

Answer on Question #43093-Math-Statistics and Probability

The probability that I go to the gym on any given day of the week is 30%.

What is the probability distribution of the number of times that I go to the gym over the course of one week (7 days)?

Solution

The probability distribution of the number of times (k) that I go to the gym over the course of 7 days is

$$\Pr(X = k) = \binom{7}{k} 0.3^k (0.7)^{7-k},$$

for $k = 0, 1, 2, \dots, 7$, where

$$\binom{7}{k} = \frac{7!}{(7-k)! k!}.$$

My physician recommends that I go to the gym at least 3 times per week. What is the probability that I follow the physician's recommendation and go to the gym at least 3 times in a one week period?

Solution

The probability that I follow the physician's recommendation and go to the gym at least 3 times in a one week period is

$$\begin{aligned} P(X \geq 3) &= 1 - \Pr(X = 0) - \Pr(X = 1) - \Pr(X = 2) \\ &= 1 - \frac{7!}{(7-0)! 0!} 0.3^0 (0.7)^{7-0} - \frac{7!}{(7-1)! 1!} 0.3^1 (0.7)^{7-1} - \frac{7!}{(7-2)! 2!} 0.3^2 (0.7)^{7-2}. \end{aligned}$$

$$\begin{aligned} P(X \geq 3) &= 1 - (0.7)^7 - \frac{7!}{(6)!} 0.3(0.7)^6 - \frac{7!}{(5)! 2!} 0.3^2 (0.7)^5 = 1 - 0.0823 - 0.2471 - 0.3176 \\ &= 0.3530. \end{aligned}$$