INSTRUCTIONS TO CANDIDATES

1. This 90 point examination consists of 44 questions divided into two sections. Section I contains 16 multiple choice questions worth one point each. Section II contains 28 problem and essay questions worth a total of 74 points.

2. To answer the multiple choice questions, use the short-answer card provided and a number 2 or HB pencil. Mark your short-answer card during the examination period. No additional time will be allowed for this after the exam has ended. Please make your marks dark and fill in the spaces completely. Fill in that it is Spring 2002, and the exam number 5.

   Darken the spaces corresponding to your Candidate ID number. Five rows are available. If your Candidate ID number is fewer than 5 digits, include leading zeros. (For example, if your Candidate ID number is 987, consider that your Candidate ID number is 00987, enter a zero on the first row, a zero on the second row, 9 on the third row, 8 on the fourth row, and 7 on the fifth [last] row.) Please write in your Candidate ID number next to the place where you darken the spaces for your Candidate ID number. Your name, or any other identifying mark, must not appear on the short-answer card.

   For each of the multiple choice questions, select the one best answer and fill in the corresponding letter. One quarter of the point value of the question will be subtracted for each incorrect answer. No points will be added or subtracted for responses left blank.

3. For the problem and essay questions, the number of points for each full question or part of a question is indicated at the beginning of the question or part. Answer these questions on the lined sheets provided in your Examination Envelope. Use dark pencil or ink. Do not use other colors.

   Write your Candidate ID number and the examination number, 5, at the top of each answer sheet. Your name, or any other identifying mark, must not appear.

   Do not answer more than one question on a single sheet of paper. Write on only the lined side of the paper, and be careful to give the number of the question you are answering on each sheet.

   The answer should be concise and confined to the question as posed. When a list of a specific size is requested, do not offer more items in your list than the number requested. For example, if you are requested to list three items, only the first three responses will be graded.
In order to receive full credit or to maximize partial credit on mathematical and computational questions, you must clearly outline your approach in either verbal or mathematical form, showing calculations where necessary. Also, you must clearly specify any additional assumptions you have made to answer the question.

4. Do all problems until you reach the last page of the examination where "END OF EXAMINATION" is marked.

5. Your Examination Envelope is pre-labeled with your Candidate ID number, name, exam number, and test center. Do not remove this label. Keep a record of your Candidate ID number for future inquiries regarding this exam.

6. At the beginning of the examination, check through the exam booklet for any missing or defective pages. The supervisor has additional exams for those candidates who have defective exam booklets.

7. Candidates must remain in the examination center until two hours after the start of the examination. You may leave the examination room to use the restroom with permission from the supervisor. To avoid excessive noise during the end of the examination, candidates may not leave the exam room during the last fifteen minutes of the examination.

8. At the end of the examination, place the short-answer card and all answer sheets in the Examination Envelope. Please insert your answer pages in your envelope in question number order. Insert a numbered page for each question, even if you have not attempted to answer that question. BEFORE YOU TURN THE EXAMINATION ENVELOPE IN TO THE SUPERVISOR, BE SURE TO SIGN IT IN THE SPACE PROVIDED ABOVE THE CUT-OUT WINDOW.

Anything written in the examination booklet will not be graded. Only the short-answer card and the answer sheets will be graded.

9. If you have brought a self-addressed, stamped envelope, you may put the examination booklet and scrap paper inside and submit it separately to the supervisor. It will be mailed to you. (Do not put the self-addressed stamped envelope inside the Examination Envelope.)

If you do not have a self-addressed, stamped envelope, please place the examination booklet in the Examination Envelope and seal the envelope. You may not take it with you. Do not put scrap paper in the Examination Envelope. The supervisor will collect your scrap paper.

Candidates may obtain a copy of the examination by contacting the CAS Office.

All extra answer sheets, scrap paper, etc., must be returned to the supervisor for disposal.

10. Candidates must not give or receive assistance of any kind during the examination. Any cheating, any attempt to cheat, assisting others to cheat, or participating therein, or other improper conduct will result in the Casualty Actuarial Society disqualifying the candidate's paper, and such other disciplinary action as may be deemed appropriate within the guidelines of the CAS Policy on Examination Discipline.

CONTINUE TO NEXT PAGE OF INSTRUCTIONS
11. An examination survey and postage-paid reply envelope are included with the examination. No postage is necessary for surveys mailed within the United States. Candidates mailing the survey outside the United States should use the courtesy reply envelope distributed by your exam supervisor. Please complete the survey and leave it with the examination supervisor, or take the survey and envelope with you when leaving the examination center. Please submit the survey to the CAS Office by May 28, 2002. Please do not enclose the survey in the Examination Envelope.

END OF INSTRUCTIONS
SECTION I, QUESTIONS 1 – 16, MULTIPLE CHOICE QUESTIONS (1 POINT EACH).

1. Based on the Statement of Principles Regarding Property and Casualty Insurance
   Ratemaking, which of the following statements is false?

   A. A rate is an estimate of the expected value of current costs.
   B. A rate provides for all costs associated with the transfer of risk.
   C. A rate provides for the costs associated with an individual risk transfer.
   D. Rates that are actuarially sound comply with the following criteria: reasonable, not
      excessive, not inadequate, and not unfairly discriminatory.
   E. Ratemaking is prospective because the property and casualty insurance rate must be
      developed prior to the transfer of risk.

2. Based on Tiller, "Individual Risk Rating – Study Note," and the following data, calculate the
   experience modification factor using NCCI's "Revised Experience Rating Plan".

   • Expected total loss 210,000
   • Expected primary loss 50,000
   • Actual total loss 320,000
   • Actual primary loss 40,000
   • Ballast factor 30,000
   • Excess loss weighting factor 0.25

   A. Less than 1.070
   B. At least 1.070, but less than 1.080
   C. At least 1.080, but less than 1.090
   D. At least 1.090, but less than 1.110
   E. At least 1.110

   Science, which of the following is not an attribute of a good individual risk rating system?

   A. A system that appropriately balances risk sharing and risk bearing
   B. A system that is responsive to large fluctuations in costs from year to year
   C. A system that is not subject to internal or external manipulation
   D. A system that is simple to administer
   E. A system that is easy to understand

CONTINUED ON NEXT PAGE
4. Based on Schofield, "Going From a Pure Premium to a Rate," and the following data, use the Expense Fee Methodology to calculate the expense fee.

- Earned Premium at Current Rate Level
  - 325,000
- Earned Exposures
  - 1,100
- Total Fixed Expense Ratio
  - 0.13
- Total Variable Expense Ratio including Profit and Contingency Provision
  - 0.23

A. Less than $40
B. At least $40, but less than $60
C. At least $60, but less than $80
D. At least $80, but less than $100
E. At least $100

5. Based on Malecki and Flitner, Commercial Liability Insurance and Risk Management, which of the following are covered under premises and operations liability insurance?

