Answer on Question #26655 – Math – Statistics and Probability

A bag contains three coins, one of which is coined with two heads, while the other two coins are normal and not biased. A coin is chosen at random from the bag and tossed four times in succession. If heads turn up each time. what is the probability that this is the two headed coin?

Solution

Let H_1 ="a two headed coin was chosen from a bag", H_2 = " a normal, not biased coin was chosen from a bag", D="heads turn up four times", $(H_1|D)$ =" a two headed coin was chosen from a bag given heads turn up four times".

The corresponding probabilities are $P(H_1) = \frac{1}{3}$, $P(H_2) = \frac{2}{3}$.

By total probability formula, $P(D) = P(D|H_1)P(H_1) + P(D|H_2)P(H_2)$.

By Bayes` formula,

$$P(H_1|D) = \frac{P(D|H_1)P(H_1)}{P(D)} = \frac{P(D|H_1)P(H_1)}{P(D|H_1)P(H_1)+P(D|H_2)P(H_2)} = \frac{\frac{1}{2^4}*\frac{1}{3}}{\frac{1}{2^4}*\frac{1}{3}+\frac{1}{2^4}*\frac{2}{3}} = \frac{1/3}{1/3+2/3} = \frac{1}{3} \approx 0.33.$$

Answer: 1/3