MEI STATISTICS 2 JANUARY 2008 Q2 POISSON

2 i) $X \sim B(94, 0.1)$

ii) n is large and p is small B1 B1

Allow appropriate numerical ranges

iii) $X \sim B(94, 0.1)$ $E(X) = np = 94 \times 0.1 = 9.4$

Approximate with $X \sim \text{Poisson}(9.4)$

A) $P(X=4) = \frac{e^{-9.4} \times 9.4^4}{4!} = 0.0269$

B) Enough rooms if $X \geqslant 4$

$P(X \geqslant 4) = 1 - P(X \leq 3)$

$= 1 - 0.0160$

$= 0.9840$

iv) P(Enough rooms for 31 consecutive nights) $= 0.9840^{31}$

$= 0.6065$

v) A) $X \sim B(2914, 0.1)$ $E(X) = 291.4$

B) $Var(X) = 2914 \times 0.1 \times 0.9$

$= 262.26$

Approximate with $X \sim N(\underset{\sigma}{291.4}, \underset{\sigma^2}{\sqrt{262.26}^2})$

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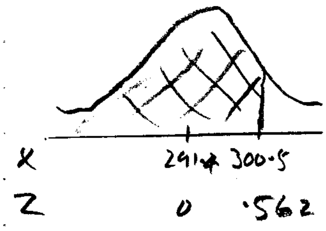
2v B) cont

Find $P(X < 300.5)$



$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{300.5 - 291.4}{\sqrt{262.26}}$$

$$z = 0.5619$$

$$z = 0.562$$

$$P(z < 0.562) = 0.7130$$

Prob at most 300 no-shows during August $= 0.7130$

In these questions where the Binomial is first approximated by the Poisson and then by the Normal, you should approximate the Binomial directly with the Normal. Do not approximate Binomial with Poisson and then approximate this Poisson with the Normal.

The difference in answer is caused by using a different variance. np would be used by the Poisson but npq would be used if you approximate the Binomial directly with the Normal.