A. Property damage to policyholder's merchandise when a customer slips on wet floor in the policyholder's store
B. Bodily injury to policyholder's employee who slips on a wet floor in the policyholder's store
C. Bodily injury to a passerby when a crane operated by the policyholder's employee negligently strikes the passerby
D. Economic loss to a competitor's business because of misleading advertisements by the policyholder
E. Property damage to pipes repaired by a policyholder, who is a contractor, when the pipes burst due to the policyholder's negligent workmanship
6. According to Trupin and Flitner, *Commercial Property Insurance and Risk Management*, which of the following is not included in the building coverage often called the "building item"?

A. Completed additions  
B. Owned personal property that is used to maintain the building  
C. Outdoor fixtures  
D. Permanently installed equipment and machinery  
E. All of the above are included.

7. According to Trupin and Flitner, *Commercial Property Insurance and Risk Management*, which of the following are generally included as covered property under the Building and Personal Property Coverage Form?

A. Money  
B. Animals held for sale  
C. Land and water  
D. Outdoor antennas  
E. None of A, B, C, D are included as covered property.

8. Based on Insurance Services Office, Inc., *Personal Automobile Manual (Effective 6-98)*, which of the following is false?

A. The Manual describes the types of vehicles eligible for coverage.  
B. The Manual specifies that all Liability and Physical Damage policies must have a policy period of no longer than 12 months.  
C. The Manual specifies which drivers must be categorized as "Youthful Operators".  
E. The Manual describes the primary and secondary classifications applicable.
9. According to Bouska, “Exposure Bases Revisited,” which of the following statements is true?

A. The factor selected as the exposure base should generally have a uniform multiplicative relationship with all the expected loss costs and rates.
B. The exposure base is considered a rating variable since the dividing line between the two may be somewhat arbitrary at times.
C. The failure to accurately predict the frequency and/or severity of future losses is usually a sign of a failing exposure base.
D. For a given line of business more than one medium should be selected as the exposure base.
E. None of A, B, C, D are true.

10. Boor, “Complement of Credibility,” discusses using competitor's rates as the complement of credibility when using ratemaking data that is unreliable. Derive the pure premium complement of credibility for Small Company, Class 1, pure premium using the data below.

Small Company, Class 1
• Present manual rate $80
• Permissible loss ratio 60%

Competitor Company, Class 1
• Present manual rate $70
• Permissible loss ratio 62%
• Projected Loss Ratio from Schedule P Analysis 75%
• Average frequency of loss per exposure 0.040

• Due to the assumed growth of Small Company, 10% more losses are expected for Small Company than Competitor Company.

A. Less than $45
B. At least $45, but less than $50
C. At least $50, but less than $55
D. At least $55, but less than $60
E. At least $60
11. According to Boor, "The Impact of the Insurance Economic Cycle on Insurance Pricing," which of the following is not typical at the beginning of a hard market?

A. Price increases
B. Increased premium to surplus ratios in marginal companies may restrict the ability of the company to grow.
C. A portion of the new profitability is absorbed into loss reserve strengthening.
D. New capital will be drawn into the insurance industry allowing greater premium volume for marginal companies.
E. None of A, B, C, D are typical at the beginning of a hard market.

12. According to Moncher, "Study Note: NCCI Data Collection Calls and Statistical Plans," which of the following is true?

A. In the Policy Year Financial Call, claim count information is not reported.
B. In the Policy Year Financial Call, incremental calendar year earned premium by policy year is reported.
C. In the Policy Year Financial Call, outstanding reserves are not separated from IBNR reserves.
D. In the Policy Year Financial Call, the latest evaluation of each of the last eight years is reported separately, with all prior years grouped together.
E. In the Policy Year Financial Call, Allocated Loss Adjustment Expenses (ALAE) is reported separately from Loss.

CONTINUED ON NEXT PAGE
13. Based on Graves & Castillo, "Commercial General Liability Ratemaking for Premises and Operations," and the following information, calculate the "Earned Premium at Present Rate Level" for the Policy Year ending December 31, 2002, to use in calculating the statewide rate level indications.

- Assumed Effective Date of Proposed Rate Change: January 1, 2003
- Selected Exposure Trend: 0%

<table>
<thead>
<tr>
<th>Type of Policy</th>
<th>Policy Year Ending December 31, 2001 Total Limits</th>
<th>Policy Year Ending December 31, 2001 Earned Premium at Present Manual Rates (PPMR)</th>
<th>Published Package Modification Factor (PMF)</th>
<th>Implicit Package Modification Factors (IMPF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monoline</td>
<td>$900,000</td>
<td>$800,000</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Multi-line (office)</td>
<td>$250,000</td>
<td>$200,000</td>
<td>0.90</td>
<td>0.950</td>
</tr>
<tr>
<td>Multi-line (Mercantile)</td>
<td>$350,000</td>
<td>$300,000</td>
<td>0.95</td>
<td>0.900</td>
</tr>
<tr>
<td>Multi-line (Service)</td>
<td>$500,000</td>
<td>$400,000</td>
<td>0.85</td>
<td>0.900</td>
</tr>
<tr>
<td>Total</td>
<td>$2,000,000</td>
<td>$1,700,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A. Less than $1,600,000
B. At least $1,600,000, but less than $1,700,000
C. At least $1,700,000, but less than $1,800,000
D. At least $1,800,000, but less than $1,900,000
E. $1,900,000 or more

14. Based on Brown and Schmitz, "Study Note Reading on Deductibles," and the following full-coverage loss experience, calculate the excess ratio for a $500 deductible.

<table>
<thead>
<tr>
<th>Loss Size ($)</th>
<th>Number of Claims</th>
<th>Amount of Losses ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 100</td>
<td>1,100</td>
<td>77,000</td>
</tr>
<tr>
<td>101 – 250</td>
<td>800</td>
<td>148,000</td>
</tr>
<tr>
<td>251 – 500</td>
<td>500</td>
<td>180,000</td>
</tr>
<tr>
<td>501 – 1000</td>
<td>350</td>
<td>245,000</td>
</tr>
<tr>
<td>1001 – 2000</td>
<td>200</td>
<td>300,000</td>
</tr>
<tr>
<td>Over 2000</td>
<td>50</td>
<td>150,000</td>
</tr>
<tr>
<td>Total</td>
<td>2,100</td>
<td>1,100,000</td>
</tr>
</tbody>
</table>

A. Less than 0.250
B. At least 0.250, but less than 0.350
C. At least 0.350, but less than 0.450
D. At least 0.450, but less than 0.550
E. At least 0.550
15. Based on Hamilton and Malecki, Personal Insurance: Property and Liability, determine the recovery from an unendorsed ISO HO-3 given the following circumstance.

Joe owns a home insured for $100,000 under an HO-3 policy with a $2,000 deductible. At the time the insurance was purchased, the house had a replacement cost of $120,000. Joe’s house was damaged by a deer breaking into Joe’s house and the subsequent attempts of the deer to escape. Joe’s house sustains a loss valued at $23,500 actual cash value (ACV) but will cost $31,600 to repair. At the time of the loss, the house had a replacement value of $150,000. Assume that the loss is to the dwelling only and there was no loss to personal property.

