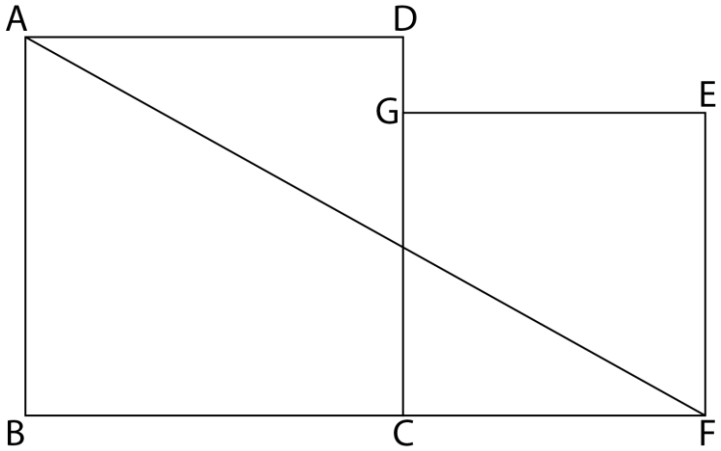
Knights of Pi Math Tournament – December 14th, 2013

Geometry 7th/8th

1	In triangle ABC, angle A is 60 degrees and angle B is 70 degrees. What is the angle measure of angle C?
2	Triangle ABC is inscribed in circle O such that A, C, and the center of circle O are collinear. If $AB = 5$ and $BC = 12$, find the radius of circle O.
3	What is $\frac{2}{3}$ of the complementary angle of 30 degrees?
4	What is the ratio of the volume of a cube with side length 5 to that of a sphere with a radius of 5?
5	Regular hexagon $DEFGHI$ is drawn inside triangle ABC such that points D and I are on side AB, H and G on side BC, and F and E on side AC. Find the ratio of the area of triangle ABC to hexagon $DEFGHI$.
6	The diagonals and sides of quadrilateral $ABCD$ have integer lengths. If $AB = 1$, $BC = 3$, $CD = 5$, and $DA = 7$, what is the length of diagonal AC?
7	Let D be the median of the hypotenuse BC of right triangle ABC. Find the value of AD if $AC = 4$ and $AB = 8$.
8	Find the length of AF in the following diagram if $ABCD$ and $GCFE$ are squares with areas of 100 and 64, respectively. 
9	Point E is the midpoint of side BC of rectangle $ABCD$ and point F is the midpoint of side AD. Let the intersection of diagonal AC and line EF be point G. What is the ratio of the area of rectangle $ABCD$ to that of quadrilateral $ABEG$?

10	Find the length of BE in the following diagram if triangle ABC is a right triangle, $AB = 4$, $AC = 5$, and triangle AED is congruent with triangle CED.