1. **Learning Objectives:**

2. The candidate will understand an actuarial appraisal.

**Learning Outcomes:**

(2a) Differentiate the components of an actuarial appraisal versus an embedded value.

(2c) Describe risks associated with interpreting an actuarial appraisal and an embedded value.

(2d) Differentiate traditional, European, and market-consistent embedded value.

**Sources:**

Embedded Value: Practice and Theory

Robert Frasca and Ken LaSorella

**Commentary on Question:**

*Commentary listed underneath question component.*

**Solution:**

(a) List differences between an embedded value (EV) calculation and an actuarial appraisal calculation.

**Commentary on Question:**

*Most candidates did well on this section of the question. Credit was also given to candidates who explained the relationship between the two values, namely that the actuarial appraisal can not be directly computed from the embedded value due to differences in assumptions, but that an appraisal could be approximated from the embedded value by making adjustments and adding in the expected value of new business.***

<table>
<thead>
<tr>
<th>Embedded Value</th>
<th>Actuarial Appraisal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not include future new business</td>
<td>Includes future new business</td>
</tr>
<tr>
<td>Uses lower discount rates</td>
<td>Uses higher discount rates</td>
</tr>
<tr>
<td>Uses company specific expense assumptions</td>
<td>Uses prevailing market expense assumptions</td>
</tr>
<tr>
<td>Often used to justify stock prices or for performance-based compensation</td>
<td>Often used in Merger and Acquisition situations</td>
</tr>
</tbody>
</table>
1. Continued

(b) List and describe the components of an EV.

Commentary on Question:
This was primarily addressed in section 2 of the source material.

Most candidates identified the two main components. To obtain full credit, the candidates needed to demonstrate understanding of the importance of the realizable value in the adjusted net worth (that it included non-admitted assets with realizable value, and excluded intangibles that did not have realizable value such as goodwill).

Two primary components:
Adjusted Net Worth (ANW) and In-Force Business Value (IBV)
EV = ANW + IBV

Adjusted Net Worth
• Adjusted net worth is the realizable value of capital and surplus
• It includes both required capital and free surplus
• It includes non-admitted assets that have realizable value,
• And excludes intangible assets that do not have realizable value such as goodwill.

In-Force Business Value
• Present value of after-tax statutory book value of profits less the present value of the cost of capital.
• Computed using best estimate assumptions
• Discounted at the risk discount rate

(c) Create an analysis of movement exhibit for the in force business value (IBV) between 12/31/2018 and 12/31/2019. Show your work.

Commentary on Question:
This is based on section 5 of the source material. This was the section most candidates struggled with. In order to get full credit, the candidates were required to create a table that showed the Opening IBV, the revised IBV, the target IBV, and the Ending IBV. Partial credit was given to students if they correctly outlined the table, even if they did not have any numbers included.
For contribution from new business:
EC(new business) = VNB for 2019 only * (1 + risk discount rate) ^ (1/2)
= 8 * (1.08)^((1/2) = 8.3

For contribution from in force business:
EC(in force business) = (IBV_{t-1} + RC_{t-1}) \times RDR
= (206 + 75\times2) \times .08 = 28.5

Note that this should be starting with the revised EV.
2. Learning Objectives:
   1. The candidate will understand and apply valuation principles for insurance contracts.

Learning Outcomes:
(1a) Describe the types of claim reserves (e.g., due and unpaid, ICOS, IBNR, LAE, PVANYD).

(1c) Calculate appropriate claim reserves given data.

(1e) Evaluate data resources and appropriateness for calculating reserves.

Sources:
Page 661 - 665 in Group Insurance

Commentary on Question:
Candidates performed well on parts a and b. Some candidates switched dates or left out a status from b. Most candidates understood the point of part c. Candidates who made progress towards the solution received partial credit.

Solution:
(a) Describe product features specific to long-term contracts that must be considered in the calculation of claims reserves.

<table>
<thead>
<tr>
<th>Periodic benefits</th>
<th>Benefit is usually specified daily or monthly amount.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term benefit periods</td>
<td>Maximum benefit periods longer than other health benefits; may be to age 65 or lifetime.</td>
</tr>
<tr>
<td>Elimination periods</td>
<td>Period of time after insured event occurs but before benefits accrue</td>
</tr>
<tr>
<td>Optional benefits</td>
<td>May affect timing or amount of monthly payments. Can include partial disability benefits and cost of living adjustments.</td>
</tr>
<tr>
<td>Integration of benefits</td>
<td>May have provisions that coordinate with Social Security or Medicare.</td>
</tr>
<tr>
<td>Limitations and exclusions</td>
<td>E.g. exclusion for self-inflicted injuries and limited pay periods for mental illness claims</td>
</tr>
</tbody>
</table>

(b) Sketch a timeline showing the progress of long-term claims through incurred but not reported (IBNR), pending, and open status, identifying each category and important dates:

(i) For claims that are reported during the elimination period.

