10. (3 points)

One common expression for the experience modification for a single-split plan is:

$$M = 1 + Z_p \frac{A_p - E_p}{E} + Z_e \frac{A_e - E_e}{E}$$

where:

- M is the modification factor
- Z_p and Z_e are credibility constants
- A_p is the actual primary loss
- A_e is the actual excess loss
- E_p is the expected primary loss
- E_e is the expected excess loss
- E is the expected total loss.

a. (0.75 point)

In the right-hand side of the equation above, there are three terms separated by '+' signs. Briefly describe the role that each term serves in computing the experience mod.

b. (0.5 point)

Of the two credibility constants, Z_p and Z_e, identify which of the two is typically the larger in magnitude, and explain why.

c. (1.75 points)

Determine the effectiveness of each of the following credibility functions and select which function is the most appropriate.

Expected Loss	Credibility			
	Function 1	Function 2	Function 3	Function 4
1,000	15%	65%	55%	80%
2,000	35%	75%	63%	75%
3,000	55%	85%	70%	62%
4,000	75%	95%	76%	53%
5,000	95%	105%	81%	40%

QUESTION 10

Total Point Value: 3.0   **Learning Objective: B3**

Sample Answers

Part a: 0.75 points

Sample 1

> 1, represents the manual rate
>
> $Zp * \frac{Ap-Ep}{E}$, the charge based upon actual primary losses deviated from expected primary losses
>
> $Ze * \frac{Ae-Ee}{E}$, the charge based upon actual excess losses deviated from expected excess losses

Sample 2

1→ unity term, no difference from class plan

$Zp * \frac{Ap-Ep}{E}$ →Primary layer mod. Primary credibility multiplied by actual primary deviation from expected.

$Ze * \frac{Ae-Ee}{E}$ →Excess layer mod. Excess credibility multiplied by actual excess deviation from expected.

Part b: 0.5 points

Sample 1

Zp is usually larger because the primary loss experience tends to be more stable than excess loss experience and is more reflective of future loss potential.

Sample 2

Zp is typically larger because primary losses have more experience and therefore less volatility so we can assign more credibility. In contrast, excess losses are more rare and have a longer tail, which increases their volatility and therefore we should allow less credibility

Part c: 1.75 points

Sample 1

> (1) $0 \leq Z \geq 100\%$
>
> (2) $\frac{d}{dx}Z \geq 0$

(3) $\frac{d}{dx} Z/x < 0$

Function 2: 105% > 100% violates (1)
Function 4: credibility decreases as expected loss increases, violates (2)
Function 1: $\frac{35\%}{2000} > \frac{15\%}{1000}$ violates (3)
Function 3: satisfies (1), (2), (3) Most appropriate

Sample 2

a) Credibility should be:
   (1) $0 \leq Z \geq 1$
   (2) $\frac{dZ}{dE} \geq 0$
   (3) $d\frac{Z}{E}/E < 0$

Function	Commentary
1	X – no, does not satisfy #2 (see below)
2	X – no, credibility > 1 for 5000 size (violates #1)
3	Y – yes, select this one
4	X – no, credibility decreases as size increases; violates #2

	Marginal Rate	
EL	Function 1	Function 3
1000		
2000	.0002 = (.35-.15)/1000	.00008 = (.63-.55)/1000
3000	.0002	.00007
4000	.0002	.00006
5000	.0002	.00005

Not decreasing

Examiners Report

- **Part a:** Most candidates did well on part a. The question was straightforward and all terms defined in the question. Candidates lost points where they failed to described the terms. Most candidates were awarded full credit, especially for the 2nd and 3rd term.
  - Several candidates noted only that the first term allows the modification to be multiplicative. This response did not demonstrate enough understanding of the material since it failed to relate this term back to its role in reflecting the manual rate as a starting point. This response was not given credit.

- Some candidates commented that the second term represented frequency and the third term represented severity. Unless other comments were included, points were not awarded for frequency. Frequency suggests that the comparison was based upon claim counts and not loss amounts and was not considered correct unless further described to represent loss dollars.
- A handful of candidates failed to describe the role of the 1 (unity factor) at all.

Part b: Most candidates were awarded full credit for part b responses. Almost all candidates were able to identify that $Z_p > Z_e$, but not all were able to explain why.

- Some candidates stated that there was more data within the primary. Without further explanation as to why more data should mean more credibility, full credit was not awarded.
- A minor number of candidates quoted the maximum value of Z_p and Z_e in the current experience rating. This again did not explain why Z_p was larger and was not awarded full credit.
- Similarly, a handful of candidates noted the Z_p must be greater as $w = Z_e/Z_p$ and $w < 1$. Again, this did not explain why and was not awarded full credit.

Part c: Again, most candidates were awarded full credit for part c responses. As shown in the sample responses, the candidate did not have to show their calculations to receive full credit. However, candidates who reached incorrect conclusions and did not show work did not receive partial credit.

- Several candidates commented about the range of values for Function 1 being more appropriate than Function 3, or that the credibility awarded under Function 3 for $E[L] = 5000$ was too high. This was subjective; objective criteria or explanation was required. As a result, candidates who solely referred to the range of values and not the linear slope of Function 1 vs. the decreasing slope of Function 3, were not awarded full points.
- A minor portion of candidates interpreted the $E[L]$ to represent the value of a single claim, and Z the credibility to a single claim of that value. The information provided in the question did not support this interpretation and it was not accepted as a valid answer.