A. Joe has no coverage since this is not a covered cause of loss.
B. Less than $20,000
C. At least $20,000, but less than $24,500
D. At least $24,500, but less than $29,000
E. At least $29,000

16. Based on Hamilton and Malecki, Personal Insurance: Property and Liability, determine how the ISO HO-4 would respond to the following claim.

Bonnie rents an apartment and has an HO-4 policy. While cooking dinner, Bonnie starts a grease fire that damages her kitchen and makes the apartment uninhabitable until repairs are completed. While Bonnie cannot live in her apartment she rents a room in a hotel. Bonnie does not have to pay her normal apartment rent while the repairs are being made to the apartment. The normal monthly expenses Bonnie pays and her monthly expenses while living in the hotel are provided in the table.

<table>
<thead>
<tr>
<th>Expense</th>
<th>Normal</th>
<th>Hotel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent</td>
<td>$650</td>
<td>$800</td>
</tr>
<tr>
<td>Utilities</td>
<td>$100</td>
<td>$ 0</td>
</tr>
<tr>
<td>Phone</td>
<td>$ 75</td>
<td>$ 75</td>
</tr>
<tr>
<td>Laundry</td>
<td>$ 25</td>
<td>$ 40</td>
</tr>
<tr>
<td>Food</td>
<td>$175</td>
<td>$250</td>
</tr>
</tbody>
</table>

A. Bonnie has no coverage since fire is not a covered peril under the HO-4.
B. Less than $100 per month
C. At least $100, but less than $300 per month
D. At least $300, but less than $1000 per month
E. At least $1000 per month

CONTINUED ON NEXT PAGE
17. (4 points)

Based on McClanahan, "Ratemaking," chapter 2 of Foundations of Casualty Actuarial Science, and the following data, answer the questions below. Show all work.

- Projected rates to be effective January 1, 2003 and in effect for 1 year.
- Target loss and ALAE ratio is 65%.
- Experience is from the accident period January 1, 2000 to June 30, 2001.
- Developed accident period loss and ALAE is $21,500.
- Annual trend factor is 3%.
- All policies have one-year terms and are written uniformly throughout the year.
- The rate on January 1, 1999 was $120 per exposure.

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Rate Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1, 2000</td>
<td>+10%</td>
</tr>
<tr>
<td>January 1, 2001</td>
<td>-15%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Written Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>200</td>
</tr>
<tr>
<td>1999</td>
<td>200</td>
</tr>
<tr>
<td>2000</td>
<td>200</td>
</tr>
<tr>
<td>2001</td>
<td>200</td>
</tr>
</tbody>
</table>

a. (1 point)

Calculate the experience period trended developed loss and ALAE.

b. (2 points)

Calculate the experience period on-level earned premium.

c. (1 point)

Calculate the indicated statewide rate level change.
18. (2 points)

Based on McClenahan, “Ratemaking,” chapter 2, Foundations of Casualty Actuarial Science, and the following data, answer the questions below. Show all work.

Earned Premium 100,000
Written Premium 150,000
Incurred Loss 80,000
Incurred ALAE 10,000
Incurred ULAE 10,000
Commission and Other Acquisition Expenses 30,000
Taxes, Licenses, and Fees 1,500
General Expense 7,500
Target Loss and ALAE Ratio 60%

a. (1 point)

Calculate the profit and contingency factor.

b. (1 point)

Describe the distinction between the profit factor and the contingency factor.
19. (4 points)

Based on in Finger, “Risk Classification,” chapter 5, Foundations in Casualty Actuarial Science, and the data provided, use the loss ratio approach to calculate territorial relativities. Show all work.

- Assume a full credibility standard of 1,082.
- Partial credibilities should be calculated according to the square root rule.

<table>
<thead>
<tr>
<th>Territory</th>
<th>Premium at Current Rates</th>
<th>Incurred Losses</th>
<th>Average Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100,000</td>
<td>80,000</td>
<td>100</td>
</tr>
<tr>
<td>B</td>
<td>120,000</td>
<td>100,000</td>
<td>110</td>
</tr>
<tr>
<td>C</td>
<td>200,000</td>
<td>250,000</td>
<td>100</td>
</tr>
</tbody>
</table>

a. (2 points)

Calculate the credibility weighted adjustment factors.

b. (1 point)

Calculate the off-balance factor.

c. (1 point)

Assuming an overall rate level change of 5%, calculate the rate change for each territory.

20. (3 points)

According to Hamilton and Malecki, Personal Insurance: Property and Liability, uninsured motorist, underinsured motorist, and no-fault coverages are attempts to decrease the number of uncompensated and undercompensated auto accident victims.

a. (1 point)

State two weaknesses of underinsured and uninsured coverage cited by Hamilton and Malecki.

b. (2 points)

Briefly describe the following types of no-fault plans:

1. Modified no-fault plans
2. Choice no-fault plans
21. (3 points)

Webb et al., Insurance Operations, describe four kinds of auto insurance residual market mechanisms. State three of these four mechanisms and describe how each of those listed operate with respect to (i) assignment of policies, insurer participation, and burden sharing, and (ii) the issuing (or servicing) carriers.

22. (2 points)

Based on Webb et al., Insurance Operations, state and describe the three sources of legal liability.

23. (3 points)

Aretha is insured under an Insurance Services Office, Inc., Personal Auto Policy (Edition 6-98) with the following coverages and limits.

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liability</td>
<td>$50,000/$100,000/$15,000</td>
</tr>
<tr>
<td>Medical Payments</td>
<td>$5,000</td>
</tr>
<tr>
<td>Uninsured Motorists</td>
<td>$50,000/$100,000</td>
</tr>
<tr>
<td>Damage to Your Auto Collision</td>
<td>$500 deductible</td>
</tr>
<tr>
<td>Other Than Collision</td>
<td>$250 deductible</td>
</tr>
</tbody>
</table>

Explain whether and to what extent coverage under Aretha’s PAP would apply for each of the following situations. Assume the events are independent of each other.

a. (1½ points)

Aretha borrowed a friend’s car (the friend also is insured by a PAP that does not provide collision coverage). While Aretha is sitting in the car, which is legally parked, it is sideswiped by a hit-and-run vehicle, causing $1,000 damage to the friend’s car. Aretha is injured and requires medical treatment that costs $2,500.

b. (1½ points)

The following day while driving her own car, Aretha slams on her brakes and swerves to avoid hitting a squirrel. Her daughter Polly strikes her head on the windshield and requires medical treatment that costs $1,000. The car also hits a curb, causing a tire to go flat. It costs $300 to replace the tire.
24. (3 points)


a. (1 point)

Describe the principle of indemnity.

b. (1 point)

What two related purposes are served by the principle of indemnity?

c. (1 point)

State two insurance policy practices that appear to violate the principle of indemnity.

25. (2 points)

According to Malecki and Flitner, *Commercial Liability Insurance and Risk Management*, an insured must be legally obligated to pay damages in order for Coverage A of the Commercial General Liability policy to respond. Describe four of the other five criteria necessary for a liability claim to be covered under Coverage A of the Commercial General Liability policy.

