

CASUALTY ACTUARIAL SOCIETY

**1996**  
**SYLLABUS OF**  
**EXAMINATIONS**



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# Casualty Actuarial Society



**1996**

## Syllabus of Examinations

**Send All Payments to:**

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P.O. Box 425  
Merrifield, Virginia 22116-0425

**Send All Other Correspondence to:**

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Internet Address: [OFFICE@CASACTSOC.COM](mailto:OFFICE@CASACTSOC.COM)

# Notice to Candidates

Candidates should note the following changes/additions in this year's *Syllabus*:

## 1. Exams

Due to a minor change in exam scheduling, the CAS exams are now referred to as Spring and Fall 1996 exams. See pages 5-6 for exact dates and times.

## 2. Refunds and Transfers

The administrative fee for refunds is now \$50. Transfers of exam fees is no longer permitted.

## 3. Analysis and Appeals

Candidates receiving a grade of 4 or 5 on a CAS specific exam will automatically receive an analysis with their grade report. All other candidates may write to the CAS Office for an analysis.

## 4. Individual Exams

Please refer to the appropriate exam parts for any changes made from 1996.

## 5. Obtaining Exam Booklet

Candidates wishing to obtain his or her own examination booklet and scrap paper should bring a self-addressed, stamped envelope to the examination center.

## 6. Part 7

Beginning in November 1996, the Part 7 exam will be offered in a Canadian version, titled 7C.

## 7. Past Examinations and Sample Solutions

Past examinations are available at a cost of \$15 (\$25 Canadian) for the three most recent years, or \$5 (\$10 Canadian) for the most recent exam. Answer keys are provided for true/false and multiple choice questions and sample answers are provided for essay questions. The appropriate fee must accompany past exam requests. Candidates must use the white order forms provided inside the back cover of this *Syllabus*.

# FOREWORD

Actuarial science originated in England in 1792 in the early days of life insurance. Because of the technical nature of the business, the first actuaries were mathematicians. Eventually, their numerical growth resulted in the formation of the Institute of Actuaries in England in 1848. Eight years later, in Scotland, the Faculty of Actuaries was formed. In the United States, the Actuarial Society of America was formed in 1889 and the American Institute of Actuaries in 1909. These two American organizations merged in 1949 to become the Society of Actuaries.

In the early years of the 20th Century in the United States, problems requiring actuarial treatment were emerging in sickness, disability, and casualty insurance—particularly in workers compensation, which was introduced in 1911. The differences between the new problems and those of traditional life insurance led to the organization of the the Casualty Actuarial and Statistical Society of America in 1914. Dr. I. M. Rubinow, who was responsible for the Society's formation, became its first president. At the time of its formation, the Casualty Actuarial and Statistical Society of America had 97 charter members of the grade of Fellow. The Society adopted its present name, the Casualty Actuarial Society, on May 14, 1921.

The purpose of the Society is to advance the body of knowledge of actuarial science in applications other than life insurance, to establish and maintain standards of qualification for membership, to promote and maintain high standards of conduct and competence for the members, and to increase the awareness of actuarial science. The Society's activities in support of this purpose include communication with those affected by insurance, presentation and discussion of papers, attendance at seminars and workshops, collection of a library, research, and other means.

Since the problems of workers compensation were the most urgent at the time of the Society's formation, many of the Society's original members played a leading part in developing the scientific basis for that line of insurance. From the beginning, however, the Society has grown constantly, not only in membership, but also in range of interest and in scientific and related contributions to all lines of insurance other than life, including automobile, liability other than automobile, fire, homeowners, commercial multiple peril, and others. These contributions are found principally in original papers prepared by members of the Society and published annually in the *Proceedings of the Casualty Actuarial Society*. The presidential addresses, also published in the *Proceedings*, have called attention to the most pressing actuarial problems, some of them still unsolved, that have faced the industry over the years.

The membership of the Society includes actuaries employed by insurance companies, industry advisory organizations, national brokers, accounting firms, educational institutions, state insurance departments, and the federal government. It also includes independent consultants. The Society has two classes of members, Fellows and Associates. Both classes require successful completion of examinations, held in February, May, and November in various cities of the United States, Canada, Bermuda, and selected overseas sites.

The publications of the Society and their respective prices are listed in the Society's *Yearbook*. The *Syllabus of Examinations* outlines the course of study recommended for its examinations. Both the *Yearbook*, at a charge of \$40 (\$60 Canadian), and the

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## Syllabus Goals and Objectives

One of the primary objectives of the Casualty Actuarial Society is 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 are as follows:

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, and finance, and how these functions are performed and interrelate.
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 practices 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 of actuarial science.

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# Examination Handbook

## The CAS Education and Examination System

The CAS education and examination system is supervised by the CAS Vice President-Admissions and is supported by four committees:

1. The Education Policy Committee establishes the goals and objectives of the CAS education and examination system to ensure that the needs of the Society, its members, and its potential members are met. The committee also monitors the operations of the other educational and examination committees to ensure continued effectiveness.
2. The Syllabus Committee determines the scope and content of the CAS *Syllabus* and course of readings for CAS examinations.
3. The Examination Committee organizes, manages, administers, and grades the CAS examinations. The committee also establishes the standards to be achieved by successful candidates.
4. The Committee on the Course on Professionalism establishes the content of the CAS Course on Professionalism and oversees its administration. All committee members are volunteers who donate their time and resources to the CAS.

## Organization of the Syllabus Committee

The Syllabus Committee is supervised by a Chairperson and is composed of members who represent a broad spectrum of CAS members including insurers, consultants, regulators, and academicians. A representative of the Canadian Institute of Actuaries (CIA) also serves on the committee; usually this person is a member of the CIA Education and Examination Committee. One or more members specialize in the material for each examination part.

These specialists recommend *Syllabus* changes; however, recommend

and a Long-Range Planning Subcommittee responsible for addressing long-term issues. Other ad hoc subcommittees are established as needed.

## Organization of the Examination Committee

The Examination Committee is supervised by a Chairperson responsible for the overall administration of the CAS examinations. The Chairperson is assisted by several senior committee officers with titles Vice Chairperson and Assistant Vice Chairperson. The committee is subdivided into Examination Part Committees each headed by an Examination Part Chairperson. The responsibility for each CAS examination is assigned to a part committee that writes, grades, and maintains the standards for that examination. Each part committee is assisted by an Exam Consultant, a CAS member who is an expert on the material covered by that exam. In addition, some part committees are assisted by Academic Consultants, independent experts from the academic community.

## Recommendations for Study

The “Recommendations for Study” which start on page 29 of this *Syllabus* are regularly reviewed by members of the Syllabus Committee. Both short- and long-term goals for improvement are developed. Textbooks and articles may be designated for inclusion in the recommendations. If the committee determines that new study material needs to be developed or that existing material needs to be revised, the committee may commission the creation of Study Notes for inclusion in the recommendations. Every effort is made to develop material that is appropriate, relevant, up-to-date, concise, and well-written. Suggestions for improvement are always welcome and should be directed to the Syllabus Committee.

## Development of Examinations

Each examination is drafted by the responsible Examination Part Committee to test candidates’ knowledge of the material listed in the “Recommendations for Study.” The individual part committee, Exam Consultants, one of the Examination Committee Vice Chairpersons, the Examination Committee Chairperson, and, in some cases, Academic Consultants review each examination to assure its quality.

examinations that contain representative, high-quality questions that test candidates' knowledge of the material. Trick questions are deliberately avoided, and the wording of each question is considered carefully to eliminate possible ambiguities. Preliminary versions of each examination are thoroughly reviewed in relation to all of these factors before the final examination is approved.

## Rules Regarding Examinations for Admission

### Spring 1996 CAS Exam Schedule

EXAM	DATE	ZONE	START TIME	FINISH TIME
1 (100)	05/14/96	All zones begin at the same time	8:30 AM	11:30 AM
2 (110)	05/14/96	All zones begin at the same time	1:00 PM	4:00 PM
3A (120)	05/21/96	All zones begin at the same time	8:30 AM	10:00 AM
3B	05/02/96	EDT, CDT, Bermuda	2:30 PM	4:00 PM
3B	05/02/96	MDT, PDT, Alaska, Asia	2:30 PM	4:00 PM
3B	05/02/96	Europe	4:00 PM	5:30 PM
3C (135)	05/21/96	All zones begin at the same time	10:45 AM	12:15 PM
4A	05/01/96	EDT, CDT, Bermuda	2:00 PM	4:00 PM
4A	05/01/96	MDT, PDT, Alaska, Asia	1:00 PM	3:00 PM
4A	05/01/96	Europe	4:00 PM	6:00 PM
4B	05/01/96	EDT, CDT, Bermuda	10:00 AM	12:30 PM
4B	05/01/96	MDT, PDT, Alaska, Asia	9:00 AM	11:30 AM
4B	05/01/96	Europe	12:30 PM	3:00 PM
5A	04/29/96	EDT, CDT, Bermuda	10:00 AM	12:00 PM
5A	04/29/96	MDT, PDT, Alaska, Asia	9:00 AM	11:00 AM
5A	04/29/96	Europe	12:30 PM	2:30 PM
5B	04/29/96	EDT, CDT, Bermuda	2:00 PM	4:00 PM
5B	04/29/96	MDT, PDT, Alaska, Asia	1:00 PM	3:00 PM
5B	04/29/96	Europe	4:00 PM	6:00 PM
6	05/03/96	USA, CAN, Bermuda, Asia	9:30 AM	1:30 PM
6	05/03/96	Europe	1:00 PM	5:00 PM
8/8C	04/30/96	USA, CAN, Bermuda, Asia	9:30 AM	1:30 PM
8/8C	04/30/96	Europe	1:00 PM	5:00 PM
10	05/02/96	USA, CAN, Bermuda, Asia	9:30 AM	1:30 PM
10	05/02/96	Europe	11:00 AM	3:00 PM

## Fall 1996 CAS Exam Schedule

EXAM	DATE	ZONE	START TIME	FINISH TIME
1 (100)	11/05/96 <sup>2</sup>	All zones begin at the same time	8:30 AM	11:30 AM
2 (110)	11/05/96 <sup>2</sup>	All zones begin at the same time	1:00 PM	4:00 PM
3A (120)	11/07/96 <sup>2</sup>	All zones begin at the same time	8:30 AM	10:00 AM
3B	10/28/96	EST, CST, Bermuda	2:30 PM	4:00 PM
3B	10/28/96	MST, PST, Alaska, Asia	2:30 PM	4:00 PM
3B	10/28/96	Europe	4:00 PM	5:30 PM
3C (135)	11/12/96 <sup>2</sup>	All zones begin at the same time	10:45 AM	12:15 PM
4A	10/30/96	EST, CST, Bermuda	2:00 PM	4:00 PM
4A	10/30/96	MST, PST, Alaska, Asia	1:00 PM	3:00 PM
4A	10/30/96	Europe	4:00 PM	6:00 PM
4B	10/30/96	EST, CST, Bermuda	10:00 AM	12:30 PM
4B	10/30/96	MST, PST, Alaska, Asia	9:00 AM	11:30 AM
4B	10/30/96	Europe	12:30 PM	3:00 PM
5A	10/29/96	EST, CST, Bermuda	10:00 AM	12:00 PM
5A	10/29/96	MST, PST, Alaska, Asia	9:00 AM	11:00 AM
5A	10/29/96	Europe	12:30 PM	2:30 PM
5B	10/29/96	EST, CST, Bermuda	2:00 PM	4:00 PM
5B	10/29/96	MST, PST, Alaska, Asia	1:00 PM	3:00 PM
5B	10/29/96	Europe	4:00 PM	6:00 PM
7	10/31/96	USA, CAN, Bermuda, Asia	9:30 AM	1:30 PM
7	10/31/96	Europe	1:00 PM	5:00 PM
9	10/28/96	USA, CAN, Bermuda, Asia	9:30 AM	1:30 PM
9	10/28/96	Europe	11:00 AM	3:00 PM

Please note the starting times for exams are on local time based on your location.

<sup>2</sup>All information for Parts 1, 2, 3A, and 3C (SOA Courses 100, 110, 120, and 135) is tentative for Fall 1996. A final Society of Actuaries Catalog reflecting any changes in dates, fees, and content will be published in May 1996.

## 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.

## Filing of Applications

### Parts 3B, 4-10

All candidates filing for an examination(s) must submit an application for each examination period. Application forms are enclosed in this *Syllabus*.

Applications for Parts 3B, 4-10 must be mailed in time to reach the CAS Office not later than March 20 for the Spring examinations and September 20 for the Fall examinations. Allow 10 working days for your application to reach the CAS Office.

**Note: Whether payment is made by personal or company check, it is the candidate's responsibility to ensure that the application is received by the stated deadline. Exceptions will not be made.**

Each application, along with the appropriate examination fee (in check, draft, or money order in U.S. or Canadian funds, made payable to the Casualty Actuarial Society), must be sent to:

Casualty Actuarial Society  
P.O. Box 425  
Merrifield, VA 22116-0425

Candidates will receive an acknowledgement of receipt of their application within three weeks of receipt of the application form at the CAS Office. This acknowledgement is the candidate's receipt of exam fees paid. Please retain this acknowledgment for tax purposes if needed.

### Parts 1-3 (Excluding Part 3B)

Candidates who wish to take one or more of Part 1 (SOA Course 100), Part 2 (SOA Course 110), Part 3A (SOA Course 120) and Part 3C (SOA



made payable to and mailed to the Society of Actuaries at the following address:

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

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

## Examination Centers/Overseas Centers

Examination centers are listed on the application. Centers are determined by the number of candidates near a center and the availability of proctors. Candidates wishing to take examinations overseas should include an additional \$40 (\$60 Canadian) fee for the test center. Requests for overseas sites must be made at least two months prior to the exam date.

Candidates will receive the exact location of their test center at least three weeks prior to the examination.

## Special Arrangements for Disabled Candidates

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

## Registering for 3B with 3A and/or 3C

Candidates who register for Parts 3B with 3A and/or 3C must submit applications to both the Casualty Actuarial Society and the Society of Actuaries.

The example instructions below provide information on how to submit

An employed candidate who registers for Parts 3A and 3B would send:

- a. \$45 (exam fee for Part 3B) with application to the Casualty Actuarial Society;
- b. \$50 (base fee) + \$38 (course fee for 3A) with application to the Society of Actuaries.

A full-time college student who registers for Parts 3A and 3B would send:

- a. \$35 (exam fee for Part 3B) with application to the Casualty Actuarial Society;
- b. \$50 (base fee) + \$30 (course fee for 3A) with application to the Society of Actuaries.

The fee structure for Part 3 is based on a candidate fee of \$50 regardless of the number of sub-parts taken in one sitting plus \$38 (\$30 for full-time college students) for Part 3A, \$45 (\$35 for full-time college students) for Part 3B, and \$25 (\$20 for full-time college students) for Part 3C.

## Fees

Examination fees must be paid each time a candidate registers for an examination. All fees for CAS exams are payable in U.S. and Canadian funds in the form of a check, draft, or money order. A \$5 surcharge (\$10 Canadian) will be assessed for all returned checks. The candidate's acknowledgement is a tax receipt.

Candidates writing any of the examinations for Parts 1, 2, and 3 (A, C) overseas, or at a specially arranged center, must pay an additional \$40 fee (contact the SOA for Canadian fees) per examination session (February, Spring, or Fall).

