

# CASUALTY ACTUARIAL SOCIETY

SYLLABUS OF EXAMINATIONS



RULES REGARDING EXAMINATIONS FOR ADMISSION  
RECOMMENDATIONS FOR STUDY

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Thirty-Sixth Edition  
1991



**CASUALTY ACTUARIAL SOCIETY**

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## SYLLABUS GOALS AND OBJECTIVES

The Casualty Actuarial Society has as one of its primary objectives the development of qualified professionals in the field of casualty actuarial practice. The Casualty Actuarial Society conducts an educational and examination program for prospective members in order to achieve this objective. The syllabus goals and objectives follow:

1. To develop a general understanding of the social, political, regulatory, legal, and economic environment of the business of property and casualty insurance and the historical development of that environment.
2. To develop a thorough understanding of the fundamental mathematical concepts applicable to solving insurance problems and a high degree of skill in their applications.
3. To develop a comprehensive understanding of the business of property and casualty insurance, including underwriting, claims, marketing, finance and how these functions are performed and relate.
4. To develop a working knowledge of insurance policies and contracts.
5. To develop an expert knowledge of a broad range of techniques to solve insurance problems; and to develop the ability to discern the appropriateness of techniques for particular applications based on a knowledge of the underlying assumptions, strengths and weaknesses.
6. To develop an expert knowledge of a broad range of relevant and standard actuarial practice, in order to present a framework for the use of problem solving techniques.
7. To encourage a sense of inquisitiveness and creativity towards insurance problem solving in order to foster an appreciation of the art in actuarial science.

## RULES REGARDING EXAMINATIONS FOR ADMISSION

### I. Dates of Examinations

Part	Date of 1991 Examinations
1 (SOA Course 100) . . . . .	morning of February 12, May 14, November 5*
2 (SOA Course 110) . . . . .	afternoon of February 12, May 14, November 5*
3a (SOA Course 120) . . . . .	morning of May 21, November 12*
3B . . . . .	morning of May 6, November 4
3c (SOA Course 135) . . . . .	morning of May 21, November 12*
4 . . . . .	morning of May 8
5 . . . . .	morning of November 7
5A . . . . .	morning of November 7
5B . . . . .	morning of November 7
6 . . . . .	morning of May 10
7 . . . . .	morning of November 8
8 . . . . .	morning of May 7
9 . . . . .	morning of November 6
10 . . . . .	morning of May 9

\* All information for Parts 1, 2, 3a, 3c (SOA courses 100, 110, 120, 135) is tentative for November, 1991. Final SOA Syllabus reflecting any changes in dates, fees and content will be published in May, 1991 and distributed coincident with transmittal of grades to all candidates registered for Parts 1 through 3 in May, 1991.

#### NOTE: Changes in Part 3 and Part 5 Examinations

Beginning in November, 1990, Operations Research is no longer a required topic for CAS students. It has been replaced by Finance, which is an increasingly important topic for actuaries.

To accomplish this, and some other goals, there has been a realignment of the Part 3 and Part 5 examination topics beginning in November, 1990. After May, 1990, Part 3b, SOA Course 130, Operations Research, is no longer sponsored by the CAS. In its place, a new examination part, Introduction to Property and Casualty Insurance, denoted as Part 3B, is offered. This examination part covers property and casualty coverages, operations, and an introduction to ratemaking and reserving. Part 3B is offered twice during 1991.

Coverages and Operations are no longer tested on Part 5. A section on Finance has been added instead, based in large measure on an MBA level textbook.

## Transition Rules

Students who have received credit for Parts 3b and 5 on or before the May 1990 examinations have credit for the new Parts 3B and 5.

Students with credit for Part 3b, Operations Research, but not Part 5, after the results of the May 1990 examinations, are given credit for Part 5B: Finance, and will receive credit for the entire Part 5 examination if they pass Part 5A of the November, 1990 or November, 1991 examinations. They do not have credit for the new Part 3B, and their credit for Part 5B will expire after the Fall 1991 examination, if Part 5A is not passed.

Students with credit for Part 5 but not Part 3b receive credit for Part 3B and Part 5A, and receive credit for the entire Part 5 examination if they pass Part 5B of the November, 1990 or 1991 examinations. The credit for Part 5A will expire after the Fall 1991 exam if Part 5B is not passed, but the credit for Part 3B will not expire.

Only students with credit for either Part 5A or Part 5B after the results of the May, 1990 examinations are allowed to take the transitional examination Part 5B or 5A, respectively. All other Part 5 students have to take the entire examination, which is comprised of Parts 5A and 5B.

Special transitional examinations Parts 5A: Economics and Risk Theory, and 5B: Finance are given in 1990 and 1991.

Transition Summary		
<u>Have Old Exam</u>	<u>Given Credit for New</u>	<u>Still Need New</u>
3b and 5	5 and 3B	Neither 5 nor 3B
3b, not 5	5B	5A and 3B
5, not 3b	5A and 3B	5B

It is customary to hold the examinations in such cities as will be convenient. The Vice President-Administration will announce the exact times and locations at which the examinations will be given.

Individual consideration will be given to providing special arrangements for persons with demonstrable physical impairments which would impose a severe handicap if examinations were taken under normal conditions. Advance notice that special arrangements will be needed must be given to the Office of the Society when applying to write an examination.

## 2. Filing of Application

### a. Parts 1-3 (excluding Part 3B)

**NOTE: Part 3B applications will no longer be processed by the Society of Actuaries.**

A candidate who wishes to take one or more of Parts 1 (SOA Course 100), 2 (SOA Course 110), 3a (SOA Courses 120) and 3c (SOA Course 135) must file an application form which may be obtained from the office of the Casualty Actuarial Society. For these Parts, application forms and the appropriate examination fee, in check, draft, or money order must be made payable to and sent to the Society of Actuaries at the following address:

Society of Actuaries  
P.O. Box 95668  
Chicago, IL 60694 USA

The applications for Parts 1-3 (excluding 3B) must be received by the Society of Actuaries by December 20 for the February Part 1 and Part 2 examinations, by March 20 for the May examinations and by September 20 for the November examinations.

### b. Parts 3B, 4-10

The first time a candidate makes application to take one or more of Parts 3B, 4-10, an application obtained from the office of the Casualty Actuarial Society must be filed. Subsequent requests to take other examinations can be accomplished by simply writing to the office of the Casualty Actuarial Society, stating the Part or Parts for which the candidate is applying. Candidates for Part 8 must specify the United States or Canadian specialty at the time of application.

Each request along with the appropriate examination fee, in check, draft, or money order payable to the Casualty Actuarial Society must be sent to:

Casualty Actuarial Society  
One Penn Plaza  
250 West 34th Street  
New York, New York 10119

The application for Parts 3B, 4-10 must be received by the Vice President-Administration by March 20 for the May examinations and by September 20 for the November examinations.

## 3. Joint Administration

The examinations for Parts 1, 2 and 3(a,c) are jointly administered by the Casualty Actuarial Society and The Society of Actuaries.

The CAS is a joint sponsor of the prizes awarded for the highest scores on the Part 1 examination.

4. *Associateship and Fellowship Examinations*

Successful completion of, or credit for, Parts 1 through 7 is required to fulfill the examination requirements for Associateship. Parts 1 and 2 are the same as the Society of Actuaries Course Exam numbers 100 and 110 respectively. Part 3 is administered as three separate examinations corresponding to each subpart. Subparts 3a and 3c are the same as the Society of Actuaries Course Exam numbers 120 and 135, respectively. **The Casualty Actuarial Society does not grant credit for subpart 3b (SOA Course Exam 130) if passed subsequent to May, 1990.** (See Rule 1 for further explanations.) Each subpart may be taken on separate examination dates such that partial credits are earned until all sections are passed.

Successful completion of, or credit for, all ten examination Parts is required to fulfill the examination requirements for Fellowship. Part 8 now has two subdivisions covering either United States or Canadian specific material and is considered completed based on either one of the two tracks.

5. *Fees*

The examination fee schedule for 1991 at time of publication is as follows:

	May, 1991		November, 1991	
	Full-Time College Students	Others	Full-Time College Students	Others
Part 1 (non-refundable) . . . .	\$ 35.00	\$ 35.00	\$ 35.00	\$ 35.00
Part 2 (non-refundable) . . . .	\$ 35.00	\$ 35.00	\$ 35.00	\$ 35.00
Part 3a . . . . .	\$ 60.00	\$ 70.00	\$ 60.00	\$ 70.00
Part 3B . . . . .	\$ 70.00	\$ 80.00	\$ 70.00	\$ 80.00
Part 3c . . . . .	\$ 53.00	\$ 60.00	\$ 53.00	\$ 60.00
Parts 3a + 3B . . . . .	\$ 90.00	\$110.00	\$ 90.00	\$110.00
Parts 3a + 3c . . . . .	\$ 73.00	\$ 90.00	\$ 73.00	\$ 90.00
Parts 3B + 3c . . . . .	\$ 83.00	\$100.00	\$ 83.00	\$100.00
Parts 3a + 3B + 3c . . . . .	\$103.00	\$130.00	\$103.00	\$130.00
Parts 4, 6, 8, 10* . . . . .	\$120.00	\$120.00	N/A	N/A
Part 5 . . . . .	N/A	N/A	\$120.00	\$120.00
Part 5A . . . . .	N/A	N/A	\$ 65.00	\$ 65.00
Part 5B . . . . .	N/A	N/A	\$ 65.00	\$ 65.00
Parts 7, 9* . . . . .	N/A	N/A	\$120.00	\$120.00

\*For each part

The fee structure for Part 3 is based on a candidate fee of \$40.00 regardless of the number of sub-parts taken in one sitting plus \$30.00 (\$20.00 for FTCS) for Part 3a, \$40.00 (\$30.00 FTCS) for Part 3B, and \$20.00 (\$13.00 for FTCS) for Part 3c.

Candidates writing any of the examinations for Parts 1, 2, 3 (a, c) overseas or at a specially arranged center must pay an additional \$35.00 per examination session (February, May or November).

Please note that all fees are payable in U.S. funds by check, draft, or money order.

6. *Late Registration, Refunds, and Transfers of Fees*

Parts 1, 2, 3a, 3c. If the application and regular fee are not received on or before March 20 for the May examinations or September 20 for the November examinations, any candidate wishing to write an examination in North America must pay a late registration fee of \$40.00 in addition to the examination fee. Late registrations will not be accepted from candidates writing outside North America. In no case will applications be accepted after April 15 for the May examinations or after October 15 for the November examinations.

For the February administration of Part 1 and Part 2, the registration deadline is December 20. After December 20, any candidate wishing to write Part 1 or 2 in February must pay a late registration fee. No applications will be accepted after January 15. Due to the January release date for November examination results, candidates who wrote the November 1990 Part 1 or 2 examination may register until January 15 without assessment of a late registration fee. Similarly, candidates who write Part 1 or 2 in the February session may register until April 15 for the May examination session without assessment of a late registration fee.

A registered candidate who requests a change in examination center must pay a \$20 change-of-center fee. No change in center may be made after January 15 for the February examination, April 15 for the May examinations or October 15 for the November examinations.

If a request for late registration or change of center occurs, the Society will make every effort to have the candidate's records and supplies on hand at the appropriate center in time for the examination. If this effort fails, however, the Society and any jointly administering or sponsoring organization are not responsible. If either the candidate's registration and fees or request for change of examination center are received so late that it is not feasible to arrange for the candidate to write the examination, the fees will be refunded. The administering organizations are not responsible for difficulties caused by postal service delays or inadequate postage.

A candidate who submits an application for any of Parts 3a or 3c and subsequently does not write one or more of these sub-parts should request an examination fee refund. This request must reach the Society no later than June 30 for a May examination or December 31 for a November examination. Later requests will not be considered. A \$40 administrative fee per examination is assessed for all refunds. Therefore, no refund is made unless the total fees for sub-parts not written exceed



\$40. The \$40 candidate fee is refundable only if the candidate does not write *any* sub-parts for which the fee is charged. Only examination fees for Parts 3a, 3B and 3c are refundable. Late registration fees, change-of-center fees and fees for writing overseas or at specially arranged centers will not be refunded in any case.

Parts 3B, 4-10. Examination fees are payable each time the candidate registers for an examination. Check, draft or money order in U.S. funds payable to the order of the Casualty Actuarial Society must be received by the Office of the Casualty Actuarial Society by March 20 for the May examinations or by September 20 for November examinations. Late registration will be accepted through April 15 and October 15 if accompanied by a \$50.00 late registration fee for each part. Change-of-center fees will be \$20.00.

The same administrative conditions will apply for changes of examination center and for late registration as for the first three exams, with the organization to be contacted being the Casualty Actuarial Society.

A candidate who has filed an application and finds that it will not be possible to take the examination should request a refund of the examination fee. This request must reach the Office of the Casualty Actuarial Society not later than April 15 for the May examinations, or October 15 for the November examinations. Later requests will not be considered. A fee of \$20.00 per examination will be assessed for all refunds. The fee of a candidate who is unavoidably absent from an examination will, upon written request within 30 days following the date of such examination, be transferred to any examination given in the next thirteen months. A fee which has been so transferred is not refundable. There will be a \$20.00 fee for such transfer, payment for which should accompany the request for transfer. Candidates must register for the examination to be taken even if the fee is being transferred from a prior examination period.

#### 7. *Waiver of Examinations for Associateship*

Waiver of individual examination requirements will be granted by the Board of Directors of the CAS in instances where an applicant has passed or received credit for examinations sponsored by another recognized actuarial organization covering equivalent material in both subject and depth. The granting of waivers by the Board will be based on the recommendation of the Vice President-Membership. His or her recommendation will be guided by the policy established by the Education Policy Committee.

The Casualty Actuarial Society will not generally grant waiver of all or any portion of its examination requirements, either for work experience, contribution to the actuarial literature, or academic courses of study. Individuals who claim competence in the areas covered by the examinations should not have difficulty demonstrating their competence through the examination process.

The Education Policy Committee has established the specific program outlined below, covering the most common requests for waiver of examination requirements.

1. Waiver of examination Part 1, 2, 3a, or 3c will be allowed for a candidate who has passed or been credited with the corresponding examinations sponsored by the Society of Actuaries prior to the joint administration of those examinations.
2. Candidates who take the Advanced Mathematics Test of the Graduate Record Examinations may apply for credit for Part 1. Credit will be granted if the candidate's score on the test is equivalent, as determined by the CAS, to a passing score on Part 1.
3. The CAS also specifically recognizes the examinations sponsored by the British Institute of Actuaries, the Australian Institute of Actuaries or the Faculty of Actuaries (Scotland). Credit will be granted for examinations passed or waived in accordance with examination equivalences between the CAS syllabus and the syllabus of each of the three aforementioned actuarial organizations. The Casualty Actuarial Society will not grant credit for exams waived on account of academic records achieved in North American universities.

