Volume of Composite Figures

Volume of Composite Figures: Find, Fix, and Work Backward

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

QUICK REVIEW

Split a solid into rectangular prisms that do not overlap, then add their volumes. Or subtract only the missing part from a full outer box. Use cubic units for volume.

Worked example

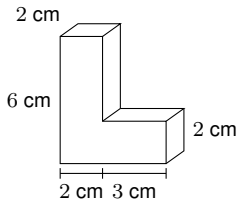
A 5 cm by 2 cm by 3 cm block is cut into 2 cm and 3 cm wide pieces. Both pieces keep the original depth and height. Show that the two pieces together have the original volume.

1. The pieces have volumes $2 \times 2 \times 3 = 12$ cm^3 and $3 \times 2 \times 3 = 18$ cm^3.
2. The sum is $12 + 18 = 30$ cm^3, the same as $5 \times 2 \times 3 = 30$ cm^3 for the original block.
Answer: Both methods give 30 cm^3.

Practice Problems

Show your thinking.

1. A student counts the pictured step as a full 5 cm by 2 cm by 6 cm box. How much empty space did the student count? Find the actual volume.



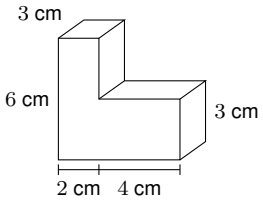
2. The left side of a stepped solid is 3 cm wide and 5 cm high. The right is 5 cm wide and 2 cm high. Both are 2 cm deep. Nia adds the full bottom prism to the full-height left prism. Which part is counted twice? Find the correct volume.

3. A 54 cm^3 solid has two prisms joined side by side. Their shared depth is 2 cm. The left prism is 3 cm wide and 5 cm high. The right is 4 cm wide. Find the right prism height.

4. A step has front rectangles 3 cm by 4 cm and 2 cm by 1 cm. Its depth changes from 3 cm to 5 cm. Jun says this doubles the volume. Check the claim and find how much volume is added.

5. The front of a solid has two rectangles measuring 4 cm by 5 cm and 3 cm by 2 cm. The solid is 3 cm deep. A key lists 26 cm^2 as its volume. Explain what 26 cm^2 measures and find the volume.

6. Tori thinks a vertical split and a horizontal split will give different total volumes. For the figure, find the total both ways: split into left and right prisms, then into lower and upper prisms at the height of the step.



Answer Key

1. Empty space 24 cm^3; solid 36 cm^3.
2. The bottom 2 cm of the left prism is counted twice. The solid is 50 cm^3.
3. 3 cm.
4. It does not double. The new volume is 70 cm^3; 28 cm^3 was added.
5. Front area 26 cm^2; volume 78 cm^3.
6. Both splits give 72 cm^3.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The full box would hold $5 \times 2 \times 6 = 60$ cm^3.
2. The missing corner is $6 - 2 = 4$ cm high, so it occupies $3 \times 2 \times 4 = 24$ cm^3.
3. The solid occupies $60 - 24 = 36$ cm^3.

Problem 2

1. The bottom prism spans $3 + 5 = 8$ cm, so it has volume $8 \times 2 \times 2 = 32$ cm^3. The full left prism has volume $3 \times 2 \times 5 = 30$ cm^3.
2. The overlap is the part of the left prism inside the bottom prism: $3 \times 2 \times 2 = 12$ cm^3.
3. Remove one copy of that overlap: $32 + 30 - 12 = 50$ cm^3.

Problem 3

1. The left prism occupies $3 \times 2 \times 5 = 30$ cm^3.
2. The right prism occupies $54 - 30 = 24$ cm^3. Its base has area $4 \times 2 = 8$ cm^2.
3. Divide the right volume by its base area: $24 \div 8 = 3$ cm.

Problem 4

1. The front area stays $3 \times 4 + 2 \times 1 = 14$ cm^2.
2. The extra depth is $5 - 3 = 2$ cm, so the added volume is $14 \times 2 = 28$ cm^3.
3. The new volume is $14 \times 5 = 70$ cm^3. Twice the old volume would be $2 \times 14 \times 3 = 84$ cm^3.

Problem 5

1. Adding the two front rectangles gives area $4 \times 5 + 3 \times 2 = 26$ cm^2, not volume.
2. Use the third dimension: $26 \times 3 = 78$ cm^3.

Problem 6

1. Vertical split: $2 \times 3 \times 6 = 36$ cm^3 on the left and $4 \times 3 \times 3 = 36$ cm^3 on the right. Total $36 + 36 = 72$ cm^3.
2. Horizontal split: the lower volume is $6 \times 3 \times 3 = 54$ cm^3. The top is $6 - 3 = 3$ cm high and occupies $2 \times 3 \times 3 = 18$ cm^3.
3. Total $54 + 18 = 72$ cm^3. Each split counts every part exactly once.

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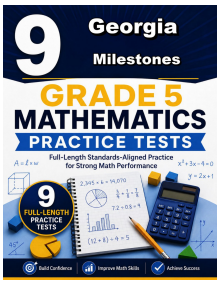

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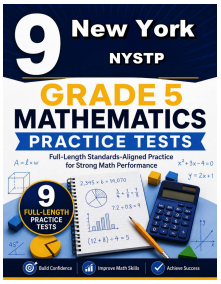

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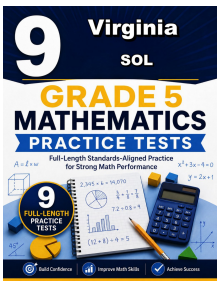

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