26. (2 points)


a. (1 point)

Briefly describe the following two optional benefits available under disability income insurance:

1. Cost-of-living provision
2. Guaranteed insurability provision

b. (1 point)

State two reasons why an insurer may not issue disability income coverage for more than a certain percentage of the worker's monthly wage.
27. (6 points)

Based on Feldblum, "Workers' Compensation Ratemaking," and the information shown below, answer the following questions. Show all work.

- Through the use of deviations and schedule rating, your company has been charging 25% below its manual rates for workers compensation.
- Policy year 2000 earned premium as of December 31, 2001 = $90 million.
- Policy year 2000 reported loss as of December 31, 2001 = $40 million.
- Written premium is distributed uniformly by month.
- Policy term is 12 months.
- Policy audits occur 6 months after expiration and produce a 10% increase in premium.
- The following rate changes have been implemented:

<table>
<thead>
<tr>
<th>Date</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1, 1999</td>
<td>-6.0%</td>
</tr>
<tr>
<td>July 1, 2000</td>
<td>+10.0%</td>
</tr>
<tr>
<td>July 1, 2001</td>
<td>+ 7.0%</td>
</tr>
</tbody>
</table>

- There was a 5% increase in the benefit levels effective January 1, 2001. There was no rate change to account for this.
- Loss development factor = 1.80.
- Annual loss trend = 8%.
- Annual wage trend = 4%.
- The effective date for this analysis is July 1, 2002.
- Rates will be effective for a period of one year.
- Loss adjustment expense = 20% of loss.
- The target loss and loss adjustment expense ratio is 72%.

a. (2 points)

What is the policy year 2000 earned premium after all appropriate adjustments for premium development, current rate level, premium trend, and benefit changes?

b. (2 points)

What are the policy year 2000 losses after the appropriate adjustments for loss development, loss trend, and benefit changes?

c. (½ point)

What is the projected loss and loss adjustment expense ratio for policy year 2000?

d. (½ point)

What is the indicated rate changed based on experience from policy year 2000?

e. (1 point)

What should the ratio of charged to manual premium be in order to produce the target loss and loss adjustment expense ratio?
28. (2 points)

Based on Feldblum, “Workers' Compensation Ratemaking,” state three reasons that higher unemployment may increase average claims severity.

29. (3 points)

Based on Schofield, “Going From a Pure Premium to a Rate,” and the information below, use the Worker's Compensation Method to calculate the discounted premium. Show all work.

- Standard Premium of 500,000
- For each premium gradation of 200,000 above 10,000, commissions and general expenses decrease by 25%.
- For the first 10,000 of Standard Premium commissions are 15% and general expenses are 10%.
- All other expenses total 8% of the discounted premium.

30. (2 points)

Using the technique outlined by Lange in “The Interpretation of Liability Increased Limits Statistics,” the following data, and stating any assumptions you may make, determine the Increased Limit Factor for the $50,000 limit. Show all work.

<table>
<thead>
<tr>
<th>Layer of Loss</th>
<th>Policy Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>10,000 – 25,000</td>
<td>500,000</td>
</tr>
<tr>
<td>25,000 – 75,000</td>
<td>300,000</td>
</tr>
<tr>
<td>75,000 – 100,000</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td>750,000</td>
</tr>
<tr>
<td></td>
<td>300,000</td>
</tr>
<tr>
<td></td>
<td>100,000</td>
</tr>
<tr>
<td></td>
<td>15,000</td>
</tr>
</tbody>
</table>
31. (2 points)

Based on Lange, "The Interpretation of Liability Increased Limit Statistics," answer the questions below.

a. (1 point)

What are the two reasons why increased limits loss trends are greater than basic limits loss trends?

b. (1 point)

Using the following data, calculate the total limits trend, basic limits trend, and the increased limits trend. Show all work.

<table>
<thead>
<tr>
<th></th>
<th>Average Claim Cost</th>
<th>Average Annual Change in Claim Cost from Fitted Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Limits</td>
<td>$1,500</td>
<td>$180</td>
</tr>
<tr>
<td>Basic Limits</td>
<td>$1,200</td>
<td>$120</td>
</tr>
</tbody>
</table>

32. (2 points)

Kelley, "Homeowners Insurance To Value – An Update," discusses potential impacts from changing levels of insurance to Value.

a. (1 point)

What are two potential impacts that are discussed that benefit the insurer?

b. (1 point)

What are two potential impacts that are discussed that are disadvantages to the insurer?
Based on the method used by McCarthy in "Premium Trend Revisited" and the data below, calculate the indicated rate need. Show all work.

- Permissible loss ratio is 75%.
- All policy periods are annual.
- New rates will be in effect from January 1, 2003 through December 31, 2003.

<table>
<thead>
<tr>
<th>Year</th>
<th>Premium at Current Rate Level</th>
<th>Exposures</th>
<th>Developed Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>400,000</td>
<td>3,000</td>
<td>300,000</td>
</tr>
<tr>
<td>2000</td>
<td>424,000</td>
<td>3,000</td>
<td>324,000</td>
</tr>
<tr>
<td>2001</td>
<td>450,000</td>
<td>3,000</td>
<td>350,000</td>
</tr>
</tbody>
</table>

a. (1 point)

Calculate the trended premium at current rate level.

b. (1 point)

Calculate the trended and developed losses.

c. (1 point)

Calculate the indicated rate level change.

d. (1 point)

According to "Actuarial Standard of Practice No. 13: Trending Procedures in Property/Casualty Insurance Ratemaking," actuaries generally place reliance on three different types of data in trending procedures for property/casualty insurance ratemaking. One of these is the data from the book of business being priced. What two other types of data may be used to estimate trend?
34. (2 points)

Based on CAS Study Note, "Group Medical/Dental Pricing," and the data below, determine the basic manual benefit costs for a year beginning July 2002 for a family living in a Metropolitan area.

- Prior studies have determined that Metropolitan experience has consistently been 10% worse than the entire book as a whole.
- Assume that medical costs are increasing at the rate of 1% per month.

**Hospital Experience January 2000 – December 2000**

<table>
<thead>
<tr>
<th></th>
<th>Employee</th>
<th>Dependent Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure Months</td>
<td>1,500,000</td>
<td>750,000</td>
</tr>
<tr>
<td>Hospital Admissions</td>
<td>10,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Inpatient Claims Incurred</td>
<td>40,000,000</td>
<td>50,000,000</td>
</tr>
<tr>
<td>Outpatient Claims Incurred</td>
<td>5,000,000</td>
<td>7,000,000</td>
</tr>
</tbody>
</table>

35. (2 points)

Use the methodology presented in Burger et al., "Incorporating a Hurricane Model into Property Ratemaking," and the data below to calculate the statewide modeled hurricane base class loss cost. Show all work.