In the above instances, candidates requesting a waiver of an examination requirement should present their request to the Vice President-Membership with appropriate evidence that demonstrates the passing of (or score on) the actuarial examinations for which a waiver is requested. The Vice President-Membership will review all such requests and recommend action to the Board of Directors.

Credits for examination equivalents of other actuarial organizations, or equivalents from the above mentioned organizations for CAS exams beyond Part 3 would only be considered on a case-by-case review where the candidate has provided documentation pertaining to the equivalence of subject matter in both scope and depth.

In such instances candidates should present their request to the Vice President-Membership and include with their applications evidence that demonstrates the asserted equivalence of the actuarial examinations passed to those for which a waiver is requested via a list of topics covered, or other relevant material. If such evidence is not included, the Vice President-Membership will request it from the candidate. In such instances the Vice President-Membership will forward the request to the Education Policy Committee. The Committee will then review the request to determine whether the waiver program should be expanded to include the examinations embodied in the candidate's request.

For recognized actuarial organizations which have formal educational requirements, but whose only means of qualification are through academic achievement, requests for waivers would be reviewed on a case-by-case basis to determine if any credit should be given based on the equivalence of the subject matter with any CAS examinations or parts thereof.

In such instances candidates should present their request to the Vice President-Membership and include with their applications evidence that demonstrates the asserted equivalence, as well as the appropriate educational policy material of the local actuarial organization. If such material is not included, the Vice President-Membership will request it from the candidate. For these type requests the Education Policy Committee will be asked to determine whether sufficient equivalence exists to permit granting any examination waiver.

#### 8. Conduct of Examinations

The examinations are exclusively in writing. Except as is noted in the following paragraphs, no books, papers, typewriters, slide rules, or electronic or mechanical aids to computation of any kind may be brought into the examination room by candidates, nor may any candidate communicate with or obtain any assistance from any other candidate during the examination.

Electronic calculators will be allowed in the examination room for all examinations. For Parts 3B, 4-10, electronic calculators, which are to be supplied by the candidate, must meet the following standards to be acceptable:

1. portable and silent;
2. battery operated during examination;
3. *must not* be programmable; and,
4. *must not* have any preprogrammed annuity functions.

A calculator with a power key ( $y^x$ ) is highly recommended.

For Parts 1-3 (a, c), the only acceptable calculator is the one sold by the Society of Actuaries. This should be purchased from the Society of Actuaries prior to the examination, as none will be available for purchase at the time of the examination.

**It is the candidate's responsibility to see that the calculator used during the examination meets the applicable standards and is in good working order.**

Parts 1, 2, and 3 (a, c) consist entirely of multiple-choice questions. On these examinations each multiple-choice problem presented includes five answer choices identified by the letters A, B, C, D, and E, only one of which is correct. A separate answer sheet provides a row of six ovals for each problem. The first five of these, identified with the letters A, B, C, D, and E, correspond to the five answer choices. The sixth oval (described below) is marked "Omit". After deciding which answer is correct, the candidate should blacken the oval which has the same letter as this answer.

Since the answer sheets are scored by optical scanning equipment, it is important that there be only one oval blackened for each question. If the candidate decides not to respond to a question for which an oval has already been blackened, the answer oval should be erased, and the "Omit" oval should then be blackened. This oval is located to the right of the answer Oval "E". This procedure assures that the scoring equipment will score the question as an omitted question and not be confused by an incompletely erased answer oval. It is *not* necessary to blacken the "Omit" oval if no

answer oval has been blackened. This is because the scoring equipment also scores a question as an omitted question if there are no ovals blackened in the row. Please note that the "Omit" oval appears on the answer sheets for Parts 1-3 (a, c) only.

#### 9. Grading of Examinations

##### a) Multiple-Choice and True-False Questions

Scoring of the multiple choice examinations will be done in such a way that there is no advantage or disadvantage to be anticipated from guessing answers in a purely random fashion as compared with omitting the answers entirely.

Parts 1-3 (a, c). There will be one-fifth point added for each multiple-choice question left blank.

Parts 3B, 4-10. There will be no addition for multiple-choice questions left blank, but one-quarter of the point value for each question will be deducted for each incorrect answer. On true-false questions, the point value of the question will be deducted for each incorrect answer.

##### b) Determination of the Pass Mark

The final decision as to where the pass mark shall be set is arrived at by consultation among the Vice President-Membership, the Officers of the Examination Committee and the Part Committee. In determining the pass mark, consideration is given both to the performance level of candidates' answers and to the comparative difficulty of the examination, in relation to that of previous examinations. Appropriate recognition is given to any peculiarities that may appear in connection with the answers to any question on an examination despite all the care taken in setting the examination questions.

##### c) Defective Questions

Occasionally, through error or because of varying interpretations, a question appearing on the examination is found to be ambiguous. If you feel a question is ambiguous, you must bring this to the attention of the Casualty Actuarial Society in writing within two weeks after the date the examination was administered. Your letter should give detailed reasons why you feel the question is ambiguous. The Examination Committee will investigate all questions brought to its attention in this way, and may make allowance in the grading process for answers which could be correct under an interpretation other than the one anticipated in setting the question. Any correspondence on questions which does not reach the CAS office within two weeks will be disregarded for grading purposes.

#### d) Candidates' Requests for Information

Any unsuccessful candidate for Parts 3B, 4-10 can get an analysis of his or her test paper by writing to the CAS office before the deadline. The normal deadline will be August 15 on May examinations and February 15 on November examinations. The candidate should provide his or her candidate number. The requests will be batched. The batched requests will go to the Examination Committee about two to four weeks after the deadline. Candidates should receive an analysis normally within two months after the deadline.

The analysis will give an outline of the subject areas in which the student was strong or weak as well as the specific question numbers (on essays) on which he or she scored well, poorly, or in-between. The Examination Committee feels that this kind of information can be developed within a reasonable amount of time and without undue effort. It should provide the educational guidance that most candidates desire.

The Examination Committee is also prepared to do an administrative check for any candidate who appeals a score, to be sure that he or she has been given the proper grade.

#### 10. Confidentiality of Examination Records

The fact that a candidate has passed a particular examination is considered public knowledge. Any further information as to examinations taken by candidates and grades received by candidates is available only to the candidates themselves and to committee chairmen as required for their committee purposes, unless the candidate requests in writing that such information be provided to someone else.

#### 11. Disciplinary Action

Candidates for the Casualty Actuarial Society's examinations are expected to follow the rules and procedures included in the "Instructions to Candidates" printed on their examination books and announced by the supervisors at the examination locations. These standards may seem stricter than those which candidates are accustomed to in other examination environments. The Casualty Actuarial Society maintains these strict standards because the examinations are such a significant part of a candidate's career. Therefore, equitable administration of the examinations and enforcement of the highest standards of conduct cannot be emphasized too strongly.

Candidates should understand that the Casualty Actuarial Society will pursue any evidence of a candidate not adhering to the spirit of the examination rules and will respond to violations with appropriate disciplinary action.

#### 12. Associateship Requirement—Seminar on Professionalism

In addition to the examination requirements for Associateship, beginning with the November, 1991 administration of exams, all prospective Associates will be

required to attend and successfully complete a seminar on professionalism prior to admission as a member. This seminar will be administered by the CAS at times and places to be announced. Eligibility for attendance is defined as having successfully completed five Associateship examinations. (Parts 3a, 3B, 3c comprise one examination.)



## LIBRARY

All candidates registered for the examinations of the Casualty Actuarial Society and all members of the Casualty Actuarial Society can borrow publications/books from the library facilities.

Books and manuals may be withdrawn from the Library for a period of one month without charge. In general, not more than two references may be in the hands of a borrower at one time.

Address requests for books to:

Casualty Actuarial Society	Phone: (212) 560-1018
Library Service	(212) 560-1019
One Penn Plaza	(212) 560-1020
250 West 34th Street	
New York, New York 10119	

## PROCEEDINGS AND OTHER PUBLICATIONS OF THE SOCIETY

The prices of past editions of the *Proceedings* and other publications of the Society and a list of those editions still in print are set out in the Yearbook of the Society.

Those wishing to purchase these publications should write to the:

Vice President-Administration	Phone: (212) 560-1018
Casualty Actuarial Society	(212) 560-1019
One Penn Plaza	
250 West 34th Street	
New York, New York 10119	

## AMERICAN ACADEMY OF ACTUARIES

Satisfactory completion of specified examinations of the Casualty Actuarial Society will satisfy the educational requirements of the American Academy of Actuaries. For further information contact the Academy at Suite 800, 475 N. Martingale Road, Schaumburg, Illinois 60173-2226.

## 1991 SYLLABUS OF EXAMINATIONS

<u>Part</u>	<u>Time Allowed</u>	<u>Subjects</u>
<i>Associateship Examinations</i>		
1*	3 hours	Calculus and Linear Algebra
2*	3 hours	Probability and Statistics
3a*	1½ hours	Applied Statistical Methods
3B	2 hours	Introduction to Property and Casualty Insurance
3c*	1½ hours	Numerical Methods
4	4 hours	Interest and Life Contingencies; Credibility Theory and Loss Distributions
5	3 hours	Principles of Economics; Theory of Risk and Insurance; Finance
5A	1½ hours	Principles of Economics; Theory of Risk and Insurance
5B	1½ hours	Finance
6	4 hours	Principles of Ratemaking and Data for Ratemaking
7	4 hours	Premium, Loss, and Expense Reserves; Insurance Accounting, Expense Analysis, and Published Financial Information
<i>Fellowship Examinations</i>		
8**	4 hours	Insurance Law and Statutory Insurance; Regulation and Regulatory Issues
9	4 hours	Advanced Ratemaking; Individual Risk Rating
10	4 hours	Financial Operations of Insurance Companies; Reinsurance; Forecasting; Valuation Topics

\* Jointly administered with the Society of Actuaries

\*\* Candidates must specify the United States or Canadian specialty at the time of application.

## RECOMMENDATIONS FOR STUDY

The objective of the Casualty Actuarial Society's education and examination process is to assist the candidate in professionally preparing for an actuarial career of managing the varied corporate responsibilities assigned to an Actuary in the casualty insurance field. The Recommendations for Study present the study material that a casualty actuarial candidate should understand thoroughly, and be able to apply professionally to actual casualty insurance situations. The examination process is designed to assure that each successful casualty actuarial candidate attains a satisfactory level of competence in the subject matter.

The examinations for admission to the two grades of membership in the Society are designed to establish the qualifications of candidates. The following Recommendations for Study are provided as a guide for the candidates in their preparation for the examinations. It should be realized that although the examination questions will be largely based upon the textual material cited, they will not necessarily be drawn directly therefrom. The examinations will test not only the candidate's knowledge of the subject matter, but also the candidate's ability to apply that knowledge. Finally, in the development of the syllabus readings and the examination questions, it is assumed that the candidate is familiar with the material covered in earlier parts. Therefore, it is recommended that the candidate take the parts in numerical order.

In their study for the mathematical sections of the Associateship Examinations, candidates are advised to work out as many examples as possible in order to acquire facility in the application of the mathematical principles and methods to specific problems. The questions on the examinations for Parts 1, 2, and 3 (a, c) are all of the multiple choice type.

**In preparing for Parts 7 through 10, the candidate should become familiar with current developments by reading regularly at least two general property and casualty insurance periodicals.**

The references to papers in the *Proceedings* of the Casualty Actuarial Society (*PCAS*) are considered to include all cited discussions of these papers. In the case of readings from out-of-print *Proceedings*, the candidate is responsible only for those discussions reprinted in the CAS Booklets referred to below.

A more detailed reference of the texts cited will be found in the Index To Readings at the end of these Recommendations. The reading materials suggested in these Recommendations are designed to acquaint the candidate with the respective subjects and should not be interpreted as representing views endorsed by the Casualty Actuarial Society.

**If a new edition or printing of any text becomes available, the student should WRITE TO — NOT PHONE — the CAS office for instructions regarding its acceptability and the appropriate chapters/pages in the new edition which correspond to the printed study requirements.**

A dagger (†) beside a reading indicates that it is either an addition to the recommended readings or that there has been a material change to a previously included reading. A dagger (†) beside the part number for a Study Kit, Part Booklet or other material available for a charge indicates that there is new material available this year.

Study notes and study kits have been prepared in connection with some examinations and can be obtained from the Society's office at the following costs (payable in U.S. Funds):

Study Kit	Cost
†Part 3B .....	\$37.00
Part 4.....	25.00
†Part 6.....	25.00
†Part 7.....	5.00
†Part 9.....	30.00

It should be noted that Study Kits and Study Notes are not simply aids, but contain additional readings that are part of the examination syllabus.

Readings from out-of-print Discussion Paper Programs and *Proceedings* of the Casualty Actuarial Society (*PCAS*) are available from the Society's office as follows:

Part Booklet	Cost
Part 6.....	\$25.00
Miller, D. L. and Davis, G. E., "A Refined Model for Premium Adjustment."	
Kallop, R., "A Current Look at Workers' Compensation Ratemaking."	
Fratello, B., "The Workmen's Compensation Injury Table and Standard Wage Distribution Table—Their Development and Use in Workmen's Compensation Ratemaking."	
Stern, P. K., "Ratemaking Procedures for Automobile Liability Insurance."	
Miller M. J., "Private Passenger Automobile Insurance Ratemaking—A Calendar Year Approach."	
Lange, J. T., "General Liability Insurance Ratemaking."	
McManus, M. F., "General Liability Ratemaking: An Update."	
Marker, J. O. and Mohl, F. J., "Rating Claims Made Insurance Policies."	
Hurley, R. L., "Commercial Fire Insurance Ratemaking Procedures."	
Walters, M. A., "Homeowners Insurance Ratemaking."	

