

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 $2 \times 2 \times 1$ | _____ | 8. Box $4 \times 4 \times 1$ plus $4 \times 4 \times 2$ | _____ |
| 2. Box $3 \times 3 \times 3$ plus $3 \times 3 \times 1$ | _____ | 9. Box $2 \times 2 \times 5$ minus $2 \times 2 \times 2$ | _____ |
| 3. Box $4 \times 2 \times 2$ plus $4 \times 2 \times 1$ | _____ | 10. Box $5 \times 5 \times 2$ plus $5 \times 5 \times 1$ | _____ |
| 4. Box $5 \times 2 \times 2$ plus $5 \times 2 \times 3$ | _____ | 11. Box $8 \times 1 \times 1$ plus $8 \times 1 \times 1$ | _____ |
| 5. Box $6 \times 1 \times 1$ plus $6 \times 1 \times 2$ | _____ | 12. Box $6 \times 2 \times 2$ plus $6 \times 2 \times 1$ | _____ |
| 6. Box $10 \times 2 \times 1$ plus $10 \times 2 \times 2$ | _____ | 13. Box $3 \times 2 \times 4$ plus $3 \times 2 \times 1$ | _____ |
| 7. Box $3 \times 3 \times 2$ plus $3 \times 3 \times 2$ | _____ | 14. Box $10 \times 1 \times 2$ plus $10 \times 1 \times 3$ | _____ |

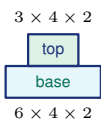
Word Problems

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. _____

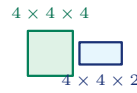


◆ Illustrated Practice

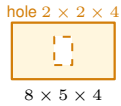
Use each picture. Break the solid into boxes, then add or subtract volumes.



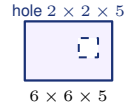
19. A platform is made from two stacked rectangular prisms. Find the total volume.



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



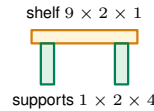
20. A box has a tunnel cut straight through it. Find the remaining volume.



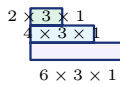
26. A square tunnel is cut through a large block. Find the remaining volume.



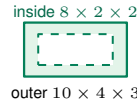
21. Two connected blocks form one solid. Find the total volume.



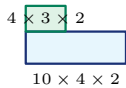
27. A shelf has a top board and two side supports. Find the total volume.



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



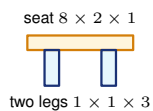
28. A planter is hollow inside. Find the volume of the material.



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



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



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



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



Answer Keys

- | | | |
|-------------------------------------|--------------------------------------|--------------------------------------|
| 1. <input type="text" value="12"/> | 11. <input type="text" value="16"/> | 21. <input type="text" value="42"/> |
| 2. <input type="text" value="36"/> | 12. <input type="text" value="36"/> | 22. <input type="text" value="36"/> |
| 3. <input type="text" value="24"/> | 13. <input type="text" value="30"/> | 23. <input type="text" value="104"/> |
| 4. <input type="text" value="50"/> | 14. <input type="text" value="50"/> | 24. <input type="text" value="22"/> |
| 5. <input type="text" value="18"/> | 15. <input type="text" value="24"/> | 25. <input type="text" value="96"/> |
| 6. <input type="text" value="60"/> | 16. <input type="text" value="36"/> | 26. <input type="text" value="160"/> |
| 7. <input type="text" value="36"/> | 17. <input type="text" value="45"/> | 27. <input type="text" value="34"/> |
| 8. <input type="text" value="48"/> | 18. <input type="text" value="45"/> | 28. <input type="text" value="88"/> |
| 9. <input type="text" value="12"/> | 19. <input type="text" value="72"/> | 29. <input type="text" value="152"/> |
| 10. <input type="text" value="75"/> | 20. <input type="text" value="144"/> | 30. <input type="text" value="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 $6 \times 2 \times 1 = 12$, 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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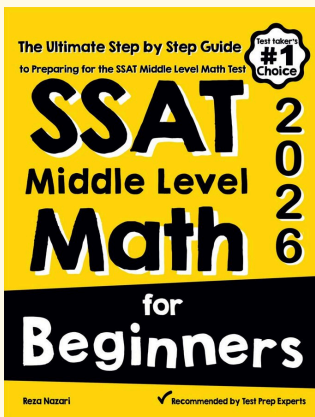
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