



CASUALTY ACTUARIAL SOCIETY
AND THE
CANADIAN INSTITUTE OF ACTUARIES



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Exam 5

Introduction to Property and
Casualty Insurance and Ratemaking

May 13, 2009

4 HOURS

INSTRUCTIONS TO CANDIDATES

1. This 75 point examination consists of 45 problem and essay questions.
2. For the problem and essay questions, the number of points for each full question and 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 multiple 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 only on the front lined side of the paper – **DO NOT WRITE ON THE BACK OF THE PAPER**. Be careful to give the number of the question you are answering on each sheet. If your response cannot be confined to one page, please use additional sheets of paper as necessary. Clearly mark the question number on each page of the response in addition to using a label such as "Page 1 of 2" on the first sheet of paper and then "Page 2 of 2" on the second sheet of paper.
 - The answer should be concise and confined to the question as posed. When a specified number of items are requested, do not offer more items than requested. For example, if you are requested to provide 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.
3. Do all problems until you reach the last page of the examination where "END OF EXAMINATION" is marked.

CONTINUE TO NEXT PAGE OF INSTRUCTIONS

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4. Prior to the start of the exam you will have a **fifteen-minute reading period** in which you can silently read the questions and check the exam booklet for missing or defective pages. A chart indicating the point value for each question is attached to the back of the examination. Writing will NOT be permitted during this time and you will not be permitted to hold pens or pencils. You will also not be allowed to use calculators. The supervisor has additional exams for those candidates who have defective exam booklets.
- Verify that you have received the reference materials:
 - a. Insurance Services Office, Inc., Personal Automobile Policy (Edition 6-98).
 - b. Insurance Services Office, Inc., Personal Automobile Manual (Effective 6-98), General Rules 1-6.
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. Candidates must remain in the examination center until two hours after the start of the examination. The examination starts after the reading period is complete. 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.
7. At the end of the examination, place all answer sheets in the Examination Envelope. Please insert your answer sheets in your envelope in question number order. Insert a numbered page for each question, even if you have not attempted to answer that question. Nothing written in the examination booklet will be graded. Only the answer sheets will be graded. Also place any included reference materials in the Examination Envelope. BEFORE YOU TURN THE EXAMINATION ENVELOPE IN TO THE SUPERVISOR, BE SURE TO SIGN IT IN THE SPACE PROVIDED ABOVE THE CUT-OUT WINDOW.
8. 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 from the CAS Web Site.
- All extra answer sheets, scrap paper, etc. must be returned to the supervisor for disposal.
9. 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 and the Canadian Institute of Actuaries 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

10. The exam survey is available on the CAS Web Site in the “Admissions/Exams” section. Please submit your survey by June 1, 2009.

END OF INSTRUCTIONS

1. (1 point)

Briefly define the terms "moral hazard" and "morale hazard" and provide an example of each.

2. (1.5 points)

According to Nyce, "Foundations of Risk Management and Insurance", every loss exposure has three distinct elements.

a. (0.75 point)

Briefly describe the three elements of a loss exposure.

b. (0.75 point)

Provide an example of how each element would apply to workers' compensation insurance.

3. (1.5 points)

Discuss three purposes of exclusions in insurance policies.

4. (1 point)

Real property is one classification of property for insurance purposes. Identify and briefly describe two others.

5. (1 point)

For each of the coverages of the Commercial General Liability Coverage (CGL) form shown below:

- i. Identify what is covered.
- ii. Identify an exclusion for the coverage.

a. (0.5 point)

Coverage A

b. (0.5 point)

Coverage B

6. (1.5 points)

Elaine has a standard unendorsed ISO HO-3 policy. Elaine and her family returned home from a 2 week vacation over winter break and found there had been a severe ice storm while they were gone. Elaine turned off the heat in her home before leaving for vacation.

For each of the losses below state whether or not there is coverage under her policy. Briefly explain your answer.

a. (0.5 point)

Power lines were downed 2 miles away from her home due to the weight of the ice, which interrupted electrical service to Elaine's home. The food in her freezer thawed and spoiled.

b. (0.5 point)

The weight of ice caused the roof of the shed in Elaine's back yard to collapse, also damaging the items stored inside.

c. (0.5 point)

A water pipe in the home froze and subsequently burst, causing water damage in the kitchen.

7. (1 point)

Bob is driving his friend Susan home in Susan's car when they are struck by a hit-and-run driver. Bob's injuries resulted in medical costs of \$175,000 and Susan's injuries resulted in medical costs of \$300,000. Both Bob and Susan have an unendorsed ISO Personal Automobile Policy with the coverage limits shown in the table below.

Coverage	Susan's Policy	Bob's Policy
Liability	\$100,000/\$300,000/\$100,000	\$250,000/\$500,000/\$250,000
Medical Payments	No Coverage	No Coverage
Uninsured Motorist	\$100,000/\$300,000/\$100,000	\$250,000/\$500,000/\$250,000

Identify the amounts paid under each coverage of:

a. (0.5 point)

Bob's policy.

b. (0.5 point)

Susan's policy.

8. (1.5 points)

Craig and Mary were driving their cars and Jeff was a passenger in Mary's car. Craig's car and Mary's car collided and Craig was determined to be at fault. The accident resulted in injuries to both Mary and Jeff and damage to Mary's car.

The court awarded damages and pre-judgment interest as shown below. Craig has an ISO Personal Automobile Policy with liability limits of \$100,000/\$300,000/\$100,000.

Bodily Injury damages to Mary	\$99,000
Bodily Injury damages to Jeff	\$250,000
Property Damage damages to Mary's Car	\$20,000
Pre-judgment interest to Mary for Bodily Injury	\$2,000
Pre-judgment interest to Jeff for Bodily Injury	\$4,000
Defense costs	\$25,000

Calculate the total amount Craig's insurer will pay under his ISO Personal Automobile Policy.