Cook, C. F., "Trend and Loss Development Factors."	
Lange, J. T., "Interpretation of Liability Increased Limits Statistics."	
Wade, R. C., "Expense Analysis in Ratemaking and Pricing."	
†Part 7.....	\$15.00
Fisher, W. H. and Lange, J. T., "Loss Reserve Testing: A Report Year Approach."	
Bornhuetter, R. L. and Ferguson, R. E., "The Actuary and IBNR."	
Berry, C. H., "A Method for Setting Retro Reserves."	
Resony, A. V., "Allocated Loss Expense Reserves."	
†Kittel, J., "Unallocated Loss Adjustment Expense Reserves in an Inflationary Economic Environment." Including discussion of paper: Bill, Richard.	
Fisher, W. H. and Lester, E. P., "Loss Reserve Testing in a Changing Environment."	
McClenahan, C. L., "A Mathematical Model for Loss Reserve Analysis."	
Khury, C. K., "Loss Reserves: Performance Standards." Committee on Annual Statement, "Report on the Annual Statement."	
Balcarek, R. J., "Effect of Loss Reserve Margins in Calendar Year Results."	
Otteson, P. M., "Some Observations Concerning Fire and Casualty Insurance Company Financial Statement."	
Pruitt, D. M., "Uniform Accounting—A Study of Regulation."	
Part 9.....	\$15.00
Lange, J. T., "Implications of Sampling Theory for Package Policy Ratemaking."	
Miccolis, R. S., "On the Theory of Increased Limits and Excess of Loss Pricing."	
Bailey, R. A., and Simon, L. J., "An Actuarial Note on the Credibility of Experience of a Single Private Passenger Car."	
Finger, R. J., "Estimating Pure Premiums by Layer."	
Meyers, G., "An Analysis of Retrospective Rating."	
Skurnick, D., "The California Table L."	
Part 10.....	\$20.00
Ferrari, J. R., "The Relationship of Underwriting, Investments, Leverage, and Exposure to Total Return on Owners' Equity."	

Brubaker, R. E., "A Constrained Profit Maximization Model for a Multi-Line Property/Liability Company."	
Butsic, R. P., "The Effect of Inflation on Losses and Premiums for Property-Liability Insurers."	
Ferguson, R. E., "Nonproportional Reinsurance and the Index Clause."	
Lommele, J. A. and Sturgis, R. W., "An Econometric Model of Workmen's Compensation."	
Sturgis, R. W., "Actuarial Valuation of Property/Casualty Insurance Companies."	
Miccolis, R. S., "An Investigation of Methods, Assumptions and Risk Modeling for the Valuation of Property-Casualty Insurance Companies."	
Panning, W. H., "Asset/Liability Matching," <i>Financial Analysis of Insurance Companies</i> .	

Any readings from *Proceedings* for years that are still in print (1977, 78, 1982 and subsequent) can be obtained by purchasing the *Proceedings* from the Society at a cost of \$40.00 or by using the library facilities. All other *Proceedings* articles and their related discussions are in the Part Booklet.

Sample examination questions for Parts 1 & 2 and copies of Parts 3B (formerly 5c and 5d), 5A (formerly 5a and 5b), 6-10 examinations for recent years may be obtained from the Casualty Actuarial Society office. Illustrative answers for essay questions on Parts 3B, 4-10 are available upon request. Also available without charge is a note entitled "Hints on Study and Exam Techniques."

In referring to a published prior examination, students should keep in mind that the questions are based on the Course of Reading in effect for that particular examination and may not in all instances reflect the current Course of Reading. Students may also expect future examinations to vary somewhat as to the proportion of question style and subjects. New forms of questions may appear from time to time, and the total number of questions may be increased or decreased.

Other material available from the Casualty Actuarial Society office:

†Part 5B	
†Butler, R. J. and Appel, D., "Internal Rate of Return Criteria in Ratemaking".....	3.00
†Part 8	
State of New York, Advisory Commission on Liability Insurance, "Insuring Our Future," "Reform of the Tort Law.".....	3.00
Joskow, P. L., "Cartels, Competition and Regulation in the Property-Liability Insurance Industry.".....	5.00
Danzon, P., "Rating Bureaus in U.S. Property—Liability Insurance Markets; Anti or Pro-competitive?.....	3.00

Excerpt from the <i>Report of the National Commission for the Review of Antitrust Laws and Procedures</i> . . . . .	3.00
Lee, J. F., "The Automobile Shared Market: Significance, Developments and Policy Issues." . . . .	3.00
Troxel, T. and Breslin, C.L., <i>Property-Liability Insurance Accounting and Finance</i> . . . . .	3.00
"NAIC Financial Condition Examiners' Handbook—Introduction" . . . .	3.00
Brown C. and Menezes J., <i>Insurance Law in Canada, Chapters 1 and 2</i> . . . .	3.00
†Hensler, D. R., Vaiana, M. E., Kakalik, J. S., Peterson, M. A., "Trends in Tort Litigation, The Story Behind the Statistics," Rand Institute for Civil Justice, 1987 . . . . .	3.00
†Koitz, David S., "The Social Security Surplus: A Discussion of Some of the Issues," Congressional Research Service, 1988 . . . . .	3.00
†Rappaport, Edward B., "Insurance Company Solvency," Congressional Research Service, 1989 . . . . .	3.00
Duncan, M.P., "An Appraisal of Property and Casualty Post-Assessment Guaranty Funds." . . . .	3.00
The following four readings for the Canadian specialty are available at a combined cost of \$3.00.	
Neal, J., "Canadian Workers' Compensation."	
Tate, H., "The Canada Pension Plan."	
Coward, L. E., "Provincial Hospital and Medical Insurance Plans."	
Bedard, M., "Canadian Unemployment Insurance."	

**Part 10**

Noris, P. D., <i>Asset/Liability Management Strategies for Property &amp; Casualty Companies</i> . . . . .	5.00
Gardner, Jr., E. S., "A Simple Method of Computing Production Intervals For Time Series Forecasts." . . . .	No charge
McLagan, D. L., "A Non-Econometrician's Guide to Econometrics." . . . .	No charge

All other material not explicitly listed in this section can be obtained by contacting the organization listed in the Index to Readings section at the end of the Syllabus.

**ASSOCIATESHIP EXAMINATIONS**

**PART 1**

**CALCULUS AND LINEAR ALGEBRA — SOA Course 100**

This Examination Part is jointly administered by the Casualty Actuarial Society and the Society of Actuaries.

The three-hour multiple-choice examination is based on material usually covered in undergraduate mathematics courses through the differential and integral calculus and a first course in linear algebra. The general scope of the examination is indicated by the following topics:

- Real and complex numbers;
- Elementary set theory, including unions, intersections, and complements;
- Functions, equations and inequalities;
- Analytic geometry of two and three dimensions;
- Standard algebraic and transcendental functions, including polynomial, rational, trigonometric, logarithmic, and exponential functions;
- Limits, continuity, differentiability, and integrability;
- Derivatives, integrals, and partial derivatives;
- The fundamental theorem of integral calculus;
- Applications of derivatives and integrals, including multiple integrals;
- Finite and infinite sequences and series, including the Taylor series expansion;
- The mean value theorem;
- Linear equations, vector spaces and generating sets;
- Bases, dimensions, and subspaces;
- Scalar products, linear transformations, and kernel and image space;
- Matrices, determinants, eigenvectors and eigenvalues.

Candidates who have not had mathematics courses covering these topics may be helped by any of the three texts covering calculus and analytic geometry and either of the two texts covering linear algebra listed below. These may be considered representative of the many texts used in colleges and universities in the United States and Canada which adequately cover the material upon which the candidate may be examined. Earlier or later editions of the texts listed below contain essentially the same information, and should be adequate for review purposes.

Thomas, G. B., Jr. and Finney, R.L., *Calculus and Analytic Geometry* (Seventh Edition).

Purcell, E. J. and Varberg, D., *Calculus with Analytic Geometry* (Fifth Edition).

Bradley, G. L., *A Primer for Linear Algebra*, Chapters 1-6.

Kolman, B., *Introductory Linear Algebra with Applications* (Fourth Edition).



An additional reference for those who may want further practice in solving linear algebra problems is *Linear Algebra* by Seymour Lipschutz (Schaum's Outline Series, McGraw-Hill).

## PART 2

### PROBABILITY AND STATISTICS — SOA Course 110

This Examination Part is jointly administered by the Casualty Actuarial Society and the Society of Actuaries.

The three-hour multiple-choice examination is based on material usually covered in undergraduate courses in mathematical probability and statistics. It can be taken by candidates who have had thorough college courses in these subjects or by persons who have done concentrated reading in these fields. The general scope of the examination is indicated by the following topics, which are among those proposed for a one-year college course in probability and statistics by the Committee on the Undergraduate Program in Mathematics (CUPM) of the Mathematical Association of America:

- Sample spaces;
- Axioms and elementary theorems of probability;
- Independence, conditional probability, and Bayes' theorem;
- Permutations and combinations;
- Random variables;
- Binomial, Poisson, normal, chi-square, t, F, and other probability distributions;
- Expectation, mean, variance, and moment generating functions of probability distributions;
- Multivariate distributions;
- Transformations of random variables;
- Conditional and marginal distributions;
- Central limit theorem;
- Point estimation, including maximum likelihood estimation and the application of criteria such as consistency, unbiasedness, and minimum variance;
- Tests of statistical hypotheses, including power functions, Type I and Type II errors, Neyman-Pearson lemma, and likelihood ratio tests;
- Applications of sampling distributions to confidence intervals and to tests for means and variances;
- Regression and correlation;
- Method of least squares;
- Interpretation of experimental results;
- Bayesian estimation.

The CUPM has reported that statistics courses can be implemented in a variety of ways, and can include different topics with different emphases on these topics. That widely divergent approaches are acceptable is illustrated by the many texts appropriate for a one-year college course. Among such texts, the following are representative of those which cover most of the above topics and which provide the mathematical background required for this examination.

1. Hogg, R. V. and Craig, A. T., *Introduction to Mathematical Statistics* (Fourth Edition).
2. Hoel, P. G., Port, S. C. and Stone, C. J., *Introduction to Probability Theory and Introduction to Statistical Theory*.
3. Mood, A. M., Graybill, F. A. and Boes, D. C., *Introduction to the Theory of Statistics* (Third Edition).

Candidates who have mastered the text material and can work the problems in any one of these references should be adequately prepared to handle the mathematical material in this examination.

The following page references to the representative texts listed above are provided to assist candidates in locating some of the appropriate background material for a few selected topics that are included in this examination:

**Moment-generating functions of probability distributions:**

1. pp. 50-57, 91-92, 101, 105-107, 110-111, 119-120 and 164-169.
2. pp. 197-200 (Volume I).
3. pp. 78-81 and 538-543.

**Applications of chi-square distribution (chi-square tests):**

1. pp. 269-283 and 312-313.
2. pp. 91-99 (Volume II).
3. pp. 440-461.

**Regression and correlation:**

1. pp. 73-78, 117-120 and 296-303.
2. pp. 99-100 (Volume I), 33, 111-119 and 148-153 (Volume II).
3. pp. 155-159, 161, 167-169 and 482-502.

**Bayesian estimation:**

1. pp. 227-233.
2. pp. 36-42 (Volume II).
3. pp. 339-350 and 396-398.

An additional reference, for candidates who may wish further practice in solving problems, is Speigel, M. R., *Theory and Problems of Statistics* (Schaum's Outline Series, McGraw-Hill). A second additional reference, for candidates who may wish to acquire further insight into the underlying nature of statistics and exposure to statistical applications is Tanur, Mosteller, et al, *Statistics: A Guide to the Unknown* (Third Edition) available in paperback form from Brooks Cole Publishing Company.

It will be assumed that the candidate is familiar with the ordinary deck of fifty-two playing cards and the ordinary six-faced die.

### PART 3 (a, c)

Part 3a and 3c are jointly administered by the Casualty Actuarial Society and the Society of Actuaries.

**The Casualty Actuarial Society will not grant credit for Part 3b (SOA Course Exam 130) if passed subsequent to May, 1990.**

This examination is administered as two separate examinations corresponding to each subpart as listed below. **Part 3B replaced part 3b beginning in November, 1990.** (See "Rules Regarding Examinations for Admission" on page 3.) Parts 3a, 3B and 3c may be taken on separate examination dates such that partial credits are earned until all sections are passed.

For many candidates, Part 3 is the first actuarial examination for which they will be preparing without the benefit of a formal course in the subject material. These candidates will find it helpful to maintain contact with other Part 3 candidates and to take advantage of opportunities to discuss with others questions that are considered difficult. Candidates should not hesitate to consult members of the profession in their own organizations or elsewhere who are knowledgeable on these subjects.

Study notes are available for each part from the Society of Actuaries at a charge. The Study Notes for the May Examinations may be ordered after January 1; those for the November examinations may be ordered after July 1. The notes include past multiple-choice exams and an Introductory Study Note which contains important information about the examination, including any changes to the readings, errata and descriptions of examination formats. If there is any conflict between information contained in the syllabus and that contained in the Introductory Study Note, the latter will govern. Candidates are urged to order the study notes for each part they plan to take.

An order form for these study notes is included on page 65. Included on page 67 is a form for study groups and classes. All correspondence should be with the Society of Actuaries. Questions concerning Study Notes or Study Note orders should be directed to the Study Note Coordinator (SOA) at (708) 706-3525.

#### (a) APPLIED STATISTICAL METHODS - SOA Course 120

The general scope of this one-and-one-half hour multiple-choice examination is indicated by the following topics:

Analysis of variance; Regression analysis; Time series analysis.

Miller, R. and Wichern, D., *Intermediate Business Statistics* (1977), Chapter 4 (up to but not including Tukey's Test on page 158), Chapters 5-8 (except Section 5.10), Chapters 9-11 including supplements. Chapters 1-3 provide a good review of concepts contained in Part 2; however, they will not be tested directly.

Study note available from the Society of Actuaries at a cost of \$15.00. (Code 120-011-83.)

#### (c) NUMERICAL METHODS - SOA Course 135

This subject encompasses various techniques for handling numerical data. Although many of the principles lend themselves readily to computer procedures and methods, knowledge of such procedures or methods is neither presupposed nor required for the examination. The general scope of this one-and-one-half-hour examination is indicated by the following topics:

Iteration; Interpolation; Numerical integration; Linear systems.

Burden, R. L. and Faires, J. D., *Numerical Analysis* (Fourth Edition), Chapters 1 (Sections 1.1\*-1.3), 2 (Sections 2.1-2.5), 3 (Sections 3.1-3.4 and 3.6\*\*), 4 (Sections 4.3-4.6), 6 (Sections 6.1-6.7).

Study note available from the Society of Actuaries at a cost of \$13.00.

\*Knowledge of this section will be assumed as background material for questions; however, questions will not be directly based on this section.

\*\*As related background material for Cubic Splines, the student should read pages 146 and 147 to the paragraph following table 4.1. However, examination questions will not be based on these pages.

## PART 3B

### INTRODUCTION TO PROPERTY AND CASUALTY INSURANCE

Part 3B was offered as a two-hour examination for the first time in November 1990. (See Rule 1 of "Rules Regarding Examinations for Admission" for a more complete explanation of this change.)

Prior to commencing study for this multiple choice examination, the candidate should read the "Recommendations for Study" section, pages 16 to 20, for study suggestions and guidance in obtaining study notes, out-of-print readings, past examinations, and other information important to sitting for this examination.

