

| #  | total pts: 70 | a    | b    | c    | d    | e |
|----|---------------|------|------|------|------|---|
| 1  | 2.50          | 1.00 | 0.50 | 0.50 | 0.50 |   |
| 2  | 1.00          | 0.25 | 0.25 | 0.25 | 0.25 |   |
| 3  | 1.75          | 0.75 | 0.50 | 0.50 |      |   |
| 4  | 3.00          | 0.50 | 1.50 | 1.00 |      |   |
| 5  | 1.50          | 0.75 | 0.75 |      |      |   |
| 6  | 2.50          | 0.50 | 0.50 | 1.00 | 0.50 |   |
| 7  | 2.50          | 0.75 | 0.50 | 0.50 | 0.75 |   |
| 8  | 3.50          | 1.25 | 0.25 | 1.00 | 1.00 |   |
| 9  | 2.00          | 0.50 | 0.75 | 0.50 | 0.25 |   |
| 10 | 1.00          | 1.00 |      |      |      |   |
| 11 | 2.75          | 0.50 | 0.75 | 0.50 | 1.00 |   |
| 12 | 4.00          | 3.00 | 1.00 |      |      |   |
| 13 | 7.00          | 2.00 | 4.50 | 0.50 |      |   |
| 14 | 2.00          | 1.25 | 0.75 |      |      |   |
| 15 | 3.25          | 2.75 | 0.50 |      |      |   |
| 16 | 2.25          | 2.25 |      |      |      |   |
| 17 | 2.50          | 1.25 | 0.75 | 0.50 |      |   |
| 18 | 1.50          | 0.75 | 0.75 |      |      |   |
| 19 | 3.00          | 1.00 | 1.00 | 1.00 |      |   |
| 20 | 1.25          | 0.50 | 0.50 | 0.25 |      |   |
| 21 | 2.50          | 1.00 | 1.00 | 0.50 |      |   |
| 22 | 2.00          | 0.50 | 0.50 | 1.00 |      |   |
| 23 | 2.75          | 1.50 | 0.50 | 0.75 |      |   |
| 24 | 2.00          | 1.50 | 0.50 |      |      |   |
| 25 | 3.50          | 1.50 | 1.00 | 1.00 |      |   |
| 26 | 2.00          | 1.50 | 0.50 |      |      |   |
| 27 | 1.75          | 0.25 | 1.50 |      |      |   |
| 28 | 2.75          | 1.00 | 1.00 | 0.75 |      |   |

BattleActs Practice Exam  
 2019.Fall  
 6-Canada  
 slay the beast

**Exam:** BattleActs 6C Practice Exam 2 (2019.Fall)

page 1

**Question:** 1

**Points:** 2.50 points

a. (1 point)

Identify 4 areas where the federal government has exclusive authority.

b. (0.5 points)

Identify 2 areas where the provincial government has exclusive authority.

c. (0.5 points)

Identify 2 matters under provincial insurance regulation.

d. (0.5 points)

Identify 1 item under each matter listed in part (c).

Explain whether the following situations are permitted according to Ontario regulations.

a. (0.25 points)

An insured purchased a new car. Their auto insurance premium increased.

b. (0.25 points)

An insured was fired from their job. Their auto insurance decreased.

c. (0.25 points)

An insurer used data from a Usage-Based Insurance program to investigate a suspicious claim.

d. (0.25 points)

An insurer used data from a Usage-Based Insurance program to deny a suspicious claim.

**Question:** 3

**Points:** 1.75 points

a. (0.75 points)

Identify 3 pieces of information that must be made available to the TNC and insurance providers after an accident where a ride-sharing vehicle is involved.

b. (0.5 points)

Describe a similarity between UBI and ride-sharing services.

c. (0.5 points)

Describe a difference between UBI and ride-sharing services.

**Question:** 4

**Points:** 3.00 points

a. (0.5 points)

Define the term "insurance contract" according to IFRS 17.

b. (1.5 points)

Briefly describe the 3 building blocks of the measurement of insurance contract liabilities under IFRS 17.

c. (1 point)

Identify 2 differences between IFRS 17 and current CIA practice regarding measurement of liabilities.

**Question:** 5

**Points:** 1.50 points

In each of the following scenarios, explain a likely outcome for the insurance company and cite any relevant precedents used to support the conclusion drawn.

a. (0.75 points)

An insured was driving his vehicle in BC when a group of car thieves shot and seriously injured him while attempting to take his vehicle. His auto policy states that he is entitled to no-fault benefits for an injury "that arises out of the ownership, use or operation of a vehicle." The insured argues that the insurance company should provide coverage as the injuries were causally connected to the use of the motor vehicle.

b. (0.75 points)

A man was injured in a head-on collision on an icy road on Markham Ontario. He claimed the city was liable for failing to maintain the roadway in good condition during a winter storm. The city claimed they had ploughed and salted the road in accordance with accepted city standards. They had cleared the snow & ice but it had reformed quickly due to the severity of the storm. The plaintiff sought 6 million dollars in damages.

**Question:** 6

**Points:** 2.50 points

a. (0.5 points)

Describe the Trilogy ruling.

b. (0.5 points)

Describe 2 reasons for the cap on general (non-pecuniary) damages.

c. (1 point)

Describe 3 exceptions to the cap on non-pecuniary damages and the Supreme Court's reason for the exceptions.

d. (0.5 points)

Describe the effect of the cap on equity between major and minor injuries.

Question: 7

Points: 2.50 points

An agricultural producer insures the production of corn under a plan with the following details:

|                 |              |
|-----------------|--------------|
| area of crop:   | 35 hectares  |
| probable yield: | 15,000 kg/ha |
| coverage level: | 80%          |
| insured price:  | \$0.26/kg    |

a. (0.75 points)

Growing Forward 2 is a comprehensive federal-provincial-territorial framework for Canada's agricultural sector. It consists of 6 Business Risk Management Programmes. Briefly describe 3 Business Risk Management Programmes that could protect this producer against crop losses or a drop in the price of the crop.

b. (0.5 points)

If the actual production of corn in a particular year is 330,000 kg, calculate the indemnity paid to the producer.

c. (0.5 points)

To calculate probable yield for insurance purposes, we normally use an average of historical yields. Sometimes, however, historical yields need to be adjusted.

- i What is the general purpose of such a historical adjustment?
- ii Identify a specific reason for a historical adjustment.

d. (0.75 points)

It is important for agricultural insurance to be self-sustainable.

- i Define the term 'self-sustainability load'.
- ii What is the statistical definition of 'self-sustainability'?



Question: 8

Points: 3.50 points

a. (1.25 points)

Identify 5 minimum requirements for RSP transfer eligibility.

b. (0.25 points)

In Ontario, why is only 85% of each risk transferred covered by the RSP.

c. (1 point)

Compare and contrast FARM and RSPs with respect to:

- i admission
- ii participation ratio

d. (1 point)

Given the following information, calculate the company's loss ratio on their share of the pool. Assume a provincial expense allowance (PEA) of: 27%

|   | company | province  |
|---|---------|-----------|
| direct earned <b>exposures not</b> ceded to the RSP | 2,000   | 25,000    |
| direct earned <b>premium</b> ceded to the RSP       | 40,000  | 750,000   |
| total incurred <b>losses</b> ceded to the RSP       | n/a     | 1,200,000 |

**Question:** 9

**Points:** 2.00 points

a. (0.5 points)

Briefly describe how terrorism has changed in recent years.

b. (0.75 points)

Briefly describe how terrorism is defined in Canada.

c. (0.5 points)

Identify 2 considerations in assessing terrorism risk for a business.

d. (0.25 points)

How is terrorism priced in Canada?

**Exam:** BattleActs 6C Practice Exam 2 (2019.Fall)

page 10

**Question:** 10

**Points:** 1.00 points

a. (1 point)

According to "ICBC Affordable and effective auto insurance – A new road forward for British Columbia", identify 4 guiding principles of an effective auto insurance system.

**Question:** 11

**Points:** 2.75 points

a. (0.5 points)

Identify 2 reasons that coverage for overland flooding has generally not been offered to residential customers in Canada.

b. (0.75 points)

Identify 3 areas of government under-investment in risk planning and mitigation.

c. (0.5 points)

Even when private flood insurance is widely available, what useful role can the government still provide in ensuring the availability & affordability of flood insurance.

d. (1 point)

Briefly describe the U.K. approach to flood insurance. Your answer should cover 4 separate points.

