

Poisson Distribution - Problems for Practice

1. X has a Poisson distribution with $P(X = 2) = \frac{2}{3}P(X = 1)$, Find $P(X = 0)$.

Ans: $\lambda = \frac{4}{3}, P(X = 0) = e^{-\frac{4}{3}}$.

2. If X is a Poisson variate such that $2P(X = 0) + P(X = 2) = 2P(X = 1)$, find $E(X)$.

Ans: $\lambda = 2, E(X) = 2$.

3. The number of monthly breakdown of a computer is a random variable having a Poisson distribution with mean equal to 1.8. find the probability that this computer will function for a month
- Without a breakdown
 - With only one breakdown and
 - With at least one breakdown

Ans: $\lambda = 1.8$

- $P(X = 0) = e^{-1.8} = 0.1653$.
- $P(X = 1) = 0.2995$.
- $P(X \geq 1) = 0.8347$.

4. Message arrives at a switch board in a Poisson manner at an average rate of six per hour. Find the probability for each of the following events
- Exactly two messages arrive within one hour
 - No message arrives within one hour
 - At least three messages arrive within one hour.

Ans: $\lambda = 6$

(i) $P(X = 2) = 0.0446$. (ii) $P(X = 0) = 0.0025$. (iii) $P(X \geq 3) = 0.9380$.

5. The number of typing mistakes that a typist makes on a given page has a Poisson distribution with a mean of 3 mistakes. What is the probability that she makes
- Exactly 7 mistakes.
 - Fewer than 4 mistakes.
 - No mistakes on the given page.

Ans: $\lambda = 3$

(i) $P(X = 7) = 0.0216$. (ii) $P(X < 4) = 0.6474$. (iii) $P(X = 0) = 0.0498$.

6. The probability that a man aged 35 years will die before reaching the age of 40 years

may be taken as 0.018. Out of a group of 400 men now aged 35 years, what is the probability that 2 men will die within next 5 years?

$$\text{Ans: } n = 400, p = 0.018. \Rightarrow \lambda = np = 7.2, P(X = 2) = 0.01935.$$

7. The no. of accidents in a year to taxi-drivers in a city follows a Poisson distribution with mean equal to 3. Out of 1000 taxi drivers, find approximately the number of drivers with (i) no accidents in a year (ii) more than 3 accidents in a year

$$\text{Ans: } \lambda = 3$$

$$\text{i. } P(X = 0) = 0.0498$$

$$\text{Number of drivers} = 1000 \times 0.0498 = 49.8 \cong 50.$$

$$\text{ii. } P(X > 3) = 0.3526$$

$$\text{Number of drivers} = 1000 \times 0.3526 = 352.6 \cong 353$$