

NSF Math Column



Problem of the month

In a room, a ladder leans against a wall at an angle of 75° with the floor and reaches a point “m” feet above the ground. Keeping the foot of the ladder at the same point, the top of the ladder is moved to the wall on the other side of the room. The ladder now makes an angle of 45° with the floor and reaches a point “n” feet above ground ($m > n$). Find, in simplest form, the distance between the two walls of the room in terms of m and n (assume the two walls are perpendicular to the floor)?

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 2-8)

81

Solution:

To start with there are 5 empty boxes. In the next iteration, when 5 additional boxes are picked and placed inside one of the empty boxes, we are left with 9 empty boxes. Similarly, in the next iteration we are left with 13 empty boxes. Thus, the pattern for the number of empty boxes is $4N + 1$ ($N = 1, 2, 3, \dots$).

Now, let's look at the pattern for boxes that are not empty. To start with, there is 1 box that is filled. In the next iteration, we have 2 boxes that are filled and so on. Thus, the pattern for the number of filled boxes = N ($N = 1, 2, 3, \dots$).

Given that the least value of boxes that are filled is 20, we have $N \geq 20$. To find the least number of empty boxes, we set the value of $N = 20$. Hence, least number of empty boxes possible is $4(20) + 1 = 81$.



Who submitted correct answers?

- Anita Patel (Princeton, NJ)
 - N. Shankar (NJ)
 - Monal Garg (East Brunswick, NJ)
 - Ajit Kadaveru (Fairfax, VA)
 - Sajiv Chandra (Miramar, FL)
 - Rick Basak (Hamden, CT)
 - Indumathi Prakash (Sharon, MA)
 - Anish Chaluvadi (Simpsonville, SC)
 - Shobha Dasari (Houston, TX)
 - Pranav Arrepu (Concord, NC)
 - Hemanth Chitti (Bangalore, India)
 - rakesh gupta (Saratoga, CA)
 - Anirudh Kuchibhatla (Hyderabad, India)
 - Meena Shankar (Bridgewater, NJ)
 - Sushovan Guha (Missouri City, TX)
 - Siddarth Guha (Missouri City, TX)
 - Anupam Sharma (Fairfax, VA)
 - Shaila Patankar (Marlboro, NJ)
 - Aditi Gurudutt (Hanover Park, IL)
 - Suraj Rathi (Edison, NJ)
 - Vanshika Ramesh (Palatine, IL)
 - Neha Khandelwal (Fairfax, VA)
 - Anirudh Rangaswamy (Dayton, OH)
 - Anupama Phatak (Ellicott City, MD)
 - Ashwin Sreevatsa (MA)
 - Srivani Edupuganti (Cary, NC)
 - Ambika Goel (Winchester, MA)
 - Nisha Goel (Winchester, MA)
 - Anish Warty (Shrewsbury, MA)
 - Akshay Prabhushankar (Olathe, KS)
 - Tejas Narayanan (Cupertino, CA)
 - Sreekar Chitti (Bangalore, India)
 - vijaya madala (Chantilly, VA)
 - Gaurav Hardykar (Princeton, NJ)
 - Shristi Anand (Union City, CA)
 - Arvind Subramanian (Olathe, KS)
 - Narahari Bharadwaj (Plano, TX)
 - Divya Goel Bloomfield Hills
 - Anish Madala (Chantilly, VA)
 - Lalitha Iyer (Indiana)
 - Rahul Madala (Chantilly, VA)
 - Bhanu Vuppala (CA)
 - Anudeep Udumula (Bear, DE)
 - Shiva Soundappan (Kathleen, GA)
 - Nivedha Soundappan (Georgia)
 - Desigamoorthy Nainar (Champaign, IL)
- Akshaj Kadaveu (Fairfax, VA)
 - Shwetark Patel (Herndon, VA)
 - Ahila Manoharan (Shrewsbury, MA)
 - Shaan Bhandarkar (Potomac Falls, VA)
 - Tarang Saluja (Nashua, NH)
 - Naveen Venkat (Coffeyville, KS)
 - Kannan Nagarajan (Weston, FL)
 - Sameer Lal (Macungie, PA)
 - yash nalla (Concord, NC)
 - anmol sakarda (Acton)
 - Himani Kalra (Johns Creek, GA)
 - Siya Kalra (Johns Creek, GA)
 - Sashidhar Guduri (Ann Arbor, MI)
 - Sankar Mahadevan (Dayton, NJ)

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- Akshyasri Dhinakaran (Westlake, OH)
- Shreya Shubhangi (Denver, CO)
- Yash Kadadi (Atlanta, GA)
- Manju C (MA)
- SHREYA BOPPUDI (Colorado Springs, CO)
- Aayush Gupta (Saratoga, CA)
- Sairam Baramkula (San Jose, CA)
- Sravan gogulapati (Cupertino, CA)
- Anjali Nambrath (Marlboro, NJ)
- Rohit Aita (Somerset, NJ)
- Mrugank Gandhi (Aurora, IL)
- Varun Ravichandran (Caldwell, NJ)
- Pranam Kalla (Simi Valley, CA)
- Pavani samala (West Chester, PA)
- Arushi Dogra (San Diego, CA)
- Shravani Samala (west chester, PA)
- Amogh Chilukuri (Irvine, CA)
- Dhivya Senthil Murugan (Denver, CO)
- Vaibhav Sharma (Oak Hill, VA)
- Anitha Ramakodi (Parsippany, NJ)

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