Items marked with an asterisk(\*) constitute the 1991 Study Kit which is available from the CAS office at a cost of \$37.00. The Study Kit can be ordered in two sections: the readings from the American Institute of Property and Liability Underwriters ("Institute readings") and all other readings at a cost of \$25.00 and \$12.00, respectively. None of this material has changed from last year but the Institute readings were not available as part of the 1990 Study Kit.

Note: *Sharing the Risk* by Marks and Craigie contains a good basic introduction to insurance. Although this reference is not part of the required readings for Part 3B, the candidate may find it useful to review this material as background for this examination. This reading is available from the Insurance Information Institute at a cost of \$9.95.

The insurance policy is the contract describing the services and protection which the insurance company is providing to the insured. It is, in effect, the only "product" which the insurance buyer receives until the time a loss occurs. The candidate should know the policy provisions and the bases of exposure used in the respective lines of insurance, with emphasis on basic coverages and features common to all lines as well as those peculiar to specific lines or types.

The candidate will be held responsible for knowledge of the policy forms (not the associated endorsements) included in the study kit. Manual excerpts should be studied as illustrative of the part played by manuals in the forms, coverages and rating area.

Underwriting is a key function in the insurance business with unique qualities which make it critical to the success of the endeavor. Actuaries will often be working closely with underwriters in their day-to-day operations. The candidate should know what the underwriting function is—its basic purpose, principles and activities.

Product design and product modification are areas in an insurance company's operations in which an actuary may become involved with the marketing function of an insurance company as it relates to pricing, market research, and marketing philosophy. The candidate should be well versed in the responsibilities of the marketing function as well as the basic differences among different marketing systems for insurance products.

Ratemaking is critical to determining the premium for an insurance policy. The candidate should understand the basic ratemaking principles.

The settlement of claims determines losses which are the key component for insurance ratemaking and reserving. The candidate should know how claims are settled, relevant policy provisions and the basic concepts of loss reserving.

\*Williams, C. A., Head, G. L., Horn, R. C. and Glendenning, G. W., *Principles of Risk Management and Insurance* (Second Edition), 1981, American Institute for Property and Liability Underwriters, Vol. II pp. 49-64, and Chapter 14.

Wood, G. L., Lilly, C. C., Malecki, D. S. and Rosenbloom, J. S., *Personal Risk Management and Insurance* (Fourth Edition), 1989, American Institute for Property and Liability Underwriters, Vol. I pp. 21-28, 40-43, 83-140, 189-268, 282-295, 302-312, 347-359, 380-400.

\*Rodda, W. H., Trieschmann, J. S., Wiening, E. A. and Hedges, R. A., *Commercial Property Risk Management and Insurance* (Third Edition), 1988, American Institute for Property and Liability Underwriters, Vol. I pp. 1-29, 131-134, 201-216, 239-245, and 260-272; Vol. II pp. 1-13, 16-19, 22, 34-37, 40-41, and 192-198.

Malecki, D. S., Horn, R. C., Wiening, E. A. and Donaldson, J. H., *Commercial Liability Risk Management and Insurance* (Second Edition), 1986, American Institute for Property and Liability Underwriters, Vol. I pp. 61-112, and 199-346; Vol. II pp. 1-58, 123-193, and 201-229. (As there are errors in the first printing of this edition, the candidate should obtain a later printing. The study kit will contain a list of additions and corrections to the first printing.)

\*Malecki, D. S. and Ligeros, P., "Excess and Umbrella Policies" in *CPCU 4 Course Guide Commercial Liability Risk Management and Insurance*, 1988, American Institute for Property and Liability Underwriters.

Webb, B. L., Launie, J. J., Rokes, W. P. and Baglini, N.A., *Insurance Company Operations* (Third Edition), 1984, American Institute for Property and Liability Underwriters, Vol. I Chapters 1-4.

\*Webb, B. L., Launie, J. J., Rokes, W. P. and Baglini, N.A., *Insurance Company Operations* (Third Edition), 1984, American Institute for Property and Liability Underwriters, Vol. II pp. 1-44, 225-238, 243-264, and 271-272.

\*Insurance Services Office:

1. Personal Automobile Policy. (Edition 6-80).
2. *Personal Automobile Manual*. (Effective 8-83). General Rules 1-6.
3. Homeowners Policy, HO-3. (Edition 4-84).



4. Commercial General Liability Policy:

- Occurrence. (Edition 11-85).
- Claims-Made. (Edition 2-86).

\*National Council on Compensation Insurance:

5. Workers Compensation Policy. (Edition 4-84).
6. *Basic Manual of Workers Compensation and Employers Liability Insurance*. (Effective 4-84). Rules I, II, IV-VIII.

\*Troxel, T. E. and Breslin, C. L., *Property Liability Insurance Accounting and Finance* (Second Edition), 1983, American Institute for Property and Liability Underwriters, pp. 103-119.

\*Peterson, T. M., *Loss Reserving Property/Casualty Insurance*, 1981, Ernst & Whinney, pp. 149-170.

\*List of additions and corrections to the first printing of the Second Edition of "Commercial Liability Risk Management and Insurance."

## PART 4

Prior to commencing study for this Part, the candidate should read the "Recommendations for Study" section, pages 16 to 20, for study suggestions and guidance in obtaining the Part 4 study kit, out-of-print readings, past examinations, and other information important to sitting for this examination. References are listed in the suggested order for study.

Minimum competency will be required on each of the two subparts of Part 4. Students who score above the passing mark but fail the minimum competency requirement will receive a 5\* on the examination.

Items marked with an asterisk (\*) constitute the 1991 study kit, which is available from the CAS office at a cost of \$25.00.

### (a) INTEREST AND LIFE CONTINGENCIES

This section represents approximately 40% of the examination.

Parmenter, M. M., *The Theory of Interest and Life Contingencies with Pension Applications: A Problem-Solving Approach*, 1988, Chapters 1, 2, 3, 4, 7, 8 (8.1-8.2).

Bowers, N. L., Gerber, H. U., Hickman, J. C., Jones, D. A. and Nesbitt, C. J., *Actuarial Mathematics*, 1986, Chapters 3 (all sections except 3.6), 4 (4.1-4.3, 4.6), 5 (5.1-5.4, 5.6), 6 (6.1-6.3, 6.6), 7 (7.1-7.4), 8 (8.1-8.5), 9 (9.1-9.3). In sections 5.6 and 6.6 the student is not responsible for formulas dealing with *m*thly payments.

\*Ferguson, R. E., "Actuarial Note on Workmen's Compensation Loss Reserves," *PCAS LVIII*, 1971. Discussions by various authors, *PCAS LIX*, 1972, pp. 118-122.

### (b) CREDIBILITY THEORY AND LOSS DISTRIBUTIONS

This section represents approximately 60% of the examination.

Hossack, I. B., Pollard, J. H. and Zehnwirth, B., *Introductory Statistics with Applications in General Insurance*, 1983, Chapters 4 (all sections), 5 (all sections), 6 (6.1-6.4), 8 (excluding 8.7).

\*Longley-Cook, L. H., *An Introduction to Credibility Theory*, 1962 (Background only).

\*Herzog, T. N., *An Introduction to Bayesian Credibility and Related Topics*, 1985, Casualty Actuarial Society.

\*Philbrick, S. W., "An Examination of Credibility Concepts," *PCAS LXVIII*, 1981, pp. 195-212.

Study note available from the Society of Actuaries at a cost of \$8: An Introduction to Stochastic Simulation (Code: 130-033-86).

Hogg, R. V. and Klugman, S. A., *Loss Distributions*, 1984.  
Chapters 3 (3.1-3.4, 3.6), 4 (4.1, 4.2, 4.4, 4.5), 5 (5.2).

Many actuarial problems involve the analysis of incurred losses for an insured event. Often in practice, the objective may be to find reasonable and usable approximations to the distribution of those losses. The loss distributions text depicts methods for doing this. Chapter 2 and the appendix of this text describe a variety of mathematical distributions. Through study of the required sections, the candidate is expected to become familiar with some uses of these distributions. The candidate will not be tested directly on the distributions themselves; rather the emphasis will be on using them in a problem solving way. Solutions to selected exercises from the text are available at no charge from the CAS office. In order to promote the proper emphasis on the preparation for this examination, the Appendix of *Loss Distributions* (pp. 217-232) will be provided to students at the time of the examination.

## PART 5A

Part 5A is being offered as a one and one half hour examination. (See Rule 1 of "Rules Regarding Examinations for Admission" for a more complete explanation.)

Only students with credit for Part 5B after the results of the May, 1990 examinations will be allowed to take transitional examination 5A. All other Part 5 students will have to take the entire three hour examination, which is comprised of Parts 5A and 5B.

Prior to commencing study for this Part, the candidate should read the "Recommendations for Study" section, pages 16 to 20, for study suggestions and guidance in obtaining study notes, out-of-print readings, past examinations, and other information important to sitting for this examination.

In studying the references it is recommended that they be read in the order listed.

### (1) PRINCIPLES OF ECONOMICS

The candidate will need to have a knowledge of the principles of economics at the college level. The candidate should be familiar with the various key concepts and basic principles of economics included in the recommended reading and be able to explain and apply them.

†Samuelson, P. A. and Nordhaus, W. D., *Economics* (13th Edition), 1989, Chapters 5-8, 9 (pp. 174-186), 10, 11 (pp. 227-233, 237-247), 12, 14, 15 (pp. 324-328), 16-19, 22, 23, 24 (pp. 566-582), 40; exclude appendices except for chapters 16, 19, 23, and 24. (While the candidate will not be tested on chapters 1-4 and 20, the candidate may find it useful to review these chapters as background for this examination. Although no direct questions will be taken from these chapters, familiarity with the material may be assumed in testing other chapters.)

### (2) THEORY OF RISK AND INSURANCE

The candidate should know what risk is, the kinds of risk, and the ways in which they can be handled, with particular emphasis on the relation to insurance.

Williams, C. A., Head, G. L., Horn, R. C. and Glendenning, G. W., *Principles of Risk Management and Insurance* (Second Edition), 1981, American Institute for Property and Liability Underwriters, Vol. I pp. 1-35, 97-151 and 223-277.

Hossack, I. B., Pollard, J. H. and Zehnirith, B., *Introductory Statistics with Applications in General Insurance*, 1983, Chapter 11.

†Bowers, N. L., Gerber, H. U., Hickman, J. C., Jones, D. A. and Nesbitt, C. J., *Actuarial Mathematics*, 1986, Chapters 1, 2, 11, 13.1-13.4.

## PART 5B

### FINANCE

Part 5B is being offered as a one and one half hour examination. (See Rule 1 of "Rules Regarding Examinations for Admission" for a more complete explanation).

Only students with credit for Part 5A after the results of the May, 1990 examinations will be allowed to take the transitional exam 5B. All other Part 5 students will have to take the entire three hour examination, which is comprised of Parts 5A and 5B.

Prior to commencing study for this Part, the candidate should read the "Recommendations for Study" section, pages 16 to 20, for study suggestions and guidance in obtaining the past examination.

In studying the references it is recommended that they be read in the order listed.

†Brealey, R. A. and Myers, S. C., *Principles of Corporate Finance* (Third Edition), 1988, Chapters 4, 5, 6 (6-1), 7-9, 12 (12-3, 12-4, 12-5), 13, 14, 20, 21, 23, 27, 28, 30 (appendix only), 34, 36; include appendices except for chapters 4, 6, 9, 28. (While the candidate will not be tested on Chapters 1-3, the candidate may find it useful to review these chapters as background for this examination. Although no direct questions will be taken from these chapters, familiarity with the material may be assumed in testing other chapters.)

†Butler, R. J. and Appel, D., "Internal Rate of Return Criteria in Rate Making," *NCCI Digest*, Volume IV, Issue III, October 1989, p. 11-23. (Available from the CAS office at a cost of \$3.)

†Mullins, D. W., Jr., "Does the Capital Asset Pricing Model Work," *Harvard Business Review*, Vol. 60, No. 1, 1982, p. 105.

## PART 6

Prior to commencing study for this Part, the candidate should read the "Recommendations for Study" section, pages 16 to 20, for study suggestions and guidance in obtaining the study kit, out-of-print readings, past examinations, and other information important to sitting for this examination.

Items marked with an asterisk (\*) constitute the 1991 Study Kit which is available from the CAS at a cost of \$25.00.

### (a) PRINCIPLES OF RATEMAKING

Section (a) contains readings which describe ratemaking concepts in broad, general principles as well as in specific detail for many lines of insurance. Certain general subjects of particular importance, such as credibility theory, classification and individual risk ratemaking, trend and loss development factors, and liability increased limits ratemaking are addressed in separate papers.

A candidate for this examination should have a thorough understanding of the general, basic principles of ratemaking such that he or she can analyze data given, select an appropriate ratemaking technique and develop a solution to a numerical problem. In addition, the candidate should be familiar with the ratemaking techniques presented in the readings, being able to compare and discuss why certain procedures are applicable to individual lines of insurance, as well as to work numerical problems.

The candidate should also be prepared to discuss specialized concepts in ratemaking, such as trend and loss development, and consider their relationship to changes in the economic environment.

The candidate is not responsible for current, specific developments in ratemaking procedures. However, a study kit is provided which contains portions of rate filings along with pertinent explanatory memoranda. This information is provided so the candidate will be aware of certain current techniques not covered in the various readings. The candidate will be responsible for an understanding of the types of techniques, their application, and how they relate to changes in the economic and social environment.

The following list of topics is typical of those a candidate should be prepared to discuss:

1. The selection and evaluation of ratemaking techniques corresponding to the characteristics of a given line of insurance.
  - a. pure premium versus loss ratio,
  - b. calendar year versus accident year versus policy year,
  - c. credibility, and
  - d. territorial and classification relativities.

2. Methods for trending and projecting losses and premiums (when appropriate).
  - a. internal versus external indices,
  - b. relation to loss development,
  - c. claim cost projection versus current cost index approach, and
  - d. impact of deductibles, coinsurance and insurance to value programs.
3. The candidate should also be prepared to discuss and apply ratemaking principles to problems which may not have generally recognized solutions.

Webb, B. L., Launie, J. J., Rokes, W. P. and Baglini, N. A., *Insurance Company Operations* (Third Edition), 1984, American Institute for Property and Liability Underwriters, Vol. II Chapter 9, p. 44-63 and Chapter 10 (including Appendices).

†*Foundations of Casualty Actuarial Science*, Published by the Casualty Actuarial Society, 1990, McClenahan, C. L., "Ratemaking," Chapter 2.

