INSTRUCTIONS TO CANDIDATES

1. This 95 point examination consists of 43 questions divided into two sections. Section I contains 17 multiple choice questions worth one point each. Section II contains 26 problem and essay questions worth a total of 78 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 2003, 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. Verify that you have received the supplemental material:


8. 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.

9. At the end of the examination, place the short-answer card, supplemental material, 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.

CONTINUE TO NEXT PAGE OF INSTRUCTIONS
10. 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.

11. 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.

12. 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 27, 2003. Please do not enclose the survey in the Examination Envelope.

END OF INSTRUCTIONS
SECTION I, QUESTIONS 1 – 17, MULTIPLE CHOICE QUESTIONS (1 POINT EACH).

1. Which of the following statements reflect fundamental principles of subrogation?

   1. The party claiming the right of subrogation must first pay the debt.
   2. Subrogation provides an additional source of recovery for injured parties.
   3. The party claiming subrogation is only secondarily liable for the debt.

   A. 1 only
   B. 2 only
   C. 1 and 3 only
   D. 2 and 3 only
   E. 1, 2, and 3

2. Which of the following statements are true regarding insurable interest?

   1. A creditor may have an insurable interest in the life of a debtor.
   2. With life insurance, the insurable interest is legally required to exist at the time of the insured’s death.
   3. With property and liability insurance, the insurable interest is legally required to exist at the time of loss.

   A. 2 only
   B. 3 only
   C. 1 and 2 only
   D. 1 and 3 only
   E. 1, 2, and 3
3. Under the Insurance Services Office, Inc., Personal Automobile Policy (Effective 6-98), which of the following are true?

1. The insurer will pay any interest accruing after a judgment is entered in any suit the insurer defends, even if the judgment exceeds the policy's coverage limit.
2. Prejudgment interest is subject to the limit of liability.
3. The insurer's duty to defend ends when the limit of liability has been exhausted by payment of defense costs.

A. 2 only
B. 3 only
C. 1 and 2 only
D. 1 and 3 only
E. 1, 2, and 3

4. According to Webb et al., Insurance Operations, which of the following is true?

A. During the maturity stage of the product life cycle, insurers attempt to maximize profit while defending market share.
B. The growth stage of the product life cycle is characterized by low sales.
C. The market development stage of the product life cycle is characterized by rapidly rising sales.
D. During the market development stage of the product life cycle, insurers offer a wide variety of product alternatives.
E. During the growth stage of the product life cycle, insurers offer a basic product.
5. According to Webb et al., *Insurance Operations*, which of the following is *not* a cooperative insurer?

A. Captive insurer  
B. Lloyd's of London  
C. Mutual insurance company  
D. Reciprocal exchange  
E. Risk retention group

6. According to Webb et al., *Insurance Operations*, underwriters are responsible for which of the following activities?

1. Determining the appropriate rate or price  
2. Formulating underwriting policy  
3. Providing service to producers and policyholders

A. 1 only  
B. 2 only  
C. 1 and 3 only  
D. 2 and 3 only  
E. 1, 2, and 3
7. Which of the following entities typically own the expirations of renewal business?

1. Independent agents
2. Exclusive agents
3. Insurance companies using direct agents

A. 1 only
B. 2 only
C. 3 only
D. 1 and 3 only
E. 1, 2, and 3

8. According to Webb et al., *Insurance Operations*, which of the following statements regarding distribution systems is not true?

A. The direct response system has been widely effective in marketing commercial lines of insurance.
B. Historically, most insurance companies marketed through the independent agency system.
C. The exclusive agency system has been successful in dealing with insurance buyers who have relatively simple needs.
D. Independent agents are very effective in reaching insurance consumers in rural areas and small towns.
E. The direct writer marketing system uses sales agents who are employees of the insurance companies they represent.

CONTINUED ON NEXT PAGE
9. An insured has a catastrophic health insurance policy with a $1,500 deductible and a 75% coinsurance clause. The policy has a $3,000 stop-loss limit. If the insured incurs a $10,000 loss, what amount of the loss must the insured pay?

A. $1,500
B. $2,125
C. $3,000
D. $3,625
E. $7,000

10. A 12-month policy is written on March 1, 2002 for a premium of $900. As of December 31, 2002, which of the following is true?

<table>
<thead>
<tr>
<th>Calendar Year 2002 Written Premium</th>
<th>Calendar Year 2002 Earned Premium</th>
<th>Inforce Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. $900</td>
<td>$900</td>
<td>$900</td>
</tr>
<tr>
<td>B. $750</td>
<td>$750</td>
<td>$900</td>
</tr>
<tr>
<td>C. $900</td>
<td>$750</td>
<td>$750</td>
</tr>
<tr>
<td>D. $750</td>
<td>$750</td>
<td>$750</td>
</tr>
<tr>
<td>E. $900</td>
<td>$750</td>
<td>$900</td>
</tr>
</tbody>
</table>
11. Given the information below, determine the written premium trend period.

- Experience period is April 1, 2001 to March 31, 2002
- Planned effective date is April 1, 2003
- Policies have a 6-month term
- Rates are reviewed every 18 months
- Historical premium is earned premium

A. Less than 1.8 years
B. At least 1.8 years, but less than 2.1 years
C. At least 2.1 years, but less than 2.4 years
D. At least 2.4 years, but less than 2.7 years
E. At least 2.7 years

12. Given the following data and using the loss development method as described by McClanahan in Foundations of Casualty Actuarial Science, calculate the projected ultimate accident year 2001 losses.

<table>
<thead>
<tr>
<th>Accident Year</th>
<th>As of December 31, 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Paid Losses</td>
</tr>
<tr>
<td>1999</td>
<td>$11,000</td>
</tr>
<tr>
<td>2000</td>
<td>$6,000</td>
</tr>
<tr>
<td>2001</td>
<td>$3,500</td>
</tr>
<tr>
<td>2002</td>
<td>$1,000</td>
</tr>
</tbody>
</table>

- Projected ultimate accident year 2000 losses = $9,240
- 12-24 case-incurred link ratio = 1.71
- 24-36 case-incurred link ratio = 1.20

A. Less than $8,700
B. At least $8,700, but less than $9,200
C. At least $9,200, but less than $9,700
D. At least $9,700, but less than $10,200
E. At least $10,200

CONTINUED ON NEXT PAGE
Based on Schofield, "Going from a Pure Premium to a Rate," which of the following is true with regards to expense fees?