9. (1 point)

John replaced his old car with a new car. John carried only liability coverage on his old car. On the day he bought the new car, John caused an accident with Bill. This accident occurred before John was able to arrange for a new policy on the new car. John was at fault and caused \$2,000 of damage to his new car and \$300 of damage to Bill's car during this accident.

a. (0.5 point)

Briefly describe what, if any, coverage exists under John's old car's ISO Personal Auto Policy for:

- i. Liability
- ii. Damage to his new car

b. (0.25 point)

Determine the total damage to all property that must occur before John exceeds the threshold to be assessed a point under the ISO Personal Auto Safe Driver Insurance Plan.

c. (0.25 point)

Given the ISO Personal Auto Safe Driver Insurance Plan and no other accidents or violations, determine how many points John will be assessed during his next policy period for this accident.

10. (1 point)

Briefly describe four common responsibilities of the underwriting function within an insurance company.

11. (1 point)

Identify and briefly describe the two most common measures of valuing property used in property claim adjusting.

12. (1 point)

a. (0.5 point)

Define the term "salvage."

b. (0.5 point)

Define the term "subrogation."

13. (1.75 points)

a. (0.75 point)

Identify the three traditional marketing systems insurers use to market their policies.

b. (1 point)

Identify and briefly describe two of the three principal characteristics that distinguish one traditional marketing system from another.

14. (2 points)

Fully describe the progression of the insurance cycle. The description should include comments on profit level, rate change activity, volume of business, and the relationship between supply and demand.

15. (1.5 points)

Identify whether the following market conditions tend to shorten or lengthen a hard market. Briefly explain your answer.

a. (0.5 point)

The state department of insurance requires a lengthy approval process prior to issuing an insurance license.

b. (0.5 point)

Insurance companies have been strengthening carried reserve levels.

c. (0.5 point)

Rate regulation is minimal and competition is encouraged.

16. (1 point)

Briefly describe two advantages and two disadvantages of Managed Care Plans.

17. (2 points)

An insurance company is considering changing the personal automobile exposure base from earned car years to number of miles driven.

a. (1 point)

Identify four desirable characteristics of an exposure base.

b. (1 point)

Discuss whether or not the change to a miles-driven exposure base should be made, referencing each of the four characteristics identified in part a. above.

18. (2 points)

The following is the premium associated with five annual policies, where premium is earned uniformly throughout the year:

Policy	Effective Date	Premium
1	January 1, 2007	\$ 750
2	April 1, 2007	\$ 1,200
3	July 1, 2007	\$ 900
4	October 1, 2007	\$ 800
5	January 1, 2008	\$ 850

a. (0.5 point)

Calculate the total calendar year 2007 written premium.

b. (0.5 point)

Calculate the total calendar year 2008 earned premium.

c. (0.5 point)

Calculate the total policy year 2007 earned premium as of March 31, 2008.

d. (0.5 point)

Calculate the total in-force premium as of July 1, 2008.

19. (2.5 points)

Given the following information:

- All policies are semi-annual.
- A +5% rate change was implemented effective October 1, 2007.
- A benefit change of +10% was enacted affecting premium on all outstanding policies on July 1, 2008.

a. (0.75 point)

Draw and label a diagram of the parallelogram method for calendar year 2008 earned premium.

b. (1.25 points)

Calculate the on-level factor for calendar year 2008 earned premium.

c. (0.5 point)

Explain why the parallelogram method may not be appropriate for calculating on-level factors for snowmobile insurance.

20. (1 point)

a. (0.5 point)

Explain why an actuary should use written premium, rather than earned premium, to analyze premium trend.

b. (0.5 point)

Explain why an actuary should use premium adjusted to current rate level to analyze premium trend.

21. (1.5 points)

For each of the following:

- i. Explain the effect on average premium level
- ii. Briefly describe how to adjust the historical premium for use in ratemaking

a. (0.75 point)

An automobile insurer implements a new 5% discount for female drivers without offsetting base rates.

b. (0.75 point)

A homeowners insurer includes an inflation guard endorsement on all policies, which automatically increases Coverage A in line with an external inflation index.

22. (2 points)

An insurance company started writing annual policies in 2005. Given the following information for claims associated with policies written in 2005:

Accidents Occuring in 2005		
Calendar Year	Payments	Reserve @ End of Year
2005	\$ 1,000,000	\$ 500,000
2006	\$ 300,000	\$ 300,000
2007	\$ 250,000	\$ 100,000
2008	\$ 50,000	\$ -

Accidents Occuring in 2006		
Calendar Year	Payments	Reserve @ End of Year
2005	\$ -	\$ -
2006	\$ 1,500,000	\$ 1,000,000
2007	\$ 700,000	\$ 200,000
2008	\$ 100,000	\$ 50,000

a. (0.5 point)

Calculate the calendar year losses for 2006.

b. (0.5 point)

Calculate the accident year incurred losses for 2006 evaluated as of December 31, 2007.

c. (0.5 point)

Calculate the policy year incurred losses for 2005 evaluated as of December 31, 2008.

d. (0.5 point)

Provide one advantage and one disadvantage associated with using calendar year incurred losses rather than accident year incurred losses for ratemaking.

23. (1 point)

Describe basic limits losses and explain when an actuary should use basic limits losses for determining an overall rate level indication.

24. (1 point)

Fully discuss why it may be inappropriate to apply a basic limits loss trend to total limits losses.

25. (1 point)

Describe two reasons why workers' compensation benefit trends have exceeded wage inflation.

26. (1 point)

Given the following information regarding a change to a workers' compensation program's indemnity benefits:

- The replacement rate for benefits is changed from 50% of gross earnings to 85% of net take-home (after-tax) pay.
- The maximum and minimum limitations do not affect the reimbursement, either before or after the change.
- The tax rate for all participants is 30%.

a. (0.5 point)

Calculate the direct effect of this benefit change.

b. (0.5 point)

Briefly explain two possible indirect effects of this change.

27. (1 point)

Fully discuss the "overlap fallacy" between trend and loss development.

28. (2 points)

An insured has purchased the following policies:

Effective Date	Policy Term	Policy Type	Retroactive Date
January 1, 2004	1 Year	Occurrence	N/A
January 1, 2005	1 Year	Occurrence	N/A
January 1, 2006	1 Year	First-Year Claims Made	January 1, 2006
January 1, 2007	1 Year	Second-Year Claims Made	January 1, 2006
January 1, 2008	1 Year	Third-Year Claims Made	January 1, 2006

A tail policy is also purchased on January 1, 2009 to cover any losses that occurred while the claims-made policies were in effect but had not been reported as of December 31, 2008.

