CASUALTY
ACTUARIAL SOCIETY

SYLLABUS OF EXAMINATIONS

RULES REGARDING EXAMINATIONS FOR ADMISSION
RECOMMENDATIONS FOR STUDY

Thirtieth Edition
1985
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RULES REGARDING EXAMINATIONS FOR ADMISSION

1. Dates of Examinations

<table>
<thead>
<tr>
<th>Part</th>
<th>Date of 1985 Examinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>morning of May 21, November 19</td>
</tr>
<tr>
<td>2</td>
<td>afternoon of May 21, November 19</td>
</tr>
<tr>
<td>3</td>
<td>morning of May 17, November 15</td>
</tr>
<tr>
<td>4</td>
<td>morning of May 2</td>
</tr>
<tr>
<td>5</td>
<td>morning of November 7</td>
</tr>
<tr>
<td>6</td>
<td>morning of May 3</td>
</tr>
<tr>
<td>7</td>
<td>morning of November 8</td>
</tr>
<tr>
<td>8</td>
<td>afternoon of May 2</td>
</tr>
<tr>
<td>9</td>
<td>morning of November 6</td>
</tr>
<tr>
<td>10</td>
<td>afternoon of May 3</td>
</tr>
</tbody>
</table>

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

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

2. Filing of Application

a. Parts 1-3

A candidate who wishes to take one or more of Parts 1, 2 and 3 must file an application form which may be obtained from the office of the Casualty Actuarial Society. For these Parts, application forms and the appropriate examination fee, in check, draft, or money order made payable to the Society of Actuaries, must be sent to:

Society of Actuaries
500 Park Blvd.
Itasca, IL 60143

The applications for Parts 1-3 must be received by the Society of Actuaries by March 20 for the May examinations and by September 20 for the November examinations.

b. Parts 4-10

The first time a candidate makes application to take one or more of Parts 4-10, an application obtained from the office of the Casualty Actuarial Society must be filed. Subsequent requests to take other examinations can be accom-

ished by simply writing to the office of the Casualty Actuarial Society, stating the Part or Parts for which the candidate is applying.

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

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

The application for Parts 4-10 must be received by the Secretary by March 20 for the May examinations and by September 20 for the November examinations.

3. Joint Administration

Part 1, the General Mathematics examination, Part 2, the Probability and Statistics examination, and Part 3, the Applied Statistical Analysis, Operations Research and Numerical Analysis examination, are jointly administered by the Casualty Actuarial Society and The Society of Actuaries.

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

4. Associateship and Fellowship Examinations

Successful completion of, or credit for, Parts 1 through 7 is required to fulfill the examination requirements for Associateship.

Successful completion of, or credit for, all ten examination Parts is required to fulfill the examination requirements for Fellowship.

5. Fees

The examination fee schedule for 1985 at time of publication is as follows:

<table>
<thead>
<tr>
<th>Parts</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>$30.00 for each part</td>
</tr>
<tr>
<td>3</td>
<td>$60.00</td>
</tr>
<tr>
<td>4-10</td>
<td>$70.00 for each part</td>
</tr>
</tbody>
</table>

Candidates writing any of Parts 1-3 overseas or at a specially arranged center must pay an additional $30.00 fee per examination session (May or November).

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

6. Late Registration, Refunds, and Transfers of Fees

Parts 1-3. If the application and regular fee are not received on or before March 20 for the May examinations, or September 20 for the November examinations, the candidate may be permitted to write the examination by the payment of a late registration fee of $30.00 for each part in addition to the regular fee for that part. Late registrations will not be accepted from candidates writing outside North America.
However, under no circumstances will any applications be accepted after April 20 for the May examinations or after October 20 for the November examinations. Also, a registered candidate may request a change of examination center, but the candidate must pay a change-of-center fee of $10.00 for each part. In such cases, every effort will be made to have the candidate's records and supplies on hand at the appropriate examination center in time for the examination. If this effort fails, it must be understood that the Society or jointly administering or sponsoring organizations will not be held responsible; in the case of a late registration, both the late registration fee and the regular fee will be refunded, while in the case of a request for change in examination center, any change-of-center fee will be refunded. If the candidate's notice and fees, or request for change of examination center, are received so late that it is manifestly not feasible to arrange for the candidate to write the examination, the fees will be refunded immediately. The organizations are not responsible for difficulties caused by delays in postal service, or for the consequences of failing to receive correspondence because of inadequate postage.

