MEI STATISTICS 2 JANUARY 2013 Q2 POISSON

2 i) A) $X \sim \text{Poisson}(2.1)$

$P(X=0) = e^{-2.1} = 0.1225$

B) $P(X \geq 2) = 1 - P(X \leq 1)$

$= 1 - 0.3796$ (tables)

$= 0.6204$

c) $X \sim \text{Poisson}(2.1 \times 5)$

$X \sim \text{Poisson}(10.5)$

$P(5 \leq X \leq 10) = P(X \leq 10) - P(X \leq 4)$

$= 0.5207 - 0.0211$ (tables)

$= 0.4996$

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ii) $X \sim \text{Poisson}(2.1 \times 60)$

$X \sim \text{Poisson}(126)$

Approximate with $X \sim N(\underset{\mu}{126}, \underset{\sigma^2}{\sqrt{126}^2})$

Find $P(X > 129.5)$

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

$P(Z > 0.312)$

$z = \frac{129.5 - 126}{\sqrt{126}}$

$= 1 - P(Z < 0.312)$

$= 1 - 0.6225$

$z = 0.312$

$= 0.3775$

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2 iii) Events no longer occur singly if pairs are blown across

2 iv) For pairs $X \sim \text{Poisson}(0.2)$ For singles $Y \sim \text{Poisson}(1.7)$

If no more than 3 in minute we have

0 pairs and ≤ 3 singles

or 1 pair and ≤ 1 single

P(at most 3 butterflies)

$$= P(X=0) \times P(Y \leq 3) + P(X=1) \times P(Y \leq 1)$$

$$= e^{-0.2} \times 0.9068 + e^{-0.2} \times 0.2 \times 0.4932$$

$$= 0.8232$$