(ii) For claims that are reported after the elimination period.
2. Continued

(i) For claims that are reported during the elimination period.

The three categories of claims can be illustrated by a timeline. For claims that are reported during the elimination period, the timeline typically looks like the following:

```
IBNR    Pending    Open

Incural Date   Report Date   Approval Date   End of EP   End of BP
```

- The approval date and end of the EP can be switched.

(ii) For claims that are reported after the elimination period.

For claims that are reported after the completion of the elimination period, the timeline looks like the following:

```
IBNR    Pending    Open

Incural Date   End of EP   Report Date   Approval Date   End of BP
```

(c) Calculate the annualized interest rate that was used to set the tabular reserve. Show your work.

- Identifying that there are 2 payment periods left.
  - Max # benefit periods (Sum 6 through 41) -> 36

<table>
<thead>
<tr>
<th>Period</th>
<th>Elim Prd</th>
<th>6</th>
<th>:</th>
<th>39</th>
<th>40</th>
<th>41</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- < just paid
- < remaining possible payment

- Set up reserve formula for the remaining two payments

\[
R = B_{40} \times C_{40} \times v + B_{41} \times C_{41} \times v^2
\]
2. Continued

- Correctly calculate the continuance probabilities to durations 40 and 41

<table>
<thead>
<tr>
<th>Duration</th>
<th>Cont Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>95.238%</td>
</tr>
<tr>
<td>41</td>
<td>90.744%</td>
</tr>
</tbody>
</table>

- Correctly calculate the benefit x continuance probability (B * C) for durations 40 and 41

<table>
<thead>
<tr>
<th>Duration</th>
<th>Ben x Cont Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>$1,904.76</td>
</tr>
<tr>
<td>41</td>
<td>$1,814.89</td>
</tr>
</tbody>
</table>

- Set up the reserve formula as a quadratic equation with the calculated components.

\[
R = B_{40} \times C_{40} \times v + B_{41} \times C_{41} \times v^2
\]

\[
3,691 = 1,904.76v + 1,814.89v^2
\]

- Then solve for v using quadratic formula.

\[
a = \$1,814.89 \\
b = \$1,904.76 \\
c = \$(3,691.00)
\]

\[
(- b \pm \sqrt{b^2 - 4 \times a \times c}) / 2a
\]

6.44% Annualized
3. **Learning Objectives:**
   1. The candidate will understand and apply valuation principles for insurance contracts.

**Learning Outcomes:**
1. **(1b)** Explain the limitations and biases of the traditional valuation methods.
2. **(1c)** Calculate appropriate claim reserves given data.
3. **(1f)** Describe, calculate and evaluate non-claim reserves and explain when each is required.
4. **(1g)** Apply applicable standards of practice related to reserving.

**Sources:**
- GHA-103-16 Health Reserves (John Lloyd)
- ASOP 23

**Commentary on Question:**
*Commentary listed underneath question component.*

**Solution:**
(a) Recommend why each of the following methods may or may not be appropriate to use for reserving this group. Justify your answer.

(i) Development Method
(ii) Loss Ratio Method
(iii) Case Reserves Method
(iv) Projection Method

**Commentary on Question:**
*Candidates did well identifying reasons why each methodology is appropriate or not appropriate for pricing a new group without historical claims experience.*

Development Method
Appropriate
- Common in the Health industry;
- HMO experience with adjustments or a manual completion factor could be used as a proxy to estimate the reserves for the new group.
3. Continued

Not appropriate
- Relies on historical patterns that do not exist on a new block of business
- Assumes consistent payment patterns

Loss Ratio Method
Appropriate
- Good when exposure data or historical claims unavailable
- Pricing or projected loss ratios could be used

Not Appropriate
- Using pricing loss ratios wouldn’t react to emerging experience

Case Reserve Method
Not Appropriate
- Most common for individual, large catastrophic claims, not for large blocks of business
- Extremely labor intensive for 10,000 members

Projection Method
Appropriate
- Similar to LR method, the projection could be used when historical claims are unavailable
- A projected PMPM can be used based on pricing assumptions

Not Appropriate
- Typically requires a historical claim rate as a function of membership which is unavailable for this block
- There is not historical data to trend forward to future periods

(b) Describe the considerations that should be made in accordance with ASOP 23 when using the data.