<table>
<thead>
<tr>
<th>Territory</th>
<th>Latest Year Coverage A</th>
<th>Latest Year Coverage B</th>
<th>Net Weighted Mean Damage Ratios</th>
<th>Latest Year House Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>30,000</td>
<td>42,000</td>
<td>0.020</td>
<td>40</td>
</tr>
<tr>
<td>B</td>
<td>50,000</td>
<td>75,000</td>
<td>0.018</td>
<td>64</td>
</tr>
<tr>
<td>C</td>
<td>10,000</td>
<td>12,000</td>
<td>0.007</td>
<td>14</td>
</tr>
<tr>
<td>Statewide</td>
<td>90,000</td>
<td>129,000</td>
<td></td>
<td>118</td>
</tr>
</tbody>
</table>

- Loss Adjustment Expense Factor 1.13
- Premium On-level Factor 1.054
- Latest Year Current Cost/Amount Factor 1.004
- Composite Projection Factor 1.08
- Latest year Class and Coverage Factor 1.25
36. (3 points)

Based on Feldblum, “Personal Automobile Premiums: An Asset Share Pricing Approach for Property-Casualty Insurance,” and the following information, answer the questions below. Show all work.

- 30 policies terminate in the third year
- The probability of termination in year 2 is 0.0816
- The termination rate in year 2 is 0.1000
- The termination rate in year 3 is 0.0750

a. (1½ points)

Calculate the number of policies terminated in year 1 and year 2.

b. (1 point)

Calculate the original number of policies in the cohort.

c. (½ point)

Calculate the termination rate and the probability of termination in year 1.

37. (2 points)

Based on Burger et al., “Incorporating A Hurricane Model in Property Ratemaking,” answer the following questions.

a. (½ point)

How is credibility assigned to the modeled hurricane loss costs when determining territorial relativities?

b. (1 point)

State two reasons for this approach to assigning credibility to the modeled hurricane losses when determining territorial relativities.

c. (½ point)

Explain why the authors give a caution about this assignment of credibility.
38. (1 point)

Bouska, "Exposure Bases Revisited," describes a problem she defines as temporal mismatch. Give an example of temporal mismatch that occurs with medical malpractice claims-made policies.

39. (2 points)

Based on Boor, "A Macroeconomic View of the Insurance Marketplace," answer the following questions.

a. (1 point)

Describe what Boor means by the term "reserve management."

b. (1 point)

Does "reserve management" extend or shorten the insurance cycle? Explain why.

40. (2 points)

According to Prevosto, "Study Note: ISO Statistical Plans," statistical plans are developed with a goal to fulfill two main needs. State and describe each of these two needs.

41. (2 points)

Based on Moncher, "Study Note: NCCI Data Collection Calls and Statistical Plans," answer the questions below regarding the Detailed Claim Information (DCI) data call.

a. (1 point)

Briefly explain why NCCI initiated the DCI data calls.

b. (1 point)

Describe two uses mentioned by Moncher of the information from the DCI data calls.
42. (2 points)

Based on Head, Insurance to Value, and the following information, calculate the pure premium rate per $100 for a 50% coinsurance clause.

- The value of the insured property is $200,000.
- The loss frequency is 3%.

<table>
<thead>
<tr>
<th>Loss, as Percentage of Total Property Value</th>
<th>Conditional Probability of a Loss in Interval</th>
<th>Arithmetic Mean Loss in Interval, as a Percent of Total Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than or equal to 25%</td>
<td>0.75</td>
<td>9%</td>
</tr>
<tr>
<td>26% to 50%</td>
<td>0.12</td>
<td>40%</td>
</tr>
<tr>
<td>51% to 75%</td>
<td>0.08</td>
<td>70%</td>
</tr>
</tbody>
</table>

43. (3 points)

Based on Marker and Mohl, "Rating Claims-Made Insurance," and the following information, calculate the dollars of "pure" IBNR reserve inadequacy for a company writing occurrence policies for five years. Show all work.

- Losses of $1,500 reported in the last year were produced in equal proportions from occurrences in the last five years.
- Losses are forecast to increase at a rate of $10 per year.
- Actual results show an unexpected shift of $5/per year/per lag towards later reportings.
44. (4 points)

Based on McClenahan, "Ratemaking," chapter 2 of Foundations of Casualty Actuarial Science, answer the following questions. State any assumptions you make and show all work.

\[ R = \text{indicated rate per unit of exposure} \]
\[ R_0 = \text{current rate per unit of exposure} \]
\[ P = \text{pure premium} \]
\[ L = \text{experience losses and loss adjustment expenses} \]
\[ E = \text{experience period earned exposures} \]
\[ F = \text{fixed expenses per exposure} \]
\[ V = \text{variable expense ratio to premium} \]
\[ Q = \text{profit and contingencies ratio to premium} \]

a. (1 point)

Using the notation above, derive the formula for the indicated rate using the pure premium approach to ratemaking.

b. (1 point)

Using the notation above, derive the formula for the indicated rate using the loss ratio approach to ratemaking.

c. (2 points)

Given your results to parts a. and b. above, demonstrate that the pure premium and loss ratio methods will produce identical rates when they are applied to identical data and consistent assumptions are used. Show all work.

END OF EXAMINATION

21
Exam 5 Multiple Choice Answers
1. A.
2. C.
3. B.
4. B.
5. C.
6. E.
7. B.
8. B.
9. A.
10. D.
11. D.
12. E.
13. B.
14. C.
15. D.
16. C.
Casualty Actuarial Society

Exam 5

Question 17

A) Developed acc. Period losses = $21,500
   Trend from ave. accident date of current period to average accident date of future period
   \[ \rightarrow 10/1/2000 \text{ to } 1/1/2004 \]
   3.25 years of trend
   Trended & dev. Losses = $21,500 \times (1.03)^{3.25} = $23,668

B) +10%           -15%

Cumulative rate change = 1.1 \times .85 = .935

Exp. Period on-level factor = \[
\frac{36 \times .935 + 144 \times 1.0 + 252 \times 1.1}{2 \times 216 + 2 \times 216 + 2 \times 216} = .888
\]

Earned premium = # exposures \times rate = 100 \times 120 + 175 \times 132 + 25 \times 112.2 = 37,905

On-level EP = .888 \times 37,905 = $33,660
   or current rate \times earned exposures = 300 \times 120 \times 1.1 \times .85 = $33,660

C) Trended Loss & ALAE ratio = \[
\frac{\text{Losses}}{\text{On-level EP}} = \frac{23,668}{33,660} = .70315
\]

Statewide Rate Level Change (assuming full credibility) = \[
\frac{\text{Actual L & ALAE ratio}}{\text{Target L & ALAE ratio}} - 1
\]
= \[
\frac{.70315}{1.0} - 1
\]
= +8.18%
Question 18

A) Target Loss Ratio

\[
G = \frac{ULAE}{Loss \& LAE} = \frac{10,000}{90,000} = 0.111
\]

\[
V = \frac{Commission \text{ et al.} + T.L\&F + \text{General Expense}}{Written \text{ premium} + \frac{31,500 + 7,500}{150,000 + 100,000}} = 0.21 + 0.075 = 0.285
\]

So, \[
\frac{1 - V - Q}{1 + G} = 1 - 0.285 - Q = 0.60
\]

Q = 0.0484 or 4.84%

B) Contingency Factor is for adverse development – losses not coming in as expected.