A candidate who has filed an application for Part 3 and does not write the examination should request a refund of the examination fee. This request must reach the Society not later than June 30 for the May examinations or Dec. 31 for the November examinations. Later requests will not be considered. A fee of $50 per examination will be assessed for all refunds. Only examination fees for Part 3 can be refunded. Late registration fees and change-of-center fees are not refundable.

Parts 4-10. Examination fees are payable each time the candidate registers for an examination. Check, draft or money order in U.S. funds payable to the order of the Casualty Actuarial Society must be received by the Office of the Casualty Actuarial Society by March 20 for the May examinations or by September 20 for November examinations. Late registration will be accepted through April 20 and October 20 if accompanied by a $50.00 late registration fee for each Part. Change-of-center fees will be $10.00.

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

A candidate who has filed an application and finds that it will not be possible to take the examination should request a refund of the examination fee. This request must reach the Office of the Casualty Actuarial Society not later than April 20 for the May examinations, or October 20 for the November examinations. Later requests will not be considered. A fee of $50.00 per examination will be assessed for all refunds. The fee of a candidate who is unavoidably absent from an examination will, upon written request within 30 days following the date of such examination, be transferred to any examination given in the next thirteen months. A fee which has been so transferred is not refundable. There will be a $15.00 fee for such transfer, payment for which should accompany the request for transfer. Candidates must register for the examination to be taken even if the fee is being transferred from a prior exam period.

7. Waiver of Examinations for Associateship

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

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

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

1. Waiver of examination Part 1, 2, or 3 will be allowed for a candidate who has passed or been credited with the corresponding examinations sponsored by the Society of Actuaries prior to the joint administration of those examinations.

2. Candidates who take the Advanced Mathematics Test of the Graduate Record Examinations may apply for credit for Part 1. Credit will be granted if the candidate's score on the test is equivalent, as determined by the CAS, to a passing score on Part 1.

3. The CAS also specifically recognizes the examinations sponsored by the British Institute of Actuaries. Credit will be granted for examinations passed or waived in accordance with the following table:

<table>
<thead>
<tr>
<th>Institute Exam Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS</td>
</tr>
<tr>
<td>Part 1</td>
</tr>
<tr>
<td>Part 2</td>
</tr>
<tr>
<td>Part 3</td>
</tr>
</tbody>
</table>

The Casualty Actuarial Society will grant credit either for exams passed by the Institute or waived by the Institute, except that credit will not be granted for exams waived by the Institute on account of academic records achieved in North American universities.
In these instances, candidates requesting a waiver of an examination requirement should present their request to the Vice President-Membership with appropriate evidence that demonstrates the passing of (or score on) the examinations for which a waiver is requested. Such request should also include an application for membership if one has not already been filed. The Vice President-Membership will review all applications and recommend action to the Board of Directors.

In instances other than those specifically delineated above, candidates should present their request to the Vice President-Membership and include with their applications evidence that demonstrates the asserted equivalence of the examinations passed to those for which a waiver is requested via a list of topics covered, or other relevant material. If such evidence is not included, the Vice President-Membership should request it from the candidate.

In such instances the Vice President-Membership will forward the request to the Education Policy Committee. The Education Policy Committee will then review the request to determine whether the waiver program should be expanded to include the examinations embodied in the candidate's request.

8. Conduct of Examinations

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

Electronic calculators will be allowed in the examination room for Parts 1-10. For Parts 4-10, electronic calculators, which are to be supplied by the candidate, must meet the following standards to be acceptable:
1. portable
2. battery operated during examination
3. must not be programmable; and
4. must not emit distracting noises

Candidates for Parts 1-3 will receive a detailed notice before the examination describing the types of calculators which are allowed.

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

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

Since the answer sheets are scored by optical scanning equipment, it is important that there be only one oval blackened for each question. If the candidate decides not to respond to a question for which an oval has already been blackened, the answer oval should be erased, and the "Omit" oval should then be blackened. This oval is located to the right of the answer oval "E". This procedure assures that the scoring equipment will score the question as an omitted question and not be confused by an incompletely erased answer oval. It is not necessary to blacken the "Omit" oval if no answer oval has been blackened. This is because the scoring equipment also scores a question as an omitted question if there are no ovals blackened in the row. Please note that the "Omit" oval appears on the answer sheets for Parts 1-3 only.

9. Grading of Examinations

a) Multiple-Choice and True-False Questions

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

Parts 1-3. There will be one-fifth point added for each multiple-choice question left blank.