Draw and label a diagram that shows what losses each policy covers, based on when the losses occurred and when they were reported, assuming all claims are reported within 3 years of occurrence.

29. (2.5 points)

Given the following information:

Expense Type	2008 Expense	% Fixed
General	\$14,000	60.0%
Other Acquisition	\$5,600	50.0%
Commission and Brokerage	\$21,000	0.0%
Taxes, License, and Fees	\$2,800	75.0%

- 2008 written premium = \$160,000
- 2008 earned premium = \$140,000
- Statewide average loss cost per exposure = \$197.25
- Profit and contingencies provision = 5%
- General expenses are incurred throughout the policy.
- All other expenses are incurred at the beginning of the policy.

a. (2 points)

Calculate the expense fee.

b. (0.5 point)

Given a rate increase implemented on January 1, 2009, identify the impact on the expense fee ratio and briefly explain a method to correct any distortion.

30. (6 points)

Given the following information:

- All policies have annual terms.
- Proposed effective date is October 1, 2009 and rates will be in effect for 12 months.
- Rate change history:
 - -4% effective July 1, 2007
 - +5% effective January 1, 2009
- Selected premium trend = 1%

Calendar Accident Year	Earned Premium	Case Incurred Losses and ALAE
2007	\$600,000	\$250,000
2008	\$650,000	\$350,000

- Historical Accident Year Case Incurred Loss and ALAE Link Ratios:

Accident Year	12-24 Months	24-36 Months	36-48 Months	48-60 Months	60-72 Months
2001	1.40	1.07	1.05	1.03	1.02
2002	1.40	1.07	1.05	1.03	1.02
2003	1.40	1.07	1.05	1.03	1.02
2004	1.40	1.07	1.05	1.03	
2005	1.30	1.15	1.05		
2006	1.30	1.15			
2007	1.30				

- A tail development factor of 1.01 is needed to account for development beyond 72 months.
- Selected annual frequency trend = -2%
- Selected annual severity trend = 5%
- ULAE is consistently 4% of ultimate losses and ALAE.
- Projected fixed expense provision = 10% of premium
- Variable expense provision = 20% of premium
- Profit and contingencies provision = 3% of premium

a. (2 points)

Calculate 2007 and 2008 projected calendar year earned premium at current rate level.

b. (1 point)

Select 12-month and 24-month age to ultimate factors. Briefly explain your selection.

c. (1.5 points)

Calculate the 2007 and 2008 projected calendar accident year losses and LAE.

d. (1.5 points)

Calculate the indicated rate change, giving 40% weight to calendar accident year 2007 and 60% weight to calendar accident year 2008.

CONTINUED ON NEXT PAGE

31. (1.5 points)

For each of the following identify whether the loss ratio or pure premium ratemaking method is preferable. Briefly explain your answer.

a. (0.5 point)

Setting prices for a new line of business.

b. (0.5 point)

Setting prices for a product that is not written uniformly throughout the year; current systems do not support re-rating policies.

c. (0.5 point)

Setting prices for a commercial lines product that has multiple complex exposures underlying each risk.

32. (2 points)

Given the following information:

- Current State X loss cost = \$1,600
- Current countrywide loss cost = \$1,800
- Indicated countrywide loss cost = \$1,710
- State X losses and LAE = \$1,000,000
- State X exposures = 1,000
- State X fixed expenses = \$200,000
- Variable expense factor = 25%
- Profit and contingency factor = 5%
- Full credibility standard is 16,000 exposures.
- Partial credibility is assigned using the square root rule.
- Complement of credibility is determined using the "Rate Change from a Larger Group" method.

Calculate the credibility-weighted indicated rate for State X.

33. (1 point)

Fully discuss how an insurance company can "skim the cream" to gain a competitive advantage.

34. (1.5 points)

An insurance company is considering using a rating factor based on a detailed psychological profile.

a. (1 point)

Identify and briefly explain two of the criteria for desirable classification rating factors.

b. (0.5 point)

Evaluate if the rating factor based on the new psychological profile meets each of the criteria identified in part a. above.

35. (3.25 points)

Given the following information:

Frequency of Claims	Loss Amount per Claim
45%	\$22,000
20%	\$35,000
15%	\$150,000
15%	\$250,000
5%	\$1,000,000

- Full Coverage Premium = \$24,793
- Expected Ground-up Loss Ratio = 59%
- ALAE = 10% of losses (assume the deductible does not apply to ALAE)
- Incremental Fixed Expenses for processing a deductible = 4% of losses in deductible layer
- Load for uncollectible deductible payments = 1% of losses in deductible layer
- Profit = 8%
- Additional Risk Load = 5%
- Commission = 10%
- Other Variable Expenses = 5%

Calculate the final premium for a policy with a \$100,000 deductible.

36. (2 points)

Given the following information:

- Basic Limit = \$1,000,000
- ULAE Provision as % of Loss (Basic Limit) = 10.0%
- ULAE Provision as % of Loss (Increased Limit) = 20.0%
- Expected Frequency (Basic Limit) = 0.15
- Expected Frequency (Increased Limit) = 0.10
- Assume no risk load

Claim	Ground-Up Uncensored Loss
1	\$300,000
2	\$600,000
3	\$750,000
4	\$1,250,000
5	\$4,500,000
6	\$10,000,000

Calculate the increased limit factor at \$5,000,000, assuming there is no ALAE.

37. (3 points)

Given the following information:

Territory	Historical Earned Exposures	Current Territorial Relativity	Average Relativity for Other Factors*	Reported Losses	Reported Claim Count
1	4,000	0.60	1.30	\$ 420,000	600
2	16,000	1.00	1.05	\$ 1,250,000	1,320
3	3,750	0.52	1.20	\$ 360,000	390

*Weighted-average rate relativity for all factors except territory.

- Territory 2 will remain the base territory.
- Full credibility standard is 1,082 claims.
- Complement of credibility is no change.

Calculate the indicated territorial relativities.

