Volume of Prisms

Explore ideas and representations

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

Prism volume is $V = Bh$, where B is the base area and h is the perpendicular distance between matching bases. A right triangle with legs $3, 4$ cm has $B = 6$ cm^2; prism length 5 cm gives $V = 6(5) = 30$ cm^3.

Worked example

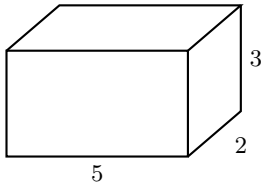
A prism base area is 12 cm^2 and height 5 cm. Find volume.

1. Use $V = Bh$ with $B = 12$, $h = 5$.
2. $V = 12(5) = 60$ cm^3.
3. Check: $60/12 = 5$ cm.
Answer: 60 cm^3.

Practice Problems

Show your thinking.

1. A rectangular prism is 5 by 2 by 3 cm. Find volume.

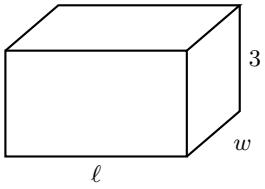


2. A prism has base area 18 cm^2 and perpendicular height 4 cm. Find volume.

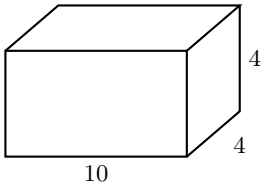
3. A triangular prism has base legs 7 and 4 cm at a right angle and prism length 3 cm. Find volume.

4. A cube has edge 4 cm. Find its volume and explain why the product has three factors of 4.

5. A rectangular prism has volume 81 cm^3 and height 3 cm. Find its base area.



6. Find and compare volumes of prisms $10 \times 4 \times 4$ and $10 \times 4 \times 5$ cm. Give the increase.



7. A 5 by 3 by 8 cm rectangular prism is cut along the diagonal of its 5 by 3 base, all the way through its length. Find each triangular piece volume.

8. A solid joins a 9 by 4 by 3 cm block and a 5 by 4 by 2 cm block without overlap. Find its volume.

Answer Key

1. 30 cm^3.
2. 72 cm^3.
3. 42 cm^3.
4. 64 cm^3.
5. 27 cm^2.
6. 160 and 200 cm^3; increase 40 cm^3.
7. 60 cm^3 each.
8. 148 cm^3.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The base area is $5(2) = 10$ cm^2.
2. There are 3 layers of 10 unit cubes, so $V = 10(3) = 30$ cm^3.
3. Each unit cube fills 1 cm^3, so the count equals the volume in cubic centimeters.

Problem 2

1. Use base area $B = 18$ cm^2 and height $h = 4$ cm in $V = Bh$.
2. Multiply to get $V = 18(4) = 72$ cm^3.
3. Check: $72/4 = 18$ cm^2, the given base area.

Problem 3

1. Triangle area: $(7)(4)/2 = 14$ cm^2.
2. Volume: $14(3) = 42$ cm^3.
3. Without the half, $7(4)(3) = 84$ cm^3 would be a rectangular prism, twice this volume.

Problem 4

1. Each layer is 4 cubes long and 4 cubes wide: $4(4) = 16$ unit cubes.
2. There are 4 layers, so $V = 16(4) = 64$ cm^3.
3. The three factors of 4 count length, width, and height.

Problem 5

1. With $V = Bh$ and $h = 3$ cm, $3B = 81$.
2. Divide by the height: $B = 81/3 = 27$ cm^2.
3. Check: $27(3) = 81$ cm^3.

Problem 6

1. Shorter volume: $40(4) = 160$ cm^3.
2. Taller volume: $40(5) = 200$ cm^3.
3. The added layer gives $200 - 160 = 40$ cm^3.

Problem 7

1. A base diagonal splits the $5(3) = 15$ cm^2 rectangle into two congruent triangles.
2. Each triangle has area $15/2$ cm^2 and extends 8 cm.
3. Each piece holds $(15/2)(8) = 60$ cm^3.

Problem 8

1. The larger block has volume $9(4)(3) = 108$ cm^3.
2. The smaller block has volume $5(4)(2) = 40$ cm^3.
3. Add the nonoverlapping volumes: $108 + 40 = 148$ cm^3.

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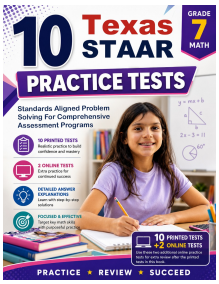

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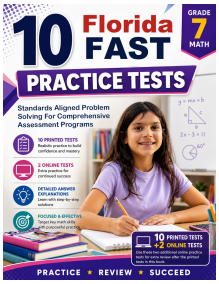

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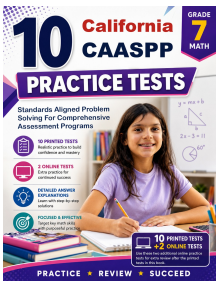

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