A. If rates are adequate, the loss cost method results in a lower expense fee than the premium method.
B. The per exposure basis for calculating fixed expenses is used when a wider range of exposures on a policy may exist.
C. In the McClenahan pure premium method, fixed expenses are calculated on a per exposure basis.
D. Under the expense fee method, the expense fee varies by rating classification.
E. When revising expense fees, variable base rates should be calculated as the product of the current territorial base rate and the expense fee ratio.
Given $E[x] = \int x f(x) dx = $152,500 and the following graph of the cumulative loss distribution, $F(x)$, as a function of the size of loss, $x$, calculate the excess ratio at $100,000$.

- Size of the area labeled $Y = 12,500$

A. Less than 0.3  
B. At least 0.3, but less than 0.5  
C. At least 0.5, but less than 0.7  
D. At least 0.7, but less than 0.9  
E. At least 0.9
15. Which of the following is a reason that increased limits cost trends increase more rapidly than basic limits cost trends?

A. The entire effect of a rising cost trend is in the excess portion of an increased limits loss.
B. Uniform frequency trends affect increased limits claim frequency more than basic limits claim frequency.
C. A rising cost trend causes an increase in basic limits claim frequency.
D. A rising cost trend has no effect on a loss below the basic limits.
E. A rising cost trend only partially affects the basic portion of an increased limits loss.

16. Based on Kelley, "Homeowners Insurance to Value – An Update," which of the statements is true regarding homeowners Guaranteed Replacement Cost (GRC) coverage?

A. GRC coverage does not permit the loss payment on the primary dwelling to exceed the dwelling coverage amount.
B. An insurer may decide to make no direct charge for GRC coverage because additional premium is automatically generated by the 100% replacement cost requirement.
C. The charge for GRC coverage in states with above average catastrophe provisions should be a lesser dollar amount than states with below average catastrophe provisions.
D. The GRC provision extends to personal property coverage.
E. The GRC provision requires a minimum of 80% insurance to value.
17. Which of the following statements are true regarding individual risk rating?

1. Schedule rating directly reflects an entity's claim experience.
2. Experience rating is used when the past, with appropriate adjustments, is predictive of the future.
3. Individual risk rating is appropriate when entities in a rating group are homogeneous.

A. 1 only  
B. 2 only  
C. 3 only  
D. 1 and 2 only  
E. 2 and 3 only
18. (3.75 points)

Wiening and Malecki, Insurance Contract Analysis, describe six purposes of coverage exclusions.

a. (1.5 points)

State three of the six purposes.

b. (2.25 points)

For each purpose listed in part a. above, cite an exclusion in the Insurance Services Office, Inc., Personal Automobile Policy (Edition 6-98) related to “coverage for damage to your auto,” and explain how the exclusion relates to the purpose.

19. (1.5 points)

State and define three types of monetary damages that may be awarded in civil liability cases.

20. (1 point)

The Commercial General Liability (CGL) pollution exclusion is not absolute. State two types of pollution liability that the CGL covers.

CONTINUED ON NEXT PAGE
21. (3 points)

Answer the following questions using the information provided. Show all work.

a. (1.5 points)

Assume a policyholder has an ISO HO-3 policy. A large fire causes the following damage:

<table>
<thead>
<tr>
<th>Damage Description</th>
<th>Replacement Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage to dwelling</td>
<td>$320,000</td>
</tr>
<tr>
<td>Damage to personal belongings in house</td>
<td>$280,000</td>
</tr>
<tr>
<td>Additional damage to attached garage</td>
<td>$50,000</td>
</tr>
<tr>
<td>Damage to shed connected to dwelling by a fence</td>
<td>$5,000</td>
</tr>
<tr>
<td>Loss in death of prize-winning show dog</td>
<td>$4,000</td>
</tr>
</tbody>
</table>

- The Coverage A limit on the policy is $400,000.
- All covered losses are settled on a replacement cost basis.

Ignoring deductibles, calculate the amount of loss that will be covered under each of Coverage A, Coverage B, and Coverage C.

b. (1.5 points)

Assume a policyholder has an ISO HO-6 policy. A large fire causes the following damage:

<table>
<thead>
<tr>
<th>Damage Description</th>
<th>Replacement Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage to dwelling</td>
<td>$150,000</td>
</tr>
<tr>
<td>Damage to fixtures and appliances</td>
<td>$15,000</td>
</tr>
<tr>
<td>Damage to personal belongings</td>
<td>$45,000</td>
</tr>
<tr>
<td>Damage to detached shed</td>
<td>$6,000</td>
</tr>
</tbody>
</table>

- The Coverage A limit on the policy is $20,000.
- The Coverage C limit on the policy is $50,000.
- Assume that all covered losses are settled on a replacement cost basis.

Ignoring deductibles, calculate the amount of loss that will be covered under each of Coverage A, Coverage B, and Coverage C.
22. (3 points)
   
a. (1 point)
   
   Define a coverage trigger.
   
b. (1 point)
   
   State how the coverage trigger for claims-made forms differs from the coverage trigger for occurrence forms.
   
c. (0.5 point)
   
   A dentist begins his practice on January 1, 2003 and retires three years later. He buys the following professional liability insurance policies:
   
   • An occurrence policy to cover his first year of practice
   • A 1st-year claims-made policy for 2004
   • A 2nd-year claims-made policy for 2005
   • A tail policy at the end of 2005
   
   A loss that occurred in 2004 was not reported until 2006. State which policy, if any, covers the loss and explain why.
   
d. (0.5 point)
   
   Assume that the dentist in part c. above instead purchased three occurrence policies, one for each of his first three years of practice. State which policy, if any, would cover the loss described in part c. above and explain why.
23. (1.5 points)
   a. (0.75 points)
      Describe three justifications for government insurance programs.
   b. (0.75 points)
      Provide an example of an insurance coverage for each of the justifications listed in part a. above.