38. (3.5 points)

Given the following information:

Class	On-Level Premium	Current Relativity	Proposed Relativity
1	\$ 500,000	1.00	1.00
2	\$ 100,000	1.25	1.15
3	\$ 400,000	1.60	1.40
Total	\$ 1,000,000		

- Class 1 will remain the base class.
- The current base rate is \$100.
- The proposed overall change is 15%.

a. (1 point)

Calculate the revised base rate.

b. (2.5 points)

Assume the actuary wants to cap all class changes at 20% while still achieving the overall change of 15%. Calculate the revised base rate and class relativities.

39. (1.75 points)

a. (1 point)

Identify two considerations from the "Statement of Principles Regarding Property & Casualty Ratemaking" that could apply to the concept of insurance to value. Briefly explain the relevance of each to insurance to value.

b. (0.75 point)

An insurance company increases the insurance to value of its book of business. Briefly describe the impact on each of the following:

- Premium
- Losses
- Expenses

40. (2 points)

Given the following:

- Property is valued at \$500,000.
- Coinsurance requirement is 88% of the property value.
- Policy face value is \$300,000.

Graph and label the coinsurance penalty function.

41. (1 point)

Describe two methods a company can use to help manage its guaranteed replacement cost exposure.

42. (1 point)

For homeowners insurance explain two reasons that hurricane rates should be priced separately from non-hurricane rates.

43. (1 point)

An insurance company uses experience rating and schedule rating to calculate Commercial General Liability (CGL) premium for bowling ball manufacturers.

- A schedule rating credit of up to 10% can be judgmentally given for loss control programs.
- There are no caps on the experience modification factors.
- The insured is a bowling ball manufacturer whose loss control program has reduced losses by an estimated 5% each year for the last 10 years.

Determine the appropriate schedule rating credit, assuming no changes to the insured's loss control program. Briefly explain your answer.

44. (1.5 points)

Contrast experience rating and retrospective rating with respect to the following concepts:

a. (0.75 point)

Providing incentive to the insured to control losses during the policy period.

b. (0.75 point)

Providing stability in the premium charged to the insured.

45. (2.25 points)

a. (0.75 point)

Define persistency rates. Briefly explain why persistency rates are important for classification ratemaking.

b. (0.75 point)

For private passenger auto, identify whether a direct writer or an independent agency company is expected to have higher persistency rates. Explain your answer.

c. (0.75 point)

There are two private passenger auto insurers. One targets non-standard insureds and the other targets preferred or standard insureds. Identify which insurer is likely to have higher persistency rates and explain your answer.

Exam 5

Introduction to P&C Insurance and Ratemaking

13-May-09

POINT VALUE OF QUESTIONS

QUESTION	VALUE OF QUESTON	SUB-PART OF QUESTION						
		(a)	(b)	(c)	(d)	(e)	(f)	(g)
1	1.00	1.00						
2	1.50	0.75	0.75					
3	1.50	1.50						
4	1.00	1.00						
5	1.00	0.50	0.50					
6	1.50	0.50	0.50	0.50				
7	1.00	0.50	0.50					
8	1.50	1.50						
9	1.00	0.50	0.25	0.25				
10	1.00	1.00						
11	1.00	1.00						
12	1.00	0.50	0.50					
13	1.75	0.75	1.00					
14	2.00	2.00						
15	1.50	0.50	0.50	0.50				
16	1.00	1.00						
17	2.00	1.00	1.00					
18	2.00	0.50	0.50	0.50	0.50			
19	2.50	0.75	1.25	0.50				
20	1.00	0.50	0.50					
21	1.50	0.75	0.75					
22	2.00	0.50	0.50	0.50	0.50			
23	1.00	1.00						
24	1.00	1.00						
25	1.00	1.00						
26	1.00	0.50	0.50					
27	1.00	1.00						
28	2.00	2.00						
29	2.50	2.00	0.50					
30	6.00	2.00	1.00	1.50	1.50			
31	1.50	0.50	0.50	0.50				
32	2.00	2.00						
33	1.00	1.00						
34	1.50	1.00	0.50					
35	3.25	3.25						
36	2.00	2.00						
37	3.00	3.00						
38	3.50	1.00	2.50					
39	1.75	1.00	0.75					
40	2.00	2.00						
41	1.00	1.00						
42	1.00	1.00						
43	1.00	1.00						
44	1.50	0.75	0.75					
45	2.25	0.75	0.75	0.75				

TOTAL	<u>75.00</u>
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These are the responses that received full credit. There may be alternative answers that could receive full credit.

Question#: 1

Moral Hazard: condition that increases the frequency or severity of loss resulting from a person acting dishonestly. ex: arson for profit

Morale Hazard: condition that increases the frequency or severity of loss resulting from an indifferent/careless behavior. ex: failing to lock an unattended building

Question#: 2

- a.
 - 1) assets exposed to loss
 - 2) cause of loss
 - 3) financial consequences of the loss
- b. In workers' compensation insurance:
 - 1) the asset exposed to loss is the workers' earning ability and health
 - 2) cause of loss: job- related injuries and illness
 - 3) financial consequences of the loss: the medical expenses for the job-related injuries and illness; loss of earnings and death

Question#: 3

1. Eliminate coverage for uninsurable loss exposures
→ these include events like war, which cannot be covered by an insurance policy
2. Assist in the management of moral and morale hazards
→ some types of losses can be caused by the insured, such as arson. Eliminating intentionally caused losses, such as arson, helps to minimize moral and morale hazards.
3. Assist in keeping premiums reasonable
→ eliminating coverage for “wear and tear” will help reduce premiums, since these types of losses occur with very high frequency and very low severity.

Question#: 4

Personal property - any property that can be physically touched and is not considered real property is personal property. Property that is not permanently attached and can be removed.

Intangible property - this is property that cannot be touched and is difficult to insure. Items include such things as patents, copyrights, etc.

Question#: 5

- a.
 - i) Coverage A provides coverage for claims against the insured due to bodily injury or property damage for which the insured is alleged to be responsible.
 - ii) Coverage A would exclude bodily injury to an employee because this claim would be covered under workers compensation insurance
- b.
 - i) Coverage B provides coverage for claims against the insured due to Personal and Advertising injury for which the insured is alleged to be responsible
 - ii) Coverage B would exclude coverage for misrepresentation of a price in a store ad.