†*Foundations of Casualty Actuarial Science*, Published by the Casualty Actuarial Society, 1990, Finger, R. J., "Risk Classification," Chapter 5.

Committee on Ratemaking Principles, "Statement of Principles Regarding Property and Casualty Insurance Ratemaking," p.71-76. (Available from the CAS office at no charge.)

†\*Study Note Reading: Bouska, A.S.—"Exposure Bases Revisited."

Miller, D. L. and Davis, G. E., "A Refined Model for Premium Adjustment," *PCAS LXIII*, 1976, p. 117. Including discussion of paper: Karlinski, F., *PCAS LXIV*, 1977, p. 103.

Kallop, R., "A Current Look at Workers' Compensation Ratemaking," *PCAS LXII*, 1975, p. 62. Including discussions of paper: Gruber, C., *PCAS LXIII*, 1976, p. 57; Scheibl, J. A., *PCAS LXIII*, 1976, p. 62.

Harwayne, F., "Use of National Experience Indications in Workers' Compensation Classification Ratemaking," *PCAS LXIV*, 1977, p. 74. (Appendix excluded.) Including discussions of paper: Golz, J. F., *PCAS LXIV*, 1977, p. 85; Dropkin, L., *PCAS LXIV*, 1977, p. 87.

Fratello, B., "The Workmen's Compensation Injury Table and Standard Wage Distribution Table—Their Development and Use in Workmen's Compensation Ratemaking," *PCAS XLII*, 1955, pp. 171-202 (only).

\*Study Note Reading: Workers Compensation 1985 State X Rate Filing— Excerpts.

Stern, P. K., "Ratemaking Procedures for Automobile Liability Insurance," *PCAS LII*, 1965, p. 139. Including discussions of paper: Dorf, S. A., *PCAS LIII*, 1966, p. 190; Gill, J. F., *PCAS LIII*, 1966, p. 192.

Miller, M. J., "Private Passenger Automobile Insurance Ratemaking—A Calendar Year Approach," *PCAS LXVI*, 1979, p. 1. Including discussion of paper: Kollar, J. J., *PCAS LXVI*, 1979, p. 38.

†\*Study Note Reading: Chernick, D. R.—"Private Passenger Automobile Physical Damage Ratemaking."

Lange, J. T., "General Liability Insurance Ratemaking," *PCAS LIII*, 1966, p. 26. Including discussions of paper: Presley, P. D., *PCAS LIII*, 1966, p. 53; DuRose, S. C., *PCAS LIII*, 1966, p. 56; Author's response, *PCAS LIII*, 1966, p. 58.

McManus, M. F., "General Liability Ratemaking: An Update," *PCAS LXVII*, 1980, p. 144. Including discussion of paper: Johnson, W., *PCAS LXIX*, 1982, p. 114.

Marker, J. O. and Mohl, F. J., "Rating Claims-Made Insurance Policies," *Pricing Property and Casualty Insurance Products*, 1980, Casualty Actuarial Society Discussion Paper Program, p. 265. Including discussion of paper: McManus, M. F., Discussion Paper Program, 1980, p. 305.

Hurley, R. L., "Commercial Fire Insurance Ratemaking Procedures," *PCAS LX*, 1973, p. 208. Including discussions of paper: Schneiker, H. C., *PCAS LXI*, 1974, p. 62; Amlie, W. P., *PCAS LXI*, 1974, p. 67; Author's response, *PCAS LXI*, 1974, p. 70.

\*Study Note Reading: Fire—Statewide Rate Level Analysis—Classification Relativity Analysis.

\*Study Note Reading: Extended Coverage—Statewide Rate Level Analysis—Classification Relativity Analysis.

Walters, M. A., "Homeowners Insurance Ratemaking," *PCAS LXI*, 1974, p. 15. Including discussions of paper: Reinbolt, J. B., and Napierski, J. D., *PCAS LXI*, 1974, p. 58; Author's response, *PCAS LXI*, 1974, p. 61.

Cook, C. F., "Trend and Loss Development Factors," *PCAS LVII*, 1970, p. 1. Including discussions of paper: Scheel, P. J., and Sturgis, R. W., *PCAS LVII*, 1970, p. 15; Uthhoff, D. R., *PCAS LVII*, 1970, p. 18; Walters, M. A., *PCAS LVII*, 1970, p. 22.

Head, G. L., *Insurance to Value*, 1971, Chapters 1, 2, 6-8, and Appendices 1-4.

\*Study Note Reading: *Casualty Contingencies* (Exposure Draft) Chapter 13— "Deductibles, Excess Covers, and Coinsurance Clauses."

Lange, J. T., "The Interpretation of Liability Increased Limits Statistics," *PCAS LVI*, 1969, p. 163. Including discussions of paper: Fowler, T.W., *PCAS LVII*, 1970, p.88. Hunter, J.R., *PCAS LVII*, 1970, p.90.

Alff, G. N., "Liability Experience Rating: Concepts and Structure," *CPCU Journal*, March 1979, Society of Chartered Property and Liability Underwriters, Volume 32, No. 1, p. 44.



†*Foundations of Casualty Actuarial Science*, Published by the Casualty Actuarial Society, 1990, D'Arcy, S. P., "Investment Issues in Property Liability Insurance," Chapter 8 (pp. 525-532).

Mahler, Howard C., "An Introduction to Underwriting Profit Models," *PCAS LXXII*, 1985, p. 239. (Exclude Appendices III-VI.)

Wade, R. C., "Expense Analysis in Ratemaking and Pricing," *PCAS LX*, 1973, p. 1. Including discussions of paper. Comey, D.R., *PCAS LX*, 1973, p. 11. Dahme, O. E., *PCAS LX*, 1973, p. 13. Author's response, *PCAS LX*, 1973, p. 14.

\*Study Note Reading: Expense Provisions in the Rates.

\*Study Note Reading: Surety Association of America—Ratemaking and Review Procedures.

\*Study Note Reading: Experience Rating and Funding Methods.

\*Study Note Reading: Group Medical/Dental Benefit Pricing.

\*Study Note Reading: The Impact of Inflation on Group Insurance Pricing.

\*Study Note Reading: *Individual Health Insurance*, 1988, Chapter 4, "Individual Health Insurance Premiums," Sections 4.1-4.7.

#### (b) DATA FOR RATEMAKING

Section (b) includes readings which cover the planning and use of internal statistical material, the compilation and presentation of insurance statistics for statistical and ratemaking purposes, and the sources and uses of external statistics, particularly as they may be required in insurance administration and ratemaking.

The candidate should be familiar with the data captured in the individual statistical plans, being able to compare the different plans, noting limitations and possible areas of improvement. The relationship to the various ratemaking techniques should be noted.

\*Study Note Reading: Excerpts from Statistical Plans.

\*Study Note Reading: "Statement of Guidance Regarding Management Data and Information."

\*Study Note Reading: Policy Year and Calendar Year Calls for Compensation Experience by State as of December 31, 1983.

## PART 7

Prior to commencing study for this Part, the candidate should read the "Recommendations for Study" section, pages 16 to 20, for study suggestions and guidance in obtaining study notes, out-of-print readings, past examinations, and other information important to sitting for this examination.

The candidate should be prepared to answer questions regarding current developments in subjects covered by this examination. To prepare for this, the candidate should regularly read at least two general property and casualty insurance periodicals. A list of the more important current events topics will be provided to students in advance of the examination. This list will cover the principal areas but may not cover every current event topic tested on the examination. This list will be available by September 1 for those who have already registered. If you plan to register after this date but wish to receive the current events as soon as they become available please write, not call, the CAS office.

Section (a) of this examination deals with the analytical techniques which an actuary may employ to develop premium, loss and expense reserves. Section (b) deals with the form, content and interpretation of the two major reports an insurance company makes to regulatory authorities and with sources of comparative data.

#### (a) PREMIUM, LOSS AND EXPENSE RESERVES

An actuary may be expected to design and test reserving methods, and complete Schedule P of the Annual Statement. The candidate should be prepared to discuss such topics as:

1. The selection and evaluation of a loss reserving method appropriate to a given line of insurance:
  - a. For known claims
  - b. For IBNR claims
  - c. For all incurred claims
2. Testing of adequacy of previous loss and loss expense reserve levels.
3. Evaluating the adequacy of current loss and loss expense reserve levels.
4. The identification of, and correction for, effects on loss reserves stemming from:
  - a. Changes in the loss climate
  - b. Changes in a company's handling of claims
  - c. Data problems
5. Special reserving problems in a line arising from:
  - a. Catastrophe losses
  - b. Reopened claims
  - c. Policies on a claims-made rather than occurrence basis
  - d. Fidelity and Surety IBNR
  - e. Credit insurance

6. The unearned premium reserve:
  - a. Improving its accuracy
  - b. The reserve for retrospective returns
  - c. Policies on a claims-made basis
  - d. Deposit premium policies
7. Allocated loss expense reserves.
8. Unallocated loss expense reserves.
9. Statutory Annual Statement reserves.

The candidate should be prepared to compare and evaluate the procedures discussed and the arguments advanced in the readings. The answers provided by the candidate will be graded based on their applicability to the specific problem presented and the professional competence evidenced by the answer. While the readings for this part provide the basic factual information necessary, practical experience has often proven helpful in successfully completing the examination.

### Readings

Study Kit of Current Articles, 1991. (Available from the CAS office at a cost of \$5.00).

1. Linqanti, A. J., "Calculation of Unearned Premium Reserves on Interim Audited Risks - Monthly, Quarterly, and Semi-Annual Bases."
2. AICPA, "Discounting Claims of Insurance Enterprises."
3. American Academy of Actuaries Statement on Discounting Loss Reserves.
4. Casualty Actuarial Society, "Statement of Principles Regarding Property and Casualty Loss and Loss Adjustment Expense Reserves," 1988.
- †5. Actuarial Standards Board, "Actuarial Standard of Practice No. 9, Documentation and Disclosure in Property and Casualty Insurance Ratemaking and Loss Reserving (Doc. No. 011)," 1989.
- †6. Office of the Superintendent of Financial Institutions Canada, "Report of the Actuary or the Reserve Specialist on the Property and Casualty Business of 1989 Pursuant to the Provisions of the Canadian and British Insurance Companies Act or the Foreign Insurance Companies Act." (Section 3 will not be tested.)

Those pages and schedules of the Association form of the 1990 Annual Statement Blank for Fire and Casualty Companies which relate to reserves.

Strain, R. W., *Property-Liability Insurance Accounting* (Fourth Edition), 1988, Chapter 5.

Salzmann, R. E., *Estimated Liabilities for Losses and Loss Adjustment Expenses*, 1984, Chapters 1-8 and 11.

†*Foundations of Casualty Actuarial Science*, Published by the Casualty Actuarial Society, 1990, Wiser, R. F., "Loss Reserving," Chapter 4.

Fisher, W. H. and Lange, J. T., "Loss Reserve Testing: A Report Year Approach," *PCAS LX*, 1973, p. 189. Including discussions of paper: Skurnick, D., *PCAS LXI*, 1974, p. 73. Author's response, *PCAS LXI*, 1974, p. 84.

Bornhuetter, R. L. and Ferguson, R. E., "The Actuary and IBNR," *PCAS LIX*, 1972, p. 181. Including discussions of paper: Cooper, W.P., *PCAS LX*, 1973, p. 161. White, H. G., *PCAS LX*, 1973, p. 165.

Berry, C. H., "A Method For Setting Retro Reserves," *PCAS LXVII*, 1980, p. 226. Including discussion of paper: Morell, R.K., *PCAS LXVIII*, 1981, p. 107.

†Adler, M. and Kline, C. D., Jr., "Evaluating Bodily Injury Liabilities Using a Claims Closure Model," *Evaluating Insurance Company Liabilities*, 1988. Casualty Actuarial Society Discussion Paper Program, p.1.

Resony, A. V., "Allocated Loss Expense Reserves," *PCAS LIX*, 1972, p. 141. Including discussion of paper: Petz, E. F., *PCAS LX*, 1973, p. 157.

†Kittel, J., "Unallocated Loss Adjustment Expense Reserves in an Inflationary Economic Environment," *Inflation Implications For Property-Casualty Insurance*, 1981, Casualty Actuarial Society Discussion Paper Program, p. 311. Including discussion of paper: Bill, R., *Inflation Implications for Property-Casualty Insurance*, 1981. Casualty Actuarial Society Discussion Paper Program, p. 332.

Fisher, W. H. and Lester, E. P., "Loss Reserve Testing in a Changing Environment," *PCAS LXII*, 1975, p. 154.

McClenahan, C. L., "A Mathematical Model for Loss Reserve Analysis," *PCAS LXII*, 1975, p. 134. (The candidate will not be held responsible for notation or the development of the formulas in this paper.) Including discussion of paper: Skurnick, D., *PCAS LXIII*, 1976, p. 125.

Berquist, J. R. and Sherman, R. E., "Loss Reserve Adequacy Testing: A Comprehensive, Systematic Approach," *PCAS LXIV*, 1977, p. 123. Including discussion of paper: Thorne, J. O., *PCAS LXV*, 1978, p. 10.

Khury, C. K., "Loss Reserves: Performance Standards," *PCAS LXVII*, 1980, p. 1. (The candidate will not be responsible for notation or development of the formulas in this paper.) Including discussion of paper: Berquist, J. R., *PCAS LXVII*, 1980, p. 22.

†Stanard, J. N., "A Simulation Test of Prediction Errors of Loss Reserve Estimation Techniques," *PCAS LXXII*, 1985, p. 124. Including discussion of paper: Robertson, J. P., *PCAS LXXII*, 1985, p. 149.

†Pinto, E. and Gogol, D. F., "An Analysis of Excess Loss Development," *PCAS LXXIV*, 1987, p. 227. Including discussion of paper: Levine, G. M., *PCAS LXXIV*, 1987, p. 256.

**(b) INSURANCE ACCOUNTING, EXPENSE ANALYSIS, AND PUBLISHED FINANCIAL INFORMATION**

The candidate should obtain a general knowledge of insurance accounting, including its terminology and practice. A suggested basic accounting reference for candidates is the American Institute for Property and Liability Underwriters' CPCU 8 text, *Introduction to Accounting*, by A. Thompson Montgomery. A suggested basic overview of insurance accounting is *Basic Concepts of Accounting and Taxation of Property/Casualty Companies*, a monograph by the Insurance Information Institute. The candidate should have detailed familiarity with the contents, purpose, and recent changes in the Annual Statement Blank and the Insurance Expense Exhibit. This includes a knowledge of the methods of preparation and interrelationships of the various exhibits, schedules, and parts comprising these reports. **Instructions for preparation of the Annual Statements are available from the NAIC. Examination questions regarding preparation of the Annual Statement will not require the candidate to purchase the instructions.** The candidate should understand the details of and reasons for the differences between the accounting methods employed under statutory and GAAP accounting. The candidate should also understand the differences between the statistics included in these reports and those used for ratemaking and the various types of experience analysis. The candidate should be able to interpret and evaluate data from the reports, identify potential distortions in the data, and suggest possible means of adjusting for any distortions.