Question: 12

Points: 4.00 points

a. (3 points)

Determine the final A.M. Best rating for the following insurer.

| asset risk                        | <i>Required Capital Amounts</i> |        |          |          |
|-----------------------------------|---------------------------------|--------|----------|----------|
|                                   | VaR 95                          | VaR 99 | VaR 99.5 | VaR 99.6 |
| (B1) Fixed income securities risk | 190                             | 246    | 266      | 270      |
| (B2) Equity securities risk       | 113                             | 146    | 158      | 161      |
| (B3) Interest rate risk           | 116                             | 150    | 162      | 165      |
| (B4) Credit risk                  | 110                             | 142    | 154      | 156      |
| <b>U/W risk</b>                   |                                 |        |          |          |
| (B5) Reserve risk                 | 700                             | 1,049  | 1,187    | 1,231    |
| (B6) Premium risk                 | 650                             | 974    | 1,102    | 1,143    |
| <b>other risk</b>                 |                                 |        |          |          |
| (B7) Business risk                | 49                              | 49     | 49       | 49       |
| (B8) Catastrophe risk             | 100                             | 124    | 185      | 226      |

| <i>Recap of Available Capital (AC)</i>    | <i>amount</i> |
|---|---------------|
| Reported Capital (surplus)                | 2,660         |
| <u>Equity adjustments</u> ( <i>lura</i> ) |               |
| loss reserves                             | 95            |
| unearned premium                          | -190          |
| reinsurance                               | 19            |
| assets                                    | 0             |
| <u>Debt adjustments</u> ( <i>sd</i> )     |               |
| surplus notes                             | 0             |
| debt service requirements                 | 0             |
| <u>Other adjustments</u> ( <i>fig</i> )   |               |
| future operating losses                   | 0             |
| intangibles                               | 66.5          |
| goodwill                                  | 66.5          |

b. (1 point)

Identify 4 considerations other than BCAR score that impact balance sheet strength assessment.

Question: 13

Points: 7.00 points

a. (2 points)

Given the following information, calculate the MCT capital available.

|                                     |        |
|-------------------------------------|--------|
| qualifying category A common shares | 28,500 |
| contributed surplus                 | 2,000  |
| Retained Earnings                   | 6,500  |
| reserves                            | 2,500  |
| AOCI                                | 7,000  |
| qualifying category B instruments   | 16,500 |
| qualifying category C instruments   | 6,000  |
| non-controlling interests           | 500    |

You'll also need some information on reinsurance ceded to unregistered reinsurers:

UEP ceded: (\$) UnEarned Premiums ceded to assuming reinsurer

O/S Recov: (\$) OutStanding losses Recoverable from assuming reinsurer

Reins Recv: (\$) Reinsurance Receivable

Reins Pay: (\$) Reinsurance Payable

NOD: (\$) Non-Owned Deposits (RSA + Other) & includes FUNDS to secure pmt from assuming insurer (the FUNDS inclusion is new for 2018)

LOC: (\$) Letters Of Credit

| UEP ceded | O/S Recov | Reins Recv | Reins Pay | NOD   | LOC   |
|-----------|-----------|------------|-----------|-------|-------|
| 15,000    | 5,000     | 2,000      | 9,000     | 8,000 | 6,000 |

b. (4.5 points)

Given the following information, calculate the MCT minimum capital required.

| Line of Business | net unpaid * | margin |
|------------------|--------------|--------|
| Line 1           | 49,000       | 13%    |
| Line 2           | 77,000       | 10%    |

*\* net unpaid is discounted but excludes PfADs*

| Line of Business | prem liabs | margin | DWP (12 mths) | AWP (12 mths) | CWP (12 mths) |
|------------------|------------|--------|---------------|---------------|---------------|
| Line 1           | 15,000     | 18%    | 81,000        | 20,000        | 10,000        |
| Line 2           | 60,000     | 16%    | 104,000       | 23,000        | 28,000        |

*Question continues on next page...*

**Exam:** BattleActs 6C Practice Exam 1 (2018.Fall)

**Question:** 13 (continued)

These 2 amounts relate to components of insurance risk:

|   |       |
|---|-------|
| capital required for unregistered reinsurers: | 2,000 |
| capital required for catastrophes:            | 5,000 |

|   |       |
|---|-------|
| The capital required for <u>interest rate</u> risk is:    | 3,000 |
| The capital required for <u>foreign exchange</u> risk is: | 1,000 |
| The capital required for <u>equity</u> risk is:           | 4,500 |
| The capital required for <u>real estate</u> risk is:      | 500   |
| The capital required for <u>credit</u> risk is:           | 4,550 |

Here is some more information that you'll need:

AWP(ig): (\$ AWP (last 12 mths) from intra-group pooling  
 CWP(ig): (\$ CWP (last 12 mths) from intra-group pooling

| DWP     | AWP    | CWP    | growth | AWP(ig): | CWP(ig): |
|---------|--------|--------|--------|----------|----------|
| 185,000 | 43,000 | 38,000 | 22%    | 0        | 0        |

|                             | risk factor |
|-----------------------------|-------------|
| DWP over last 12 months     | 2.50%       |
| AWP over last 12 months     | 1.75%       |
| CWP over last 12 months     | 2.50%       |
| AWP(ig) over last 12 months | 0.75%       |
| CWP(ig) over last 12 months | 0.75%       |
| premium growth above 20%    | 2.50%       |
| capital factor *            | 8.50%       |

*\* capital factor applies to total capital required BEFORE operational risk margin and diversification credit.*

c. (0.5 point)

Calculate the MCT ratio and state whether it is above or below the supervisory target.

Question: 14

Points: 2.00 points

a. (1.25 points)

Calculate the investment income attributable to insurance operations.

investment yield: 7%

| AY   | APV<br>yr-end 14 | APV<br>yr-end 15 | paid in<br>CY 2015 |
|------|------------------|------------------|--------------------|
| 2012 | 3,000            | 2,000            | 800                |
| 2013 | 4,000            | 3,000            | 900                |
| 2014 | 4,500            | 3,500            | 1,000              |
| 2015 |                  | 4,500            | 4,000              |

|         | yr-end 14 | yr-end 15 |  |
|---------|-----------|-----------|--|
| UPR     | 5,000     | 6,000     | <== unearned premium reserve                     |
| PDR     | 600       | 400       | <== premium deficiency reserve                   |
| UEcomm  | 1,200     | 900       | <== unearned commissions                         |
| PH Recv | 300       | 100       | <== policy holder receivables (agents & brokers) |

b. (0.75 points)

Calculate the excess (deficiency) **amount** for CY 2015 (not the ratio).



Question: 15

Points: 3.25 points

Suppose you're given the following information

**BALANCE SHEET**

|  | current (1) | prior (0) |
|--|-------------|-----------|
| Cash   | 7,800       | 5,800     |
| Bonds and Debentures                                     | 58,300      | 63,500    |
| Common Shares  | 4,500       | 3,400     |
| Real Estate  | 19,600      | 23,900    |
| Agents and Brokers Receivables                           | 700         | 1,200     |
| Unearned Premiums Recoverable                            | 17,100      | 16,900    |
| <b>Unpaid Claims</b> and Adjustment Expenses Recoverable | ?           | ?         |
| Total Assets   | 181,100     | 163,100   |
| Gross Unpaid Claims and Adjustment Expenses              | 63,400      | 56,600    |
| Equity   | 50,300      | 42,200    |

**INCOME STATEMENT**

|   | current (1) | prior (0) |
|---|-------------|-----------|
| Net Premiums Written                      | 69,000      | 79,600    |
| Decrease in Net Unearned Premiums         | 1,800       | 1,600     |
| Net <b>Claims</b> and Adjustment Expenses | 60,400      | 48,700    |
| Total Acquisition Expenses                | 7,200       | 8,100     |
| General Expenses                          | 4,500       | 5,100     |
| Investment Income                         | 10,000      | 6,100     |
| Realized Gains                            | -1,700      | 800       |
| Investment Expenses                       | 800         | 600       |
| Income Taxes – Total                      | 4,000       | 4,100     |

**ALSO:**

|  |      |     |
|--|------|-----|
| Net Leverage Ratio ( <i>at end of current year</i> ) : | 220% | n/a |
|--|------|-----|

a. (2.75 points)

Calculate these quantities and assess the financial health of the company.

- |                               |                             |
|-------------------------------|-----------------------------|
| (i) InvYld (Investment Yield) | (iii) ROA                   |
| (ii) ROE                      | (iv) Net U/W Leverage Ratio |

b. (0.5 point)

Calculate the unpaid claims and adjustment expenses recoverable at the end of the current year.

