QUESTION Find approximately the probability that a Poisson variable with mean 20 takes the value 20.

ANSWER

$\phi(20)$ has $\mu = 20, \ \sigma^2 = 20.$

$P(X = 20) = P(19.5 < Z < 20.5)$

$P(Z < 20.5) = \Phi(\frac{20.5-20}{\sqrt{20}}) = \Phi(0.112) = 0.5444$

$Hence P(19.5 < Z < 20.5) = 0.5444 - 0.4556 = 0.0888 \approx 0.09$