Because Parts 3A and 3C are jointly administered by the CAS and the SOA and Part 3B is administered solely by the CAS, candidates taking a combination of these parts must submit an application to both the SOA and CAS. (See pages 10, 11, and 12 for more information on submitting applications and fees.) The fee for Part 3B, in this case, is \$45 (\$65 Canadian) for employed candidates, \$35 (\$50 Canadian) for full-time college students, and it must be paid to the CAS. **To determine Canadian**

SPRING 1996	Employed Candidates		Full-Time College Students	
	U.S.	Canada	U.S.	Canada
	Part 1 (non-refundable)	\$40	Contact SOA	\$40
Part 2 (non-refundable)	\$40	Contact SOA	\$40	Contact SOA
Part 3A	\$95	Contact SOA	\$95	Contact SOA
Part 3B	\$85	\$120	\$75	\$105
Part 3C	\$80	Contact SOA	\$80	Contact SOA
Parts 3A + 3B	\$140	\$65 (3B only, contact SOA for 3A)	\$130	\$50 (3B only, contact SOA for 3A)
Parts 3A + 3C	\$125	Contact SOA	\$125	Contact SOA
Parts 3B + 3C	\$125	\$65 (3B only, contact SOA for 3C)	\$125	\$50 (3B only, contact SOA for 3C)
Parts 3A + 3B + 3C	\$170	\$65 (3B only, contact SOA for 3A, 3C)	\$160	\$50 (3B only, contact SOA for 3A, 3C)
Part 4A	\$70	\$100	\$60	\$85
Part 4B	\$80	\$115	\$70	\$100
Part 5A	\$80	\$115	\$70	\$100
Part 5B	\$70	\$100	\$60	\$85
Part 6	\$140	\$195	\$110	\$155
Part 8	\$140	\$195	\$110	\$155
Part 10	\$140	\$195	\$110	\$155

OTHER FEES	U.S.	Canada
	Exam Refund	\$50
Overseas Center	\$40	\$60
Change-of-Center	\$20	\$30
Late Fee	\$50	\$75

FALL 1996	Employed Candidates		Full-Time College Students	
	U.S.	Canada	U.S.	Canada
	Part 1 (non-refundable)	\$40	Contact SOA	\$40
Part 2 (non-refundable)	\$40	Contact SOA	\$40	Contact SOA
Part 3A	\$95	Contact SOA	\$95	Contact SOA
Part 3B	\$85	\$120	\$75	\$105
Part 3C	\$80	Contact SOA	\$80	Contact SOA
Parts 3A + 3B	\$140	\$65 (3B only, contact SOA for 3A)	\$130	\$50 (3B only, contact SOA for 3A)
Parts 3A + 3C	\$125	Contact SOA	\$125	Contact SOA
Parts 3B + 3C	\$125	\$65 (3B only, contact SOA for 3C)	\$115	\$50 (3B only, contact SOA for 3C)
Parts 3A + 3B + 3C	\$170	\$65 (3B only, contact SOA for 3A, 3C)	\$170	\$50 (3B only, contact SOA for 3A, 3C)
Part 4A	\$70	\$100	\$60	\$85
Part 4B	\$80	\$115	\$70	\$100
Part 5A	\$80	\$115	\$70	\$100
Part 5B	\$70	\$100	\$60	\$85
Part 7	\$140	\$195	\$110	\$155
Part 9	\$140	\$195	\$110	\$155

## Late Registrations

If the application and regular fees are not received on or before the deadlines of March 20 for the Spring examinations or September 20 for the Fall examinations, candidates wishing to write an examination in North America must pay a late registration fee in addition to the examination fee. The late fee for the Casualty Actuarial Society is \$50 (\$75 Canadian) per exam and the late fee for the Society of Actuaries is \$50 (contact the SOA for the Canadian equivalent). The late fee will apply to applications received from March 21 through April 15 for the Spring examinations and September 21 through October 15 for the Fall examinations. Late registrations will not be accepted from candidates writing outside North America. **In no case will applications be ac-**

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 Fall examination results, candidates who wrote the November 1995 Parts 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 Spring examination session without assessment of a late registration fee. Candidates who wish to apply for Parts 3B, 4-10, and wrote Parts 1 or 2 in February may register until April 15 for the Spring examinations without assessment of a late fee.

Any registered candidate who requests a change in examination center must pay a \$20 (\$31 Canadian) change-of-center fee. (Contact the Society of Actuaries for its change-of-center fee in Canadian funds.) No change of center requests will be accepted after January 15 for the February examinations, April 15 for the Spring examinations, or October 15 for the Fall examinations.

If a request for late registration or change of center occurs, every effort will be made 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 sponsoring organizations are not responsible. If either a candidate's registration and fees or request for change of 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.

## Refunds

### Joint Exams

Any 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 of Actuaries no later than June 30 for a Spring examination or December 31 for a Fall examination. Later requests will not be considered. A \$50 administrative fee per examination is assessed for all refunds. (Contact the Society of Actuaries for the Canadian equivalent.) Therefore, no refund is made unless the total fees for the sub-parts not written exceed \$50. The \$50 candidate fee is refundable only if the candidate writes at least one

for writing overseas or at specially arranged centers will not be refunded in any case.

### Parts 3B, 4-10

Any candidate who has filed an application and finds it impossible to take the examination should request a refund of his/her examination fee. This request must reach the CAS Office not later than June 5 for the Spring examinations, or December 5 for the Fall examinations. Later requests will not be considered. A fee of \$50 (\$75 Canadian) per examination will be assessed for all refunds. Refunds will be issued on a biweekly basis.

## Associateship and Fellowship Examinations

Successful completion of, or credit for, Parts 1 through 7 is required to fulfill the examination requirements for Associateship in the Casualty Actuarial Society. 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 sub-part. Sub-parts 3A and 3C are the same as the Society of Actuaries Course Exam numbers 120 and 135, respectively. Each sub-part may be taken on separate examination dates so that partial credits may be earned until all sections are passed.

Successful completion of, or credit for all 10 examination parts is required to fulfill the examination requirements for Fellowship. Parts 7 and 8 now have two subdivisions covering United States or Canadian-specific material, and passage of either of the two tracks fulfills the completion requirements.

## 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 Admissions. The Vice

The Casualty Actuarial Society generally will not grant waiver of all or any portion of its examination requirements for either work experience, contribution to the actuarial literature, academic courses of study, or examinations of non-actuarial organizations. 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 Parts 1, 2, 3A, or 3C will be allowed for candidates who have 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 and the Society of Actuaries, to a passing score on Part 1. Requests should be submitted to the Society of Actuaries.
3. The CAS also recognizes the examinations sponsored by the British Institute of Actuaries, the Australian Institute of Actuaries, and 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 syllabuses of each of the three aforementioned actuarial organizations.

The Casualty Actuarial Society will not grant credit for examinations waived by the aforementioned organizations on account of academic records achieved in North American universities, nor for credit granted by the aforementioned organizations to candidates not qualifying directly in obtaining membership through the normal qualification/examination process applicable to residents of those countries. Waivers under this paragraph will be subject to an administrative fee of \$40 in U.S. funds (\$60 in Canadian). This fee is payable by check, draft, or money order.

4. Credit for examination Part 5B will be granted to candidates who have passed SOA Course 130/CAS Part 3b prior to November 1990. Waiver requests are not necessary for this credit. This credit will be automatically granted upon the candidate's application to take his/her first CAS examination (other than Parts 1, 2, 3A, and 3C).
5. Waiver of examination Part 4A will be granted to candidates passing either SOA Course 141 or Courses 140 and 150. This waiver is subject to an administrative fee of \$40 in U.S. funds (\$60 in Canadian funds). A check, draft, or money order in U.S. or Canadian funds for these amounts must accompany all applications for waivers for Part 4A.

In the above instances, (except item 4.), candidates requesting a waiver of an examination requirement should present their request and applicable fee, if any, to the Vice President-Admissions with appropriate evidence that demonstrates the passing of (or score on) the actuarial examinations for which a waiver is requested. The Vice President-Admissions will review all such requests and recommend action to the CAS Board of Directors.

Please address all waiver requests to:

Vice President-Admissions  
Casualty Actuarial Society  
P.O. Box 425  
Merrifield, VA 22116-0425

Credits for examination equivalents of other actuarial organizations are considered on a case-by-case basis 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 requests to the Vice President-Admissions 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-Admissions will request it from the candidates. The Vice President-Admissions will forward the request to the Education Policy

of qualification are through academic achievement, requests for waivers will be reviewed on a case-by-case basis to determine if any credit should be given based on the equivalence of the subject matter to any CAS examinations or parts thereof.

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

## Associateship Requirements

In addition to the examination requirements for membership in the Casualty Actuarial Society, all prospective Associate members will be required to obtain two letters of reference and to attend and actively participate in the Course on Professionalism prior to admission.

The Course on Professionalism 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, and 3C comprise one examination, as well as Parts 4A and 4B, and 5A and 5B).

Letters of reference from two members of the Casualty Actuarial Society are required. Obtaining the two letters of reference is the prospective Associate's responsibility. If no members of the CAS are familiar with the prospective Associate and his/her work history, references from members of the American Academy of Actuaries, the Canadian Institute of Actuaries, the Society of Actuaries, or senior executives where the candidate is employed may be substituted. For further information on alternative, acceptable references, please contact the CAS Office. An application for membership will not be processed without these references.

## Conduct of Examinations

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 all CAS exams, the only acceptable calculator is the one sold by the Society of Actuaries. All candidates *must* order the official calculator from the Society of Actuaries. No calculators will be shipped after January 15 for the February examinations, April 15 for the Spring examinations, or October 15 for the Fall examinations.

It is the candidate's responsibility to see that the calculator used during the examination is in good working order. Supervisors will have several spare calculators available for those candidates whose calculators may malfunction. They are not to be distributed to candidates without calculators.

## Multiple Choice Joint Examinations

Parts 1, 2, and 3 (A, C) consist entirely of multiple-choice questions. For 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, candidates should blacken the oval which has the same letter as the appropriate answer.

Since the answer sheets are scored by optical scanning equipment, a Number 2 pencil must be used to blacken the ovals. Also note that it is important that there be only one oval blackened for each question. If a 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

## Lost Examinations

The Casualty Actuarial Society is not responsible for lost or destroyed examinations. In the case where an examination is lost or destroyed, the examination fee will be refunded. The CAS and other jointly-administered, or jointly-sponsored, organization will assume no other obligation and candidates must take the examinations with this knowledge.

## Guessing Adjustment

On Parts 3B, 4-10, multiple-choice questions are scored 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.

For Parts 1, 2, 3A and 3C, no guessing adjustment is made to candidates' scores. Therefore, candidates will maximize their scores on the joint exams by answering every question.

## Grading of Examinations

Answers to multiple-choice questions are read by optical scanning equipment and scored by computer. As a check, several papers are scored by hand. A statistical analysis is prepared for each question; if this information indicates there might be a problem, the question is carefully examined.

Any multiple-choice question found to be defective is carefully examined to determine the most reasonable way to correct the situation. In some cases, the question is discarded, leaving scores and rankings as they would have been if the defective question had not been asked; when this happens, the scores of individual candidates immediately below the pass mark are reviewed to determine if credit should be granted for the defective question. In other cases, more than one answer is given credit for being correct.

Every effort is made to grade answers to essay questions according to completely objective standards. The anonymity of the candidates is fully preserved; committee members see only candidate numbers when grading an examination, not candidate names.

grading a sufficient number of papers, each grader evaluates the model answer in light of the responses. If either grader believes that the model answer or the values assigned for sub-points should be revised, the two graders confer and revise the model answer, if necessary. Then both graders restart the grading process. After all papers have been graded, the two graders compare the scores assigned to each candidate for that question and reconcile differences.

After all questions have been graded, the multiple-choice scores and essay scores are combined, and candidates are ranked in order by score. A preliminary pass mark is established, and the answers given by candidates near the mark are regraded. The candidates are re-ranked after the regrading, and a final pass mark is determined.

### Parts 3B, 4-10

No additional points will be given 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.

## Determination of the Pass Mark

The goal when determining the pass mark is to maintain consistent standards of qualification for membership. Because the level of difficulty for each exam varies from year to year, each part committee collects extensive data to ascertain the level of difficulty of its examination. The part committee compares the performance of the present year's candidates to the performance of candidates from prior years. 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. After this, the pass mark is set to achieve the desired consistency. The Examination Part Chairperson presents the recommended pass mark with the supporting data to the Vice Chairperson who oversees that examination part, the Examination Committee Chairperson, and the Vice President-Admissions. The final decision on the pass mark is the responsibility of the Vice President-Admissions.

After the passing mark is finalized, each candidate is assigned a score. Scores of 0 to 5 are assigned to candidates who do not pass. On this scale, each interval is 10 percent of the pass mark. For example, a grade of 5 means failing with a mark of at least 90 percent, but less than 100 percent, of the pass mark. A grade of 0 means that the candidate's score is less than 50 percent of the pass mark. Candidates at or above the passing mark receive a Pass.

### **Examination Results**

Candidates receive individual statements of examination results approximately eight weeks after the examination date. A list of passing candidate ID numbers is mailed at the same time. Several weeks later a list of all passing candidates is distributed. Passing candidates are informed that they passed the examination, but they are not given a numeric score. Candidates with scores of 0 to 5 are informed of the score.

### **Defective Questions**

Occasionally, through error or because of varying interpretations, a question on the examination is found to be ambiguous or defective. If a candidate believes a question is ambiguous or defective, he/she should bring this to the attention of the Casualty Actuarial Society in writing within two weeks after the examination date; the candidate may fax this letter to the CAS Office. The letter should include detailed reasons why the question is believed to be ambiguous or defective. The Examination Committee will investigate all questions brought to its attention in this manner and may make allowances in the grading process for answers which could be correct under an interpretation other than the one anticipated when the question was written. Any defective question will be eliminated from the grading process. Correspondence that does not reach the CAS Office within two weeks will be disregarded in the grading process.

### **Analysis**

Any candidate receiving a grade of 4 or 5 on an examination will automatically receive an analysis of their examination upon grade notification. Any other unsuccessful candidate for Parts 3B, 4-10 may obtain an analysis of their examination by writing to the CAS Office.

given for both the actual score and how the actual score relates to the mean of all candidates. This information is intended to provide the educational guidance that most candidates desire.

### **Appeals**

Once a candidate has received an analysis of their exam, they may appeal their grade. Only candidates with valid appeals will be considered. An example of a non-valid appeal would be the following: "I am appealing my score of 5 on Part 10, please recheck my examination." Candidates should address specific issues that are based on their review of the analysis. In order to aid the candidate when appealing, answer keys for multiple choice and true/false questions and sample answers to essay questions will be available no later than July 31 for Spring exams and January 30 for Fall exams.

Appeals should reach the CAS Office no later than September 1 for Spring exams and March 1 for Fall exams. Once a valid appeal is received, it is reviewed by the Part Chair and a recommendation is made to the Examination Chair. The Examination Chair will respond based on the recommendation by the Part Chair.

### **Confidentiality of Examination Records**

The fact that any candidate has passed a particular examination is considered public knowledge. Any further information as to examinations taken by candidates and scores received by candidates is available only to the candidates themselves, to Examination Committee officials if required for committee purposes, and to the CAS Office, unless the candidate requests in writing that such information be provided to someone else.

### **Transition Programs**

The Casualty Actuarial Society generally reviews and makes revisions in the recommended study material on an annual basis. Occasionally, a major topic will be added or deleted from the recommended study material. A major topic is defined as a series of readings comprising a segment of an examination. When a major topic is deleted from the recommended study material, the Syllabus Committee will determine if a transition program

A transition program will provide candidates with at least two opportunities to complete the requirements for that examination part. The completion of the requirements will result in the achievement of credit for that entire examination part. The failure to complete the requirements for that complete examination part could result in the expiration of credit for that deleted topic at the end of the transition period.

The CAS Board of Directors must approve any transition program.

