

2007 IUPUI High School Mathematics Contest

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www.math.iupui.edu/news/contest

1. Call a point in the plane “integer” if both of its coordinates are integers. Let a “configuration” be any random selection of 5 integer points. Prove that in any configuration, the line segment joining 2 of the points passes through another integer point (in some cases another point of the configuration).
2. The shortest side of a triangle has length 1 and the tangents of all of its angles are integers. Find the possible lengths of the other two sides.
3. Find the last two digits of the natural number $13^{12^{11^{3^2}}}$.
4. The squares of an n by n “chessboard” are randomly assigned the numbers 1 through n^2 . You are told the sum of every two squares that are adjacent, either vertically or horizontally (not diagonally).
 - (a) In the case of a normal 8 by 8 chessboard, is this information always enough to determine which number is in each square?
 - (b) What about a superlarge 2007 by 2007 chessboard?
5. Write an essay of 500 to 700 words (complete with bibliography) on an application of statistics to decision making.