18. (3.5 points)

The following Probable Maximum Loss (PML) outputs from an earthquake model are available. All amounts are in millions of dollars.

Return period	Eastern Canada	Western Canada
100 years	400	200
250 years	600	350
500 years	1,000	600

The insurance company does not purchase reinsurance and has $3 billion in surplus. The company has no earthquake premium reserves.

The insurer is progressively phasing in from a 420-year return period in 2014 to a 500-year return period in 2022.

a. (1.5 points)

Calculate the insurance company's earthquake reserves as at December 31, 2016.

b. (2 points)

Identify and briefly describe four considerations when evaluating PML estimates from an earthquake model.

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QUESTION 18	
TOTAL POINT VALUE: 3.5	**LEARNING OBJECTIVE(S): C1**
SAMPLE ANSWERS	

Part a: 1.5 points

Sample answer

(Numbers in millions)

East PML 420 = 0.68 * 1000 + 0.32 * 600 = 872

West PML 420 = 0.68 * 600 + 0.32 * 350 = 520

Max (East PML 420, West PML 420) = 872

Countrywide PML 500 = (1000^1.5 + 600^1.5) ^ (1/1.5) = 1290

Countrywide PML 440 = (2022-2016)/8 * 872+ (2016-2014)/8 * 1290 = 976.5

Financial resources = 10% of Surplus = 0.1 * 3000 = 300

EPR = 0

EQ Reserve Component = 976.5 – 300 = 676.5

EQ Reserve = 1.25 * (EPR + ERC) = 1.25 * (0 + 676.5) = 845.6

Part b: 2 points

Sample answer

- Data quality: need to understand the impact of data limitations on results and make appropriate adjustments
- Non-modelled exposures and risk factors: need to consider risks that are not adequately considered in the model, e.g. auto and marine insurance (or any other valid examples)
- Model uncertainty: need to factor in a safety margin to account for uncertainty associated with model assumptions
- Exposure to multiple regions: it is not sufficient to only base the PML on the larger of the BC and Quebec PMLs. This approach understates the PML for insurers with significant exposures to both regions.

Additional answers also accepted:

- Data verification: insurers should have processes in place to verify data accuracy and completeness
- Model validation: compare model estimates against actual events to verify whether the results are consistent
- Model versions: insurers should consider using more than one model to counter the inherent uncertainty in models
- Staffing/training: ensure there are adequately qualified staff to run in-house models and that the staff understands the assumptions underlying the model

EXAMINER'S REPORT

Candidates were expected to know the earthquake reserve calculation and understand the considerations related to PML estimates.

Part a

Candidates were expected to be able to calculate the 2016 earthquake reserves as outlined in the MCT guideline.

Common mistakes include:

- Calculating the EQ Reserve Component instead of the Earthquake Reserves
- Incorrectly calculating the East and West PML 420
- Not considering the Financial Resources

Part b

Candidates were expected to demonstrate understanding of the considerations related to PML estimates. Considerations related to the use of earthquake models were also accepted as valid answers.

A common mistake was:

- Listing a consideration without proper description.