

Answer on Question 49648 - Math - Statistics and Probability

Of all the smokers in a particular district, 40% prefer brand A and 60% prefer brand B. Of those smokers who prefer brand A, 40% are females, and of those who prefer brand B, 30% are female. What is the probability that a randomly selected smoker prefers brand B, given that the person selected is a female?

Solution

We need to use Bayes' theorem here. First find probability $P(B)$ to have woman-smoker by total probability formula.

$$P(B) = \sum_{i=1}^2 P(B|A_i)P(A_i) = 0.4 \cdot 0.4 + 0.6 \cdot 0.3 = 0.34$$

Now theorem tells us

$$P(A_2|B) = \frac{P(B|A_2)P(A_2)}{P(B)} = \frac{0.3 \cdot 0.6}{0.34} \approx 0.53$$

Hence probability that a randomly selected smoker prefers brand B, given that the person selected is a female, is 53%.