## Examination Discipline

Candidates must not give or receive assistance of any kind during the examination. Any cheating, any attempt to cheat, assisting others to cheat, or participating therein, or engaging in such improper conduct as listed below is a serious violation and will result in the Casualty Actuarial Society disqualifying the candidate's paper, and such other disciplinary action as may be deemed appropriate. Candidates have agreed in their applications for examination to be bound by the rules and regulations governing the examinations.

Examples of improper conduct include but are not limited to:

- a. Gaining access to examination questions before the examination or aiding someone else to do so.
- b. Using an unauthorized calculator (as defined in the *Syllabus*) or other mechanical aid not permitted.
- c. Looking in the examination book before the signal to begin is given.
- d. Marking or otherwise writing on the examination book or answer sheet before the signal to begin is given.
- e. Making any changes, additions, deletions, or otherwise marking, erasing, or writing on the examination book or answer sheet after the time for the examination has expired.
- f. Having access to or consulting notes or books during the examination.
- g. Looking at or copying from another candidate's paper

- i. Talking or otherwise communicating with another candidate during the examination.
- j. Disturbing other candidates during the examination.
- k. Consulting other persons outside the examination room during the examination.
- l. Taking an examination book from the examination room.
- m. Taking an examination for another candidate.
- n. Arranging to have another person take an examination for the candidate.
- o. Presenting false information on an examination application.
- p. Failing to follow other examination instructions.

The Examination Committee of the CAS, or its designee, will investigate any irregularity or suspected violation of the rules involving the examination process, and a determination will be made regarding the matter. Where there is a determination to invoke a penalty, the candidate is advised by letter. In the case of a candidate who is a member of the CAS, (ACAS or FCAS), the Actuarial Board for Counseling and Discipline (ABCD) or CIA will be advised about the member's conduct when the final penalty invoked is more than disqualification of the examination.

Candidates for the Casualty Actuarial Society's examinations are expected to follow the rules and procedures included in this *Syllabus*, the "Notice of Examinations," and the "Instructions to Candidates" printed on their examination booklets as well as announcements made by the supervisors at the examination locations. All candidates, on their applications for examinations, are required to read and sign the following statement: "I have read all the rules regarding the examination(s) for which I am applying, and agree to be bound thereby."

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 candidate's careers. Therefore, the equitable administration of the examinations and enforcement of the highest standards of



## Publications of the Society

CAS publications that are still in print may be purchased at the prices listed below. Prices include postage and handling for orders delivered in the U.S. and Canada. For deliveries outside North America, add 50% to prices shown below. Canadian residents must add 7% for GST. Virginia residents must add 4.5% sales tax. Bulk orders of 20 or more of any publication will receive a 20% discount. Prepayment is required for all orders. Payment may be in the form of check, draft, or money order in U.S. or Canadian funds. **NO RETURNS.** Please use the white order forms provided inside the back cover of this *Syllabus*.

PUBLICATIONS	PRICES	
	U.S.	Canada
Proceedings of the Casualty Actuarial Society (PCAS)		
Single Bound Volumes		
These volumes are available for sale:		
Volume LXIV (1977)	\$50	\$75
Volume LXIX (1982)		
Volume LXX (1983)		
Volume LXXI (1984)		
Volume LXXII (1985)		
Volume LXXIII (1986)		
Volume LXXIV (1987)		
Volume LXXV (1988)		
Volume LXXVI (1989)		
Volume LXXVII (1990)		
Volume LXXVIII (1991)		
Volume LXXIX (1992)		
Volume LXXXI (1994)		
Index to CAS Literature		
Volumes XXXI to XL	\$1	\$5
Volumes LI to LX	\$6	\$10
Volumes LI to LXX	\$15	\$25
Volumes LI to LXXV	\$30	\$45

PUBLICATIONS, Cont'd.	PRICES	
	U.S.	Canada
1988—Evaluating Insurance Company Liabilities	\$30	\$45
1989—Valuation Issues	\$30	\$45
1990—Pricing Issues (2 Vols.)	\$40	\$60
1991—International Topics, Global Insurance Pricing, Reserving and Coverage Issues	\$30	\$45
1992—Insurer Financial Solvency (2 Vols.)	\$55	\$80
1993—The Actuary as Business Manager	\$30	\$45
1995—Incorporating Risk Factors in Dynamic Financial Analysis	\$55	\$80
1996 Yearbook and Membership Information Update	\$40	\$60
CAS Yearbook (Membership Directory) on Diskette	\$35	\$50
American Remarriage Table	\$10	\$20
Syllabus of Examinations	\$0	\$0
The Actuarial Review (Annual Subscription)	\$10	\$20
Casualty Actuarial Society Forum (per volume)	\$30	\$45
Bibliographies	\$15	\$25
Foundations of Casualty Actuarial Science (Textbook)	\$75	\$105
Report on the Annual Statement	\$1	\$5
Various Study Notes and Study Kits	See this <i>Syllabus</i>	
Statement of Principles Regarding Property and Casualty Insurance Ratemaking	\$4	\$10
Statement of Principles Regarding Property and Casualty Loss and Loss Adjustment Expense Reserves	\$4	\$10
Statement of Principles Regarding Property and Casualty Valuations	\$4	\$10

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## Library

All candidates registered for the examinations of the Casualty Actuarial Society and all members of the Casualty Actuarial Society have access to the library facilities. The CAS Library is located at the CAS Office in Arlington, Virginia.

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 one borrower at a time. Address requests for books to:

Casualty Actuarial Society  
Library Service  
1100 North Glebe Road, Suite 600  
Arlington, VA 22201

The CAS Office ships North American packages via United Parcel Service (UPS) and international via Air Mail. Due to delays in the mail system, the CAS requires all shipments of books returned to the CAS Office to be shipped via UPS or an equivalent carrier with tracking capabilities. Please do not use the United States Postal Service.

Overdue books will be charged at a cost of 10¢ per day.

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## National Organizations

### American Academy of Actuaries (AAA)

The American Academy of Actuaries is a professional membership, government information, and public relations organization for all actuaries practicing in the United States, regardless of specialty. The Academy also establishes qualification standards for making public statements of actuarial opinion. Professional standards of practice and discipline procedures are the responsibility of the Actuarial Standards Board and the Actuarial Board of Counseling and Discipline, respectively, both independent entities within the Academy.

Satisfactory completion of specified examinations of the Casualty Actuarial Society will satisfy the educational requirements for admission to the American Academy of Actuaries. The Academy has additional continuing education requirements. For further information contact:

American Academy of Actuaries  
Membership Manager  
475 N. Martingale Road, Suite 800  
Schaumburg, IL 60173-2226.

### Canadian Institute of Actuaries (CIA)

The Canadian Institute of Actuaries is a research, accreditation, and membership organization for actuaries practicing in Canada, regardless of specialty. The CIA is responsible for professional standards of practice and disciplinary procedures for its members. The federal government and provincial governments recognize Fellowship in the CIA as the standard of actuarial qualification to practice in Canada.

Educational requirements for Fellowship set by the CIA currently may be met through examinations administered by the Casualty Actuarial Society. The CIA maintains other affiliation, experience, and continuing education requirements. For further information contact:

Canadian Institute of Actuaries

# 1996 Syllabus of Examinations

## ASSOCIATESHIP EXAMINATIONS

Part	Time Allowed	Subjects
1 <sup>3</sup>	3 hours	Calculus and Linear Algebra
2 <sup>3</sup>	3 hours	Probability and Statistics
3A <sup>3</sup>	1-½ hours	Applied Statistical Methods
3B	1-½ hours	Introduction to Property and Casualty Insurance
3C <sup>3</sup>	1-½ hours	Numerical Methods
4A	2 hours	Interest and Life Contingencies
4B	2-½ hours	Credibility Theory and Loss Distributions
5A	2 hours	Principles of Economics; Theory of Risk and Insurance
5B	2 hours	Finance
6	4 hours	Principles of Ratemaking and Data for Ratemaking
7 <sup>4</sup>	4 hours	Premium, Loss, and Expense Reserves; Insurance Accounting, Expense Analysis, and Published Financial Information

## FELLOWSHIP EXAMINATIONS

Part	Time Allowed	Subjects
8 <sup>4</sup>	4 hours	Tort 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; Assets,

## Recommendations for Study

The objective of the Casualty Actuarial Society's education and examination process is to assist candidates in their professional preparation for an actuarial career of managing the varied responsibilities assigned to an actuary in the casualty insurance field. The "Recommendations for Study" present the study material that casualty actuarial candidates 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 candidates in their preparation for the examinations. It should be realized that while 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 candidates' knowledge of the subject matter, but also candidates' ability to apply that knowledge. Finally, in the development of the *Syllabus* readings and the examination questions, it is assumed that candidates are familiar with the material covered in earlier parts. Therefore, it is recommended that candidates 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 1-4 are all of the multiple-choice or true/false types.

In preparing for Part 8, candidates should become familiar with current developments by reading property and casualty insurance articles for the indicated period of time.

The references to papers in the *Proceedings of the Casualty Actuarial Society (PCAS)* are considered to include all cited discussions of these papers, unless otherwise noted. In the case of readings from out-of-print *Proceedings*, candidates are responsible only for those discussions re-

page 98 of this *Syllabus*. The reading materials suggested in these recommendations are designed to acquaint candidates 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, candidates should contact the CAS Office for instructions regarding its acceptability and the appropriate chapters/pages in the new edition which correspond to the printed study requirements.

## Study Kits

A bold **NEW** 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 bold **SK** represents 1996 Study Kit material and a bold **SKU** represents new material included in the 1996 Study Kit and the 1995 Study Kit Update. 1996 Study Kits and 1995 Study Kit Updates have been prepared in connection with some examinations and may be obtained from the CAS Office at the following prices (payable in U.S. or Canadian funds). Please use the order form at the back of this *Syllabus*.

1996 STUDY KITS	PRICE		1995 STUDY KIT UPDATES	PRICE	
	U.S.	Can.		U.S.	Can.
Part 3B	\$26	\$40	Part 3B	\$10	\$20
Part 4A	\$5	\$10			
Part 4B	\$16	\$25			
Part 6	\$88	\$125	Part 6	\$20	\$30
Part 7	\$64	\$90	Part 7	\$30	\$45
Part 8	\$60	\$85	Part 8	\$12	\$20
Part 9	\$45	\$65			
Part 10	\$50	\$75	Part 10	\$26	\$40

Canadian residents must add 7% for GST; Virginia residents must add

Candidates should check the Study Kits and Study Kit Updates for completeness (i.e., defective pages and/or omissions).

Any readings from *Proceedings* for years that are still in print (1977, 1982, and subsequent) may be obtained by purchasing the *Proceedings* from the Society at a cost of \$50 (\$75 Canadian) or by using the CAS Library facilities. All other *Proceedings* articles and Discussion Papers which are out of print are included in the Study Kits.

Sample examination questions for Parts 1 and 2 are available at no charge from the CAS Office. Copies of Part 3B and Parts 4-10 examinations for the three most recent years, and illustrative answers for essay questions on Parts 5-10, are available at a charge of \$15 (\$25 Canadian). The most recent exams with sample answers may be purchased at a cost of \$5 (\$10 Canadian) from the CAS Office. Please use the white order forms provided inside the back cover of this *Syllabus*.

In referring to a published prior examination, candidates should keep in mind that the questions were based on the course of reading in effect for that particular examination, and may not in all instances reflect the current course of reading. Candidates 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.

While the CAS Library has nearly all the 1996 readings available for loan, there are still a few that must be obtained by contacting the organizations listed in the "Index to Text References" on page 98 of this *Syllabus*.

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# Hints on Study and Exam Techniques

These hints do not include any material on which candidates will be examined, but are passed along by the CAS Syllabus and Examination Committees to encourage candidates to do their best when sitting for CAS examinations.

These “Hints” are largely based on the experience and advice of others and were originally prepared for Society of Actuaries candidates by James L. Clare. Later, these were adapted to use by Casualty Actuarial Society candidates by G.D. Morison and were updated in 1992. The Casualty Actuarial Society will be glad to consider incorporating further comments and suggestions periodically. If you have any changes to suggest, please send them to the CAS Office.

## Hints on Study and Exam Techniques

Motivation is the single most important ingredient in learning—and in passing examinations.

Motivation suffers when candidates worry about or are preoccupied with personal matters or other problems. This suggests that candidates should keep studying and exam taking at the very top of their lists of priorities, and should always have a constructive attitude about their studying. In particular, candidates should approach the exam as an opportunity to enhance their knowledge and understanding of actuarial science, rather than as an obstacle in their paths to membership in the Casualty Actuarial Society.

Motivation is increased by incentives, such as the following.

- Passing actuarial exams requires many hours of study—more for some people and less for others—but often more than many candidates realize. Putting in enough hours can actually save a candidate time. Suppose, for example, that mastering the *Syllabus* for one exam will take a candidate 400 study hours, and that one candidate only puts in 200 hours and fails the exam. If

sooner. It is recommended that candidates decide for themselves how many hours they really need to study, and then do that much studying—the first time around.

- Candidates can increase their motivation level by regarding the examinations as a stepping stone to greater responsibility at their places of employment, to opportunities for getting more done on their own, and to greater results and rewards from their work.
- Candidates can also increase their motivation through sufficiently intensive and sustained study so that they come to appreciate more fully the fascination of the various subjects, and the interrelationship between them.

A number of doctors, educators, executives, and personnel people all agree that motivation can be greatly increased by having a goal in mind. Candidates must determine their goals and keep them in mind.

## Techniques

It has been proven many times in various countries, both by individuals and by controlled groups, that improved study and exam techniques can strengthen a candidate’s mastery of a subject and increase his or her exam scores significantly. Provided that the candidate is motivated and spends enough hours studying, techniques such as those given here may often make the difference between failing or passing an exam.

Each person has his or her own strengths and weaknesses, so candidates are advised to work out their own personal sets of techniques which will work best for them. What follows is merely a set of suggestions to help candidates in getting started in building up their own techniques.

## The Challenge

It is easy to underestimate the effort that is required since substantial changes may be needed to switch from college or university life over to successfully passing actuarial exams.

University courses often stress understanding, and usually do much to smooth the path for the student with lectures, personal contacts, organized places of study, and a focus on learning.

weekend when one's friends are free to do as they please. Making adequate time available for studying requires sustained self-discipline, and is a purely individual and personal responsibility.

### Schedule of Study

There is only one substitute for hours of study time omitted one week. This is at least as many additional hours of study in another week.

An unavoidably "necessary condition" for success in studying (but a not necessarily "sufficient condition") is—simply spending enough total hours in studying.

Candidates must decide how many hours in total they need to study. Then they need to set out their schedules in writing, specifically stating the weekday evening and weekend periods allocated to studying. They then should total the number of hours made available. If the total hours scheduled are less than the total hours necessary, candidates should expand their schedules until they at least have equalled the required total time plus an additional cushion for absorbing time that will inevitably be lost along the way on account of illness, work pressures, etc.

Then candidates should fit all the segments of the *Syllabus* into their schedules so that they will thoroughly cover the course of reading in good time before the exam, with time left over for a thorough final review. It is important for candidates to spread their time over the entire *Syllabus* in some deliberate way, as, for example, in proportion to the pages of reading material on the *Syllabus*.

Candidates may find it helpful to study several subjects within an exam, or all of them in parallel. This gives them more variety each week, and may give them a combination of both study which is more appealing and study which requires greater effort and concentration. Particularly demanding study may perhaps be best left for weekends when candidates are less fatigued from regular work.

It is a good idea for candidates to keep a record of the hours they spend studying. Even if candidates are completely confident that they know the *Syllabus* before putting in their required total hours, there is much to be said for carrying out their full schedule and completing their total time quotas.

