Answer on Question #62877 – Math – Statistics and Probability

Question

If two numbers are selected at random from the numbers 1, 2, 3, 4, determine the probability that their sum is odd when they are selected together and one by one with replacement.

Solution

The numbers are selected together. In this case the space of the elementary events has the next form:

$\Omega = \{(1,2),(1,3),(1,4),(2,3),(2,4),(3,4)\}$ (order is not important).

Obviously there are 4 favorable outcomes:

$$N = \{(1,2),(1,4),(2,3),(3,4)\}.$$

So the required probability is equal to

$$P_1 = \frac{mes(N)}{mes(\Omega)} = \frac{4}{6} = \frac{2}{3}.$$

The numbers are selected one by one with replacement. In this case there are $4^2 = 16$ elementary outcomes (or 16 ordered pairs):

$$\Omega = \left\{ \begin{matrix} (1,1),(1,2),(1,3),(1,4),(2,1),(2,2),(2,3),(2,4),(3,1),(3,2),(3,3),(3,4), \\ (4,1),(4,2),(4,3),(4,4) \end{matrix} \right\}$$

(order is important).

Obviously there are 8 favorable outcomes:

$$N = \{(1,2),(1,4),(2,1),(2,3),(3,2),(3,4),(4,1),(4,3)\}.$$

So the required probability is equal to

$$P_2 = \frac{mes(N)}{mes(\Omega)} = \frac{8}{16} = \frac{1}{2}.$$

Answer: $\frac{2}{3}$ and $\frac{1}{2}$ respectively.