So I had this Probability Question in class, and I didn't understand how my teacher got that answer.

So the Question is:

Two fair dice is rolled 'n' times. Find the probability of obtaining a double six 'at least once'.

How I answered the question was that, if we want a Double six at least once (which means getting a Double six, any number of times, be it once, twice, thrice....n times)

So the complement of that would be not getting a double six at all

And the P(Not getting a double six at all) = 35/36

so the P(Getting a double six at least once) = 1 - P(Not getting a double six at all)

P(Getting a double six at least once) = 1 - 35/36 = 1/36

So the Probability of getting a Double Six at least once (n times) = (1/36)*(1/36)*(1/36)....n times

P(getting a Double Six at least once (n times)) = (1/36)^n

but my teacher said that the answer is = 1 - (35/36)^n

Now, I didn't understand the logic she applied so please please can you please solve this and tell me if my answer is right or explain how is my teacher's answer right! Please, this Questions has been eating my head!

Solution

Your teacher`s answer is right. Your answer is wrong.

Event A='double six appear at least once at the time of n experiments ' is the complement to event B='no double six appear at the time of n experiments' (these events are mutually exclusive). So the complement of that would be not getting a double six at all.

When two fair dice is rolled 'n' times, event B =' no double six appear at the time of n experiments ' is the intersection of n events:

C_i= ' a double six does not appear at ith roll', $i=1, 2,…, n$, which are mutually independent.

So, by the multiplication rule for independent events the probability of event B is

$$\Pr(B)=\Pr(C_1)*\Pr(C_2)*…*\Pr(C_n)=35/36*35/36*…*35/36=(35/36)^n.$$

Therefore, for mutually exclusive events, the probability

$$\Pr(A)=1 - \Pr(B)=1 - (35/36)^n.$$

If we consider events 'getting a Double Six at least once (k times) ', they are not independent (the more times we roll two fair dice the more value of probability of 'getting a Double Six at least once' we obtain). So, the multiplication rule is not applicable for these events.