



1999

*Syllabus of Examinations*

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## Casualty Actuarial Society



# 1999 Syllabus of Examinations

**Send check and money order payments to:**

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

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# Notice to Candidates

Including Important Changes to the  
1999 CAS Syllabus Of Examinations

## 1. Languages Other than English

The following is a new policy that will be implemented with the Spring 1999 Examinations:

Examination questions and instructions will be printed, and examinations administered, exclusively in English. Should a candidate wish to respond to any or all of the essay questions in a language other than English, advance notice of the language selected must be provided to the CAS Office when applying to write an examination. Provided such advance notice was received and a suitable translator is available, responses submitted in languages other than English will be translated into English by qualified translators and graded exclusively in translation. If advance notice has not been provided, non-English responses will not be graded. For non-English responses provided in languages other than French, a translation fee of \$200 per examination must be submitted along with the examination fee. If a suitable translator cannot be engaged prior to the date of the examination, the candidate will be notified and the translation fee refunded.

*The CAS cannot guarantee the accuracy of any translation, and appeals of examination grades based upon errors in translation of candidates' responses will not be considered.* Grade reports for examinations requiring translation may be delayed.

## 2. Preliminary Multiple Choice and True/False Answers

The following is a new procedure that was implemented with the Fall 1998 Examinations:

Approximately one week after all examinations have been completed, a *preliminary* list of multiple-choice and true/false answers will be posted in the Students' Corner of the CAS Web Site ([www.casact.org](http://www.casact.org)). This will assist candidates in determining whether they believe a question is ambiguous or defective.

## 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 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 as described in this *Syllabus*.

### 3. Transition Rules

The transition rules for the CAS 2000 education and examination system have been finalized. A summary is provided on pages 22-24.

### 4. Date of Examinations

The Spring 1999 CAS Examinations will be held in early May; the Fall 1999 CAS Examinations will be held in early November. Exact dates are listed on pages 5-6.

### 5. Individual Examinations

Please refer to the appropriate examination section for changes.

### 6. Obtaining Examination Booklet

A candidate wishing to obtain his or her own examination booklet and scrap paper subsequent to the examination should bring a self-addressed, stamped envelope to the examination center. The recommended minimum postage is \$2.39 for domestic mail in the U.S. **NOTE:** Copies of the examinations will not be made available until they are released with sample solutions on July 30, 1999 for Spring Examinations, and January 31, 2000 for Fall Examinations.

### 7. CAS Web Site

The *Syllabus of Examinations* is available in the Students' Corner of the CAS Web Site ([www.casact.org](http://www.casact.org)). The "List of Passing Candidate Numbers," *Future Fellows*, *Notice of Examinations*, updates to the 1999 *Syllabus*, and other important notices also will be posted in the Students' Corner.

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- Order Form for Study Material for Spring 1999 CAS Examinations (White)
- Application Form for Fall 1999 CAS Examinations (Peach)
- Order Form for Study Material for Fall 1999 CAS Examinations (White)

**Note:** This *Syllabus* is subject to change in the future. The CAS is not responsible for any errors or omissions in the *Syllabus*.

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# INTRODUCTION

## Goals and Objectives

One of the primary objectives of the Casualty Actuarial Society (CAS) is the development of qualified professionals in the field of casualty actuarial science. The CAS 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 toward insurance problem-solving in order to foster an appreciation of the art in actuarial science.

## Education and Examination System

The CAS Vice President-Admissions supervises the CAS education and examination system. The Vice President-Admissions is supported by the following four admissions committees.

### CAS Education Policy Committee

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.

### CAS Syllabus Committee

The Syllabus Committee determines the scope and content of the CAS *Syllabus* and course of readings for CAS Examinations.

A chairperson supervises the committee which is composed of Fellows who represent a broad spectrum of CAS members including insurers, consultants, regulators, and academicians. At least one representative of the Canadian Institute of Actuaries (CIA) also serves on the committee; usually at least one of the representatives 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, recommendations must be approved by the committee.

The “Materials for Study” 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. 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. 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 at the CAS Office address.

### CAS Examination Committee

The Examination Committee organizes, manages, administers, and grades the CAS Examinations. The committee also establishes the standards to be achieved by successful candidates.

The chairperson supervises the committee and is 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 examination consultant who is a CAS member and an expert on the material covered by that examination. In addition, some part committees are assisted by academic consultants who are independent experts from the academic community.

Each examination is drafted by the responsible Examination Part Committee to test candidates’ knowledge of the items listed in the “Materials for Study.” The individual part committee, examination 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.

Every effort is made to ensure that the questions fall within the scope of the “Materials for Study.” Complete coverage of all material is not practical for every examination every year. The goal is to produce 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.

### CAS Student Liaison Committee

The Student Liaison Committee strives to focus on issues of importance to candidates who are taking CAS Examinations. The committee serves as a direct point of contact for students to voice individual or group concerns regarding the education and examination process. It also provides a means for an exchange of information between students and the admissions committees via *Future Fellows*, a newsletter which it publishes quarterly. Two candidates who are actively involved in the examination process serve as advisors to the committee.

# 1999 CAS SYLLABUS SUMMARY

## Associateship Examinations

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

## Fellowship Examinations

Part	Subjects
8†	Tort Law and Statutory Insurance; Regulation and Regulatory Issues
9	Advanced Techniques; Individual Risk Rating
10	Financial Operations of Insurance Companies; Reinsurance, Assets, Valuation, Solvency, and Capital

\* Jointly administered with the Society of Actuaries.

† Candidates must specify their U.S. or Canadian specialty at the time of applications.

2000 Exam Dates  
5-5/1; 7-5/2; 8-5/3

# 1999 CAS EXAMINATION SCHEDULE

## Spring 1999

EXAM	DATE	ZONE	START TIME	FINISH TIME
1 (100)	05/11/99*	All time zones.	8:30 a.m.	11:30 a.m.
2 (110)	05/11/99*	All time zones.	1:00 p.m.	4:00 p.m.
3A (120)	05/18/99*	All time zones.	8:30 a.m.	10:00 a.m.
3B	05/06/99	EDT, CDT, Bermuda	2:30 p.m.	4:00 p.m.
3B	05/06/99	MDT, PDT, Alaska, Asia	2:30 p.m.	4:00 p.m.
3B	05/06/99	Europe	4:00 p.m.	5:30 p.m.
3C (135)	05/18/99*	All time zones.	10:45 a.m.	12:15 p.m.
4A	05/05/99	EDT, CDT, Bermuda	2:00 p.m.	4:00 p.m.
4A	05/05/99	MDT, PDT, Alaska, Asia	1:00 p.m.	3:00 p.m.
4A	05/05/99	Europe	4:00 p.m.	6:00 p.m.
4B	05/05/99	EDT, CDT, Bermuda	10:00 a.m.	12:30 p.m.
4B	05/05/99	MDT, PDT, Alaska, Asia	9:00 a.m.	11:30 a.m.
4B	05/05/99	Europe	12:30 p.m.	3:00 p.m.
5A	05/03/99	EDT, CDT, Bermuda	10:00 a.m.	12:00 p.m.
5A	05/03/99	MDT, PDT, Alaska, Asia	9:00 a.m.	11:00 a.m.
5A	05/03/99	Europe	12:30 p.m.	2:30 p.m.
5B	05/03/99	EDT, CDT, Bermuda	2:00 p.m.	4:00 p.m.
5B	05/03/99	MDT, PDT, Alaska, Asia	1:00 p.m.	3:00 p.m.
5B	05/03/99	Europe	4:00 p.m.	6:00 p.m.
6	05/07/99	USA, CAN, Bermuda, Asia	9:30 a.m.	1:30 p.m.
6	05/07/99	Europe	1:00 p.m.	5:00 p.m.
8/8C	05/04/99	USA, CAN, Bermuda, Asia	9:30 a.m.	1:30 p.m.
8/8C	05/04/99	Europe	1:00 p.m.	5:00 p.m.
10	05/06/99	USA, CAN, Bermuda, Asia	9:30 a.m.	1:30 p.m.
10	05/06/99	Europe	11:00 a.m.	3:00 p.m.

Note: Starting times for examinations are local time for the specified zone(s).

\*Final information for jointly administered examinations is available from the Society of Actuaries at (847) 706-3500.



2000 exam notes

6-10/31; 9-11/1

Fall 1999

EXAM	DATE	ZONE	START TIME	FINISH TIME
1 (100)	11/09/99*	All time zones.	8:30 a.m.	11:30 a.m.
2 (110)	11/09/99*	All time zones.	1:00 p.m.	4:00 p.m.
3A (120)	11/16/99*	All time zones.	8:30 a.m.	10:00 a.m.
3B	11/01/99	EST, CST, Bermuda	2:30 p.m.	4:00 p.m.
3B	11/01/99	MST, PST, Alaska, Asia	2:30 p.m.	4:00 p.m.
3B	11/01/99	Europe	4:00 p.m.	5:30 p.m.
3C (135)	11/16/99*	All time zones.	10:45 a.m.	12:15 p.m.
4A	11/03/99	EST, CST, Bermuda	2:00 p.m.	4:00 p.m.
4A	11/03/99	MST, PST, Alaska, Asia	1:00 p.m.	3:00 p.m.
4A	11/03/99	Europe	4:00 p.m.	6:00 p.m.
4B	11/03/99	EST, CST, Bermuda	10:00 a.m.	12:30 p.m.
4B	11/03/99	MST, PST, Alaska, Asia	9:00 a.m.	11:30 a.m.
4B	11/03/99	Europe	12:30 p.m.	3:00 p.m.
5A	11/02/99	EST, CST, Bermuda	10:00 a.m.	12:00 p.m.
5A	11/02/99	MST, PST, Alaska, Asia	9:00 a.m.	11:00 a.m.
5A	11/02/99	Europe	12:30 p.m.	2:30 p.m.
5B	11/02/99	EST, CST, Bermuda	2:00 p.m.	4:00 p.m.
5B	11/02/99	MST, PST, Alaska, Asia	1:00 p.m.	3:00 p.m.
5B	11/02/99	Europe	4:00 p.m.	6:00 p.m.
7	11/04/99	USA, CAN, Bermuda, Asia	9:30 a.m.	1:30 p.m.
7	11/04/99	Europe	1:00 p.m.	5:00 p.m.
9	11/01/99	USA, CAN, Bermuda, Asia	9:30 a.m.	1:30 p.m.
9	11/01/99	Europe	11:00 a.m.	3:00 p.m.

Note: Starting times for examinations are local time for the specified zone(s).

\*Final information for jointly administered examinations is available from the Society of Actuaries at (847) 706-3500.

SOA  
100  
110  
120  
135  
14102  
1400150

CAS  
Pt. 1  
Pt. 2  
3A  
3C  
4A

## RULES REGARDING EXAMINATION

### Registration

### Administration of Examinations

The CAS administers Parts 3B, 4-10. Parts 1, 2, 3A, and 3C are jointly administered by the CAS and the Society of Actuaries (SoA). 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 (Spring and/or Fall). Application forms are enclosed in this *Syllabus*. Applications must be mailed in time to reach the CAS Office **not later than March 17, 1999** for the Spring Examinations and **September 15, 1999** 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.

Payment must accompany each application. Send application with payment in U.S. or Canadian funds by check, draft, or money order (payable to the "Casualty Actuarial Society") to:

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

If paying by credit card, all fees will be processed in U.S. funds (please indicate fees accordingly). Send application to:

Casualty Actuarial Society  
1100 North Glebe Road, Suite 600  
Arlington, VA 22201-4798

Candidates will receive an acknowledgment of receipt of their application within three weeks of the date that the application form was received at the

CAS Office. This acknowledgment is the candidate's receipt of exam fees paid. Please retain this acknowledgment for tax purposes if needed.

### Parts 1, 2, 3A, and 3C

Candidates who wish to take one or more of Part 1 (*SoA Course 100*), Part 2 (*SoA Course 110*), Part 3A (*SoA Course 120*), or Part 3C (*SoA Course 135*) must file an application form with the Society of Actuaries. (Forms may be obtained from the SoA at the address below.) For Parts 1, 2, 3A, and 3C, **application forms and the appropriate examination fee (in the form of a check, draft, money order, or credit card) must be made payable to and mailed to the Society of Actuaries** at the following address:

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

Credit card payments may be sent to directly to the SoA Office (see address on page 9).

The applications for Parts 1, 2, 3A, and 3C must be received by the Society of Actuaries by January 15, 1999 for the February Parts 1 and 2 examinations, by April 1, 1999 for the Spring Examinations, and by October 1, 1999 for the Fall Examinations. (Candidates who register for Part 3B with either 3A or 3C should refer to the special section on page 12.)

### Fees

Examination fees must be paid each time a candidate registers for an examination.

### Parts 3B, 4-10

All fees for CAS Examinations are payable in U.S. or Canadian funds in the form of a check, draft, or money order to the CAS. Credit card payments (MasterCard, Visa, American Express, Diners Club, or Discover) will be processed in U.S. funds. A \$15 surcharge (\$27 Canadian) will be assessed for all returned checks. The candidate's acknowledgment is a tax receipt. Canadian fees include a \$4 service charge.

### Parts 1, 2, 3A, and 3C

All fees are payable in U.S. or Canadian funds in the form of a check, draft, money order, or credit card to the SoA. A \$15 surcharge (contact the SoA for the Canadian equivalent) will be assessed for all returned checks. The candidate's admission ticket is a tax receipt.