**Readings**

National Association of Insurance Commissioners, *Proceedings*, Financial Condition (EX4) Subcommittee Blanks Task Force for 1986 through 1990, as applicable to the Fire and Casualty Blank.

(1) *Insurance Accounting*

Association Form of 1990 Annual Statement Blank for Fire and Casualty Companies (both individual and consolidated basis).

Strain, R. W., *Property-Liability Insurance Accounting* (Fourth Edition), 1988, Chapters 1, 2, 3, 6, 7, 8, 10, 11, 12, 14, 15, 16, and Appendices.

Committee on Annual Statement, "Report on the Annual Statement," *PCAS LII*, 1965, p. 244.

American Institute of Certified Public Accountants. *Audits of Fire and Casualty Insurance Companies*, Chapter 9.

Balcarek, R. J., "Effect of Loss Reserve Margins in Calendar Year Results," *PCAS LIII*, 1966, p. 1. Including discussion of paper: Longley-Cook, L. H., *PCAS LIII*, 1966, p. 17.

Otteson, P. M., "Some Observations Concerning Fire and Casualty Insurance Company Financial Statements," *PCAS LII*, 1965, p. 215. Including discussions of paper: Carleton, J. W., *PCAS LIII*, 1966, p. 195; Espie, R. G., *PCAS LIII*, 1966, p. 198; Linder, J., *PCAS LIII*, 1966, p. 207; Author's response, *PCAS LIII*, 1966, p. 197.

(2) *Expense Analysis*

1990 Insurance Expense Exhibit.

Strain, R. W., *Property-Liability Insurance Accounting* (Fourth Edition), 1988, Chapter 9.

New York State Regulations, Title 11, Parts 105 through 109 (Regulation 30). (Available from CAS Library.)

Pruitt, D.M., "Uniform Accounting—A Study of Regulation," *PCAS XXXVI*, 1949, p. 22.

Insurance Accounting and Statistical Association, "Uniform Classification of Expenses for Property and Liability Insurance Companies," *Proceedings*, 1979, p. 290.

(3) *Published Financial Information*

The candidate should be familiar with the sources of published insurance statistics in order to know where to obtain such information when the need arises. The following annual publications constitute a representative list of such sources:

Best, A.M., Co., Inc.

Best's Insurance Reports—Property/Casualty  
Best's Aggregates and Averages—Property/Casualty  
Best's Executive Data Service  
Best's Key Rating Guide—Property/Casualty  
Best's Casualty Loss Reserve Development Series

The National Underwriter

Argus F.C.&S. Chart  
Argus Chart of Health Insurance

New York Insurance Department. *Statistical Tables from Annual Statements*.

## FELLOWSHIP EXAMINATIONS

### PART 8

Prior to commencing study for this Part, the candidate should read the "Recommendations for Study" section, pages 16 to 20, for study suggestions and guidance in obtaining study notes, out-of-print readings, past examinations, and other information important to sitting for this examination.

The candidate should be prepared to answer questions regarding current developments in subjects covered by this examination. To prepare for this, the candidate should regularly read at least two general property and casualty insurance periodicals. A list of the more important current events topics will be provided to students in advance of the examination. This list will cover the principal areas but may not cover every current event topic tested on the examination. This list will be available by March 1 for those who have already registered. If you plan to register after this date but wish to receive the current events as soon as they become available please write, not call, the CAS office.

In each section, there is a body of core material for which each student will be responsible. The remaining material in the section is divided according to the country, either the United States or Canada, for which it is primarily relevant. The student may choose to be tested on either the material designated Canadian or the material designated as United States and must declare this choice at the time of registration. All students will be tested on the core material. An asterisk is shown beside the United States material and a diamond is shown beside Canadian material.

#### (a) TORT LAW AND STATUTORY INSURANCE

Legal foundations of tort law and statutory insurance are subjects which are not strictly actuarial in nature, but which affect many areas of an actuary's work. Since no prior legal knowledge is assumed, the first section includes several readings on tort law. This material should provide background and a basic understanding of how tort law gives rise to the need for insurance.

The background material is followed by a study of insurance coverages mandated by statute. In reviewing the recommended readings the candidate should be aware of the modifications of tort law with the introduction of various "first party" compensation systems. These first party systems are exemplified by the Automobile No-fault and Workers' Compensation coverages. Statutory coverages include those mandated by the state/province and those required by the federal government. State/province mandated coverages may include automobile, workers' compensation and employers' liability coverages. For automobile insurance, the candidate should be aware of the different legal environments presented by different states/provinces including financial responsibility or compulsory insurance laws and various involuntary market mechanisms. The large variety of individually tailored state or provincial laws in workers' compensation makes this area particularly complex, but the

candidate should understand the basic concepts and structure common to the diverse state or provincial statutes.

Finally, coverages required by the federal government or social insurance plans are presented. The candidate is expected to be familiar with the basic principles and concepts underlying the Social Security system in the United States or the social insurance systems in Canada and with the general actuarial principles involved in the valuation of these systems. One is not expected to have detailed knowledge of the current level of benefits or the formulas used to calculate such benefits.

#### (1) *Background Law and Insurance*

Lorimer, J. J., Perlet, H. F., Kempin, F. G., and Hodosh, F. R., *The Legal Environment of Insurance* (Third Edition), 1987, American Institute for Property & Liability Underwriters, Vol. II pp. 131-142, 183-249.

Keeton, R., "The Impact on Insurance of Trends in Tort Law" in *Issues in Insurance* (Third Edition), 1984, American Institute for Property & Liability Underwriters Vol. I.

State of New York, Advisory Commission on Liability Insurance, "Insuring Our Future", Part Two, Section II, "Reform of the Tort Law", pp. 121-163. (Available from the CAS office at a cost of \$3.00.)

†Hensler, D. R., Vaiana, M. E., Kalkalik, J. S., Peterson, M. A., "Trends in Tort Litigation, The Story Behind the Statistics", Rand Institute for Civil Justice, 1987. (Available from the CAS office at a cost of \$3.00.)

♦Waddams, S. M., *The Law of Damages*, 1983, Chapter 3. (The candidate will not be tested on details of cases mentioned only briefly, but will be responsible for knowledge of cases treated in some depth.)

♦Brown, C. and Menezes, J., *Insurance Law in Canada*, 1982, Chapter 1. (Available from the CAS office together with Chapter 2 at a cost of \$3.00.)

#### (2) *Statutory Insurance*

##### (A) *Automobile Insurance*

The Select Committee on Company Law, *The Insurance Industry*, Part III. "Government Presence in the Insurance Industry," Chapters 9-11. (Available from Insurer Advisory Organization, Toronto, Canada at a cost of \$5.00.)

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♦Canadian content

†\*American Insurance Association, *Summary of Selected State Laws and Regulations Relating to Automobile Insurance*, 1990 Edition. (Including any subsequent addenda.)

- a. No-Fault Benefits (pp. 1-9)
- b. Add-On Benefits (pp. 10-17)
- c. Compulsory Liability, Financial Responsibility, and Uninsured Motorists Laws (pp. 19-35)
- d. Residual Market Plans (p. 63)

(B) *Workers' Compensation*

†Chamber of Commerce of the United States, *Analysis of Workers' Compensation Laws*, 1990. (Although the candidate is not expected to memorize the detail of this reading, he or she should be familiar with the contents thereof and the coverages described.)

◆Neal, J., *Canadian Workers' Compensation*. (Part of Canadian material available from the CAS office at a cost of \$3.00.)

(C) *Government Programs*

†Wood, G. L., Lily, C. C., Malecki, D. S., Graves, E. E. and Rosenblum, J. S., "Personal Risk Management and Insurance", (Fourth Edition), 1989, American Institute for Property and Liability Underwriters, Vol. I, pp. 335-347.

†Robertson, A. H., *The Coming Revolution in Social Security*, 1981, Chapters 4-8, 11, 13-16, 20, and 24.

\*Myers, R. J., *Social Security* (Third Edition), 1985, Chapters 5 (excluding pp. 416-442), 13, 15 (including appendices to Chapters 13 and 15).

†Koitz, David S., "*The Social Security Surplus: A Discussion of Some of the Issues*", Congressional Research Service, 1988. (Available from CAS office at a cost of \$3.00.)

◆Tate, H., *The Canada Pension Plan*. (Part of Canadian material available from the CAS office at a cost of \$3.00.)

◆Coward, L. E., *Provincial Hospital and Medical Insurance Plans*. (Part of Canadian material available from the CAS office at a cost of \$3.00.)

◆Bedard, M., *Canadian Unemployment Insurance*. (Part of Canadian material available from the CAS office at a cost of \$3.00.)

Greene, M., "Government Insurers" in *Issues in Insurance* (Fourth Edition), 1988, American Institute for Property and Liability Underwriters, Vol. I.

\*United States content

◆Canadian content

## (b) REGULATION AND REGULATORY CONCERNS

This Section includes readings covering both the fundamentals of insurance regulation and a discussion of important issues that confront a regulator.

The candidate should understand the role of the insurance business as a supplier of an essential service. Because of the essential and highly technical nature of insurance a system of regulatory controls has been established to require the industry to demonstrate that it is providing fair and reliable service.

The basis for insurance regulation is the law of the particular jurisdiction: either state, provincial or federal. *The New York Insurance Law* and various Canadian laws are included as typical laws that have evolved over time. In both the background material and in the law itself, the candidate should concentrate on those concepts of law which relate to the insurance contract, to the conduct of the business of insurance, and to the way insurance is marketed.

Judicial decisions interpreting the law are also an important component of insurance regulation. Several readings summarize significant cases which served to develop legal precedents.

In recent years, several reports have been issued examining the role of governments in insurance regulation. Excerpts from these reports are included on the syllabus so that the candidate can understand the unique nature of a state/province regulatory system, insurance's antitrust immunity and proposals for change in this immunity.

The candidate should be familiar with the major changes in rate regulation and the various approaches currently in use. The candidate should consider how well each style of rate regulation meets the basic objectives of regulation: insurer solvency, availability of insurance, and fair treatment of policyholders and claimants.

The candidate should be familiar with a wide range of issues that attract the attention of regulators: ratemaking, classification, shared markets, availability of insurance, insurer profitability, monitoring for solvency, guaranty funds (limiting the harmful effect of solvency if monitoring does not prevent it), insurance groups, policy language and unfair competition. The candidate should not only understand the importance of such areas for regulators but also the methods that are used to achieve regulatory goals. The candidate may gain a better understanding of the solvency tests used, by reviewing the NAIC publication entitled, "Using the NAIC Insurance Regulatory Information System," Property and Liability edition, 1989, but will not be held responsible for its contents.

The National Association of Insurance Commissioners is the central body of all state regulation. The NAIC meets regularly to consider current issues of concern. Typically, a task force and an advisory committee are established to make recommendations to a full committee and to the NAIC itself. These recommendations often take the form of a model law to be enacted by each affected state.

The NAIC *Proceedings* provides material on a wide range of subjects affecting insurance regulation. Before reading material listed on the syllabus it is suggested that the individual review the introductory portion of the Proceedings book and become familiar with the structure of the books and of the NAIC itself in order to facilitate location of the required information and trace its development through the various committees to ultimate resolution.

Although there are specific citations for the following topics, the candidate is also responsible for current developments:

- i) Availability
  - ii) Guaranty Funds
  - iii) Risk Retention Groups
- (1) *Introduction to Regulation*

Joskow, P. L., "Cartels, Competition and Regulation in the Property-Liability Insurance Industry." (Available from the CAS office at a cost of \$5.00.)

Danzon, P., "Rating Bureaus in U.S. Property - Liability Insurance Markets; Anti- or Pro-Competitive?", Geneva Papers on Risk and Insurance, October, 1983, pp. 371-402. (Available from the CAS office at a cost of \$3.00.)

Kimball, S. L. and Denenberg H. S., (Eds.) *Insurance, Government, and Social Policy*, 1969, Chapters 1, 3, 4, 10.

Mintel, J., *Insurance Rate Litigation*, 1983, Chapter 5, 7. (The candidate will not be tested on details of cases mentioned only briefly, but will be responsible for knowledge of cases treated in some depth.)

\*Mertz, A. C., *The First Twenty Years*.

\*Joskow, P. L., Excerpt from the *Report of the National Commission for the Review of Antitrust Laws and Procedures*, Report of Economic Advisory Panel, "Competition and Regulation in the Property/Casualty Insurance Industry." (Available from the CAS office at a cost of \$3.00.)

◆Brown, C. and Menezes, J., *Insurance Law in Canada*, 1982, Chapter 2. (Available from the CAS office together with Chapter 1, at a cost of \$3.00.)

(2) *Ratemaking (including Classification and Profitability)*

Mintel, J., *Insurance Rate Litigation*, 1983, Chapters 1, 8, 10, 11 and 13.

†American Insurance Association, *Workers' Compensation Insurance Rate Regulation Study*, 1982, Summary.

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\*United States content

◆Canadian content

Bureau of Insurance, Richmond, Virginia. *Competition in the Property and Casualty Insurance Industry*, January 1978. (Available from the CAS library).

National Association of Insurance Commissioners, *Proceedings*, Volume II, 1980, "Report of the Advisory Committee on Competitive Rating to the National Association of Insurance Commissioners." Chapters III-VI and Comments. (The candidate will not be responsible for the language of the model rating law itself nor the alternative model laws submitted in the report).

\*New York (State) Laws, Statutes, etc., New York Insurance Law, Article 1, Section 107, Article 23 (all sections). (The Candidate is responsible only for the sections of the law as stated. If studying from publications such as the Consolidated Laws Service, which cite case histories as well as the law itself, the candidate is not responsible for the case histories although they may be helpful in gaining an understanding of the law. Candidates will not be tested on those sections of the New York Laws dealing exclusively with life insurance and/or annuities.)

◆*Alberta Insurance Act*, Part 7, Sections 337-347.

◆*New Brunswick Insurance Act*, Part VII, Sections 267.1-267.9.

◆*Newfoundland Automobile Insurance Act*, Sections 45-57.

◆*Nova Scotia Insurance Act*, Part VI, Sections 105-111.

†◆*Ontario Motorist Protection Plqn.* (Bill 68), Explanatory notes, Sections 31, 37, 39, 45, 48, 49, 52, 55, 56, 57 (excluding subsection 234), 61, 63, 74, and Accident Benefit Schedule, Parts II-VII.

