Answer on Question #85605 – Math – Statistics and Probability

Question

In 500 independent calculations, a student made 25 errors. His instructor randomly checked seven calculations of the student. Find the probability that instructor detects
i) Exactly 2 errors
ii) At most two errors

Solution

Let ***p*** is the probability that instructor detects error in randomly selected calculation of the student.
Then ***p*** = $\frac{25}{500} = 0.05$.
The probability that instructor detects in ***n*** calculations exactly ***k*** errors is equal to

$$P_n(k) = \frac{n!}{k!(n-k)!} p^k (1-p)^{n-k},$$

i) In our problem ***n*** = 7, ***k*** = 2, ***p*** = 0.05.

So $P_7(2) = \frac{7!}{2!*(7-2)!} * 0.05^2 * (1-0.05)^{7-2} = 21 * 0.05^2 * 0.95^5 = 0.04062$

ii) The probability that instructor detects in 7 calculations at most two errors is equal to

$$P_7(\le 2) = P_7(2) + P_7(1) + P_7(0) = \frac{7!}{2!*(7-2)!} * 0.05^2 * (1-0.05)^{7-2} +$$

$$+ \frac{7!}{1!*(7-1)!} * 0.05^1 * (1-0.05)^{7-1} + \frac{7!}{0!*(7-0)!} * 0.05^0 * (1-0.05)^{7-0} =$$

$$= 0.04062 + 7 * 0.05^1 * 0.95^6 + 1 * 1 * 0.95^7 = 0.04062 + 0.25728 + 0.69834 =$$

$$= 0.9962$$

Answer:

i) The probability that instructor detects in 7 calculations exactly 2 errors is equal to 0.04062.

ii) The probability that instructor detects in 7 calculations at most two errors is equal to 0.9962.