Candidates taking Exam 3B with 3A and/or 3C have a different fee structure and must submit applications to both the CAS and SoA. (This is due to the joint administration of Parts 3A and 3C.) For details on fees and registration, refer to the special section on page 12.

The charts below show the examination fee schedules for Spring 1999 and Fall 1999 at the time of publication. All fees are subject to change. Other fees that may apply include fees for late registration, change of center, translation, and/or centers outside North America.

Spring 1999 Examination Fees				
	Employed Candidates		Full-Time College Students	
	US\$	CANS	US\$	CANS
Part 1 (non-refundable)	Contact the Society of Actuaries.			
Part 2 (non-refundable)	Contact the Society of Actuaries.			
Part 3A	-Contact the Society of Actuaries.			
Part 3B*	\$120	\$188	\$100	\$157
Part 3C	Contact the Society of Actuaries.			
Part 4A	\$120	\$188	\$100	\$157
Part 4B	\$120	\$188	\$100	\$157
Part 5A	\$120	\$188	\$100	\$157
Part 5B	\$120	\$188	\$100	\$157
Part 6	\$200	\$310	\$160	\$249
Part 8	\$200	\$310	\$160	\$249
Part 10	\$200	\$310	\$160	\$249

### \*Taking Part 3B with 3A and/or 3C

Part 3A	Contact the Society of Actuaries.			
Part 3B	\$60	\$96	\$50	\$81
Part 3C	Contact the Society of Actuaries.			

Addresses	
Send payment with application to:	For information on jointly-administered examinations, please contact:
Casualty Actuarial Society P.O. Box 425 Merrifield, VA 22116-0425 (703) 276-3100	Society of Actuaries 475 Martingale Road, Suite 800 Schaumburg, IL 60173 (847) 706-3583

<b>Fall 1999 Examination Fees</b>				
	<b>Employed Candidates</b>		<b>Full-Time College Students</b>	
	<b>USS</b>	<b>CANS</b>	<b>USS</b>	<b>CANS</b>
<b>Part 1 (non-refundable)</b>	<i>Contact the Society of Actuaries.</i>			
<b>Part 2 (non-refundable)</b>	<i>Contact the Society of Actuaries.</i>			
<b>Part 3A</b>	<i>Contact the Society of Actuaries.</i>			
<b>Part 3B</b>	\$120	\$188	\$100	\$157
<b>Part 3C</b>	<i>Contact the Society of Actuaries.</i>			
<b>Part 4A</b>	\$120	\$188	\$100	\$157
<b>Part 4B</b>	\$120	\$188	\$100	\$157
<b>Part 5A</b>	\$120	\$188	\$100	\$157
<b>Part 5B</b>	\$120	\$188	\$100	\$157
<b>Part 7</b>	\$200	\$310	\$160	\$249
<b>Part 9</b>	\$200	\$310	\$160	\$249

**\*Taking Part 3B with 3A and/or 3C**

<b>Part 3A</b>	<i>Contact the Society of Actuaries.</i>			
<b>Part 3B</b>	\$60	\$96	\$50	\$81
<b>Part 3C</b>	<i>Contact the Society of Actuaries.</i>			

<b>Other CAS Fees</b>		
	<b>USS</b>	<b>CANS</b>
Examination Refund	\$60	\$96
Center Outside N. America	\$40	\$65
Change of Exam Center	\$30	\$50
Late Registration (For Each Examination)	\$50	\$81
Translation Fee (For Each Examination)	\$200	\$310

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

## Change of Center

Any registered candidate who requests a change in examination center must pay the following change-of-center fee.

### Parts 1, 2, 3A, and 3C

The change of center fee is \$30 (contact the SoA for the Canadian equivalent). No requests will be accepted after January 15, 1999 for the February examinations, April 15, 1999 for the Spring Examinations, or October 1, 1999 for the Fall Examinations.

### Parts 3B, 4-10

The change of center fee is \$30 (\$50 Canadian). No requests will be accepted after March 29, 1999 for the Spring Examinations, or September 27, 1999 for the Fall Examinations. [See boxed note below.]

## Examination Centers Outside North America

Candidates wishing to take Parts 3B, 4-10 outside North America should include an additional fee of \$40 (\$65 Canadian). Requests must be made at least two months prior to the examination date, i.e., March 3, 1999 for the Spring Examinations and September 1, 1999 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.

## Late Registrations

Late registrations are not accepted for Parts 1, 2, 3A, and 3C.

For Parts 3B, 4-10, if the application and regular fees are not received on or before the deadline, candidates wishing to write an examination in North America must pay a late registration fee in addition to the examination fee. The late fee of \$50 (\$81 Canadian) per examination will apply to applications received from March 18 through March 29, 1999 for the Spring Examinations and September 16 through September 27, 1999 for the Fall Examinations. Late registrations will not be accepted from

candidates writing outside North America. In no case will applications be accepted after March 29, 1999 for the Spring Examinations, or September 27, 1999 for the Fall Examinations.

Candidates who wish to apply for Parts 3B, 4-10, and wrote Parts 1 or 2 in February may register until March 29, 1999 for the Spring Examinations without assessment of a late fee. [See boxed note above.]

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

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

The fee structure for Part 3 is calculated with a base candidate fee of \$60 regardless of the number of sub-parts taken in one sitting. In addition to the base candidate fee (which is paid to the SoA), there is an examination/course fee for each examination: \$53 for Part 3A; \$60 (\$50 for full-time college students) for Part 3B; and \$35 for Part 3C. [For CAS fees in Canadian funds, see examination fees chart; for SoA fees, contact the SoA.] The examples below demonstrate how to submit applications and fees to the appropriate organizations. Fees are subject to change.

### Examples

An employed candidate in the U.S. who registers for Parts 3A and 3B would send:

- a. \$60 (exam fee for Part 3B) with application to the Casualty Actuarial Society; and
- b. \$60 (base fee) + \$53 (course fee for 3A) with application to the Society of Actuaries.

A full-time college student in the U.S. who registers for Parts 3A and 3B would send:

- a. \$50 (exam fee for Part 3B) with application to the Casualty Actuarial Society; and
- b. \$60 (base fee) + \$53 (course fee for 3A) with application to the Society of Actuaries.

## Languages Other than English

Examination questions and instructions will be printed, and examinations administered, exclusively in English. Should a candidate wish to respond to any or all of the essay questions in a language other than English, advance notice of the language selected must be provided to the CAS

Office when applying to write an examination. Provided such advance notice was received and a suitable translator is available, responses submitted in languages other than English will be translated into English by qualified translators and graded exclusively in translation. If advance notice has not been provided, non-English responses will not be graded. For non-English responses provided in languages other than French, a translation fee of \$200 per examination must be submitted along with the examination fee. If a suitable translator cannot be engaged prior to the date of the examination, the candidate will be notified and the translation fee refunded. *The CAS cannot guarantee the accuracy of any translation, and appeals of examination grades based upon errors in translation of candidates' responses will not be considered.* Grade reports for examinations requiring translation may be delayed.

## Special Arrangements for Disabled Candidates

Individual consideration will be given to provide special arrangements for persons with demonstrable impairments that would impose a severe handicap if examinations were taken under normal conditions. Advanced notice that special arrangements will be needed must be provided to the CAS Office at the time the candidate registers to write an examination.

## Refunds

### Parts 1, 2, 3A, and 3C (Joint Examinations)

Fees for Parts 1 and 2 are non-refundable. 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 submit a written request for an examination fee refund. This request must reach the Society of Actuaries not later than June 30, 1999 for the Spring Examinations or December 30, 1999 for the Fall Examinations. Later requests will not be considered. A \$50 administrative fee per examination is assessed for all refunds (contact the SoA for the Canadian equivalent). Therefore, no refund is made unless the total fees for the sub-parts not written exceed \$50. The \$60 candidate fee is refundable only if the candidate does not write any sub-parts for which the fee is charged. Examination fees for Parts 3A and 3C are only refundable from the SoA. Late registration fees, change-of-center fees, and special center fees 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 May 17, 1999 for the Spring Examinations, or November 15, 1999 for the Fall Examinations. Later requests will not be considered. A fee of \$60 (\$96 Canadian) per examination will be assessed for all refunds. Late registration fees, change-of-center fees, and fees for writing overseas will not be refunded in any case. Checks will be issued one month after the deadline for refunds.

## The Examination

### Introduction

The examinations for admission to the Casualty Actuarial Society are designed to establish the qualifications of candidates. 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. 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.

### Conduct of Examinations

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

Candidates must respond in English unless advance notice is given with the registration (see "Languages Other than English" on page 12).

Examination answer sheets are not returned to candidates. A candidate wishing to obtain his or her own examination booklet and scrap paper subsequent to the examination must bring a self-addressed, stamped envelope to the examination center. The recommended minimum postage is \$2.39 for domestic mail in the U.S. Copies of the examinations will not be available until they are released with sample solutions on July 30, 1999 for Spring Examinations, and January 31, 2000 for Fall Examinations.

### Calculators

Electronic calculators will be allowed in the examination room for all examinations. For all examinations jointly administered by the Society of Actuaries (SoA) and the CAS (i.e., Parts 1, 2, 3A, and 3C), the only acceptable calculator is one which bears the official SoA logo. Candidates *must* order the official calculator from the SoA. No calculators will be shipped after January 15, 1999 for the February examinations, April 15,

1999 for the Spring Examinations, or October 1, 1999 for the Fall Examinations.

For examinations administered by the CAS (i.e., Parts 3B, 4-10), candidates may use the battery- or solar-powered models of the following Texas Instruments calculators: BA-35 (the official SoA/CAS calculator), TI-30X, or TI-30Xa. The CAS logo is not required on the calculator. Candidates may use more than one of the approved calculators during the CAS-administered examinations. For candidates who cannot locate the TI-30Xa model, the CAS Office will have the calculator available (see order form). **Note: Any unauthorized calculator brought to the examination center will be confiscated for the duration of the examination.**

**It is the candidate's responsibility to see that the calculator used during the examination is in good working order.** Supervisors will have a spare approved calculator available for a candidate whose calculator may malfunction. It is not to be distributed to a candidate without a calculator or whose unauthorized calculator has been confiscated.

## Examination Discipline

Candidates must not give or receive assistance of any kind during the examination. Any cheating, attempt to cheat, assisting others to cheat, participating therein, or engaging in such improper conduct as listed below, is a serious violation and will result in the CAS disqualifying the candidate's paper, and 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.
- h. Enabling another candidate to copy from one'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 CAS Examination Committee, 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, the candidate's conduct will be reported to the Actuarial Board for Counseling and Discipline (ABCD) or to the Canadian Institute of Actuaries (CIA) if the final penalty invoked is more than disqualification of the examination.

Candidates for the CAS 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 CAS maintains these strict standards because the examinations are such a significant part of a candidate's career. Therefore, the equitable administration of the examinations and enforcement of the highest standards of conduct cannot be emphasized too strongly.

Candidates who wish to obtain a copy of the full CAS Policy on Examination Discipline should make a request in writing to the CAS Office.

## Parts 1, 2, 3A, and 3C

### *Multiple-Choice, Joint Examinations*

Parts 1, 2, 3A, and 3C consist entirely of multiple-choice questions. For these examinations, each multiple-choice problem 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 five ovals for each problem, identified with the letters A, B, C, D, and E, corresponding to the five answer choices. 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. It is important that only one oval be blackened for each question.

### Guessing Adjustment

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

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. 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.

### Lost Examinations

The CAS 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 organizations that jointly administer and/or jointly sponsor CAS Examinations will assume no other obligation and candidates must take the examinations with this knowledge.



## Grades and Accreditation

### Examination Processing

Examination papers are sent to the CAS Office upon completion of the final examination. The CAS office prepares the examinations for the grading process. Approximately one week after all examinations have been completed, a *preliminary* list of multiple-choice and true/false answers will be posted in the Students' Corner of the CAS Web Site ([www.casact.org](http://www.casact.org)). This is intended to assist candidates in determining whether they believe a question is ambiguous or defective.

### Defective Questions

Occasionally, through error or because of varying interpretations, a question on an 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 CAS 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 CAS 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 is unlikely to be able to be considered in the grading process.

### 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.

A model answer is developed for each question prior to grading, including the recommended numerical value for each sub-point in the answer. Each question is assigned to two graders who separately and independently grade the candidates' answers using the model answer as a guide. After 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 re-graded. The candidates are re-ranked after the re-grading, and a final pass mark is determined.

## 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. Raw scores and the pass mark are not provided to candidates.

The percentage of candidates passing will vary from year to year; however, those candidates demonstrating the required level of competence with the material will pass.

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

Examination results are available approximately eight weeks after the examination date. After examination results are received at the CAS Office, a list of passing candidate ID numbers will be posted in the Students' Corner of the CAS Web Site ([www.casact.org](http://www.casact.org)).

Individual statements of examination results are mailed to candidates on the day that they are posted on the CAS Web Site. 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. Several weeks later, a list of the names of all passing candidates is distributed.

## Analysis

Candidates receiving a grade of 4 or 5 on an examination will automatically receive an analysis of their examination upon grade notification. Other unsuccessful candidates for Parts 3B, 4-10 may obtain an analysis of their examination by writing to the CAS Office before the stated deadline. The deadline is July 30, 1999 for Spring Examinations, and January 31, 2000 for Fall Examinations. The analysis of an examination is computer-generated. Actual points received for multiple-choice and true/false questions will be displayed. For essay questions, ranges will be 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 candidates have received an analysis of their exam, they may appeal their grade. Only candidates with valid appeals will be considered. 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 not later than July 30, 1999 for Spring Examinations, and January 31, 2000 for Fall Examinations. The sample essay answers are actual responses that have received credit and are illustrative of successful answers, although they may not be considered perfect answers.