Question: 16

Points: 2.25 points

a. (2.25 points)

Given the following information, calculate the TOTAL NET COMMISSIONS. Note that I've used abbreviations in the table so the table would fit in the width of the page.

**DFcomm:** Deferred Commissions

**@ start:** at start of year

**UEcomm:** Unearned Commissions

**@ end:** at end of year

| LOB | (02)           | (03)           | commissions in respect of WP |        |       |       | (08)         | (09)         | (10)     |
|-----|----------------|----------------|------------------------------|--------|-------|-------|--------------|--------------|----------|
|     | DFcomm @ start | UEcomm @ start | Direct                       | Assm'd | Ceded | Net   | DFcomm @ end | UEcomm @ end | Net Comm |
| 1   | 1,200          |                | 1,100                        | 150    | 500   |       | 2,200        |              |          |
| 2   | 1,700          |                | 1,200                        |        | 300   | 1,000 | 1,700        |              |          |
| Tot | 2,900          |                | 2,300                        |        | 800   |       | 3,900        |              |          |

|  |       |
|--|-------|
| gross contingent commissions           | 800   |
| ceded contingent commissions           | 200   |
| gross other non-deferrable commissions | 400   |
| ceded other non-deferrable commissions | 75    |
| ceded commission income (LOB1 + LOB2)  | 1,400 |

Question: 17

Points: 2.50 points

a. (1.25 points)

Calculate the earthquake reserve using the model method with phase-in. (*EPR is the earthquake premium reserve.*)

|            |        |
|------------|--------|
| Year       | 2020   |
| deductible | 20,000 |

|                 |         |
|-----------------|---------|
| EastCan.PML.500 | 60,000  |
| WestCan.PML.500 | 240,000 |

|                 |         |
|-----------------|---------|
| EastCan.PML.420 | 30,000  |
| WestCan.PML.420 | 120,000 |

|                     |        |
|---------------------|--------|
| EPR                 | 29,600 |
| Financial Resources | 55,000 |

|                      |         |
|----------------------|---------|
| EastCan. <b>PTIV</b> | 46,800  |
| WestCan. <b>PTIV</b> | 196,800 |

b. (0.75 points)

Identify and briefly describe 3 principles of earthquake risk management.

c. (0.5 points)

Identify and briefly describe 2 sound earthquake modeling practices.

Question: 18

Points: 1.50 points

For each of the following scenarios, evaluate whether risk transfer has occurred and briefly explain your answer. Your explanation may be either qualitative or quantitative as appropriate.

a. (0.75 points)

A risk manager purchases an annual 90% quota-share policy for \$1,500,000. The portfolio contains 150 policies. The individual loss distribution is given in the table below:

| <u>probability of loss</u> | <u>severity of loss</u> |
|----------------------------|-------------------------|
| 90%                        | 0                       |
| 10%                        | 1,500                   |

b. (0.75 points)

A risk manager purchases a policy with the following terms:

|                      |       |                         |
|----------------------|-------|-------------------------|
| premium:             | 1,000 |                         |
| probability of loss: | 6%    |                         |
| expected severity:   | 150   | <i>(net of premium)</i> |

Question: 19

Points: 3.00 points

a. (1 point)

Given the following information about Company A and Company B, explain whether the appointed actuary can conclude whether each company is in good financial condition.

| Company A        | Metric         | 2019   | 2020   | 2021   |
|------------------|----------------|--------|--------|--------|
| Base Scenario    | MCT Ratio      | 150%   | 175%   | 200%   |
|                  | Capital (000s) | 10,000 | 15,000 | 20,000 |
| Adverse Scenario | MCT Ratio      | 120%   | 150%   | 155%   |
|                  | Capital (000s) | 5,000  | 10,000 | 15,000 |

| Company B        | Metric         | 2019   | 2020   | 2021   |
|------------------|----------------|--------|--------|--------|
| Base Scenario    | MCT Ratio      | 160%   | 150%   | 140%   |
|                  | Capital (000s) | 2,000  | 1,000  | 300    |
| Adverse Scenario | MCT Ratio      | 150%   | 135%   | 95%    |
|                  | Capital (000s) | 10,000 | 10,000 | 10,000 |

b. (1 point)

Define the following terms:

- i plausible adverse scenario
- ii reverse stress testing

c. (1 point)

Suppose the adverse scenario in Company B is investment risk and results in a significant decrease in the value of the company's portfolio. Identify 2 possible ripple effects and 2 possible management actions.

Question: 20

Points: 1.25 points

a. (0.5 points)

Calculate the maximum allowable DPAE and the PDR (if any.)

|         |        |
|---------|--------|
| net UPR | 72,890 |
| FutRe   | 5,960  |
| ELR     | 85%    |
| ULAE    | 2,320  |

|               |        |
|---------------|--------|
| discount rate | 5.5%   |
| MfAD(inv)     | 75 bps |
| MfAD(claims)  | 10.0%  |
| MfAD(re)      | 10.0%  |

|            |        |
|------------|--------|
| <b>APV</b> | 58,846 |
|------------|--------|

|                |        |
|----------------|--------|
| gross (PV+LAE) | 62,590 |
| maintenance    | 3,680  |
| UEComm         | 1,130  |

b. (0.5 points)

Identify the purpose of DPAE and whether it is classified as an asset or a liability.

c. (0.25 points)

Identify 1 example of a DPAE.

**Question:** 21

**Points:** 2.50 points

a. (1 point)

Identify the steps in a natural catastrophe stress test.

b. (1 point)

Identify the elements of strong cat risk management according to A.M. Best.

c. (0.5 points)

Identify a conceptual difference between MCT and BCAR regarding the time horizon.

**Question:** 22

**Points:** 2.00 points

a. (0.5 points)

Identify 2 considerations in determining concentration risk of an insurer.

b. (0.5 points)

Briefly describe the 2 approaches which account for the time value of money when evaluating the runoff of claims liabilities.

c. (1 point)

Identify 4 considerations in determining the interest rate used to discount policy liabilities.



Question: 23

Points: 2.75 points

a. (1.5 points)

Solvency II is a principles-based insurance regulatory system for capital levels of insurance companies in the European Union. Identify and briefly describe the 3 pillars of Solvency II.

b. (0.5 points)

ENID (*Events Not in Data*) are often described as high-severity, low-probability events not reflected in historical data.

According to the Institute & Faculty of Actuaries reading, "Solvency II Technical Provisions for General Insurers", what is the **proposed** definition of ENID.

(*This definition is sometimes referred to as the **purpose** of ENID.*)

c. (0.75 points)

Identify 3 ways ENIDs may be identified.

**Exam:** BattleActs 6C Practice Exam 2 (2019.Fall)

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**Question:** 24

**Points:** 2.00 points

a. (1.5 points)

Describe 3 key elements of ORSA.

b. (0.5 points)

Identify a way that ORSA is a better management tool than MCT.

**Question:** 25

**Points:** 3.50 points

a. (1.5 points)

According to the CIA paper on modeling, identify and briefly describe the 3 elements a model should contain.

b. (1 point)

Identify and briefly describe the 4 steps in validating a newly created model.

c. (1 point)

Given the following information, use the 2-dimensional model risk rating system to evaluate the overall model risk.

**task:** forecast capital requirements on a quarterly basis

**method:** use a brand new untested model of high complexity

**model risk considerations:**

- capital requirements are significant
- model is used frequently
- there is no documentation for the model
- a summer intern with no prior actuarial experience is running the model

**Question:** 26

**Points:** 2.00 points

a. (1.5 points)

Identify and briefly describe 2 items that should be included in a Risk Appetite Framework.

b. (0.5 points)

Identify 2 elements of good corporate governance.

**Question:** 27

**Points:** 1.75 points

a. (0.25 points)

Define the term 'subsequent event'.

b. (1.5 points)

The Appointed Actuary of a property and casualty insurance company is valuing policy liabilities as at December 31, 2019. The report date is February 22, 2020. For each of the following scenarios, briefly discuss the actions that the Appointed Actuary should take.

- i A insurance company's reinsurer became insolvent on Jan 15. The primary insurer's actuary became aware on Jan 16.
- ii The stock market suffered a 10% drop in value on Jan 5. The actuary became aware on the same day.
- iii A severe winter storm occurred on Jan 19. The actuary became aware on Jan 21.