24. (3 points)
   Compare and contrast the behavior of commercial insurance companies during a soft market and a hard market. Include in your answer a discussion of pricing, underwriting, and reserving.

25. (2 points)
   Based on the Health Insurance Association of America, Group Life and Health Insurance—Part C, describe four strategies that an employer can use to reduce health care costs.

CONTINUED ON NEXT PAGE
26. (2 points)

Bouska, in "Exposure Bases Revisited," states that a severe mismatch between premiums and losses can be introduced by low exposure estimates.

a. (1 point)

Explain when this would typically happen and why.

b. (0.5 point)

What is the eventual outcome of the systematic underestimation of exposures in a steady state environment?

c. (0.5 point)

What might be the result if this steady state environment abruptly changed and the low exposure estimates stopped?

27. (1 point)

Explain why the exposure base is a proxy for the true exposure, using automobile collision coverage as an example.
EXAM 5, SPRING 2003, SECTION II

28. (9 points)

Use the data below to answer the questions on the following page. Show all work.

<table>
<thead>
<tr>
<th>Policy Year</th>
<th>Basic Limits Earned Premium at Current Rate Level (Trended)</th>
<th>Developed Basic Limits Loss and LAE (Untrended)</th>
<th>Number of Incurred Claims</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>$70,000</td>
<td>$70,000</td>
<td>750</td>
</tr>
<tr>
<td>1999</td>
<td>$75,000</td>
<td>$50,000</td>
<td>400</td>
</tr>
<tr>
<td>2000</td>
<td>$80,000</td>
<td>$60,000</td>
<td>650</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expenses as percent of premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Expense</td>
</tr>
<tr>
<td>Acquisition Expense</td>
</tr>
<tr>
<td>Premium Taxes</td>
</tr>
<tr>
<td>Allocated Loss Adjustment Expense</td>
</tr>
<tr>
<td>Unallocated Loss Adjustment Expense</td>
</tr>
<tr>
<td>Profit Load</td>
</tr>
</tbody>
</table>

- All policy terms are annual
- Proposed effective date = January 1, 2003
- Annual exposure trend = 3%
- Annual frequency trend = -1%
- Annual severity trend = 5%
- Full credibility standard = 3,000 claims
- Partial credibility is calculated using the square root rule
- Target loss and LAE ratio from last rate review = 68%
- Rate change filed for a January 1, 2002 effective date = 15%
- Rate change approved with a January 1, 2002 effective date = 10%
28. (Continued from previous page)

a. (2 points)

Using weights of 20%, 30%, and 50% for policy years 1998, 1999, and 2000, respectively, calculate the projected weighted loss and LAE ratio.

b. (1.5 points)

Calculate a complement of credibility and briefly describe the method used.

c. (1.5 points)

Using your results from parts a. and b. above, calculate the indicated rate level change.

d. (2 points)

State and describe two methods of adjusting premium to current rate level, including any underlying assumptions.

e. (1 point)

State two reasons why it may be appropriate to use basic limits data when calculating a rate level indication.

f. (1 point)

Explain why it is appropriate to both trend and develop losses (i.e., why there is no overlap).
29. (3 points)

Given the information below, calculate the premium for an occurrence policy written in Year 1. Show all work.

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50%</td>
</tr>
<tr>
<td>2</td>
<td>80%</td>
</tr>
<tr>
<td>3</td>
<td>95%</td>
</tr>
<tr>
<td>4</td>
<td>100%</td>
</tr>
</tbody>
</table>

- Mature claims-made pure premium for Year 1 = $600
- Loss trend = 5%
- Fixed expense per policy = $150
- Commissions = 12%
- Premium taxes = 5%
- Loss adjustment expense as percent of loss = 8%
- Profit provision = 3%

30. (3 points)

The Statement of Principles Regarding Property and Casualty Insurance Ratemaking lists numerous considerations involved in the ratemaking process. State and briefly discuss three of these considerations that have been impacted by the recent rise in worldwide terrorist activity.

CONTINUED ON NEXT PAGE
31. (3 points)

Based on Jones, "An Introduction to Premium Trend," answer the following questions.

a. (1 point)

State four changes that can cause the future average premium level to differ from the past average premium level.

b. (1 point)

Provide one example of each change listed in part a. above.

c. (1 point)

Note whether each change has, in general, a one-time or continuous effect on the average premium level.
Based on Burger, et al., "Incorporating a Hurricane Model into Property Ratemaking," and the following information, answer the questions below. Show all work.

<table>
<thead>
<tr>
<th>Territory</th>
<th>Aggregate Loss Cost Volume At Current Level</th>
<th>Credibility Weighted Non-Hurricane Base Class Loss Costs</th>
<th>Modeled Hurricane Base Class Loss Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>75,000</td>
<td>165</td>
<td>35</td>
</tr>
<tr>
<td>B</td>
<td>100,000</td>
<td>190</td>
<td>110</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Territory</th>
<th>Aggregate Loss Cost Volume At Current Level</th>
<th>Projected Experience Non-Hurricane Base Class Loss Costs</th>
<th>Modeled Hurricane Base Class Loss Costs</th>
<th>Credibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90,000</td>
<td>180</td>
<td>40</td>
<td>0.20</td>
</tr>
<tr>
<td>B</td>
<td>120,000</td>
<td>200</td>
<td>140</td>
<td>0.30</td>
</tr>
</tbody>
</table>

a. (1 point)

Calculate the territory relativity for each territory from the prior review.

b. (4 points)

For the current review, calculate the indicated changes to the territory relativities for each territory.

CONTINUED ON NEXT PAGE
33. (2 points)

Using the information shown below, calculate the factor needed to adjust policy year 2002 written premium to current level. Show all work.

- Policies are written uniformly throughout the year and have a term of 12 months.
- The law amendment change affects all policies in force.