There are two types of valid appeals. The first type is an administrative check of the candidate's short answer card to verify that the card reader



scanned the card correctly and that the output file reflected this data. The second type of appeal is for an incorrect answer key or sample essay answer. If the candidate believes that the answer key or sample answer is incorrect or there is an alternative correct solution, the candidate must provide specific information on why his or her solution is correct. An example of a non-valid appeal would be the following: "I am appealing my score of 5 on Part 10, please re-check my examination." Another example of a non-valid appeal would be: "On question number 2, I believe I should get full credit because I answered the following . . ."

Appeals must reach the CAS Office not later than August 31, 1999 for Spring Examinations and March 1, 2000 for Fall Examinations. When a valid appeal is received, it is reviewed by the part chair and a recommendation is made to the Examination Committee chair. The Examination Committee 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 CAS generally reviews and makes revisions in the study material on an annual basis. Occasionally, a major topic will be added to or deleted from the 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 is appropriate. A transition program generally will be appropriate when candidates are in a position to lose credit for a segment of an examination.

A transition program usually 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 fulfill 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.

## Transition Rules for the 2000 Syllabus

The CAS Board of Directors has approved the following transition rules for the new CAS education and examination system that will be implemented with the Spring 2000 Examinations. Exams 1, 2, 3, and 4 will be jointly sponsored with the Society of Actuaries (SoA).

### CAS Exam 1/SoA Course 1

#### Mathematical Foundations of Actuarial Science—Calculus and Probability

Credit will be given if candidate has passed Part 1 (Calculus & Linear Algebra) or Part 2 (Probability & Statistics). No credit will be given for Graduate Record Examinations once the new system is effective in 2000. The CAS transition rule is the same as the SoA conversion rule for Exam 1.

### CAS Exam 2/SoA Course 2

#### Interest Theory, Economics, and Finance

Credit will be given if candidate has passed Parts 1 (Calculus & Linear Algebra), 2 (Probability & Statistics), and 5B (Finance); **OR** if candidate has passed Parts 5A (Principles of Economics, Theory of Risk and Insurance) and 5B (Finance). The CAS will recognize the SoA conversion rule for Exam 2 (contact the SoA for details). The SoA will recognize the CAS transition rule.

### CAS Exam 3/SoA Course 3

#### Actuarial Models

Credit will be given if candidate has passed Parts 2 (Probability and Statistics), 3A (Applied Statistical Methods), and 4A (Interest and Life Contingencies); **OR** if candidate has passed Parts 2, 4A, and 5A (Principles of Economics, Theory of Risk and Insurance). The CAS will recognize the SoA conversion rule for Exam 3 (contact the SoA for details). The SoA will not recognize the CAS transition rule.

### CAS Exam 4/SoA Course 4

#### Actuarial Modeling

Credit will be given if candidate has passed Parts 4B (Credibility Theory and Loss Distributions) and 5A (Principles of Economics, Theory of Risk and Insurance); **OR** if candidate has passed Parts 3C (Numerical Methods—if it was passed in or prior to the Fall 1997 Examinations) and 4B; **OR** if candidate has passed Parts 3A (Applied Statistical Methods) and 4B. The CAS will recognize the SoA conversion rule for Exam 4 (contact the SoA for details). The SoA will not recognize the CAS transition rule.

### CAS Exam 5

#### Introduction to Property/Casualty Insurance and Ratemaking

Credit will be given if candidate has passed Parts 3B (Introduction to Property and Casualty Insurance) and 6 (Ratemaking).

#### **CAS Exam 6**

##### **Reserving, Insurance Accounting Principles, and Reinsurance**

Credit will be given if candidate has passed Part 7C or Part 7US (Reserving and Accounting).

#### **CAS Exam 7**

##### **Nation-Specific: Annual Statement, Taxation, and Regulation**

Credit will be given if candidate has passed corresponding nation-specific (Canadian/US) Parts 7 (Reserving and Accounting) and 8 (Law and Regulation). If candidate has passed both Parts 7 and 8, candidate receives credit for Exams 6 and corresponding Canadian/US 7. If an Associate does not have credit for both Parts 7 and 8, he/she will continue to be an Associate, but will have to pass Exam 7 in order to become a Fellow.

#### **CAS Exam 8**

##### **Investments, Valuation, and Solvency**

Credit will be given if candidate has passed Part 10.

#### **CAS Exam 9**

##### **Advanced Ratemaking, Rating Plans, and Rate of Return**

Credit will be given if candidate has passed Part 9.

## **CAS Membership Requirements**

*The current requirements for membership will be in effect through the CAS Fall 1999 Examinations. Beginning in 2000, the requirements will be updated to reflect the new CAS examination and education system.*

### **Associateship**

Candidates for Associateship in the Casualty Actuarial Society must fulfill the examination requirements by successful completion of, or credit for, Parts 1 through 7. 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. Information for receiving credit or waivers is provided below.

After completing the prescribed examination requirements, all prospective Associate members must make formal application to the Casualty Actuarial Society. The CAS Office will mail application materials to these candidates, including instructions for obtaining letters of reference from two CAS members. 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.

Candidates must attend the CAS Course on Professionalism prior to admission to the CAS. After all requirements are met and application is made, each candidate is voted on by the CAS Executive Council. Upon approval of the CAS Executive Council, the candidate will be admitted as an Associate of the Casualty Actuarial Society (ACAS). Candidates approved by the Executive Council will be notified by letter from the CAS President.

### **Fellowship**

In addition to fulfilling all the requirements of Associateship, successful completion of, or credit for, all 10 examination parts (including their sub-parts) is required to fulfill the examination requirements for Fellowship and to be designated as a Fellow of the Casualty Actuarial Society (FCAS). Parts 7 and 8 now have two sub-divisions covering United States or Canadian-specific material, and passage of either of the two tracks fulfills the completion requirements.

## **CAS Course on Professionalism**

The CAS Course on Professionalism is designed to present candidates with real situations that contain ethical and professional issues for the actuary. Volunteer Fellows of the CAS facilitate small group discussions of four actual case studies. Due to the nature of this course, business attire is expected.

Although grades are not given for the Course on Professionalism, candidates must actively participate in order to receive credit. Successful completion of this course is required before a candidate can become a member of the Casualty Actuarial Society. Candidates are urged to register for this course when they have passed five or more CAS Examinations. [Eligibility for attendance is defined as having successfully completed five Associateship examinations (Parts 3A, 3B, and 3C comprise one examination, as do Parts 4A and 4B, and 5A and 5B).]

Dates for the CAS Course on Professionalism will be published in the newsletter *Future Fellows*. Registered candidates will receive a study book of required readings before the start of the course. Each course is limited to 60 participants; early registration is recommended. Facility information and course times will be provided upon registration.

## Waiver of Examinations for Associateship

Waiver of individual examination requirements will be granted by the CAS Board of Directors in instances where an applicant has passed or received credit for examinations sponsored by another recognized actuarial organization that cover 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 President-Admissions' recommendation will be guided by the policy established by the CAS Education Policy Committee.

The CAS generally will not grant waiver of all or any portion of its examination requirements for either work experience, contribution to 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 by participating in the examination process.

The Education Policy Committee has established the specific program outlined below that covers 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 Subject 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 equivalencies between the CAS *Syllabus* and the syllabi of each of the three aforementioned actuarial organizations. Waivers under this paragraph will be subject to an administrative fee of \$40 in U.S. funds (\$65 Canadian). This fee is payable by credit card (MasterCard, Visa, American Express, Diners Club, or Discover) or by check, draft, or money order payable to the Casualty Actuarial Society.

The CAS 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.

4. Credit for examination Part 5B will be granted to candidates who passed SoA Course 130/CAS Part 3b prior to November 1990. Waiver requests are not necessary. 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 (\$65 Canadian). Date of successful examination(s) and payment 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 candidate. The Vice President-Admissions will forward the request to the Education Policy Committee; its members will then review the request.

For those recognized actuarial organizations outside of the U.S. and Canada that have formal education requirements, but whose only means of qualification are through academic achievement, requests for waivers will be reviewed on a case-by-case basis. Each review will 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.

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## HINTS ON STUDY & EXAM TECHNIQUES

*Editor's Note: These hints do not include any material on which candidates will be examined, but are provided by members of the CAS Syllabus and Examination Committees to encourage candidates to do their best when sitting for CAS Examinations.*

*"Hints On Study & Exam Techniques" is largely based on the experience and advice of others and was originally prepared for Society of Actuaries candidates by James L. Clare. Later, it was adapted by G.D. Morison for use by CAS candidates and was updated in 1992. The CAS 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.*

### Motivation

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 CAS.

Motivation is increased by incentives, such as the following:

- Passing actuarial examinations 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 300 hours and fails the exam the first time. He or she then puts in a second 300 hours and passes the exam the second time. That candidate will have spent 600 hours, when by studying 400 hours the first time around, he or she would have saved 200 hours, not to mention passing one year 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 because substantial changes may be needed to switch from college or university life to successful study of actuarial examinations.

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.

By contrast, actuarial candidates must work a great deal on their own and generally must make a "long and grueling" journey to reach their goals. Much actuarial studying is normally fit in after a full day's work, or is done on a 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 (though 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, 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 that is more appealing and study that requires greater effort and concentration. Particularly demanding study may 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.

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 multiple-choice.

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 their driving skills until they become "second nature." This is easier to do if they keep practicing their driving in the days immediately after a lesson. 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 examinations on knowledge. However, they should remember that the best way to learn facts by heart is 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, candidates find gaps in their knowledge or in their understanding, they should bear down on those areas and master them.

Another study technique candidates might want to try is to test themselves as they go along. They can review previous examinations when they start to study to get an idea of the mastery of the *Syllabus* expected. Candidates can also take these as "trial examinations" 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, perhaps, 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 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*

Candidates can definitely improve their speed and mastery by seriously practicing on sample examination-type questions before the examination. It helps to have a good understanding of the subject material. Candidates can also develop valuable shortcuts, such as 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 speed up, or 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 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 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. This will allow the candidate to quickly return to these questions.

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 or formulae, then enter appropriate values. They should lay out complicated calculations in tables which demonstrate their understanding of the correct solution.

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.

If a candidate believes that a question is ambiguous, or that it does not provide all the information necessary to answer the question, the candidate should state how he or she interprets the question and/or what assumptions are made to answer 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 comes easily to them, gradually work into the questions they find more challenging, and end on a question that they think can be answered readily even though, by that time, their energy and concentration may be falling 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, with all their wits about them, and with an eager desire to do their best.

Some candidates fail in the first half-hour or so of an examination. Perhaps it would be more accurate to say they “defeat themselves” in that time. 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 bumbles 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 it is also true of actuarial examinations, 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 examinations 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 types 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 if 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 during the time they are studying. Rather, they should read such books as they wish, and decide for themselves a single, clear path to travel—and then stick to it.

# STUDY RESOURCES

## CAS Study Kits

Study Kits have been prepared to provide candidates with readings that are part of the *Syllabus of Examinations*. Study Kit Updates of the previous year’s Study Kits contain new material that has been added for the current year. Study Kits become available on December 1 for the subsequent year’s examinations. To order Study Kits, please use the form at the back of the *Syllabus*.

1999 Study Kits	Price		1999 Update to the 1998 Study Kits	Price	
	US\$	CAN\$		US\$	CAN\$
Part 3B	\$34	\$56			
Part 4A	\$18	\$32			
Part 4B	\$16	\$28			
Part 6	\$93	\$146			
Part 7-Canada	\$99	\$156	Part 7-Canada	\$19	\$33
Part 7-U.S.	\$95	\$149	Part 7-U.S.	\$17	\$30
Part 8-Canada	\$88	\$139	Part 8-Canada	\$36	\$59
Part 8-U.S.	\$78	\$123	Part 8-U.S.	\$18	\$32
Part 9	\$45	\$73	Part 9	\$22	\$38
Part 10	\$66	\$105			

Canadian residents must add 7% for GST; Virginia residents must add 4.5% sales tax. Residents outside North America should add 50% of the total cost for shipping. Candidates should check the Study Kits and Study Kit Updates for completeness (i.e., defective pages and/or omissions). **Please allow four to six weeks for delivery.**

**NO RETURNS, NO REFUNDS.**

## Sample Examination Questions

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 sample answers for essay questions on



Parts 5-10, are available at a charge of \$20 (\$35 Canadian). The most recent examinations with sample answers may be purchased at a cost of \$10 (\$19 Canadian) from the CAS Office. The sample essay answers are actual responses that have received credit and are illustrative of successful answers, although they may not be considered perfect answers. **NOTE:** Because sample answers are not available until July 30, 1999 for Spring Examinations and January 31, 2000 for Fall Examinations, the three-year set and the most recent examination packages will not be updated until these dates. Please use the white order forms provided inside the back cover of the *Syllabus*. **NO RETURNS, NO REFUNDS.**

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.

## CAS Library

The CAS Library has nearly all the books for the 1999 readings available for loan. All candidates registered for CAS Examinations and all members of the CAS 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. Requests must be in writing and must include the borrower's complete name, address, and telephone number. Address requests for books to:

Casualty Actuarial Society  
Library Service  
1100 North Glebe Road, Suite 600  
Arlington, VA 22201-4798  
Fax: (703) 276-3108  
Internet Address: [library@casact.org](mailto:library@casact.org)

The CAS Office ships the requested book(s) in North America via United Parcel Service (UPS) and internationally 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.

