Measuring Volume with Unit Cubes

Measuring Volume with Unit Cubes: Find, Fix, and Work Backward

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

Each unit cube takes up one cubic unit of space. Count a complete layer, then count how many layers have that size. Add separate layer counts if the layers differ. Include hidden cubes, not just faces you can see.

Worked example

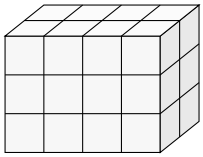
A model has 28 unit cubes and 2 rows of 7 cubes in each complete layer. A label says 4 layers. Recover the actual number.

1. Each layer takes $2 \times 7 = 14$ cubes, so $28 \div 14 = 2$ layers.
2. Four layers would take $4 \times 14 = 56$ cubes, not 28.
Answer: 2 layers.

Practice Problems

Show your thinking.

1. A student counts 12 cubes on the front of the pictured solid and calls that the volume. Use one full horizontal layer to correct the count.



2. A block uses 36 cubes in 3 equal layers. Each layer has 3 equal rows. Recover the number of cubes per row.

3. Mia counts 15 cubes in the top layer of a block with 3 complete layers. She adds $15 + 3$ for the volume. Correct her calculation and explain.

4. A 5 by 2 by 4 block of unit cubes loses its entire top layer. A student says the volume dropped by one cubic unit. Find the drop and the volume left.

5. The top of a rectangular block is 4 cubes by 2 cubes. The block contains 56 unit cubes. Find the number of complete layers and check it.

6. A stack uses 21 cubes. Each of the two lower layers is full and holds 8. How many cubes are in the top layer, and how many more would fill it?

7. A student writes $3 \times 3 \times 2 = 18$ square inches for a stack of one-inch cubes. Keep or change the number and unit, and explain why.

8. Use all 36 cubes in exactly 4 full layers. A proposed layer is 2 by 6 or 3 by 3. Choose the one that works and explain why the other fails.

Answer Key

1. 24 cubic units; the back row was missed.
2. 4 cubes per row.
3. 45 cubic units; count 15 for each layer.
4. Drop 10 cubic units; 30 cubic units left.
5. 7 layers.
6. 5 cubes in the top; 3 more to fill it.
7. Keep 18; change the unit to cubic inches.
8. Use 3 by 3; the 2 by 6 layers need 48 cubes.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. One layer is 4 cubes across and 2 deep, so $4 \times 2 = 8$ cubes.

2. All 3 layers give $8 \times 3 = 24$ cubes. Counting only the front misses one row in each layer.

Problem 2

1. One layer has $36 \div 3 = 12$ cubes.

2. Each row has $12 \div 3 = 4$ cubes. Check $3 \times 3 \times 4 = 36$.

Problem 3

1. Every one of the 3 layers contains 15 cubes, not just one cube.

2. Count $15 + 15 + 15 = 45$ cubes, the same as $3 \times 15 = 45$.

Problem 4

1. A layer has $5 \times 2 = 10$ cubes, so removing it removes 10 cubic units.

2. The other $4 - 1 = 3$ layers contain $3 \times 10 = 30$ cubic units.

Problem 5

1. A full layer contains $4 \times 2 = 8$ cubes.

2. There are $56 \div 8 = 7$ layers. Check $7 \times 8 = 56$ cubes.

Problem 6

1. The lower layers account for $2 \times 8 = 16$ cubes.

2. The top has $21 - 16 = 5$ cubes and needs $8 - 5 = 3$ more.

Problem 7

1. Each layer has $3 \times 3 = 9$ cubes; two layers have $9 \times 2 = 18$.

2. Every one-inch cube fills 1 cubic inch, so 18 cubes fill 18 cubic inches, not square inches.

Problem 8

1. The needed count per layer is $36 \div 4 = 9$ cubes, and $3 \times 3 = 9$.

2. The other design uses $2 \times 6 = 12$ per layer, or $4 \times 12 = 48$ cubes.

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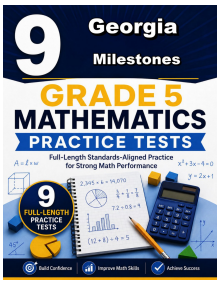

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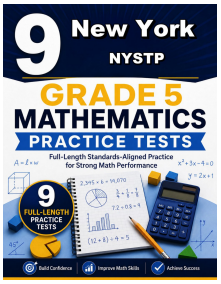

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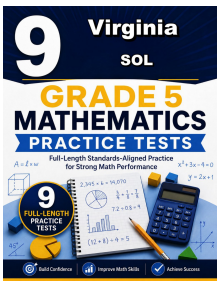

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