6.

1. The random variable X has a Poisson distribution. If $P(X=1)=0.01487, P(X=2)=0.04461$, then find $P(X=3)$.

A. $P(X=1) = \frac{e^{-\lambda}\lambda}{1!} = 0.01487$

$P(X=2) = \frac{e^{-\lambda}\lambda^2}{2!} = 0.04461$

$\frac{P(X=2)}{P(X=1)} = \frac{\lambda^2}{2!\,\lambda} = \frac{\lambda}{2}$

$\frac{\lambda}{2} = \frac{0.04461}{0.01487} \Rightarrow \lambda = 6$

$P(X=3) = \frac{e^{-\lambda}.\lambda^3}{3!} = \frac{e^{-6}.(6)^3}{3!} = 0.0892$

2. Wireless sets are manufactured with 25 soldered joints each. On the average, 1 joint in 500 is defective. How many sets can be expected to be free from defective joints in a consignment of 10000 sets?

A.

$p = \frac{1}{500}$ $n = 10000$ $\lambda = np = 20$

$P(X=25) = \frac{e^{-\lambda}.\lambda^x}{x!} = \frac{e^{-20}.(20)^{25}}{25!} = 0.04458$

In 10000, No. of defective joints $= 10000 \times 0.04458$

$= 445.8 \simeq 446$

No. of sets free from defective joints in 10000 $= 10000 - 446$

$= 9554$

3. Suppose the number of telephone calls on an operator received from 9.00 to 9.25 follow a Poisson distribution with mean 3. Find the probability that
   i. The operator will receive no calls in that time interval tomorrow.
   ii. In the next three days, the operator will receive a total of 1 call in that time interval.

A. $\lambda = 3$

i) $X = 0$

$P(X=0) = \frac{e^{-\lambda}.\lambda^x}{x!} = \frac{e^{-3}.3^0}{0!} = 0.0497$

ii) $P(X=1)$ where $\lambda = 3 \times 3$

$P(X=1) = \frac{e^{-9} \times 9^1}{1!} = 0.0011$