Commentary on Question:
Candidates frequently listed the considerations when selecting data from ASOP 23 and not the considerations when using data. Partial credit was given.

- The data are of sufficient quality to perform the analysis
- The data require enhancement before the analysis can be performed, and it is practical to obtain additional or corrected data that will allow the analysis to be performed
3. Continued

- Judgmental adjustments or assumptions can be applied to the data that allow the actuary to perform the analysis. Any judgmental adjustments to data or assumptions should be disclosed in accordance with section 4.1(f). If the actuary judges that the use of the data, even with adjustments and assumptions applied, may cause the results to be highly uncertain or contain a significant bias, the actuary may choose to complete the assignment but should disclose the potential existence of the uncertainty or bias, and, if reasonably determinable, the nature and potential magnitude of such uncertainty or bias, in accordance with section 4.1(g). Alternatively, the actuary may compensate for the data deficiencies by adjusting the results, such as by increasing the range of reasonable estimates, and disclose the adjustments, in accordance with section 4.1(f).

- If the actuary believes that the data are likely to contain significant defects, the actuary should determine, if practical, the nature and extent of any checking, verification, or audit of the data that has been performed. Then, if, in the actuary’s professional judgement, a more extensive review is needed, the actuary should arrange for such a review prior to completing the assignment.

- If, in the actuary’s professional judgement, the data are so inadequate that the data cannot be used to satisfy the purpose of the analysis, then the actuary should obtain different data or decline to complete the data.

(c) Calculate the total claim IBNR reserve as of March 31 for the group. Show your work.

**Commentary on Question:**
*Candidates did well on the reserve calculation. A common mistake was not multiplying the IBNR PMPM by membership, and some candidates multiplied the final IBNR by 12 months.*

<table>
<thead>
<tr>
<th></th>
<th>Cumulative Paid by incurred month (a)</th>
<th>Completion Factor (b)</th>
<th>Incurred Estimate (c = a / b)</th>
<th>IBNR (d = c – a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>130</td>
<td>81.30%</td>
<td>159.9</td>
<td>29.9</td>
</tr>
<tr>
<td>Feb</td>
<td>89</td>
<td>65.20%</td>
<td>136.5</td>
<td>47.5</td>
</tr>
<tr>
<td>Mar</td>
<td>38</td>
<td>23.90%</td>
<td>159</td>
<td>121</td>
</tr>
<tr>
<td>Total PMPM</td>
<td></td>
<td></td>
<td></td>
<td>198.4</td>
</tr>
<tr>
<td>Total $</td>
<td></td>
<td></td>
<td></td>
<td>$198.4 *</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10,000 mbrs =</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$1,984,000</td>
</tr>
</tbody>
</table>

GH FVA Fall 2019 Solutions
3. Continued

(d)

(i) Describe each of the above provisions.

(ii) Explain reserving considerations for each of the above provisions.

Commentary on Question:
Candidates did well describing the provisions but sometimes confused risk based payment with risk adjusted revenue payment. Some reserving provisions could apply to more than one of the considerations.

(i) Descriptions

Risk based payment: The provider shares risk based on a targeted cost per covered member or a targeted loss ratio.

Bonus or incentive contracts: These payments are for goals less directly linked to claims, such as utilization metrics (e.g. hospital days / 1,000) or childhood inoculation rates.

Stop loss provisions: The provider may limit their risk by purchasing stop-loss coverage from the managed-care organization, for example over a large deductible such as $150,000 or for specific procedures such as transplants.