The few books that are not available through the CAS Library may be obtained by contacting the organizations listed in the "Index to Text References" in this *Syllabus*.

## CAS Publications

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 the U.S. or Canada, 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 single publication will receive a 20% discount. Pre-payment is required for all orders. Payment may be in U.S. or Canadian funds in the form of check, draft, or money order. Credit card payments (MasterCard, Visa, American Express, Diners Club, or Discover) will be processed in U.S. funds. Please use the white order form provided inside the back cover of the *Syllabus*. **Allow four to six weeks for delivery. NO RETURNS, NO REFUNDS.**

PUBLICATIONS	PRICES	
	US\$	CAN\$
<i>Proceedings of the Casualty Actuarial Society (PCAS)</i>		
Volume LXIX (1982)	\$50	\$81
Volume LXX (1983)	\$50	\$81
Volume LXXI (1984)	\$50	\$81
Volume LXXIII (1986)	\$50	\$81
Volume LXXIV (1987)	\$50	\$81
Volume LXXV (1988)	\$50	\$81
Volume LXXVI (1989)	\$50	\$81
Volume LXXVII (1990)	\$50	\$81
Volume LXXIX (1992)	\$50	\$81
Volume LXXXI (1994)	\$50	\$81
Volume LXXXII (1995)	\$50	\$81
Volume LXXXIII (1996)	\$50	\$81
Volume LXXXIV (1997)	\$50	\$81
<i>Index to the Literature of the Casualty Actuarial Society</i>		
Volumes XXXI to XL (1944-1953)	\$1	\$6
Volume XLI to L (See 1963 PCAS)	In the 1963 PCAS	
Volumes LI to LXXX (1964-1993)	\$30	\$50

PUBLICATIONS, Continued	PRICES	
	US\$	CAN\$
<i>Foundations of Casualty Actuarial Science</i> (Third Ed.)	\$75	\$119
<i>CAS Discussion Paper Programs</i>		
1984-Financial Solvency	\$30	\$50
1989-Valuation Issues	\$30	\$50
1991-International Topics, Global Insurance Pricing, Reserving, and Coverage Issues	\$30	\$50
1993-The Actuary as Business Manager	\$30	\$50
1995-Incorporating Risk Factors in Dynamic Financial Analysis	\$30	\$50
1996-Alternative Markets/Self Insurance	\$30	\$50
1997-Health Care Issues for Property/Casualty Insurers	\$30	\$50
1998-Dynamic Analysis of Pricing Decisions	\$30	\$50
<i>Casualty Actuarial Society Forum</i> (per volume)	@ \$30	@ \$50
<input type="checkbox"/> Fall 1987		<input type="checkbox"/> Summer 1994
<input type="checkbox"/> Spring 1988		<input type="checkbox"/> Fall 1995
<input type="checkbox"/> Fall 1988		<input type="checkbox"/> Winter 1996
<input type="checkbox"/> Spring 1989		<input type="checkbox"/> Spring 1996
<input type="checkbox"/> Fall 1989		<input type="checkbox"/> Summer 1996
<input type="checkbox"/> Winter 1991		<input type="checkbox"/> Winter 1997
<input type="checkbox"/> Fall 1991		<input type="checkbox"/> Spring 1997
<input type="checkbox"/> Spring 1992		<input type="checkbox"/> Summer 1997 (2 vols.)
<input type="checkbox"/> Winter 1993		<input type="checkbox"/> Winter 1998
<input type="checkbox"/> Summer 1993		<input type="checkbox"/> Summer 1998
<input type="checkbox"/> Winter 1994		<input type="checkbox"/> Fall 1998
<input type="checkbox"/> Spring 1994 (2 vols.)		<input type="checkbox"/> Winter 1999
1999 <i>Yearbook and Membership Listing by Employment Type</i>	\$40	\$65
<i>CAS Bibliographies</i>	\$15	\$27
Statement of Principles Regarding P&C Insurance Ratemaking	\$4	\$10
Statement of Principles Regarding P&C Loss and Loss Adjustment Expense Reserves	\$4	\$10
Statement of Principles Regarding P&C Valuations	\$4	\$10

## MATERIALS FOR STUDY

### Introduction

The *Syllabus* presents 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.

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* volumes, candidates are responsible only for those discussions reprinted in the Study Kits. [*Proceedings* for years that are still in print may be purchased from the CAS. Articles from the *CAS Proceedings*, *Forum*, and *Discussion Paper Program* that are out of print are included in the Study Kits.]

Information for ordering CAS Study Kits, sample examination questions, and CAS publications, and for using the CAS Library, is provided in the *Syllabus*.

A detailed identification of the text references cited in the examination part descriptions will be found in the "Index to Text References" at the end of each examination description and at the end of the *Syllabus*. The suggested reading materials are designed to acquaint candidates with the respective subjects and should not be interpreted as representing views endorsed by the CAS. Although the CAS Library has nearly all the 1999 readings available for loan, there are still a few that must be obtained by contacting the organizations listed in the "Index to Text References."

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.

### Key

**NEW** Indicates that the material is either an addition to the recommended readings or that there has been a material change to a previously included reading.

- SK** Represents material included in the 1999 CAS Study Kit.
- SKU** Represents new material included in both the 1999 CAS Study Kit *and* the 1999 Update to the 1998 CAS Study Kit.
- L** May be borrowed from the CAS Library.

## 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 traditionally 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:

- 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 their applications;
- The fundamental theorem of calculus;
- Partial derivatives, multiple integrals and their applications;
- Sequences and series, including the Taylor series expansion;
- Linear equations, vector spaces, bases (spanning sets), dimension and subspaces;
- Scalar products, linear transformations, and kernel and image space;
- Matrices, determinants, eigenvectors, and eigenvalues;
- Polar coordinates and parametric equations.

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SK = In the 1999 CAS Study Kit      L = May be borrowed from the CAS Library  
 SKU = In the 1999 Update to the 1998 CAS Study Kit      NEW = New or updated material

A short table of integrals will be provided. Copies of that table are available along with sample sets of questions in the *Preliminary Actuarial Exams* booklet.

Candidates who have not taken mathematics courses covering these 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

Anton, H., *Elementary Linear Algebra* (Seventh Edition), 1994.

Kolman, B., *Introductory Linear Algebra with Applications* (Sixth Edition), 1997.

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

Thomas, G.B. Jr.; and Finney, R.L., *Calculus and Analytic Geometry* (Ninth Edition), 1996.

Purcell, E.J.; and Varberg, D., *Calculus with Analytic Geometry* (Sixth Edition), Prentice-Hall, Inc.; telephone: (800) 374-1200.

Thomas, G.B. Jr.; and Finney, R.L., *Calculus and Analytic Geometry* (Ninth Edition), Addison-Wesley Publishing Co., Inc., Reading, MA, 01867.

### Index to Text References for Part 1

The following information is furnished for those who wish to purchase the text references cited above.

Actuarial Bookstore, P.O. Box 1229, Dover, NH, 03821-1229; telephone: (800) 582-9672, or (603) 692-5598, fax: (603) 692-5597. Credit card orders accepted.

Anton, H., *Elementary Linear Algebra*, John Wiley & Sons, One Wiley Drive, Somerset, NJ, 08875; telephone: (908) 469-4400, or (800) 225-5945.

Kolman, B., *Introductory Linear Algebra With Applications* (Sixth Edition), Macmillan, Inc. (This text is not available from the publisher, but may be purchased at many college bookstores.)

Mad River Books (A division of ACTEX Publications), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT, 06098; telephone: (800) 282-2839, fax: (860) 738-3152, e-mail: retail@actexamdriver.com.

SK = In the 1999 CAS Study Kit      L = May be borrowed from the CAS Library  
SKU = In the 1999 Update to the 1998 CAS Study Kit      NEW = New or updated material

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SKU = In the 1999 Update to the 1998 CAS Study Kit      NEW = New or updated material

## 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, method of moments, and the application of criteria such as consistency, unbiasedness, and minimum variance;

SK = In the 1999 CAS Study Kit      L = May be borrowed from the CAS Library  
SKU = In the 1999 Update to the 1998 CAS Study Kit      NEW = New or updated material

- Tests of statistical hypotheses, including power functions, Type I and Type II errors, Neyman-Pearson lemma, and likelihood ratio tests;
- Applications of sampling distributions to confidence intervals and to tests for means and variances;
- Regression and correlation;
- Method of least squares;
- Interpretation of experimental results;
- Bayesian estimation.

The CUPM has reported that statistics courses can be implemented in a variety of ways, and can include different topics with different emphases on these topics. 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**

Hoel, P.G.; Port, S.C.; and Stone, C.J., *Introduction to Probability Theory*, 1971, and *Introduction to Statistical Theory*, 1971. [Note: Out of print.]

Hogg, R.V.; and Craig, A.T., *Introduction to Mathematical Statistics* (Fifth Edition), 1995.

Hogg, R.V.; and Tanis, E.A., *Probability and Statistical Inference* (Fifth Edition), 1997.

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.

For candidates who would like additional reference and practice problems, study manuals are available from the Society of Actuaries.

An additional reference for candidates who may wish to acquire further insight into the underlying nature of statistics and exposure to statistical applications is:

SK = In the 1999 CAS Study Kit      L = May be borrowed from the CAS Library  
SKU = In the 1999 Update to the 1998 CAS Study Kit      NEW = New or updated material

Tanur, Mosteller, et al, *Statistics: A Guide to the Unknown* (Third Edition) 1989.

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

## Index to Text References for Part 2

The following information is furnished for those who wish to purchase the text references cited above.

Actuarial Bookstore, P.O. Box 1229, Dover, NH, 03821-1229; telephone: (800) 582-9672, or (603) 692-5598, fax: (603) 692-5597. Credit card orders accepted.

Hoel, P.G.; Port, S.C.; and Stone, C.J., *Introduction to Probability Theory and Introduction to Statistical Theory*, 1971, Houghton Mifflin Co., 2 Park Street, Boston, MA 02107, or 551 Fifth Ave., New York, NY, 10017; telephone: (800) 225-1464.

Hogg, R.V.; and Craig, A.T., *Introduction to Mathematical Statistics* (Fifth Edition), Prentice-Hall, Inc.; telephone: (800) 374-1200.

Mad River Books (A division of ACTEX Publications), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT, 06098; telephone: (800) 282-2839, fax: (860) 738-3152, e-mail: retail@actexamdriver.com.

Mood, A.M.; Graybill, F.A.; and Boes, D.C., *Introduction to the Theory of Statistics* (Third Edition), McGraw-Hill Book Co., 1221 Avenue of the Americas, New York, NY, 10036.

Spiegel, M.R., *Statistics: 975 Problems* (Second Edition), (Schaums Outline Series), McGraw-Hill Book Co., 860 Taylor Station Road, Blacklick, OH 43004; telephone: (800) 262-4729.

Tanur; Mosteller; Kruskal; Link; Pieters; and Rising, *Statistics: A Guide to the Unknown*, Wadsworth, Inc., 7625 Empire Drive, Florence, KY, 41042; telephone: (800) 354-9706; or ITP Nelson, 1120 Birchmont Road, Scarborough, Ontario, M1K 5G4, Canada; telephone: (416) 752-9448.

## 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 (847) 706-3525.

The "Index to Text References" for Part 3 is located after the description of Part 3C.

SK = In the 1999 CAS Study Kit      L = May be borrowed from the CAS Library  
SKU = In the 1999 Update to the 1998 CAS Study Kit      NEW = New or updated material

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## 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

Pindyck, R.; and Rubinfeld, D., *Econometric Models and Economic Forecasts* (Fourth Edition), 1998, Chapters 1, 3-7, 15-19.

Study notes and sample examinations are available from the Society of Actuaries. Candidates are encouraged to review the regression material in any of the texts used for Part 2 (SoA Course 110) for additional background.

## Part 3B Introduction to Property and Casualty Insurance

Prior to commencing study for this 90-minute examination, candidates should read the introduction and key to "Materials for Study" on pages 41-42 of this *Syllabus*. Items marked with a bold **SK** constitute the 1999 CAS Study Kit which is available from the CAS Office for a cost of \$34 (\$56 Canadian). There are no changes from the 1998 to the 1999 Study Kit. Any previously purchased 1998 Study Kit—or Study Kit and Update combination for 1998—will be valid for the 1999 examination.

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. policy forms included in the 1999 Study Kit. Candidates will not be held responsible for the associated endorsements. 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 that make it critical to the success of the endeavor. Actuaries will often work closely with underwriters as part of their day-to-day operations. Candidates should know what the underwriting function is—its basic purpose, principles, and activities.

Product design and product modification are areas in an insurance company's operations where an actuary may become involved with the marketing function of the 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 (800) 644-2101.

### Readings

- L** Wiening, E.A.; and Malecki, D.S., *Insurance Contract Analysis* (First Edition), American Institute for Chartered Property Casualty Underwriters, 1992, pp. 4-30, 37-91, 110-121, 125-135, 319-358, and 373-382.
- L** 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** 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.
- L** 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, Vol. I (1995), pp. 1-33, 71-152, 165-207; Vol. II (1996), pp. 1-60. **NOTE:** Vol. I is available in a fourth edition; please specify the **third edition** when ordering.
- 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.

