Prove Beta-Binomial conjugation
$$X = \sum_{i=1}^{N} x_i'$$

$$P(\Theta|X) = \frac{P(X|\Theta)P(\Theta)}{P(X)} = \frac{P(X,\Theta)}{S_0^1 P(X,\Theta) dX}$$

$$P(X|\Theta) = \binom{n}{X} \Theta (1-\Theta)^{n-X} P(\Theta) = \frac{T(a+b)}{T(a)T(b)} \Theta^{a-1} (1-\Theta)^{b-1}$$

$$\binom{n}{X} = \frac{n!}{X!(n-X)!} T(n+1)$$

$$= \frac{T(n+1)}{T(x+1)T(n-x+1)}$$

$$P(x,\theta) = \frac{n!}{x!(n-x)!}, T(\alpha t 1) = \alpha!$$

$$= \frac{T(n+1)}{T(x+1)T(n-x+1)}$$

$$P(x,\theta) = P(x(\theta) P(\theta))$$

$$= \frac{T(a+b)T(n+1)}{T(a)T(b)T(x+1)T(n-x+1)}$$

 $= \langle \Theta^{(\alpha'-1)}(1-\theta)^{(b'-1)}$

 $= Y \Theta^{(\alpha-1+x)}(1-\Theta)^{(b-1+n-x)}$

$$P(x_{i}\theta) = P(x_{i}\theta) P(\theta)$$

$$T(a+b)T(n+1)$$

 $\alpha = \alpha + x$

b=b-Xtn

$$\frac{1}{\ell 1} \Theta^{(\alpha-1\ell \times j)} (1-\theta)$$

$$P(x) = \int_{0}^{1} P(x, \theta) d\theta$$

$$= \int_{0}^{1} \frac{T(a+b+n)}{T(a+x)T(b-x+n)} \Theta^{a-1+x}(1-\theta) \frac{(b-1+n-x)}{d\theta} \frac{T(a+x)T(b+x-n)}{T(a+b+n)}$$

$$P(x, \theta) = Y \Theta^{(a-1+x)}(1-\theta) \frac{(b-1+n-x)}{(b-1+n-x)} \frac{beta - binomial}{beta - binomial}$$

$$P(x) = Y \frac{T(a+x)T(b+x-n)}{T(a+b+n)} \frac{P(x, \theta) = P(\theta|x)P(x)}{P(x|\theta)P(\theta)}$$

$$P(x) = \frac{Y \Theta^{(a-1+x)}(1-\theta)}{Y \Theta^{(a-1+x)}(1-\theta)} \frac{(b-1+n-x)}{(a+b+n)}$$

$$= \frac{T(a+b+n)}{T(a+x)T(b+x-n)} \Theta^{(a-1+x)}(1-\theta) \frac{(b-1+n-x)}{(1-\theta)}$$

$$= Beta(atx,b-xtn)$$

$$a'=atx$$

$$b'=b-xtn$$