(ii) Reserving considerations

Risk based payment
- Liabilities are based on projected contractual payout, which is often the difference between target costs and projected costs.
- Projection of outcome costs is normally based on incurred claims which are estimated by normal actuarial techniques.
- Final settlement is often lagged after the contract period to minimize the effect of estimates. Estimates of the final settlement must be made at each valuation date.
- Reserves used in developing these claim costs typically are best estimate, without conservative margin.
- Contracts may include stop-loss or other carve-outs, which must be considered when estimating liabilities.
- Provision for adverse deviation should be included in the estimates of provider liabilities, with a goal of producing sufficient estimates.
- The reserve process should maintain consistency between best estimates for IBNR and the development of provider liabilities.
3. Continued

- Mid-contract variations and contractual estimates often lack sufficient data for accurate estimation, so may be based on pricing assumptions or historical loss ratios

Bonus or incentive contracts
- Estimates are based on utilization studies or other analyses not directly related to financial reporting
- Periodic studies should be updated for current experience

Stop loss provisions
- Stop loss provisions will cause an offset to the provider liability and then a corresponding increase in the carrier claims reserve
4. **Learning Objectives:**
   2. The candidate will understand an actuarial appraisal.

**Learning Outcomes:**
(2d) Differentiate traditional, European, and market-consistent embedded value.

**Sources:**
Embedded Value: Practice and Theory

**Commentary on Question:**
*Generally, candidates were able to score part marks on this question, however, may not have provided sufficient detail or justification to receive full credit.*

**Solution:**
(a) Explain advantages of embedded value reporting for measuring financial performance in contrast to:

(i) Statutory reporting

(ii) US GAAP-like methods

**Commentary on Question:**
*Candidates were required to highlight differences and explain why these differences were advantages to embedded value reporting in order to receive full credit.*

(i) EV provides better analysis explaining the period-to-period movement in values by category.

   EV gives a better picture of realizable value than stat by including nonadmitted assets and liabilities.

(ii) EV assumptions are more frequently updated and better reflect changes in the economic environment.

   EV gives a better picture of realizable value than GAAP by excluding intangibles that aren’t realizable (like US GAAP goodwill).
4. **Continued**

(b) Calculate the following:

(i) Adjusted net worth

(ii) Free surplus

(iii) Value of in-force business

(iv) Total embedded value

Show your work.

**Commentary on Question:**
*Candidates that were able to recall and manipulate the formulae performed well. Most candidates did not remove Balance Sheet Value of Goodwill and Intangibles to calculate Adjusted Net Worth.*

(i) Adjusted Net Worth = Common shareholders' equity under IFRS + FVA - Balance Sheet Value of Goodwill and Intangibles = 6,300 + (200) - 2,000 = 4,100

(ii) Free Surplus = Adjusted Net Worth - Required Capital = 4,100 - 3,600 = 500

(iii) Value of in-force business = PV of Future Profits - PV of CoC = 6,400 - 2,100 = 4,300

(iv) Total embedded value = Adjusted Net Worth + Value of in-force Business = 4,100 + 4,300 = 8,400

(c) Evaluate the directional effect (positive or negative) on embedded value for each of the scenarios without using the table and calculations shown above in part (b). Justify your answers.

**Commentary on Question:**
*Candidates were required to provide justification to be given credit.*

1. Decrease EV - PV of future profits will be reduced
2. Increase EV – greater future growth in assets will increase PVFP
3. Increase EV – greater future growth in assets will increase PVFP
4. Increase EV – higher fair value of current asset portfolio increases ANW
5. Decrease EV – increases PV of cost of capital for in-force
6. Increase EV – larger future block produces higher PVFP
7. Increase EV – lower expenses increases PVFP
8. Increase EV – higher PVFP on life insurance business (but lower on annuities)
4. Continued

(d) Explain potential impacts on embedded value from having operations in multiple countries.

**Commentary on Question:**
*Candidates generally were able to receive part marks on this part of the question.*

General differences between countries affect economic results:
- Business and regulatory environment
- Macroeconomic factors such as economic growth, price and cost levels
- Level of competition
- Market opportunity and sales growth

More direct impacts on EVM calculations:
- Interest rates vary by country, which directly factor into EVM calculations.
- Currency movement effects - income and assets in other jurisdictions are converted to a common currency for financial reporting and EV calculations. This can increase or decrease net income and EV.
- Statutory required capital amounts differ by country, so that the required capital component of the ANW would be different.
- Taxes - e.g. US tax reform had large effects on EV due to lower income tax rate, which might increase EV due to higher PV of future profits, but decrease it due to loss of deferred tax assets.
5. Learning Objectives:
1. The candidate will understand and apply valuation principles for insurance contracts.

Learning Outcomes:
(1c) Calculate appropriate claim reserves given data.
(1d) Reflect environmental factors in reserve calculations (trend, seasonality, claims processing changes, etc.).
(1f) Describe, calculate and evaluate non-claim reserves and explain when each is required.

