and 4 cm high. Find its volume and total surface area.	**384 cm^3; 352 cm^2**

PART 2 · APPLY IT

1. **672 cm^3** Multiply the three dimensions: 12 × 8 × 7 = 672.
2. **188 cm^2** Add the bottom and four sides: 10 × 6 + 2(10 × 4) + 2(6 × 4) = 188.

CHALLENGE

Height: 4 cm; total surface area: 280 cm^2

Accept equivalent calculations with correct units. For the open-top bin, the top face must not be included.