Answer on Question #65390 - Math – Statistics and Probability

Box I contains 3 red and 2 blue marbles while Box II contains 2 red and 8 blue marbles. A fair coin is tossed. If the coin turns up heads a marble is chosen from Box I, if it turns up tails a marble is chosen from Box II. Find the probability that a red marble is chosen.

Solution. Denote A={a red marble is chosen },

B_1={Box I is chosen}, B_2={Box II is chosen}

By the formula for total probability (e.g. [1], p.23, (3)),

$$P(A) = P(A|B_1)P(B_1) + P(A|B_2)P(B_2).$$

$$P(B_1) = P(B_2) = \frac{1}{2}, P(A|B_1) = \frac{3}{5}, P(A|B_2) = \frac{2}{10} = \frac{1}{5}.$$

Then

$$P(A) = \frac{1}{2} \cdot \frac{3}{5} + \frac{1}{2} \cdot \frac{1}{5} = \frac{4}{10} = \frac{2}{5}.$$

Answer. $\frac{2}{5}$.

References

1. Shiryaev A.N. Probability-1. Third edition. Springer. 2016.