NSF Math Column

Problem of the month

Five boxes are placed inside an empty box. Each of the 5 new boxes is either left empty or has 5 new boxes placed inside it. This process is repeated until there are at least 20 boxes containing other boxes. What is the least number of empty boxes?

Would you like submit your answer? Please click on the following link:
https://spreadsheets.google.com/viewform?formkey=dHR6ek5BazVnRVM3d01nbG1fNVdybXc6MA

Names of everybody who submitted correct answers will be published in the next edition!

Interested to know the solution for last column's problems? Refer to the end of this document!

For any questions or comments, please contact the team at NSFMathColumn@gmail.com

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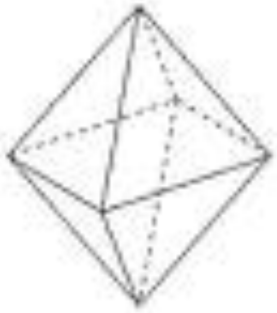
Answer to Problem of the month (Vol 2-7)

2/11

Solution: (Source: RMT 2012)



The figure shows a regular octahedron. If the two ants are not on the same vertex, they can either be on opposite vertices or on adjacent vertices. Let x and y be the probabilities that the ants will eventually meet on an edge when starting out from opposite vertices and from adjacent vertices, respectively. From opposite vertices, one of the ants must move to one of the remaining four vertices, which are all equivalent with respect to the other ant. That ant can either meet the first ant at a vertex, become adjacent to it (two ways to do this), or again become opposite from it. So

$x = (1/4)x + (1/2)y$

If the two ants are adjacent, the cases become slightly more complicated. If the first ant moves towards the second ant, the second ant can move towards it (meeting on an edge); otherwise they will be adjacent.
If the first ant moves away from the second ant, they will become adjacent no matter what the second ant does. If the first ant moves to the side (two ways to do this), they will be opposite if the second ant chooses the other direction, and will meet at a vertex if it chooses the same direction. Otherwise they will be adjacent.
So

$y = (1/8)x + (11/16)y + (1/16)$

This system of equations is easily solved to obtain x = **2/11**.

Who submitted correct answers?

- Shwetark Patel (Herndon, VA)
- Sushovan Guha (Missouri City, TX)
- Indumathi Prakash (Sharon, MA)
- Siddarth Guha (Missouri City, TX)
- Sankar Mahadevan (Dayton, NJ)
- Sashidhar Guduri (Ann Arbor, MI)
- Varun Ravichandran (Caldwell, NJ)
- Rohit Aita (Somerset, NJ)
- Shaan Bhandarkar (Potomac falls, VA)
- Shaan Bhandarkar (Potomac falls, VA)
- N Shankar (Bridgewater, NJ)
- Yash Nalla (Concord, NC)
- Akshaj Kadaveru (Fairfax, VA)
- Venkatesh Madapoosi (GROVER, MO)
- Dhivya Murugan (Denver, CO)
- Anirudh Kuchibhatla (Hyderabad, India)
- Anirudh Rangaswamy (Dayton, Ohio)
- Desigamoorthy Nainar (Champaign, IL)
- Shravani Samala (West Chester, PA)
- Hemanth Chitti (Bangalore, India)
- Sreekar Chitti (Bangalore, India)
- Anitha Ramakodi (Parsippany, NJ)
- Ajit Kadaveru (Fairfax, VA)
- Tarang Saluja (Nashua, NH)

Thanks to all who attempted to solve the problem of the month. We look forward to your continued interest and increased participation.