### Retention

As part of human nature, our memories forget facts and ideas most rapidly during the time immediately following our study of them.

For a given number of study hours, therefore, candidates will remember more if they review promptly and frequently. It is recommended that candidates review what they have learned as part of ending their study for the day. As they begin their next study session, candidates should review what they learned the last time, and what they learned during other recent sessions. Then they can recall points they have learned during odd spare moments in between study sessions. It is important for candidates to leave time for a thorough final review before the exam.

There are some analogies that can be made between preparing for an actuarial examination and learning to drive a car. Most inexperienced drivers have good motivation for learning to drive, and have a strong goal clearly in mind. Yet they still need to practice and rehearse their driving knowledge and skills until they become "second nature." This is easier to do if they keep practicing their driving in the days immediately after a lesson in which they learned something. Candidates should equally be the master of their actuarial studies by the time they enter the exam room. Experienced drivers should be able to pass a driving test not just on a few familiar streets, but over any legal route. In the same way, actuarial candidates should be able to pass any set of exam questions which has been drawn from the *Syllabus*.

Candidates should note the considerable emphasis in actuarial exams on knowledge. However, they should remember that the best way to learn facts by heart is very often to understand the whole subject, and to tie together ideas which are related. They should look at any single subject from several different angles, relating what they learn to what they know already. Candidates should look for as many connections as they can between their actuarial work and their actuarial studies.

As humans, we learn by doing. While the extent of a candidate's notes will be a matter of his or her own personal tastes, taking thorough notes will be a good investment of time for most people. For candidates, "translating" the subject matter into their own words helps their memories, and forces to their attention those items which they do not really understand and require further study. When, upon reviewing their notes,

Another study technique candidates might want to try is to test themselves as they go along. They can review previous exams when they start to study to get an idea of the mastery of the *Syllabus* expected. Candidates can also take these as “trial exams” to help them in testing their knowledge and understanding of the course of reading, and in improving their exam speed and confidence. Some candidates deliberately test themselves; others prefer not to do so.

Candidates should expect a gradual gathering of momentum as they begin their study for a particular exam. By keeping at it, according to their plans, candidates will find their rate of progress speeding up after the first few weeks.

When a candidate finds himself or herself getting very “stale,” one possibility is to stop studying altogether for (say) three days. Then the candidate should continue on with his or her study plan, no matter how he or she feels, for at least the next month or six weeks. A candidate’s study plan should have enough spare time available in it to allow for such occasional “down time.” A mixed schedule, with a weekly combination of subjects that the candidate likes and subjects that he or she finds difficult, will help to minimize staleness.

Discussing the *Syllabus* with friends taking the same exam, or with others who have passed the exam will help candidates remember the material firmly and to understand it. It also helps candidates to realize their own gaps and difficulties. If effective study circles and tuition courses can be found, they will also help give candidates a different slant on the subject, give them a chance to review and to practice, keep them moving through the *Syllabus*, and help to combat lethargy and self-satisfaction.

Candidates should beware, however, of someone else doing their own thinking for them—it is imperative that they develop and maintain their own command and understanding of each subject. When reading, candidates should challenge the author in their minds and debate with him or her, rather than merely swallowing everything whole.

## Formulating Answers

### Multiple-Choice Questions

eliminating impossible answers by checking out boundary conditions or by inspecting other aspects of certain suggested solutions, or by substituting numerical values and cutting out some answers. Since questions are varied, candidates will need a variety of techniques to cope with them.

In a multiple-choice examination, speed is an important factor. Candidates increase their chances of passing if they are able to seriously attempt each question on the entire paper at least once. It may help them to determine the proportionate number of questions to answer in the first half-hour of the exam, to check how much ground they cover in that time, and then accordingly either (a) speed up, or (b) slow down and dig more deeply.

When pressed for time, it may pay for candidates to omit a few multiple-choice questions which they expect to take them more time than average, so as to have time for a larger number of more quickly-answered questions. For example, a cluster of questions may have a common introduction which a candidate does not readily grasp, in which case he or she might well skip the entire cluster at a first attempt.

Candidates may find it helpful to keep a list of the number of the questions not answered so that they quickly can get an idea of how many they are omitting, and so that they can go back to them more rapidly later on.

There is no advantage in guessing answers if a guess is 100% purely random.

Candidates should change their answers only if they are sure that their first solution was wrong.

### Essay Questions

The model response to the typical essay question is brief, less than one-half of a written page. Be concise—candidates do not need to answer in complete sentences when a well-composed outline format is more appropriate. Candidates should not waste time on obscure details. They should show that they have learned the relevant material, and that they understand it. They should state the obvious, if it is part of the answer.

For questions which require candidates to work a numerical solution, candidates should take the time to set up the problem so that they document their understanding. They should set forth relevant equations

Candidates should keep each answer relevant to the precise question being asked. They should make sure they first understand exactly what is wanted before they begin to answer a question. When they have written part or all of their answer, they should take another look at the question and make sure they have answered—not their own question—but the question as set on the examination page.

If candidates are asked to “discuss” a proposal, they should list all significant arguments both for and against it.

Candidates should take time to write legibly, since examiners can only give credit for what they can read. They should try to “organize” their answer. Then, their main aim is to get down as much relevant material as they can.

There is no advantage to answering the questions in any particular order. Candidates may answer the questions in the order given if they wish. Alternatively, candidates can quickly read over the whole paper, warm up with whichever question that comes easily to them, gradually working into the questions they find more challenging, and end up on a question which they think can be answered readily even though, by that time, their energy and concentration may be tending to fall off.

Note that since each question is graded separately, each answer must be self-contained. Candidates should not say, “Part of my answer to question 1 is found in my answer to question 3.”

It is important that candidates remember that they have limited time. Candidates will find that it is worth checking their progress to assure that they have an opportunity to respond to every question. If they know that a question will take too much time, they can pass it and return to it later, if time permits.

### **Final Mental Preparations**

Olympic and professional athletes often vary their training schedules as a major contest approaches. They often ease up on endurance training, and shift their aim to sharpening their alertness, their effectiveness, and their will to win.

In any exam, it is just as important that candidates be alert and effective,

They become pessimistic and discouraged, and think too much about the possibility of their having made a bad start in answering the questions.

Other candidates, with the same ability, knowledge, and preparation—and making bungles just as bad in parts of the exam as the first type of candidates—nevertheless succeed in passing the same exam. As in life itself so in actuarial exams, the difference between failure and success is often linked to a person’s attitude. Confidence and optimism, based on mastery of the subject through hard work and many hours of study, will help a candidate to keep going.

Instead of wasting time and energy worrying about how badly they believe they are doing—candidates should do something constructive on another question. They can always come back later to the weak answer, time permitting.

Candidates should never give up in the exam room. They should use every minute and every second of the available time. They should not “grade their own papers,” and decide not to hand in an answer to a question or two because they feel it is all wrong. They should hand in all of their answers, and let the examiners do the grading. At least one candidate has not handed in some answer pages which he or she had condemned in his or her own mind, only to find out later that the work was correct, and to find out still later that he or she had narrowly failed to pass.

### **Books to Read**

Some candidates may find it a good investment of their time to read one or more books discussing study and exam techniques. On the other hand, many candidates have successfully completed all their exams without reference to such texts. These texts will be of little value to a candidate with solid study habits. For those candidates who have not developed good study habits, then these type of texts are more likely to be worthy of their consideration.

It is up to the candidate to decide for himself or herself on a single strategy to follow, especially he or she refers to more than one book. While all books will have a common thrust, there may be some differences between them on certain points, such as on the most desirable level of the extensiveness of the notes a candidate should take. It is important for candidates to not chop and change from one technique to another all the time they are



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# 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.

This three-hour, multiple-choice examination is based on material usually covered in undergraduate mathematics courses including differential and integral calculus and a first course in linear algebra. The general scope of this 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

- Scalar products, linear transformations, and kernel and image space
- Matrices, determinants, eigenvectors, and eigenvalues

Candidates who have not taken mathematics courses covering those topics may be helped by any of the texts covering calculus, analytic geometry, and linear algebra listed below. These readings 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 candidates may be examined. Earlier or later editions of the texts listed below contain essentially the same information, and should be considered adequate for review purposes.

#### **Readings**

Thomas, G.B., Jr., and Finney, R.L., *Calculus and Analytic Geometry* (Eighth Edition), 1992.

Purcell, E.J., and Varberg, D., *Calculus with Analytic Geometry* (Sixth Edition), 1992.

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

Kolman, B., *Introductory Linear Algebra with Applications* (Fifth Edition), 1993.

## Part 2

### Probability and Statistics—SOA Course 110

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

This 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 this 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

- 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 those topics. The fact 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 provide the mathematical background required for this examination.

#### Readings

Hogg, R.V., and Craig, A. T., *Introduction to Mathematical Statistics* (Fifth Edition), 1994 [Note: Fourth Edition may also be used].

Hoel, P.G., Port, S.C., and Stone, C.J., *Introduction to Probability Theory and Introduction to Statistical Theory*, 1971.

Mood, A.M., Graybill, F.A., and Boes, D.C., *Introduction to the Theory of Statistics* (Third Edition), 1974.

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:

Hogg and Craig—pp. 50-57, 91-92, 101, 105-107, 110-111, 119-120, and 164-169.

Hoel, Port, and Stone—pp. 197-200 (Vol. I).

Mood, Graybill, and Boes—pp. 78-81 and 538-543.

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

Hogg and Craig—pp. 200-222 and 212-213

### **Regression and correlation:**

Hogg and Craig—pp. 73-78, 117-120, and 296-303.

Hoel, Port, and Stone—pp. 99-100 (Vol. I), 33, 111-119, and 148-153 (Vol. II).

Mood, Graybill, and Boes—pp. 155-159, 161, 167-169, and 482-502.

### **Bayesian estimation:**

Hogg and Craig—pp. 227-233.

Hoel, Port, and Stone—pp. 36-42 (Vol. II).

Mood, Graybill, and Boes—pp. 339-350 and 396-398.

An additional reference for candidates who may wish further practice in solving problems is:

Speigel, M.R., *Statistics: 975 Problems* (Second Edition), 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).

In addition, it will be assumed that candidates are familiar with an ordinary deck of 52 playing cards and an ordinary six-faced die.

## **Part 3 (A, B, and C)**

This examination is administered as three separate examinations corresponding to each sub-part as listed below. Parts 3A, 3B, and 3C may be taken on separate examination dates so that partial credits may be earned until all sections are passed.

Parts 3A and 3C are jointly administered by the Casualty Actuarial Society and the Society of Actuaries. Part 3B is administered solely by the Casualty Actuarial Society.

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 may find it helpful to maintain contact with other Part 3 candidates and to take advantage of opportunities to discuss questions that are considered difficult. Candidates should not hesitate to consult members of the profession in their own organizations or others who are knowledgeable on these subjects.

SOA Study Notes are available for Parts 3A and 3C from the Society of Actuaries for a charge. The SOA Study Notes for the Spring examinations may be ordered after January 1; those for the Fall examinations may be ordered after July 1. The notes include past multiple-choice exams and an SOA Introductory Study Note which contains important information about the examinations, 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 SOA Introductory Study Note, the latter will govern. Candidates are urged to order the SOA Study Notes for each part they plan to take.

Direct all correspondence to the Society of Actuaries. Questions concerning SOA Study Notes or Study Note orders should be directed to the SOA Study Note Coordinator at (708) 706-3525.

## Part 3A

### Applied Statistical Methods— SOA Course 120

The general scope of this 90-minute, multiple-choice examination is indicated by the following topics:

- Regression analysis
- Time series analysis
- Forecasting

#### *Readings*

Abraham, B., and Ledolter, J., *Statistical Methods for Forecasting*, 1983, Chapters 1-3, 4 (Sections 1-2), 5 (all except Sections 5.6.4, 5.7.1, and Appendix 5), 7 and 8 (Section 5 only).

## Part 3B

### Introduction to Property and Casualty Insurance

Prior to commencing study for this 90-minute examination, candidates should read the “Recommendations for Study” section on pages 29-31 of this *Syllabus* for study suggestions, guidance in obtaining the 1996 Study Kit and past examinations, and other information important to sitting for this examination. Items marked with a bold **SK** and a bold **SKU** constitute the 1996 Study Kit which is available from the CAS Office for a cost of \$26 (\$40 Canadian). A 1995 Study Kit Update is available for a cost of \$10 (\$20 Canadian), and includes the items marked with a bold **SKU**.

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, candidates may find it useful to review this material as background for this examination. This reading is available from the Insurance Information Institute, 110 William St., New York, NY 10038, for a cost of \$9.95.

The insurance policy is the contract describing the services and protection which the insurance company provides to the insured. It is, in effect, the only “product” the insurance buyer receives until the time a loss occurs. Because actuaries will be pricing this “product,” it is essential that they have an understanding of what the product includes. Also, as the contract is amended, either by choice or by legislative or judicial activity, an actuary will be called upon to evaluate the effect these changes will have on the cost of providing the coverage. Therefore, in studying the policy forms, candidates should develop an understanding of the nature of the coverages provided and the bases of exposure used in the respective lines of insurance.

Candidates will be held responsible for knowledge of the U.S. and Canadian policy forms included in the 1996 Study Kit. Candidates will not be held responsible for the associated endorsements, except for the Canadian endorsement noted below. 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

Product design and product modification are areas in an insurance company's operations where an actuary may become involved with the marketing function of an insurance company as it relates to pricing, market research, and marketing philosophy. Candidates 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 determine the premium for an insurance policy. Candidates should understand the basic ratemaking principles.

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

The readings for Part 3B include a significant portion of the material covered by several CPCU examinations. For more information about CPCU examinations, contact the American Institute for Chartered Property Casualty Underwriters at 1-800-644-2101.

### **Readings**

Brown, R.L., *Introduction to Ratemaking and Loss Reserving for Property and Casualty Insurance*, Mad River Books, Sections 4.1-4.6, pp. 105-135; available from Mad River Books for a cost of \$35.

Hamilton, K.L. and Malecki, D.S., *Personal Insurance: Property and Liability* (First Edition), American Institute for Chartered Property Casualty Underwriters, 1994, pp. 1-19, 47-98, 103-144, 153-193, 210-239, 281-291.

**SK** Hallman, G.V. and Hamilton, K.L., *Personal Insurance: Life, Health, and Retirement* (First Edition), American Institute for Chartered Property Casualty Underwriters, 1994, pp. 1-39.

**SK** Trieschmann, J. S., Weining, E.A., Hedges, R.A., Trupin, J., and Flitner, A.L., *Commercial Property Insurance and Risk Management* (Fourth Edition), American Institute for Chartered Property Casualty Underwriters, 1994, Vol. I, pp. 1-9, 103-127, 173-176, 201-204; Vol. II, pp. 97-103, 149-157.

Malecki, D.S., Horn, R.C., Wiening, E.A., and Donaldson, J.H., *Commercial Liability Risk Management and Insurance* (Second Edition),

**NEW** Malecki, D.S., Horn, R.C., Wiening, E.A., and Flitner, A.L., *Commercial Liability Insurance and Risk Management* (Third Edition), American Institute for Chartered Property Casualty Underwriters, 1995, Vol. I., pp. 1-33, 71-152, 165-207.

**SK** Malecki, D.S., and Ligeros, P., "Excess and Umbrella Policies" in *CPCU 4 Course Guide Commercial Liability Risk Management and Insurance*, American Institute for Chartered Property Casualty Underwriters, 1992.

**SKU** Troxel, T.E., and Bouchie, G.E., *Property-Liability Insurance Accounting and Finance* (Fourth Edition), American Institute for Chartered Property Casualty Underwriters, 1995, pp. 89-106.

