$$p = \frac{n}{\left(\sum_{i=1}^{n} x_i - n\right)} = \frac{1}{\bar{x}} \longrightarrow$$

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$$E(x) = \frac{1}{p}$$

ב) $X \sim B(n,p) \longrightarrow P(X=x) = \binom{n}{x} \cdot p^{x}(1-p)^{n-x}$

$$L(p) = \prod_{i=1}^{n} \binom{n}{x_i} \cdot p^{x_i} \cdot (1-p)^{n-x_i} = \binom{n}{x_i}^{n} \cdot p^{\sum_{i=1}^{n} x_i} \cdot (1-p)^{n^2 - \sum_{i=1}^{n} x_i}$$

$\downarrow$

$$\ln L(p) = \ln \binom{n}{x_i}^{n} + \sum_{i=1}^{n} x_i \ln p + \left(n^2 - \sum_{i=1}^{n} x_i\right) \cdot \ln(1-p)$$

$\downarrow$

$$\frac{d \ln L(p)}{dp} = \sum_{i=1}^{n} x_i \cdot \frac{1}{p} + \left(n^2 - \sum_{i=1}^{n} x_i\right) \cdot \frac{-1}{(1-p)} = 0$$

$$\sum_{i=1}^{n} x_i (1-p) - p \cdot \left(n^2 - \sum_{i=1}^{n} x_i\right) = 0 \Rightarrow \sum_{i=1}^{n} x_i - \cancel{p \cdot \sum_{i=1}^{n} x_i} - pn^2 + \cancel{p \cdot \sum_{i=1}^{n} x_i} = 0$$

$$\sum_{i=1}^{n} x_i - pn^2 = 0$$

$$p = \frac{\overset{\bar{x}}{\sum_{i=1}^{n} x_i}}{n \cdot n} \Rightarrow \hat{p} = \frac{\bar{x}}{n}$$

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$$E(x) = n \cdot p$$