Exercise: Boy or Girl Paradox

Bookmark this page

Exercise: Boy or Girl Paradox

3 points possible (graded)

Alice has two children. Let's look at the probability that both children are girls, given different observations. We'll assume that the underlying finite probability space is as follows for Alice's children:

Outcome	Probability
1st child: girl, 2nd child: girl	1/4
1st child: girl, 2nd child: boy	1/4
1st child: boy, 2nd child: girl	1/4
1st child: boy, 2nd child: boy	1/4

- What is the probability that both children are girls? (This is an unconditional probability in that we aren't given any observations.) (Please be precise with at least 3 decimal places, unless of course the answer doesn't need that many decimal places. You could also put a fraction.)

Answer: 1/4

- What is the probability that both children are girls given that the younger child is a girl? (Please be precise with at least 3 decimal places, unless of course the answer doesn't need that many decimal places. You could also put a fraction.)

Answer: 1/2

- What is the probability that both children are girls given that at least one child is a girl? (Please be precise with at least 3 decimal places, unless of course the answer doesn't need that many decimal places. You could also put a fraction.)

Answer: 1/3

Solution:

Let's use G to denote that the child is a girl and B to denote that the child is a boy. Thus, the ordering GB would mean that the first child is a girl and the second child is a boy. Using this encoding, the finite sample space for this problem becomes $\Omega = \{GG, GB, BG, BB\}$.

- Since we are not given any observations and the gender of each child is independent of the other, the probability of having two girls, the probability of having two boys, the probability of the older one being a boy and the younger one being a girl and the probability of the older one being a girl and the younger one being a boy are the same. Thus, the probability of having two girls is $\frac{1}{4}$.

- We now observe that the second child is a girl. This reduces the sample space to $\Omega = \{BG, GG\}$. The first child can be either a boy or a girl with equal probability. Thus, the probability that both children are girls given that the younger child is a girl becomes $\frac{1}{2}$.

- Now we observe that at least one of the two children is a girl, but we don't necessarily know if it's the older or younger child. Thus, our sample space is reduced to $\Omega = \{BG, GG, GB\}$. Each outcome is equally likely, thus the probability that both children are girls given that at least one of them is a girl becomes $\frac{1}{3}$.

Submit You have used 0 of 5 attempts

Discussion

Topic: Conditioning on Events / Exercise: Boy or Girl Paradox

Hide Discussion

Add a Post

"at least one is a girl" :)

discussion posted 2 months ago by **Mike103**

That's a somewhat ethereal piece of information, isn't it! Looking forward to other examples of "meta-information(?)"* like this, in useful...

This post is visible to everyone.

✚ Expand discussion

Amazing :)

discussion posted 2 months ago by anonymous

Amazing example, thanks

This post is visible to everyone.

✚ Expand discussion

Exercise: Conditioning on Events

question posted 2 months ago by **donald-duck**

this question is related to the exercise under the previous tab (there was no discussion button there). i have a question regarding $P(A\cup...

This post is visible to everyone.

✚ Expand discussion

Is this connected to the previous lecture somehow?

discussion posted 2 months ago by **ashikyan**

As always, thank you very much for your time and efforts in this novel approach to teaching and learning.

Unfortunately, I am getting more and...

This post is visible to everyone.

+ Expand discussion

Thanks for Boy Girl Paradox question

discussion posted 2 months ago by anonymous

I find this question to be complex enough for variety of questions on simple topic that only use common sense is sufficient, yet, simple enough...

This post is visible to everyone.

+ Expand discussion