Question#: 6

- a) Not covered - because utility services damaged away from premises are excluded
- b) Covered - weight of ice is a covered peril
- c) Not covered - excluded because insured did not take an action to prevent a pipe from getting frozen.
Elaine should not have turned off all of the heat in her home before leaving for vacation.

Question#: 7

Susan's coverage is primary.

- a. \$75,000 in uninsured motorist coverage for Bob's injury
- b. \$100,000 in uninsured motorist coverage for Susan's injury
\$100,00 in uninsured motorist coverage for Bob's injury

Question#: 8

<u>Craig's BI/PD</u>		
BI Mary	99k	99k
BI Jeff	250k	100k - capped by 100k limit per person
PD Mary	20k	20k
Pre-Judge Mary	2k	1k - included in limit, 100k per person
Pre-Judge Jeff	4k	0 – included in limit, 100k exhausted
Defense Cost	25k	<u>25k</u> – add. to limit

245k

Pre-judgment interest is included in the limit
Defense cost is additional to the limit

Question#: 9

- a) i. Liability - same liability coverage as the old car
 - ii. Damage to new car - \$500 deductible if John reports the car within 4 days of purchase
- b) Total damage must exceed \$500 for all property
- c) One point will be assigned since total damages exceed \$500 and his prior record was clean

Question#: 10

- 1) Evaluate loss exposures, identify hazards
- 2) Determine underwriting alternatives (accept risk, reject risk, make counter offer with modifications)
- 3) Determine the appropriate premium for the coverage (classify risk)
- 4) Monitor the loss exposure

Question#: 11

1. Replacement cost - cost to repair or replace property with new material of like kind of quality with no depreciation
2. Actual cash value - replacement cost minus depreciation

Question#: 12

a) salvage - refers to the value of damaged property that the insurer takes possession of in the event of a total loss. Typically occurs with auto physical damage losses → car is damaged beyond repair either via collision or other than collision. Insurer pays insured actual cash value (typically appraised value) for vehicle and takes possession of vehicle. Insurer may be able to recover some of the loss costs by selling vehicle to another party (i.e. junk yard) and recovering salvage amount.

b) subrogation - the insurer pays the loss to the insured, then takes the place of the insured to ask for remedy from the at-fault 3rd party. The insured has waived the rights to ask for remedy from the 3rd party once he/she has accepted the payment from the insurer.

Question#: 13

- a. 1) Independent agent and brokerage system
 2) Exclusive agency
 3) Direct writers
- b. (2 of these 3)

Contractual agreement:

- Independent agency are independent contractors that can deal with as many insurers as they want
- Exclusive agency are independent contractors that deals with a unique insurance company
- Direct writers are often employees that sell insurance for that company they work for

Ownership of expirations:

- Independent agents own the expirations of their policies and can move their business to other insurers as they wish
- Exclusive agency do not own the expiration of the policies
- Direct writers do not own the expirations of the policies

Compensation methods

- Independent agency - paid a commission % for all business written (both new and renewal)
 may have a profit sharing % after a certain premium volume goal has been reached with an insurer
- Exclusive Agency- paid a commission % for new business written and a lower commission % for renewal business
- Direct writer - paid by salary, commission or both

Question#: 14

Supply > demand

Insurer's volume of business down

Insurers lower prices

Profit levels down

Insurers leave market

Supply < demand

Insurers raise prices

Insurers volume of business up

Profit levels up

Insurers enter market

Supply > demand

Question#: 15

- a) When companies have a hard time entering market, this **lengthens** the hard market because it delays excess supply that will cause insurers to have to lower prices.
- b) Insurance companies strengthening reserve levels **lengthens** the hard market because this masks some of the profits which delays some firms from entering, therefore delaying excess supply.
- c) Minimal rate regulation and competition encouragement **shorten** the hard market. New firms can easily enter, causing excess supply. With minimal rate regulation, insurers can quickly lower prices in response to competition.

Question#: 16

Advantages:

1. Health care costs are lower because Managed Care Plans emphasize cost control.
2. Plan Members will pay little or no out-of-pocket money for the services covered

Disadvantages:

1. Emphasizing cost control will reduce the quality of medical treatment
2. The physicians cannot treat the members without restrictions; Managed Care Plans are compromising the traditional doctor-patient relationship.

Question#: 17

- a.
 - 1) varies with the hazard
 - 2) verifiable
 - 3) not subject to manipulation
 - 4) practical
- b.
 - 1) Miles driven certainly varies with the hazard; the more you drive the more likely you are to get in an accident.
 - 2) Verifiable- may not be easy to verify. Someone would have to inspect each car at the end of the year to read the odometer.
 - 3) Certainly subject to manipulation. If the insured was asked how many miles driven in a year without verification, he could easily lie. Even if the number was verified, there are still ways to turn the numbers on an odometer back.
 - 4) Miles driven is practical and intuitive. Most insured would understand that miles driven would be directly correlated to probability of accidents.

Overall, the change to miles driven should not be made since the downsides of costly verification and possibility of manipulation out weigh the benefits of varying with the hazard and practicality.

Question#: 18

- a. CY 2007 written premium:

$$750 + 1,200 + 900 + 800 \\ = \$3,650$$

- b. CY 2008 earned premium:

$$1,200 (3/12) + 900 (6/12) + 800 (9/12) + 850 \\ = 300 + 450 + 600 + 850 \\ = \$2,200$$

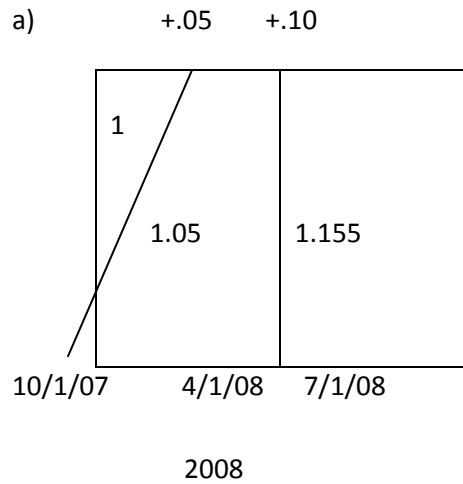
- c. PY 2007 earned premium as of 3/31/08

$$750 + 1,200 + 900 (9/12) + 800 (6/12) \\ = 750 + 1200 + 675 + 400 \\ = \$3,025$$

- d. In-force premium as of 7/1/08

$$800 + 850 = \$1,650$$

Question#: 19



b)

$$(6/12)(3/12)(1/2) 1 + [(1/2)-(6/12)(3/12)(1/2)] 1.05 + (1/2)1.155$$

$$= .0625 + .459375 + .5775$$

$$= 1.099375$$

$$\text{On-level factor} = 1.155/1.099375 = 1.05059693$$

c) Snowmobile insurance is not uniformly earned throughout the year. The parallelogram method assumes uniform earnings.