Sources:
AAA Premium Deficiency Reserves Discussion Paper

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe the situations for which a premium deficiency reserve (PDR) should be established.

Commentary on Question:
The question asked about the situations in which a PDR should be established, which was discussed in Principle 1 of the discussion paper (page 7). The considerations listed there must appear in the solution to receive full credit. Many candidates mentioned other aspects of PDRs, which received partial credit.

Situations that result in a PDR being established include the following:
• A block of business will experience losses over the near term, either because of overall premium inadequacy for that block, or because the losses on a particular subset within the block will exceed the profits on the other subsets.
• A block of business will be profitable in the near term, but long-term guarantees will cause it to be unprofitable over the projection period.

(b) Calculate the total PDR as of 12/31/2018. Show your work.

Commentary on Question:
Many candidates received full credit on parts b, c, and d. Candidates lost points for a) including 2018 results in the 12/31/2018 PDR, b) trending claims incorrectly, and c) calculating the PDR only on a PMPM basis and not calculating the total.
5. Continued

U/W G/L Formula = Premium – Claims – Expense
PDR = PV(Claims) + PV(Expenses) – PV(Premium)

<table>
<thead>
<tr>
<th>As Of</th>
<th>Members</th>
<th>Prem PMPM</th>
<th>Claims PMPM</th>
<th>Expense PMPM</th>
<th>U/W G/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/31/2018</td>
<td>1,000</td>
<td>$800</td>
<td>$765</td>
<td>$15</td>
<td></td>
</tr>
<tr>
<td>12/31/2019</td>
<td>1,000</td>
<td>$800</td>
<td>$765 * 1.03 = $787.95</td>
<td>$15</td>
<td>$800 - $788 - $15 = $-2.95</td>
</tr>
<tr>
<td>12/31/2020</td>
<td>1,000</td>
<td>$800</td>
<td>$788 * 1.03 = $811.59</td>
<td>$15</td>
<td>$800 - $812 - $15 = $-26.59</td>
</tr>
<tr>
<td>12/31/2021</td>
<td>1,000</td>
<td>$800</td>
<td>$812 * 1.03 = $835.94</td>
<td>$15</td>
<td>$800 - $836 - $15 = $-50.94</td>
</tr>
</tbody>
</table>

PDR as of 12/31/2018 = $2.95 + $26.59 + $50.94 = $80.47 PMPM
Total PDR = $80.47 * 12 * 1,000 = $965,696

(c) Calculate the total change in PDR to be recorded in the 12/31/2019 income statement given the new claims projection and your answer from part (b). Show your work.

Commentary on Question:
Candidates received nearly full credit if the calculations were done correctly but used incorrect results from part (b). Some candidates incorrectly recalculated the 12/31/2018 PDR for deriving the change in PDR for 2019.

<table>
<thead>
<tr>
<th>As Of</th>
<th>Members</th>
<th>Prem PMPM</th>
<th>Claims PMPM</th>
<th>Expense PMPM</th>
<th>U/W G/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/31/2019</td>
<td>1,000</td>
<td>$800</td>
<td>$780</td>
<td>$15</td>
<td>$800 - $780 - $15 = $5</td>
</tr>
<tr>
<td>12/31/2020</td>
<td>1,000</td>
<td>$800</td>
<td>$803</td>
<td>$15</td>
<td>$800 - $803 - $15 = $-18</td>
</tr>
<tr>
<td>12/31/2021</td>
<td>1,000</td>
<td>$800</td>
<td>$827</td>
<td>$15</td>
<td>$800 - $827 - $15 = $-42</td>
</tr>
</tbody>
</table>

PDR as of 12/31/2018 = $80.47 PMPM (from part b)
PDR as of 12/31/2019 = $18.00 + $42.00 = $60.00 PMPM
Change in PDR for 2019 = $60.00 - $80.47 = $-20.47
Total Change in PDR = $-20.47 * 12 * 1,000 = $-245,696 (decrease or release of PDR)

(d) Calculate the total gain/loss to be recorded in the 12/31/2019 income statement. Show your work.

Commentary on Question:
Candidates received nearly full credit if the calculations were done correctly but used incorrect results from part (b) or (c). Some candidates did not include the change in PDR in the total gain/loss, and only showed the underwriting gain/loss.
5. Continued

Total gain/loss = Underwriting gain/loss – change in PDR

Underwriting gain/loss for 2019 = $5.00 (from part c)
Change in PDR for 2019 = -$20.47 (from part c)
Gain/loss for 2019 = $5.00 – (-$20.47) = $25.47
Total gain/loss = $25.47 * 12 * 1,000 = $305,696
6. **Learning Objectives:**
1. The candidate will understand and apply valuation principles for insurance contracts.

