Year 2010-2011

Problemath Series 1

20 September 2010

(Deadline: Friday 8 October 14:00)

Problemath 1

abc is right triangle with the right angle at point *a*. Let p be a point on side $[a,b]$, and q be a point on side $[a,c]$. Given that $|bc|=3$, $|ap|=|aq|=1$, and that there exists a point r of the hypotenuse $[b,c]$ such that $aprq$ is a square, what is the exact measure of angle $\widehat{acb}$?

Problemath 2

A large $3\times3\times3$ cube is made of twenty seven $1\times1\times1$ small cubes the faces of which are all white. The faces of the large cube are painted in black, after which the cube is entirely dismantled. A blindfolded person randomly rebuilds the large cube out of its 27 smaller cubes. What is the probability that this large cube has all its faces black?

Problemath 3

$P(x)$ is a 2009th degree polynomial with real coefficients, such that $P(n)=\frac{n}{n+1}$ for all whole numbers $n\in\{0,1,2,...,2009\}$.

Evaluate $P(2010)$.