Question#: 20

a. The written premium should be used to analyze premium trend because it allows for the use of more recent data, which could reflect trends that have yet to show up in EP. Also, in the “Jones” two-step trending procedure the length of the uncertain projection period is shorter for written premium than for earned premium.

b. If premiums are not adjusted to current rate levels, the trend calculated would reflect both the rate level changes and actual premium trend. Rate level changes are one-time changes; however, the trend calculated would suggest that those rate levels changes in the data would continue in the future, which is an inappropriate assumption. In addition, the abrupt changes in the data may make it difficult to select a trend.

Question#: 21

- a.
 - i) average premium level will decrease since the new discount was not offset
 - ii) treat as a one time, measurable rate change using on-level factors
- b.
 - i.) average premium level will increase since the Cov. A limit will increase with the inflation index and result in increased premiums
 - ii) treat as a gradual/continuous change and adjust historical premiums with a premium trend (similar to an automobile model year/symbol factor)

Question#: 22

- a) Calendar Year 2006 losses

Question is ambiguous with respect to whether it refers to paid losses or incurred losses.

Assuming Paid Losses:

$$\rightarrow 300,000 + 1,500,000 = \$1,800,000$$

Assuming Incurred Losses (i.e. paid + change in reserves):

$$\begin{aligned} \rightarrow & \$1,800,000 + (300,000 - 500,000) + (1,000,000 - 0) \\ & = \$2,600,000 \end{aligned}$$

- b) AY 2006 incurred losses @ 12/31/07

$$= (\text{AY 06 paid until 12/31/07}) + (\text{AY 06 reserves @ 12/31/07})$$

$$= (1,500,000 + 700,000) + 200,000$$

$$= \$2,400,000$$

- c) PY 2005 incurred losses @ 12/31/08

$$= (\text{PY 05 Paid until 12/31/08}) + (\text{PY 05 reserves @ 12/31/08})$$

$$= (1,000,000 + 300,000 + 250,000 + 50,000) \quad (0)$$

+

$$(1,500,000 + 700,000 + 100,000) \quad (50,000)$$

$$= \$3,950,000$$

- d) CY incurred losses are more responsive than AY since loss info is known once CY is complete.

AY incurred provides a better match to premium and loss than CY basis, although not as well as PY matches premium and loss.

Question#: 23

Basic limits losses: losses capped at the basic limit/level

- 1) More responsive to frequency than to severity
- 2) Not easily influenced by large/unusual losses
- 3) Avoid any influences by different policy limits
- 4) More credible loss data

Question#: 24

If loss costs are increasing, basic limit losses will trend at a lower rate than total losses, and thus a basic limit trend will understate the actual underlying loss trend.

Basic limit losses trend at a lower rate than total losses because for losses near or at basic limits before trending, the full trend will not be realized by limiting losses. A loss that is already at or above basic limits, in fact, will observe no basic limit trends if losses are increasing.

Question#: 25

1) Patient claims have increasing shift from health insurance to worker's compensation because: there are no deductibles or coinsurance in worker's comp and doctors are paid more for services (moral hazards)

2) Greater attorney involvement: attorney involvement increases duration of disability (as per disabled employee), increases cost of case settlement and may contribute to higher frequency or claims being reported.

Question#: 26

- a) Before : benefits = $(.5)(\text{pre-tax pay})$
After: benefits = $(.85)(\text{post-tax pay})$
 $= (.85)(1 - .3)(\text{pre-tax pay})$
 $= (.595)(\text{pre-tax pay})$
 $\rightarrow$ benefits have increased by $(.595/.5) - 1 = .19 = \mathbf{19\%}$
- b) We would expect higher frequencies, since the higher benefit will provide employees with more incentive to file claims
We would expect employees to stay on disability longer, rather than returning to work, since they will receive higher benefits.

Question#: 27

It was believed that loss development and loss trend capture the same change in loss patterns. Therefore, using both would be “double counting”. This belief was referred to as “overlap fallacy”. It is incorrect, because loss trend projects losses from the midpoint of experience period to the midpoint of exposure period, while loss development projects losses from midpoint of the exposure period to ultimates.

Successful Evaluation Periods



Question#: 28

Report Year								
LAG	2004	2005	2006	2007	2008	2009	2010	2011
0	A	B	C	D	E			
1		A	B	D	E	F		
2			A	B	E	F	F	
3				A	B	F	F	F

A: Occurrence Policy Effective 1/1/2004

B: Occurrence Policy Effective 1/1/2005

C: 1st year CM Policy 1/1/2006

D: 2nd year CM Policy Effective 1/1/2007

E: 3rd year CM Policy Effective 1/1/2008

F: Tail Policy Effective 1/1/2009

Question#: 29

Expense Type	2008 Expense	Expense Provision	%Fixed	Fixed	Variable
General	1400	14000/140000= .1	.6	.06	.04
OA	5000	5000/160000 = .035	.5	.0175	.0175
Commission & Brokerage	21000	21000/160000 = .13125	0	0	.13125
Taxes, License fees	2800	2800/16000= .0175	.75	.013125	.004375
				H= .090628	V=.193125

$$a) \text{ ERF} = \frac{H}{1 - V - Q} = \frac{.090625}{1 - .193125 - .05} = .11974$$

$$\text{ELR} = 1 - V - H - Q = 1 - .193125 - .090625 - .05 = .66625$$

$$b) \text{ S/W avg rate} = \frac{\text{S/W avg loss cost}}{\text{ELR}} = \frac{197.20}{.66625} = 296.1$$

$$\begin{aligned} \text{EF} &= \text{S/W avg rate} \times \text{EFR} \\ &= 296.1 \times .11974 = 35.455 \end{aligned}$$

- b) The expense fee ratio will be over estimated due to the rate increase implemented on 1/1/2009 but after the expense fee ratio is calculated based on 2008's data. One method to correct this is to bring the historical premium on-level at the current rate.