Question: 28

Points: 2.75 points

a. (1 point)

Identify 4 of the legal requirements surrounding the appointment of the Appointed Actuary.  
(Note that this is different from the **qualifications** required of the AA.)

b. (1 point)

Briefly describe 4 roles or duties of the Appointed Actuary (AA).

c. (0.75 points)

Identify 3 objectives of a peer review.

Answer: 1

Points: 2.50 points

Source: McD.Intro

(1 point) a. Any 4 of: *(there may be others - I've only listed items from the wiki)*

- regulation of trade & commerce
- taxation
- banking
- bankruptcy & insolvency
- aliens & naturalization
- criminal law

(0.5 points) b. Any 2 of: *(there may be others - I've only listed items from the wiki)*

- provincial taxes
- civil property rights
- hiring & supervising provincial employees
- operating jails & hospitals

(0.5 points) c. - contract matters  
- transaction matters

(0.5 points) d. For contract matters, any 1 of: *(there may be others - I've only listed items from the wiki)*

- policy contents
- policy terms *(includes effective date)*
- premium payment
- insurable interest
- reinstatement
- designation of beneficiaries

For transaction matters, any 1 of:

- A**gent licensing
- U**nfair practices
- C**laims handling

**Answer:** 2

**Points:** 1.00 points

**Source:** FSCO.PPA, FSCO.UBI

- (0.25 points) a. **Permitted.**  
- premium can be based on the value of a car
- (0.5 points) b. **Permitted.**  
- the insurer **cannot** use employment status, but this situation could still be allowed if the premium adjustment (decrease) is based on the insured driving fewer miles by not having to drive to work
- (0.25 points) c. **Permitted.** *(based on new version of syllabus reading)*  
- the current version of the FSCO.UBI syllabus reading **does** permit investigation of claims based on UBI data (the previous version did not)
- (0.25 points) d. **Permitted.** *(based on new version of syllabus reading)*  
- fraud prevention is permitted so if the insurer used UBI to determine a claim is fraudulent, they should be permitted to deny the claim



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**Answer:** 3

**Points:** 1.75 points

**Source:** AB.TNC, FSCO.UBI

- (0.75 points) a. accident information:  
- date/time of accident  
- circumstances of accident  
electronic information:  
- times when driver was logged in/out to the TNC app
- (0.5 points) b. both require new technology  
- UBI requires a device to be installed in your car  
- ride-sharing a smart-phone to connect drivers & customers  
*(there are probably also other valid answers)*
- (0.5 points) c. - UBI affects a customer's premiums for traditional auto policies  
- ride-sharing is a new type of insurance policy to cover the use of personal vehicles to carry paying customers

Answer: 4

Points: 3.00 points

Source: IFRS 17

(0.5 points) a. You really should memorize this **exactly** as given :  
a **contract** under which 1 party (the issuer)...  
**accepts** significant insurance risk from another party (the policyholder)...  
by **agreeing** to compensate the policyholder...  
**if** a specified uncertain future event (the insured event) adversely affects the policyholder

(1.5 points) b. Hint: **PV-risk-CSM**  
1. **Present Value of future cash flows**  
- similar to PV(liabilities) (includes acquisition expenses and all premiums, excludes financial risk)  
2. **risk adjustment for non-financial risk**  
- similar to PfADs for non-economic risk (claims development, reinsurance recovery)  
3. **Contractual Service Margin (CSM)**  
- represents unearned profit from a group of insurance contracts (so no front-ending of profits)  
(*new concept in IFRS 17 – current CIA standards do allow front-ending of profits*)

(1 point) c. Any 2 of:  
**criteria:**  
IFRS 17: allows PAA for short-term contracts without testing whether PAA reasonably approximates GMA  
CIA: allows (UEP – DAC) to be used only if it's a reasonable approximation to the explicit valuation approach  
**DAC deferral:**  
IFRS 17: entity may choose deferral or direct expense for short-term contracts  
CIA: no deferral in explicit valuation, but deferral if (UEP – DAC) is held  
**DAC amount:**  
IFRS 17: allows deferral of DAC that is directly attributable to the portfolio of insurance contracts  
CIA: allowable deferral is different  
**Discounting of LRC:**  
IFRS 17: entity may choose not to discount (if discounting is not significant)  
CIA: requires discounting  
**Discounting of LRC:**  
IFRS 17: ignore discounting and financial risk for LIC if:  
- PAA is used for LRC  
- LIC cash flows are received  $\leq 1$  year within incurred date of claims  
CIA: requires discounting

Answer: 5

Points: 1.50 points

Source: Land.Cases

- (0.75 points) a. likely outcome: - insurer must provide coverage  
precedent: - Amos v ICBC  
explanation: PURPOSE TEST: was the car being used in a normal way? **Yes.**  
CAUSALITY TEST: was there a link between the use of the car and the shooting? **Yes.**  
- Supreme Court agreed that purpose test and causality test had been satisfied  
*(Note that this may not be applicable in Ontario where the policy term "arising from" is replaced by "caused by".)*
- (0.75 points) b. likely outcome: - city must pay 6 million in damages  
precedent: - Belangar v Sudbury  
explanation: - the city claimed they followed established procedures  
- appeals court upheld award stating that "standard of care" had been breached  
- city should ADAPT to conditions, not just blindly follow procedures

Answer: 6

Points: 2.50 points

Source: Dav.NonPec

(0.5 points) a. The Supreme Court of Canada established a \$100,000 cap on non-pecuniary damages. *(later given an inflation-adjustment, and subject to certain exceptions)*

(0.5 points) b. Any 2:  
- limitless claims by the severely injured lead to extravagant awards  
- extravagant awards lead to social burdens that impact availability & affordability  
- plaintiff would already be fully compensated for loss of income & future care  
- ensures predictability of awards *(creates a good environment for insurers)*

(1 point) c. exceptions:           - sexual abuse (S.Y. v F.G.C.)  
                                  - defamation (Hill v Church of Scientology, Young v Bella)  
                                  - negligence causing financial loss

reason:   - no evidence that cost of insurance or social burden would be increased

(0.5 points) d.   - minor injuries may be over-compensated  
                  - major injuries may be under-compensated *(because past a certain point, there is no longer a distinction based on severity)*

Answer: 7

Points: 2.50 points

Source: Chev.Agric

- (0.75 points) a. agricultural insurance: - protects against production loss  
 agricultural stability: - protects against margin decline  
 agricultural recovery: - protects against disaster

- (0.5 points) b. A = Area PG = Production Guarantee  
 P = Probable Yield AP = Actual Production  
 C = Coverage Level

|                     |  |
|---------------------|--|
| PG                  | Indemnity  |
| = A x P x C         | = max(0, PG - AP) x (insured price)                                  |
| = 35 x 15,000 x 80% | = max(0, 420000 - 330000) x 0.26                                     |
| = 420,000           | <span style="border: 1px solid black; padding: 2px;">= 23,400</span> |

- (0.5 points) c. i to reflect current production capability  
 ii Any 1 of:  
 - change in farming or management practices  
 - change in insurance programme design  
 - change in data source or data collection technique  
 - maturity of perennials (yield would vary of their life cycle)  
 - quality variation of crop from year-to-year (possibly due to insured perils)

- (0.75 points) d. i a load in rates to recover deficits and maintain surplus  
 ii FOR ALL base & adverse scenarios with:  
*initial deficit = 6th yr, 95th percentile*  
 MUST RECOVER DEFICIT:  
 - in 15 years on average  
 - in 25 years with 80% probability

Answer: 8

Points: 3.50 points

Source: FA.Dutil

(1.25 points) a. - PPA only  
- insured can't be eligible for FARM  
- policy must satisfy statutory minimum coverage requirements  
- insurer must follow proper classification and rating, and provide documentation  
- insurer must use approved rates

(0.25 points) b. insurer has incentive to:  
- use effective U/W  
- maintain adequate pricing  
- manage claims properly

(1 point) c. admission:  
FARM: - only if agent/broker cannot place business with a voluntary company  
RSPs: - use U/W rules of ceding company

participation ratio:

FARM: - established separately by jurisdiction, class, AY

RSPs: - established in proportion to direct earned exposures for:  
*Total, Voluntary, PPA, Non-Fleet, 3rd Party Liability*

(1 point) d. First calculate the participation ratio PR:  
= (company ceded exposures) / (province ceded exposures)  
= 2,000 / 25,000  
= 8%

