Question

I have a bag with 5 dk chocolates, 5 white chocolates, and 5 dk chocolates. If I take two and eat them what is the probability of getting a dk chocolate the next time.

Solution

So we have 10 dk chocolates and 5 white chocolates.

If you took 2 dk chocolates, then the probability of getting a dk chocolate the next time:

$$p_1 = \frac{10 - 2}{8 + 5} = \frac{8}{13}$$

The probability that you took 2 dk chocolates:

$$P_1 = \frac{10}{15} \cdot \frac{9}{14} = \frac{3}{7}$$

If you took 1 dk chocolate and 1 white chocolate, then the probability of getting a dk chocolate the next time:

$$p_2 = \frac{10 - 1}{13} = \frac{9}{13}$$

The probability that you took 1 dk chocolate and 1 white chocolate:

$$P_2 = \frac{10}{15} \cdot \frac{5}{14} = \frac{5}{21}$$

If you took 2 white chocolates, then the probability of getting a dk chocolate the next time:

$$p_3 = \frac{10}{13}$$

The probability that you took 2 white chocolates:

$$P_3 = \frac{5}{15} \cdot \frac{4}{14} = \frac{2}{21}$$

Finally, using the formula of total probability:

$$p = p_1 \cdot P_1 + p_2 \cdot P_2 + p_3 \cdot P_3 = \frac{8}{13} \cdot \frac{3}{7} + \frac{9}{13} \cdot \frac{5}{21} + \frac{10}{13} \cdot \frac{2}{21} = \frac{72 + 45 + 20}{13 \cdot 21} = \frac{137}{273}$$