Question#: 30

a)

2007	2008	2009
1	.96	1.008
7/1/07	1/1/09	

$$\text{2007 on-level factor} = \frac{1.008}{[(.5)(.5)(.5)](.96) + (.875)(1)} = 1.0131$$

$$\text{2008 on-level factor} = \frac{1.008}{(.125)(1) + (.875) .96} = 1.0446$$

2007 trend factor goes from 7/1/07 to 10/1/10

2008 trend factor goes from 7/1/08 to 10/1/10

$$\text{2007 projected CY earned premium} = (600,000)(1.0131)(1.01)^{3.25} =$$

627,839

$$\text{2008 projected CY earned premium} = (650,000)(1.0446)(1.01)^{2.25} =$$

694,363

b)

	12-24	24-36	36-48	48-60	60-22
Average factors	1.3	1.15	1.05	1.03	1.02

Chosen

$$\text{12-month age-to-ultimate} = (1.3)(1.15)(1.05)(1.03)(1.02)(1.01) =$$

1.6657

$$\text{24-month age-to-ultimate} = (1.15)(1.05)(1.03)(1.02)(1.01) =$$

1.2813

There was probably a change in reserving methods underlying the abrupt changes in historical 12-24 and 24-36 link ratios. The new method reflecting the recent link ratios should be used.

$$\text{c) 2007 AY projected loss + LAE} = (250,000)(1.2813)(1.04) [(.98)(1.05)]^{3.25} =$$

365,573

$$\text{2008 AY projected loss + LAE} = (350,00)(1.6657)(1.04) [(.98)(1.05)]^{2.25} =$$

646,596

$$\text{d) Weighted loss ratio} = (.4)(365,573/627,839) + (.6)(646,596/694,363) = .7916$$

$$\text{Indicated rate change} = (.7916 + .1)/(1-.2-.03) - 1 =$$

15.8%

Question#: 31

- a) Pure premium - because it produces an indicated rate, which does not require historical rates
- b) Pure premium- loss ratio method requires on-level premiums which would be challenging/ not possible here
- c) Loss ratio - in this situation it would be easier to use premiums and not have to deal with difficult exposures in the pure premium method.

Question#: 32

$$\text{Complement} = 1600 \times (1710/1800) = 1520$$

$$\text{Credibility} = \sqrt{\frac{1000}{16000}} = .25$$

$$\text{Indicated loss lost} = \frac{1,000,000}{1000} = 1000$$

$$\text{Credibility weighed indicated loss costs} = .25 (1000) + .75 (1520) = 1390$$

$$\text{Credibility weighed indicated rate} = (1390 + 200,000/1000)/(1 - .25 - .05) = 2271.43$$

Question#: 33

If an insurer notices a positive characteristic that is not used in their rating structures (or competitors), the insurer can market to those with the positive characteristic and try to write more of them (skimming the cream). The insurer will then benefit from lower loss ratios and better profitability.

Question#: 34

- a) Cost effective- the cost of obtaining the information should not exceed the benefit of additional accuracy.

Privacy – insured may rather pay more to avoid disclosing certain information

- b) For cost effectiveness, detailed psychological profile may cost a lot to obtain. This is most likely not cost effective.

For privacy, many people will not want to take the psychological test for the profile or may not wish to disclose their profile to insurance company.

Alternate Solution:

- a) 1) Social criteria: privacy, affordability, causality and controllability
2) Operational: Low administrative expense, objective definition, verification intuitively related, underlying losses
- b) 1) Social: privacy not met, insured may not want to disclose that information and it's not something that's easily controllable, although it may be good from causality standpoint.
2) Operational: increased administrative expense, but it is objectively defined, verifiable, and likely intuitively related.

Question#: 35

$$\begin{aligned}\text{LER (100K)} &= \frac{.45 (22,000) + .20 (35,000) + .35 (100,000)}{.45 (22,000) + .2 (35,000) + .15 (150,000) + .15 (250,000) + .05 (100,000)} \\ &= \frac{51,900}{126,900} = .4089 \quad \text{Excess ratio} = .591\end{aligned}$$

$$\text{losses} = 24,793 (.59) = 14,627.87$$

$$\text{Excess loss} = .591 (14,627.87) = 8,645.31$$

$$\text{Loss in Ded. layer} = 14,627.87 - 8,645.31 = 5,982.56$$

$$\text{Assume ALAE not reduced by Ded.} \rightarrow .1(14,627.87) = 1,462.787$$

$$\text{processing Ded.} = .04(5,982.56) = 239.302$$

$$\text{Uncollected Ded.} = .01 (5,982.56) = 59.826$$

$$\begin{aligned}\text{Risk Load (assume from excess layer)} &= .05(8,645.31) \\ &= 432.27\end{aligned}$$

$$\text{Premium} = \frac{8,645.31 + 1,462.787 + 239.302 + 59.826 + 432.27}{1 - .08 - .1 - .05}$$

$$= \boxed{14,077.27}$$

Question#: 36

$$\begin{aligned}\text{LAS (100,000)} &= [300,000 + 600,000 + 750,000 + 3(1,000,000)] / 6 \\ &= 775,000\end{aligned}$$

$$\begin{aligned}\text{LAS (5,00,000)} &= [300,000 + 600,000 + 750,000 + 1,250,000 + 4,500,000 + 500,000] / 6 \\ &= 2,066,667\end{aligned}$$

$$\text{ILF} = \frac{[\text{LAS (5,000,000)} + \text{ULAE (5,000,000)}] \times \text{Freq(5,000,000)}}{[\text{LAS (1,000,000)} + \text{ULAE (1,000,000)}] \times \text{Freq(1,000,000)}}$$

freq
freq

$$\begin{aligned}&= \frac{2066667 \times 1.2 \times .1}{775000 \times 1.1 \times .15}\end{aligned}$$

$$= 1.9394$$

Question#: 37

	(1) (Historical x relativities)	(2)	(3) = (2)/(1)	(4) = (3)/91.19	(5) $\sqrt{(\text{claims}/1082)}$	(6) =(5)x((4)- 1)+1	(7) =(6)/.816xCur. Rel.
Terr.	Base Exposures	Rep. Losses	Base Premium	Prelim. Adjustment	Credibility	Cred. Adjustment	New Relativity
1	3,120	420,000	134.62	1.476	.7447	1.354	.996
2	16,800	1,250,000	74.40	.816	1	.816	1.000
3	2,340	360,000	153.85	1.687	.6004	1.412	.900
Total	22,260	2,030,000	91.19				

