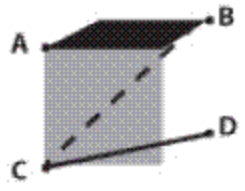


Cube & Rectangular Solids Problem

1. If a 4 cm cube is cut into 1 cm cubes, then what is the percentage increase in the surface area of the resulting cubes?
 - A. 4%
 - B. 166%
 - C. 266%
 - D. 300%
 - E. 400%

2. A cube of side 7 cm is coloured on pair of opposite faces by Red, Green and Yellow shades. The cube is then cut into unit cubes. How many of the unit cubes will have exactly two coloured faces?
 - A) 150
 - B) 125
 - C) 60
 - D) 49
 - E) 40

3. If the box shown is a cube, then the difference in length between line segment BC and line segment AB is approximately what fraction of the distance from A to C?

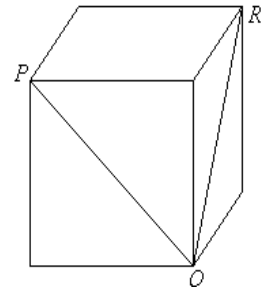


 - A. 10%
 - B. 20%
 - C. 30%
 - D. 40%
 - E. 50%

4. A rectangular box has dimensions of 8 feet, 8 feet, and z feet. In terms of z , what is the greatest possible (straight-line) distance, in feet, between any two points on the box?
 - (A) $8 + z$
 - (B) $8\sqrt{2} + z$
 - (C) $8z\sqrt{2}$
 - (D) $\sqrt{64 + z^2}$
 - (E) $\sqrt{128 + z^2}$

5. For the cube shown right, what is the degree measure of PQR?

A. 30
B. 45
C. 60
D. 75
E. 90



6. A rectangular box is 10 inches wide, 10 inches long, and 5 inches high. What is the greatest possible (straight-line) distance, in inches, between any two points on the box?

(A) 15
(B) 20
(C) 25
(D) $10\sqrt{2}$
(E) $10\sqrt{3}$

7. A welder received an order to make a 1 million liter cube-shaped tank. If he has only 4x2 meter sheets of metal that can be cut, how many metal sheets will be required for this order? (1 cubic meter = 1,000 liters)

A. 92
B. 90
C. 82
D. 78
E. 75

8. If a certain cube has Volume V and a second cube has twice the surface area of the first cube, what is the volume of the second cube in terms of V ?

A. $\sqrt{2}V$
B. $2\sqrt{2}V$
C. $2V$
D. $4V$
E. $8V$

9. A wrapping paper has dimensions 1 yard by 7 yards. What is the volume in Ft^3 of the largest cube that could be packed using this paper?

(1 yard = 3 Ft)

A. 8
B. 9
C. 18
D. 27
E. 36

10. Jean puts N identical cubes, the sides of which are 1 inch long, inside a rectangular box, each side of which is longer than 1 inch, such that the box is completely filled with no gaps and no cubes left over. What is N ?

- (1) $56 < N < 63$
- (2) N is a multiple of 3.

11. A certain cube floating in a bucket of water has between 80 and 85 percent of its volume below the surface of the water. If between 12 and 16 cubic centimeters of the cube's volume is above the surface of the water, then the length of a side of the cube is approximately

- A. 4
- B. 5
- C. 7
- D. 8
- E. 9

12. A big cube is formed by rearranging the 160 coloured and 56 non-coloured similar cubes in such a way that the exposure of the coloured cubes to the outside is minimum. The percentage of exposed area that is coloured is :

- A. 25.9%
- B. 44.44%
- C. 35%
- D. 61%
- E. None of these

13. What is the measure of the angle made by the diagonals of the any adjacent sides of a cube.

- A. 30
- B. 45
- C. 60
- D. 75
- E. 90

14. A wooden cube whose edge length is 10 inches is composed of smaller cubes with edge lengths of one inch. The outside surface of the large cube is painted red and then it is split up into its smaller cubes. If one cube is randomly selected from the small cubes, what is the probability that the cube will have AT LEAST one red face?

- A. 36.0%
- B. 48.8%
- C. 50.0%
- D. 52.5%
- E. 60%

15. A large cube consists of 125 identical small cubes, how many of the small cubes are exposed in air?
- (A) 64
(B) 72
(C) 98
(D) 100
(E) 116
16. 64 small identical cubes are used to form a large cube. How many more cubes are needed to add one top layer of small cube all over the surface of the large cube ?
- A. 64
B. 128
C. 152
D. 216
E. 256
17. The entire exterior of a large wooden cube is painted red, and then the cube is sliced into n^3 smaller cubes (where $n > 2$). Each of the smaller cubes is identical. In terms of n , how many of these smaller cubes have been painted red on at least one of their faces?
- A. $6n^2$
B. $6n^2 - 12n + 8$
C. $6n^2 - 16n + 24$
D. $4n^2$
E. $24n - 24$
18. A rectangular solid is changed such that the width and length are increased by 1 inch apiece and the height is decreased by 9 inches. Despite these changes, the new rectangular solid has the same volume as the original rectangular solid. If the width and length of the original rectangular solid are equal and the height of the new rectangular solid is 4 times the width of the original rectangular solid, what is the volume of the rectangular solid?
- (A) 18
(B) 50
(C) 100
(D) 200
(E) 400

19. A closed aluminum rectangular box has inner dimensions x centimeters by y centimeters by z centimeters. Each of the six sides of the box is 1 centimeter thick. Calculate the volume of the aluminium, in cubic centimeters?

- A. $xyz + 8$
- B. $2(xy + xz + yz + 4)$
- C. $2(xy + xz + yz) - xyz$
- D. $2(xy + xz + yz + x + y + z + 4)$
- E. $2(xy + xz + yz + 2x + 2y + 2z + 4)$

20. The measurements obtained for the interior dimensions of a rectangular box are 200 cm by 200 cm by 300cm. If each of the three measurements has an error of at most 1 centimeter, which of the following is the closes maximum possible difference, in cubic centimeters, between the actual capacity of the box and the capacity computed using these measurements?

- A. 100,000
- B. 120,000
- C. 160,000
- D. 200,000
- E. 320,000

21. A container is used to pack and ship cube shaped boxes. The container is a rectangular solid with one face completely open. The volume of the cubic boxes is 64 cubic inches. How many boxes can be packed in the container?

- (1) The volume of the container is 1024 cubic inches.
- (2) The opening of the container is 16 inches by 16 inches.

22. The base of a rectangular block has an area of 60 square centimeters. Is the block a cube?

- (1) The area of the front face of the block is 60 square centimeters.
- (2) The area of a side of the block is 60 square centimeters.

23. What is the volume of a certain cube?

- (1) The sum of the areas of the faces of the cube is 54.
- (2) The greatest possible distance between two points on the cube is $3\sqrt{3}$

24. What is the volume of a certain rectangular solid?

- (1) Two adjacent faces of the solid have areas 15 and 24, respectively.
- (2) Each of two opposite faces of the solid has area 40.

25. What is the volume of the cube in the right?

- (1) The surface area of the cube is 600 square inches
- (2) The length of diagonal AB is $10\sqrt{3}$ inches