**SK** Wiening, E.A., and Malecki, D.S., *Insurance Contract Analysis* (First Edition), American Institute for Chartered Property Casualty Underwriters, 1990, pp. 4-30, 37-91, 110-121, 125-135, and 373-382.

Webb, B.L., Harrison, C.M., and Markham, J.J., *Insurance Operations* (First Edition), American Institute for Chartered Property Casualty Underwriters, 1992, Vol. I, Chapters 1-4; Vol. II, Chapters 10, 11, and pp. 197-248.

**SK** Health Insurance Association of America, *Group Life and Health Insurance—Part C* (Third Edition), 1992, Chapter 2, pp. 11-33.

**SK** Black, K., Jr., and Skipper, H., Jr., *Life Insurance* (Twelfth Edition), Prentice Hall Publishers, pp. 639-660.

**SK** Ontario Insurance Commission, *Ontario Policy Form (O.P.F. No. 1) —Owner's Form*, 6/90 Edition, Parts A-D. Candidates should focus on differences with U.S. coverages, not on detailed information such as limits, benefit amounts, etc.

**SK** Ontario Insurance Commission, *Ontario Endorsement Form (O.E.F. No. 44)—Family Protection Endorsement*, 6/90 Edition, Sections 1-8. Candidates should focus on differences with U.S. coverages, not on detailed information such as limits, benefit amounts, etc.

**SK Insurance Services Office, Inc.:**

Personal Automobile Policy (Edition 12-89)  
Personal Automobile Manual (Effective 12-89), General  
Rules 1-6  
Homeowners Policy, HO-3 (Edition 4-91)  
Commercial General Liability Policy:  
Occurrence (Edition 11-85)  
Claims-Made (Edition 2-86)

**SK National Council on Compensation Insurance:**

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

## Part 3C

### 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 90-minute examination is indicated by the following topics:

- Iteration, Interpolation
- Numerical integration
- Linear systems.

#### **Readings**

Burden, R.L., and Faires, J.D., *Numerical Analysis* (Fifth Edition), Chapters 1 (Sections 1.1-1.3), 2 (Sections 2.1-2.5), 3 (Sections 3.1, 3.2, 3.4<sup>5</sup>), 4 (Sections 4.3-4.6), and 6 (Sections 6.1-6.6).

SOA Study Notes, available from the Society of Actuaries for a cost of \$25.

## Part 4 (A and B)

This examination is administered as two separate examinations corresponding to each sub-part as listed below. Parts 4A and 4B may be taken on separate examination dates so that partial credits may be earned until all sections are passed.

### Part 4A

#### Interest and Life Contingencies

Prior to commencing study for this two-hour examination, candidates should read the "Recommendations for Study" section on pages 29-31 of this *Syllabus* for study suggestions, guidance in obtaining past examinations, and other information important to sitting for this examination. Items marked with a bold **SK** constitute the 1996 Study Kit which is available from the CAS Office for a cost of \$5 (\$10 Canadian).

##### Theory of Interest

Candidates will need to understand the basic theory of interest and interest functions, as well as basic applications. An understanding of annuities, amortization, and sinking funds is also required.

##### Life Contingencies

Candidates will be expected to have an understanding of the various types of life insurance products and their characteristics. Additionally, the successful candidate will be required to understand the basic theory and concepts of actuarial mathematics. Major topics include:

- survival functions and mortality tables;
- life insurance;
- life annuities;
- net premiums and net premium reserves;
- multiple life functions;

##### Readings

**SK** Hallman, G.V., and Hamilton, K.L., *Personal Insurance: Life, Health and Retirement* (First Edition), American Institute for Chartered Property and Casualty Underwriters, 1994, Chapter 4.

**NEW** Parmenter, M.M., *The Theory of Interest and Life Contingencies with Pension Applications: A Problem-Solving Approach* (Revised Edition), 1988, Chapters 1-4, 7, and 8 (8.1). The current catalog from Mad River Books (i.e., ACTEX Publication) indicates that there exists a 1993 edition of the above text. This reference relates to the revised edition, as noted on the front cover and the title page. When the revised edition was published, the copyright date was inadvertently left unchanged and appears as "1988".

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), 5 (5.1-5.4); 6 (6.1-6.3), 7 (7.1-7.4), 8 (8.1-8.5), and 9 (9.1-9.3).

**SK** Snader, R.H., "Reserving Long Term Medical Claims," *PCAS* LXXIV, 1987, pp. 322-353.

## Part 4B

### Credibility Theory and Loss Distributions

Prior to commencing study for this two-and-one-half-hour examination, candidates should read the "Recommendations for Study" section on pages 29-31 of this *Syllabus* for study suggestions, guidance in obtaining the 1996 Study Kit, and other information important to sitting for this examination. Items marked with a bold **SK** constitute the 1996 Study Kit which is available from the CAS Office for a cost of \$16 (\$25 Canadian). References are listed in the suggested order for study.

#### Credibility Theory

The candidate will be required to have a thorough understanding of credibility theory and concepts contained in the readings. Knowledge of Bayes' Theorem and its relationship to credibility is also necessary.

#### Loss Distributions

Statistical distributions are essential for modeling insurance claims by size. An understanding of the concepts underlying statistical distributions in general, and for use in modeling insurance claims in particular, is required. Major topics include:

- statistical concepts of location and dispersion;
- statistical distributions useful to insurance; and
- making inferences from insurance data.

#### Readings

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), and 8 (excluding 8.7).

**NEW** Herzog, T.N., *Introduction to Credibility Theory*, 1994, Chapters 1, 2, 4-9. Mad River Books; available for \$35. A solution guide to the problems in this text is also available, but will not be tested.

**SK** Philbrick, S.W., "An Examination of Credibility Concepts," *PCAS*

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), and 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, candidates are expected to become familiar with some uses of these distributions. Candidates will not be tested directly on the distributions themselves; rather, the emphasis will be on using them in a problem-solving manner. Solutions to selected exercises from the text are available in the 1996 Study Kit.

**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 5 (A and B)

This examination is administered as two separate examinations corresponding to each sub-part as listed below. Parts 5A and 5B may be taken on separate examination dates so that partial credits may be earned until all sections are passed.

### Part 5A

#### Principles of Economics Theory of Risk and Insurance

Part 5A is being offered as a two-hour examination. Prior to commencing study for this examination, candidates should read the "Recommendations for Study" section on pages 29-31 of this *Syllabus* for study suggestions, guidance in obtaining SOA Study Notes, out-of-print readings, past examinations, and other information important to sitting for this examination. References are listed in the suggested order of study.

#### Principles of Economics

Candidates will be required to have a knowledge of economics at the advanced college level. Candidates should be familiar with microeconomic theory, and should be prepared to apply that theory to specific questions in the area of insurance. Candidates should understand the macroeconomic model presented in the SOA Study Note, and be prepared to use that model to address questions regarding likely changes in prices, interest rates, and output resulting from macroeconomic shocks such as changes in raw material prices, changes in aggregate wealth, and changes in government fiscal or monetary policy.

##### Readings

Stigler, G.J., *The Theory of Price* (Fourth Edition), 1987, Chapters 1-13, 14 (pp. 236-242), 15, 19, 20 (pp. 320-330), and Appendix A. Candidates should be prepared to answer questions regarding the theory as presented in the text, and will be expected to have considered the implications of the conclusion of each covered chapter

Wachtel, P., *Macroeconomics*, 1991, SOA Course 220 Study Note, Chapters I-VI, available from the Society of Actuaries for a cost of \$29. (This study note is expected to be revised in May 1996. Candidates for November 1996 will be notified if a revision has been published.)

#### Theory of Risk and Insurance

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

##### Readings

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

Daykin, C.D., Pentikäinen, T., Pesonen, M., *Practical Risk Theory for Actuaries*, 1994, Chapters 1, 6.1, 6.2, 6.3, 6.6.

## Part 5B

### Finance

Part 5B is being offered as a two-hour examination. Prior to commencing study for this examination, candidates should read the "Recommendations for Study" section on pages 29-31 of this *Syllabus* for study suggestions, guidance in obtaining past examinations, and other information important to sitting for this examination.

#### Readings

Brealey, R.A., and Myers, S.C., *Principles of Corporate Finance* (Fourth Edition), 1991, 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, and 36; including Appendices except for Chapters 4, 6, 9, and 28. (While candidates will not be tested on Chapters 1-3, they 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.)

## Part 6

### Principles of Ratemaking and Data for Ratemaking

Prior to commencing study for this four-hour examination, candidates should read the "Recommendations for Study" section on pages 29-31 of this *Syllabus* for study suggestions, guidance in obtaining the 1996 Study Kit and other information important to sitting for this examination. Items marked with a bold **SK** and an **SKU** constitute the 1996 Study Kit which is available from the CAS for a cost of \$88 (\$125 Canadian). A 1995 Study Kit Update is available for a cost of \$20 (\$30 Canadian), and includes the items marked with just a bold **SKU**.

#### A. Principles of Ratemaking

This section contains readings which describe ratemaking concepts in broad, general principles as well as in specific detail. 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. Issues specific to individual lines of insurance are also separately addressed.

Candidates for this examination should have a thorough understanding of the general, basic principles of ratemaking such that they can analyze the data given, select an appropriate ratemaking technique, and develop a solution to a numerical problem. In addition, candidates should be familiar with the ratemaking techniques presented in the readings, and should be able to compare the relative advantages and disadvantages of the methods presented. Candidates should be able to discuss why certain procedures are applicable to individual lines of insurance, as well as work numerical problems using those techniques.

Candidates 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.

Candidates are not responsible for current, specific developments in ratemaking procedures outside of the readings noted below.

- 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 its complement
  - d. territorial and classification relativities
- 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
  - d. impact of deductibles, coinsurance, and insurance-to-value programs
- Candidates should also be prepared to discuss and apply ratemaking principles to problems which may not have generally-recognized solutions.

### Readings

McClenahan, C.L., "Ratemaking," *Foundations of Casualty Actuarial Science* (Second Edition), Casualty Actuarial Society, 1992, Chapter 2, pp. 25-90.

Finger, R.J., "Risk Classification," *Foundations of Casualty Actuarial Science*, (Second Edition) Casualty Actuarial Society, 1992, Chapter 5, pp. 231-276.

SK Committee on Ratemaking Principles, *Statement of Principles Regarding Property and Casualty Insurance Ratemaking*, Casualty Actuarial Society, pp. 73-76.

SK Study Note Reading: Bouska, A.S., "Exposure Bases Revisited."

SK Miller, D.L., and Davis, G.E., "A Refined Model for Premium Adjustment," *PCAS LXIII*, 1976, pp. 117-124. Including discussion of paper: Karlinski, F., *PCAS LXIV*, 1977, pp. 103-105.

SK Study Note Reading: Feldblum, S., "Workers' Compensation Rate-

SKU Study Note Reading: Feldblum, S., "Personal Automobile Premiums: An Asset Share Pricing Approach for Property-Casualty Insurance."

SK Miller, M.J., "Private Passenger Automobile Insurance Ratemaking—A Calendar Year Approach," *PCAS LXVI*, 1979, pp.1-37. Including discussion of paper: Kollar, J.J., *PCAS LXVI*, 1979, pp. 38-40.

SK Study Note Reading: Chernick, D.R., "Private Passenger Automobile Physical Damage Ratemaking."

SK Graves, N., and Castillo, R., "Commercial General Liability Insurance Ratemaking for Premises and Operations," *Pricing Issues*, Casualty Actuarial Society *Discussion Paper Program*, 1990, Vol. II, pp. 631-696.

SK Marker, J.O., and Mohl, J.J., "Rating Claims-Made Insurance Policies," *Pricing Property and Casualty Insurance Products*, Casualty Actuarial Society *Discussion Paper Program*, 1980, pp. 265-304. Including discussion of paper: McManus, M.F., pp. 305-322.

NEW Boor, J.A., "The Complement of Credibility," *Casualty Actuarial Society Forum*, Fall 1995, pp. 323-354. Examination questions will not be based directly on Appendices A, B and C, which were included in this Study Note for completeness.

NEW Kelley, R., "Homeowners Insurance to Value—An Update," *Casualty Actuarial Society Forum* including the Ratemaking Call Papers, 1994, pp. 529-562.

SK Homan, Mark, "Homeowners Insurance Pricing," *Pricing Issues*, Casualty Actuarial Society *Discussion Paper Program*, 1990, Vol. II, pp. 719-780.

SK Cook, C.F., "Trend and Loss Development Factors," *PCAS LVII*, 1970, pp. 1-14. Including discussions of paper: Scheel, P.J., and Sturgis, R.W., *PCAS LVII*, 1970, pp. 15-17; Uhthoff, D.R., *PCAS LVII*, 1970, pp. 18-22; Walters, M.A., *PCAS LVII*, 1970, pp. 22-26.

SK Study Note Reading: Head, G.L., *Insurance to Value*, Chapters 1, 2, and 6-8, and Appendices 1-4 (reproduced with permission of Huebner Foundation).

**SK** Lange, J.T., "The Interpretation of Liability Increased Limits Statistics," *PCAS* LVI, 1969, pp. 163-173. Including discussions of paper: Fowler, T.W., *PCAS* LVII, 1970, pp. 88-89; Hunter, J.R., *PCAS* LVII, 1970, pp. 90-103.

Tiller, M.W., "Individual Risk Rating," *Foundations of Casualty Actuarial Science* (Second Edition), Casualty Actuarial Society, 1992, Chapter 3, pp. 91-142.

**SK** Study Note Reading: Tiller, M.W., "Individual Risk Rating."

D'Arcy, S.P., "Investment Issues in Property Liability Insurance," *Foundations of Casualty Actuarial Science*, (Second Edition) Casualty Actuarial Society, 1992, Chapter 8, pp. 525-532.

**SK** Study Note Reading: Robbin, Ira, "The Underwriting Profit Provision" (as updated in 1992).

**SK** Wade, R.C., "Expense Analysis in Ratemaking and Pricing," *PCAS* LX, 1973, pp. 1-10. Including discussions of paper: Comey, D.R., *PCAS* LX, 1973, pp. 11-12. Dahme, O.E., *PCAS* LX, 1973, pp. 13-14; Author's response, *PCAS* LX, 1973, pp. 14-15.

**SK** Study Note Reading: "Expense Provisions in the Rates."

**SK** Study Note Reading: "Experience Rating and Funding Methods."

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

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

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

**SK** Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice No. 13, Trending Procedures in Property/Casualty Insurance Ratemaking."

**SK** Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice No. 17, Expert Testimony by Actuaries."

statistics, particularly as they may be required in insurance administration and ratemaking.

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

### **Readings**

**SK** Study Note Reading: "Excerpts from Statistical Plans."

**SK** Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice No. 23, Data Quality."

**SK** Study Note Reading: "NCCI Reporting Guidebook for the Annual Calls for Experience," December 1, 1993, Calls #3, #5, #17, and #19.

## **B. Data for Ratemaking**

## Part 7

### Premium, Loss, and Expense Reserves: and Insurance Accounting, Expense Analysis, and Published Financial Information.

Prior to commencing study for this four-hour examination, candidates should read the "Recommendations for Study" section, on pages 29-31 of this *Syllabus*, for study suggestions, guidance in obtaining the 1996 Study Kit (which contains Study Notes and out-of-print readings), and other information important to sitting for this examination. Items marked with a bold **SK** and a **SKU** constitute the 1996 Study Kit which is available from the CAS Office for a cost of \$64 (\$90 Canadian). A 1995 Study Kit Update is available at a cost of \$30 (\$45 Canadian), and includes the items marked with just a bold **SKU**.