Profit factor is to provide an adequate return on the funds provided by investors (surplus).
Question 19
Part A)

\[ \sqrt{\left(\frac{\text{Loss}}{\text{Prem}}\right)} = \sqrt{\left(\frac{80,000}{100,000}\right)} = \sqrt{0.8} \]

\[ \text{Territory} \times [\text{Territory} - 1] + 1 \]

B) The off balance factor is
\[
\frac{[0.812 \times 100,000] + [0.829 \times 120,000] + [1.22 \times 200,000]}{420,000} = 1.011
\]

C) Rate change by territory is
Terr A: \( \frac{0.812}{1.011} \times 1.05 - 1 = -15.7\% \)
Terr B: \( \frac{0.829}{1.011} \times 1.05 - 1 = -13.9\% \)
Terr C: \( \frac{1.22}{1.011} \times 1.05 - 1 = +26.7\% \)

Question 20
A) Weaknesses of UM or UIM
1) Coverage does not serve to decrease the number of uninsured/underinsured motorists on the road.
2) Forces the responsible insured motorists to bear the cost of the uninsured motorists

B) Modified no-fault plans: Not a true “no fault” plan because tort system is only limited, not removed altogether. First party benefits are paid to injured and they have no right to sue at fault party unless their injuries exceed a certain threshold. Threshold may be verbal, monetary, or both.

2) Choice no-fault plans allow the motorist to decide between full tort type coverage or a no-fault type coverage for a reduction in premium.
Question 21

A) Assigned Risk Plans
   1) Policies are assigned based on voluntary market share; all licensed insurers must participate; burden = losses from policies assigned
   2) All participating insurers are servicing carriers

B) Auto Reinsurance Plans
   1) Cannot refuse coverage, but reinsurance guaranteed; burden shared based on voluntary market share
   2) All insurers using the plan are issuing/servicing carriers

C) Joint Underwriting Associations
   1) Policies are not assigned, but carried by the JUA; all licensed insurers must participate; burden based on voluntary market share
   2) A small number of insurers are designated as issuing/servicing carriers

Question 22

A) Statutes – An individual may be required to do something or refrain from doing something because a legislative body has enacted a law to that effect.

B) Contracts – A legal liability to do something or to refrain from doing something can arise out of having made an agreement to that effect.

C) Torts – The category of legal liability encompasses all noncontractual civil wrongs.

Question 23

A) Aretha’s collision coverage would apply as excess coverage less her deductible. Thus, Aretha’s collision coverage would pay for $500 of loss to her friend’s car.

If Aretha’s Friend has med pay coverage, then that would pay for Aretha’s damages. If not, Aretha’s med pay would pay for the damages. UM would kick in if the damages exceeded the med pay limits.

B) Aretha’s policy will not pay to repair tire because the accident would be considered a collision (hit the curb) and the collision deductible ($500) is more than the damage to the tire ($300). Aretha’s policy will pay for Polly’s medical bills in full ($1,000) under medical payments coverage.
**Question 24**

A) Principle of indemnity – an insured shall not receive a benefit greater than the loss incurred

B) Reduces; moral hazard
   1) Prevents insured from profiting from loss

C)  
   1) Valued policies (pay stated value for loss) and
   2) Replacement cost coverage (may receive payment larger than property worth)

**Question 25**

- The damages must apply to bodily injury or property damage.
- The damages must be caused by an occurrence as defined in the policy.
- The occurrence must take place in the coverage territory.
- In the occurrence form of the CGL policy, the occurrence must also take place during the coverage period.

**Question 26**

1.  
   1) Cost of living provision automatically increases an insured’s benefits to keep up with inflation.
   2) Guaranteed insurability provision allows an insured to purchase greater levels of insurance without having to be underwritten.

2.  
   1) It gives the insured more incentive to return to work.
   2) The insured does not have to pay taxes on benefits received if premiums were paid with post-tax dollars.
Question 27

A) 

\[ 1.1 \times 1.07 = 1.177 \]  
(5% increase in benefits is not considered, therefore no rate charge)

Factor for PY 2000 EP: 

\[ 0.5 \times 1 + 0.5 \times 1.1 = 1.05 \]

\[ 1.77 \div 1.05 = 1.121 = \text{On-level factor} \]

Average written dates for PY 2000 is 7/1/2000
Average written dates for effective date 7/1/2002 : 1/1/2003 \[ \text{difference is } 2.5 \text{ years} \]

\[ 90 \times 1.121 \times \frac{1.1}{0.5 \times 1 + 0.5 \times 1.1} \times 1.04^{2.5} \]

\[ = 116.58 \text{ M} \]

B) Average accident dates for PY 2000 is 1/1/2001
Average accident dates for exposure period 7/1/2003 \[ \text{difference is } 2.5 \text{ years} \]

\[ 40 \times \text{LDF} \times \text{Trend} \times \text{benefit change} \times \text{LAE} \]
\[ = 40 \times 1.8 \times 1.08^{2.5} \times (1.05 \div [0.5 + 0.5(1.05)]) \]
\[ = 107.28 \text{ M} \]

C) \[ LR = 107.28 \text{ M} \div 116.58 \text{ M} = 92\% \]

D) \[ \frac{92\%}{72\%} - 1 = 27.8\% \]

E) \[ x = 1.278 \times (1 - 0.25) = 0.96 \]

therefore 0.96 is charged to manual prem
**Question 28**

1. People already out on WC might stay out longer because benefits may be more steady income than returning to tentative job.

2. Higher unemployment
   ⇒ keep experienced, older workers
   ⇒ less claim frequency but higher claim severity because older take longer to recover.

3. People worried about losing job may not make claims for the small injuries for fear of getting fired, so only large injuries left.

---

**Question 29**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Prem in</th>
<th>Comm</th>
<th>Gen Exp</th>
<th>Other Exp</th>
<th>Reduction</th>
<th>Disc %</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0, 10)</td>
<td>10</td>
<td>0.15</td>
<td>0.1</td>
<td>0.08</td>
<td>0.25 – 0.25 = 0</td>
<td>0</td>
</tr>
<tr>
<td>(10, 210)</td>
<td>200</td>
<td>0.1125</td>
<td>0.075</td>
<td>0.08</td>
<td>0.25 - 0.1875 = 0.0625</td>
<td>0.0679</td>
</tr>
<tr>
<td>(210, 410)</td>
<td>200</td>
<td>0.0844</td>
<td>0.0563</td>
<td>0.08</td>
<td>0.25 - 0.1407 = 0.1093</td>
<td>0.1188</td>
</tr>
<tr>
<td>(410, 610)</td>
<td>90</td>
<td>0.0633</td>
<td>0.0422</td>
<td>0.08</td>
<td>0.25 - 0.1055 = 0.1445</td>
<td>0.1571</td>
</tr>
</tbody>
</table>

Discount = 10 (0) + 200 (.0679) + 200 (.1188) + 90 (.1571) = 51.479

Discounted Premium = 500,000 – 51,479 = 448,521
Question 30

NOTE: A wide variety of solutions were accepted to this question. If the student clearly stated his/her assumption with respect to the problem and solved the problem consistent with that assumption he/she could earn full credit. 3 examples of solutions which were accepted are included with these sample answers.

