10. (2.5 points)

A company writes homeowners insurance in a large state divided in half by a mountain range. The company currently uses two geographic rating territories, one on either side of the mountains, as the range has an effect on weather patterns. Each territory has sufficient exposures for its loss experience to be considered fully credible.

a. (0.5 point)

Briefly discuss two disadvantages of the company's current territorial rating approach.

b. (2 points)

Discuss the process by which an actuary would develop new rating territory definitions for this state. Briefly explain a consideration for each step in the process.

QUESTION 10	
TOTAL POINT VALUE: 2.5	**LEARNING OBJECTIVE: A8**
SAMPLE ANSWERS	

Part a: 0.5 point

Sample 1
- The company's current approach doesn't take into account differences between rural & urban areas since there are only two relativities (not enough territories)
- The company's current approach doesn't have homogeneous risks in the territories since it's only based on one variable

Sample 2
- First, this is a large state but only contains two territories. That means we are only accounting for the mountain range and ignoring all other factors
- Second, these groups are not homogeneous, which will lead to adverse selection on the basis of territory

Sample 3
- Other companies may deviate greater and have more than two territories. You could gain competitive advantage if you added more territories
- Homeowner claims come from many other perils besides weather (ie theft, liability, fire, water) so breaking the territories by just the weather pattern might not be as accurate as you could be

Part b: 2 points

Sample 1
Step #1: Divide the state in geographic units, such as zip codes or counties.
- Consider: zip code definitions are subject to change
Step #2: Estimate the geo-demographic and geo-physical relativities of each unit using a GLM
- Consider: geographic units are highly correlated with other rating variables, so need to distinguish signal from noise
Step #3: Calculate a residual geographic factor not explained in step #2 and smooth across units using spatial smoothing, for example
- Consider: use either adjacency or spatial smoothing depending on risk in policy (ex: use adjacency for theft)
Step #4: group geographic units into territories using clustering methods, for example
- Consider: figure out if you want an equal number of units in each territory to create balance

Sample 2
First, the actuary should define the basic geographical unit, usually a zip code or county. A consideration might be balancing granularity (zip code) or a constant unit definition (county). Second the actuary should quantify each basic unit's geographic systematic risk. Preferably using a GLM. This will remove the effect of exposure correlation in the analysis & ensure the geographic rating variable is just for territory. If that's not a consideration, a consideration might be in choosing the link function. Third, the actuary should use spatial smoothing to allocate the residual geographic risk (which should also be given by a GLM). A consideration might be the optical weight for smoothing, like using distance or adjacency bases. Fourth, the actuary should

consider if they want to group the basic units into larger territories. Considerations for this step include choosing the clustering method, such as quantile or similarity method
EXAMINER'S REPORT
Candidates were expected to understand the importance of sufficiently granular rating territories and how these rating territory definitions are created
Part a
Candidates were expected to understand why company would not want to use overly broad territorial definitions. Common mistakes included: • Providing only one disadvantage • Providing advantages of the companies territorial rating approach
Part b
Candidates were expected to understand the steps involved in developing new rating territories. Common mistakes included: • Simply listing each step, and not providing any consideration for each step • Neglecting to cluster geographic units into final rating territories • Describing criteria for evaluating rating variables