HW6 PHY 950

1.(a) $a=20$, $\delta=7.23$ all codes are posted

(b) $a=15$, $\delta=1.63$

(c) $a=30$, $\delta=20.8$

2. (a) Binomial prob. $f(n) = C_{18}^{n} p^{n} (1-p)^{18-n}$

ML estimate: $L(4, p) = f(4) = A\, p^{4} (1-p)^{18-4}$

$$\frac{\partial L}{\partial p} = 0 \Rightarrow \hat{p} = \frac{2}{9} = 0.222$$

68.3% central confidence level $\Rightarrow \alpha = \beta = \frac{1}{2}\gamma = \frac{1}{2}(1-68.3\%) = 15.85\%$

$$\begin{cases} \alpha = \sum_{n=4}^{18} C_{18}^{n} a^{n} (1-a)^{18-n} \\ \beta = \sum_{n=0}^{4} C_{18}^{n} b^{n} (1-b)^{18-n} \end{cases} \Rightarrow \begin{cases} a = 0.119 \\ b = 0.363 \end{cases} \Rightarrow \begin{cases} d = \hat{p} - a = 0.023 \\ c = b - \hat{p} = 0.141 \end{cases}$$

$$\Rightarrow p = 0.222^{+0.141}_{-0.023}$$

(b) By code, $\sigma = 0.075$

$$\hat{p} \pm \hat{\sigma}_{p} = 0.222 \pm 0.075$$

The interval $[0.119, 0.363]$ from (a) means in 68.3% of experiments the interval will include the true value.

While, the interval $[\hat{p} - \hat{\sigma}_{p}, \hat{p} + \hat{\sigma}_{p}]$ means the observed data located in this interval has a probability of 68.3%

(c) Because each events don't happen with equal probability.