

(a) X: No. of bad eggs (in a box of a dozen)

$$X \sim \text{Bin}(12, 0.1)$$

$$(i) P(X=2) = {}^{12}C_2 \cdot 0.1^2 \cdot 0.9^{10} = 0.2301278$$

$$(ii) P(X < 3) = P(X=0) + P(X=1) + P(X=2)$$

$$P(X=0) = {}^{12}C_0 \cdot 0.1^0 \cdot 0.9^{12} = 0.282495$$

$$P(X=1) = {}^{12}C_1 \cdot 0.1^1 \cdot 0.9^{11} = 0.3765727$$

$$\Rightarrow P(X < 3) = 0.282495 + 0.3765727 + 0.2301278$$

$$= 0.88913$$

$$(iii) P(X \geq 3) = 1 - P(X < 3)$$

$$= 1 - 0.88913 = 0.11087$$

$$(iv) P(X=0) = 0.282495$$

(b) Y: No. of boxes containing at least 3 bad eggs.
 $Y \sim \text{Bin}(10, 0.11087)$

$$P(Y > 1) = 1 - P(Y \leq 1)$$

$$= 1 - \{P(Y=0) + P(Y=1)\}$$

$$= 1 - \left\{ {}^{10}C_0 \cdot 0.11087^0 \cdot 0.88913^{10} \right.$$

$$\left. + {}^{10}C_1 \cdot 0.11087^1 \cdot 0.88913^9 \right\}$$

$$= 1 - 0.6938185 = 0.3061815$$