Assume the following rate changes:
- Law amendment change on July 1, 2002 = +10%
- Experience rate change on October 1, 2002 = +5%
- Experience rate change on January 1, 2003 = +7%

34. (3 points)

a. (2 points)

Describe how Graves and Castillo in “Commercial General Liability Ratemaking for Premises and Operations” suggest using each of the following in basic limits ratemaking.

1. Allocated loss adjustment expense
2. Unallocated loss adjustment expense

b. (1 point)

What is the concern with the method in which allocated loss adjustment expense is used in the ratemaking calculations?
35. (3 points)

Based on Schofield, "Going from a Pure Premium to a Rate," and the following information, calculate the expense fee. Assume rates are adequate. Show all work.

<table>
<thead>
<tr>
<th>Expense Type</th>
<th>Total Expense</th>
<th>% Fixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commission</td>
<td>0.150</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other Acquisition</td>
<td>0.080</td>
<td>75.0%</td>
</tr>
<tr>
<td>General</td>
<td>0.030</td>
<td>100.0%</td>
</tr>
<tr>
<td>Premium Tax</td>
<td>0.020</td>
<td>0.0%</td>
</tr>
<tr>
<td>Misc. Licenses &amp; Fees</td>
<td>0.005</td>
<td>80.0%</td>
</tr>
<tr>
<td>Profit &amp; Contingencies</td>
<td>0.050</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exposure Distribution by Deductible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Territory</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Territory</th>
<th>Base Rate</th>
<th>Deductible</th>
<th>Deductible Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$250</td>
<td>$250</td>
<td>1.00</td>
</tr>
<tr>
<td>B</td>
<td>$300</td>
<td>$500</td>
<td>0.90</td>
</tr>
<tr>
<td>C</td>
<td>$200</td>
<td>$1,000</td>
<td>0.75</td>
</tr>
<tr>
<td>D</td>
<td>$400</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
36. (5 points)

Using the following information, answer the questions below. Show all work.

- On-level earned premium = $500,000
- Experience period losses = $400,000
- Experience period earned exposure = 5,000
- Premium-related expense factor = 22%
- Non-premium-related expenses = $20,000
- Profit and Contingencies factor = 3%

a. (1 point)

Calculate the target loss ratio using the loss ratio method.

b. (1 point)

Calculate the indicated rate level change using the loss ratio method.

c. (1 point)

Calculate the indicated rate level change using the pure premium method.

d. (1 point)

Describe a situation where the pure premium method cannot be used.

e. (1 point)

Describe a situation where the loss ratio method cannot be used.
37. (2 points)

Based on the information below, answer the following questions. Show all work.

- Current base rate = $200
- Overall proposed rate increase = +20%
- Base class is Class 2

<table>
<thead>
<tr>
<th>Class</th>
<th>Current relativity to class 2</th>
<th>On-level earned premium</th>
<th>Experience Loss &amp; ALAE</th>
<th>Indicated relativities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.800</td>
<td>$20,000</td>
<td>$18,000</td>
<td>0.900</td>
</tr>
<tr>
<td>2</td>
<td>1.000</td>
<td>$10,000</td>
<td>$8,000</td>
<td>1.000</td>
</tr>
<tr>
<td>3</td>
<td>1.200</td>
<td>$12,000</td>
<td>$9,000</td>
<td>1.125</td>
</tr>
</tbody>
</table>

a. (1 point)

Calculate the off-balance factor and the revised base rate.

b. (1 point)

Explain why the off-balance factor is necessary.
38. (3 points)

Given the information below, calculate the loss elimination ratio for ABC Company's collision coverage in State X at a $250 deductible. Show all work.

- ABC insures 5,000 cars at a $250 deductible with the following fully credible data on the collision claims:
  - Paid losses are $1,000,000 per year.
  - The average number of claims per year is 500.
- A fully credible study found that in State X:
  - The average number of car accidents per year involving collision damage was 10,000.
  - The average number of vehicles was 67,000.
- Assume ABC Company's expected ground-up claims frequency is equal to that of State X.
- Assume the average size of accidents that fall below the deductible is $150.
39. (3 points)

In "The Complement of Credibility," Boor discusses several methods for calculating complements of credibility in first dollar ratemaking. Briefly discuss three of these methods and comment on the effectiveness of each method as a complement of credibility.

40. (2.25 points)

An insurer writing fire insurance uses coinsurance in its rating structure by means of an "average clause." A coinsurance percentage of 80% applies to all policies. Based on the following information, answer the questions below. Show all work.

<table>
<thead>
<tr>
<th>Policy</th>
<th>Amount of Loss</th>
<th>Property Value</th>
<th>Face Amount of Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$50,000</td>
<td>$200,000</td>
<td>$150,000</td>
</tr>
<tr>
<td>2</td>
<td>$155,000</td>
<td>$160,000</td>
<td>$120,000</td>
</tr>
<tr>
<td>3</td>
<td>$375,000</td>
<td>$480,000</td>
<td>$400,000</td>
</tr>
</tbody>
</table>

a. (1.5 points)

For each of the policies above, calculate the indemnity payment made by the insurer.

b. (0.75 points)

For each of the policies above, calculate the additional insurance, if any, that would have been required for the insurance company to indemnify the full amount of the loss.
41. (2 points)

Listed below are two NCCI data collection programs:
- Workers Compensation Statistical Plan (WCSP)
- Annual Financial Call Data Reports

a. (1 point)

Briefly describe the purpose of each program.

b. (1 point)

Briefly discuss the type of data collected by each program.
42. (3 points)
   a. (1.5 points)

   Using the following information, calculate the final retrospective premium. Show all work.
   
