

Answer on Question #77078 – Math – Statistics and Probability

Question

In a group of 60 students 20 study history, 24 study French and 8 study both history and French.

Are the events 'a student studies History' and 'a student studies French' independent?

Solution

Let A be the events 'a student studies History' and let B be 'a student studies French'. These two events are independent, by definition, if probability of their intersection equals to product of separate probabilities, $P(A \cap B) = P(A)P(B)$. Here $A \cap B$ is the event 'a student studies both History and French'. Let's check this.

First, probability of A is $P(A) = \frac{20}{60} = \frac{1}{3}$ and probability of B is $P(B) = \frac{24}{60} = \frac{2}{5}$. Second, probability of their intersection is $P(A \cap B) = \frac{8}{60} = \frac{4}{15}$. Now we can see that there is no equality:

$$P(A \cap B) = \frac{4}{15} \neq \frac{2}{15} = \frac{1}{3} \cdot \frac{2}{5} = P(A)P(B)$$

Answer:

The events are dependent.