There is a body of core material for which students will be held responsible. The remaining material is nation-specific, relating to either the United States or Canada. Candidates may choose to be tested on either the Canadian or the US material; candidates must declare this choice at the time of registration. All students will be tested on the core material.

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 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, complete reserve related schedules of the Annual Statement (e.g. Schedule P), and provide a statement of opinion relating to reserves. Candidates should be prepared to discuss such topics as:

- Professional principles and standards of practice applicable to loss reserves.

- 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
- Testing of adequacy of previous loss and loss expense reserve levels.
- Evaluating the adequacy of current loss expense reserve levels.
- 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
- Special reserving situations in a line arising from:
  - a. Catastrophe losses
  - b. Reopened claims
  - c. Policies on a claims-made rather than occurrence basis
  - d. Excess loss reserves
  - e. Discounting loss reserves
- 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
- Allocated loss expense reserves
- Unallocated loss expense reserves
- Statutory Annual Statement reserves

Candidates should be prepared to compare and evaluate the procedures discussed and the arguments advanced in the readings. The answers provided by candidates will be graded based on their applicability to the specific problem presented and the candidates' professional competence evidenced by

## Readings

### 1. Core

#### Reserving Techniques

**SK** Salzmann, R.E., *Estimated Liabilities for Losses and Loss Adjustment Expenses*, 1984, Chapters 1-3, 6 and 11.

Wiser, R.F., "Loss Reserving," *Foundations of Casualty Actuarial Science* (Second Edition), Casualty Actuarial Society, 1992, Chapter 4, pp. 143-230.

**SK** Brosius, E., "An Actuarial Model of Loss Development."

**SKU** Brosius, E., "Loss Development Using Credibility," December, 1992.

**SK** Fisher, W.H., and Lange, J.T., "Loss Reserve Testing: A Report Year Approach," *PCAS LX*, 1973, pp. 189-207. Including discussions of paper: Skurnick, D., *PCAS, LXI*, 1974, pp. 73-83; Author's response, *PCAS, LXI*, 1974, pp. 84-85.

**SK** Bornhuetter, R.L., and Ferguson, R.E., "The Actuary and IBNR," *PCAS LIX*, 1972, pp. 181-195. Including discussions of paper: Cooper, W.P., *PCAS LX*, 1973, pp. 161-164; White, H.G., *PCAS LX* 1973, pp. 165-168.

Adler, M., and Kline, C.D., Jr., "Evaluating Bodily Injury Liabilities Using a Claims Closure Model," *Evaluating Insurance Company Liabilities*, Casualty Actuarial Society Discussion Paper Program, 1988, pp. 1-66.

**SK** Fisher, W.H., and Lester, E.P., "Loss Reserve Testing in a Changing Environment," *PCAS LXII*, 1975, pp. 154-171.

**SK** McClenahan, C.L., "A Mathematical Model for Loss Reserve Analysis," *PCAS LXII*, 1975, pp. 134-145. Including discussion of paper: Skurnick D., *PCAS LXIII*, 1976, pp. 125-127. (Candidates will not be held responsible for notation or the development of the formulae in this paper.)

Berquist, J.R., and Sherman, R.E., "Loss Reserve Adequacy Testing: A Comprehensive, Systematic Approach," *PCAS LXIV*, 1977, pp. 1-10. (Candidates will not be held responsible for notation or the development of the formulae in this paper.)

**SK** Khury, C.K., "Loss Reserves: Performance Standards," *PCAS LXVII*, 1980, pp. 1-21. (Candidates will not be responsible for notation or development of the formulae in this paper.) Including discussion of paper: Berquist, J.R., *PCAS LXVII*, 1980, pp. 22-23.

Stanard, J.N., "A simulation Test of Prediction Errors of Loss Reserve Estimation Techniques," *PCAS LXXII*, 1985, pp. 124-148. Including discussion of paper: Robertson, J.P., *PCAS LXXII*, 1985, pp. 149-153.

Pinto, E., and Gogol, D.F., "An Analysis of Excess Loss Development," *PCAS LXXIV*, 1987, pp. 227-255. Including discussions of paper: Levine, G.M., *PCAS LXXIV*, 1987, pp. 256-271, and Bear, R.A., *PCAS LXXIX*, 1992.

Insurance Accounting and Systems Association, Inc., *Property-Casualty Insurance Accounting* (Sixth Edition), 1994, Chapter 5.

**SK** Berry, C.H., "A Method for Setting Retro Reserves," *PCAS LXVII*, 1980, pp. 226-238. Including discussion of paper: Morrell, R.K., *PCAS LXVIII*, 1981, pp. 107-110.

**SK** Linqianti, A.J., "Calculation of Unearned Premium Reserves on Interim Audited Risks—Monthly, Quarterly, and Semi-Annual Basis."

**SK** Resony, A.V., "Allocated Loss Expense Reserves," *PCAS LIX*, 1972, pp. 141-149. Including discussion of paper: Petz, E.F., *PCAS LX*, 1973, pp. 157-160.

Johnson, W.A., "Determination of Outstanding Liabilities for Unallocated Loss Adjustment Expenses," *PCAS LXXVI*, 1989, pp. 111-125. (Corrections to Exhibits 2-5 are available from the CAS Office.)

**SK** Kittel, J., "Unallocated Loss Adjustment Expense Reserves in an Inflationary Economic Environment," *Inflation Implications for Property-Casualty Insurance, Casualty Actuarial Society Discussion Paper Program*, 1981, pp. 311-331. Including discussion of paper: Bill, R., pp. 332-343.

#### Standards of practice and actuarial opinions

**SK** Casualty Actuarial Society, *Statement of Principles Regarding Property-Casualty Loss and Loss Adjustment Expense Reserves*, 1981.

**SK** Actuarial Standards Board of American Academy of Actuaries, "Actuarial Standard of Practice No. 9, Documentation and Disclosure in Property and Casualty Insurance Ratemaking, Loss Reserving, and Valuations (Doc. No. 027)," 1991. Excluding Appendices 1 & 3.

**SK** Actuarial Standards Board of American Academy of Actuaries, "Actuarial Standard of Practice No. 5, Incurred Health Claim Liabilities, (Doc. No. 028)," 1991.

**SKU** Committee on Property and Liability Financial Reporting, American Academy of Actuaries, "Property and Casualty Practice Note 1994-1 Statements of Actuarial Opinion on P & C Loss Reserves as of December 1993." including "Changes to P&C Practice Note 1994-1," October 28, 1994.

### **Discounting**

**SK** Actuarial Standards Board of American Academy of Actuaries, "Actuarial Standard Practice No. 20, Discounting of Property and Casualty Loss and Loss Adjustment Expense Reserves (Doc. No. 037)," 1992.

Lowe, S.P., and Philbrick, S.W., "Issues Associated with the Discounting of Property/Casualty Loss Reserves," *Journal of Insurance Regulations*, June 1986, pp. 72-102.

## **2. U.S. Specific**

### **Reserving Techniques**

**SKU** Machtinger, J.K., and Brown, R.L., "Long-Term Disability Losses under OMPP: A Statistical Treatment," April 1995. (Including Errata)

**SKU** Canadian Institute of Actuaries, "Valuation Technique Paper No. 9—Valuation of Single Premium Annuities," December 1993.

### **Standards of practice and actuarial opinions**

**SK** Canadian Institute of Actuaries, "Standards of Practice For the Appointed Actuary of an Insurance Company," June 1992.

**SK** Canadian Institute of Actuaries. "Provisions for Adverse Deviations-

**SKU** Canadian Institute of Actuaries, "Educational Notes on the Application of the Standard of Practice Concerning Provision for Adverse Deviation," November 1994.

### **Discounting**

Committee on Reserves of the Casualty Actuarial Society, "Risk Margins for Discounted Loss Reserves," *Casualty Actuarial Society Forum*, Winter 1991, pp. 139-160.

**SK** American Institute of Certified Public Accountants, "Discounting Claims of Insurance Enterprises"

**SKU** Canadian Institute of Actuaries, "Educational Notes on Discounting," November 1994.

## **3. Canadian Specific**

### **Reserving Techniques**

**SKU** Machtinger, J.K., and Brown, R.L., "Long-Term Disability Losses under OMPP: A Statistical Treatment," April 1995. (Including Errata)

**SKU** Canadian Institute of Actuaries, "Valuation Technique Paper No. 9, Valuation of Single Premium Annuities," December 1993.

### **Standards of practice and actuarial opinions**

**SKU** Office of the Superintendent of Financial Institutions Canada, "1995 Instructions for Actuarial Reports on Property and Casualty Business."

**SK** Canadian Institute of Actuaries, "Joint Policy Statement," 1991

**SKU** Canadian Institute of Actuaries, "Appointed Actuary Compliance Questionnaire for Property-Casualty Insurance Company Financial Reporting in Canada, 1995 Year-End," December 1995.

**SK** Canadian Institute of Actuaries, "Recommendations for Property-Casualty Insurance Company Financial Reporting." January 1990.

**SK** Canadian Institute of Actuaries, "Standard of Practice for the Appointed Actuary of an Insurance Company," June 1992.

**SK** Canadian Institute of Actuaries. "The Appointed Actuary's Report

**SK** Canadian Institute of Actuaries, "Provisions for Adverse Deviations-Property & Casualty Insurance Companies," November 1993.

**SKU** Canadian Institute of Actuaries, "Educational Notes on the Application of the Standard of Practice Concerning Provision for Adverse Deviation," November 1994.

### **Discounting**

**SKU** Canadian Institute of Actuaries, "Educational Notes on Discounting," November 1994.

**NEW** Insurance Bureau of Canada, "Discounting of Loss Reserves in the Property and Casualty Insurance Industry," September 14, 1990, pp. 1-69, A-1 to A-49.

**NEW** Insurance Bureau of Canada, "Discounting of Loss Reserves in the Property and Casualty Insurance Industry Phase II," March 1, 1993, pp. 1-42.

## **B. Insurance Accounting, Expense Analysis, and Published Financial Information**

Candidates 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 Chartered Property Casualty Underwriters CPCU 8 text, *Introduction to Accounting*. 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.

Candidates 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 Statement and Insurance Expense Exhibit are available from the National Association of Insurance Commissioners (NAIC). The NAIC instructions may be purchased from the NAIC for \$100. Both instructions may also be borrowed from the CAS Library at no charge.

Candidates should understand the details of and reasons for the differences

in addition, candidates 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**

#### **1. U.S. Specific**

##### **Insurance Accounting**

Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (Sixth Edition), 1994, Chapters 1-3, 6-8, 10-15, 18, appendices E and F, (for Chapter 13, pp. 1-34 and 56-64 only).

**SK** Balcarek, R.J., "Effect of Loss Reserve margins in Calendar Year Results," PCAS LIII, 1966, pp. 1-16. Including discussion of paper: Longley-Cook, L.H., PCAS LIII, 1966, pp. 17-18.

**NEW** Association Form of 1995 Annual Statement Blank for Fire and Casualty Companies (both individual and consolidated basis), pp. 2-12, 14, Notes 12-21, Schedules D (excl DA and DB), DM, F, H, P (candidates will be expected to have knowledge of other sections of the annual statement that are discussed in other syllabus readings).

**SKU** Feldblum, S., "Selected Notes to the Fire and Casualty Annual Statement."

**SK** Feldblum, S., "Direct Charges and Credits to Surplus."

**SKU** Feldblum, S., "Reinsurance Accounting: Schedule F."

**SKU** Feldblum, S., "Completing and Using Schedule P."

**SK** Committee on Annual Statement, "Report on the Annual Statement" PCAS LII, 1965, pp. 244-258.

National Association of Insurance Commissioners, Proceedings, Financial Condition (EX4) Subcommittee Blanks Task Force for 1990-1992 as applicable to the Fire & Casualty Blank, specifically: 1990-Volume II, pp. 302, 305-307; 1991-Volume IA; pp. 366-371, and Volume IIA, pp. 324, 437, 447-458, and 478; and 1992-Volume IA, pp. 253-254, 325-327, 337-350, 353-354, 427-431.

**SK** American Institute of Certified Public Accountants, *Audits of Property and Liability Insurance Companies*, 1993, Ch. 8.



**SK** Financial Accounting Standards Board, "Statement of Financial Accounting Standards No. 60—Accounting and Reporting by Insurance Enterprises," Paragraphs 1-9, 11, 13-14, 17-18, 20, 27-34, 38-41, 44, 60 a-h.

Almagro, M., and Ghezzi, T.L., "Federal Income Taxes—Provisions Affecting Property/Casualty Insurers, *PCAS LXXV*, 1988, pp. 95-162.

**SKU** Feldblum, S., "Selected Exhibits from the Canadian Annual Statement," 1995.

### **Expense Analysis**

**NEW** 1995 Insurance Expense Exhibit

**SKU** Feldblum, S., "The Insurance Expense Exhibit and the Allocation of Investment Income."

Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (Sixth Edition), 1994, Chapter 9.

New York State Regulations, Title 11, 1963, Parts 105-109 (Regulation 30)

Insurance Accounting and Systems Association, "Uniform Classification of Expenses for Property and Liability Insurance Companies," *Proceedings 1979*, pp. 290-292.

### **Published Financial Information**

D'Arcy, S.P., "Special Issues—Data Sources," *Foundations of Casualty Actuarial Science* (Second Edition), Casualty Actuarial Society, 1992, Chapter 9, pp. 561-567.

## **2. Canadian Specific**

### **Insurance Accounting**

Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (Sixth Edition), 1994, Chapters 3, 6-8, 10-12, 18.

**NEW** KPMG Peat Marwick Thorne, *The Property & Casualty Insurance Industry in Canada*. 1992. excluding Appendix A.

**NEW** Association Form of 1995 Annual Statement Blank for Fire and Casualty Companies (both individual and consolidated basis), pp. 2-4,6-11, Schedules F&P.

**SK** Feldblum, S., "Direct Charges and Credits to Surplus."

**SKU** Feldblum, S., "Reinsurance Accounting: Schedule F."

**SKU** Feldblum, S., "Completing and Using Schedule P."

Almagro, M., and Ghezzi, T.L., "Federal Income Taxes—Provisions Affecting Property/Casualty Insurers," *PCAS LXXV*, 1988, pp. 95-162.

**NEW** 1995 Uniform Annual Return approved by the Canadian Council of Insurance Regulators—P&C-1, pp. 10.40-10.42, 10.60, 20.10-20.51, 30.xx (all), 40.10, 40.90, 60.xx, 61.xx, 65.xx, 67.xx, 70.10-70.35, 80.xx, 99.10.

**NEW** 1995 Uniform Annual Return approved by the Canadian Council of Insurance Regulators—P&C-2, pp. 10.40-10.42, 10.60, 20.10-20.40, 30.xx (all), 40.10, 40.90, 60.xx, 61.xx, 65.xx, 67.xx, 70.xx, 80.xx.

**NEW** Canadian Council of Insurance Regulators, *Annual Statement Instructions P&C-1*, Sections I, III, IV, VI, VIII, IX (b), IX (e), IX (l).

**NEW** Canadian Council of Insurance Regulators, *Annual Statement Instructions P&C-2*, Sections I, III, IV, VI, VIII, IX (b), IX (e).

**SKU** Feldblum, S., "Selected Exhibits from the Canadian Annual Statement," 1995.

**NEW** Reinsurance (Canadian Companies) Regulations, and Reinsurance (Foreign Companies) Regulations.

**SKU** Potvin, R., "Study Note on Reinsurance Accounting and Regulations," 1995.

**SKU** CICA/CIA, *Communications Between the Actuary and the Auditor*, December 1994.

**SKU** Potvin, R., "Study Note on Minimum Asset Test," 1995.

### **Expense Analysis**

Insurance Accounting and Systems Association, Property-Casualty Insurance Accounting (Sixth Edition), 1994, Chapter 9.

