Lesson 10-2

Monday, February 3, 2020 8:44 PM

MB 593

Name _____

Solve

Lesson 10-2
Develop a Volume Formula

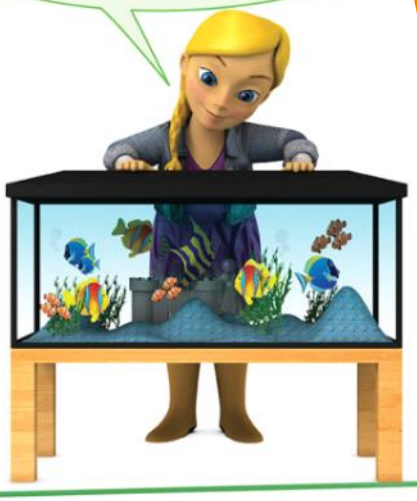
I can ...
find the volume of rectangular prisms using a formula.

Content Standards 5.MD.C.4, 5.MD.C.5a, 5.MD.C.5b
Mathematical Practices MP.1, MP.2, MP.3, MP.4, MP.6

Solve & Share

Kevin needs a new aquarium for his fish. The pet store has a fish tank in the shape of a rectangular prism that measures 5 feet long by 2 feet wide by 4 feet high. Kevin needs a fish tank that has a volume of at least 35 cubic feet. Will this fish tank be big enough? ***Solve this problem any way you choose.***

Make Sense and Persevere
Read the problem carefully to make sure that you understand what you are trying to find. *Show your work!*



Volume: Area of the base x height of the prism

$V = l \times w \times h$

$V = 5ft \times 2ft \times 4ft$

$V = 10ft^2 \times 4ft$

$V = 40\ ft^3$

Yes $40ft^3 > 35ft^3$

Look Back! MP.3 Critique Reasoning Malcolm says the volume of the aquarium would change if its dimensions were 2 feet long, 4 feet wide, and 5 feet high. Do you agree? Explain.

No. The commutative or associative properties say that the same factors can be multiplied in any order.

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Learn Glossary

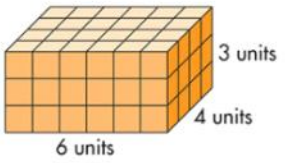
Essential Question

How Can You Use a Formula to Find the Volume of a Rectangular Prism?

A

Remember that volume is the number of cubic units (units³) needed to pack a solid figure without gaps or overlaps.

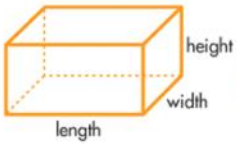
Find the volume of the rectangular prism if each cubic unit represents 1 cubic foot.



B If the dimensions of a rectangular prism are given as length ℓ, width w, and height h, then use this formula to find the volume V:

Volume = length × width × height

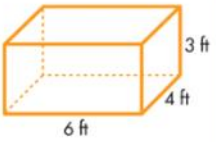
$V = (\ell \times w) \times h$ or $V = \ell \times (w \times h)$



The factors in the formula can be regrouped using the Associative Property.

C Use the formula to find the volume of the rectangular prism.

$V = \ell \times w \times h$
$V = (6 \times 4) \times 3$
$V = 24 \times 3$
$V = 72$



The volume of the rectangular prism is 72 cubic feet or 72 ft³.

Convince Me! MP.2 Reasoning Give the dimensions of a different rectangular prism that also has a volume of 72 ft³. Explain how you decided.

$72\ ft^3$

$12\ ft^2 \times 6\ ft$

$6\ ft \times 2\ ft$

length = 6 ft
width = 2 ft
height = 6 ft

Name _____

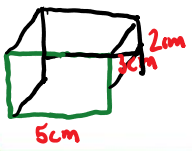
Guided Practice

Do You Understand?

1. In the example on page 594, could you first multiply the width by the height? Explain.

Yes, b/c of the associative property

2. MP.4 Model with Math A wooden block measures 5 centimeters long, 3 centimeters wide, and 2 centimeters tall. Draw a rectangular prism to show the block and label it. What is the volume of the block?

