QUESTION

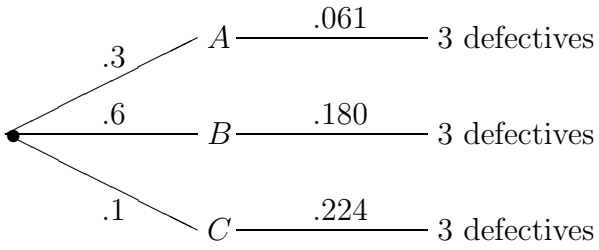
An engineering works receives supplies of a certain component from three different factories, 30% from factory A, 60% from factory B and the remainder from factory C. Past experience has shown the percentage defective produced by the factories A, B and C are 1%,2% and 3%respectively. A random sample of 100 components all from the same unknown factory are examined and 3 defectives are found. Find approximately the probability that the sample came from factory A.

ANSWER

	A	B	C
% supplied	30	60	10
%defective	1	2	3
Poisson μ	1	2	3

Given 100 components, if x% are defective where x is small, the number of components which are defective is $P(x)$. Since we have three defectives we need to find $P(3)$.

$$\begin{aligned} A : P(3) &= \frac{e^{-1}1^3}{3!} = 0.061 \\ B : P(3) &= \frac{e^{-2}2^3}{3!} = 0.180 \\ C : P(3) &= \frac{e^{-3}3^3}{3!} = 0.224 \end{aligned}$$



$P(3 \text{ defectives}) = 0.3 \times 0.61 + 0.6 \times 0.180 + 0.1 \times 0.224 = 0.1487$
$P(A|3 \text{ defectives }) = \frac{0.3 \times 0.061}{0.1487} = 0.123$