Question#: 38

a) Off bal. = $500/1 \times 1 + 100/1.25 \times 1.15 + 400/1.6 \times 1.4 =$

942

$1000/942 = 1.062$

Revised Base = $1.062 \times 1.15 \times 100 = \mathbf{\$122.08}$

b)

	Current	Proposal	% Δ	
1	100	122.08	22.08	.0208(500) = 10,400 must be spread to 2 & 3
2	125	140.392	12.31	
3	160	170.91	6.8	

$$\frac{10,400}{(100,000 \times 1.1231 + 400,000 \times 1.068)} = .0193$$

$$1.0193 \times \frac{1.2208}{1.2} = 1.037$$

Revised Base Rate = $100 \times 1.2 = \mathbf{\$120}$

Revised Relativities =	class	rel
	1	1
	2	$1.15 \times 1.037 = \mathbf{1.193}$
	3	$1.4 \times 1.037 = \mathbf{1.452}$

Question#: 39

a)

Mix of business - changing mix of ITV in the book will influence premium and loss trends.

Economic/Social

Social trends - if there is a movement towards lower insurance to value because people are purchasing lower amounts of coverage to save money on premium due to hard economic times, the actuary may want to evaluate the insurance to value contemplated on the current rates.

b) Premium – could see higher prem. as a result of larger exposure amounts written

- Could see lower premium if there are higher cancel/non-renews

Losses – expect to see larger total and near total claim amts. from larger exposures

- Losses may decrease from higher cancel/non-renew
- Losses may decrease if reinspection also leads to loss control measures implemented by homeowners.

Expenses – increased inspection/reinspection may create additional expenses, however increase relative to premium change is unclear.

Question#: 40

Property value = 500,000

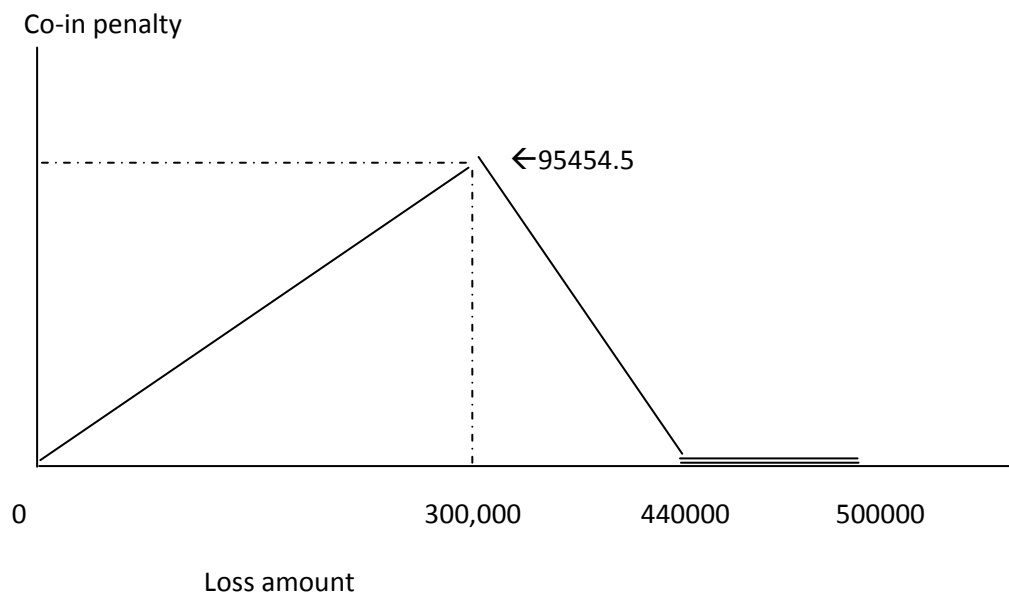
Coins. Req. = $500,000 \times 0.88$
= 440,000

Face value = 300,000

Coinsurance proportion = 68.2%

max co-in penalty occurs when loss = 300,000
penalty = $300,000 (1 - 0.6818)$
= 95454.5

Co-in penalty function is:



Question#: 41

Put a cap on the amount a payment can exceed the policy face value, such as a limit of 125% of face value.

Automatic inflation coverage adjustment provisions which automatically increase coverage A each policy renewal. This will help maintain the level of insurance to value.

Question#: 42

Ratemaking becomes a much easier process if premiums are split. Traditional techniques can be applied on the non-hurricane portion without having to deduce the non-hurricane portion each time.

Allows appropriate classification. For example, it does not make sense to have a 25% discount for fire protection in an area where 80% of losses are hurricane-related.

Question#: 43

No schedule rating credit should be given. The reduced losses have already been measured and would be reflected in the experience rating. If the insured were to also be given a schedule credit then there would be a double counting of credits.

Question#: 44

- a) In retrospective rating, insurer will try to control losses in coming period because their loss experience will be used to calculate their rate. In experience rating, they have less motivation to control losses, because rate is based on past experience.
- b) Experience rating is more stable because it uses experience over several periods and retrospective rating is very likely to fluctuate because it is based on loss experience during a single policy period only.

Question#: 45

- a) Persistency rates are the proportion of business that remains in force from one period to the next. They are important in classification ratemaking because certain classes may have higher persistency than others, making them more profitable to write when you consider the complete expected lifetime of the policy.
- b) A direct writer is expected to have higher persistency rates since the company owns the renewals. In the independent agency systems, the agent owns the renewals and may put the insured with a different company in order to get a better rate.
- c) Standard insured has higher persistency rate because non-standard insureds are high risk, which means they are either likely to shop around for cheap coverage or more likely to be cancelled by the company.