

Lesson 27

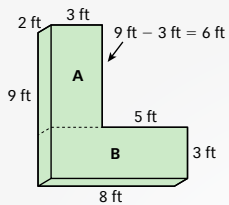
Name: _____

Break Apart Solid Figures to Find Volume

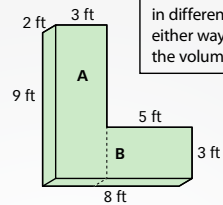
Study the example problem showing how to break apart a solid figure into rectangular prisms and find its volume. Then solve problems 1–8.

Example

Molly wants to know how much soil she needs to fill her two-tiered planter. What is the volume of the planter?



Prism A is $3 \text{ ft} \times 6 \text{ ft} \times 2 \text{ ft}$.
Volume of prism A = 36 cubic feet
Prism B is $8 \text{ ft} \times 3 \text{ ft} \times 2 \text{ ft}$.
Volume of prism B = 48 cubic feet
 $36 + 48 = 84$ cubic feet



Prism A is $3 \text{ ft} \times 9 \text{ ft} \times 2 \text{ ft}$.
Volume of prism A = 54 cubic feet
Prism B is $5 \text{ ft} \times 3 \text{ ft} \times 2 \text{ ft}$.
Volume of prism B = 30 cubic feet
 $54 + 30 = 84$ cubic feet

You can break the figure into two rectangular prisms in different ways. With either way, you then add the volumes of both prisms.

- B** 1 Show how to find the volume of prism D.

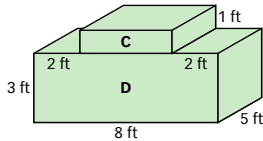
$3 \text{ ft} \times 8 \text{ ft} \times 5 \text{ ft} = 120$ cubic feet

- M** 2 Find the volume of prism C.

volume = $4 \text{ ft} \times 1 \text{ ft} \times 5 \text{ ft}$, or 20 cubic feet

- B** 3 What is the volume of the whole figure?

$120 + 20 = 140$; volume = 140 cubic feet



Solve.

- B** 4 Draw lines in figures A and B to separate them into two rectangular prisms. Do each in a different way.

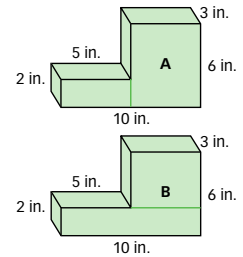
- M** 5 Show how to find the volume of shape A.

Answers will vary. Possible answer: $10 \text{ in.} - 5 \text{ in.}$

$= 5 \text{ in.}; 6 \text{ in.} \times 3 \text{ in.} \times 5 \text{ in.} = 90$ cubic inches.

$2 \text{ in.} \times 3 \text{ in.} \times 5 \text{ in.} = 30$ cubic inches.

$90 + 30 = 120$, so volume = 120 cubic inches



- M** 6 Show how to find the volume of shape B.

Answers will vary. Possible answer: $6 \text{ in.} - 2 \text{ in.} = 4 \text{ in.}$ and $10 \text{ in.} - 5 \text{ in.} = 5 \text{ in.}$

$4 \text{ in.} \times 3 \text{ in.} \times 5 \text{ in.} = 60$ cubic inches. $10 \text{ in.} \times 3 \text{ in.} \times 2 \text{ in.} = 60$ cubic inches.

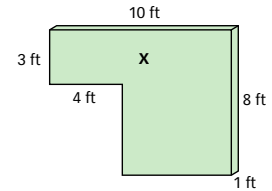
$60 + 60 = 120$, so volume = 120 cubic inches

- M** 7 What is the volume of figure X?

Show your work.

