Pdf for normal distributn

$$\Rightarrow \prod_{i=1}^{n} \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

$$\prod P(x_i) = \frac{1}{(\sigma\sqrt{2\pi})^n} e^{-\frac{1}{2}\sum\left(\frac{x_i-\mu}{\sigma}\right)^2}$$

$$\log(\cancel{P(x} \theta_1 \theta_2) = -n\log(\sqrt{\theta_2}\sqrt{2\pi}) - \frac{1}{2}\sum\left(\frac{x_i-\theta_1}{\sqrt{\theta_2}}\right)^2$$

$$\log(\theta_1 \theta_2) = -\frac{n}{2}\log(\theta_2 2\pi) - \frac{1}{2}\sum\left(\frac{x_i-\theta_1}{\sqrt{\theta_2}}\right)^2$$

$$\frac{\partial \log(\theta_1\theta_2)}{\partial\theta_1} = \cancel{\frac{-n \log}{2\theta_2 \times 2\pi} \times 2\pi} - \frac{1}{2}$$

for measuring θ_1

$$\underbrace{\frac{\partial\log(\theta_1\theta_2)}{\partial\theta_1}}_{\downarrow} = 0 - \frac{1}{2\theta_2^2}\sum x_i - n\theta_1$$

$$0 = -\sum x_i + n\theta_1$$

$$\sum x_i = n\theta_1$$

$$\boxed{\theta_1 = \frac{\sum x_i}{n}}$$

for measuring θ_2

$$\frac{\partial \log(\theta_1, \theta_2)}{d\theta_2} = \frac{-n}{2\theta_2 \cancel{2\pi}} \cancel{\times 2\pi} + \frac{1}{2\theta_2^2} \sum (x_i - \theta_1)^2$$

$$0 = -\frac{n}{2\theta_2} + \frac{1}{2\theta_2^2} \sum (x_i - \theta_1)^2$$

$$\frac{\sum (x_i - \theta_1)^2}{\cancel{2}\theta_2^{\cancel{2}}} = \frac{n}{\cancel{2}\cancel{\theta_2}}$$

$$\theta_2 = \frac{\sum (x_i - \theta_1)^2}{n}$$

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$$B(m,Q) = {}^{m}C_{x}\, Q^{x}(1-Q)^{m-x}$$

$$\prod_{i=1}^{n} = \prod {}^{m}C_{x_i}\, Q^{x_i}\,(1-Q)^{m-x_i}$$

$$= {}^{m}C_{x_1} \times {}^{m}C_{x_2} \cdots \times {}^{m}C_{x_n}\, Q^{\sum x_i}\,(1-Q)^{\sum m-x_i}$$

$$(a)\ \sum_{i=1}^{n} \log({}^{m}C_{x_i}) + \sum x_i \log Q + \sum m-x_i \log(1-Q)$$

$$\frac{dl}{dQ} = 0 + \frac{\sum x_i}{Q} + \frac{\sum(m-x_i)}{1-Q}(-1)$$

$$0 = \sum x_i - \cancel{\sum x_i Q} - nmQ + \cancel{\sum x_i Q}$$

$$\sum x_i = nmQ$$

$$Q = \frac{\sum x_i}{nm}$$

$$\boxed{Q = \frac{\bar{x}}{m}}$$