   - Standard premium = $300,000
   - Basic premium factor = 0.18
   - Loss conversion factor = 1.20
   - Excess loss premium factor = 0.25
   - Tax multiplier = 1.04
   - Loss limit per accident = $50,000

<table>
<thead>
<tr>
<th>Reported losses</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$70,000</td>
<td></td>
</tr>
<tr>
<td>$15,000</td>
<td></td>
</tr>
<tr>
<td>$25,000</td>
<td></td>
</tr>
</tbody>
</table>

   b. (1 point)

   Explain why the retrospective rating process tends to produce back-and-forth payments between the insured and insurer.

   c. (0.5 point)

   Briefly describe a mechanism that can be used to smooth these back-and-forth payments.
EXAM 5, SPRING 2003, SECTION II

43. (5 points)

a. (4 points)

You are given the following information:

- Indicated adult class new business policy premium = $1,000
- Adult class discounted new business loss ratio = 80%
- Youthful class discounted loss cost during first policy year = $1,500
- Premiums increase 10% annually
- Losses increase 5% annually
- Variable expense ratio = 20% for all business
- All expenses are variable
- Annual adult class lapse rate = 10%
- Annual youthful class lapse rate = 25%
- The company's cost of capital is 10%
- 3-year present value of premium for adult class = $2,710
- 3-year present value of profit for adult class = $90.30
- Assume same return is earned for all classes

Using the procedure described by Feldblum in “Personal Automobile Premiums: An Asset Share Pricing Approach for Property/Casualty Insurance,” calculate the indicated premium relativity for youthful drivers. Use a three year time horizon to determine your answer. Show all work.

b. (1 point)

How might traditional ratemaking methods be misleading in determining classification relativities?
Exams 5 – Spring 2003

1. C.

2. D.

3. C., A.

4. A.

5. B.

6. E.

7. D.

8. A.

9. D., C.

10. E.

11. D.

12. E.

13. C.

14. B.

15. A.

16. B.

17. B.
18.  
a. 1. Eliminate losses that are uninsurable (war).
   2. Keep it down (reasonable) by eliminating losses that are predictable.
   3. Eliminate coverage not needed by the typical purchaser.

b. 1. Uninsurable losses: Exclusion #4 on page 8 of the ISO’s PAP, excludes losses due to war (point c). Those losses are uninsurable because of their catastrophic nature which would result in tremendous costs for insurers.
   2. Keep it down: Exclusion #2, point a on page 8 of the ISO’s PAP excludes damage due and confined to wear and tear. As those losses occur normally during the life of a car (are predictable), their inclusion in the PAP would only raise premium because premium equals losses and expenses. By retaining this exposure, insureds save the expense component.
   3. Eliminate coverage not needed by typical purchaser: Exclusion #11 on page 9 of the ISO’s PAP excludes loss to any custom furnishing or equipment in or upon any pickup or van. As those items are possessed by only a few people, their inclusion in the PAP coverage would make all insureds bear the cost of such rather than only by those who have such.

19. 1. Nominal – small in dollar amount awarded to recognize minimal harm was done
   2. Punitive – damages awarded when conduct was malicious. They are damages meant to punish the wrong-doer.
   3. Compensatory – damages used to compensate the plaintiff for harm done by liable party’s action. These can be special or general damages. Special damages are for damage that is tangible (medical bills). General damages are intangible in nature (pain and suffering).
20. 1. Smoke damage caused by a hostile fire emanating from the insured’s premises.
   2. Pollution damage resulting from operations occurring away from the insured’s premises, as long as:
      a. Pollutants were not brought to the site by the insured
      b. Operations were not to respond to pollutant cleanup

21. a. Dwelling and attached garage are covered under “Coverage A”
    Loss: $320,000 + $50,000 = $370,000 < policy limit of $400,000
    Coverage A covers $370,000

    Shed is covered under “Coverage B” with limit 10% x $400,000 = $40,000
    Loss: $5,000 < limit
    Coverage B covers loss of $5,000

    Personal property is covered under “Coverage C”
    Limit = 50% x $400,000 = $200,000
    Coverage C cover loss $200,000

    Dog is not covered

b. Fixture, detached shed are covered under “Coverage A”
   Loss: $15,000 + $6,000 = $21,000 > limit
   Min ($21,000, $20,000) = $20,000
   Coverage A cover $20,000
   Coverage B is included in A in HO-6 form

   Personal belongings is covered under “Coverage C”
   Loss: $45,000 < limit
   Coverage C cover $45,000
22.  
   a. A coverage trigger is an event that must occur, subject to requirements in the policy before the policy will respond to a claim.
   
   b. For claims-made forms, coverage is triggered for a loss that is reported to the insurer during the effective period of the policy. (The claim may be subject to a retroactive date.) For occurrence forms, coverage is triggered when a loss occurs during the effective period of the policy.
   
   c. The tail policy covers the claim because the tail policy covers all claims reported 1/1/2006 and afterwards for losses that occurred between 1/1/2004 and 12/31/2005.
   
   d. The 2004 occurrence policy covers the loss because the 2004 occurrence policy covers all losses that occurred in 2004 regardless of when the loss is reported.

23.  
   a. 1. To provide coverage that the voluntary private market won’t provide.
      2. Because it may be unfair for insurer to profit from insurance required by law.
      3. To provide affordable insurance to groups that would pay much more if rates weren’t kept artificially low.
   
   b. 1. Flood insurance
      2. Worker’s comp insurance (run by the states)
      3. Crop insurance

24.  

<table>
<thead>
<tr>
<th></th>
<th>SOFT MARKET</th>
<th>HARD MARKET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pricing</td>
<td>Insurers lower prices in response to competitive pressures and an excess of supply.</td>
<td>Insurers raise prices due to a lack of supply and an excess of demand</td>
</tr>
<tr>
<td>Underwriting</td>
<td>The aggregate premium goal of all underwriters exceeds the total demand in the market. Therefore, underwriters write less desirable business than they normally do and they are willing to lower prices.</td>
<td>The aggregate premium goal of all underwriters is less than the total demand of the market. Underwriters can be very selective in deciding what business to write.</td>
</tr>
<tr>
<td>Reserving</td>
<td>Insurers typically lower reserve adequacy to mask losses</td>
<td>Insurers typically strengthen reserves. This masks profits.</td>
</tr>
</tbody>
</table>
25. 1. Control plan utilization  
2. Require employee contributions  
3. Reducing plan benefits  
4. Negotiate price discounts with providers

26. a. When underwriters face a highly competitive environment and need to write a risk, they can do so by under-pricing the risk by low-balling the risk’s exposure, resulting in lower price being charged.

b. In a steady state environment, with the exposures being underestimated, the price level will increase such that adequate pricing is achieved. As a result the higher price is based on a low exposure level.

c. If the low exposure estimates stopped, and were to a more accurate level, the prices being charged would be excessive and not competitive.

