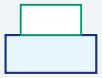
Volume and Surface Area of Composite Solids

Name: _____	Date: _____	Score: _____ / 30

Quick Review and Helpful Hints

A *composite solid* is built from simpler solids. Find the volume of each piece and *add* them – or *subtract* a hollowed-out part. Use $V = lwh$ for boxes. Answers are in cubic units.

▷ **Example:** A solid is a $4 \times 3 \times 2$ box stacked on a $4 \times 3 \times 1$ box. Find the total volume. **Work:** Top box $= 4 \times 3 \times 2 = 24$. Bottom box $= 4 \times 3 \times 1 = 12$. Add: $24 + 12$. ★ **Answer:** 36



Add the volume of each piece.

Practice Problems

Find each total volume.

1. Box $2 \times 2 \times 2$ plus $2 \times 2 \times 1$ _____

2. Box $3 \times 3 \times 3$ plus $3 \times 3 \times 1$ _____

3. Box $4 \times 2 \times 2$ plus $4 \times 2 \times 1$ _____

4. Box $5 \times 2 \times 2$ plus $5 \times 2 \times 3$ _____

5. Box $6 \times 1 \times 1$ plus $6 \times 1 \times 2$ _____

6. Box $10 \times 2 \times 1$ plus $10 \times 2 \times 2$ _____

7. Box $3 \times 3 \times 2$ plus $3 \times 3 \times 2$ _____

8. Box $4 \times 4 \times 1$ plus $4 \times 4 \times 2$ _____

9. Box $2 \times 2 \times 5$ minus $2 \times 2 \times 2$ _____

10. Box $5 \times 5 \times 2$ plus $5 \times 5 \times 1$ _____

11. Box $8 \times 1 \times 1$ plus $8 \times 1 \times 1$ _____

12. Box $6 \times 2 \times 2$ plus $6 \times 2 \times 1$ _____

13. Box $3 \times 2 \times 4$ plus $3 \times 2 \times 1$ _____

14. Box $10 \times 1 \times 2$ plus $10 \times 1 \times 3$ _____

Word Problems

15. A bench is a $6 \times 2 \times 1$ seat on a $6 \times 1 \times 2$ base. Find the total volume. _____

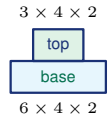
16. A $4 \times 4 \times 3$ box has a $2 \times 2 \times 3$ hole cut through it. Find the remaining volume. _____

17. Two boxes $5 \times 3 \times 2$ and $5 \times 3 \times 1$ are stacked. Find the total volume. _____

18. A $3 \times 3 \times 3$ cube sits on a $3 \times 3 \times 2$ box. Find the total volume. _____

Illustrated Practice

Use each picture. Break the solid into boxes, then add or subtract volumes.



19. A platform is made from two stacked rectangular prisms. Find the total volume.

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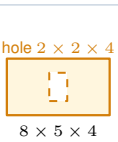

20. A box has a tunnel cut straight through it. Find the remaining volume.

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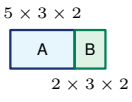

21. Two connected blocks form one solid. Find the total volume.

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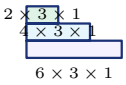

22. A display has three step layers. Find the total volume.

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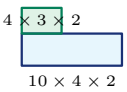

23. An L-shaped block is made from two rectangular prisms. Find its volume.

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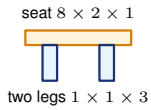

24. A bench has one seat and two legs. Find the total volume.

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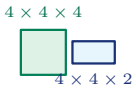

25. A cube is attached to a short prism. Find the total volume.

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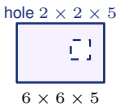

26. A square tunnel is cut through a large block. Find the remaining volume.

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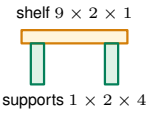

27. A shelf has a top board and two side supports. Find the total volume.

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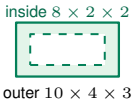

28. A planter is hollow inside. Find the volume of the material.

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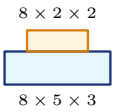

29. A storage unit has a base and a raised back section. Find the total volume.

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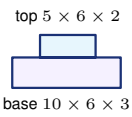

30. A two-level display stand is built from two prisms. Find the total volume.

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Answer Keys

1. 12	**11.** 16	**21.** 42
2. 36	**12.** 36	**22.** 36
3. 24	**13.** 30	**23.** 104
4. 50	**14.** 50	**24.** 22
5. 18	**15.** 24	**25.** 96
6. 60	**16.** 36	**26.** 160
7. 36	**17.** 45	**27.** 34
8. 48	**18.** 45	**28.** 88
9. 12	**19.** 72	**29.** 152
10. 75	**20.** 144	**30.** 240

Step-by-Step Explanations

1. Start by naming the process: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $8 + 4 = 12$. So the final answer is 12.

2. A good way to think about this is: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $27 + 9 = 36$. So the final answer is 36.

3. Step by step: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $16 + 8 = 24$. So the final answer is 24.

4. Take it one move at a time: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $20+30 = 50$. So the final answer is 50.