\* Use 1st edition

SK = In the 1999 CAS Study Kit L = May be borrowed from the CAS Library  
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- 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** 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.
- L** Webb, B.L.; Harrison, C.M.; and Markham, J.J., *Insurance Operations* (Second Edition), American Institute for Chartered Property Casualty Underwriters, 1997, Vol. I, Chapters 1-4; Vol. II, Chapters 10, 11, and pp. 199-246.
- L** 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.
- SK** 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** 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. 432-444.
- SK** Insurance Services Office, Inc.:
- Personal Automobile Policy (Edition 6-94);
  - Personal Automobile Manual (Effective 6-94), General Rules 1-6;
  - Homeowners Policy, HO-3 (Edition 4-91);
  - Commercial General Liability Policy:
    - Occurrence (Edition 1-96);
    - Claims-Made (Edition 1-96).
- SK** National Council on Compensation Insurance:
- Workers' Compensation Policy (Edition 4-92);
  - Basic Manual of Workers' Compensation and Employers Liability Insurance (Effective 4-96), Rules I, II, IV-VIII.

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## 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, multiple-choice examination is indicated by the following topics:

- Iteration, Interpolation;
- Numerical integration;
- Linear systems.

### Readings

Burden, R.L.; and Faires, J.D., *Numerical Analysis* (Sixth Edition), 1997, Chapters 1 (Sections 1.1-1.3), 2 (Sections 2.1-2.5), 3 (Sections 3.1, 3.2, 3.4), 4 (Sections 4.3-4.6), and 6 (Sections 6.1-6.6). Note: Candidates may use the fifth edition, same chapters as listed for the sixth edition.

Study notes and sample examinations are available from the Society of Actuaries.

### Index to Text References for Part 3

The following information is furnished for those who wish to purchase the text references cited for Part 3.

Actuarial Bookstore, P.O. Box 1229, Dover, NH 03821-1229; telephone: (800) 582-9672, or (603) 692-5598, fax: (603) 692-5597. Credit card orders accepted.

- 3B American Institute for Chartered Property Casualty Underwriters, Order Department: P.O. Box 3016, Malvern, PA, 19355-0716; telephone: (610) 644-2100, fax: (610) 640-9576.

- 3B Brown, Robert L., *Introduction to Ratemaking and Loss Reserving for Property and Casualty Insurance*, Mad River Books (A division of ACTEX Publications), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT, 06098; telephone: (800) 282-2839, fax: (860) 738-3152, e-mail: retail@actexmadriver.com.
- 3C Burden, R.L.; and Faires, J.D., *Numerical Analysis* (Sixth Edition), PWS Publishers, 20 Park Plaza, Boston, MA, 02116.
- 3B Insurance Services Office, 7 World Trade Center, New York, NY, 10048; telephone: (800) 888-4476.
- 3B *Journal of Insurance Regulation*, National Association of Insurance Commissioners, 120 W. 12th Street, #1100, Kansas City, MO, 64105; telephone: (816) 842-3600.
- Mad River Books (A division of ACTEX Publications), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT, 06098; telephone: (800) 282-2839, fax: (860) 738-3152, e-mail: retail@actexmadriver.com.
- 3B National Council on Compensation Insurance, 750 Park of Commerce Drive, Boca Raton, FL, 33487; telephone: (800) NCCI-123.
- 3A Pindyck, Robert; and Rubinfeld, Daniel, *Econometric Models and Economic Forecasts* (Fourth Edition), 1998, McGraw-Hill Book Co., Manchester Road, Manchester, MO, 63011; telephone: (212) 512-4100.
- 3A, 3C Society of Actuaries, Suite 800, 475 N. Martingale Road, Schaumburg, IL, 60173-2226; telephone: (847) 706-3500.

## 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. The "Index to Text References" for Part 4 is located after the description of Part 4B.

### Part 4A Interest and Life Contingencies

Prior to commencing study for this two-hour examination, candidates should read the introduction and key to "Materials for Study" on pages 41-42 of this *Syllabus*. Items marked with a bold **SK** constitute the 1999 CAS Study Kit which is available from the CAS Office for a cost of \$18 (\$32 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;
- multiple decrement models; and
- stationary populations.

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SKU = In the 1999 Update to the 1998 CAS Study Kit      NEW = New or updated material

#### *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.
- L** Parmenter, M.M., *The Theory of Interest and Life Contingencies with Pension Applications: A Problem-Solving Approach* ~~2<sup>nd</sup>~~ (Revised Edition), 1988, Chapters 1-4, 7, and 8 (8.1). Mad River Books. This reference relates to the revised edition, as noted on the front cover and the title page.
- L** Bowers, N.L.; Gerber, H.U.; Hickman, J.C.; Jones, D.A.; and  
**NEW** Nesbitt, C.J., *Actuarial Mathematics* (Second Edition), 1997, Chapters 3 (all sections except 3.6), 4 (4.1-4.3), 5 (5.1-5.3), 6 (6.1-6.3), 7 (7.1-7.4), 9 (9.1-9.5, 9.7), and 10 (10.1-10.3). Society of Actuaries.
- SK** Snader, R.H., "Reserving Long Term Medical Claims," *PCAS* LXXIV, 1987, pp. 322-353.

*\*3<sup>rd</sup> edition can be used same citations*

SK = In the 1999 CAS Study Kit      L = May be borrowed from the CAS Library  
SKU = In the 1999 Update to the 1998 CAS Study Kit      NEW = New or updated material

## Part 4B Credibility Theory and Loss Distributions

Prior to commencing study for this two-and-one-half-hour examination, candidates should read the introduction and key to "Materials for Study" on pages 41-42 of this *Syllabus*. Items marked with a bold **SK** constitute the 1999 CAS Study Kit which is available from the CAS Office for a cost of \$16 (\$28 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*

- L** 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).
- L** Herzog, T.N., *Introduction to Credibility Theory* (Second Edition), 1996, Chapters 1, 2, 4-6, 8-10. Mad River Books. 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 LXVIII*, 1981, pp. 195-212.

*can use 2nd edition w/ same citations*

SoA Study Note, "An Introduction to Stochastic Simulation" (Code: 130-33-86), available from the Society of Actuaries.

- L** 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 1999 Study Kit [**SK**].

**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.**

### Index to Text References for Part 4

The following information is furnished for those who wish to purchase the text references cited for Part 4.

- Actuarial Bookstore, P.O. Box 1229, Dover, NH, 03821-1229; telephone: (800) 582-9672, or (603) 692-5598, fax: (603) 692-5597. Credit card orders accepted.
- 4A** Bowers, N.L.; Gerber, H.U.; Hickman, J.C.; Jones, D.A.; and Nesbitt, C.J., *Actuarial Mathematics* (Second Edition), 1997, Society of Actuaries, P.O. Box 95668, Chicago, IL, 60694.
- Casualty Actuarial Society *Forum*, *PCAS*, and *Discussion Paper Program*, 1100 N. Glebe Road, Suite 600, Arlington, VA, 22201-4798; telephone: (703) 276-3100, fax: (703) 276-3108; e-mail: office@casact.org.
- 4B** Herzog, T.N., *Introduction to Credibility Theory*, 1996, Mad River Books (A division of ACTEX Publications), 140 Willow Street, P.O. Box 974, Winsted, CT, 06098; telephone: (800) 282-2839, fax: (860) 738-3152; e-mail: retail@actexamdriver.com.

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- 4B Hogg, R.V.; and Klugman, S.A., *Loss Distributions*, John Wiley & Sons, One Wiley Drive, Somerset, NJ, 08875; telephone: (908) 469-4400, or (800) 225-5945.
- 4B Hossack, I.B.; Pollard, J.H.; and Zehnwirth, B., *Introductory Statistics with Applications in General Insurance*, Cambridge University Press, 32 East 57th Street, New York, NY, 10022; telephone: (800) 872-7423.
- 4A Parmenter, M.M., *The Theory of Interest and Life Contingencies with Pension Applications: A Problem-Solving Approach* (Revised Edition), Mad River Books (A division of ACTEX Publications), 140 Willow Street, P.O. Box 974, Winsted, CT, 06098; telephone: (800) 282-2839, fax: (860) 738-3152; e-mail: retail@actexamdriver.com.
- 4B Society of Actuaries, Suite 800, 475 N. Martingale Road, Schaumburg, IL, 60173-2226; telephone: (847) 706-3500.

## 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. The "Index to Text References" for Part 5 is located after the description of Part 5B.

## 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 introduction and key to "Materials for Study" on pages 41-42 of this *Syllabus*. 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*

- L Landsburg, Steven E., *Price Theory and Applications* (Third Edition), 1995, Chapters 1, 3-5, 7, 8.1 (pp. 239-275), 9-14, and 18 (excl. 18.3 and 18.4). [Or candidates may use the fourth edition with the following citations: Landsburg, Steven E., *Price Theory and Applications* (Fourth Edition), 1998, Chapters 1, 3 (excluding Appendix), 4, 5, 7, 8 (pp. 241-276), 9-14, and 18 (excl. 18.3 and 18.4).]

Wachtel, P., *Macroeconomics*, Second Printing, 1991, SoA Course 220 Study Note, Chapters I-VI, available from the Society

of Actuaries. **NOTE:** Candidates must specify the 1991 edition when ordering through the SoA. (A 1997 edition is available that will not be applicable to the 1999 CAS Examinations.) The Study Note number for the correct edition is #220-28-91.

### ***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**

- L Bowers, N.L.; Gerber, H.U.; Hickman, J.C.; Jones, D.A.; and Nesbitt, C.J., *Actuarial Mathematics* (Second Edition), 1997, Chapters 2, 12.
- L Daykin, C.D.; Pentikäinen, T.; Pesonen, M., *Practical Risk Theory for Actuaries*, 1994, Chapters 1, 6.1, 6.2, 6.3, 6.6.

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## **Part 5B Finance**

Part 5B is being offered as a two-hour examination. Prior to commencing study for this examination, candidates should read the introduction and key to "Materials for Study" on pages 41-42 of this *Syllabus*.

#### **Readings**

- L Brealey, R.A.; and Myers, S.C., *Principles of Corporate Finance* (Fifth Edition), 1996, Chapters 3 (3-5), 4, 5 (excluding 5-6), 6 (6-1), 7-9, 12 (12-3, 12-4, 12-5), 13, 14, 17-21, 23, 27, 34; including Appendices except for Chapters 5, 9, and 18. While candidates will not be tested on Chapters 1-3 (except 3-5), 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.

#### **Index to Text References for Part 5**

The following information is furnished for those who wish to purchase the text references cited for Part 5.

Actuarial Bookstore, P.O. Box 1229, Dover, NH, 03821-1229; telephone: (800) 582-9672, or (603) 692-5598, fax: (603) 692-5597. Credit card orders accepted.

- 5A Bowers, N.L.; Gerber, H.U.; Hickman, J.C.; Jones, D.A.; and Nesbitt, C.J., *Actuarial Mathematics* (Second Edition), 1997, Society of Actuaries, P.O. Box 95668, Chicago, IL, 60694.
- 5B Brealey, R.A.; and Myers, S.C., *Principles of Corporate Finance* (Fifth Edition), McGraw-Hill Inc., 860 Taylor Station Road, Blacklick, OH 43004; telephone: (800) 262.4729.
- 5A Daykin, C.D.; Pentikäinen, T.; and Pesonen, M., *Practical Risk Theory for Actuaries*, First Edition, 1994, Chapman and Hall; telephone: (800) 634-7064.
- 5A Landsburg, Steven E., *Price Theory and Applications* (Fourth Edition), International Thompson Publishing, Order Department, P.O. Box 6904, Florence, KY 41022; telephone: (800) 347-7707.

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Mad River Books (A division of ACTEX Publications), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT, 06098; telephone: (800) 282-2839, fax: (860) 738-3152, e-mail: retail@actexamdriver.com.

Society of Actuaries, Suite 800, 475 N. Martingale Road, Schaumburg, IL, 60173-2226; telephone: (847) 706-3500.

## Part 6 Principles of Ratemaking and Data for Ratemaking

Prior to commencing study for this four-hour examination, candidates should read the introduction and key to "Materials for Study" on pages 41-42 of this *Syllabus*. Items marked with a bold **SK** constitute the 1999 CAS Study Kit which is available from the CAS Office for a cost of \$93 (\$146 Canadian).

### *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, 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 following list of topics is typical of those that candidates should be prepared to discuss:

- 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; and
  - 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; and
  - 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

- L** McClenahan, C.L., "Ratemaking," *Foundations of Casualty Actuarial Science* (Third Edition), Casualty Actuarial Society, 1996, Chapter 2, pp. 25-90.
- L** Finger, R.J., "Risk Classification," *Foundations of Casualty Actuarial Science*, (Third Edition), Casualty Actuarial Society, 1996, Chapter 5, pp. 233-281.
- 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 = In the 1999 CAS Study Kit      L = May be borrowed from the CAS Library  
 SKU = In the 1999 Update to the 1998 CAS Study Kit      NEW = New or updated material

- 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** 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; Uthhoff, D.R., *PCAS* LVII, 1970, pp. 18-22; Walters, M.A., *PCAS* LVII, 1970, pp. 22-26.
- SK** 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.
- SK** Study Note Reading: Head, G.L., *Insurance to Value*, Chapters 1, 2, 6, and 7, and Appendices 1-4 (reproduced with permission of Huebner Foundation).
- SK** Kelley, R., "Homeowners Insurance to Value—An Update," *Casualty Actuarial Society Forum* including the Ratemaking Call Papers, 1994, pp. 529-562.
- SK** Homan, Mark J., "Homeowners Insurance Pricing," *Pricing Issues*, Casualty Actuarial Society *Discussion Paper Program*, 1990, Vol. II, pp. 719-780.
- SK** Brockmeier, D., "Homeowners Premium Trend," *Casualty Actuarial Society Forum*, Including the Ratemaking Call Papers, 1994, pp. 439-484.
- SK** Study Note Reading: Burger, G.; Fitzgerald, B.; Woods, P.; and White, J., "Incorporating a Hurricane Model into Property Ratemaking," omitting pages 42-53. Examination questions will not be based directly on the Appendix and Glossary, which were included in this Study Note for completeness.
- SK** Feldblum, S., "Personal Automobile Premiums: An Asset Share Pricing Approach for Property-Casualty Insurance," *PCAS* LXXXIII, 1996, pp. 190-296.

