

# Mathematics Competition

## *Problem #2 of five - September 27 to October 10, 2013*

a) An ant is crawling on the plane horizontally or vertically (changing direction from horizontal to vertical and vice versa). The ant starts and ends its path at the same point A. As a result, the ant's path is a closed broken line with  $n$  segments.

Can  $n$  be equal to one of the following numbers: 2012, 2013, 2014, 2015, or 2016? If yes, which one(s)? If yes, show or explain the ant's path with this number of  $n$  segments; if not, explain why such a path cannot exist.

b) A bug in three dimensional space can fly parallel to the  $x$ , the  $y$ , or the  $z$ -axis (changing direction from parallel to one axis to parallel to another axis). It starts and ends its path at the same point A. As a result, the bug's path is a closed spatial broken line with  $n$  segments.

Can  $n$  be equal to one of the following numbers: 2012, 2013, 2014, 2015, or 2016? If yes, which one(s)? If yes, show or explain the bug's path with this number of  $n$  segments; if not, explain why such a path cannot exist.

*Direct any questions to Gregory Galperin, OM 3361, or Keith Wolcott, OM 3341*

## Rules and Awards

- Any undergraduate currently enrolled at EIU is eligible to participate.
- Each solution is to be the work of one individual and is to be submitted with the solver's name, year in school, email address, local address and home address.
- Each solution is to be written or typed and is due in the main Mathematics Department office (OM3611) by **2:00 p. m., Thursday, October 10.**
- Entries will be judged on the basis of clarity of exposition and elegance of solution.
- Up to \$40 will be distributed as prize money for each problem. It will be distributed based on the quality of the solutions, but roughly, an award of \$10 will be awarded for the best solutions and \$5 will be awarded for partial solutions. In the case that there are many correct solutions, we will have a drawing for the prizes and in case no award is made, the prize money will be added to the next problem's prize fund.

- **Challenges, solutions, names of all solvers, and comments will be posted on the Challenge of the Week homepage:**

<http://www.eiu.edu/math/challenge.php>