**Learning Outcomes:**

(1f) Describe, calculate and evaluate non-claim reserves and explain when each is required

**Sources:**
Individual Insurance Chapter 6 pages 218 and 219
AAA Premium Deficiency Reserves Discussion Paper Pg 13-14

**Commentary on Question:**
*Commentary listed underneath question component.*

**Solution:**

(a) List and describe all premium reserves that would be utilized in a financial statement.

**Commentary on Question:**
*Two of the key components of this question are the valuation date and the premium due date. These two components are used to differentiate between the premium reserves.*

**Premium Paid In Advance Reserve (PIA):**
- A policyholder may pay premium before the premium is due for the current renewal period.
- If the premium is due after the valuation date but was paid before the valuation date, the insurer must set up a reserve for such periods until the period occurs for which the premium applies.
- Any amount paid as premium that is not owed is considered as a premium paid in advance reserve.

**Premium Due and Unpaid Reserves (DUP):**
- Sometimes premium payments are made after the premium due date and are still outstanding as of the valuation date.
- When that occurs, some or all of that premium is expected to be received and some credit is taken on the statement (as an asset) for such premium due and unpaid.
- There is a limit put on this. In statutory accounting, this is limited to the smaller of 90 days past due (payments owed in the last 90 days) or one modal premium.
- In any event, such an asset is not taken beyond what might reasonably be expected to be collected.
6. Continued

**Gross Unearned Premium Reserves (UPR):**
- These reserves are required for all contacts where premium was due before the valuation date with a coverage period extending beyond the valuation date.
- The NAIC specifies that the minimum UPR for a given policy is the period beyond the valuation date.
- If there is a contract reserve (which necessitates the calculation of valuation net premium), then the net premium is the minimum; otherwise it is the gross period.
- If the basis is net premium plus contract reserves, then the reserve must still in aggregate, at least equal the gross UPR.

(b) Recommend the appropriate premium reserve amounts for each policy. Justify your answer.

**Policy 001**
- The policyholder was required to pay one $100 premium on 12.16.2019 to cover the period from 12.16.2019 to 1.15.2020. The policyholder seems to have made two payments covering the period all the way to 2.15.2020.
- PIA: Premium covering 1.16.2020 to 2.15.2020 is a premium paid in advance as it was not yet due. Thus, the premium paid in advance reserve is $100.
- DUP: There are no premiums that were due that have been unpaid. Thus, the due and unpaid reserve is $0.
- UPR: The coverage period after the valuation date, 12.31.19, for which a premium is already paid and was due is from 1.1.2020 to 1.15.2020. This is one half of one month of modal premium or $50. Alternately, one can calculate using days where the premium payment covers 31 days so the portion of the premium that is unearned is 15/31 * 100 = $48.39.

**Policy 002**
- PIA: There have been no premiums that have been paid beyond what is owed. $0.
- DUP: The individual owes two modal payments and hence both would be considered Due and Unpaid. There is a limit, however, on statutory calculations of Due and Unpaid to limit the calculation to the minimum of one modal payment or 90 days. Since it has been over 90 days since the premium is due, at most one modal premium or 90 days can be considered due and unpaid. In this case, this is the same value ($300).
- UEP: No collected premium or DUP asset is covering the period beyond 12.31.2019 and hence no Unearned Premium is calculated ($0).
6. Continued

Policy 003

- **PIA**: There have been no premiums that have been paid beyond what is owed. $0.
- **DUP**: The individual owes one modal payment and hence it would be considered Due and Unpaid. There is a limit, however, on statutory calculations of Due and Unpaid to limit the calculation to the minimum of one modal payment or 90 days. As the only missing premium was due in the last 90 days, the entire modal premium is considered Due and Unpaid ($1200).
- **UEP**: The period after the valuation date for which we have counted in asset (either as a collected premium or due and unpaid reserve) in excess of the Paid in Advance liability is considered as a Gross Unearned Premium reserve. The due and unpaid premium covers the period until 11.30.2020. Thus, the Unearned Premium covers the portion of the modal premium from 1.1.2020 to 11.30.2020 or 11/12 of the modal premium (11/12 * 1200 = $1100).