Answer on Question #83216 – Math – Statistics and Probability

Question

Suppose there are two urns A and B. A contains two red balls and one green ball, while B contains one red ball and two green balls. An urn is randomly selected, and then two balls are randomly selected (without replacement) from the urn. The first ball is red and the second ball is green. What is the probability that the urn selected was A?

a. 0.7
b. 0.9
c. 0.4
d. 0.5

Solution

Let *P(A)* be the probability that the urn A was chosen. *P(A) = 1/2*.

$P_A(RG)$ is the probability that a red ball was first pulled out from the urn A and then green (event RG). $P_A(RG) = \dfrac{2}{3} * \dfrac{1}{2} = \dfrac{1}{3}$

Similarly, *P(B)* is the probability that the urn B was chosen. *P(B) = 1/2*.

$P_B(RG)$ is the probability that the red ball was first pulled out from the urn B and then green.

$P_B(RG) = \dfrac{1}{3} * 1 = \dfrac{1}{3}$

In general, the probability that a red ball was first pulled out and then a green one is found using the formula of total probability, $P(RG) = P(A)*P_A(RG) + P(B)*P_B(RG) = \dfrac{1}{2} * \dfrac{1}{3} + \dfrac{1}{2} * \dfrac{1}{3} = \dfrac{1}{3}$

Now, using the Bayes` formula, we find the probability that, under the condition of RG, the urn A was originally chosen:

$$P_{RG}(A) = \frac{P(A)*P_A(RG)}{P(RG)} = \frac{\frac{1}{2}*\frac{1}{3}}{\frac{1}{3}} = \frac{1}{2}.$$

Answer:

d. 0.5