Time limit: 60 minutes.
Instructions: This test contains 10 short answer questions. All answers must be expressed in simplest form unless specified otherwise. Only answers written inside the boxes on the answer sheet will be considered for grading.
No calculators.

1. What is the largest n such that there exists a non-degenerate convex n-gon such that each of its angles are an integer number of degrees, and are all distinct?

2. Let S be the set of points A in the xy-plane such that the four points A, $(2,3)$, $(-1,0)$, and $(0,6)$ form the vertices of a parallelogram. Let P be the convex polygon whose vertices are the points in S. What is the area of P?

3. Let $ABCDEF$ be a regular hexagon with side length 1. Now, construct square $AGDQ$. What is the area of the region inside the hexagon and not the square?

4. How many lattice points (v, w, x, y, z) does a 5-sphere centered on the origin, with radius 3, contain on its surface or in its interior?

5. Suppose the side lengths of triangle ABC are the roots of polynomial $x^3 - 27x^2 + 222x - 540$. What is the product of its inradius and circumradius?

6. Given a cube with side length 1, we perform six cuts as follows: one cut parallel to the xy-plane, two cuts parallel to the yz-plane, and three cuts parallel to the xz-plane, where the cuts are made uniformly independent of each other. What is the expected value of the volume of the largest piece?

7. Determine the maximal area triangle such that all of its vertices satisfy $\frac{x^2}{9} + \frac{y^2}{16} = 1$.

8. Given a circle of radius 25, consider the set of triangles with area at least 768. What is the area of the intersection of all the triangles in this set?

9. Let $\triangle ABC$ be a triangle. Let D be the point on BC such that DA is tangent to the circumcircle of ABC. Let E be the point on the circumcircle of ABC such that DE is tangent to the circumcircle of ABC, but $E \neq A$. Let F be the intersection of AE and BC. Given that $BF/FC = 4/5$, find the maximum possible value for $\sin \angle ACB$.

10. Colorado and Wyoming are both defined to be 4 degrees tall in latitude and 7 degree wide in longitude. In particular, Colorado is defined to be at $37°N$ to $41°N$, and $102°03'W$ to $109°03'W$, whereas Wyoming is defined to be $41°N$ to $45°N$, and $104°03'W$ to $111°03'W$. Assuming Earth is a perfect sphere with radius R, what is the ratio of the areas of Wyoming to Colorado, in terms of R?