LESSON MAKER PRO

Build, Cut, Count

Model useful objects with volume and surface area.

HIGH SCHOOL · MT.CORE.GEOM.MEAS.4.b

MT.CORE.GEOM.MEAS.4.b "Use geometric shapes, their measures, and their properties to model objects and use those models to solve problems in context. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities..."

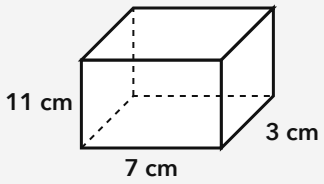
NAME _____ DATE _____

COUNT WHAT REMAINS

For a rectangular prism, volume is length * width * height, and surface area is 2(lw + lh + wh). Add volumes when pieces are joined, and subtract the volume of any piece removed. For surface area, count only exposed faces, including new faces inside a cutout.

WORKED EXAMPLE

What is the surface area of the block shown?

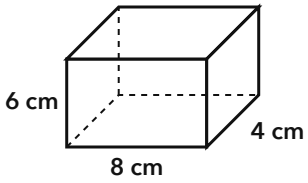


1. Find the three different face areas: 7 * 3 = 21, 7 * 11 = 77, and 3 * 11 = 33 cm^2.
2. Add them: 21 + 77 + 33 = 131 cm^2.
3. Double for the opposite faces: 2 * 131 = 262 cm^2.

Answer: 262 cm^2

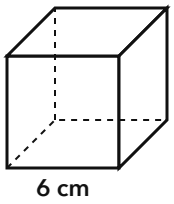
PRACTICE 6 problems

1 What is the volume of the block shown?



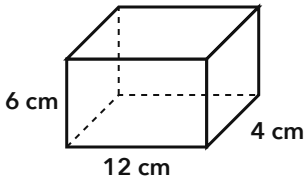
ANSWER _____

2 What is the surface area of the cube shown?



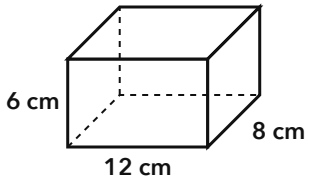
ANSWER _____

3 What is the surface area of the block shown?



ANSWER _____

4 A 4 cm by 4 cm opening is cut straight through the height of the block shown. What volume remains?



ANSWER _____

5 A 10 cm by 8 cm by 4 cm block sits on a 12 cm by 10 cm by 6 cm block. What is their combined volume?

ANSWER _____

6 A 12 cm by 10 cm by 4 cm block has an 8 cm by 6 cm by 4 cm block attached flat to its top. What is the exposed surface area of the combined solid?

ANSWER _____

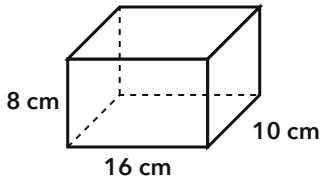
APPLY IT Show your work

1 A student at Salish Kootenai College in Pablo, Montana, plans an open-top display tray for an art show. The tray is 12 cm long, 8 cm wide, and 4 cm deep. How many square centimeters of material cover its bottom and four sides? Ignore material thickness and waste.

WORK SPACE

ANSWER _____

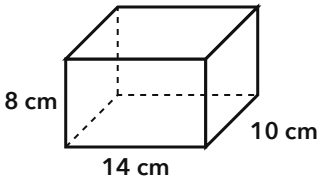
2 For a watershed exhibit at Blackfeet Community College in Browning, students carve a channel from the top of the foam block shown. The channel is 16 cm long, 4 cm wide, and 2 cm deep. What volume of foam remains?



ANSWER _____

CHALLENGE One step up

A 4 cm by 4 cm square tunnel is cut straight through the height of the block shown. What is the new surface area, including the tunnel walls? Show how you count the faces that change.



WORK SPACE AND ANSWER

ANSWER KEY

Build, Cut, Count

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	What is the volume of the block shown?	**192 cm^3**
2	What is the surface area of the cube shown?	**216 cm^2**
3	What is the surface area of the block shown?	**288 cm^2**
4	A 4 cm by 4 cm opening is cut straight through the height of the block shown. What volume remains?	**480 cm^3**
5	A 10 cm by 8 cm by 4 cm block sits on a 12 cm by 10 cm by 6 cm block. What is their combined volume?	**1,040 cm^3**
6	A 12 cm by 10 cm by 4 cm block has an 8 cm by 6 cm by 4 cm block attached flat to its top. What is the exposed surface area of the combined solid?	**528 cm^2**

PART 2 · APPLY IT

1. **256 cm^2** Count the bottom and four sides, but not the open top: 12 * 8 + 2(12 * 4) + 2(8 * 4) = 256 cm^2.
2. **1,152 cm^3** Subtract the channel's volume from the original block's volume: 16 * 10 * 8 - 16 * 4 * 2 = 1,152 cm^3.

CHALLENGE

760 cm^2. The original surface area is 664 cm^2. Subtract 2 * 4 * 4 = 32 cm^2 for the openings, then add 4 * 4 * 8 = 128 cm^2 for the tunnel walls.

For surface area, accept any correct method that counts exposed faces once. The challenge tunnel has openings on both the top and bottom.