Now, the company's share of the losses is

= (province ceded losses) x PR  
= 1,200,000 x 8%  
= 96,000

And the company's share of the premium is

= (province ceded premiums) x PR + (company ceded premium) x PEA  
= 750,000 x 8% + 40,000 x 27%  
= 70,800

Putting it all together, the loss ratio is

= (company's share of losses) / (company's share of premium)  
= 96,000 / 70,800  
= **135.6%**      <== final answer to part (d)

**Answer:** 9

**Points:** 2.00 points

**Source:** IIC.Terrorism

- (0.5 points) a. Any 2 of:  
organized attacks → lone actors  
bombings → armed attacks  
state targets → civilian targets
- (0.75 points) b. Hint: **RIP**  
Terrorism is defined as an act committed for any of these purposes:  
**R**eligious  
**I**deological  
**P**olitical
- (0.5 points) c. Any 2 of:  
- attractiveness of location as a terror target (*# of employees, profile of business*)  
- accessibility of location (*security, # of entry points*)  
- financial impact (*risk to assets, business interruption*)  
- crisis management framework
- (0.25 points) d. - a percentage of property premium

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**Answer:** 10

**Points:** 1.00 points

**Source:** ICBC.Affordable

(1 point)

- a. Any 4 of:  
Fair, Affordable, Sustainable, Efficient, Simple



Answer: 11

Points: 2.75 points

Source: IBC.Flood

- (0.5 points) a. Any 2 of: [Hint: **adverse-under-maps**]  
*adverse:* - adverse selection (if offered, only people who definitely need it would buy it, and it would be too expensive)  
*under:* - government under-investment in risk planning and mitigation  
*maps:* - lack of effective flood hazard maps
- (0.75 points) b. Any 3 of: [Hint: **BAIL** me out!]  
**B**uilding codes that are obsolete  
**A**sset management that is poor  
**I**nfrastructure is lacking (*levies, sewers,...*)  
**L**and use planning is inadequate
- (0.5 points) c. Any 2 of:  
- private insurance may have coverage limits that are exceeded in a major disaster (*so government pays the excess*)  
- government may subsidize otherwise uninsurable risks through taxation  
- provide accurate flood maps  
- provide good infrastructure (*levies, sewers*)  
- educate public on ways to mitigate and financially plan for flood losses  
- provide incentives for public to mitigate risks by limiting government compensation
- (1 point) d. Any 4 of: (*regarding the U.K. flood insurance program*)  
model: - *private*  
purchase: - *voluntary*  
package: - *bundled with homeowner's insurance*  
pricing: - *risk-based*  
subsidies: - *cross-subsidized among policyholders*  
government: - *acts as an enabler through risk: mitigation, flood mapping, zoning*

Answer: 12

Points: 4.00 points

Source: BCAR.Cdn2018

(3 points)

- a. **step 1:** calculate AC starting with Reported Capital (surplus) and making the indicated adjustments

**add:** equity adjustments**subtract:** intangibles & goodwill

$$\begin{array}{rclclclcl} \text{then} & \text{AC} & = & 2,660 & + & -76 & - & 133 \\ & & = & \underline{2,451} & & & & \end{array}$$

- step 2:** calculate NRC for each VaR level using the covariance adjustment formula

NRC

$$= (B7) + \text{SQRT} [ (B1)^2 + (B2)^2 + (B3)^2 + (0.5 \times (B4))^2 + (0.5 \times (B4) + (B5))^2 + (B6)^2 + (B8)^2 ]$$

$$\text{NRC} = \frac{\text{VaR 95} \quad \text{VaR 99} \quad \text{VaR 99.5} \quad \text{VaR 99.6}}{1,082 \quad 1,575 \quad 1,774 \quad 1,839}$$

- step 3:** calculate BCAR corresponding to each VaR level using the standard formula

$$\text{BCAR} = (\text{AC} - \text{NRC}) / \text{AC} \times 100$$

$$\text{BCAR} = \frac{\text{VaR 95} \quad \text{VaR 99} \quad \text{VaR 99.5} \quad \text{VaR 99.6}}{55.8 \quad 35.8 \quad 27.6 \quad 25.0}$$

- step 4:** use the BCAR results at the different VaR levels to determine the A.M. Best financial strength rating

$$\text{rating} = \text{very strong} \quad \Leftarrow \text{final answer}$$

(1 point)

- b. Hint: **Q<sup>2</sup>-SALAMI** (Cured Salami - put meat on the bones of the basic BCAR numbers)

Any 4**Q<sup>2</sup>:** Quality of capital, Quality of reinsurance**S**tress testing (how well does the company perform under stress)**A**dequacy of reserves**L**iquidity of Capital**A**ctions of affiliates (affiliates could drag you down or pull you up)**M**atching of assets & liabilities (this is desirable for paying your bills on time)**I**nternal capital models (is there a good procedure for assessing capital needs)**TIP:**

Make sure you also look at the practice template for the calculation of B5. This is in BattleQuiz #4 of the BCAR.Cdn2018 wiki article.

Answer: 13

Points: 7.00 points

Source: OSFI.MCT

(2 points) a. capital available gross of deductions: 69,500 *(sum entries in first table)*  
 deduction for unregistered reinsurance: 0 *(see full solution in external PDF)*  
 deduction for excess B & C capital: 1,625 *(see full solution in external PDF)*  
 MCT net capital available **67,875**

(4.5 points) b. capital required for insurance risk: **35,584** *(sum the components)*  
 component: unpaid claims 14,070 *(see full solution in external PDF)*  
 component: premium liabilities 14,514 *(see full solution in external PDF)*  
 component: unregistered reinsurance 2,000 *(given)*  
 component: catastrophes 5,000 *(given)*

capital required for market risk: **9,000** *(sum the components)* [Hint: **Mr. IFER**]  
 component: interest rate risk 3,000 *(given)*  
 component: foreign exchange 1,000 *(given)*  
 component: equity 4,500 *(given)*  
 component: real estate 500 *(given)*

capital required for credit risk: **4,550** *(given)*

capital required for operational risk: **10,597** *(see full solution in external PDF)*

MCT minimum capital required: **36,368**  
 diversification credit: 5,180

(0.5 points) c. MCT ratio: = CapAvail / minCapReq  
 = 67,875 / 36,368  
 = **187%**

This is ABOVE the supervisory target of 150%. *(They would NOT be under increased scrutiny by OSFI.)*

Answer: 14

Points: 2.00 points

Source: CCIR.ARinstr

(1.25 points) a. investment income = (yield rate) x (money lying around)  
 = 7% x 19,100  
 = 1,337.0 <== final answer to part (a)

money lying around = + items - - items  
 = 19,100

| + items | average |
|---------|---------|
| UCAE    | 12,250  |
| UPR     | 5,500   |
| PDR     | 500     |
| UEcomm  | 1,050   |
| total   | 19,300  |

| - items                            | average |
|------------------------------------|---------|
| DPAE                               | 0       |
| receivables: installment premiums  | 0       |
| receivables: PH + agents & brokers | 200     |
| total                              | 200     |

The UCAE average of 12,250 is calculated as the average of (CY 2015) & (CY 2014) as follows:

**CY 2014:** SUM(APV at Dec14) over all accident years  
 = 3,000 + 4,000 + 4,500  
 = 11,500

**CY 2015:** SUM(APV at Dec15) over all accident years  
 = 2,000 + 3,000 + 3,500 + 4,500  
 = 13,000

UCAE average = average( 11,500 , 13,000 )  
 = 12,250

(0.75 points) b. We must apply the following formula for each AY for CY 15 and then SUM

$$\text{excess amount} = [ U(\text{beg}) - U(\text{end}) - Pd(\text{All}) + ii ]$$

Let's first reorganize the given information into triangles to make it (hopefully) easier to understand.

