Question #1

If A = The surface area of a regular hexahedron of side length 4,

B = The volume of this regular hexahedron, C = The volume of a sphere with diameter 4,

and D = the largest of A, B, and C, What is the value of $\frac{ABC}{D}$?

Question #2 Begin with the number 10. For each true statement below, add 7.

For each false statement below, subtract 1.

What is your total?

A. An undecagon has less sides than a dodecagon

B. 36 is both a triangular and square number

C. The number of faces of a solid plus the number of vertices of a solid, minus the number of edges of a solid always equals 2.

D. Given the statement $p \rightarrow q$, the statement $\sim p \rightarrow \sim q$ must be true.

E. An inscribed angle is always equal in measure to the angle measure of the arc it intercepts.

F. The slope of the line containing the points (3,4) and (3,7) is zero.

Question #3

Stumpy the dog lives on a ranch 120 yards north of a stream. Starting from his house, he wishes to visit his friend Misty's house, after getting a drink of water from the stream. If Misty's house is 300 feet east of Stumpy's house and 60 yards north of the same stream, what is the shortest distance (in yards) which Stumpy can travel in order to get his drink and reach Misty's house?

Question #4

A = The area of a regular heptagon with apothem 5, to the nearest hundredth.

B = The volume of the frustum created when a cone of radius 8 and height 12 is sliced parallel to its base, 4 units from the top (to the nearest hundredth) What is B - A?

Question #5

If A = The radius of a cone whose volume is 4 times its height, and B = The radius of the circle with area $\frac{\pi^2}{3}$,

What is AB?

Question #6

An ant decides to traverse a very odd path.

- First, he crawls down and simultaneously around a cylinder of radius $\frac{6}{\pi}$ and height 5, so that he goes around it exactly once.
- Now on level ground, the ant travels on the round part of a semicircular path of radius $6\sqrt{11}$.
- Once at the end of the semicircle, the ant begins on a regular octagonal path, but only manages to traverse 7 sides. If completed, the octagon would have had area $18 + 18\sqrt{2}$.

What is the total distance traveled by the ant?

Question # 7

A semicircle of radius 9 feet stands upright on the ground. There is a point at which a 6 - foot - tall man can barely walk through, and there is a point wher e a 3 - foot - tall boy can barely walk through. What is the horizontal distance between th ese points, if both points are to the left of the semicircle 's apex?

Question #8

A. Circle Q has diameter AB = $\sqrt{65}$. How many points X on circle Q have the property that the lengths of AX and XB are both integral?

B. How many right triangles with integral side lengths have exactly one side measuring less than 10? What is the product of the answers you determined in A and B?

Questions # 9

A helicopter is flying east at a constant altitude of 4000 feet at a constant speed of 100 mph. Joe is standing on the ground. If Joe is 5000 yards west of an upright, 50 story building at 11:50 AM, and if the helicopter is initially 75 miles west of Joe, at what time, to the nearest minute, will Joe just barely no longer be able to see the helicopter, due to the fact that the building is blocking it? (1 story = 10 feet, Joe is of negligible height)

Question # 10

What is the sum of the maximum and minimum possible areas of an equilateral triangle inscribed in a regular hexagon of side length 6?

Question # 11

Consider acute ΔABC with orthocenter G. Points D, E, and F are across from A, B, and C, respectively, and are in line with G as well as their corresponding A, B, or C point. If AB = 7, BC = 5, and AC = 8, what is AG + BG + GD + GE?

Question # 12

How many different lines can you draw between 2 of 8 randomly arranged coplanar points, no three of which are collinear?

Question # 13

How many distinct equilateral triangles can be drawn such that the triangle shares at least 2 vertices with a regular hexagon?

Question # 14

Consider rectangle ABCD, with isosceles right triangle EDA drawn on top of it and sharing a side, right angle at E. The length of AB = 6, and $m\angle DAC = 30°$. If EB can be expressed as $\sqrt{p+q\sqrt{3}}$, what is $\frac{p}{q}$?

Question # 15

A cylinder of height 4 and radius 4 is filled with water. That water is poured into a cone with radius 6 and height 7.

How much more water could be poured into the cone with no water overflowing, in units^3?