



Shipping Center

Mission: A delivery truck holds exactly 100 cubic feet. Measure the boxes, find their volumes, and load the truck so it is packed exactly full, with no wasted space.

Big question: How can we use volume to solve real packing problems?

★ Warm-up: Would you rather?

Choose and explain with numbers.

Carry a $2 \times 2 \times 2$ ft box or a $1 \times 1 \times 6$ ft box? Which holds more? ✓ $2 \times 2 \times 2 = 8 \text{ ft}^3$ holds more than 6 ft^3 .

Can two boxes have the same volume but different shapes? ✓ Yes, e.g., $2 \times 6 \times 1$ and $3 \times 4 \times 1$.

Key vocabulary

Capacity	The most a container can hold.
Additive	Volumes of separate parts can be added.
Cubic feet (ft^3)	Volume of a $1 \text{ ft} \times 1 \text{ ft} \times 1 \text{ ft}$ cube.
Constraint	A limit you must work within.

1 Box 1

Biggest box?

Box D is the LONGEST box. Does it have the most volume?

☐ No: it holds the least (12 ft^3) ☐ Yes, longest means biggest ☐ They are all equal

✓ **No: it holds the least (12 ft^3)**

2 Box 2

Too much?

In the simulator: Load boxes until one won't fit.

How many cubic feet of space are left in the truck now?

Answer: _____ ft^3 ✓ **varies: check the student's simulator readout**

3 Box 3

Pack it perfectly

In the simulator: Unload, then find a combination that fills the truck EXACTLY to 100 ft^3 .

Write your combination as an equation (like $20 + 20 + \dots = 100$).

Look for: Totals 100; Shows addition; a number from the simulator; at least 4 words

4 Box 4

Another way

Which combinations also fill exactly 100 ft³? Choose all.

Choose all that apply.

☐ 5 Box A (20 + 20 + 20 + 20 + 20) ☐ 2 Box C + 1 Box D + 2 Box A (24 + 24 + 12 + 20 + 20)

☐ 3 Box B + 1 Box D (27 + 27 + 27 + 12) ☐ 4 Box B (27 × 4)

✓ **5 Box A (20 + 20 + 20 + 20 + 20); 2 Box C + 1 Box D + 2 Box A (24 + 24 + 12 + 20 + 20)**

5 Box 5

Legend: design a box Legend only

Design ONE new box so that 4 of them fill the truck exactly. Give its length, width, and height.

Look for: Gives dimensions; a number from the simulator; at least 4 words

6 Box 6

Shipping report

Explain how you decided which boxes fit in the truck. Use the words "volume" and "add".

Look for: Uses volume; Explains adding volumes; a number from the simulator

Exit ticket: answer the big question in your own words

How can we use volume to solve real packing problems?

Look for: Find each box's volume with $V = l \times w \times h$. Volume is additive: the space used by several boxes is the sum of their volumes. Comparing the total to the truck's capacity tells you what will fit.

Completion codes

Students see a code like **ABC-I3** when they finish. The first part must match below. The letter is the level (E = Explorer, I = Investigator, L = Legend), and the number at the end is how many stars they earned.

Level	Code starts with
 Explorer	19K-E
 Investigator	S29-I
 Legend	M98-L

Watch for these misconceptions

- "Volume and area are the same." Area is 2-D square units; volume is 3-D cubic units.
- "Add the dimensions." Volume multiplies them.
- "Composite figures: multiply all the numbers you see." Split into separate prisms first.