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upto p.36

- SK** Study Note Reading: Feldblum, S., "Workers' Compensation Ratemaking," September 1993. Examination questions will not be based directly on the appendices, which were included in this Study Note for completeness.
- 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** 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.
- SK** Study Note Reading: "Deductibles, Excess Covers, and Coinsurance Clauses," *Casualty Contingencies* (Exposure Draft), Chapter 13.
- 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.
- L** Tiller, M.W., "Individual Risk Rating," *Foundations of Casualty Actuarial Science* (Third Edition), Casualty Actuarial Society, 1996, Chapter 3, pp. 91-141.
- SK** Study Note Reading: Tiller, M.W., "Individual Risk Rating."
- L** D'Arcy, S.P., "Investment Issues in Property Liability Insurance," *Foundations of Casualty Actuarial Science*, (Third Edition) Casualty Actuarial Society, 1996, Chapter 8, pp. 531-538.
- 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"  
*Pages were replaced & added at the end*  
*18 & 19* *20-24*

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- SK** Study Note Reading: "Experience Rating and Funding Methods."
- SK** Study Note Reading: "Group Medical/Dental Benefit Pricing."
- SK** Study Note Reading: "Causes and Effects of Inflationary Trends in 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."
- SK** Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice No. 25, Credibility Procedures Applicable to Accident and Health, Group Term Life, and Property/Casualty Coverages."

**B. Data for Ratemaking**

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

Candidates should be familiar with the kinds of data captured in the data collection plans discussed. Candidates must also be able to compare the different plans and note limitations and possible areas of improvement. The relationship to the various ratemaking techniques should be noted.

**Readings**

- SK** Study Note Reading: Prevosto, V.R., "Study Note: ISO Statistical Plans."
- SK** Study Note Reading: Moncher, R.B., "Study Note: NCCI Data Collection Calls and Statistical Plans." Examination questions will not be taken from the history section which was included to emphasize the changing nature of data collection activities over time.

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

## Index to Text References for Part 6

The following information is furnished for those who wish to purchase the text references cited for Part 6.

Actuarial Bookstore, P.O. Box 1229, Dover, NH, 03821-1229; telephone: (800) 582-9672, or (603) 692-5598, fax: (603) 692-5597. Credit card orders accepted.

Casualty Actuarial Society *Forum*, *PCAS*, and *Discussion Paper Program*, 1100 N. Glebe Road, Suite 600, Arlington, VA, 22201-4798; telephone: (703) 276-3100, fax: (703) 276-3108; e-mail: office@casact.org.

*Foundations of Casualty Actuarial Science*, Casualty Actuarial Society, 1100 N. Glebe Road, Suite 600, Arlington, VA, 22201-4798; telephone: (703) 276-3100; e-mail: office@casact.org.

Head, G.L., *Insurance to Value*, Richard D. Irwin, Inc., 1818 Ridge Road, Homewood, IL, 60430.

Mad River Books (A division of ACTEX Publications), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT, 06098; telephone: (800) 282-2839, fax: (860) 738-3152, e-mail: retail@actexamdriver.com.

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## Part 7 Premium, Loss, and Expense Reserves; Insurance Accounting, Expense Analysis, and Published Financial Information

Prior to commencing study for this four-hour examination, candidates should read the introduction and key to "Materials for Study" on pages 41-42 of this *Syllabus*. Items marked with a bold **SK** or **SKU** constitute the 1999 CAS Study Kit. The 7C Study Kit is available from the CAS Office for a cost of \$99 (\$156 Canadian); the 7US Study Kit costs \$95. The 1999 Update to the 1998 CAS Study Kit includes the items marked with a bold **SKU**; the 7C Update costs \$19 (\$33 Canadian); the 7US Update costs \$17.

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; and
  - c. For all incurred claims.

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- 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; and
  - 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; and
  - 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; and
  - d. Deposit premium policies.
- Allocated loss expense reserves.
- Unallocated loss expense reserves.
- Statutory Annual Statement reserves.

Candidates should have a conceptual knowledge of Dynamic Financial Analysis models and their application in evaluating balance sheet adequacy.

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 their answers. While the readings for this part provide the basic factual information necessary, practical experience has often proved helpful in successfully completing the examination.

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## Readings

### 1. Core

#### Reserving Techniques

- L**      Wiser, R.F., "Loss Reserving," *Foundations of Casualty Actuarial Science* (Third Edition), Casualty Actuarial Society, 1996, Chapter 4, pp. 143-232.
- SK**      Brosius, E., "Loss Development Using Credibility," March 1993.
- 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.
- SK**      Bouska, A.S.; and McIntyre, T.S., "Measurement of U.S. Pollution Liabilities," *Casualty Actuarial Society Forum*, Summer 1994 Edition, pp. 73-160. Candidates will not be held responsible for material in appendices E through H.
- SK**      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.
- SK**      Berquist, J.R.; and Sherman, R.E., "Loss Reserve Adequacy Testing: A Comprehensive, Systematic Approach," *PCAS LXIV*, 1977, pp. 123-184. Including discussion of paper: Thorne, J.O., *PCAS LXV*, 1978, pp. 10-33.

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- 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.
- SK** 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; Peck, E.F., *PCAS* LXXXII, 1995, pp. 104-120.
- SK** 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, pp. 134-148.
- SK** Siewert, J.J., "A Model for Reserving Workers Compensation High Deductibles," *Casualty Actuarial Society Forum*, Summer 1996, pp. 217-244.
- L** 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** Perkins, M.; Teng, M.T.S., "Estimating the Premium Asset on Retrospectively Rated Policies."
- SK** Linquanti, 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.
- SK** Johnson, W.A., "Determination of Outstanding Liabilities for Unallocated Loss Adjustment Expenses," *PCAS* LXXVI, 1989, pp. 111-125. Corrections to Exhibits 2-5 are included.

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- 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 and Casualty Loss and Loss Adjustment Expense Reserves*, May 1988.
- SK** Actuarial Standards Board of American Academy of Actuaries, "Actuarial Standard of Practice No. 9, Documentation and Disclosure in Property and Casualty Insurance Ratingmaking, Loss Reserving, and Valuations (Doc. No. 027)," 1991. Excluding Appendices 1 and 3.
- SKU** Committee on Property and Liability Financial Reporting, American Academy of Actuaries, "Property and Casualty Practice Note 1997 Statements of Actuarial Opinion on P & C Loss Reserves as of December 31, 1997."

### **Discounting**

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

### **Dynamic Financial Analysis**

- SK** Warthen, T.V., III; Sommer, D.B., "Dynamic Financial Modeling—Issues and Approaches," *Casualty Actuarial Society Forum*, Spring 1996, pp. 291-328.

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

#### **Reserving Techniques**

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

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### **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, "Provision for Adverse Deviations—Property & Casualty Insurance Companies," November 1993.
- SK** Canadian Institute of Actuaries, "Educational Notes on the Application of the Standard of Practice Concerning Provision for Adverse Deviation," November 1994.

### **Discounting**

- SK** Committee on Reserves of the Casualty Actuarial Society, "Risk Margins for Discounted Loss Reserves," *Casualty Actuarial Society Forum*, Winter 1991, pp. 139-160.
- SK** Canadian Institute of Actuaries, "Educational Notes on Discounting," November 1994.

### **3. Canadian Specific**

#### **Reserving Techniques**

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

#### **Standards of Practice and Actuarial Opinions**

- SKU NEW** Office of the Superintendent of Financial Institutions Canada, "1997 Instructions for the Actuary's Report on Property and Casualty Insurance Business."
- SK** Canadian Institute of Actuaries, "Joint Policy Statement," 1991.
- SKU NEW** Canadian Institute of Actuaries, "Appointed Actuary Compliance Questionnaire for Property-Casualty Insurance Company Financial Reporting in Canada, 1997 Fiscal Year-End," December 1997.
- SK** Canadian Institute of Actuaries, "Recommendations for Property-Casualty Insurance Company Financial Reporting." January 1990.

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- SK** Canadian Institute of Actuaries, "Standard of Practice for the Appointed Actuary of an Insurance Company," June 1992.
- SKU NEW** Canadian Institute of Actuaries, "The Appointed Actuary's Report for Insurance Company Published Financial Statements," Revised December 1997.
- SK** Canadian Institute of Actuaries, "Provision for Adverse Deviations—Property & Casualty Insurance Companies," November 1993.
- SK** Canadian Institute of Actuaries, "Educational Notes on the Application of the Standard of Practice Concerning Provision for Adverse Deviation," November 1994.

### **Discounting**

- SK** Canadian Institute of Actuaries, "Educational Notes on Discounting," November 1994.
- L** 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.
- L** 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

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Insurance Commissioners (NAIC). The NAIC instructions may be purchased from the NAIC. Both instructions may also be borrowed from the CAS Library at no charge.

Candidates should understand the details of, and reasons for, the differences between the accounting methods employed under statutory and Generally Accepted Accounting Principles (GAAP) accounting. Candidates should also understand the differences between the statistics included in these reports and those used for ratemaking and the various types of experience analysis. 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

- L** 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.
- L** *Official NAIC Annual Statement Blanks, Property and Casualty, 1998* (both individual and consolidated basis), pp. 2-13, 15; Notes 13-19, 21-23, 27; Schedules D (exclude DA, DB, and DC), 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.
- SK** Feldblum, S., "Selected Notes to the Fire and Casualty Annual Statement" (Fourth Edition), September 1997.
- SK** Feldblum, S., "Direct Charges and Credits to Surplus" (Third Edition), January 1997.
- SK** Feldblum, S., "Reinsurance Accounting: Schedule F" (Fifth Edition), October 1997.

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- SK** Feldblum, S., "Completing and Using Schedule P" (Third Edition), January 1996, including errata.
- SK** American Institute of Certified Public Accountants, *Audits of Property and Liability Insurance Companies*, 1993, Chapter 8.
- SK** Financial Accounting Standards Board, "Statement of Financial Accounting Standards No. 5—Accounting for Contingencies," Paragraphs 1-4, 8-11, 15, 40-45.
- 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.
- SK** Almagro, M.; and Ghezzi, T.L., "Federal Income Taxes—Provisions Affecting Property/Casualty Insurers," *PCAS* LXXV, 1988, pp. 95-161.
- SK** Feldblum, S., "Selected Exhibits from the Canadian Annual Statement," February 1996.
- L** Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (Sixth Edition), 1994, Appendix D, pages D12, D13, D20, D21, D22 (Canadian Annual Statement Exhibits).

#### Expense Analysis

- L/NEW** 1998 Insurance Expense Exhibit.
- SK** Feldblum, S., "The Insurance Expense Exhibit and the Allocation of Investment Income" (Fifth Edition), May 1997.
- L** Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (Sixth Edition), 1994, Chapter 9.
- L** New York State Regulations, Title 11, 1963, Parts 105-109 (Regulation 30).
- L** Insurance Accounting and Systems Association, "Uniform Classification of Expenses for Property and Liability Insurance Companies," *Proceedings* 1979, pp. 290-292.

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## Published Financial Information

- L D'Arcy, S.P., "Special Issues—Data Sources," *Foundations of Casualty Actuarial Science* (Third Edition), Casualty Actuarial Society, 1996, Chapter 9, pp. 567-573.

## 2. Canadian Specific

### Insurance Accounting

- L Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (Sixth Edition), 1994, Chapters 3, 6-8, 10-12, 18.
- L KPMG Peat Marwick Thorne, *The Property & Casualty Insurance Industry in Canada*, 1992, excluding Appendix A.
- 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.
- L **NEW** *Official NAIC Annual Statement Blanks, Property and Casualty*, 1998 (both individual and consolidated basis), pp. 2-4, 6-12, Schedules F and P.
- SK Feldblum, S., "Direct Charges and Credits to Surplus" (Third Edition), January 1997.
- SK Feldblum, S., "Reinsurance Accounting: Schedule F" (Fifth Edition), October 1997.
- SK Feldblum, S., "Completing and Using Schedule P" (Third Edition), January 1996.
- SK Almagro, M.; and Ghezzi, T.L., "Federal Income Taxes—Provisions Affecting Property/Casualty Insurers," *PCAS LXXV*, 1988, pp. 95-161.
- L **NEW** 1998 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, 65.xx, 67.xx, 70.10-70.35, 80.xx, 99.10.
- L **NEW** 1998 Uniform Annual Return approved by the Canadian Council of Insurance Regulators—P&C-2, pp. 10.40-10.42, 10.60, 20.10-20.45, 30.xx (all), 40.10, 40.90, 60.xx, 65.xx, 67.xx, 70.xx, 80.xx.

