p = (float)(sum)/n;

printf("The prob. is %lf \n", p);

}

Point Estimation

3. (a) $X_{11}, X_{12}, \ldots, X_{1n_1} \sim N(\theta_1, \theta_2)$
$X_{21}, X_{22}, \ldots, X_{2n_2} \sim N(\theta_1, \theta_3)$ } independent

The joint pdf of $X_{11}, X_{12}, \ldots, X_{1n_1}, X_{21}, X_{22}, \ldots, X_{2n_2}$ is

$$f_{X_{11},\ldots,X_{1n_1},X_{21},\ldots,X_{2n_2}}(x_{11},\ldots,x_{1n_1},x_{21},\ldots,x_{2n_2})$$

$$= \frac{1}{(2\pi)^{n_1/2}} e^{-\frac{1}{2\theta_2}\sum_{i=1}^{n_1}(x_{1i}-\theta_1)^2} \cdot \frac{1}{(2\pi)^{n_2/2}} e^{-\frac{1}{2\theta_3}\sum_{j=1}^{n_2}(x_{2j}-\theta_1)^2}$$

$$= \frac{1}{(2\pi)^{\frac{n_1+n_2}{2}}} e^{-\frac{1}{2}\left[\frac{1}{\theta_2}\sum_{i=1}^{n_1}(x_{1i}-\theta_1)^2 + \frac{1}{\theta_3}\sum_{j=1}^{n_2}(x_{2j}-\theta_1)^2\right]}$$

$$= \frac{1}{(2\pi)^{\frac{n_1+n_2}{2}}} e^{-\frac{1}{2}\left[\frac{\sum_{i=1}^{n_1}x_{1i}^2 - 2\theta_1\sum_{i=1}^{n_1}x_{1i} + n_1\theta_1^2}{\theta_2} + \frac{\sum_{j=1}^{n_2}x_{2j}^2 - 2\theta_1\sum_{j=1}^{n_2}x_{2j} + n_2\theta_1^2}{\theta_3}\right]}$$

Let $\underset{\sim}{X} = (X_{11}, X_{12}, \ldots, X_{1n_1}, X_{21}, X_{22}, \ldots, X_{2n_2})$
and $\underset{\sim}{Y} = (Y_{11}, Y_{12}, \ldots, Y_{1n_1}, Y_{21}, Y_{22}, \ldots, Y_{2n_2})$
be two two distinct samples. $\underline{\theta} = (\theta_1, \theta_2, \theta_3)$

$$\therefore \frac{p_{\underline{\theta}}(\underline{x})}{p_{\underline{\theta}}(\underline{y})} = e^{-\frac{1}{2}\left[\frac{\sum_{i=1}^{n_1}x_{1i}^2 - 2\theta_1\sum_{i=1}^{n_1}x_{1i} + n_1\theta_1^2}{\theta_2} + \frac{\sum_{j=1}^{n_2}x_{2j}^2 - 2\theta_1\sum_{j=1}^{n_2}x_{2j} + n_2\theta_1^2}{\theta_3}\right]}$$

$$= \frac{}{e^{-\frac{1}{2}\left[\frac{\sum_{i=1}^{n_1}y_{1i}^2 - 2\theta_1\sum_{i=1}^{n_1}y_{1i} + n_1\theta_1^2}{\theta_2} + \sum_{j=1}^{n_2}y_{2j}^2 - 2\theta_1\sum_{j=1}^{n_2}y_{2j}\right.}}$$