◆*Quebec Automobile Insurance Act*, Title VII.

Report to the Congress of the United States by the Comptroller General, *Issues and Needed Improvements in State Regulation of the Insurance Business*, October 1979, Chapter 6—"Regulation of Automobile Risk Classification," pp. 102-142. (Available from U.S. General Accounting Office.)

Williams, C. A., "Regulating Property and Liability Insurance Rates Through Excess Profits Statutes," *Journal of Risk and Insurance*, September 1983, pp. 445-471.

(3) *Shared Markets and Availability*

Wood, G. L., Lilly, C. C., Malecki, D. S., Graves, E. E. and Rosenbloom, J. S., *Personal Risk Management and Insurance* (Fourth Edition), 1989, American Institute for Property and Liability Underwriters, Vol. I, pp. 169-175, 313-325.

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\*United States content

◆Canadian content

Lee, J. F. "The Automobile Shared Market: Significance, Developments and Policy Issues," *Journal of Insurance Regulation*, September 1982, pp. 107-122. (Available from the CAS office at a cost of \$3.00).

†NAIC, *Proceedings*, 1986, Vol. I pp. 708-719, 726; 1986, Vol. II pp. 734-736, 779-786; 1987, Vol. I pp. 747-799; 1987, Vol. II pp. 775-776, 800-805, 1989, Vol. II pp. 606-610.

(4) *Solvency Monitoring and Guaranty Funds*

Kimball, S. L. and Denenberg, H. S., Eds., *Insurance, Government and Social Policy*, 1969, Chapters 8 and 9.

†*Foundations of Casualty Actuarial Science*, Published by the Casualty Actuarial Society, 1990, D'Arcy, S. P., "Special Issues," pp. 541-547.

†Ludwig, S. and McAuley, R., "A Nonparametric Approach to Evaluating Reinsurers' Relative Strength", PCAS LXXV, 1988, pp. 219-239.

†Rappaport, Edward B., "Insurance Company Solvency", Congressional Research Service, 1989. (Available from CAS Office at a cost of \$3.00.)

Troxel, T. and Breslin, C.L., *Property-Liability Insurance Accounting and Finance* (Second Edition). American Institute for Property and Liability Underwriters, 1983, pp. 231-245. (Available from the CAS office at a cost of \$3.00.)

*NAIC Financial Condition Examiners' Handbook*—Introduction, pp. 9-17, 23-39. (Available from the CAS office at a cost of \$3.00.)

\**New York Insurance Law*, Sections 1301, 1302, 1303, 1305, 1308, 1309, 1310, 1311, 1414, 4117.

◆*Canadian and British Insurance Companies Act*, Parts III and VI.

Duncan, M.P., "An Appraisal of Property and Casualty Post-Assessment Guaranty Funds," *Journal of Insurance Regulation*, March 1984, pp. 289-303. (Available from the CAS office at a cost of \$3.00.)

NAIC, *Proceedings*, 1986, Vol. I pp. 292-305; 1986, Vol. II pp. 408-416; 1987, Vol. I pp. 419-425.

(5) *Other Issues*

†NAIC Study Committee Report, "Regulating Workers' Compensation Groups" in *Issues in Insurance* (Fourth Edition), 1988, American Institute for Property and Liability Underwriters. Vol. II Parts I-III, VI and IX. (1984 edition will also be acceptable.)

NAIC *Proceedings*, 1987, Vol. I pp. 857-865; 1987, Vol. II pp. 774-798; 1988, Vol. I pp. 758-762; 1988, Vol. II pp. 249, 255, 693.

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\*United States content

◆Canadian content



## PART 9

Prior to commencing study for this Part, the candidate should read the "Recommendations for Study" section, pages 16 to 20, for study suggestions and guidance in obtaining study notes, out-of-print readings, past examinations, and other information important to sitting for this examination.

This candidate should be prepared to answer questions regarding current developments in subjects covered by this examination. To prepare for this, the candidate should regularly read at least two general property/casualty insurance periodicals. A list of the more important current events topics will be provided to students in advance of the examination. This list will cover the principal areas but may not cover every current event topic tested on the examination. This list will be available by September 1 for those who have already registered. If you plan to register after this date but wish to receive the current events as soon as they become available please write, not call, the CAS office.

Items marked with an asterisk(\*) constitute the 1991 Study Kit which is available from the CAS office at a cost of \$30.00. A Study Kit update is available at a cost of \$10.00 which includes the items marked by both a dagger(†) and an asterisk(\*)).

### (a) ADVANCED RATEMAKING

Candidates for this part are expected to have acquired considerable technical knowledge and practical experience in insurance ratemaking. In addition, they should keep in touch with current developments and problems in ratemaking. The examination will assume a working knowledge of basic ratemaking and will deal with advanced problems such as those covered in the papers listed below. The examination will not necessarily be limited to the excerpts expressed in the listed papers. The ability to apply ratemaking knowledge and experience may be tested through questions dealing with problems for which there are no generally recognized solutions. To some degree, they will deal with the types of practical problems which a fully qualified actuary working in ratemaking should be able to solve.

Advanced ratemaking consists of two principle sections: (1) classification ratemaking topics and (2) excess and deductible rating.

All the papers in this part should be read for illustrations of basic principles and theories, as well as any insights into advanced ratemaking problems and their solutions. In none of the papers is the derivation of formulas or equations to be stressed, but some applications of those techniques may be required. Some papers are included primarily for their historical significance or to illustrate unique solutions to a ratemaking problem.

#### (1) *Classification Ratemaking Topics.*

Brown, R. L., "Minimum Bias with Generalized Linear Models," *PCAS LXXV*, 1988. Sections 1-5 only and associated exhibits.

†Cummins, J. D., Smith, B. D., Vance, R. N., and VanDerhei, J. L., *Risk Classification in Life Insurance*, 1983, Chapters 3-6. (The student is not responsible for mathematical proofs.)

\*Insurance Services Office: Study Note on Monoline-Multiline Ratemaking, Included in Study Kit.

Lange, J. T., "Implications of Sampling Theory for Package Policy Ratemaking," *PCAS LIII*, 1966, p. 285. Including discussion of paper: Graves, C. H., *PCAS LIV*, 1967, p. 145; Nelson, D. A., *PCAS LIV*, 1967, p. 147; Cook, C. F., *PCAS LIV*, 1967, p. 149.

American Academy of Actuaries Committee on Risk Classification, "Risk Classification Statement of Principles," June 1980. (Available from the American Academy of Actuaries at no charge.)

†Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice No. 12 Concerning Risk Classification", October 1989. (Available from the American Academy of Actuaries at no charge.)

Dropkin, L. B., "Some Considerations on Automobile Rating Systems Utilizing Individual Driving Records," *PCAS LXXIV*, 1987, p. 391. Including discussion of paper: Bailey, R. A., *PCAS LXXIV*, 1987, p. 406; Philbrick, S., *PCAS LXXIV*, 1987, p. 418; Svendsgaard, S., *PCAS LXXIV*, 1987, p. 424; Feldblum, S., *PCAS LXXIV*, 1987, p. 411.

Bailey, R. A., and Simon, L. J., "An Actuarial Note on the Credibility of Experience of a Single Private Passenger Car," *PCAS XLVI*, 1959, p. 159. Including discussion of paper: Hazam, W. J., *PCAS XLVII*, 1960, p. 150.

†*Foundations of Casualty Actuarial Science*, Published by the Casualty Actuarial Society, 1990, Venter, G. G., "Credibility", Chapter 7 (pp. 375-431). (The student is not responsible for mathematical proofs, and is not responsible for the topic of Diffuse Priors.)

#### (2) *Excess and Deductible Rating*

This section deals with various techniques for risk sharing between an insured and an insurer.

The candidate should have a general knowledge and understanding of deductible and excess coverages, and the problems inherent in pricing these coverages for various lines.

Hogg, R. V. and Klugman, S. A., *Loss Distributions*, 1984, Chapter 5 (5.3-5.6A). (Students may need to review sections included in Part 4 readings. Also, note errata sheet in Study Kit.)\*

Lee, Y. S., "The Mathematics of Excess of Loss Coverages and Retrospective Rating—A Graphical Approach," Sections 1-3, *PCAS LXXV*, 1988.

†\*Snader, R. H., "Fundamentals of Individual Risk Rating and Related Topics," Part III of Study Note. (Updated in 1990 by Gillam, W. R., and Bear, R. A.; included in Study Kit.)

Miccolis, R. S., "On the Theory of Increased Limits and Excess of Loss Pricing," *PCAS LXIV*, 1977, p. 27. Including discussion of paper: Rosenberg, S., *PCAS LXIV*, 1977, p. 60.

Finger, R. J., "Estimating Pure Premiums by Layer," *PCAS LXIII*, 1976, p. 34. Including discussion of paper: Steeneck, L. R., *PCAS LXIII*, 1976, p. 53.

#### (b) INDIVIDUAL RISK RATING

One of the most important functions performed by an actuary is the rating of individual risks. Prior to Part 9, most of the readings were addressed to group or classification risk rating. This part provides detail readings on individual experience risk rating so that the candidate will be prepared to design and manage an individual risk rating system.

Individual risk rating consists of two principal sections:

- 1) Prospective rating which is more commonly known as Experience rating.
- 2) Retrospective rating.

The readings range from those which discuss the theoretical foundation of individual risk rating to those which discuss the application of various plans.

The candidate will be expected to have a good working knowledge of credibility, loss limitation, and rate modification concepts as they apply to prospective and retrospective rating, and loss distribution, insurance charge and excess loss charge concepts as they apply to retrospective rating. The candidate can be expected to apply these concepts in a creative and problem solving manner.

The candidate is also expected to be knowledgeable in the application of individual risk rating plans currently in use (excluding individual state pages) and should anticipate answering questions in the manner of an insurance consultant for an insured. Finally, the candidate should keep abreast of current developments and problems as they apply to individual risk rating.

Candidates unfamiliar with the general principles underlying individual risk rating plans should review Chapter 22 of the Kulp and Hall text, or the section on Merit Rating Plans in Chapter 10 of *Insurance Company Operations*, Volume II, from the American Institute for Property and Liability Underwriters before studying the required readings for this part. The candidate may gain a better understanding of the application of prospective and retrospective rating plans from John R. Stafford's books, *Workers' Compensation Experience Rating and Retrospective Rating*, but will not be held responsible for their contents. It is realized that parts of some technical articles cited in the recommended reading for this part are not current. However, the candidate should study all articles for their explanation of theory.

#### (1) Experience Rating

†\*Snader, R. H., "Fundamentals of Individual Risk Rating and Related Topics," Part I of Study Note. (Updated by Gillam, W.R., and Bear, R.A.; included in Study Kit.) (The student is not responsible for the material pertaining to Perryman's second formula.)

The candidate should study the following rating plans and the forms used in the application thereof:

\*National Council on Compensation Insurance:  
*Experience Rating Plan* (1984 edition with 1989 supplement) (Included in Study Kit).

\*Insurance Services Office: *Experience and Schedule Rating Plans* (7/88 edition) applicable to *General Liability* (Included in Study Kit).

†*Foundations of Casualty Actuarial Science*, Published by the Casualty Actuarial Society, 1990, Venter, G. G., "Credibility," Chapter 7 (pp. 431-436, 442-457, 460-462). (The student is not responsible for mathematical proofs, and is not responsible for the topic of Diffuse Priors.)

†\*Study Note on the Workers' Compensation Revised Experience Rating Plan. (Included in Study Kit.) Including (a) Venter, G. G., "Experience Rating—Equity and Predictive Accuracy"; (b) Gillam, W. R., "What Every Actuary Should Know About Workers Compensation Experience Rating (and Then Some)," Sections I-V; (c) Mahler, H. C., "An Actuarial Analysis of the NCCI Revised Experience Rating Plan", excluding the Appendix.

#### (2) Retrospective Rating

†\*Snader, R. H., "Fundamentals of Individual Risk Rating and Related Topics," Part II of Study Note (Updated in 1990 by Gilliam, W. R., and Bear, R. A.; included in Study Kit.)

The candidate should study the following retrospective rating plans and the forms used in the application thereof:

\*National Council on Compensation Insurance:  
*Retrospective Rating Plan Manual for Workers Compensation and Employers Liability Insurance* (1984 edition) (Included in Study Kit)

\*Insurance Services Office:  
*Retrospective Rating Plan for Automobile, General Liability, Glass and Theft* (7/89 edition) (Included in Study Kit)

†\*Gillam, W. R., "Retrospective Rating: Excess Loss Factors", Sections A-D. (Included in Study Kit.) (The student is not responsible for loss distribution formulas.)

Lee, Y. S., "The Mathematics of Excess of Loss Coverages and Retrospective Rating—A Graphical Approach," Section 4 *PCAS LXXV*, 1988.

Meyers, G., "An Analysis of Retrospective Rating," *PCAS LXVII*, 1980, p. 110. Including discussion of paper: Fiebrink, M. E., *PCAS LXVIII*, 1981, p. 113.

Skurnick, D., "The California Table L," *PCAS LXI*, 1974, p. 117. Including discussion of paper: Harwayne, F., *PCAS LXII*, 1975, p. 16; Snader, R., *PCAS LXII*, 1975, p. 24.

### (3) *Miscellaneous Rating*

The candidate should study the following rating plan and the forms used in the application thereof:

#### \*Insurance Services Office:

*Composite Rating Plan* (10/88 edition) (*Automobile, General Liability, Glass and Theft*) (Included in Study Kit).

## PART 10

Prior to commencing study for this Part, the candidate should read the "Recommendations for Study" section, pages 16 to 20, for study suggestions and guidance in obtaining study notes, out-of-print readings, past examinations, and other information important to sitting for this examination.

The candidate should be prepared to answer questions regarding current developments in subjects covered by this examination. To prepare for this, the candidate should regularly read at least two general property/casualty insurance periodicals. A list of the more important current events topics will be provided to students in advance of the examination. This list will cover the principal areas but may not cover every current event topic tested on the examination. This list will be available by March 1 for those who have already registered. If you plan to register after this date but wish to receive the current events as soon as they become available please write, not call, the CAS office.

Part 10 represents the final step in the examination process and is designed to test both the breadth and depth of the candidate's understanding of the insurance process. The candidate is expected to have acquired considerable technical knowledge and practical experience during preparation for the previous examinations.

The required reading material for this examination is divided into four sections, much of which builds on information covered in previous examinations. Questions may be asked which require use of material mastered in preparation for these previous examinations.

