Assignment 12

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1 QUESTION No. 2.5

A couple has two children,

1) Find the probability that both children are male, if it is known that at least one of the children is male.

2) Find the probability that both children are female, if it is known that at least one of the children is female.

2 SOLUTION

Lemma 2.1. *If A and B are two events in a sample space S, then the Conditional Probability of A given B is defined as* $P(A \mid B) = \frac{P(A \cap B)}{P(B)}$

From the given information we have,

Events	Description
$E1$	Both children are male
$F1$	At least one child is male
$E2$	Both children are female
$F2$	At least one child is female
$(E1 \cap F1)$	Both children are male and at least one child is male
$(E1 \cap F2)$	Both children are female and at least one child is female

Let boy be denoted by B and girl be denoted by G respectively.

$$S = \{BB, BG, GB, GG\} \qquad (2.0.1)$$

1) We need to find P $=(E1 \mid F1)$:

$$P(E1) = \frac{1}{4}, P(F1) = \frac{3}{4} \qquad (2.0.2)$$

$$P(E1 \cap F1) = \frac{1}{4} \qquad (2.0.3)$$

$$\therefore P(E1|F1) = \frac{1}{3} \qquad (2.0.4)$$

2) We need to find P $=(E2 \mid F2)$:

$$P(E2) = \frac{1}{4}, P(F2) = \frac{1}{2} \qquad (2.0.5)$$

$$P(E2 \cap F2) = \frac{1}{4} \qquad (2.0.6)$$

$$\therefore P(E2|F2) = \frac{1}{2} \qquad (2.0.7)$$