<u>EXAM P QUESTIONS OF THE WEEK</u>

S. Broverman, 2007

<u>Week of January 29/07</u>

An insurer is insuring 800 independent losses.

400 of the losses each have an exponential distribution with mean 1, and the other 400 losses each have an exponential distribution with mean 2.

The insurer applies the normal approximation to find each of the following:
(a) the 95-th percentile of the aggregate of the first 400 losses with mean 1 each, say A ,
(b) the 95-th percentile of the aggregate of the second 400 losses with mean 2 each, say B , and
(c) the 95-th percentile of the aggregate of all 800 losses, say C .

Find $\frac{C}{A+B}$.

The solution can be found below.

Week of January 29/07 - Solution

The mean and variance of the exponential loss with mean 1 are 1 and 1, and the mean and variance of the exponential distribution with mean 2 are 2 and 4.

(a) $S_a = X_1 + \cdots + X_{400}$. $E[S_a] = 400(1) = 400$, $Var[S_a] = 400(1) = 400$.
$P[S_a \leq A] = P[\frac{S_a - 400}{\sqrt{400}} \leq \frac{A-400}{\sqrt{400}}] = .95 \rightarrow \frac{A-400}{\sqrt{400}} = 1.645 \rightarrow A = 432.9$.

(b) $S_b = Y_1 + \cdots + Y_{400}$. $E[S_b] = 400(2) = 800$, $Var[S_b] = 400(4) = 1600$.
$P[S_b \leq B] = P[\frac{S_b - 800}{\sqrt{1600}} \leq \frac{B-800}{\sqrt{1600}}] = .95 \rightarrow \frac{B-800}{\sqrt{1600}} = 1.645 \rightarrow B = 865.8$.

(c) $S_c = X_1 + \cdots + X_{400} + Y_1 + \cdots + Y_{400}$.
$E[S_c] = 400 + 800 = 1200$, $Var[S_c] = 400 + 1600 = 2000$.
$P[S_c \leq C] = P[\frac{S_c - 1200}{\sqrt{2000}} \leq \frac{C-1200}{\sqrt{2000}}] = .95 \rightarrow \frac{C-1200}{\sqrt{2000}} = 1.645 \rightarrow A = 1273.6$.

$\frac{C}{A+B} = \frac{1273.6}{432.9+865.8} = .9807$ ..