27. True exposure is constantly changing, and dependent on an innumerable set of factors. Even if it weren’t, it could never be measured with perfect accuracy. For example, a car’s collision exposure is different when it’s in the garage, from when it’s parked on the street or being driven. It changes with the flow of traffic on the road, weather conditions, familiarity of the driver with the surroundings, and recency of maintenance. The exposure base could never account for everything, and even if it could, everything changes.
Policy Year 98 trend period 1/1/99 – 1/1/04 = 5 years (assuming rates in effect one year)
Freq * severity = 0.99 * 1.05 = 1.0395

Policy Year 99 trend period 1/1/99 – 1/1/04 = 5 years (assuming rates in effect one year)
Freq * severity = 0.99 * 1.05 = 1.0395

Policy Year 00 trend period 1/1/99 – 1/1/04 = 5 years (assuming rates in effect one year)
Freq * severity = 0.99 * 1.05 = 1.0395

<table>
<thead>
<tr>
<th>Policy Year</th>
<th>Trended B/L EP @ Current</th>
<th>Developed Basic Loss+LAE</th>
<th>Trend Period</th>
<th>Trend Factor</th>
<th>Trended Developed Loss +LAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>70,000</td>
<td>70,000</td>
<td>5 years</td>
<td>(1.0395)^5=1.214</td>
<td>70,000*1.214=84,980</td>
</tr>
<tr>
<td>1999</td>
<td>75,000</td>
<td>50,000</td>
<td>4 years</td>
<td>(1.0395)^4=1.168</td>
<td>50,000*1.168=58,400</td>
</tr>
<tr>
<td>2000</td>
<td>80,000</td>
<td>60,000</td>
<td>3 years</td>
<td>(1.0395)^3=1.123</td>
<td>60,000*1.123=67,380</td>
</tr>
</tbody>
</table>

Projected weighted loss ratio = .2*(1.214) + .3*(0.779) + .5*(0.842) = 0.8975

b. Trended present rate complement is used- bring present rates forward to current with trend accounting for any rate change that was indicated but not approved. Trend period begins at effective date anticipated in last filing and ends at effective date anticipated in this filing (1/1/02 – 1/1/03 = 1)
Complement = (1.15/1.10) * [(0.99*1.05/1.03)^1] * 0.68 = 0.717

c. Credibility = sqrt[(750+400+650)/3000] = 0.775
Credibility weighted loss ratio = 0.775*.8975 + (1-.775)*.717 = .857
Target loss & LAE ratio = 1 – 0.15 -0.12 – 0.03-0.05=.65
(since ULAE&ALAE appear to be included in above losses, no adjustment made for this)
Indication = (.857/.65) – 1 = .318 or 31.8%
28.d. 1. Extension of exposures – rerates each individual policy with the current rate level
2. Parallelogram method – method which adjusts premiums at the current rate level based on
geometric relationships and based on the assumption that exposures are uniformly written
over the period

e. 1. Data less affected by single large severity events (cats, etc)
2. Data not affected by shifts in policy limit distribution

f. Trending projects the losses from the average experience period to the midpoint of the
exposure period, whereas losses are developed from the midpoint of exposure period which
brings them to their ultimate value.

<table>
<thead>
<tr>
<th>Lag</th>
<th>Report Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>1</td>
<td>180 189</td>
</tr>
<tr>
<td>2</td>
<td>90 99.23</td>
</tr>
<tr>
<td>3</td>
<td>30 34.73 600</td>
</tr>
</tbody>
</table>

180 x (1.05) = 189
90 x (1.05)^2 = 99.23
30 x (1.05)^3 = 34.73

Pure premium = 300 + 189 + 99.23 + 34.73 = 622.96
Rate = \([622.96 x (1.08) + 150] / (1 – 0.12 – 0.05 – 0.03) = 1028.50\)
30. 1. Reinsurance – Reinsurance has become more expensive because of the major losses on Sept 11. In addition, many reinsurers have become insolvent, making recoverages uncertain. Both the cost of reinsurance and the solvency of the reinsurer must be considered.

2. Catastrophe losses – The terrorist attacks were considered a catastrophe. The possibility for future attacks need to be considered in any catastrophe provisions in rates.

3. Legislation – There is a bill that has or is about to be passed about government involvement in losses sustained in terrorist attacks. When this bill is passed, the effects on the net losses for insurers will need to be considered in ratemaking process.

31. a. 1. Past rate changes
    2. Past rating plan changes
    3. Rating plans causing the premium level to change over time
    4. Change in the mix of business

b. 1. Company A increases rates by 15%.
   2. Company B implements a new discount program.
   3. Model year and symbol rating plans in private passenger automobile insurance.
   4. Change in consumers preferences for larger liability limits in private passenger automobile insurance

c. 1. One time change
   2. One time change
   3. Continuous change
   4. Continuous change
### 32. a. Prior Review

<table>
<thead>
<tr>
<th>Terr</th>
<th>Agg</th>
<th>Total</th>
<th>Curr Relativity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LC</td>
<td>BCLC</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>75,000</td>
<td>165+35 = 200</td>
<td>0.778 = 200/257.14</td>
</tr>
<tr>
<td>B</td>
<td>100,000</td>
<td>190+110 = 300</td>
<td>1.167</td>
</tr>
<tr>
<td>Wtd avg</td>
<td>257.14</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

