1. Customers arriving at a restaurant

Problem Set due Feb 19, 2020 05:29 IST *Completed*

Problem 1. Customers arriving at a restaurant

2.0/2.0 points (graded)

Six customers enter a three-floor restaurant. Each customer decides on which floor to have dinner. Assume that the decisions of different customers are independent, and that for each customer, each floor is equally likely. Find the probability that exactly one customer dines on the first floor.

64/243 ✔ **Answer:** 0.2633

Solution:

Solution 1 (Counting): Since each customer has three possible choices, the sample space consists of $3^6 = 729$ different seating assignments.

Of these assignments, in order to find those satisfying the problem's requirements, we count as follows. First, we select a person to dine on first floor. There are $\binom{6}{1}$ different ways of doing this. After that, the remaining 5 people can each select among two floors, which can be done in 2^5 ways. Hence, in total, we have $\binom{6}{1} \times 2^5 = 192$ different ways.

Therefore, the desired probability is $192/729 = 64/243 \approx 0.2633$.

Solution 2: The number of customers dining on the first floor is a Binomial random variable, with parameters $n = 6$ and $p = 1/3$. This is because we can interpret each customer as an i.i.d. Bernoulli trial, with success probability $1/3$, where a success corresponds to choosing the first floor. Thus,

$$\mathbb{P}\left(\mathrm{Bin}\left(6, 1/3\right) = 1\right) = \binom{6}{1}\left(\frac{1}{3}\right)^{1} \cdot \left(\frac{2}{3}\right)^{5} \approx 0.2633,$$

as in the first solution.

Submit You have used 3 of 3 attempts

Answers are displayed within the problem

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Topic: Unit 3: Counting:Problem Set 3 / 1. Customers arriving at a restaurant

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- Hint: think of an unfair coin toss — 1
  I used the multinomial worked example special case of coin toss. H is 1st floor, T is either other floor.
- Is the question sufficiently precise? — 3
  Why wouldn't stars and bars work? Example: 00010010 is 3 customers on first floor, 2 on second floo...
- Hint: Just like the Rook in Chessboard — 1
  Try to draw the grid and you will get it. good luck
- Hint ! — 4
  It took me sometime but I got it right. Some hints which helped me think clearly: 1. It is a probability s...
- Just think in simple probabilties — 1
  I solved by working out the probability that any single person entering the restaurant chooses the firs...
- Tricky — 1
  I am not sure if anyone else felt this too, this was the trickiest of all the problems. I had to come back ...
- A different approach, binomial? — 3
  Hi. I thought maybe I would approach it as if k= # people on floor one. People are either on floor one ...
- 3 Steps to Solve this Problem — 9
  I struggled with this problem and got it on my last attempt. I want to take my time to explain clearly, ...
- Multinomial Probability Approach

i started out listing all the possibilities but it started feeling a bit tedious so I tried the multinomial pro... 4

Die approach 8

This looks like 6 rolls of an equalily likely three-sided die to me.

hint 2 1

This problem is more similar to the problem of arranging letters/numbers in a certain sequence than ...

Not intuitive... 1

...at least at first. As is often the case for me in probability problems, though, the answer sometimes s...

? Does order matter here? is {3,3,3,3,3,2} and {3,3,3,3,2,3} the same choice of dining (the same outcome)? 6

Let's consider that each element of the following six sets [a), b), c)...] represents a dining floor choice f...