

## Hybleland L9-Lesson 15 Solid Geometry I

## Surface Area and Volume-Assignment

## Problem 1.

The side, front, and bottom faces of a rectangular solid have areas of  $\sqrt{3}$ ,  $\sqrt{5}$  and  $\sqrt{15}$  square units, respectively. What is the number of units in the length of the space diagonal of the solid?

- (A)9      (B)6      (C)3      (D)2      (E)1

## Problem 2.

The total area of all the faces of a rectangular solid is  $26 \text{ cm}^2$ , and the total length of all its edges is 28 cm. Then the length in cm of any one of its internal diagonals is

- (A) $3\sqrt{5}$       (B) $5\sqrt{3}$       (C) $5\sqrt{2}$       (D) $2\sqrt{5}$       (E)notsure

## Problem 3.

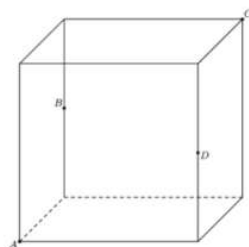
A unit cube has the vertices ABCD-A'B'C'D'. Points L,M,N,L',M',N' are the midpoints of BC, CD, DD', D'A', A'B', B'B, respectively. The cube is sliced by a plane that passes through the points L,M,N,L',M',N'. Find the area of hexagon LMNL'M'N'.

- (A) $\frac{3\sqrt{3}}{4}$       (B) $\frac{4\sqrt{3}}{3}$       (C) $\frac{3\sqrt{3}}{2}$       (D) $\frac{2\sqrt{3}}{3}$       (E) $\frac{3\sqrt{2}}{4}$

Problem 4.

AMC10A 2008 / Problem 21

A cube with side length 1 is sliced by a plane that passes through two diagonally opposite vertices  $A$  and  $C$  and the midpoints  $B$  and  $D$  of two opposite edges not containing  $A$  and  $C$ , as shown. What is the area of quadrilateral  $ABCD$ ?



- A.  $\frac{\sqrt{6}}{2}$  B.  $\frac{5}{4}$  C.  $\sqrt{2}$  D.  $\frac{3}{2}$  E.  $\sqrt{3}$

Problem 5.

AMC10A 2010 / Problem 20

A fly trapped inside a cubical box with side length 1 meter decides to relieve its boredom by visiting each corner of the box. It will begin and end in the same corner and visit each of the other corners exactly once. To get from a corner to any other corner, it will either fly or crawl in a straight line. What is the maximum possible length, in meters, of its path?

- A.  $4 + 4\sqrt{2}$  B.  $2 + 4\sqrt{2} + 2\sqrt{3}$  C.  $2 + 3\sqrt{2} + 3\sqrt{3}$  D.  $4\sqrt{2} + 4\sqrt{3}$   
E.  $3\sqrt{2} + 5\sqrt{3}$

Problem 6.

AMC10A 2009 / Problem 11

One dimension of a cube is increased by 1, another is decreased by 1, and the third is left unchanged. The volume of the new rectangular solid is 5 less than that of the cube. What was the volume of the cube?

- A. 8 B. 27 C. 64 D. 125 E. 216

Problem 7.

AMC10A 2010 / Problem 17

A solid cube has side length 3 inches. A 2-inch by 2-inch square hole is cut into the center of each face. The edges of each cut are parallel to the edges of the cube, and each hole goes all the way through the cube. What is the volume, in cubic inches, of the remaining solid?

- A. 7 B. 8 C. 10 D. 12 E. 15

Problem 8.

SASMO Grade8 – 2015 / Problem 9

A big cube is made up of 64 small cubes. All the faces of the big cube are then painted. How many of the small cubes have exactly one painted face?

- A. 6 B. 12 C. 24 D. 72 E. None of the above

Problem 9.

SASMO Grade8 – 2016 / Problem 9

In mathematics, Figure 1 is called Menger Sponge. The construction of Menger Sponge is described as follows:

1. Begin with a cube.
2. Sub-divide the cube into 27 smaller cubes (Figure 2 )
3. Remove the smaller cube in the middle of each face, and remove the smaller cube in the very center of the larger cube, leaving 20 smaller cubes (Figure 1 ).

If the surface area of the cube (Figure 2 ) in Step 1 is  $216\text{cm}^2$ , what is the surface area of Menger Sponge (Figure 1 )?

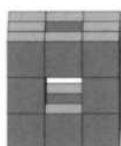


Figure 1



Figure 2

- A. 192 B. 216 C. 224 D. 256 E. 288

Problem 10.

A rectangular box has integer side lengths in the ratio 3:4:5. Which of the following could be the total surface area of the box?

- (A) 282      (B) 376      (C) 470      (D) 564      (E) 345

Problem 11.

AMC10A 2007 / Problem 3

An aquarium has a rectangular base that measures 100 cm by 40 cm and has a height of 50 cm. It is filled with water to a height of 40 cm. A brick with a rectangular base that measures 40 cm by 20 cm and a height of 10 cm is placed in the aquarium. By how many centimeters does the water rise?

- A. 0.5   B. 1   C. 1.5   D. 2   E. 2.5

Problem 12.