### b.

<table>
<thead>
<tr>
<th>Terr</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agg</td>
<td>Prior NH</td>
<td>Prior</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LC @ CRL</td>
<td>NHBCLC</td>
<td>BCLC</td>
<td>Rel</td>
<td>Cred</td>
</tr>
<tr>
<td>A</td>
<td>90,000</td>
<td>180</td>
<td>165</td>
<td>0.92</td>
<td>0.2</td>
</tr>
<tr>
<td>B</td>
<td>120,000</td>
<td>200</td>
<td>190</td>
<td>1.06</td>
<td>0.3</td>
</tr>
</tbody>
</table>

|      | 191.43 | 179.28 | 1.00 |

<table>
<thead>
<tr>
<th>Terr</th>
<th>(6)</th>
<th>(7)</th>
<th>(8) = (6) + (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cred Wtd NHBLCL</td>
<td>Modeled</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>(2) x (5) + (1-((5)) x avg(2) x (4)</td>
<td>HBCLC</td>
<td>BCLC</td>
</tr>
<tr>
<td>A</td>
<td>176.89</td>
<td>40</td>
<td>216.89</td>
</tr>
<tr>
<td>B</td>
<td>202.04</td>
<td>140</td>
<td>342.04</td>
</tr>
</tbody>
</table>

|      | 288.40 |

<table>
<thead>
<tr>
<th>Terr</th>
<th>Prop Rel</th>
<th>Curr Rel</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.752</td>
<td>0.778</td>
<td>-3.3%</td>
</tr>
<tr>
<td>B</td>
<td>1.186</td>
<td>1.167</td>
<td>+1.6%</td>
</tr>
</tbody>
</table>
33.

3 rate levels were in effect during PY 2002:
1/1/02 level – cum index of 1.00
7/1/02 level – cum index of 1.10
10/1/02 level – cum index of 1.155

The respective weights for these 3 areas are 1/8, 5/8, and 1/4.
The average rate level in effect is 1.101.
The current index level = 1.10 x 1.05 x 1.07 = 1.236
The premium adjustment factor = 1.236 / 1.101 = 1.122

34. a. 1. Allocated loss adjustment expense should be added to the basic limit losses (and not be limited)

2. Unallocated loss adjustment expense should be added in via a factor that will be multiplied by the basic limit losses + unlimited ALAE to get total losses. This factor is computed as:

(Loss + ALAE + ULAE) / (Loss + ALAE) (in this case, use total limits losses)

b. There is a concern that ALAE is becoming a larger and larger component of losses and could potentially distort the development factors being applied to Loss + ALAE. Graves and Castillo discuss an adjustment to LDFs, which addresses this concern. They multiply by a factor which comes from looking at loss + ALAE developed together and loss and ALAE developed separately.
Expense Fee Ratio = $H / (1-V-Q) = .094 / (1-.241) = 0.1238

Expenses:

<table>
<thead>
<tr>
<th>Expense Type</th>
<th>Total</th>
<th>% Fixed</th>
<th>Fixed</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commissions</td>
<td>0.15</td>
<td>0</td>
<td>0</td>
<td>.15</td>
</tr>
<tr>
<td>Other Acquisition</td>
<td>0.08</td>
<td>75</td>
<td>.06</td>
<td>.02</td>
</tr>
<tr>
<td>General</td>
<td>0.03</td>
<td>100</td>
<td>.03</td>
<td>0</td>
</tr>
<tr>
<td>Premium Tax</td>
<td>0.02</td>
<td>0</td>
<td>0</td>
<td>.02</td>
</tr>
<tr>
<td>Misc. Licenses &amp; Fees</td>
<td>0.005</td>
<td>80</td>
<td>.004</td>
<td>.001</td>
</tr>
<tr>
<td>Profit &amp; Contingencies</td>
<td>0.05</td>
<td>0</td>
<td>0</td>
<td>.05</td>
</tr>
<tr>
<td></td>
<td>.335</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( H = .094 \quad V+Q=.241 \)

Deductible:

<table>
<thead>
<tr>
<th>Territory</th>
<th>$250</th>
<th>$500</th>
<th>$1000</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>60</td>
<td>75</td>
<td>15</td>
<td>150</td>
</tr>
<tr>
<td>B</td>
<td>40</td>
<td>50</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>C</td>
<td>100</td>
<td>150</td>
<td>50</td>
<td>300</td>
</tr>
<tr>
<td>D</td>
<td>100</td>
<td>125</td>
<td>25</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>400</td>
<td>100</td>
<td>800</td>
</tr>
</tbody>
</table>

Avg deductible factor = \((300/800) \times 1.00 + (400/800) \times 0.90 + (100/800) \times 0.75\)
\[= (300 + 360 + 75) / 800 = 735 / 800 = .91875\]

Avg base rate = \((150/800) \times 250 + (100/800) \times 300 + (300/800) \times 200 + (250/800) \times 400\)
\[= (37,500 + 30,000 + 60,000 + 100,000) / 800 = 227,500 / 800 = 284.375\]

Statewide Avg rate = \(.91875 \times 284.375 = 261.27\)

Expense Fee = Statewide avg rate x Expense fee ratio
\[= 261.27 \times .1238 = 32.35\]
36. a. Target loss ratio = \( (1 - V - Q) / (1+G) \)
   \[ = (1-.22-.03) / (1.05) = .7143 = 71.43\% \]

   \( G = \frac{\text{Fixed expense/loss}}{400,000} = 0.05 \)

b. Experience loss ratio = \( \frac{400,000}{500,000} = 0.8 \)
   Indicated rate level change = \( \frac{0.8}{0.7143} - 1 = 12\% \)

c. \( R = \frac{P + F}{(1 - V - Q)} = \frac{84}{(1 - 0.25)} = 112 = \text{indicated rate} \)
   \( P = \frac{400,000}{5,000} = 80 \)
   \( F = \frac{20,000}{5,000} = 4 \)
   Current rate = \( \frac{500,000}{5,000} = 100 \)
   Rate change = \( \frac{112}{100} - 1.0 = 12.0\% \)

d. The pure premium method cannot be used if exposure information is not available.

e. The loss ratio method cannot be used for a new line of business because the method requires existing rate.
37.  