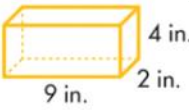


V = l x w x h
V = 5cm x 3cm x 2cm
V = 15cm² x 2cm
V = 30 cm³

Do You Know How?

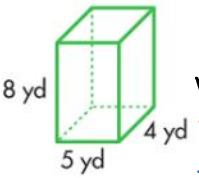
In **3** and **4**, find the volume of each rectangular prism.

3.



V = l x w x h
V = 9in x 2in x 4in
V = 18in² x 4in
V = 72in³

4.



V = l x w x h
V = 5yd x 4yd x 8yd
V = 20yd² x 8yd
V = 160yd³

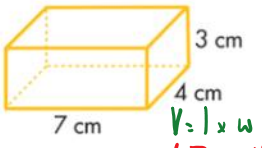
3
18
x4
72

Independent Practice

Complete 5-7

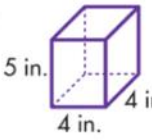
In **5–10**, find the volume of each rectangular prism.

5.



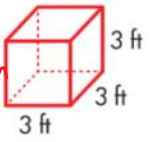
V = l x w x h
V = 7cm x 4cm x 3cm
V = 28cm² x 3cm
V = 84cm³

6.



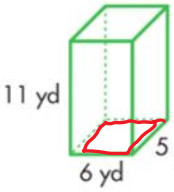
V = l x w x h
V = 4in x 4in x 5in
V = 16in² x 5in
V = 80 in³

7.



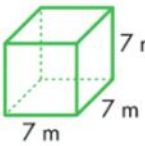
V = l x w x h
V = 3ft x 3ft x 3ft
V = 9ft² x 3ft
V = 27 ft³

8.



V = l x w x h
V = 6yd x 5yd x 11 yd
V = 30yds² x 11yds
V = 330 yds³

9.



V = l x w x h
V = 7m x 7m x 7m
V = 49m² x 7m
V = 343m²

10.

V = l x w x h
V = 10cm x 3cm x 5cm
V = 30cm² x 5cm
V = 150cm³

*For another example, see Set B on page 625.

Complete questions: 9, 10, 11, 12, 14, & 17

Math Practices and Problem Solving

In **11** and **12**, use the picture of the dictionary.

11. The dictionary is 3 inches thick. What is the volume of the dictionary?

V = l × w × h
V = 7 in. × 9 in. × 3 in.
V = 63 in.² × 3 in.
V = 189 in.³

189 in.³

12. **MP.2 Reasoning** A school orders 10 dictionaries. They cost $25 each. The school also pays $15 for shipping. How much does the school pay to get the new dictionaries? Show your work.

10 books × $25 = $250
$250 + $15 = $265

13. **MP.1 Make Sense and Persevere** The Outer Bay exhibit at the Monterey Bay Aquarium has a viewing window that is 56.5 feet long, 17 feet tall, and 13 inches thick. Estimate its volume in cubic feet. Remember 12 inches = 1 foot.

14. **Higher Order Thinking** What is the height of a rectangular prism that has a volume of 280 cubic meters, a length of 8 meters, and a width of 7 meters? Show how you found your answer.

V = l × w × h
280 m³ = 8 m × 7 m × h
280 m³ = 56 m² × h

56 × 5 = 280
280 − 280 = 0

The height is 5 m

15. **Algebra** Nat used the expression $3 \times s$ to find the cost of 3 shirts. What is the value of the expression if $s = \$16$?

16. The height of a tree is 8.194 meters. What is the height rounded to the nearest tenth of a meter?

Common Core Assessment

17. Choose all the expressions that can be used to find the volume of this wooden box.

- [x] $(6 \times 4) \times 3$
- [ ] $(6 \times 4) + 3$
- [ ] 6×4
- [x] $6 \times (4 \times 3)$ – Associative Property
- [x] $(4 \times 3) \times 6$ – Associative Property

V = l × w × h
V = 6 × 4 × 3