AMC10B 2017 / Problem 6

What is the largest number of solid 2-in  $\times$  2-in  $\times$  1-in blocks that can fit in a 3-in  $\times$  2-in  $\times$  3-in box?

- A. 3   B. 4   C. 5   D. 6   E. 7

Problem 13.

AMC10A 2003 / Problem 3

A solid box is 15 cm by 10 cm by 8 cm. A new solid is formed by removing a cube 3 cm on a side from each corner of this box. What percent of the original volume is removed?

- A. 4.5   B. 9   C. 12   D. 18   E. 24

Problem 14.

AMC10A 2016 / Problem 5

A rectangular box has integer side lengths in the ratio  $1 : 3 : 4$ . Which of the following could be the volume of the box?

- A. 48   B. 56   C. 64   D. 96   E. 144

Problem 15.

A solid box is 21cm by 12cm by 8cm. A new solid is formed by removing a cube 3cm on a side from each corner of this box. What fractional part of the original volume is removed?

- (A)  $\frac{4}{5}$       (B)  $\frac{9}{35}$       (C)  $\frac{13}{50}$       (D)  $\frac{16}{63}$       (E)  $\frac{2}{7}$

Problem 16.

The volume of a certain rectangular solid is  $27\text{cm}^3$ , its total surface area is  $66\text{ cm}^2$ , and its three dimensions are in geometric progression. The sum of the lengths in cm of all the edges of this solid is

- (A) 28      (B) 32      (C) 36      (D) 40      (E) 44

Problem 17.

AMC10A 2004 / Problem 11

A company sells peanut butter in cylindrical jars. Marketing research suggests that using wider jars will increase sales. If the diameter of the jars is increased by 25% without altering the volume, by what percent must the height be decreased?

- A. 10   B. 25   C. 36   D. 50   E. 60

Problem 18.

AMC10A 2015 / Problem 9

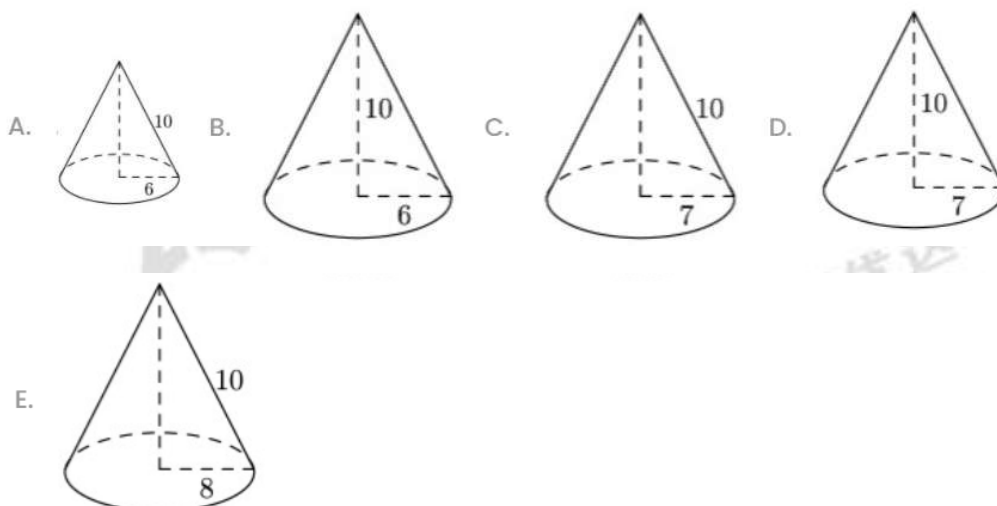
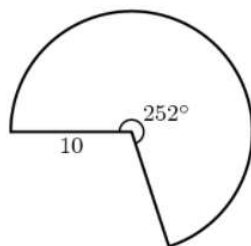
Two right circular cylinders have the same volume. The radius of the second cylinder is 10% more than the radius of the first. What is the relationship between the heights of the two cylinders?

- A. The second height is 10% less than the first.
- B. The first height is 10% more than the second.
- C. The second height is 21% less than the first.
- D. The first height is 21% more than the second.
- E. The second height is 80% of the first.

Problem 19.

AMC10 2001 / Problem 17

Which of the cones listed below can be formed from a  $252^\circ$  sector of a circle of radius 10 by aligning the two straight sides?



Problem 20.

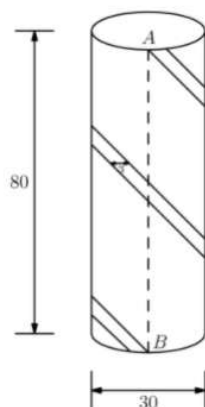
The diameter of a right circular cylinder equals to its height. This cylinder is inscribed in a right circular cone with diameter 10 and altitude 12. The axes of the cylinder and cone coincide. Find the height of the cylinder.

- (A)9      (B)6      (C)3      (D)2      (E)1

Problem 21.

AMC10A 2004 / Problem 19

A white cylindrical silo has a diameter of 30 feet and a height of 80 feet. A red stripe with a horizontal width of 3 feet is painted on the silo, as shown, making two complete revolutions around it. What is the area of the stripe in square feet?



- A. 120   B. 180   C. 240   D. 360   E. 480