3. Exercise Three

(a) $W_1 = (75 \times 300) / (75 \times 300 + 115 \times 100) = 66.18\%$

$1 - W_1 = 1 - 66.18\% = 33.82\%$

(b) $W_j = (n_j \times P_j) / \sum_{i=1}^{N} (n_i \times P_i)$ And $\sum_{j=1}^{N} W_j = 1$

4. Exercise Four:

△ For retur (net):

$$W_1R_1 + W_2R_2 + \cdots + W_nR_n = W_1\left(\frac{P_t^1}{P_{t-1}^1} - 1\right) + W_2\left(\frac{P_t^2}{P_{t-1}^2} - 1\right) + \cdots + W_n\left(\frac{P_t^n}{P_{t-1}^n} - 1\right)$$

$$= \left(W_1\frac{P_t^1}{P_{t-1}^1} + W_2\frac{P_t^2}{P_{t-1}^2} + \cdots + W_n\frac{P_t^n}{P_{t-1}^n}\right) - (W_1 + W_2 + \cdots + W_n)$$

$$= \frac{W_1P_t^1(P_{t-1}^2 \times \cdots \times P_{t-1}^n) + \cdots + W_nP_t^n(P_{t-1}^1 \times \cdots \times P_{t-1}^{n-1})}{P_{t-1}^1 \times \cdots \times P_{t-1}^n} - 1$$

$$= \frac{W_1P_t^1 + W_2P_t^2 + \cdots + W_nP_t^n}{W_1P_{t-1}^1 + W_2P_{t-1}^2 + \cdots + W_nP_{t-1}^n} - 1 = \frac{P_t}{P_{t-1}} - 1 = R_P$$

△ For Gross Return

$$W_1R_1 + W_2R_2 + \cdots + W_nR_n = W_1\left(\frac{P_t^1}{P_{t-1}^1}\right) + W_2\left(\frac{P_t^2}{P_{t-1}^2}\right) + \cdots + W_n\left(\frac{P_t^n}{P_{t-1}^n}\right)$$

$$= \frac{W_1P_t^1(P_{t-1}^2 \times \cdots \times P_{t-1}^n) + \cdots + W_nP_t^n(P_{t-1}^1 \times \cdots \times P_{t-1}^{n-1})}{P_{t-1}^1 \times P_{t-1}^2 \times \cdots \times P_{t-1}^n} = \frac{W_1P_t^1 + W_2P_t^2 + \cdots + W_nP_t^n}{W_1P_{t-1}^1 + W_2P_{t-1}^2 + \cdots + W_nP_{t-1}^n}$$

$$= R_t / P_{t-1} = R_P$$

△ For log Return.

$$W_1R_1 + W_2R_2 + \cdots + W_nR_n = \log\left[\left(\frac{P_t^1}{P_{t-1}^1}\right)^{W_1}\left(\frac{P_t^2}{P_{t-1}^2}\right)^{W_2} \times \cdots \times \left(\frac{P_t^n}{P_{t-1}^n}\right)^{W_n}\right]$$

$$R_P = \log\frac{P_t}{P_{t-1}} = \log\left[\frac{W_1P_t^1 + W_2P_t^2 + \cdots + W_nP_t^n}{W_1P_{t-1}^1 + W_2P_{t-1}^2 + \cdots + W_nP_{t-1}^n}\right] = \log W_1(\log P_t^1 - \log P_{t-1}^1) + \cdots + \log W_n(\log P_t^n - \log P_{t-1}^n)$$