Cube Packing Check

Decide which solids can be filled exactly with unit cubes.

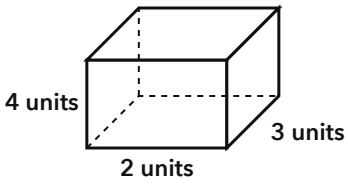
NY-5.MD.3.b "Recognize that a solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units."

NAME _____ DATE _____

CAN PACK

A solid PACKS if whole unit cubes can fill it with no gaps or overlaps. Its volume is the number of unit cubes, measured in cubic units.

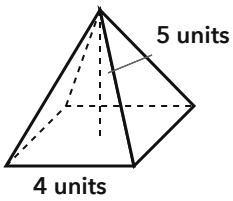
A rectangular prism that is 2 units by 3 units by 4 units packs 24 unit cubes.



CANNOT PACK

A solid CANNOT pack if unit cubes would leave gaps or stick out. It cannot be filled exactly by a whole number of unit cubes.

A square pyramid cannot be filled exactly with unit cubes because its slanted sides would leave gaps or make cubes stick out.



1 SORT

8 items

Circle the category for each figure, then choose two figures and explain how the shape and measurements show whether unit cubes can fill it with no gaps or overlaps.

1.

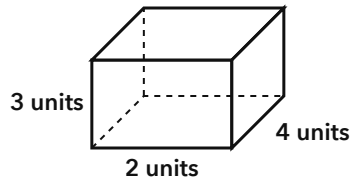


Figure 1

PACKS CANNOT

2.

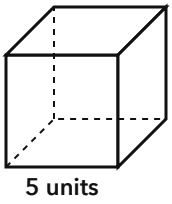


Figure 2

PACKS CANNOT

3.

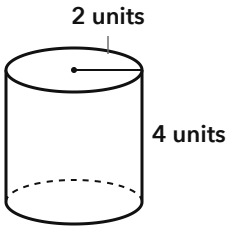


Figure 3

PACKS CANNOT

4.

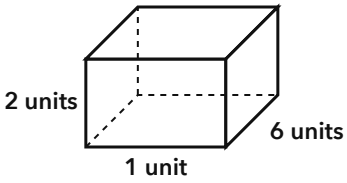


Figure 4

PACKS CANNOT

5.

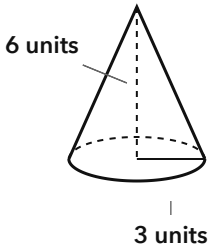


Figure 5

PACKS CANNOT

6.

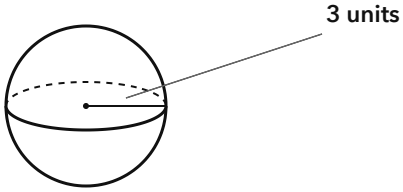


Figure 6

PACKS CANNOT

7.

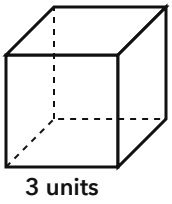


Figure 7

PACKS CANNOT

8.

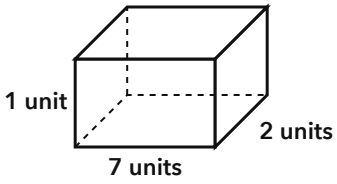


Figure 8

PACKS CANNOT

2 PROVE IT

Explain your thinking

Pick two items from Part 1. For each one, tell how you knew where it belonged.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new example of a solid that PACKS and one new example of a solid that CANNOT pack exactly with unit cubes.

PACKS _____

CANNOT _____

CHALLENGE

Create a rectangular prism that PACKS, name its three side lengths, find how many unit cubes fill it, and write its volume in cubic units.

ANSWER KEY

Cube Packing Check

GRADE 5 · NY-5.MD.3.b

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	Figure 1 (prism)	**PACKS**	A 2 by 4 by 3 rectangular prism can be filled by 24 unit cubes with no gaps or overlaps.
2	Figure 2 (cube)	**PACKS**	A cube with 5-unit edges can be filled by 125 unit cubes.
3	Figure 3 (cylinder)	**CANNOT**	The curved side of a cylinder prevents unit cubes from filling it exactly without gaps or cubes sticking out.
4	Figure 4 (prism)	**PACKS**	A 1 by 6 by 2 rectangular prism can be filled by 12 unit cubes.
5	Figure 5 (cone)	**CANNOT**	The curved surface and pointed top of a cone prevent exact packing with unit cubes.
6	Figure 6 (sphere)	**CANNOT**	The curved surface of a sphere prevents exact packing with unit cubes.
7	Figure 7 (cube)	**PACKS**	A cube with 3-unit edges can be filled by 27 unit cubes.
8	Figure 8 (prism)	**PACKS**	A 7 by 2 by 1 rectangular prism can be filled by 14 unit cubes.

PART 2 · PROVE IT

Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **PACKS**: A rectangular prism that is 3 units by 3 units by 2 units packs 18 unit cubes without gaps or overlaps.
- **CANNOT**: A hemisphere cannot be filled exactly with unit cubes because its curved surface leaves gaps or makes cubes stick out.

Challenge: A rectangular prism that is 4 units by 3 units by 2 units packs 24 unit cubes. Its volume is 24 cubic units.

Sort answers are 1 PACKS, 2 PACKS, 3 CANNOT, 4 PACKS, 5 CANNOT, 6 CANNOT, 7 PACKS, and 8 PACKS. In the explanations, look for students to connect flat rectangular faces and whole-number dimensions to filling with unit cubes, or curved or slanted surfaces to gaps or cubes sticking out.