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- L Canadian Council of Insurance Regulators, *Annual Statement Instructions P&C-1*, Sections I, III, IV, VI, VIII, IX (b), IX (e), IX (f).
- L Canadian Council of Insurance Regulators, *Annual Statement Instructions P&C-2*, Sections I, III, IV, VI, VIII, IX (b), IX (e).
- SK Feldblum, S., "Selected Exhibits from the Canadian Annual Statement," February 1996.
- SK Potvin, R., "Reinsurance (Canadian Companies) Regulations, and Reinsurance (Foreign Companies) Regulations," CAS Study Note, 1995.
- SK Potvin, R., "Accounting for Reinsurance in P&C-1 and P&C-2," CAS Study Note, 1995.
- SK CICA/CIA, *Communications Between the Actuary and the Auditor*, December 1994.
- SK Potvin, R., "Minimum Asset Tests," CAS Study Note, 1995.

### Expense Analysis

- L/NEW 1998 Insurance Expense Exhibit.
- SK Feldblum, S., "The Insurance Expense Exhibit and the Allocation of Investment Income" (Fifth Edition), May 1997.
- L Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (Sixth Edition), 1994, Chapter 9.
- L **NEW** Insurance Council of Canada, Direct Expense Report, Instructions, Forms and Results.

### Published Financial Information

- SK Doherty, S., "Sources of Financial Information of Canadian P&C Companies," CAS Study Note, 1995.

## Index to Text References for Part 7

The following information is furnished for those who wish to purchase the text references cited for Part 7.

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American Institute of Certified Public Accountants, 1211 Avenue of the Americas, New York, NY, 10036; telephone: (212) 318-0500.

American Institute for Chartered Property Casualty Underwriters, Order Department: P.O. Box 3016, 720 Providence Road, Malvern, PA, 19355-0716; telephone: (610) 644-2100, fax: (610) 640-9576.

*Association Form of the 1998 Annual Statement Blanks*, John S. Swift Co., Route 46, Teterboro, NJ, 07608; telephone: (201) 288-2050.

Canadian Institute of Actuaries, Secretariat, Suite 820, 360 Albert Street, Ottawa, Ontario, K1R 7X7, Canada; telephone: (613) 236-8196, fax: (613) 233-4552; Web site: [www.actuaries.ca](http://www.actuaries.ca).

Casualty Actuarial Society *Forum*, PCAS, and *Discussion Paper Program*, 1100 N. Glebe Road, Suite 600, Arlington, VA, 22201-4798; telephone: (703) 276-3100, fax: (703) 276-3108; e-mail: [office@casact.org](mailto:office@casact.org).

Financial Accounting Standards Board, 401 Merret 7, P.O. Box 5116, Norwalk, CT, 06856-5116; telephone: (203) 847-0700.

*Foundations of Casualty Actuarial Science*, Casualty Actuarial Society, 1100 N. Glebe Road, Suite 600, Arlington, VA, 22201-4798; telephone: (703) 276-3100; e-mail: [office@casact.org](mailto:office@casact.org).

Insurance Accounting and Systems Association, *Property-Casualty Insurance Accounting* (Sixth Edition), 1994, IASA Fulfillment Center, 6001 Chapel Hill Road, Suite 112, Raleigh, NC, 27607; telephone: (919) 489-0991.

Insurance Council of Canada (formerly the Insurance Bureau of Canada), 151 Yonge Street, Suite 1800, Toronto, Ontario, M5C 2W7, Canada; telephone: (416) 362-2031; fax: (416) 361-5952; Web site: [www.ibc.ca](http://www.ibc.ca).

Insurance Expense Exhibit, 1998, John S. Swift Co., Route 46, Teterboro, NJ, 07608; telephone: (201) 288-2050.

*Journal of Insurance Regulation*, National Association of Insurance Commissioners, 120 W. 12th Street, #1100, Kansas City, MO, 64105; telephone: (816) 842-3600.

Mad River Books (A division of ACTEX Publications), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT, 06098; telephone: (800) 282-2839, fax: (860) 738-3152, e-mail: [retail@actexmadriver.com](mailto:retail@actexmadriver.com).

National Association of Insurance Commissioners, 120 W. 12th Street, #1100, Kansas City, MO, 64105; telephone: (816) 842-3600.

New York (State) Insurance Department, Publications Unit, Agency Building 1, Empire State Plaza, Albany, NY, 12257; telephone: (518) 474-1203.

## 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 introduction and key to “Materials for Study” on pages 41-42 of this *Syllabus*. Items marked with a bold **SK** or **SKU** constitute the 1999 CAS Study Kit. The 8C Study Kit is available from the CAS Office for a cost of \$88 (\$139 Canadian); the 8US Study Kit costs \$78. The 1999 Update to the 1998 CAS Study Kit includes the items marked with a bold **SKU**; the 8C Update costs \$36 (\$59 Canadian); the 8US Update costs \$18.

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 from several source readings which will be available by January 15. References for these source readings will be placed in the Students’ Corner of the CAS Web Site and will be included in the *Notice of Examinations*. The readings will be included in the CAS Part 8 Study Kit and Update after January 15. (An addendum will be sent to candidates who had previously purchased the 1999 CAS Part 8 Study Kit or Update). To obtain a copy, candidates may contact the CAS Office.

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● = U.S. material    ◆ = Canadian material  
SK = In the 1999 CAS Study Kit                              L = May be borrowed from the CAS Library  
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#### 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 automobile insurance, candidates should be aware of the different legal environments presented by different states/provinces including financial responsibility or compulsory insurance laws and various involuntary market mechanisms.

The large variety of individually tailored state or provincial laws in workers compensation makes this area particularly complex, but 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.

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● = U.S. material    ◆ = Canadian material  
SK = In the 1999 CAS Study Kit                              L = May be borrowed from the CAS Library  
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## Classification Ratemaking Topics

### Readings

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.]

- 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.
- SK** Study Note: Insurance Services Office, Inc., "Monoline-Multiline Ratemaking."
- L** Brown, R.L., "Minimum Bias with Generalized Linear Models," *PCAS LXXV*, 1988, pp. 187-198, Sections 1-4 only and associated exhibits. Including discussion of paper: Venter, G.G., *PCAS LXXVII*, 1990, pp. 337-349, excluding Section 4.  
**Note:** The candidate may find it helpful to read: Bailey, R.A., "Insurance Rates with Minimum Bias," *PCAS L*, 1963, p. 4, where this issue was raised. There will be no questions taken from this Bailey reading.
- L** Cummins, J.D.; Smith, B.D.; Vance, R.N.; and VanDerhei, J.L., *Risk Classification in Life Insurance*, 1983, Chapters 3 and 4. Candidates are not responsible for mathematical proofs. (This text can be purchased from the CAS. Use the white order form inside the back cover of the *Syllabus*.)
- L** Mahler, H.C., "An Example of Credibility and Shifting Risk Parameters," *PCAS LXXVII*, 1990, pp. 225-282. Candidates will not be tested on the appendices.

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## 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

- L** 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.
- L** Lee, Y.S., "The Mathematics of Excess of Loss Coverages and Retrospective Rating—A Graphical Approach," Sections 1-3, *PCAS LXXV*, 1988, pp. 49-64.
- 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.
- SK** Teng, M.T.S., "Pricing Workers' Compensation Large Deductible and Excess Insurance," *Casualty Actuarial Society Forum*, Winter 1994, pp. 413-437.
- SK** Gillam, W.R.; and Snader, R.H., "Fundamentals of Individual Risk Rating," 1992, Part III.

### The Loading for Risk

- SK** Feldblum, S., "Risk Load for Insurers," *PCAS LXXVII*, 1990, pp. 160-195, including discussions of paper: Philbrick, S.W., *PCAS LXXVIII*, 1991, pp. 56-63; and Bault, T., *PCAS LXXXII*, 1995, pp. 78-96.
- SK** Meyers, G.G., "An Introduction to the Competitive Market Equilibrium Risk Load Formula." Candidates are not responsible for mathematical proofs or for memorization of formulae. Also, candidates are not responsible for Appendices.

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## 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 is intended to prepare candidates to design and manage an individual risk rating system.

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, they will be expected to have knowledge of 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

- SK** Venter, G.G., "Experience Rating—Equity and Predictive Accuracy," *NCCI Digest*, April 1987, Vol. II, Issue I, p. 27.
- L** Gillam, W.R., "Workers' Compensation Experience Rating: What Every Actuary Should Know," *PCAS LXXIX*, 1992, Sections 1-5, pp. 215-239.
- SK** Gillam, W.R.; and Snader, R.H., "Fundamentals of Individual Risk Rating," 1992, Part I.
- SKU** National Council on Compensation Insurance, *The 1998*  
**NEW** *Adjustment to the Experience Rating Plan: Your Guide to Understanding the Changes.*

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

- SKU** National Council on Compensation Insurance, *Experience Rating Plan Manual for Workers Compensation and Employers Liability Insurance* (as of July 1, 1998). Candidates are responsible for only the excerpted material.
- SK** Insurance Services Office, Inc., *Experience and Schedule Rating Plans Applicable to General Liability*, ISO Circular GL-90-217 (Conversion to Loss Cost Basis).

### Retrospective Rating

#### Readings

- SK** Gillam, W.R.; and Snader, R.H., "Fundamentals of Individual Risk Rating," 1992, Part II.

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

- SKU** National Council on Compensation Insurance, *Retrospective Rating Plan Manual for Workers Compensation and Employers Liability Insurance* (as of July 1, 1998). Candidates are responsible for only the excerpted material.
- SK** Insurance Services Office, Inc., *Retrospective Rating Plan for Automobile, General Liability, Glass and Theft* (July 1989 edition).

The following readings address issues in retrospective rating:

- L** Lee, Y.S., "The Mathematics of Excess of Loss Coverage and Retrospective Rating—A Graphical Approach," Section 4, *PCAS LXXV*, 1988, pp. 64-78. Candidates are not responsible for "Other Applications" on pp. 75-76.
- L** 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 discussion of this paper: Gillam, W.R., *PCAS LXXX*, 1993 pp. 353-365.

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

## Index to Text References for Part 9

The following information is furnished for those who wish to purchase the text references cited for Part 9.

Actuarial Bookstore, P.O. Box 1229, Dover, NH, 03821-1229; telephone: (800) 582-9672, or (603) 692-5598, fax: (603) 692-5597. Credit card orders accepted.

Cummins, J.D.; Smith, B.D.; Vance, R.N.; and VanDerhei, J.L., *Risk Classification in Life Insurance*. (Candidates may purchase book from the CAS Office.)

Hogg, R.V.; and Klugman, S.A., *Loss Distributions*, John Wiley & Sons, One Wiley Drive, Somerset, NJ, 08875; telephone: (908) 469-4400, or (800) 225-5945.

Insurance Services Office, 7 World Trade Center, New York, NY, 10048; telephone: (800) 888-4476.

Mad River Books (A division of ACTEX Publications), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT, 06098; telephone: (800) 282-2839, fax: (860) 738-3152, e-mail: retail@actexamdriver.com.

National Council on Compensation Insurance, 750 Park of Commerce Drive, Boca Raton, FL, 33487; telephone: (800) NCCI-123.

*plus 3 more readings  
see insert*

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## 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 introduction and key to "Materials for Study" on pages 41-42 of this *Syllabus*. Items marked with a bold **SK** constitute the 1999 CAS Study Kit which is available from the CAS Office for \$66 (\$105 Canadian).

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 concepts and demonstrate the major relationships.
- The two readings by Butsic deal with inflation rates and risk adjusted discount rates, both for insurance profits and for loss reserves. The Philbrick paper and the Philbrick errata discuss the accounting treatment 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

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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 reading 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, Investment, Leverage, and Exposure to Total Return on Owners' Equity," *PCAS LV*, 1968, pp. 295-302. Includes discussions: Balcarek, R.J., *PCAS LVI*, 1969, pp. 58-60; Bailey, R.A., *PCAS LVI*, 1969, pp. 60-62.
- L** 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.
- L** D'Arcy, S.P., "Investment Issues in Property Liability Insurance," *Foundations of Casualty Actuarial Science* (Third Edition), Casualty Actuarial Society, 1996, Chapter 8, pp. 515-531.
- 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.
- SK** Butsic, R.P., "Determining the Proper Interest Rate for Loss Reserve Discounting: An Economic Approach," *Evaluating Insurance Company Liabilities*, Casualty Actuarial Society *Discussion Paper Program*, 1988, pp. 147-188.
- L** Philbrick, S.W., "Accounting for Risk Margins," *Casualty Actuarial Society Forum*, Spring 1994, Vol. I, pp. 1-87.
- SK** Philbrick, S.W., "Errata and Additional Material Related to 'Accounting for Risk Margins'," *Casualty Actuarial Society Forum*, Winter 1997, pp. 105-110.

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- L** 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.
- L** 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," May 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, and how it is marketed and underwritten. 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 and Reinartz readings describe the various types and purposes of reinsurance, its unique features and how it is utilized in company operations. **Note:** The candidate may wish to refer for background to the Part 3B reading: Brockett, Witt, and Aird, "An Overview of Reinsurance and the Reinsurance Markets," *Journal of Insurance Regulation*, March 1991, Vol. 9, No. 3, pp. 432-444, but no questions will be taken from this reading.
- The Clark, Ludwig, Patrik, 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' readings deal with important accounting concepts and standards that apply to the GAAP and statutory financial reporting of reinsurance.

## Readings

- L** Strain, R.W., (Ed.) *Reinsurance*, The College of Insurance, 1980, Chapters 3, and 9. [**Note:** The 1980 edition will be used. When

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ordering, please specify the 1980 edition, not the 1997 edition.] Candidates may find the following companion book helpful in preparing for this material: *Reinsurance Practices—Workbook with Cases*, Strain, R.W. (Ed.), The College of Insurance, 1982. However, no questions will be taken directly from this workbook. (Copies may be purchased from Strain Publishing & Seminars.)