NEW Insurance Bureau of Canada, Direct Expense Report, Instructions, Forms and Results.

**Published Financial Information**

SKU Doherty, S., "Study Note on Published Financial Data of Canadian P&C Companies," 1995.

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## Fellowship Examinations

### Part 8

#### Tort Law and Statutory Insurance; Regulation and Regulatory Issues

Prior to commencing study for this four-hour examination, candidates should read the "Recommendations for Study" section, on pages 29-31 of this *Syllabus*, for study suggestions, guidance in obtaining the 1996 Study Kit (which contains Study Notes and out-of-print readings), and other information important to sitting for this examination. Items marked with a bold **SK** constitute the 1996 Study Kit which is available from the CAS Office for a cost of \$60 (\$85 Canadian). It contains some United States- and Canadian-specific material. A 1995 Study Kit Update is available at a cost of \$12 (\$20 Canadian), and includes the items marked with just a bold **SKU**.

In each section, there is a body of core material for which candidates will be held 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. Candidates 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 candidates will be tested on the core material. A black circle (●) is shown beside the United States material and a black diamond (◆) is shown beside Canadian material.

Candidates should be prepared to answer questions regarding current developments in subjects covered by this examination. Questions will be taken only from a list of potential current events topics which will be available by January 15. It will be provided to those students who have already registered by that date. If you plan to register after this date, but wish to receive the current events as soon as they become available, please contact the CAS Office.

examination through March of the year of the examination. However, answers based on more recent information will be acceptable.

### **Readings**

- Candidates should read all issues of the following publications for information based on the published current event topics:

#### *Business Insurance*

*The National Underwriter* (Property-Casualty Risk and Benefits Management Edition)

*Best's Review*—Property/Casualty Insurance Edition

- ◆ Candidates should read all issues of the following publications for information based on the published current event topics:

#### *Canadian Underwriter*

*Thompson's Insurance World News* (Note: For candidates who do not have easy access to this publication, one year of issues may be obtained from the Secretariat of the Canadian Institute of Actuaries.)

## **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, candidates 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 automo-

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 candidates 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. Candidates are 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. Candidates are not expected to have detailed knowledge of the current level of benefits or the formulae used to calculate such benefits.

## **Background Law and Insurance**

### **Readings**

Lorimer, J.J., Perlet, H.F., Kempin, F.G., and Hodosh, F.R., *The Legal Environment of Insurance* (Fourth Edition), American Institute for Chartered Property Casualty Underwriters, 1993, Vol. II, pp. 1-28, and 71-104.

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

SK State of New York Advisory Commission on Liability Insurance, "Reform of the Tort Law," *Insuring Our Future*, Part Two, Section II, pp. 121-163.

SK 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.

NEW ◆ Waddams, S.M., *The Law of Damages*, 1991, Chapter 3. Published by Canada Law Book, (905) 841-6472. (Candidates will not be tested on details of cases mentioned only briefly, but will be responsible for knowledge of cases treated in some depth.)

SKU ♦ Brown, C., and Menezes, J., *Insurance Law in Canada*, 1991, Chapter 1.

## Statutory Insurance

### Automobile Insurance

#### Readings

SK Select Committee on Company Law, *The Insurance Industry*, "Government Presence in the Insurance Industry," Part III, Chapters 9-11.

SK • O'Connell, J., and Joost, R.H., "Giving Motorists a Choice Between Fault and No-Fault Insurance," *Virginia Law Review*, February 1986.

NEW • American Insurance Association, *Summary of Selected State Laws and Regulations Relating to Automobile Insurance*, 1995 Edition, (including any subsequent addenda):

- a. No-Fault Benefits
- b. Add-On Benefits
- c. Compulsory Liability, Financial Responsibility, and Uninsured Motorists Laws
- d. Residual Market Plans

### Workers' Compensation

#### Readings

NEW Chamber of Commerce of the United States, *Analysis of Workers' Compensation Laws*, 1995. (Although candidates are not expected to memorize the details of this reading, they should be familiar with the contents thereof and the coverages described.)

SK ♦ *Mercer Handbook of Canadian Pension and Benefit Plans*, April 1991, Chapter 17.

## Government Programs

#### Readings

SKU Hallman, G.V. and Hamilton, K.L. *Personal Insurance: Life, Health and Retirement* (First Edition), American Institute for Chartered Property Casualty Underwriters, 1994, pp. 66-74.

Robertson, A.H., *Social Security: What Every Taxpayer Should Know*, 1992, Chapters 4-8, 10-11, 13-15, 17, and 21-22.

• Myers, R.J., *Social Security* (Fourth Edition), 1993, Chapter 5 (excluding pp. 458-486 and the Appendix).

SK Koitz, David S., *The Social Security Surplus: A Discussion of Some of the Issues*, Congressional Research Service, 1988.

SK ♦ *Mercer Handbook of Canadian Pension and Benefit Plans*, April 1991, Chapters 7, 14, and 19.

♦ Towers Perrin, *Provincial Health Insurance Plans in Canada*, January 1993 and April 1994 Update. (Candidates are responsible for: Standard Conditions, applied to all provinces; Eligibility and Financing, for each province; and Coverage for each province, not including details such as premium charge, allowance, and age breakdown.) Candidates may obtain a copy of this item by contacting the CAS Office.

♦ Towers Perrin, *Provincial Hospital Insurance Plans in Canada*, January 1993 and April 1994 Update. (Candidates are responsible for: Standard Conditions, applied to all provinces; and Eligibility and Financing, for each province.) Candidates may obtain a copy of this item by contacting the CAS Office.

Greene, M., "Government Insurers," *Issues in Insurance* (Fourth Edition), American Institute for Property and Liability Underwriters, 1987, Vol. I.

Insurance Bureau of Canada, by the Insurance Studies Department of Laval University, Conrade LeBlanc Foundation, *Insurability of Natural Disasters*, April 1991, Research Report Summary.

NEW ♦ Task Force on Unemployment Insurance, Canadian Institute

## B. Regulation and Regulatory Issues

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

Candidates 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 in accordance with the statutes and regulations of the jurisdiction.

Each jurisdiction has an agency in the executive branch of its government that is empowered to carry out the duties of regulation. 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, candidates 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 also impact insurance regulation to the extent they interpret the law and thereby modify regulatory behavior. 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 those reports are included on the *Syllabus* so that candidates may understand the unique nature of a state/province regulatory system, insurance industry's antitrust immunity, and proposals for change in this immunity.

Candidates should be familiar with the major changes in rate regulation and the various approaches currently in use. Candidates 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.

Candidates should also 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 insolvency if monitoring

areas for regulators but also the methods that are used to achieve regulatory goals.

Candidates may gain a better understanding of the solvency tests used by reviewing the National Association of Insurance Commissioners (NAIC) publication entitled, *Using the NAIC Insurance Regulatory Information System* (Property and Liability Edition), 1993, but they will not be held responsible for its contents.

The NAIC is the umbrella organization of the various state insurance departments. It coordinates quarterly conventions of all the various state insurance departments, along with many other smaller meetings. In the NAIC structure, working groups report to task forces, which report to committees. Each of these levels are staffed by insurance department officials, commissioners at the higher levels, with technical assistance from the NAIC staff. Insurance industry experts, "interested parties", are frequently involved in the NAIC process.

The drafting of model laws and model regulations, designed for state enactment, along with making revisions to the various NAIC standard reports, e.g., the Annual Statement Blank, constitute two of the major agenda items at NAIC meetings.

### **Readings**

**NEW** Candidates will be responsible for the material on **Redlining** as discussed by the Insurance Availability and Affordability EX3 Task Force and found in the following issues of the *Proceedings of the NAIC*.

1993 3rd Q, pp. 134-145

1993 4th Q, pp. 143-150

1994 1st Q, pp. 154-160

1994 2nd Q, pp. 178-200.

## Introduction to Regulation

### Readings

- SK Kimball, S.L., "The Meaning of McCarran-Ferguson Today," *Journal of Insurance Regulation*, September 1991, pp. 5-22.
- SK Joskow, P.L., *Cartels, Competition, and Regulation in the Property-Liability Insurance Industry*.
- SK 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.
- Kimball, S.L., and Denenberg H.S., (Eds.) *Insurance, Government, and Social Policy*, 1969, Chapters 1, 3, 4, and 10.
- Mintel, J., *Insurance Rate Litigation*, 1983, Chapters 5 and 7. (Candidates 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*. National Association of Independent Insurers (Available from many property-liability insurance companies and from the CAS Library).
- SK • 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."
- SKU ♦ Brown, C., and Menezes, J., *Insurance Law in Canada*, 1991, Chapter 2.

## Ratemaking (including Classification and Profitability)

### Readings

- Mintel, J., *Insurance Rate Litigation*, 1983, Chapters 1, 8, 10, 11, and 13. (Candidates will not be tested on details of cases mentioned only briefly, but will be responsible for knowledge of cases treated in some depth.)
- SK American Insurance Association, *Workers' Compensation Insur-*

Bureau of Insurance, Richmond, Virginia, *Competition in the Property and Casualty Insurance Industry*, January 1978.

- SK ♦ Alberta Automobile Insurance Board, *A Study of Premium Stability in Compulsory Automobile Insurance*, September 1991, (including Exhibits I and II).
- SK ♦ Insurance Bureau of Canada, *Submission to the Committee Appointed by the Minister of Consumer and Corporate Affairs, Alberta to Report on the Study of Premium Stability in Compulsory Automobile Insurance Conducted by the Alberta Automobile Insurance Board*, January 1992.
- National Association of Insurance Commissioners, "Report of the Advisory Committee on Competitive Rating to the National Association of Insurance Commissioners," *Proceedings*, 1980, Vol. II, Chapters III-VI and Comments. (Candidates will not be responsible for the language of the model rating law itself nor the alternative model laws submitted in the report).
- SKU • Study Note Reading: Feldblum, S., "A Student's Guide to the New York Insurance Law; Article 23: Property/Casualty Insurance Rates."
- SKU • New York (State) Laws, Statutes, etc., *New York Insurance Law*, Article 23 (all sections). (Candidates are 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, candidates are 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, Chapter I-5, Sections 337-347.*
  - ♦ *New Brunswick Insurance Act, Chapter I-12, Sections 267. 1-267.9.*
  - ♦ *Newfoundland Automobile Insurance Act, Chapter A-22, Sections 48-60.*
  - ♦ *Nova Scotia Insurance Act, Part VI, Chapter 231, Sections 152-*

♦ *Quebec Automobile Insurance Act, Chapter A-25, Title VII, Sections 177-183.1.*

SKU♦ Ontario Insurance Commission, *Filing Guidelines for Proposed Revisions to Automobile Insurance Rates and Risk Classification Systems, Section 412 of the Ontario Insurance Act*, September 1993, including all Appendices. (Candidates will not be responsible for the detail information.)

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.

## Shared Markets and Availability

### Readings

SKU Hallman, G.V. and Hamilton, K.L. *Personal Insurance: Property and Liability* (First Edition), American Institute for Chartered Property Casualty Underwriters, 1994, pp. 291-310.

SK Lee, J.F., "The Automobile Shared Market: Significance, Developments, and Policy Issues," *Journal of Insurance Regulation*, September 1982, pp. 107-122.

SKU♦ Plan of Operation, March 1995, Facility Association, (excluding articles V, VI, XII, XV, XVI).

## Solvency Monitoring and Guaranty Funds

### Readings

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

D'Arcy, S.P. "Special Issues," *Foundations of Casualty Actuarial Science* (Second Edition) Casualty Actuarial Society, 1992, pp.

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

NEW♦ T.R.A.C. Insurance Services Ltd., *Insurance T.R.A.C. Report* (Canada) 1995, pp. 83-106, summary tables, including individual company details. (Candidates are not expected to memorize details of published insurance statistics.)

SK Rappaport, E.B., *Insurance Company Solvency*, Congressional Research Service, 1989.

SKU Troxel, T., and Bouchie, G.E. *Property-Liability Insurance Accounting and Finance* (Fourth Edition), American Institute for Chartered Property Casualty Underwriters, 1995, pp. 216-236.

SK National Association of Insurance Commissioners, *Financial Condition Examiners Handbook*, 1991, Introduction, pp. 1-15, 19-36.

• *New York Insurance Law*, Sections 1301-1303, 1305, 1308-1311, 1414, and 4117.

♦ "Insurance Companies Act," *Financial Institutions Act*, Chapter 47, Sections: 165(1), 165(2), 203, 331(1), 331(2), 331(4), 346, 357, 359, 360, 362-370, 464, 465, 476-478, 516(1), 516(4), 517, 581, 610, 628-632, 641, 664, 665, 666(1), 666(2), 667(1), 667(2), and 674 (assented to December 13, 1991).

SK National Association of Insurance Commissioners, *Post-Assessment Property and Liability Insurance Guaranty Association Model Act*, October 1993.

## Other Issues

### Readings

National Association of Insurance Commissioners Study Committee Report, "Regulating Workers' Compensation Groups," *Issues in Insurance* (Fourth Edition), American Institute for Property and Liability Underwriters, 1987, Vol. II, Parts I-III, VI, and IX. (The 1984 edition will also be acceptable.)

## Part 9

### Advanced Ratemaking; Individual Risk Rating

Prior to commencing study for this four-hour examination, candidates should read the "Recommendations for Study" section on pages 29-31 of this *Syllabus* for study suggestions, guidance in obtaining the 1996 Study Kit (which contains Study Notes and out-of-print readings), and other information important to sitting for this examination. Items marked with a bold **SK** constitute the 1996 Study Kit which is available from the CAS Office for a cost of \$45 (\$65 Canadian).

#### A. Advanced Ratemaking

Candidates for this part are expected to have acquired considerable technical knowledge and practical experience in insurance ratemaking. This examination will assume a working knowledge of basic ratemaking, and will deal with advanced problems such as those covered in the readings listed on the next page. This examination will not necessarily be limited to the excerpts expressed in the listed readings. 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 that a fully-qualified actuary working in ratemaking should be able to solve.

Advanced ratemaking consists of two principal sections:

- Classification Ratemaking Topics, and
- Excess and Deductible Rating.

All the readings 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 readings is the derivation of formulae or equations to be stressed, but some applications of those techniques may be required. Some readings are included primarily for their historical significance or to illustrate unique solutions to a ratemak-

### Classification Ratemaking Topics

#### Readings

Brown, R.L., "Minimum Bias with Generalized Linear Models," *PCAS LXXV*, 1988, pp. 187-218, Sections 1-5 only and associated exhibits. Including discussion of paper: Venter, G.G., *PCAS LXXVII*, 1990, pp. 337-349.

Cummins, J.D., Smith, B.D., Vance, R.N., and VanDerhei, J.L., *Risk Classification in Life Insurance*, 1983, Chapters 3-6. Candidates are not responsible for mathematical proofs. (This text can be purchased from the CAS Library for \$60 in U.S. funds or \$85 in Canadian.)

**SK** Study Note: Insurance Services Office, Inc., "Monoline-Multiline Ratemaking."

American Academy of Actuaries Committee on Risk Classification, "Risk Classification Statement of Principles," June 1980. (Available from the American Academy of Actuaries at (202) 223-8196 at no charge.)

Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice No. 12, Concerning Risk Classification," 1989. (Available from the American Academy of Actuaries at (202) 223-8196 at no charge.)

Dropkin, L.B., "Some Considerations on Automobile Rating Systems Utilizing Individual Driving Records," *PCAS LXXIV*, 1987, pp. 391-405. Including discussions of paper: Bailey, R.A., *PCAS LXXIV*, 1987, pp. 406-410; Feldblum, S., *PCAS LXXIV*, 1987, pp. 411-417; Philbrick, S., *PCAS LXXIV*, 1987, pp. 418-423; Svendsgaard, C., *PCAS LXXIV*, 1987, pp. 424-428.

