Understanding Volume

Understanding Volume: Find, Fix, and Work Backward

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

QUICK REVIEW

Volume measures occupied space. A cube with edge 1 unit occupies 1 cubic unit. The count of cubes and their volume are different quantities, even when their numbers match. Empty space is not part of the occupied volume.

Worked example

A solid has layers of $4, 4, 3$ unit cubes. Find its cube count and volume.

1. Count all layers: $4 + 4 + 3 = 11$ cubes.
2. Each contributes 1 cubic unit, so $11 \times 1 = 11$ cubic units.
Answer: 11 cubes; 11 cubic units.

Practice Problems

Show your thinking.

1. A solid of identical 2 cm-edge cubes occupies 40 cm^3. A student says there are 40 cubes. Find the actual count.

2. From one view, exactly 10 cubes are visible. The solid has two complete layers of 8 unit cubes. Find the occupied volume and how many cubes are hidden in that view.

3. Twelve unit cubes are rearranged from a tall stack to a flat layer. No cubes overlap or are lost. Does the occupied volume change?

4. One cube has 1 cm edges and another has 2 cm edges. A student says they have the same volume because both are one cube. Correct the claim.

5. A box has room for 30 cubes with 1 inch edges. Six cube positions are empty. Find the cube count and occupied volume.

6. A model must occupy 23 cubic units when complete. Its lower layers use $7, 7, 5$ unit cubes. How many cubes must go in the top layer?

Answer Key

1. 5 cubes.
2. 16 cubic units; 6 cubes hidden.
3. No; both are 12 cubic units.
4. 1 cm^3 and 8 cm^3; not equal.
5. 24 cubes; 24 cubic inches occupied.
6. 4 cubes.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Each cube occupies $2 \times 2 \times 2 = 8$ cm^3.

2. Divide by volume per cube: $40 \div 8 = 5$ cubes. The given 40 measures space, not objects.

Problem 2

1. Both layers contain $2 \times 8 = 16$ cubes of 1 cubic unit each.

2. Hidden in this view: $16 - 10 = 6$ cubes. They still contribute to the 16 cubic units.

Problem 3

1. Before: $12 \times 1 = 12$ cubic units.

2. After: the same 12 cubes still occupy $12 \times 1 = 12$ cubic units.

Problem 4

1. The first occupies $1 \times 1 \times 1 = 1$ cm^3.

2. The second occupies $2 \times 2 \times 2 = 8$ cm^3. Equal object counts do not mean equal volumes.

Problem 5

1. Occupied positions: $30 - 6 = 24$, with one cube in each.

2. Each cube occupies 1 cubic inch, so $24 \times 1 = 24$ cubic inches are occupied.

Problem 6

1. The lower layers contain $7 + 7 + 5 = 19$ cubes, occupying 19 cubic units.

2. The top must add $23 - 19 = 4$ cubic units, so add 4 unit cubes.

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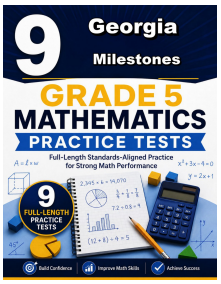

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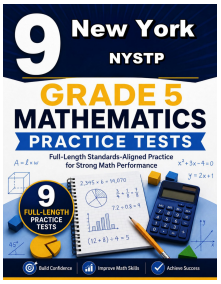

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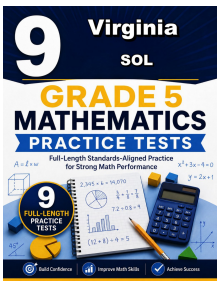

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