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

b) Determination of the Pass Mark

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

c) Candidates' Requests for Information

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

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

The Examination Committee is also prepared to do an administrative check for any candidate who appeals a score, to be sure that he or she has been given the proper grade. It will also entertain any inquiries regarding the accuracy or ambiguity of specific exam questions.

Several weeks after receiving their notification of grade, failing candidates for Part 1 to 3 will receive, an analysis listing their percentile rank by topic. This will enable the candidate to identify areas requiring additional study.

10. Confidentiality of Examination Records

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

11. Disciplinary Action

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

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

LIBRARY

All candidates registered for the examinations of the Casualty Actuarial Society and all members of the Casualty Actuarial Society have access to all the library facilities. The CAS Library is located at One Penn Plaza, 250 West 34th Street, New York, New York 10119, Phone: (212) 560-1018—(212) 560-1019.

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

Address requests for books to:

Vice President-Administration
CAS Library Service
One Penn Plaza
250 West 34th Street
New York, New York 10119

Phone: (212) 560-1018
(212) 560-1019

PROCEEDINGS AND OTHER PUBLICATIONS OF THE SOCIETY

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

Those wishing to purchase these publications should write the Secretary:

Vice President-Administration
Casualty Actuarial Society
One Penn Plaza
250 West 34th Street
New York, New York 10119

Phone: (212) 560-1018
(212) 560-1019

AMERICAN ACADEMY OF ACTUARIES

Satisfactory completion of specified examinations of the Casualty Actuarial Society will satisfy the educational requirements of the American Academy of Actuaries. For further information contact the Academy at 500 Park Blvd., Itasca, IL 60143.
### 1985 SYLLABUS OF EXAMINATIONS

<table>
<thead>
<tr>
<th>Part</th>
<th>Time Allowed</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>*<em>1</em></td>
<td>3 hours</td>
<td>General Mathematics</td>
</tr>
<tr>
<td>*<em>2</em></td>
<td>3 hours</td>
<td>Probability and Statistics</td>
</tr>
<tr>
<td>*<em>3</em></td>
<td>4 hours</td>
<td>Applied Statistical Analysis, Operations Research and Numerical Analysis</td>
</tr>
<tr>
<td>**4</td>
<td>4 hours</td>
<td>Mathematics of Compound Interest, Life and Casualty Contingencies, Credibility Theory and Loss Distributions</td>
</tr>
<tr>
<td>**5</td>
<td>3 hours</td>
<td>Principles of Economics; Theory of Risk and Insurance; Policy Forms and Coverages; Underwriting, Marketing and Claim Function</td>
</tr>
<tr>
<td>**6</td>
<td>4 hours</td>
<td>Principles of Ratemaking and Data for Ratemaking</td>
</tr>
<tr>
<td>**7</td>
<td>4 hours</td>
<td>Insurance Accounting, Expense Analysis, and Published Financial Information; Premium, Loss, and Expense Reserves</td>
</tr>
<tr>
<td>**8</td>
<td>3 hours</td>
<td>Insurance Law, Supervision and Regulation, and Statutory Insurance</td>
</tr>
<tr>
<td>**9</td>
<td>4 hours</td>
<td>Advanced Ratemaking and Individual Risk Rating</td>
</tr>
<tr>
<td>**10</td>
<td>4 hours</td>
<td>Financial Operations of Insurance Companies, Reinsurance and Excess Rating, Forecasting, and Current Events and Issues</td>
</tr>
</tbody>
</table>

*Jointly administered with the Society of Actuaries

### RECOMMENDATIONS FOR STUDY

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

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

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

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

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

A more detailed reference of the texts cited will be found in the Index To Readings at the end of these Recommendations. The reading materials suggested in these Recommendations are designed to acquaint the candidate with the respective subjects and should not be interpreted as representing views endorsed by the Casualty Actuarial Society. If a new edition or printing of any text becomes available, the student should WRITE — NOT PHONE — the CAS office for instructions regarding its acceptability and the appropriate chapters/pages in the new edition which correspond to the printed study requirements.