**paid loss during CY**

| AY / CY | CY 12 | CY 13 | CY 14 | CY 15 |
|---------|-------|-------|-------|-------|
| AY 12   | 0     | 0     | 0     | 800   |
| AY 13   |       | 0     | 0     | 900   |
| AY 14   |       |       | 0     | 1,000 |
| AY 15   |       |       |       | 4,000 |

**discounted UCAE (including PfAD) at END of CY**

| AY / CY | CY 12 | CY 13 | CY 14 | CY 15 |
|---------|-------|-------|-------|-------|
| AY 12   | 0     | 0     | 3,000 | 2,000 |
| AY 13   |       | 0     | 4,000 | 3,000 |
| AY 14   |       |       | 4,500 | 3,500 |
| AY 15   |       |       |       | 4,500 |

Let's calculate (excess amount)<sub>AY12</sub> in detail, then the other AYs are similar:

$$\begin{aligned} (\text{excess amount})_{\text{AY12}} &= 3,000 - 2,000 - 800 + ii \\ &= 3,000 - 2,000 - 800 + 175.0 \\ &= \underline{375.0} \end{aligned}$$

where ii = investment income

$$\begin{aligned} ii_{\text{CY12}} &= 7\% \times \text{average}( 3,000 , 2,000 ) \\ &= 175.0 \end{aligned}$$

$$\begin{aligned} &= 4,000 - 3,000 - 900 + 245 = \underline{345.0} \\ &= 4,500 - 3,500 - 1,000 + 280 = \underline{280.0} \\ &= \text{cannot be calculated for the most current AY / CY combination: set = 0 by defn} \quad \underline{0} \end{aligned}$$

final answer to part (b) ==> total AY12, AY13, AY14, AY15 = 1,000.0

Answer: 15

Points: 3.25 points

Source: MSA Ratios

(0.75 points) a. 
$$\text{InvYld} = \frac{2 \times \text{NII}}{(\text{InvAss0} + \text{InvAss1} - \text{NII})}$$

InvYld =  $\frac{2 \times 7,500}{(96,600 + 90,200 - 7,500)}$  = 8.37% <== final answer to (i) - use judgment to assess financial health (Looks pretty good!)

|     |   |              |   |                       |   |         |
|-----|---|--------------|---|-----------------------|---|---------|
| NII | = | InvInc       | + | Realized Gains/Losses | - | InvExps |
| NII | = | 10,000       | + | -1,700                | - | 800     |
|     | = | <u>7,500</u> |   |                       |   |         |

|         |   |       |   |                    |   |                |   |                        |
|---------|---|-------|---|--------------------|---|----------------|---|------------------------|
| InvAss  | = | cash  | + | bonds & debentures | + | commons shares | + | real estate            |
| InvAss0 | = | 5,800 | + | 63,500             | + | 3,400          | + | 23,900 = <u>96,600</u> |
| InvAss1 | = | 7,800 | + | 58,300             | + | 4,500          | + | 19,600 = <u>90,200</u> |

(0.75 points) 
$$\text{ROE} = \frac{(\text{NI.preTax} - \text{Tot. Tax})}{\text{equity}}$$

ROE =  $\frac{(6,200 - 4,000)}{50,300}$  = 4.37% <== final answer to (ii) - compare to acceptable minimum of 5.4% BAD

|           |   |              |   |         |   |        |   |         |   |       |
|-----------|---|--------------|---|---------|---|--------|---|---------|---|-------|
| NI.pretax | = | NEP          | - | net.CAE | - | TotAcq | - | GenExps | + | NII   |
|           | = | 70,800       | - | 60,400  | - | 7,200  | - | 4,500   | + | 7,500 |
|           | = | <u>6,200</u> |   |         |   |        |   |         |   |       |

|     |   |               |   |                               |
|-----|---|---------------|---|-------------------------------|
| NEP | = | NWP           | - | change(UEP)                   |
|     | = | NWP           | - | [ current(UEP) - prior(UEP) ] |
|     | = | 69,000        | - | [ -1,800 ]                    |
|     | = | <u>70,800</u> |   |                               |

(0.75 points) 
$$\text{ROA} = \frac{(\text{NI.preTax} - \text{Tot. Tax})}{(\text{2-yr average of assets})}$$

ROA =  $\frac{(6,200 - 4,000)}{\text{average}(181,100, 163,100)}$  = 1.28% <== final answer to (iii) - compare to acceptable minimum of 2.6% BAD

(0.5 points) 
$$\text{Net U/W Leverage Ratio} = \frac{\text{NWP}}{\text{equity}}$$

Net U/W Leverage Ratio =  $\frac{69,000}{50,300}$  = 137% <== final answer to (iv) - compare to acceptable MAXIMUM of 300% GOOD

(1 point)

Calculation of UCAE: We're given the value for Net Leverage Ratio, so let's write down the formula and see where it leads...

|                    |   |               |   |   |           |   |   |        |
|--------------------|---|---------------|---|---|-----------|---|---|--------|
| Net Leverage Ratio | = | (             | NWP   | + | Net.Liabs | ) | / | equity |
| 220%               | = | (             | 69,000  | + | Net.Liabs | ) | / | 50,300 |
| ==> Net.Liabs      | = | <u>41,660</u> | <== Net.Liabs was the only unknown so I decided to solve for it |   |           |   |   |        |

Ok, but where do we go from here? You need to relate the unknown, UCAE recoverable, to quantities we have. To do this, it helps to recall that "Net" means "Net of reinsurance". Then we can relate "Net" and "Total" liabilities with this formula...

|                  |   |               |                                      |                  |   |                 |
|------------------|---|---------------|--------------------------------------|------------------|---|-----------------|
| Net.Liabs        | = | Tot.Liabs     | -                                    | UCAE recoverable | - | UEP recoverable |
| 41,660           | = | 130,800       | -                                    | UCAE recoverable | - | 17,100          |
| UCAE recoverable | = | <u>72,040</u> | <== final answer to UCAE recoverable |                  |   |                 |

The term "Tot.Liabs" used in the above calculation was calculated as follows:

|                  |   |            |   |        |   |         |   |        |   |                       |
|------------------|---|------------|---|--------|---|---------|---|--------|---|-----------------------|
| <b>Tot.Liabs</b> | = | Tot.Assets | - | equity | = | 181,100 | - | 50,300 | = | <u><b>130,800</b></u> |
|------------------|---|------------|---|--------|---|---------|---|--------|---|-----------------------|

Answer: 16

Points: 2.25 points

Source: CCIR.ARinstr

- (2.25 points) a. The key is knowing the layout of the exhibit and the formulas to complete the columns. It is exactly like 2016.Spring #18. I found the answer in the examiner's report very confusing. It's much easier if you put everything into a table like in **Exhibit 80.10**. You can see the layout of this **net commissions exhibit** in the sample quarterly statement.

There is a summary box to this exhibit that isn't given in the statement of the problem. You have to memorize this. The only number you don't have is the **commission expense**.

| summary of commissions          |              |  |
|---------------------------------|--------------|--|
| gross                           |              |  |
| <b>commission expense</b>       | 1,550        | = (02) + (04) + (05) - (08) [use totals row] |
| contingent commission           | 800          | <-- given                                    |
| other non-deferrable commission | 400          | <-- given                                    |
| <b>total gross</b>              | <b>2,750</b> | = sum of gross commissions                   |
| ceded                           |              |  |
| commission income               | 1,400        | <-- given                                    |
| contingent commission           | 200          | <-- given                                    |
| other non-deferrable commission | 75           | <-- given                                    |
| <b>total ceded</b>              | <b>1,675</b> | = sum of ceded commissions                   |
| <b>TOTAL NET COMMISSIONS</b>    | <b>1,075</b> | = (total gross) - (total ceded)              |

final answer ---->

So, we have to get the total for **column (05)**. We need the corresponding value for LOB 2. This is easy. We just use the standard formula:

$$\text{Direct} + \text{Assumed} - \text{Ceded} = \text{Net}$$

Rearrange this as follows:

$$\begin{aligned} \text{Assumed} &= \text{Net} - \text{Direct} + \text{Ceded} \\ &= 1,000 - 1,200 + 300 \\ &= 100 \end{aligned}$$

Substitute this into the table below and calculate the **sum of column (05)**. *C'est très facile!*

| LOB | (02)           | (03)           | (04) (05) (06) (07)          |        |       |       | (08)         | (09)           | (10)     |
|-----|----------------|----------------|------------------------------|--------|-------|-------|--------------|----------------|----------|
|     | DFcomm @ start | UEcomm @ start | commissions in respect of WP |        |       |       | DFcomm @ end | UEcomm @ start | Net Comm |
|     |                |                | Direct                       | Assm'd | Ceded | Net   |              |                |          |
| 1   | 1,200          |                | 1,100                        | 150    | 500   |       | 2,200        |                |          |
| 2   | 1,700          |                | 1,200                        | 100    | 300   | 1,000 | 1,700        |                |          |
| Tot | 2,900          |                | 2,300                        | 250    | 800   |       | 3,900        |                |          |

Now we calculate the **commission expense** using the green highlighted values:

$$\begin{aligned} \text{commission expense} &= (02) + (04) + (05) - (08) \\ &= 2,900 + 2,300 + 250 - 3,900 \\ &= 1,550 \end{aligned}$$