<table>
<thead>
<tr>
<th>Class</th>
<th>Curr Rel</th>
<th>WP on-level</th>
<th>Ind Rel</th>
<th>[(2) / (1)] (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.8</td>
<td>20,000</td>
<td>0.9</td>
<td>22,500</td>
</tr>
<tr>
<td>2</td>
<td>1.0</td>
<td>10,000</td>
<td>1.0</td>
<td>10,000</td>
</tr>
<tr>
<td>3</td>
<td>1.2</td>
<td>12,000</td>
<td>1.125</td>
<td>11,250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>42,000</td>
<td></td>
<td>43,750</td>
</tr>
</tbody>
</table>

a. Off-balance factor = 42,000 / 43,750 = 0.96  
Revised base rate = $200 x 1.20 x 0.96 = $230.40

b. The off-balance factor is necessary because the average relativity under indicated rates is different from the average relativity underlying the current rates.

38. Frequency = Claims / exposures = 10,000/67,000 = 0.1493 (from credible study)  
ABC # losses = # cars x frequency = 5000 cars x 0.1493 = 747  
Claims below deductible = 747 – 500 = 247  
E(x) = 150 x 247 + 1,000,000 + 500 x 250 = 1,162,050  
E(x;250) = 150 x 247 + 500 x 250 = 162,050  
Loss elimination ratio = E(x;250) / E(x) = 162,050 / 1,162,050 = 13.95%

39.  
1. Classic Bayesian credibility uses a larger group mean (including the base class) to compute the complement. This complement is biased and inaccurate, independent if the base class doesn’t predominate the data, is readily available, easy to compute, and has an explainable relationship to the base class.

2. Trended present rates where the complement is the present rate adjusted for the residual indication and trended from the last filing’s target effective date. It is unbiased, accurate, independent, available, easy to compute, and easy to explain since we are using the rates of the base class.

3. Rate change from a larger group applied to present rates where we apply a rate change from a larger group to present rates. This complement is unbiased, accurate, independent, available, easy to compute, and easily explainable.
40.

a. ITV for Policy 1: 150 / 200 = 75%
   ITV for Policy 2: 120 / 160 = 75%
   ITV for Policy 3: 400 / 480 = 83.3%

   Policies 1 & 2 do not meet coinsurance requirement so adjustment must be made
   Policy 1: 50,000 x (150,000 / (200,000 x 0.8)) = 46,875

   Policy 2: 155,000 x (120,000 / (160,000 x 0.8)) = 145,312
   Amount of adjusted loss exceeds the policy limit, so policy limit of 120,000 (the lesser of the values) is paid

   Policy 3: Meets coinsurance amount and loss is less than policy limit so loss is paid at $375,000

b. Policy 1: 0.8 * 200,000 = 160,000 ➔ additional 10,000 needed

   Policy 2: 80% coinsurance would be 0.8 * 160,000 = 128,000, but in this case loss exceeds this amount. To cover total loss insured would have needed an additional 155,000 – 120,000 = 35,000

   Policy 3: No additional amount is necessary since policy limits meets coinsurance requirement and loss is less than policy limit.
41.  
   a. WCSP – Mainly used for loss cost relativities and experience modifications. 
      Annual Financial Call Papers – used for overall loss cost changes 
   b. WCSP collects individual policy data 
      Annual Financial Call Papers collects aggregate premium and loss information 

42.  
   SP = 300,000  
   BPF = .18  
   LCF = 1.20  
   XSPF = .25  
   Tax = 1.04  
   B/L = 50,000  

   3 claims of 70,000, 15,000, 25,000. 
   Converted capped @ B/L losses = (50,000 + 15,000 + 25,000) x 1.20 = 108,000  

   a. Retro Prem = [BP + CL + XS + RDP] x Tax  
      = [Basic Prem + Converted Losses + Excess Losses + Retro Development Premium] x Tax Multiplier  
      
      BP = 300,000 x 0.18 = 54,000  
      CL = 90,000 x 1.20 = 108,000  
      XS = 300,000 x 0.25 x 1.20 = 90,000 
      RDP = ignore  
      
      Retro Prem = (54,000 + 108,000 + 90,000) x 1.04 = 262,080  

   b. There are back and forth premiums often because the retro adjustments modify the premium based on loss experience sustained. The 1st adjustment (18 months after inception) is usually return premium (refund) because little loss experience is reported. Subsequent adjustments typically require more premium due the insured.  

   c. The retrospective development premium can be used to offset and smooth out some of the uneven cash flows.
43. 

a. For Youthful Class

<table>
<thead>
<tr>
<th>Year</th>
<th>Premium</th>
<th>Losses</th>
<th>Expenses</th>
<th>Persistency Rate</th>
<th>Discount Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x</td>
<td>1500</td>
<td>0.2x</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1.1x</td>
<td>1500 * 1.05 = 1575</td>
<td>0.22x</td>
<td>1 * (1-25p)=0.75</td>
<td>1.1</td>
</tr>
<tr>
<td>3</td>
<td>1.21x</td>
<td>1575 * 1.05 = 1653.75</td>
<td>0.242x</td>
<td>0.75 * (1-25p)=0.5625</td>
<td>(1.1)^2 = 1.21</td>
</tr>
</tbody>
</table>

3-year present value of profit
= (x-0.2x-1500) * 1/1 + (1.1x-0.22x-1575) * 0.75/1.1 + (1.21x-0.242x-1653.75) * 0.5625/1.21
= (0.8x-1500) + (0.88x-1575) * 0.682 + (0.968x-1653.75) * 0.465
= 1.85x – 3342.65

3-year present value of premium
= x * 1/1 + 1.1x * 0.75/1.1 + 1.21x * 0.5625/1.21
= 2.3125P

Adult return = PV of profit / PV of premium = 90.30 / 2710 = 3.33% which is the same for youthful class
3.33% = (1.85x – 3342.65) / 2.3125x
x = 1885 = youthful premium for year 1

Youthful Prem relativity = 1.885 / 1.000 = 1.885 = youthful prem for year 1/adult prem for year 1

b. Since traditional ratemaking methods don’t take into account persistency rates, they tend to underestimate relativities for classifications with poor persistency and overestimate relativities for classifications with good persistency.