Assignment 1

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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 $X \epsilon \{0, 1, 2, 3\}$ represent a random variable where
- $0 \to$ Both males.
- $1 \to$ At least one of the children is male.
- $2 \to$ Elder child is female.
- $3 \to$ Both females.

(i)From the given information

$$\Pr(X = 0, X = 1) = \frac{\Pr(X = 0 \& X = 1)}{\Pr(X = 1)} \quad (2.0.1)$$

$$\Pr(X = 0, X = 1) = \frac{\frac{1}{4}}{\frac{3}{4}} \quad (2.0.2)$$

$$\Pr(X = 0, X = 1) = \frac{1}{3} \quad (2.0.3)$$

$$(2.0.4)$$

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

$$\Pr(X = 3, X = 2) = \frac{\Pr(X = 3 \& X = 2)}{\Pr(X = 2)} \quad (2.0.5)$$

$$\Pr(X = 3, X = 2) = \frac{\frac{1}{4}}{\frac{1}{2}} \quad (2.0.6)$$

$$\Pr(X = 3, X = 2) = \frac{1}{2} \quad (2.0.7)$$

$$(2.0.8)$$

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