Answer on Question #72712 – Math – Statistics and Probability.

Question

The number of customers arriving per hour at a certain automobile service facility is assumed to follow a Poisson distribution with mean $\lambda = 7$.

(a) Compute the probability that more than 10 customers will arrive in a 2-hour period.

(b) What is the mean number of arrivals during a 2-hour period?

Solution

The random number X of customers arriving per hour is Poisson distributed with mean $\lambda = 7$.

This is The Poisson distribution. We will use the formula

$$P(X=x)=\frac{(\lambda t)^x}{x!}e^{-\lambda t}.$$

(a) We want

$$\Pr(X > 10) = 1 - \Pr(X \le 10) = 1 - \sum_{x=0}^{10} \frac{(2\lambda)^x}{x!} e^{-2\lambda}.$$

So,

$$\Pr(X > 10) = 1 - \sum_{x=0}^{10} \frac{(2\lambda)^x}{x!} e^{-2\lambda} = 1 - \sum_{x=0}^{10} \frac{(14)^x}{x!} e^{-14} \approx$$

 $\approx 1 - (0.00000 + 0.00001 + 0.00008 + 0.00038 + 0.00133 + 0.00373 + 0.00870 +$

$$+0.01739 + 0.03044 + 0.04734 + 0.06628) = 1 - 0.17577 = 0.82423$$
.

(b) The mean number of arrivals during a 2-hour period is $2\lambda = 2 \cdot 7 = 14$.

Answer: (a) 0.82423; **(b)** 14.

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