ILF 50,000 limit

<table>
<thead>
<tr>
<th>Layer</th>
<th>0 - 10 K</th>
<th>10K - 25 K</th>
<th>25K - 75 K</th>
<th>75K - 100 K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit</td>
<td>10,000</td>
<td>50,000</td>
<td>100,000</td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td>500,000</td>
<td>50,000</td>
<td>30,000</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td>25,000</td>
<td>30,000</td>
<td>100,000</td>
<td>100,000</td>
</tr>
<tr>
<td></td>
<td>75,000</td>
<td>300,000</td>
<td>300,000</td>
<td>150,000</td>
</tr>
<tr>
<td></td>
<td>100,000</td>
<td>150,000</td>
<td>30,000</td>
<td>15,000</td>
</tr>
</tbody>
</table>

10 K – 25 K layer: \[ \frac{50,000 + 30,000 + 150,000}{300,000 + 750,000 + 200,000} = \frac{500}{1250} = .4 \]

25 K – 75 K layer: Do not have a layer that stops at 50,000

→ For 50,000 limit column, no problem

→ For 100,000 limit need to determine how much of that 30,000 is in the 25,000 – 50,000 range versus the 50,000 – 75,000 range

• More should be in the 25,000 – 50,000 range since any claim that is in the 50 K to 75 K range will put 25,000 into the 25 K – 50 K range

→ Have 3 choices:

• all 30,000 in 25 K – 50 K range
• only 25,000 in 25 K – 50 K range, remainder in 50 K – 75 K range
• at least 25,000, but no more than 30,000 in 25 K – 50 K range, remainder in 50 K – 75 K range

Note: in order for 75 K – 100 K range to have money, 25 K – 50 K layer must be saturated (i.e. at least 50,000 of one loss = 75,000 – 25,000) must be in layer, but only 30,000 in 25 K – 75 K layer. Something is wrong!

I will assume a single loss, so

25,000 in 25 – 50 K range
5,000 in 50 – 75 K range

for the 100,000 policy limit data

\[ \frac{100,000 + 25,000}{750,000 + 200,000} = \frac{125}{950} = .132 \]

\[ \text{ILF}_{50,000} = 1 + .4 + .132 = 1.532 \]
Alternate Response #1 to Question 30

\[
10,000 - 25,000 = \frac{50,000 + 300,000 + 150,000}{300,000 + 750,000 + 200,000} = 0.4
\]

\[
25,000 - 50,000 = \frac{100,000}{750,000} = 0.13
\]

I am only using losses under the 50,000 limit as we cannot determine what portion of losses are between the 25 – 50 and 50 – 75 layer for the 100,000.

\[
\text{ILF}_{50,000} = 1 + .4 + .13 = 1.53
\]

Alternate Response #2 to Question 30

I am assuming that there is an error in the labeling of the table. The table I am assuming is

<table>
<thead>
<tr>
<th>Layer loss</th>
<th>Policy limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>0 – 10 K</td>
<td>500,000</td>
</tr>
<tr>
<td>10K – 25 K</td>
<td>50,000</td>
</tr>
<tr>
<td>25K – 50 K</td>
<td>100,000</td>
</tr>
<tr>
<td>50 K – 100 K</td>
<td></td>
</tr>
</tbody>
</table>

\[
10,000 - 25,000 = \frac{50,000 + 300,000 + 150,000}{300,000 + 750,000 + 200,000} = 0.4
\]

\[
\frac{100,000 + 30,000}{750,000 + 200,000} = \frac{130}{950} = .137
\]

\[
\text{ILF}_{50,000} = 1 + .4 + .137 = 1.537
\]
Question 31

A)  
1) For losses above the limit, all the trend occurs in the excess layer and none in the primary layer.

2) Some losses that were below the limit before the trend will be above the limit after the trend, adding additional losses in the excess layer and increasing the increased limits trend.

B)  

<table>
<thead>
<tr>
<th></th>
<th>Avg. Claim Cost</th>
<th>Avg. Annual Change in Claim Cost from Fitted Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Limits</td>
<td>1500</td>
<td>180</td>
</tr>
<tr>
<td>Basic Limits</td>
<td>1200</td>
<td>120</td>
</tr>
<tr>
<td>Increased Limits</td>
<td>300</td>
<td>60</td>
</tr>
</tbody>
</table>

Total Limits trend = \[(1500 + 180) ÷ 1500\] – 1 = +12%
Basic Limits trend = \[(1200 + 120) ÷ 1200\] – 1 = +10%
Increased Limits trend = \[(300 + 60) ÷ 300\] – 1 = +20%

Question 32

Benefits
- The additional premium generated by larger coverage amounts from actions such as inspections and reinspections.
- The reduced claim payouts from increased numbers of cancellations and non-renewals.
- The reduced claim payouts if broader reinspection programs result in suggestions to reduce the risk of loss which are then carried out.
- The eventual savings in loss adjustment expenses from fewer (or reduced) claims.
- Less need for a rate increase.

Disadvantages
- The additional total, and near total, losses which accompany the larger coverage amounts generated by additional inspections and reinspections.
- The reduced premium from increased numbers of cancellations and non-renewals.
- The greater cost of additional inspection and reinspection activity.
- The greater cost generated by increased premium-relate expenses, such as commissions and taxes (which result from additional premium).
**Question 33**

<table>
<thead>
<tr>
<th>Year</th>
<th>Trend</th>
<th>Premium @ Present Rates</th>
<th>Expos</th>
<th>Developed Losses</th>
<th>Pure Premium</th>
<th>Avg Premium @ Present Rates</th>
<th>Trended Prem @ Present Rates</th>
<th>Trended Developed Losses</th>
<th>Loss Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>4.5</td>
<td>400,000</td>
<td>3,000</td>
<td>300,000</td>
<td>100</td>
<td>133.33</td>
<td>519,920</td>
<td>424,158</td>
<td>81.58%</td>
</tr>
<tr>
<td>2000</td>
<td>3.5</td>
<td>424,000</td>
<td>3,000</td>
<td>324,000</td>
<td>108</td>
<td>141.33</td>
<td>519,920</td>
<td>424,158</td>
<td>81.58%</td>
</tr>
<tr>
<td>2001</td>
<td>2.5</td>
<td>450,000</td>
<td>3,000</td>
<td>350,000</td>
<td>117</td>
<td>150.00</td>
<td>520,568</td>
<td>424,255</td>
<td>81.50%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1,274,000</td>
<td>974,000</td>
<td>1,560,407</td>
<td>1,272,572</td>
<td></td>
<td>81.55%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Trend 8.0% 6.0%

