Q1.

Messi scores an average of 0.56 goals per game in club competitions. What's the probability of scoring __at least__ 3 goals.

Solution:

Recall that poisson distribution models #of events on average during a set period of time. for discrete events. So let

(1) $X =$ # of goals in one game $\Rightarrow$

(2) $X \sim poi(\lambda)$ where $\lambda = $ avg # event occurrence.

(3) $\Rightarrow f(x) = e^{-\lambda}\left(\dfrac{\lambda^x}{x!}\right)$ is the pdf. & $\Rightarrow$

(4) $E(X) = \lambda.$ Hence for our case

(5) $\lambda = 0.56;$

then probability of scoring at least 3 goals is

$$P(X \geq 3) = 1 - \underbrace{P(X < 3)}$$

$$= 1 - P(X \leq 2) \leftarrow \text{applying by (3)}$$

$$= 1 - \sum_{x=0}^{2} \frac{e^{-0.56}\cdot(0.56)^x}{x!}$$

$$= 1 - e^{-0.56}\left[\frac{(0.56)^0}{0!} + \frac{(0.56)^1}{1!} + \frac{(0.56)^2}{2!}\right]$$

$$= 0.01935.$$