Answer: 17

Points: 2.50 points

Source: OSFI.Eqk

(1 point)

- a. ERX\_1 (Earthquake Risk Exposure) *without phase-in*
- $$= ( \text{East Canada PML500}^{1.5} + \text{West Canada PML500}^{1.5} ) ^ {1/1.5}$$
- $$= (60,000^{1.5} + 240,000^{1.5}) ^ {1/1.5}$$
- $$= 259,605$$
- ERX\_2 (Earthquake Risk Exposure) *with phase-in*
- $$= \text{ERX}_1 \times (\text{year} - 2014)/8 + \max( [\text{East Can PML420}], [\text{West Can PML420}] ) \times (2022 - \text{year})/8$$
- $$= 259,605 \times (6/8) + 120,000 \times (2/8)$$
- $$= 224,704$$

ERC (Earthquake Reserve Component)

$$= \text{ERX}_2 - (\text{Financial Resources})$$

$$= 224,704 - 55,000$$

$$= 169,704$$

ER (Earthquake Reserve)

$$= (\text{ERC} + \text{EPR}) \times 1.25$$

$$= (169,704 + 29,600) \times 1.25$$

$$= 249,130 \quad \leftarrow \text{final answer}$$

(0.5 points)

- b. Any 3 of:
- risk management**
- earthquake exposure risk management policies are subject to oversight by Board of Directors and implemented by Senior Management
- data management**
- data required is MORE than for traditional ratemaking
  - must address data Integrity, Verification, Limitations (IVL)
- models**
- understand (assumptions, methods, limitations) of earthquake models
- PML (Probable Maximum Loss)**
- PML = Total Expected Ultimate Cost
  - includes considerations for data quality, non-modeled exposure, model uncertainty, multi-region exposure
- financial resources & contingency plan**
- Financial Resources: quantification of how financial resources cover PML
  - Contingency Plan: how to continue efficient business operations after disaster

(0.75 point)

- c. Any 2 of: [Hint: **DAQKD-UP**]
- D**ocs: - document use of model within risk management program
- A**lternative: - explain why a particular model is used versus alternatives
- Q**ualified: - qualified staff needed to run in-house models regularly
- K**nowledge: - AML (require KNOWLEDGE of Assumptions, Methods, Limits of Model)
- D**ata: - must show that GRANULARITY & QUALITY of data is appropriate
- U**ncertainty: - understand how uncertainty affects: (capital adequacy, reinsurance)
- P**ML: - if  $\text{PML}_1 < \text{PML}_2$ : explain (differences, subsequent model adjustments)

Answer: 18

Points: 1.50 points

Source: Reinsurance

- (0.75 points) a. transfer of risk: - yes  
type of method: - qualitative  
method: - apply the 'substantially all' rule  
- the insurer can suffer a loss, but it isn't large enough to pass the ERD test (*see below*)  
- but since the quota-share percentage is 90%, we can apply the 'substantially all' rule to conclude there is risk transfer  
- this may be a situation where the risk manager wants to withdraw immediately from the market

*this shows that the ERD test fails ==> (but it doesn't matter in this case)*

- ERD (*Expected Reinsurer Deficit*)
- frequency of loss = 10%
- severity of loss as a % of premium =  $1,500 / (1,500,000 / 150) = 15\%$   
==> then apply quota-share %:  $15\% \times 90\% = 13.5\%$
- ERD = frequency x severity =  $10\% \times 13.5\% = 0.135\% < 1\%$
- this test requires ERD > 1% for transfer of risk
- by the ERD test there would be NO transfer of risk

- (0.75 points) b. transfer of risk: - no  
type of method: - quantitative  
method: - ERD (*Expected Reinsurer Deficit*)  
- frequency of loss = 6%  
- severity of loss as a % of premium =  $150 / 1000 = 15\%$   
- ERD = frequency x severity =  $6\% \times 15\% = 0.9\% < 1\%$   
- this test requires ERD > 1% for transfer of risk  
- therefore there is NO transfer of risk

Answer: 19

Points: 3.00 points

Source: CIA.DCAT

(1 point)

a. Requirements for good financial condition:

[1] MCT ratio > 150% (*for base scenario, for all years*)

[2] Capital > 0 (*for base and all adverse scenarios for all years*)

**Company A:** good financial condition

- condition [1] is satisfied

- condition [2] is satisfied because capital > 0 for base & adverse scenario for all years

**Company B:** cannot conclude good financial condition

- condition [1] is not satisfied because MCT < 150% for 3rd year of base scenario

- condition [2] is satisfied because capital > 0 for base & adverse scenario for all years

(1 point)

b. **plausible adverse scenario:**

- (set of assumptions) for an (undesirable but reasonably possible event) relating to (insurer's financial condition)

- statistically, the scenario should lie between the 95th and 99th percentile on the loss distribution (*the CAS seems to require this as part of the definition*)

**reverse stress testing:**

- HOW FAR must risk factors change TO DRIVE the insurer's surplus negative during forecast period THEN determine whether such change is plausible

(1 point)

c. There are lots of valid answers. Here are the ones I chose:

**ripple effects:**

- significant reduction in cash flow

- forced sale or liquidation (*to pay policyholder claims*)

**management actions:**

- sell assets to raise cash

- change investment strategy (*rebalance portfolio from stocks to bonds to reduce risk*)

Answer: 20

Points: 1.25 points

Source: CIA.PrLiabs

- (0.5 points) a. *This is the easy version of the DPAA problem. You should also practice the harder version where you are not given **APV** but have to calculate it. There is a practice template for both versions in the BattleQuizzes for CIA.PrLiabs.*

$$\begin{array}{rclclcl}
 \text{DPAA} & = & \text{UPR} & - & \text{PolLiabs(UPR)} & + & \text{UEComm} \\
 & = & 72,890 & - & 68,486 & + & 1,130 \\
 & = & \boxed{5,534} & & & & \text{<== final answer to part (a)}
 \end{array}$$

$$\begin{array}{rclclcl}
 \text{PolLiabs(UPR)} & & & & & & \\
 & = & \text{APV} & + & \text{FutRe} & + & \text{maintenance} \\
 & = & 58,846 & + & 5,960 & + & 3,680 \\
 & = & \boxed{68,486} & & & & 
 \end{array}$$

- (0.5 points) b. DPAA is an asset. Its **purpose** is to recognize prepaid policy expenses over the policy term provided such costs are recoverable from equity in the UPR. *(This has the advantage of matching of revenue and expenses.)*

**Not part of the question:** Only 1 of DPAA and PDR can be non-zero. Also, PDR is a liability.

- (0.25 points) c. Any 1 of: (there are probably other examples also)
- commissions
  - TLF (Taxes, Licenses, Fees)
  - advertising

Answer: 21

Points: 2.50 points

Source: BCAR.Cat

- (1 point) a. **surplus:** - reduce reported surplus by PML (net post-tax 1-in-100 year event)  
**reinsurance:** - increase reinsurance recoverables by at least 40% of ceded PML  
**reserves:** - increase reserves by 40% of net PML  
**optional:** - adjust PMLs used in cat risk portion of standard BCAR score due to changes in reinsurance structure after 1st cat event

After completing these 4 steps, recalculate the BCAR score according to the standard methodology.

