

Poisson Mixed Exercise 2

$$a) \quad X \sim P_0(0.7) \quad P(X=0) = e^{-0.7} = 0.4966$$

$$b) \quad Y \sim P_0(2.1) \quad P(Y=2) = \frac{e^{-2.1} \times 2.1^2}{2!} = 0.2700$$

$$c) \quad Z \sim B\left(6, 0.4966\right) \quad P(Z=2) = {}^6C_2 \times 0.4966^2 \times 0.5034^4 \\ = 0.2376$$

$$3) \quad Y \sim P_0(\lambda) \quad P(Y=r) = \frac{e^{-\lambda} \lambda^r}{r!}$$

$$P(Y=5) = 1.25 P(Y=3)$$

$$\frac{e^{-\lambda} \lambda^5}{5!} = \frac{1.25 e^{-\lambda} \lambda^3}{3!}$$

$$\frac{\lambda^5}{120} = \frac{1.25 \lambda^3}{6}$$

$$\frac{\lambda^5}{\lambda^3} = \frac{1.25 \times 120}{6}$$

$$\lambda^2 = 25$$

$$\underline{\lambda = 5}$$

5 a) n is large, p is small

$$b) X \sim B(50, 0.08)$$

$$P(X \leq 3) = 0.4253$$

$$c) E(X) = 50 \times 0.08 = 4$$

$$\text{Let } Y \sim P_0(4)$$

$$P(Y \leq 3) = 0.4335$$

$$d) \frac{0.4335 - 0.4253}{0.4253} \times 100 \% = 1.93 \%$$

$$7) X \sim B(20, 0.075)$$

$$a) i) P(X=2) = 0.2627$$

$$ii) P(X > 4) = 1 - P(X \leq 4) \\ = 1 - 0.9858 = 0.0142$$

$$b) X \sim B(80, 0.075) \quad E(X) = 6$$

Approx with $Y \sim P_0(6)$

$$\begin{aligned} P(Y \geq 8) &= 1 - P(Y \leq 7) \\ &= 1 - 0.7440 \\ &= 0.2560 \end{aligned}$$

9) $X \sim P_0(2.5)$

a) i) $P(X=4) = 0.1336$

ii) $P(X \geq 3) = 1 - P(X \leq 2)$
 $1 - 0.5438 = 0.4562$

b) $Y \sim P_0(2.5 \times 4) = P_0(10)$

$$\begin{aligned} P(Y > 12) &= 1 - P(Y \leq 12) \\ &= 1 - 0.7916 = 0.2084 \end{aligned}$$

c) $Z \sim B\left(8, 0.2084\right)$

$$P(Z=2) = 0.2992$$