Permissible Loss Ratio = 75.0%
Rate Need = 81.55% / 75.0% = 8.75%

A) Trended Premium at Current Rate Level is 1,560,407
B) Trended and Developed Loss is 1,272,572
C) Indicated change is 8.75%
Other insurance data (Best/Fast Track, industry data) and non-insurance data (CPI data, external indices)

**Question 34**

Cost for employee = (Inpatient Incurred + Outpatient Incurred) ÷ Exposure Months

\[= \frac{40 + 5}{1.5} \]

\[= 30 \text{ /unit} \]

Cost for dependent = \(\frac{50 + 7}{0.75}\)

\[= 76 \text{ /unit} \]

\[\Rightarrow \text{Total} = 106 \text{ /unit} \]

Metropolitan is 10% worse:

\[\Rightarrow 106 \times 1.10 = 116.60 \]

Trend losses (from Jul 2000 to Jan 2003) = \(116.60 \times (1.01)^{30 \text{ months}}\)

\[= $157.16 \text{ for a family} \]
**Question 35**

<table>
<thead>
<tr>
<th>Amount of Insurance</th>
<th>MDR</th>
<th>Amount of Hurricane Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 30,000</td>
<td>0.02</td>
<td>600</td>
</tr>
<tr>
<td>B 50,000</td>
<td>0.018</td>
<td>900</td>
</tr>
<tr>
<td>C 10,000</td>
<td>0.007</td>
<td>70</td>
</tr>
<tr>
<td>total</td>
<td></td>
<td>1570</td>
</tr>
</tbody>
</table>

Statewide Hurricane Loss Cost = 1570 ÷ 118 = 13.305

Statewide Hurricane Base Class Loss Cost = (13.305 × 1.13 × 1.004 × 1.08) ÷ 1.25 = $13.04

**Question 36**

A)  

\[
\begin{array}{ccc}
\text{policies term} &=& 1 \\
\text{policies persisting} &=& 2 \\
\text{total} &=& 3 \\
95 &=& 44 \\
444 &=& 30
\end{array}
\]

termination rate\(_3\) = \frac{\text{# policies terminating}}{\text{# policies terminating + # policies persisting}}

# policies persisting = (30 ÷ .0750) – 30 = 370

termination rate\(_2\) = \frac{\text{# policies terminating}}{\text{# policies terminating + # policies persisting}}

# policies terminating = [(.1)(400)] ÷ (1 − .1) = 44

policies terminating in yr\(_1\) = # original policies [from part B] – persisting policies [from above] = 539 – 444 = 95

B)  

probability of termination\(_2\) = \# terminations\(_2\) ÷ \# original policies

# original policies = 44 ÷ .0816 = 539

C)  

termination rate\(_1\) = \text{prob of termination}\(_1\)

= 95 ÷ 539

= .176
Question 37
A) We assign full credibility to the modeled hurricane loss costs when determining territorial relativities.

B) 
1. We consider all the hurricane data available in the past century to do the analysis
2. There is not credibility standard for the volume of the date.
3. There is no recognized complement for the credibility.

C) There is a large amount of parameter risk in the modeling process, which can affect the outcome. Caution should be taken by the actuary when interpreting the model’s output.

Question 38
Temporal mismatch-
Medical malpractice claims-made policies have coverage trigger by notification of a claim but are rate on an occurrence basis.

Question 39
A) Reserve management is the tendency of insurers to over-reserve during profitable periods and under-reserve during less profitable or un-profitable years

B) Reserve management extends the insurance cycle. Under-reserving during unprofitable periods makes it appear like business is more profitable that it really is. Therefore, insurers keep selling, even at a loss, elongating the period of loss and lengthening the cycle.

Question 40
1. Regulatory Need – To assist regulators in ensuring that rates meet statutory standards (i.e., rates are not inadequate, excessive, or unfairly discriminatory), companies must report their statistical information on premiums and losses through a statistical agent or where permitted, directly with the regulator.

2. Business Need – To provide a broader database on insurance underwriting operations, premiums and losses are reported through Statistical Plans. Businesses need this information, as they may not have enough credible data for a particular policy type and/or classification to perform an adequate actuarial analysis without access to a broader database.
Question 41
Invalid Question

Question 42

<table>
<thead>
<tr>
<th>Loss as % of Total</th>
<th>Unconditional Probability</th>
<th>Pure Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than or equal to 25%</td>
<td>0.75 x 0.03 = 0.0225</td>
<td>0.0225 x 0.09 x 200,000 = 405</td>
</tr>
<tr>
<td>26 to 50%</td>
<td>0.12 x 0.03 = 0.0036</td>
<td>0.0036 x 0.4 x 200,000 = 288</td>
</tr>
<tr>
<td>51% to 75%</td>
<td>0.08 x 0.03 = 0.0024</td>
<td>0.0024 x 0.5 x 200,000 = 240</td>
</tr>
<tr>
<td>Greater than 75%</td>
<td>0.05 x 0.03 = 0.0015</td>
<td>0.0015 x 0.5 x 200,000 = 150</td>
</tr>
</tbody>
</table>

Pure premium rate = \( \frac{\text{405} + \text{288} + \text{240} + \text{150}}{200,000 \times 50\% \div 100} \)

\[ = 1.083 \]

Question 43

<table>
<thead>
<tr>
<th>Lag</th>
<th>0</th>
<th>300</th>
<th>310</th>
<th>320</th>
<th>330</th>
<th>340</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>300</td>
<td>310</td>
<td>320</td>
<td>330</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>300</td>
<td>310</td>
<td>320</td>
<td>330</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>300</td>
<td>310</td>
<td>320</td>
<td>330</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>300</td>
<td>310</td>
<td>320</td>
<td>330</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>4+</td>
<td>300</td>
<td>310</td>
<td>320</td>
<td>330</td>
<td>340</td>
<td></td>
</tr>
</tbody>
</table>

IBNR = 3200

<table>
<thead>
<tr>
<th>Shift</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>300</td>
<td>305</td>
<td>310</td>
<td>315</td>
<td>320</td>
</tr>
<tr>
<td>1</td>
<td>310</td>
<td>320</td>
<td>330</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>310</td>
<td>320</td>
<td>330</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>310</td>
<td>320</td>
<td>330</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>315</td>
<td>330</td>
<td>345</td>
<td>360</td>
<td></td>
</tr>
</tbody>
</table>

IBNR = 1245 + 970 + 675 + 360 = 3250

Change in IBNR = 3250 – 3200

\[ = 50 \]
**Question 44**

A) \( R = P + F + VR + QR \)
\[
R = \frac{P + F}{1 - V - Q}
\]

B) \( R = AR_o \)
\[
A = \frac{W}{t} \quad W = \frac{L}{(ER_o)} \quad T = \frac{(1 - V - Q)}{(1 + FE/L)}
\]
\[
R = \frac{L(1 + FE/L)}{E(1 - V - Q)}
\]

C) \( P = \frac{L}{E} \)
\[
EP = L
\]

L/R approach
\[
\frac{L(1 + FE/L)}{E(1 - V - Q)} = \frac{P(1 + F/P)}{(1 - V - Q)} = \frac{P + F}{1 - V - Q}
\]