*This is different from the answer given in examiner's reports for 2018.Spring and prior. (The syllabus changed for 2018.Fall)*

- (1 point) b. **catastrophe modeling:**  
- parameter selection is critical & use more than 1 model  
**data quality:**  
- accurate property location & coding (type of building)  
- accurate property value & insurance-to-value  
- conduct site reviews (so that information is up-to-date)  
- safeguards to prevent manipulation by insured  
**aggregate loss exposure:**  
- use aggregate losses as a secondary test of model  
**monitoring (MML):**  
- Measure, Monitor, Limit exposure on a continuous basis

- (0.5 points) c. BCAR: - capital must support current & future premium risk  
MCT: - focuses more on current year's risk

**Note:** DCAT usually projects for 3 years, so if you combine MCT with DCAT, you get a longer time horizon (*not part of answer, just a side note.*)

**Answer:** 22

**Points:** 2.00 points

**Source:** CIA.Disclosure, CIA.Runoff, CIA.Discnt

- (0.5 points) a. Any 2 of:
- diversification: - by line of business (*more lines is better*)
  - diversification: - geographically (*greater diversification is better*)
  - U/W limit: - lower is better
  - reinsurance: - more sources of reinsurance is better
- (0.5 points) b. - discount the paid & unpaid amounts at time  $t$  back to time  $t - 1$   
- subtract investment income earned during calendar year  $t$  on supporting assets and liabilities
- (1 point) c. Any 4 of: [Hint: **MARY-(IE)-CapG**]
- M**ethods for asset valuation and reporting investment income
  - A**llocation of assets and investment income by LOB
  - R**eturn on assets at balance sheet date
  - Y**ield on assets acquired after balance sheet date
  - I**nvestment **E**xpenses and losses from default
  - CapG**: capital gains/losses on assets sold after balance sheet date
- Notes:**
- a. *from wiki article CIA.Disclosure*
  - b. *from wiki article CIA.Runoff and 2016.Fall #26d*
  - c. *from wiki article CIA.Discnt and **BattleHack #1: Top Questions***

Answer: 23

Points: 2.75 points

Source: Odo.FinReg, IFA.Solvency2

- (1.5 points) a. **3 pillars:** [Hint: QGT]
- Q**uantitative Pillar:
    - sets SCR & MCR (*Solvency Capital Requirement & Minimum Capital Requirement*)
    - SCR corresponds to 99.5% VaR (*Value at Risk*)
  - G**overnance Pillar:
    - requires adequate governance for:
      - internal audit
      - actuarial
      - risk management
      - compliance
  - T**ransparency
    - supervisory reporting & public disclosure  
(*increases market discipline because companies know their decisions are public*)
- (0.5 points) b. - the balancing amount required to bring the best estimate of loss reserves before ENID up to an amount allowing for all possible future outcomes
- (0.75 points) c. Any 3 of: consider...
- future settlements of past events
  - potential future claims related to current exposures
  - catastrophes
  - court awards
  - legislative changes

Answer: 24

Points: 2.00 points

Source: OSFI.ORSA

(1.5 points)

- a. Any 3 of:
- risk identification and assessment:**
    - identify & assess the materiality of foreseeable & emerging risks
  - relate risk to capital:**
    - set internal capital using stress-testing techniques
    - must withstand a specified loss without falling below supervisory capital requirements
  - responsibilities of Board of Directors:**
    - review reasonableness & appropriateness of risk profile & capital requirements in the context of board approved risk appetite & risk tolerance
  - monitoring & reporting of risks:**
    - annual reports to Board of Directors & Senior Management on risk profile & capital assessment
  - internal controls & objective review**
    - review for accuracy, integrity, reasonableness
    - objective reviewer: internal or external auditor OR skilled professional not involved in the ORSA process

**NOTE:** *The answers given in the examiner's report for 2015.Fall #23 are very long. I think shorter answers could still receive full credit because each element is only worth 0.5 points.*

(0.5 points)

- b. Any 1 of:
- ORSA considers **more risks** than MCT and includes all material risks
  - ORSA considers **dependencies** and correlations between risks whereas MCT uses a simplified approach that only considers correlation between insurance and asset risk
  - ORSA includes assessment of **internal controls** to allow for better management
  - ORSA allows for the setting of an **internal target** to reflect an insurer's risk appetite
  - ORSA allows for a better **qualitative** assessment of risk (*MCT is only quantitative*)
  - ORSA is **tailored** to a company's own risk profile, whereas MCT is a formula-based approach that is not specific to the company
  - ORSA is more of a **forward-looking** measure
  - ORSA is used for **mitigation** (*or prevention*) of future problems

**Note:**

*- several of these also apply to BCAR versus MCT*



Answer: 25

Points: 3.50 points

Source: CIA.Models

- (1.5 points) a. **model elements:**
- all models require 3 elements: [Hint: **SIR**]
  - model **S**pecification
    - ==> a description of the parts of a model and their interactions (*includes data, assumptions, methods, entities, events*)
  - model **I**mplementation
    - ==> the systems that perform the calculations (*computer programs, spreadsheets,...*)
  - model **R**un
    - ==> the inputs/outputs of the implementation
- (2 points) b. **validating a new model:** (see BattleCard answers for more details if desired)
- review specification:
    - ==> verify that DAMs are appropriate (*D ata, M ethods, A ssumptions*)
  - validate implementation:
    - ==> do backtesting with historical data
  - deal with limitations:
    - ==> understand the range of uses for which the model was designed & tested
  - keep documentation:
    - ==> how the model was chosen & tested (*should also note limitations of model*)
- (2 points) c. For severity of failure, consider: [Hint: **FIF**]
- F**inancial significance: high (*so risk is high*)
  - I**mportance of Model: no info provided
  - F**requency of use: high (*so risk is high*)
- Conclusion:** severity risk is HIGH
- For likelihood of failure, consider
- complexity: - high (*so risk is high*)
  - expertise of user: - low (*so risk is high*)
  - docs: - none (*so risk is high*)
  - testing: - none (*so risk is high*)
- Conclusion:** likelihood of failure is HIGH
- Overall conclusion:** risk of model failure is HIGH

**Exam:** BattleActs 6C Practice Exam 2 (2019.Fall) - [ANSWER SHEET]

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**Answer:** 26

**Points:** 2.00 points

**Source:** OSFI.CorpGov

- (1.5 points) a. Any 2 with 2 sub-points: (See 2015.Spring #4 for other answers)
- Risk Appetite Statement
    - reflects aggregate level of risk
    - reflects type of risk
  - Risk limit/Risk tolerance is the allocation of the FRFI's risk appetite statement to
    - specific risk categories (*IMCO: insurance, market, credit, operational*)
    - line of business
  - Roles/Responsibilities of those implementing Risk Appetite Framework
    - Board of Directors
    - Senior Management
- (0.5 points) b. elements of good corporate governance:
- **incentivize** good corporate behaviour
  - **enable monitoring** of operations & performance

Answer: 27

Points: 1.75 points

Source: CIA.Subseq

(0.25 points) a. **subsequent event:**  
- an event the AA becomes aware of after the calculation date but before the report date

(1.5 points) b. i - actuary became aware after the CalcDt but before the RptDt, therefore this is a subsequent event and we're on the middle branch  
- Error: no  
- **W**hen did event occur: after CalcDt  
- **D**ifferent (*did the event make the entity different?*) : yes, before CalcDt  
(*failure provided further evidence of deteriorating conditions with reinsurer*)  
--> **reflect** (*assuming the event is material*)

ii - actuary became aware after the CalcDt but before the RptDt, therefore this is a subsequent event and we're on the middle branch  
- Error: no  
- **W**hen did event occur: after CalcDt  
- **D**ifferent (*did the event make the entity different?*) : yes, after CalcDt  
- **P**urpose: report on entity as it was  
--> **inform only** (*assuming the event is material*)

iii - actuary became aware after the CalcDt but before the RptDt, therefore this is a subsequent event and we're on the middle branch  
- Error: no  
- **W**hen did event occur: after CalcDt  
- **D**ifferent (*did the event make the entity different?*) : yes, after CalcDt  
- **P**urpose: report on entity as it was  
--> **inform only** (*assuming the event is material*)

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**Answer:** 28

**Points:** 2.75 points

**Source:** OSFI.AA

- (1 point) a. **legal requirements:** Any 4 of...
- insurer must appoint an AA
  - insurer must notify OSFI of the appointment
  - AA must be a FCIA
  - AA cannot be CEO/COO or anything similar without authorization from OSFI
  - AA cannot be CFO without audit committee permission
  - insurer must notify OSFI if the Board of Directors revokes AA's appointment
  - outgoing AA must submit report to Board of Directors & OSFI on reasons for leaving
  - incoming must review outgoing AA's report within 15 days (*if report is available*)
- (1 point) b. **roles & duties:** Any 4: See 2016.Fall #34c
- perform **valuation** of policy liabilities at year-end using accepted actuarial practice
  - produce **AA** report
  - produce annual **financial position** report to Board of Directors
  - produce **financial condition** report when directed by OSFI, possibly using DCAT
  - produce **MAE report** (Material Adverse Event) for items requiring rectification
  - produce **policyholder report** on whether policyholders are treated fairly regarding dividends, bonuses, other benefits
  - **final opinion/memo** on financial statement items requiring significant calcs or judgment
- (0.75 point) Hint: **AAC** See 2016.Fall #27f
- A**ssist OSFI in assessing insurer safety & soundness
  - A**ssist AA by providing independent advice and a source for professional development
  - C**onfidence: increase confidence in the AA with management, public, regulators