

Answer on Question #42092 – Math – Statistics and Probability

There are two winning tickets among ten tickets available. Determine the probability that (i) one or both of these tickets will be winning among five tickets selected at random.

Solution.

For a start, we number the tickets. Let, 1 and 2 – winning tickets; 3, 4, 5, 6, 7, 8, 9, 10 – non-winning tickets.

Let $\Omega = \{(\omega_1, \omega_2, \dots, \omega_5) \mid \omega_i \in \overline{1, 10}, \omega_i \neq \omega_j, \text{ if } i \neq j\}$ – probability space. $|\Omega| = C_{10}^5$

Now, we find the probability that none of these tickets will be winning among five tickets selected at random. We denote it $P(A)$.

$$A = \{(\omega_1, \omega_2, \dots, \omega_5) \in \Omega \mid \omega_i \in \overline{3, 10}, \omega_i \neq \omega_j, \text{ if } i \neq j\}, |A| = C_8^5$$

Using classical definition of probability, we have

$$P(A) = \frac{|A|}{|\Omega|} = \frac{C_8^5}{C_{10}^5} = \frac{8!}{5! \cdot 3!} \cdot \frac{5! \cdot 5!}{10!} = \frac{2}{9}$$

Let $B = \{\text{one or both of these tickets will be winning among five tickets selected at random}\}$

Then, A and B are complement events, so

$$P(B) = 1 - P(A) = \frac{7}{9}$$

Answer: the probability that one or both of these tickets will be winning among five tickets selected at random is $\frac{7}{9}$.