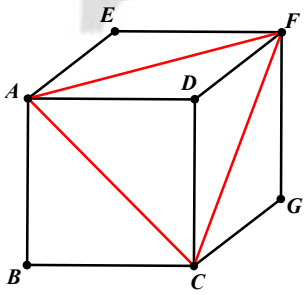
Hybleland L9-Lesson 16 Solid Geometry II

Tetrahedron and Sphere-Assignment

Problem 1.

A cube with sides of length 4 cm has three face diagonals drawn as shown to form the edges of a new (6-edged) solid. Find the ratio of the surface area of the cube to the surface area of the tetrahedron.

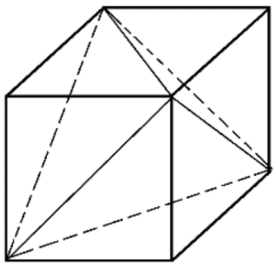
$(A)\frac{3+\sqrt{3}}{8}$ $(B)\frac{3-\sqrt{3}}{8}$ $(C)\frac{12-\sqrt{3}}{8}$ $(D)3-\sqrt{3}$ $(E)3+\sqrt{3}$



Problem 2.

A cube with sides of length 4 cm has three face diagonals drawn from a vertex. These three diagonals, along with three other face diagonals, form the edges of a new (6-edged) solid. What is the number of cubic centimeters in the volume of the new solid?

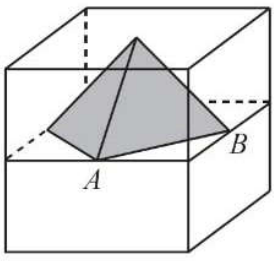
$(A)21\frac{2}{3}$ $(B)20\frac{2}{3}$ $(C)22\frac{2}{3}$ $(D)21\frac{1}{3}$ $(E)21\frac{1}{5}$



Problem 3. (AMC 10A)

Centers of adjacent faces of a unit cube are joined to form a regular octahedron. What is the volume of this octahedron?

$(A)\frac{1}{8}$ $(B)\frac{1}{6}$ $(C)\frac{1}{4}$ $(D)\frac{1}{3}$ $(E)\frac{1}{2}$



Problem 4.

Centers of adjacent faces of a unit cube are joined to form a regular octahedron. Find the ratio of the surface area of the cube to the surface area of the octahedron.

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

Problem 5.

In a regular tetrahedron with the edge length of $18\sqrt{2}$, the centers of four faces are the vertices of a smaller tetrahedron. Find the volume of this smaller tetrahedron.

$(A)72$ $(B)76$ $(C)78$ $(D)73$ $(E)71$

Problem 6.

T is a regular tetrahedron. T' is the tetrahedron whose vertices are the centers of the faces of T. The ratio of the volume of T' to that of T is m/n, where m and n are relatively prime. What is the value of m+n?

$(A)22$ $(B)26$ $(C)28$ $(D)23$ $(E)21$

Problem 7.

AMC10A 2006 / Problem 24

Centers of adjacent faces of a unit cube are joined to form a regular octahedron. What is the volume of this octahedron?

A. $\frac{1}{8}$ B. $\frac{1}{6}$ C. $\frac{1}{4}$ D. $\frac{1}{3}$ E. $\frac{1}{2}$

Problem 8.

AMC10B 2007 / Problem 23

A pyramid with a square base is cut by a plane that is parallel to its base and is 2 units from the base. The surface area of the smaller pyramid that is cut from the top is half the surface area of the original pyramid. What is the altitude of the original pyramid?

A. 2 B. $2+\sqrt{2}$ C. $1+2\sqrt{2}$ D. 4 E. $4+2\sqrt{2}$

Problem 9.

AMC10B 2003 / Problem 17

An ice cream cone consists of a sphere of vanilla ice cream and a right circular cone that has the same diameter as the sphere. If the ice cream melts, it will exactly fill the cone. Assume that the melted ice cream occupies 75% of the volume of the frozen ice cream. What is the ratio of the cone's height to its radius?

A. $2:1$ B. $3:1$ C. $4:1$ D. $16:3$ E. $6:1$

Problem 10.

AMC10A 2007 / Problem 21

A sphere is inscribed in a cube that has a surface area of 24 square meters. A second cube is then inscribed within the sphere. What is the surface area in square meters of the inner cube?

A. 3 B. 6 C. 8 D. 9 E. 12

Problem 11. (AMC 10A)

Three mutually tangent spheres of radius 1 rest on a horizontal plane. A sphere of radius 2 rests on them. What is the distance from the plane to the top of the larger sphere?

$(A)3+\frac{\sqrt{30}}{2}$ $(B)3+\frac{\sqrt{69}}{3}$ $(C)3+\frac{\sqrt{123}}{4}$ $(D)\frac{52}{9}$ $(E)3+2\sqrt{2}$