### (a) FINANCIAL OPERATIONS OF INSURANCE COMPANIES

This section explores the various relationships that exist between underwriting results, investment income, and taxes that arise out of the underwriting process and total operating income. The candidate is also expected to develop an appreciation of the varying standards employed in measuring overall operations from the perspective of the stockholder, the manager, the regulator and the policyholder. The candidate should be prepared to compare and evaluate the procedures discussed and the arguments advanced in the readings. Candidates who are not familiar with the Capital Assets Pricing Model may find it helpful to read the Mullins article on part 5B.

†*Foundations of Casualty Actuarial Science*, Published by the Casualty Actuarial Society, 1990, D'Arcy, S.P., "Investment Issues in Property Liability Insurance," Chapter 8 (pp. 509-525).

†Butsic, R. P. "Determining the Proper Interest Rate for Loss Reserve Discounting: An Economic Approach," *Evaluating Insurance Company Liabilities*, 1988 Casualty Actuarial Society Discussion Paper Program, p. 147.

†Myers, S., and Cohn, R., "A Discounted Cashflow Approach to Property-Liability Insurance Rate Regulation," In Cummins, F. D., and Harrington, S. E. (Editors), *Fair Rate of Return in Property-Liability Insurance*, 1987 p. 55.

Ferrari, J. R., "The Relationship of Underwriting, Investments, Leverage, and Exposure to Total Return on Owners' Equity," *PCAS LV*, 1968, p. 295. Including discussion of paper: Balcarek, R. J., *PCAS LVI*, 1969, p. 58; Bailey, R. A., *PCAS LVI*, 1969, p. 60.

Long, J. D., and Randall—"Report of the Investment Income Task Force to the National Association of Insurance Commissioners," in *Issues in Insurance Volume II* (Third Edition) 1984. Monograph 8 (Appendix Excluded). The candidate may elect instead to study from: N.A.I.C., Study of Investment Income, Supplement to the Proceedings, 1984, Vol. II. (pp. 3-95, Appendix Excluded).

N.A.I.C., Study of Investment Income, Supplement to the Proceedings, 1984, Vol. II. (pp. 496-530).

Brubaker, R.E., "A Constrained Profit Maximization Model for a Multi-Line Property/Liability Company," *Total Return Due a Property/Casualty Insurance Company*, 1979 Casualty Actuarial Society Discussion Paper Program, p. 28. Candidate is not responsible for the detailed iterations in the exhibits.

Butsic, R. P., "The Effect of Inflation on Losses and Premiums for Property-Liability Insurers," *Inflation Implications for Property-Casualty Insurance*, 1981 Casualty Actuarial Society Discussion Paper Program. p. 58.

Strain, R. W., *Property-Liability Insurance Accounting* (Fourth Edition), 1988, Chapter 13.

Almagro, M., and Ghezzi, T. L. "Federal Income Taxes—Provisions Affecting Property/Casualty Insurers" *PCAS LXXV*, Part 2, 1988, p. 95.

#### (b) REINSURANCE

This section deals with various techniques for risk sharing between an insurer and a reinsurer.

The candidate should have a general knowledge and understanding of the various types of reinsurance, the purpose and/or function of each type, reinsurance programs, reinsurer underwriting, the effects of reinsurance transactions on company operating results and other financial information, as well as methods employed to analyze costs.

†*Foundations of Casualty Actuarial Science*, Published by the Casualty Actuarial Society, 1990, Patrik, G. S., "Reinsurance", Chapter 6, p. 277.

Webb, B. L., Launie, J. J., Rokes, W. P. and Baglini, N. A., *Insurance Company Operations* (Third Edition), 1984, American Institute for Property and Liability Underwriters, Vol. I Chapters 7 and 8.

Strain, R. W., (Editor) *Reinsurance*, 1980, The College of Insurance. Chapters 3, 9, 12, 14, 21. (Note: The student should refer to the appropriate schedules in the current annual statement in those cases where references are made to schedules which have been replaced or revised since the date of publication of this book.)

(The student may find the following companion book helpful in preparing for this material: *Reinsurance Practices - A Workbook with Cases*, R. W. Strain, Editor, The College of Insurance, 1982. No questions will be taken directly from this workbook.)

Stone, J. M., "A Theory of Capacity and the Insurance of Catastrophe Risks," *The Journal of Risk and Insurance*, Part I in Vol. XL No. 2 (June 1973), p. 231 and Part II in Vol. XL No. 3 (September 1973), p. 339.

Ferguson, R. E., "Nonproportional Reinsurance and The Index Clause," *PCAS LXI*, 1974, p. 141. Including discussions of paper: Cook, C. F., *PCAS LXI*, 1974, p. 165; Khury, C. K., *PCAS LXII*, 1975, p. 9; Levin, J. W., *PCAS LXII*, 1975, p. 1; Rodermund, M., *PCAS LXII*, 1975, p. 5.

Ferguson, R. E., "Actuarial Note on Loss Rating," *PCAS LXV*, 1978, p. 50. Including discussion of paper: Patrik, G. S., *PCAS LXV*, 1978, p. 56.

#### (c) FORECASTING

In addition to employing forecasting techniques in both ratemaking and reserving, an actuary may be expected to develop both short and long range forecasts, and to play a key role in the corporate planning process of an insurance company. This section is designed to familiarize the candidate with various techniques employed in forecasting and planning. It is intended to provide an understanding of the advantages and disadvantages of various forecasting methods, how to interpret statistical measures in evaluating various techniques, and the assumptions underlying each.

Makridakis, S. and Wheelwright, S. C., *Forecasting Methods for Management* (Fifth Edition), 1989, Chapters 1-2, 4-7, 10, 15, 17, 20. (Candidates are presumed to be familiar with the material on regression in chapters 8 and 9, which is also covered in the Miller and Wichern text on Part 3a-SOA Course 120.)

Lommele, J.A. and Sturgis, R.W., "An Econometric Model of Workmen's Compensation," *PCAS LXI*, 1974, p. 170. Including discussions of paper: Brian, R. A., *PCAS LXII*, 1975, p. 172; Skurnick, D., *PCAS LXII*, 1975, p. 174.

McLagan, D.L., "A Non-Econometrician's Guide to Econometrics," *Business Economics*, Vol. VIII, No. 3, May 1973, p. 38. (Available from CAS office at no charge.)

Alff, G.N., "A Note Regarding Evaluation of Multiple Regression Models," *PCAS LXXI*, 1984, p. 84.

Gardner, Jr., E. S., "A Simple Method of Computing Prediction Intervals for Time Series Forecasts," *Management Science*, Vol. 34, No. 4, April 1988, p. 541-546. (Available from CAS office at no charge.)

#### (d) VALUATION TOPICS

This section presents an introduction to several concepts involved in the valuation of insurance companies. The candidate is expected to develop an understanding of the various techniques presented in the readings and be able to apply these techniques in a problem-solving situation. Since the concept of valuation is a developing area of actuarial practice, the candidate should be prepared to compare and evaluate the procedures discussed and the arguments advanced in the readings.

Sturgis, R. W., "Actuarial Valuation of Property/Casualty Insurance Companies," *PCAS LXVIII*, 1981, p. 146. Including discussions of paper: Lowe, S. P., *PCAS LXIX*, 1982, p. 120; Rothman, R., and Deutsch, R. V., *PCAS LXIX*, 1982, p. 126.

Miccolis, R. S., "An Investigation of Methods, Assumptions and Risk Modeling for the Valuation of Property-Casualty Insurance Companies," *Financial Analysis of Insurance Companies*, 1987 Casualty Actuarial Society Discussion Paper Program, p. 281.

Ferguson, R. E., "Duration," *PCAS LXX*, 1983, p. 265. Including discussion of paper: D'Arcy, S., *PCAS LXXI*, 1984, p. 8.

Noris, P. D., "Asset/Liability Management Strategies for Property & Casualty Companies," (Excluding sections I, II, V, and VI). May 1985, Morgan Stanley. (Available from the CAS office at a cost of \$5.00.)

Panning, W. H., "Asset/Liability Matching," *Financial Analysis of Insurance Companies*, 1987 Casualty Actuarial Society Discussion Paper Program, p. 322.

Dembiec, L. A., Pogorzelski, J. D. and Rowland, Jr., V. T., "The Measurement and Management of Interest Rate Risk," *Valuation Issues*, 1989 Casualty Actuarial Society Special Interest Seminar, p. 71.

Feldblum, S., "Asset Liability Matching For Property/Casualty Insurers," *Valuation Issues*, 1989 Casualty Actuarial Society Special Interest Seminar, p. 117.

†Casualty Actuarial Society, "Statement of Principles Regarding Property and Casualty Valuations as adopted September 22, 1989," *Casualty Actuarial Society 1990 Yearbook*, p. 144.

#### INDEX TO READINGS

Readings are available through the library of the Casualty Actuarial Society. However, the following information is furnished for those who wish to purchase the references.

#### Part(s)

8 *Alberta Insurance Act*, Public Affairs Bureau, 9945 108th Street, Edmonton, Alberta, Canada T5K 2G6

9 American Academy of Actuaries, Suite 800, 475 N. Martingale Road, Schaumburg, Illinois 60173-2226.

7 American Institute of Certified Public Accountants, *Audits of Fire and Casualty Insurance Companies*, Chapter 9, American Institute of Certified Public Accountants, P. O. Box 1003, New York, NY 10108-1003.

3,5-10 American Institute for Property and Liability Underwriters, Order Department: 420 Eagleview Blvd., Exton, PA 19341-1115, (215) 644-2100, FAX: (215) 458-1972.

8 American Insurance Association, *Summary of Selected State Laws and Regulations Relating to Automobile Insurance* (1990 Edition), American Insurance Association, 1130 Connecticut Ave. NW, Washington, D.C. 20036; (202) 828-7100. \$36.71

8 American Insurance Association, *Workers' Compensation Insurance Rate Regulation Study*. A limited number of copies has been made available to CAS students at a reduced price. Copies may be purchased in person at 85 John St., NYC (Fourth Floor) for \$5.00. By mail, the per-copy price is \$10.00. Written requests and checks payable to "American Insurance Assn." should be directed to: Publications Dept., American Ins. Assn., 85 John St., New York, NY 10038.

7 Best, A. M., Company, Inc., Ambest Road, Oldwick, NJ 08858.

4,5 Bowers, N. L., Gerber, H. U., Hickman, J. C., Jones, D. A. and Nesbitt, C. J., *Actuarial Mathematics*, Society of Actuaries, P. O. Box 95668, Chicago, IL 60694.

1 Bradley, G. L., *A Primer for Linear Algebra*, Prentice-Hall, Inc., Englewood Cliffs, NJ 07632.

5 Brealey, R. A. and Myers, S. C., *Principles of Corporate Finance* (Third Edition), McGraw-Hill Book Company, Manchester Road, Manchester, MO 63011.

3 Burden, R. L. and Faires, J. D., *Numerical Analysis* (Third Edition), PWS Publishers, 20 Park Plaza, Boston, MA 02116.

**Part(s)**

- 8 Bureau of Insurance, Richmond, Virginia, *Competition in the Property and Casualty Insurance Industry*, January 1978, Bureau of Insurance, State Corporation Commission, Richmond, VA 23219. \
- 8 *Canadian and British Insurance Companies Act*, Government Publishing Center, Supply and Services Canada, Ottawa, Ontario, Canada K1A 0S9
- 4,6-10 Casualty Actuarial Society, One Penn Plaza, 250 West 34th Street, New York, NY 10119.
- 8 Chamber of Commerce of the United States, 1615 H. Street, N. W., Washington D.C. 20062.
- 10 Cummins, J. D., and Harrington, S. E. (editors), *Fair Rate of Return in Property Liability Insurance*, (Huebner International series on risk insurance and economic security), 1987, order should be placed through: Kluwer Academic Publishers, P.O. Box 358, Accord Station, Hingham, MA 02018-0358; (617) 871-6600.
- 9 Cummins, J. D., Smith, B. D., Vance, R. N., and VanDerhei, J. L., *Risk Classification in Life Insurance*, order should be placed through: Kluwer Academic Publishers, P.O. Box 358, Accord Station, Hingham, MA 02018-0358; (617) 871-6600.
- 6-10 *Foundations of Casualty Actuarial Science*, Published by Casualty Actuarial Society, One Penn Plaza, 250 West 34th Street, New York, NY 10119; (212) 560-1018.
- 5 *Harvard Business Review*, Reprints, Soldiers Field, Boston, MA 02163.
- 6 Head, G. L., *Insurance to Value*, Richard D. Irwin, Inc., 1818 Ridge Road, Homewood, IL 60430.
- 3 Hillier, F. S. and Lieberman, G. J., *Operations Research* (Fourth Edition), Holden-Day, 4432 Telegraph Avenue, Oakland, CA 94609.
- 2 Hoel, P. G., Port, S. C. and Stone, C. J., *Introduction to Probability Theory and Introduction to Statistical Theory*, Houghton Mifflin Co., 2 Park Street, Boston, MA 02107 or 551 Fifth Avenue, New York, NY 10017.
- 2 Hogg, R. V. and Craig, A. T., *Introduction to Mathematical Statistics* (Fourth Edition), Macmillan Publishing Company, Inc., 866 Third Avenue, New York, NY 10022.
- 4,9 Hogg, R. V. and Klugman, S. A., *Loss Distributions*, John Wiley and Sons, 1 Wiley Drive, Somerset, NJ 08873; (201) 469-4400.

**Part(s)**

- 4,5 Hossack, I. B., Pollard, J. H. and Zehnwirth, B., *Introductory Statistics with Applications in General Insurance*, Cambridge University Press, 510 North Avenue, New Rochelle, NY 10801.
- 7 Insurance Accounting and Statistical Association, P. O. Box 8857, Durham, NC 27707.
- 3 Insurance Information Institute, 110 William St., New York, NY 10038.
- 3 Insurance Services Office, 160 Water Street, New York, NY 10038.
- 8 Insurers' Advisory Organization of Canada, 180 Dundas St. West, Toronto, Ontario, M5G 1Z9.
- 1 Johnson, R. E., Kiokemeister, R. L. and Wolk, E. S., *Calculus with Analytic Geometry* (Sixth Edition), Allyn and Bacon, Inc., Rockleigh, NJ 07647.
- 8,10 *Journal of Risk and Insurance* (The), Brooks Hall, University of Georgia, Athens, GA 30602.
- 8 Kimball, S. L. and Denenberg, H. S., (Eds.) *Insurance, Government and Social Policy*, Richard D. Irwin, Inc., 1818 Ridge Road, Homewood, IL 60430.
- 1 Kolman, B., *Introductory Linear Algebra With Applications* (Third Edition), MacMillan, Inc. This text is *not* available from the publisher, but may be purchased at many college bookstores.
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