5. Start by naming the process: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $6 + 12 = 18$. So the final answer is 18.

6. A good way to think about this is: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $20 + 40 = 60$. So the final answer is 60.

7. Step by step: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $18 + 18 = 36$. So the final answer is 36.

8. Take it one move at a time: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $16+32 = 48$. So the final answer is 48.

9. Start by naming the process: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $20 - 8 = 12$. So the final answer is 12.

10. A good way to think about this is: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $50 + 25 = 75$. So the final answer is 75.

11. Step by step: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $8 + 8 = 16$. So the final answer is 16.

12. Take it one move at a time: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $24+12 = 36$. So the final answer is 36.

13. Start by naming the process: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $24 + 6 = 30$. So the final answer is 30.

14. A good way to think about this is: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $20 + 30 = 50$. So the final answer is 50.

15. Step by step: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is Seat $6 \times 2 \times 1 = 12$, base $6 \times 1 \times 2 = 12$; total 24. So the final answer is 24.

16. Take it one move at a time: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is Whole $4 \times 4 \times 3 = 48$ minus hole $2 \times 2 \times 3 = 12$; 36. So the final answer is 36.

17. Start by naming the process: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $30+15 = 45$. So the final answer is 45.

18. A good way to think about this is: Break the composite solid into simpler pieces, calculate each piece, and combine the results. The setup/work is $27 + 18 = 45$. So the final answer is 45.

19. The solid is two boxes stacked together. Find each volume first: the base is $6 \cdot 4 \cdot 2 = 48$, and the top is $3 \cdot 4 \cdot 2 = 24$. Add them: $48 + 24 = 72$.

20. Start with the full box, then subtract the tunnel. The full box is $8 \cdot 5 \cdot 4 = 160$, the tunnel is $2 \cdot 2 \cdot 4 = 16$, and $160 - 16 = 144$.

21. Treat the two connected blocks as separate prisms. Block A is $5 \cdot 3 \cdot 2 = 30$, block B is $2 \cdot 3 \cdot 2 = 12$, so the total is $30 + 12 = 42$.

22. For the steps, add the volume of each layer. The layers are $6 \cdot 3 \cdot 1 = 18$, $4 \cdot 3 \cdot 1 = 12$, and $2 \cdot 3 \cdot 1 = 6$, giving $18 + 12 + 6 = 36$.

23. Split the L-shape into the long base and the upright block. Their volumes are $10 \cdot 4 \cdot 2 = 80$ and $4 \cdot 3 \cdot 2 = 24$, so the total volume is 104.

24. The bench has one seat plus two legs. The seat is $8 \cdot 2 \cdot 1 = 16$, each leg is $1 \cdot 1 \cdot 3 = 3$, and $16 + 3 + 3 = 22$.

25. Add the cube and the short prism. The cube volume is $4^3 = 64$, the prism volume is $4 \cdot 4 \cdot 2 = 32$, and $64 + 32 = 96$.

26. Use subtraction because a tunnel is removed. The whole block is $6 \cdot 6 \cdot 5 = 180$, the tunnel is $2 \cdot 2 \cdot 5 = 20$, so the remaining volume is $180 - 20 = 160$.

27. The shelf is a top board plus two supports. The board is $9 \cdot 2 \cdot 1 = 18$, each support is $1 \cdot 2 \cdot 4 = 8$, and $18 + 8 + 8 = 34$.

28. For a hollow planter, subtract the empty inside from the outside. Outside volume is $10 \cdot 4 \cdot 3 = 120$, inside volume is $8 \cdot 2 \cdot 2 = 32$, and $120 - 32 = 88$.

29. Add the base and the raised back section. The base is $8 \cdot 5 \cdot 3 = 120$, the raised section is $8 \cdot 2 \cdot 2 = 32$, so the total is 152.

30. The stand has a large base and a smaller top block. The base volume is $10 \cdot 6 \cdot 3 = 180$, the top volume is $5 \cdot 6 \cdot 2 = 60$, and $180 + 60 = 240$.

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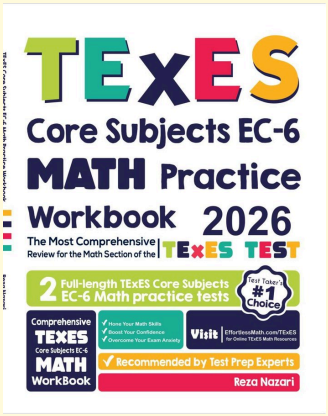

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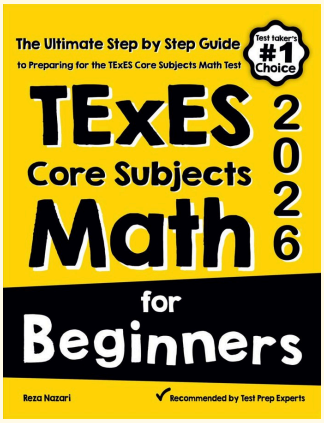

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