

# 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  $3 \times 2 \times 1$  \_\_\_\_\_

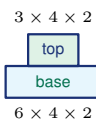
14. Box  $10 \times 1 \times 2$  plus  $10 \times 1 \times 3$  \_\_\_\_\_

## ◆ 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. \_\_\_\_\_

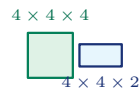
◆ **Illustrated Practice**

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



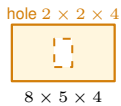
**19.** A platform is made from two stacked rectangular prisms. Find the total volume.

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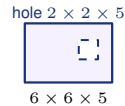
**25.** A cube is attached to a short prism. Find the total volume.

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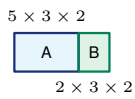
**20.** A box has a tunnel cut straight through it. Find the remaining volume.

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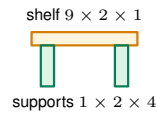
**26.** A square tunnel is cut through a large block. Find the remaining volume.

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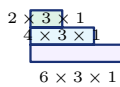
**21.** Two connected blocks form one solid. Find the total volume.

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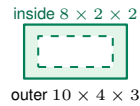
**27.** A shelf has a top board and two side supports. Find the total volume.

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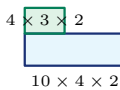
**22.** A display has three step layers. Find the total volume.

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

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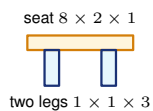
**23.** An L-shaped block is made from two rectangular prisms. Find its volume.

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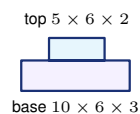
**29.** A storage unit has a base and a raised back section. Find the total volume.

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**24.** A bench has one seat and two legs. 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

- |                                     |                                      |                                      |
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| 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"/> |
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| 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"/> |

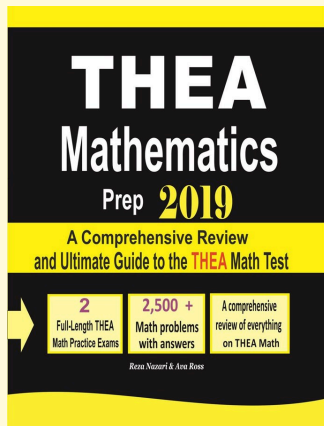
### Step-by-Step Explanations

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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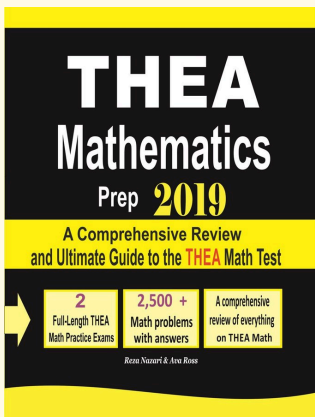
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