

Poisson Distribution

If a bank receives on average 6 bad checks per day:

a) What is the probability that the bank will receive 4 bad checks on a given day?

b) What is the probability it will receive 9 bad checks in any given 2 days?

c) What is the probability it will receive at least 1 bad check every 2 hours? (Business day is from 8am - 6pm = 10 hours)

A local drugstore owner knows that, on average, 100 people per hour stop by his store. Find the probability that in a given 3-minute period nobody enters the store.

Poisson Distribution

Note: $E_x = \lambda t$
 $\sigma_x^2 = \lambda t$

$$f(x) = \frac{e^{-\lambda t} (\lambda t)^x}{x!}$$

If a bank receives on average 6 bad checks per day:

a) What is the probability that the bank will receive 4 bad checks on a given day?

$\lambda = 6$
 $t = 1$ (1 day)

$$f(4) = \frac{e^{-6(1)} \cdot (6(1))^4}{4!} = \frac{e^{-6} \cdot 6^4}{4!} = \boxed{.1339}$$

b) What is the probability it will receive 9 bad checks in any given 2 days? $\lambda = 6$ $t = 2$ (2 days)

$$f(9) = \frac{e^{-6(2)} (6(2))^9}{9!} = \boxed{.08736}$$

c) What is the probability it will receive at least 1 bad check every 2 hours? (Business day is from 8am - 6pm = 10 hours) $\lambda = 6$ $t = \frac{2}{10} = \frac{1}{5} = .2$

find $P(X \geq 1) = 1 - P(X < 1) = 1 - P(X = 0)$

$$f(0) = \frac{e^{-6(.2)} (6(.2))^0}{0!} = \frac{e^{-1.2} \cdot 1}{1} = e^{-1.2} = .30119 \approx \boxed{.3012}$$

A local drugstore owner knows that, on average, 100 people per hour stop by his store. Find the probability that in a given 3-minute period nobody enters the store.

$\lambda = 100$ $t = \frac{3}{60}$ (hour) $X = 0$

$$f(x) = \frac{e^{-\lambda t} (\lambda t)^x}{x!} = \frac{e^{-100(\frac{3}{60})} (100 \cdot \frac{3}{60})^0}{0!} = e^{-5} = .00673$$

$\approx \boxed{.0067}$