Possible work: $10 \text{ ft} \times 3 \text{ ft} \times 1 \text{ ft} = 30$ cubic feet
and $6 \text{ ft} \times 5 \text{ ft} \times 1 \text{ ft} = 30$ cubic feet.
 $30 + 30 = 60$ cubic feet

Solution: 60 cubic feet

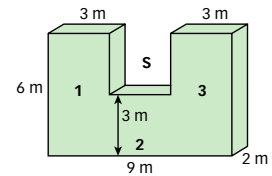


- C** 8 Show how to break figure S into 3 rectangular prisms. Then show how to find the volume.

Show your work.

Possible answer:
prism 1: $6 \text{ m} \times 3 \text{ m} \times 2 \text{ m} = 36$ cubic meters
prism 2: $3 \text{ m} \times 2 \text{ m} \times 3 \text{ m} = 18$ cubic meters
prism 3: same as prism 1
 $36 + 18 + 36 = 90$ cubic meters

Solution: 90 cubic meters



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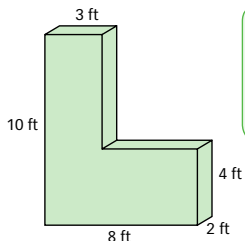
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Find Volume of Composite Figures

Solve the problems.

M

- 1 Which expression can you use to find the volume of this figure? Circle the letter for all that apply.



There is more than one way to break the shape into rectangular prisms.



- A $(10 \times 8 \times 2) + (3 \times 3 \times 4)$
B $(10 \times 3 \times 2) + (5 \times 4 \times 2)$
 C $(10 \times 3 \times 2) + (8 \times 2 \times 4)$
D $(8 \times 4 \times 2) + (3 \times 6 \times 2)$
 E $(8 \times 10 \times 3) + (4 \times 5 \times 2)$

C

- 2 A monument has a base and a statue. The base is a rectangular prism that measures 4 feet by 6 feet by 2 feet. The statue is a cube with edges that are 2 feet long. What is the volume of the monument?

- A 48 cubic feet **C** 56 cubic feet
 B 50 cubic feet D 96 cubic feet

Bob chose **B** as the correct answer. How did he get that answer?

Answers will vary. Possible answer: He found the volume of the base as

$4 \times 6 \times 2 = 48$ cubic feet. Then he used 2 cubic feet as the volume of the

statue and added it to 48 cubic feet. The volume of the statue is

$2 \times 2 \times 2 = 8$ cubic feet, so the volume of the monument is

$48 + 8 = 56$ cubic feet.

What are the attributes of a cube?



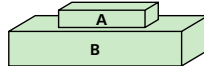
Solve.

M

- 3 Brody makes this wooden platform. Prism B is 10 feet long, 2 feet tall, and 4 feet deep. All dimensions of prism A are half those of prism B. What is the volume of the whole platform?

Show your work.

Possible work:
 Volume of B: $10 \times 2 \times 4 = 80$ cubic feet
 Volume of A: $5 \times 1 \times 2 = 10$ cubic feet
 $80 + 10 = 90$



I would start by finding the dimensions of prism A.



Solution: 90 cubic feet

M

- 4 A set of stairs is made of two blocks of cement. One block is a rectangular prism 6 feet long, 2 feet wide, and 1 foot tall. The other block is twice as tall as the first and the other dimensions are the same. What is the total volume of cement used to make the stairs?

Show your work.

Possible work:
 $(6 \times 2 \times 1) + (6 \times 2 \times 2)$
 $12 + 24 = 36$

Only one dimension is different in the two blocks of cement.



Solution: 36 cubic feet

C

- 5 Laney builds a tower with wooden cubes. The bottom cube's edges are 8 centimeters long. The middle cube's edges are 2 centimeters shorter than the bottom cube. The top cube's edges are 2 centimeters shorter than the middle cube. What is the total volume of the cubes in the tower?

Show your work.

Possible work:
 $(8 \times 8 \times 8) + (6 \times 6 \times 6) + (4 \times 4 \times 4)$
 $512 + 216 + 64 = 792$

It might help to draw a picture of the tower.



Solution: 792 cubic centimeters

