3.   (2.75 points)

An insurance company has a private passenger auto book of business with the following claims experience:

Group	Number of Accident-Free Years	Earned Premiums	Current Merit Rating Factor	Number of Claims Incurred
A	3 or more	216,000,000	0.60	25,000
X	2	135,000,000	0.75	18,000
Y	1	63,750,000	0.85	20,000
B	0	200,000,000	1.00	C
Total		614,750,000		63,000 + C

- Claim counts follow a Poisson distribution with parameter $\lambda = 0.05$.
- The credibility for the new policy period for an insured that has had no claim-free years is equal to 0.038.

a.   (1.5 points)

Calculate C, the number of claims incurred for Group B.

b.   (0.75 point)

Calculate the merit rating factor for an exposure that is accident-free for two or more years for the new policy period.

c.   (0.5 point)

Briefly explain two circumstances under which using earned premium as the exposure base would not correct for maldistribution.

QUESTION 3	
TOTAL POINT VALUE: 2.75	**LEARNING OBJECTIVE(S): A1, A2**
SAMPLE ANSWERS	

Part a: 1.5 points

Sample 1

$Mod = ZR + (1 - Z)$

$R = \dfrac{1}{1 - e^{-\lambda}} = \dfrac{1}{1 - e^{-0.05}} = 20.504$

$Z = 0.038$

$Mod = 0.038(20.504) + (1 - 0.038) = 1.7411$

Assume earned premium not at present B rates. Adjusted earned premiums:

$A - \dfrac{216,000,000}{0.6} = 360,000,000$

$Y - 75,000,000$

$X - 180,000,000$

$B - 200,000,000$

$Total - 815,000,000$

$\dfrac{\dfrac{C}{200,000,000}}{\dfrac{63,000 + C}{815,000,000}} = 1.7411$

$\dfrac{C}{200,000,000} = \dfrac{109,689.3 + 1.7411C}{815,000,000}$

$2.19 * 10^{13} + 348,220,000C = 815,000,000$

$C = 47,000$

Sample 2

$Z_B = 0.038$

$Mod_B = Z * R + (1 - Z)$

Approximate R because we don't have prior yr data $\rightarrow$ *est. R using* $\dfrac{1}{1 - e^{-\lambda}}$ *where* λ

$= 0.05 \text{ so } R = \dfrac{1}{1 - e^{-0.05}} = 20.504$

$\rightarrow Mod_B = \left(\dfrac{\dfrac{C}{200M}}{\dfrac{63000 + C}{815M}} \right) = 0.038 * 20.504 + (1 - 0.038) = 1.741$

	EP @ B Rates	# Claims
A	216M/0.6 = 360M	25,000
X	135M/0.75 = 180M	18,000
Y	63.75M/0.85 = 75M	20,000
B	200M	46,948
Total	815M	109,948

$C = 0.427(63000 + C)$

$0.573C = 29,601$

$C = 46,948$

Part b: 0.75 point

Sample 1

$Rel\ Freq = Mod$

$A + X: \dfrac{\dfrac{25,000 + 18,000}{360,000,000 + 180,000,000}}{\dfrac{110,000}{815,000,000}} = 0.59$

Merit Factor is 0.59

Sample 2

$Mod\ for\ A + X = \left(\dfrac{\dfrac{25,000 + 18,000}{360M + 180M}}{\dfrac{109,948}{815M}} \right) = 0.590$

Sample 3

$Mod\ for\ A + X = \left(\dfrac{\dfrac{25,000 + 18,000}{360,000 + 180,000}}{\dfrac{109,948}{815,000}} \right) = 0.590$

$Mod\ for\ B = 1.741$

$Merit\ Factor = \dfrac{0.59}{1.741} = 0.339$

Sample 4

$Merit\ Rating = \left(\dfrac{\dfrac{25 + 18}{360 + 180}}{\dfrac{47}{200}} \right) = 0.3388$

Part c: 0.5 point

Sample 1
- When high claim frequency territories are not high average premium territories
- When territorial differentials are not proper

Sample 2
- If high frequency (to earned car years) territories were not also high avg premium territories
- If territorial rate differentials were not proper (LRs across territories after applying rate differentials were not approximately equal)

EXAMINER'S REPORT

Candidates were expected to back out the appropriate claim count using the table, credibility, and lambda values provided, calculate the mod for other groups, and understand the proper use of earned premium as an exposure base.

SAMPLE ANSWERS AND EXAMINER'S REPORT

Part a

Candidates were expected to use the provided lambda value to derive R, utilize the mod formula to calculate the mod, and equate that answer to the relative frequency of the correct group. Candidates were also expected to back out the merit rating factor to obtain earned premium at Group B rates.

Common mistakes included:
- Assuming earned premium was already at "B" rates. This was incorrect as it was not explicitly stated as such; rather, the current merit rating factors were provided. The purpose was to back out the current merit rating program before evaluating the credibility of the loss experience provided.
- Setting up the calculation based off the relative frequency of the wrong group (instead of group B)

Part b

Candidates were expected to utilize the claim counts calculated in part a to calculate the merit rating factor for another risk group.

Candidates who calculated the mod (relative frequency to total) or the merit rating factor (relative frequency to group B) received full credit. Candidates who did additional calculations, such as finding Z, were given full credit as long as the mod was correctly calculated and utilized.

Common mistakes included:
- Mislabeling the mod as Z
- Calculating the mod for the incorrect group

Part c

Candidates were expected to know the circumstances under which earned premium was an appropriate exposure base (and corrected for maldistribution).

Most candidates mentioned territory in their responses, but this was not necessary to obtain full credit because maldistribution can be applied to other rating variables as well.

Common mistakes included:
- Stating that loss ratios across territory were not equal, without mentioning that territory differentials were improper (since this alone would not prove territory caused the mispricing)
- Stating circumstances where earned premium is (as opposed to is not) an appropriate exposure base without also stating that this was the case