Math 404 Quiz 9 Spring 2018 Name____________________

YOU ARE BEING GRADED FOR WORK

		A	B	sum if applicable	
i)	prior probabilities	1/4	3/4	1	
ii)	likelihood (of experience)	4/27	16/81		
iii)	joint probabilities	1/27	12/81	15/81	$\approx .1852$
iv)	posterior probabilities	1/5	4/5	1	
v)	hypothetical means	660	368		
vi)	Bayesian premium contr.	132	294.4	$\boxed{426.4}$	

1) For risks of type A, $E(N) = 6/9$ and $E(X) = 990$. For risks of type B, $E(N) = 12/9$ and $E(X) = 276$. The above table was formed for a randomly selected risk which had an observed total loss of 500. The hypothetical mean for each class is $E(S) = E(N)E(X)$. Fill in the above table and find the Bayesian premium for the next year for the same risk.

(total loss $S = \sum_{i=1}^{N} X_i$, $E(S) = E(N)E(X)$)

hyp mean A: $E(S) = \frac{6}{9} 990 = 660$ (row v))

B: $E(S) = \frac{12}{9} 276 = 368$

B. P. contr: $\frac{1}{5} 660 = 132$, $\frac{4}{5} 368 = 294.4$ (row vi))

(use row (iv) times row v) columnwise)

sum = Bayesian premium = $\boxed{426.4}$

see E3 rev 116)

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$n_0 = \left(\frac{1.96}{.03}\right)^2 = 4268.4444$ (E3 rev 121)

2) Limited fluctuation credibility methods are used. Claim counts are Poisson(0.2). Claim sizes have mean 1000 and coefficient of variation 2. (Hint: W to be within k of the expected p of the time.) $\leftarrow E(x)$ $\leftarrow CV(x)$

a) You want the claim size (severity) for a group to be within 3% of the expected 95% of the time. How much expected aggregate losses must be incurred for the group to be given full credibility? $W \equiv X,\ e = a_F = n_0 E(x)[CV(x)]^2$

$= 4000\, n_0 = \boxed{17{,}073{,}777.6}$

$E(x)[CV(x)]^2 = 1000(2^2) = 4000$

b) You want the number of claims for a group to be within 3% of the expected 95% of the time. How many members must the group have for full credibility?

$W = N,\ e = e_F = \frac{n_0}{\lambda} = \frac{4268.4444}{0.2} = \boxed{21342.2220}$

c) You want aggregate losses for a group to be within 3% of the expected 95% of the time. How many expected claims much you observe to give full credibility to the experience? $W = S,\ e = n_F = n_0(1 + [CV(x)]^2) = 5\, n_0 = \boxed{21342.2220}$

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3) Suppose $X \sim$ Poisson(λ) where $\lambda \sim G(\alpha = 1, \theta = 1.2)$. Find Buhlmann's Z if $n = 2$. $E(X|\lambda) = \lambda = V(X|\lambda)$ $\leftarrow X|\lambda \sim Poisson(\lambda)$

$EPV = E(V(X|\lambda)) = E(\lambda) = \alpha\theta = 1.2$

$VHM = V(E(X|\lambda)) = V(\lambda) = \alpha\theta^2 = (1.2)^2 = 1.44$

$K = \frac{EPV}{VHM} = \frac{1.2}{1.44} = \frac{1}{1.2} = 0.8333 = \frac{1.2}{(1.2)^2}$

$Z = \frac{n}{n+K} = \frac{2}{2 + \frac{1}{1.12}} = \boxed{0.7059} = \frac{12}{17}$

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(E3 rev 127))