

Assignment 1

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Download all python codes from

<https://github.com/Yagna20/AI1103/blob/main/Assignment1/Assignment%201.py>

and latex-tikz codes from

<https://github.com/Yagna20/AI1103/edit/main/Assignment1/Assignment1.tex>

1 PROBLEM 2.5

A couple has two children, (i) Find the probability that both children are males, if it is known that at least one of the children is male. (ii) Find the probability that both children are females, if it is known that the elder child is a female.

2 SOLUTION

Let X_1 and X_2 represent the elder and younger child respectively.

Let male child be represented as 1 and female child be represented as 0.

(i) From the given information,

$$\Pr(X_1 = X_2 = 1/X_1 + X_2 \geq 1) = \frac{\Pr(X_1 = X_2 = 1 \& X_1 + X_2 \geq 1)}{\Pr(X_1 + X_2 \geq 1)} \quad (2.0.1)$$

$$\Pr(X_1 = X_2 = 1/X_1 + X_2 \geq 1) = \frac{\left(\frac{1}{4}\right)}{\left(\frac{3}{4}\right)} \quad (2.0.2)$$

$$\Pr(X_1 = X_2 = 1/X_1 + X_2 \geq 1) = \frac{1}{3} \quad (2.0.3)$$

$$(2.0.4)$$

So the probability that both the children are male is $\frac{1}{3}$. (ii) From the given information

$$\Pr(X_1 + X_2 = 0/X_1 = 0) = \frac{\Pr(X_1 + X_2 = 0 \& X_1 = 0)}{\Pr(X_1 = 0)} \quad (2.0.5)$$

$$\Pr(X_1 + X_2 = 0/X_1 = 0) = \frac{\left(\frac{1}{4}\right)}{\left(\frac{1}{2}\right)} \quad (2.0.6)$$

$$\Pr(X_1 + X_2 = 0/X_1 = 0) = \frac{1}{2} \quad (2.0.7)$$

$$(2.0.8)$$

So the probability that both the children are female is $\frac{1}{2}$.