**SK** Bailey, R.A., and Simon, L.J., "An Actuarial Note on the Credibility of Experience of a Single Private Passenger Car," *PCAS XLVI*, 1959, pp. 159-164. Including discussion of paper: Hazam, W.J., *PCAS XLVII*, 1960, pp. 150-152.

Mahler, Howard C., "An Example of Credibility and Shifting Risk Parameters," *PCAS LXXVII*, 1990, pp. 225-308.



## Excess and Deductible Rating

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

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

### Readings

Gillam, W.R., and Snader, R.H., "Fundamentals of Individual Risk Rating," Part III, available from the National Council on Compensation Insurance at 1-800-NCCI-123 for \$25.95.

Hogg, R.V. and Klugman, S.A., *Loss Distributions*, 1984, Chapter 5 (5.3-5.6A). (Candidates may need to review sections included in Part 4 readings.)

Lee, Y.S., "The Mathematics of Excess of Loss Coverages and Retrospective Rating—A Graphical Approach," Sections 1-3, *PCAS LXXV*, 1988, pp. 49-78.

**SK** Meyers, G.G., "An Introduction to the Competitive Market Equilibrium Risk Load Formula," submitted for publication. (Candidates are not responsible for mathematical proofs or for memorization of formulae. Also, candidates are not responsible for Appendices.)

**SK** Miccolis, R.S., "On the Theory of Increased Limits and Excess of Loss Pricing," *PCAS LXIV*, 1977, pp. 27-59. Including discussion of paper: Rosenberg, S., *PCAS LXIV*, 1977, pp. 60-73.

**SK** Finger, R.J., "Estimating Pure Premiums by Layer," *PCAS LXIII*, 1976, pp. 34-52. Including discussion of paper: Steeneck, L.R., *PCAS LXIII*, 1976, pp. 53-55.

## B. Individual Risk Rating

One of the 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 candidates will be prepared to

Individual risk rating consists of two principal sections:

- Prospective rating, which is more commonly known as Experience Rating, and
- Retrospective rating.

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

Candidates 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; in addition to loss distribution, insurance charge, and excess loss charge concepts as they apply to retrospective rating. Candidates can be expected to apply these concepts in a creative and problem-solving manner.

Candidates are 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.

## Experience Rating

### Readings

Gillam, W.R., and Snader, R.H., "Fundamentals of Individual Risk Rating," Part I, available from the National Council on Compensation Insurance at 1-800-NCCI-123 for \$25.95.

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

**SK** National Council on Compensation Insurance, *Experience Rating Plan* (as of July 1, 1992).

**SK** Insurance Services Office, Inc., *Experience and Schedule Rating Plans Applicable to General Liability*, ISO Circular GL-90-217 (Conversion to Loss Cost Basis.)

**SK** Venter, G.G., "Experience Rating—Equity and Predictive Accuracy," *NCCI Digest*, April 1987, Vol. II, Issue I, p. 27.

Gillam, W.R., "Workers' Compensation Experience Rating: What

## Retrospective Rating

### Readings

Gillam, W.R., and Snader, R.H., "Fundamentals of Individual Risk Rating," Part II, 1992, available from the National Council on Compensation Insurance at 1-800-NCCI-123 for \$25.95.

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

**SK** National Council on Compensation Insurance, *Retrospective Rating Plan Manual for Workers' Compensation and Employers Liability Insurance* (as of July 1, 1992).

**SK** Insurance Services Office, Inc., *Retrospective Rating Plan for Automobile, General Liability, Glass and Theft* (July 1989 edition).

Gillam, W.R., "Retrospective Rating: Excess Loss Factors," *PCAS LXXVIII*, 1991, pp. 1-40. (Candidates are not responsible for loss distribution formulae.)

Lee, Y.S., "The Mathematics of Excess of Loss Coverage and Retrospective Rating—A Graphical Approach," *PCAS LXXV*, 1988, p. 64, Section 4. (Candidates are not responsible for "Other Applications" on pp. 75-76.)

Robbin, I., "Overlap Revisited: The 'Insurance Charge Reflecting Loss Limitation' Procedure," *Pricing, Casualty Actuarial Society Discussion Paper Program*, 1990, Vol. II, pp. 809-850. (Candidates are not responsible for Exhibits 4 and 5, and Appendix D.)

**SK** Skurnick, D., "The California Table L," *PCAS LXI*, 1974, pp. 117-140. Including the discussion of this paper: Gillam, W.R., *PCAS LXXX*, 1993 pp. 353-365.

## Part 10

### Financial Operations of Insurance Companies; Reinsurance, Assets, Valuation, Solvency, and Capital

Prior to commencing study for this four-hour examination, candidates should read the "Recommendations for Study" section on pages 29-31 of this *Syllabus* for study suggestions, guidance in obtaining the 1996 Study Kit (which includes Study Notes and out-of-print readings), and other information important to sitting for this examination. Items marked with a bold **SK** and a **SKU** constitute the 1996 Study Kit which is available from the CAS Office for \$50 (\$75 Canadian). A 1995 Study Kit Update is available for \$26 (\$40 Canadian) and includes the items marked with just a bold **SKU**.

Part 10 represents the final step in the examination process and is designed to test both the breadth and depth of the candidates' understanding of the insurance process. Candidates are 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 three sections, much of which builds upon information covered in previous examinations. Questions may be asked which require use of material mastered in preparation for previous examinations.

#### A. Financial Operations of Insurance Companies

This section explores the relationship between insurance concepts (such as underwriting profits, premium-to-surplus ratios, and investment income) and financial concepts (such as interest rates, inflation rates, cost of capital, and risk premiums).

#### Readings

The readings may be grouped into three categories:

- The Ferrari, Roth, and D'Arcy readings discuss the primary

of risk margins on the balance sheet and income statement as well as a method for calculating margins.

- The Myers and Cohn, the D'Arcy and Doherty, and the Feldblum readings present financial pricing models that are currently used in the insurance industry. Candidates should pay particular attention to two questions:
  1. How do these pricing models differ from each other? For instance, how does a net present value model differ from an internal rate of return model?
  2. Whose point of view is represented by each model—that of the insurer, the regulator, the policyholder, or the equity provider?

Candidates may find the Part 5B readings useful as background for the Part 10A material. The textbook by Brealey and Myers is important, particularly for comprehending the Ferrari and Butsic readings.

**SK** Ferrari, J.R., "The Relationship of Underwriting, Investments, Leverage, and Exposure to Total Return on Owners' Equity," *PCAS LV*, 1968, pp. 295-302. Includes discussions: Balcarek, R.J., *PCASLVI*, 1969, pp. 58-60; Bailey, R.A., *PCASLVI*, 1969, pp. 60-62.

Roth, R., "Analysis of Surplus and Rate of Return Without Using Leverage Ratios," *Insurer Financial Solvency*, Casualty Actuarial Society *Discussion Paper Program*, 1992, Vol. I, pp. 439-464.

D'Arcy, S.P., "Investment Issues in Property Liability Insurance," *Foundations of Casualty Actuarial Science* (Second Edition), Casualty Actuarial Society, 1992, Chapter 8, pp. 509-525.

**SK** Butsic, R.P., "The Effect of Inflation on Losses and Premiums for Property-Liability Insurers," *Inflation Implications for Property-Casualty Insurance*, Casualty Actuarial Society *Discussion Paper Program*, 1981, pp. 58-102. Includes discussion of paper: Balcarek, R.J., pp. 103-109.

Butsic, R.P., "Determining the Proper Interest Rate for Loss Reserve  
Determination: A Dynamic Approach," *Evaluating Insurance*

**NEW** Philbrick, S.W., "Accounting for Risk Margins," *Casualty Actuarial Society Forum*, Spring 1994, Vol. I, pp. 1-87.

Myers, S., and Cohn, R., "A Discounted Cash Flow Approach to Property-Liability Insurance Rate Regulation," *Fair Rate of Return in Property-Liability Insurance*, Cummins, J.D., Harrington, S.A., Eds.; Kluwer Nijhoff Publishing, 1987, pp. 55-78.

D'Arcy, S.P., and Doherty, N.A., *The Financial Theory of Pricing Property-Liability Insurance Contracts*, 1988, Chapters 1-4, 7, and 8 (except pp. 89-91).

**SK** Feldblum, S., "Pricing Insurance Policies: The Internal Rate of Return Model," 1992.

## B. Reinsurance

A key component of the insurance process is the sharing of risk between an insurer and a reinsurer. In this section, candidates should develop a thorough understanding of the types of reinsurance, the purposes of reinsurance, how it is marketed and underwritten, and how company reinsurance programs are developed. Candidates should appreciate the unique characteristics of reinsurance, and how actuarial concepts such as pricing and reserving are adapted to apply to reinsurance. Candidates should also understand the financial reporting issues and concepts that apply to reinsurance transactions.

The readings may be grouped into three general categories:

- The Strain, Brockett, and Reinartz readings describe the various types and purposes of reinsurance, its unique features and how it is utilized in company operations.
- The Patrik, Ludwig, and Stone readings use actuarial and economic concepts to describe how reinsurance is priced and financially evaluated.
- The Financial Accounting Standards Board statement and the National Association of Insurance Commissioners's readings deal with important accounting concepts and standards that apply to the GAAP and statutory financial reporting of reinsurance.

companion book helpful in preparing for this material: *Reinsurance Practices—A Workbook with Cases*, Strain, R.W. (Ed.), The College of Insurance, 1982. However, no questions will be taken directly from this workbook.)

**SK** Brockett, P.L., Witt, R.C., and Aird, P.R., "An Overview of Reinsurance and the Reinsurance Markets," *Journal of Insurance Regulation*, March 1991, Vol. 9, No. 3, pp. 432-454.

Reinarz, R.C., Schloss, J.O., Patrik, G.S., and Kensicki, P.R., *Reinsurance Practices*, Insurance Institute of America, 1990, Vol. I, Chapter 3; Vol. II, Chapters 9, 10, and 11.

Patrik, G.S., "Reinsurance," *Foundations of Casualty Actuarial Science* (Second Edition), Casualty Actuarial Society, 1992, Chapter 6, pp. 277-374.

**NEW** Ludwig, S.J., "An Exposure Rating Approach to Pricing Property Excess-of-Loss Reinsurance," *PCAS LXXVIII*, 1991, pp. 110-145. Includes discussion: Feldblum, S., *PCAS LXXX*, 1993, pp. 380-395.

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

**SK** National Association of Insurance Commissioners, "Reinsurance," *Accounting Practices and Procedures Manual for Property/Casualty Companies*, 1994, Chapter 22.

**SK** Financial Accounting Standards Board, "Statement of Financial Accounting Standards, No. 113, Accounting and Reporting for Reinsurance of Short-Duration and Long-Duration Contracts," December 1992, Summary, plus pp. 1-10 and 37-46. (Appendices B and C are included as part of the formal reading from which questions may be taken. Candidates may find Appendix A helpful in preparing for this material; however, no questions will be taken directly from it.)

## C. Assets, Valuation, Solvency and Capital

While there is overlap between these topics, the readings can be grouped as follows:

- The Maginn and Tuttle reading deals with investment strategy, asset risk, and portfolio construction; the Altman reading presents both a study of bond default rates using a mortality model as well as a measure of overall performance across a spectrum of bonds; the Fama and Schwert reading investigates the efficacy of various assets as inflation hedges. These topics are important in assessing potential effects on a company's assets from changing external environments.
- The Ferguson, Norris, Panning, and Feldblum 1989 readings address asset-liability management concepts.
- The Sturgis, Miccolis, ASB Standard of Practice 19, and CAS Principles on Valuation readings deal with valuation and appraisal issues.
- The Willenborg paper provides an overview of insolvency issues, while the Daykin text covers dynamic solvency testing through stochastic modeling of an insurance enterprise.
- The Feldblum (1995) and Butsic readings present NAIC risk based capital and some related issues. The reading by Hodes and Feldblum presents issues arising interest rate risk in relation to risk based capital.

Candidates are expected to develop an understanding of the various issues, concepts, and techniques presented in the readings, and, for risk based capital, also to know specifics of how the formula works. Candidates will be expected to synthesize material from other examinations and examination parts that have material within this part.

### Readings

Maginn, J.L. and Tuttle, D.L. Eds., *Managing Investment Portfolios: A Dynamic Process* (Second Edition), Warren, Gorham & Lamont, 1990, pp. 2-11 to 2-39, 4-40 to 4-68, 5-48 to 5-63, 6-2 to 6-28, 7-1 to 7-25, 8-1 to 8-71.

**SK** Altman, E.I., "Measuring Corporate Bond Mortality and Performance," *The Journal of Finance*, Vol. 44, No. 4, September

**SK** Fama, E.F. and Schwert, G.W., "Asset Returns and Inflation." *Journal of Financial Economics*, Vol. 5, 1977, pp. 115-146. (Note: Candidates will not be responsible for reproducing equations, but will be responsible for interpreting equations, being able to describe the more important relationships and understanding the concepts contained therein.)

Ferguson, R.E., "Duration," *PCAS LXX*, 1983, pp. 265-288. Including discussion of paper: D'Arcy, S., *PCAS LXXI*, 1984, pp. 8-25.

**SK** Noris, P.D., "Asset/Liability Management Strategies for Property and Casualty Companies," (Excluding sections I, II, V, and VI), Morgan Stanley, May 1985.

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Feldblum, S., "Asset Liability Matching For Property/Casualty Insurers," *Valuation Issues*, Casualty Actuarial Society *Special Interest Seminar*, 1989, pp. 117-154.

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Casualty Actuarial Society, "Statement of Principles Regarding Property and Casualty Valuations as adopted September 22, 1989." *Casualty Actuarial Society Yearbook* 1995, pp. 228-234.

Daykin, C.D., Pentikäinen, T., and Pesonen, M. *Practical Risk Theory for Actuaries* (First Edition), 1994, Chapman and Hall; Sections 7.3, 8.4(a), 8.4(b), 8.4(c), 8.4(d), 8.5, 9.1, 9.2, 9.3, 9.4, 9.5.4, 9.6, Chapters 10, 11, 12, 13, Sections 14.1, 14.2, 14.3(a), 14.3(b), 14.4, 14.6(a), 14.6(b), 14.6(c), 14.6(d), 14.6(e), 14.6(f), 14.6(g). (Note: Candidates will not be responsible for reproducing equations, other than the Cash Flow Equation and the Accounting Equation, but will be responsible for interpreting equations, being able to describe the more important relationships and understanding the concepts contained therein. Also, the candidate may find it useful to refer to other non-included parts of this text in chapters 1 through 14. However, questions will not be drawn from these parts.)

**SKU** Feldblum, S., CAS Study Note "Risk Based Capital Requirements," 1995.

**SKU** Butsic, R.P., "Solvency Measurement for Property-Liability Risk Based Capital Applications." *The Journal of Risk and Insurance*, Vol. 61, No. 4, (December 1994) pp. 656-690.

**SKU** Hodes, D.M., and Feldblum, S., "Interest Rate Risk and Capital Requirements for Property-Casualty Insurance Companies," 1995.

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## Index to Text References

Most of these text references may be obtained on loan from the CAS Library. Material that is new in 1996 will be made available as soon as possible. The following information is furnished for those who wish to purchase the text references cited in the examination part descriptions.

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- 3B, 4-10 Actuarial Bookstore, PO Box 1229, Dover, NH 03821-1229, telephone: 1-800-582-9672, or (603) 742-1806, fax: (603) 749-9151. Credit card orders accepted.
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