

Answer on Question #42723– Math – Statistics and Probability

Question:

Experiment - choosing two cards with replacement from a standard deck of cards

Event A - the first card is a seven

Event B - the second card is a seven

Is this independent or dependent

Solution:

Two events A and B are independent if and only if their joint probability equals the product of their probabilities:

$$P(A \cap B) = P(A)P(B)$$

Let the standard deck of cards has m cards and k sevens. Then the probability to choose a seven is $\frac{k}{m}$, so $P(A)P(B) = \frac{k}{m} * \frac{k}{m} = \frac{k^2}{m^2}$. And the probability that we choose a seven, and after that we choose a seven again is $P(A \cap B) = \frac{k}{m} * \frac{k-1}{m} = \frac{k(k-1)}{m^2}$, because after first event the deck of cards has one seven less. Thus, $P(A \cap B) \neq P(A)P(B)$.

Answer.

These events are dependent.