- L** Reinartz, 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. [Note: When ordering, please specify the 1990 edition, not the 1997 edition.]
- SK** Clark, D.R., CAS Study Note, "Basics of Reinsurance Pricing," 1996.
- SK** 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.
- L** Patrik, G.S., "Reinsurance," *Foundations of Casualty Actuarial Science* (Third Edition), Casualty Actuarial Society, 1996, Chapter 6, pp. 344-370 (Section on Reinsurance Loss Reserving).
- SK** Stone, J.M., "A Theory of Capacity and the Insurance of Catastrophe Risks," *The Journal of Risk and Insurance*, June 1973, Vol. XL No. 2, Part I, p. 231-243, and September 1973, Vol. XL No. 3, Part II, p. 339-355.
- 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

This section presents an introduction to concepts involved in asset and investment risk, asset liability management, valuation and solvency of the

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insurance enterprise including dynamic solvency testing and the NAIC risk-based capital requirements. It provides important educational material associated with the appointed actuary concept.

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 Daykin text, with the accompanying Feldblum Guided Tour (both of which should be read together), covers dynamic solvency testing through stochastic modeling of an insurance enterprise.
- The Feldblum (1996) and Butsic readings present NAIC risk-based capital and some related issues. The reading by Hodes and Feldblum presents issues arising from 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. The Part 5B Brealey and Myers' text provides useful background, particularly for the discussion of assets.

#### Readings

- L** 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 (excluding material on contingent claims analysis on pp. 8-46, 8-47, and 8-48).

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- SK** Altman, E.I., "Measuring Corporate Bond Mortality and Performance," *The Journal of Finance*, Vol. 44, No. 4, September 1989, pp. 909-922.
- 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, describing the more important relationships, and understanding the concepts contained therein.
- L** 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.
- SK** Panning, W.H., "Asset-Liability Management for a Going Concern." *The Financial Dynamics of the Insurance Industry*, Altman, E.I.; and Vanderhoof, I.T., Eds. Irwin Professional Publishing, 1995, chapter 12, pp. 257-291. **Note:** Candidates are not required to derive or reproduce equations 12.8 through 12.20.
- L** Feldblum, S., "Asset Liability Matching For Property/Casualty Insurers," *Valuation Issues*, Casualty Actuarial Society *Special Interest Seminar*, 1989, pp. 117-154.
- SK** Sturgis, R.W., "Actuarial Valuation of Property/Casualty Insurance Companies," *PCAS LXVIII*, 1981, pp. 146-159. Including discussions of paper: Lowe, S.P., *PCAS LXIX*, 1982, pp. 120-126; Rothman, R., and Deutsch, R.V., *PCAS LXIX*, 1982, pp. 126-130.
- SK** Miccolis, R.S., "An Investigation of Methods, Assumptions, and Risk Modeling for the Valuation of Property/Casualty Insurance Companies," *Financial Analysis of Insurance Companies*, Casualty Actuarial Society *Discussion Paper Program*, 1987, pp. 281-321.
- SK** Actuarial Standards Board of the American Academy of Actuaries, "Actuarial Standard of Practice No. 19, Actuarial Appraisals (Doc. No. 034)," 1991.

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- L** Casualty Actuarial Society, "Statement of Principles Regarding Property and Casualty Valuations as adopted September 22, 1989," *Casualty Actuarial Society Yearbook*, 1998, pp. 273-279.
- SK** Feldblum, S., CAS Study Note, "A Guided Tour Through Daykin, Pentikäinen, and Pesonen's *Practical Risk Theory for Actuaries*" 1996.
- L** 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 except 9.6(e), Chapters 10, 11, 12, 13, Sections 14.1, 14.2, 14.3, 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, describing 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.
- SK** Feldblum, S., "NAIC Property/Casualty Insurance Company Risk-Based Capital Requirements" *PCAS LXXXIII*, 1996, pp. 297-435.
- SK** 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.
- SK** Hodes, D.M.; and Feldblum, S., "Interest Rate Risk and Capital Requirements for Property-Casualty Insurance Companies," *PCAS LXXXIII*, 1996, pp. 490-562.

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## Index to Text References for Part 10

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Actuarial Bookstore, P.O. Box 1229, Dover, NH, 03821-1229; telephone: (800) 582-9672, or (603) 692-5598, fax: (603) 692-5597. Credit card orders accepted.

Altman, E.I.; and Vanderhoof, I.T., Eds. *The Financial Dynamics of the Insurance Industry*. Irwin Professional Publishing, Division of Richard D. Irwin Co., 1333 Burr Ridge Parkway, Burr Ridge, IL, 60521; telephone: (800) 634-3966.

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

Casualty Actuarial Society *Forum*, *PCAS*, and *Discussion Paper Program*, 1100 N. Glebe Road, Suite 600, Arlington, VA, 22201-4798; telephone: (703) 276-3100, fax: (703) 276-3108; e-mail: office@casact.org.

Cummins, J.D.; and Harrington, S.A., Eds. *Fair Rate of Return in Property-Liability Insurance*, Kluwer Academic Publishers, 101 Philip Drive, Norwell, MA, 02061; telephone: (781) 871-6600.

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Financial Accounting Standards Board, 401 Merret 7, P.O. Box 5116, Norwalk, CT, 06856-5116; telephone: (203) 847-0700.

*Foundations of Casualty Actuarial Science*, Casualty Actuarial Society, 1100 N. Glebe Road, Suite 600, Arlington, VA, 22201-4798; telephone: (703) 276-3100; e-mail: office@casact.org.

Insurance Institute of America, 720 Providence Road, Malvern, PA, 19355-0770; telephone: (610) 644-2100.

*Journal of Risk and Insurance (The)*, American Risk and Insurance Association, The Wharton School, Colonial Penn Center, 3641 Locust Walk, Philadelphia, PA, 19104-6218.

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Maginn, J.L.; and Tuttle, D.L., *Managing Investment Portfolios: A Dynamic Process* (Second Edition), 1990, Warren, Gorham & Lamont, Boston Paper. (Available from the Actuarial Bookstore.)

National Association of Insurance Commissioners, 120 W. 12th Street, #1100, Kansas City, MO, 64105; telephone: (816) 842-3600.

Strain, R.W., *Reinsurance* [specify the 1980 edition], Strain Publishing & Seminars, Inc., Box 1520, Athens, TX, 75751; telephone: (903) 677-5974.

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## Index to Text References

Most of these text references may be borrowed from the CAS Library. Material that is new in 1999 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 descriptions.

Part(s)	Text
3B, 4-10	<sup>P.O. Box 430 Somersworth</sup> Actuarial Bookstore, P.O. Box <del>1229</del> , <del>Dover</del> , NH, 0382 <del>178</del> <del>1229</del> ; telephone: (800) 582-9672, or (603) 692-5598; fax: (603) 692-5597. Credit card orders accepted.
8	<i>Actuarial Digest</i> , P.O. Box 1127, Ponte Vedra, FL, 32004.
10	Altman, E.I.; and Vanderhoof, I.T., Eds. <i>The Financial Dynamics of the Insurance Industry</i> . Irwin Professional Publishing, Division of Richard D. Irwin Co., 1333 Burr Ridge Parkway, Burr Ridge, IL, 60521; telephone: (800) 634-3966.
10	American Academy of Actuaries, Suite 800, 475 N. Martingale Road, Schaumburg, IL, 60173-2226.
7	American Institute of Certified Public Accountants, 1211 Avenue of the Americas, New York, NY, 10036; telephone: (212) 318-0500.
3B, 7, 8	American Institute for Chartered Property Casualty Underwriters, Order Department: P.O. Box 3016, 720 Providence Road, Malvern, PA, 19355-0716; telephone: (610) 644-2100; fax: (610) 640-9576.
8	American Insurance Association, <i>Summary of Selected State Laws and Regulations Relating to Automobile Insurance</i> (1997 Edition), American Insurance Association, 1130 Connecticut Avenue, N.W., Washington, D.C., 20036; telephone: (202) 828-7100.
1	Anton, H., <i>Elementary Linear Algebra</i> , John Wiley & Sons, One Wiley Drive, Somerset, NJ, 08875; telephone: (908) 469-4400, or (800) 225-5945.
7	<i>Association Form of the 1998 Annual Statement Blanks</i> , John S. Swift Co., Route 46, Teterboro, NJ, 07608; telephone: (201) 288-2050.
4A, 5A	Bowers, N.L.; Gerber, H.U.; Hickman, J.C.; Jones, D.A.; and Nesbitt, C.J., <i>Actuarial Mathematics</i> (Second Edition), 1997, Society of Actuaries, P.O. Box 95668, Chicago, IL, 60694.
5B	Brealey, R.A.; and Myers, S.C., <i>Principles of Corporate Finance</i> (Fifth Edition), McGraw-Hill Inc., 860 Taylor Station Road, Blacklick, OH 43004; telephone: (800) 262.4729.
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3B	Brown, Robert L., <i>Introduction to Ratemaking and Loss Reserving for Property and Casualty Insurance</i> , Mad River Books, (A division of ACTEX Publications) 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT, 06098; telephone: (800) 282-2839; fax: (860) 738-3152; e-mail: retail@actexamdriver.com.
3C	Burden, R.L.; and Faires, J.D., <i>Numerical Analysis</i> (Sixth Edition), PWS Publishers, 20 Park Plaza, Boston, MA, 02116.
7, 8	Canadian Institute of Actuaries, Secretariat, Suite 820, 360 Albert Street, Ottawa, Ontario, K1R 7X7, Canada; telephone: (613) 236-8196; fax: (613) 233-4552; Web site: www.actuaries.ca.
4, 6-8, 10	Casualty Actuarial Society <i>Forum</i> , PCAS, and <i>Discussion Paper Program</i> , 1100 N. Glebe Road, Suite 600, Arlington, VA, 22201-4798; telephone: (703) 276-3100; fax: (703) 276-3108; e-mail: office@casact.org; Web site: www.casact.org.
8	Chamber of Commerce of the United States, 1615 H Street, N.W., Washington, D.C., 20062; telephone: (202) 659-6000 or (800) 638-6582.
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9 Cummins, J.D.; Smith, B.D.; Vance, R.N.; and VanDerhei, J.L., *Risk Classification in Life Insurance*. (Candidates may purchase book from the CAS Office.)

10 D'Arcy, S.P.; and Doherty, N.A., *The Financial Theory of Pricing Property-Liability Insurance Contracts*, Huebner Foundation, 3733 Spruce Street, Vance Hall, Philadelphia, PA, 19104-6301; telephone: (215) 898-2515.

5A, 10 Daykin, C.D.; Pentikäinen, T.; and Pesonen, M., *Practical Risk Theory for Actuaries*, First Edition, 1994, Chapman and Hall; telephone: (800) 634-7064.

8 Facility Association, 20 Richmond Street East, Suite 200, Toronto, Ontario, M5C 2R9, Canada; telephone: (416) 863-1750; fax: (416) 868-0894.

7, 10 Financial Accounting Standards Board, 401 Merret 7, P.O. Box 5116, Norwalk, CT, 06856-5116; telephone: (203) 847-0700.

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6-8, 10 *Foundations of Casualty Actuarial Science*, Casualty Actuarial Society, 1100 N. Glebe Road, Suite 600, Arlington, VA, 22201-4798; telephone: (703) 276-3100; e-mail: office@casact.org.

8 Hall, G.M. (Ed.), *Mercer Handbook of Canadian Pension and Benefit Plans*, CCH Canadian Limited, 90 Shepherd East, Suite 300, North York, Ontario M2N 6X1, Canada; telephone: (416) 224-2248; fax: (800) 461-4131.

6 Head, G.L., *Insurance to Value*, Richard D. Irwin, Inc., 1818 Ridge Road, Homewood, IL, 60430.

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2 Mood, A.M.; Graybill, F.A.; and Boes, D.C., *Introduction to the Theory of Statistics* (Third Edition), McGraw-Hill Book Co., 860 Taylor Station Road, Blacklick, OH 43004; telephone: (800) 262-4729.

8 Myers, R.J., *Social Security* (Fourth Edition), 1993, University of Pennsylvania Press; telephone: (800) 445-9880.

7, 8, 10 National Association of Insurance Commissioners, 120 W. 12th Street, #1100, Kansas City, MO, 64105; telephone: (816) 842-3600.

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3A, 3C, 4B, 5 Society of Actuaries, Suite 800, 475 N. Martingale Road, Schaumburg, IL, 60173-2226; telephone: (847) 706-3500.

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8 T.R.A.C. Insurance Services Ltd., Suite 600, 133  
Richmond Street West, Toronto, M5H 2I3, Canada;  
telephone: (416) 363-8266; Web site: www.trac.com.

8 Waddams, S.M., *The Law of Damages*, Canada Law  
Book Ltd., 240 Edward Street, Aurora, Ontario, L4G  
3S9, Canada; telephone: (905) 841-6472.



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*All correspondence and accompanying forms of payment must reach the CAS Office by the stated deadlines. No exceptions will be made.*

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Refund Request .....	May 17, 1999
Analysis Request .....	July 30, 1999
Appeal .....	August 31, 1999

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## CAS Fall 1999 Examinations

Registration .....	September 15, 1999
Late Registration .....	September 27, 1999
Change of Center .....	September 27, 1999
Refund Request .....	November 15, 1999
Analysis Request .....	January 31, 2000
Appeal .....	March 1, 2000



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