Area Volume and Surface Area

Lesson 8 Packing Fractional Unit Cubes

Standards 6.G.A.2

Learning target I can connect fractional unit cubes with a prism volume formula.

Materials Rulers, grid paper, unit cubes or paper cube models, paper and scissors for nets.

Lesson Flow 50 Minutes

0–5 Activate prior knowledge. Read the learning target. Ask students what they already know about packing fractional unit cubes. Use a quick model or estimate to make their starting ideas visible.

5–17 Teach and model. For cubes with edge 1/n, each cube has volume 1/n^3 cubic unit. Divide each prism edge by 1/n to count cubes along it. Multiply the counts, then multiply by the volume of one small cube. Work through the two examples on the attached instruction page. Have students name the first step before showing it.

17–22 Guided practice. Revisit worked Example 2 with its solution covered. Students propose the next step and explain why it is valid; uncover and compare with the worked solution.

22–45 Independent classwork. Assign the attached 10 questions in order. Check items 1–3 for entry-level understanding, 4–6 for connected procedures, 7–8 for representation and explanation, and 9–10 for application or justification. Ask students to use the instruction-page notes area or extra grids for longer work.

45–50 Check understanding. Use classwork question 10 as an exit discussion: Fill a prism 2/3 × 2 × 4/3 units with cubes of edge 1/3 unit. How many cubes fit? Use their volumes to verify lwh. Compare the result with the answer key and ask a student to defend the method.

Support and Extension

Support Model item 1 together with the listed tools, then have students attempt item 2 independently. Watch perpendicular height, missing faces, and square versus cubic units.

Extension Ask students to solve a final item another way, draw a second representation, or create a related problem with a checked answer.

Next step Record which students can explain the target independently. Begin the next teaching session with a brief correction for any recurring error.

Name _____ Date _____

Area Volume and Surface Area

Lesson 8 Packing Fractional Unit Cubes

Standards 6.G.A.2

Learning target I can connect fractional unit cubes with a prism volume formula.

Learn and Discuss

For cubes with edge 1/n, each cube has volume 1/n^3 cubic unit. Divide each prism edge by 1/n to count cubes along it. Multiply the counts, then multiply by the volume of one small cube.

Example 1 Fill a prism 5/2 × 2 × 1 units with cubes of edge 1/2 unit. How many cubes fit? Use their volumes to verify lwh.
Solution 40 cubes; each 1/8 cubic unit; prism 5 cubic units. Counts along edges: 5, 4, 2. Product 40; 40 × 1/8 = 5, also lwh.
Example 2 Fill a prism 5/3 × 7/3 × 5/3 units with cubes of edge 1/3 unit. How many cubes fit? Use their volumes to verify lwh.
Solution 175 cubes; each 1/27 cubic unit; prism 175/27 cubic units. Counts along edges: 5, 7, 5. Product 175; 175 × 1/27 = 175/27, also lwh.

Classwork Show Your Work

Complete the 10 problems on the following page. Refer to the examples, draw models, and check your results.

My Notes or Second Method

Lesson 8 Packing Fractional Unit Cubes

Name _____ Show calculations, models, and units.

1. Fill a prism 3 × 7/2 × 3/2 units with cubes of edge 1/2 unit. How many cubes fit? Use their volumes to verify lwh.

2. Fill a prism 4 × 1 × 5/2 units with cubes of edge 1/2 unit. How many cubes fit? Use their volumes to verify lwh.

3. Fill a prism 4 × 3/2 × 3/2 units with cubes of edge 1/2 unit. How many cubes fit? Use their volumes to verify lwh.

4. Fill a prism 4 × 7/2 × 1 units with cubes of edge 1/2 unit. How many cubes fit? Use their volumes to verify lwh.

5. Fill a prism 5/2 × 5/2 × 3/2 units with cubes of edge 1/2 unit. How many cubes fit? Use their volumes to verify lwh.

6. Fill a prism 1 × 3 × 5/2 units with cubes of edge 1/2 unit. How many cubes fit? Use their volumes to verify lwh.

7. Fill a prism 2/3 × 2/3 × 2 units with cubes of edge 1/3 unit. How many cubes fit? Use their volumes to verify lwh.

8. Fill a prism 7/3 × 1 × 5/3 units with cubes of edge 1/3 unit. How many cubes fit? Use their volumes to verify lwh.

9. Fill a prism 4/3 × 2/3 × 2/3 units with cubes of edge 1/3 unit. How many cubes fit? Use their volumes to verify lwh.

10. Fill a prism 2/3 × 2 × 4/3 units with cubes of edge 1/3 unit. How many cubes fit? Use their volumes to verify lwh.

Packing Fractional Unit Cubes

Area Volume and Surface Area

1. 126 cubes; each 1/8 cubic unit; prism 63/4 cubic units
Reasoning Counts along edges: 6, 7, 3. Product 126; 126 × 1/8 = 63/4, also lwh.

2. 80 cubes; each 1/8 cubic unit; prism 10 cubic units
Reasoning Counts along edges: 8, 2, 5. Product 80; 80 × 1/8 = 10, also lwh.

3. 72 cubes; each 1/8 cubic unit; prism 9 cubic units
Reasoning Counts along edges: 8, 3, 3. Product 72; 72 × 1/8 = 9, also lwh.

4. 112 cubes; each 1/8 cubic unit; prism 14 cubic units
Reasoning Counts along edges: 8, 7, 2. Product 112; 112 × 1/8 = 14, also lwh.

5. 75 cubes; each 1/8 cubic unit; prism 75/8 cubic units
Reasoning Counts along edges: 5, 5, 3. Product 75; 75 × 1/8 = 75/8, also lwh.

6. 60 cubes; each 1/8 cubic unit; prism 15/2 cubic units
Reasoning Counts along edges: 2, 6, 5. Product 60; 60 × 1/8 = 15/2, also lwh.

7. 24 cubes; each 1/27 cubic unit; prism 8/9 cubic units
Reasoning Counts along edges: 2, 2, 6. Product 24; 24 × 1/27 = 8/9, also lwh.

8. 105 cubes; each 1/27 cubic unit; prism 35/9 cubic units
Reasoning Counts along edges: 7, 3, 5. Product 105; 105 × 1/27 = 35/9, also lwh.

9. 16 cubes; each 1/27 cubic unit; prism 16/27 cubic units
Reasoning Counts along edges: 4, 2, 2. Product 16; 16 × 1/27 = 16/27, also lwh.

10. 48 cubes; each 1/27 cubic unit; prism 16/9 cubic units
Reasoning Counts along edges: 2, 6, 4. Product 48; 48 × 1/27 = 16/9, also lwh.