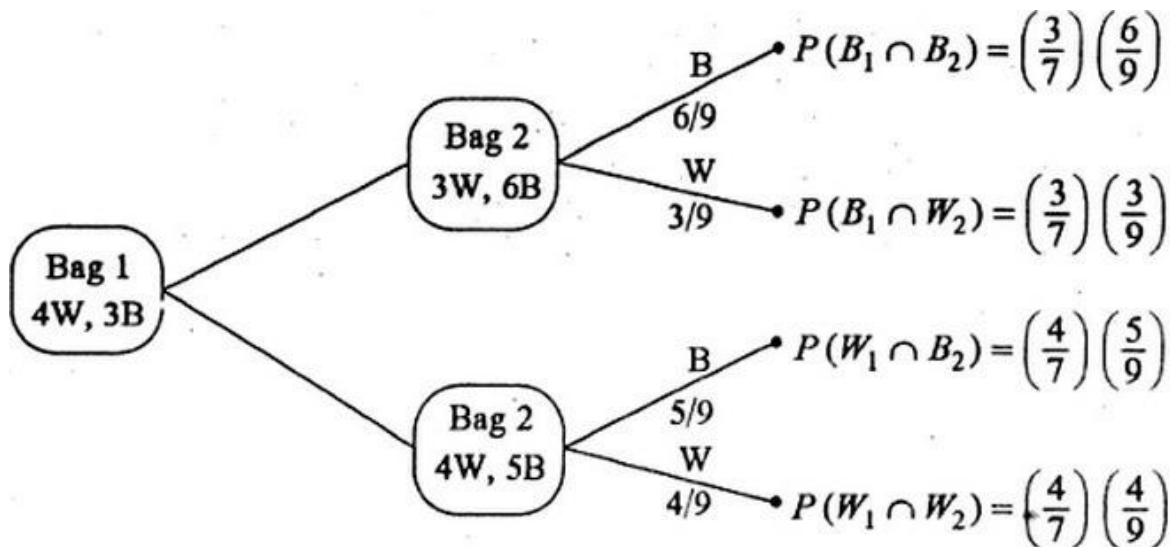Answer on Question#38819, Math, Statistics

One bag contains 4 white balls and 3 black balls, and a second bag contains 3 white balls and 5 black balls. One ball is drawn from the first bag and placed unseen in the second bag. What is the probability that a ball now drawn from the second bag is black?

Solution

Let B_1, B_2, W_1, W_2 represent, respectively, the drawing of a black ball from bag 1, a black ball from bag 2 and a white ball from bag 2. We are interested in the union of the mutually exclusive events $B_1 \cap B_2$ and $W_1 \cap B_2$. The various possibilities and their probabilities are illustrated in figure.

Now,

$$P[(B_1 \cap B_2) \text{ or } (W_1 \cap B_2)] = P(B_1 \cap B_2) + P(W_1 \cap B_2) = P(B_1)P(B_2|B_1) + P(W_1)P(B_2|W_1)$$

$$= \left(\frac{3}{7}\right)\left(\frac{6}{9}\right) + \left(\frac{4}{7}\right)\left(\frac{5}{9}\right) = \left(\frac{38}{63}\right).$$

Answer: $\frac{38}{63}$.