Cube Packing Test

Sort solids by whether unit cubes can fill them exactly.

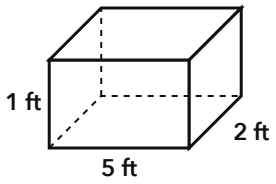
5.M.B.18 "Identify volume as an attribute of solid figures, and measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised (non-standard) units. a..."

NAME _____ DATE _____

CUBES FIT

Equal-size unit cubes can fill the solid with no gaps or overlaps. Count the cubes to find its volume in cubic units.

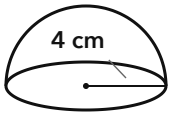
A storage box that is 5 ft by 2 ft by 1 ft fits ten 1-ft cubes.



CUBES LEAVE GAPS

Unit cubes cannot fill the solid exactly. They would leave gaps or stick out.

A dome has a rounded surface, so unit cubes cannot fill it exactly.



1 SORT

8 items

Circle FIT or GAPS for each figure; then, for PROVE IT, choose one figure from each group and explain how you know.

1.

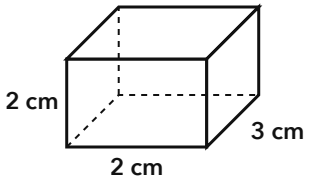


Figure 1

FIT GAPS

2.

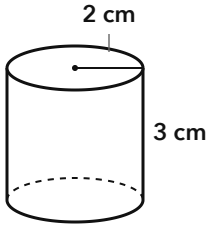


Figure 2

FIT GAPS

3.

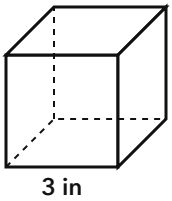


Figure 3

FIT GAPS

4.

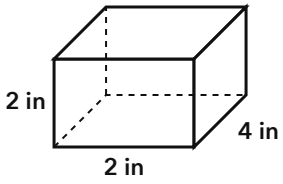


Figure 4

FIT GAPS

5.

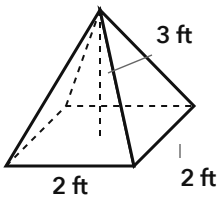


Figure 5

FIT GAPS

6.

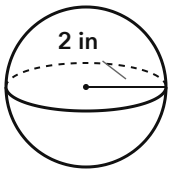


Figure 6

FIT GAPS

7.

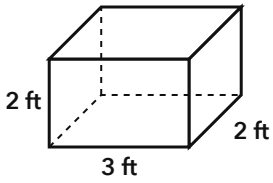


Figure 7

FIT GAPS

8.

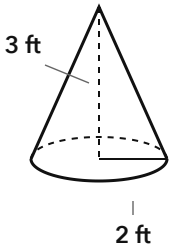


Figure 8

FIT GAPS

2 PROVE IT

Explain your thinking

Choose one figure from each group and explain how you know.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

For MAKE YOUR OWN, write one new solid that unit cubes can fill exactly and one they cannot; explain why each belongs in its group.

FIT _____

GAPS _____

CHALLENGE

A box is 4 cm long, 3 cm wide, and 2 cm high. How many 1-cm cubes fill it, what is its volume in cubic centimeters, and why does counting the cubes work?

ANSWER KEY

Cube Packing Test

GRADE 5 · 5.M.B.18

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	Figure 1 (prism)	**FIT**	Twelve 1-cm cubes fill this rectangular prism exactly.
2	Figure 2 (cylinder)	**GAPS**	Cubes cannot match the cylinder's curved side exactly.
3	Figure 3 (cube)	**FIT**	Twenty-seven 1-in cubes fill this cube exactly.
4	Figure 4 (prism)	**FIT**	Sixteen 1-in cubes fill this rectangular prism exactly.
5	Figure 5 (pyramid)	**GAPS**	Cubes cannot match the pyramid's slanted faces exactly.
6	Figure 6 (sphere)	**GAPS**	Cubes cannot match the sphere's curved surface exactly.
7	Figure 7 (prism)	**FIT**	Twelve 1-ft cubes fill this rectangular prism exactly.
8	Figure 8 (cone)	**GAPS**	Cubes cannot match the cone's curved side and pointed top exactly.

PART 2 · PROVE IT

Task: Choose one figure from each group and explain how you know.
Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **FIT**: A box that is 1 cm by 4 cm by 2 cm fits eight 1-cm cubes without gaps or overlaps.
- **GAPS**: A ball cannot be filled exactly with unit cubes because its curved surface would leave gaps.

Challenge: Twenty-four 1-cm cubes fill the box. Its volume is 24 cubic centimeters because the cubes fill it without gaps or overlaps.

FIT: 1, 3, 4, 7. GAPS: 2, 5, 6, 8. For PROVE IT, accept explanations that connect a figure's flat, square-edged faces or its curved or slanted faces to whether cubes fill it exactly.