A dagger (†) beside a reading indicates that it is either an addition to the recommended readings or that there has been a material change to a previously included reading.
Study notes and study kits have been prepared in connection with some examinations and can be obtained from the Society’s office at the following costs (payable in U.S. Funds):

<table>
<thead>
<tr>
<th>Study Kit</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 4</td>
<td>$15.00</td>
</tr>
<tr>
<td>Part 6</td>
<td>15.00</td>
</tr>
<tr>
<td>Part 7</td>
<td>3.00</td>
</tr>
<tr>
<td>(SAME AS 1983 + 1984)</td>
<td>3.00</td>
</tr>
<tr>
<td>Part 10</td>
<td>7.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study Note</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 5</td>
<td>$3.00</td>
</tr>
<tr>
<td>Parts 9b &amp; 10</td>
<td>3.00</td>
</tr>
</tbody>
</table>

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

Readings from out-of-print Proceedings of the Casualty Actuarial Society are available from the Society’s office as follows:

<table>
<thead>
<tr>
<th>Part Booklet</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 6</td>
<td>$5.00</td>
</tr>
<tr>
<td>Part 7 &amp; 9a</td>
<td>5.00</td>
</tr>
<tr>
<td>Part 8</td>
<td>5.00</td>
</tr>
<tr>
<td>Part 9b</td>
<td>7.00</td>
</tr>
</tbody>
</table>

Sample examination questions for Parts 1 & 2 and copies of Parts 5-10 examinations for recent years may be obtained from the Casualty Actuarial Society office. Illustrative answers for essay questions on Parts 4-10 are available upon request. Also available without charge is a note entitled “Hints on Study and Exam Techniques.”

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

Other material available for a charge from the Casualty Actuarial Society office:

**Part 4**
Herzog, T.N. *Study Note: An Introduction to Bayesian Credibility and Related Topics.* $7.00

**Part 5**
Excerpts from the following manuals:
Insurance Services Office:
*Personal Automobile Manual. General Rules 1-13* $3.00
*Homeowners 76 Policy Program Manual. General Rules. pp. GR1-6* 3.00

National Council on Compensation Insurance:

**Part 6**
Excerpts from the following plans:
Insurance Services Office. *Automobile Statistical Plan* 3.00
Insurance Services Office. *Commercial Statistical Plan* 3.00
National Council on Compensation Insurance
*Unit Statistical Plan* 7.00

Longley-Cook, L. H. *An Introduction to Credibility Theory. 1962* 3.00

**Part 8**
"Post-Assessment Property and Liability Insurance Guaranty Fund" 3.00
Excerpt from the *Report of the National Commission for the Review of Antitrust Laws and Procedures* 3.00
"NAIC Financial Condition Examiners’ Handbook — Introduction" 3.00
Myers, R. *Summary of the Provisions of the OASDI System, the HI System, and the SMI System* 3.00
ASSOCIATESHIP EXAMINATIONS

PART 1

GENERAL MATHEMATICS

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

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

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

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

- Purcell, E. J. *Calculus with Analytic Geometry*. (Third Edition)
- Bradley, Gerald L. *A Primer for Linear Algebra*. Chapters 1-6.

An additional reference for those who may want further practice in solving linear algebra problems is *Linear Algebra* by Seymour Lipschutz (Schaum's Outline Series, McGraw-Hill).
PART 2

PROBABILITY AND STATISTICS

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

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

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

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


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

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

**Moment generating functions of probability distributions:**
2. pp. 197-200 (Volume I).
3. pp. 78-81 and 538-543.

**Applications of chi-square distribution (chi-square tests):**
1. pp. 269-283 and 312-313.
2. pp. 91-99 (Volume II).

**Regression and correlation:**
1. pp. 73-78, 117-120 and 296-303.
Bayesian estimation:
2. pp. 36-42 (Volume II).


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

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**PART 3**

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

The four-hour multiple-choice examination covers the three separate subjects of applied statistical analysis, operations research, and numerical analysis. Minimum standards will be imposed for each section of this examination. The use of these standards is intended to ensure that each candidate has a reasonably sufficient working knowledge of each subject covered on the examination. The minimum standard for each subject is lower than the passing percentage for the entire examination, and is normally equal to 35% of the total points available for that subject. Different minimum standards may be imposed when appropriate, such as after the introduction of a new text or a new topic, or when a subject is particularly important. If a candidate fails to meet the minimum standard for a particular section of an examination, yet would have otherwise passed the examination as a whole, that candidate will receive a score of 5*, which is a failing score. The examination is based on the material found in the textbooks listed below.

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

Solutions to selected exercises from *Intermediate Business Statistics* and the two Society of Actuaries study notes are available from the Society of Actuaries at a combined cost of $5.

**(a) APPLIED STATISTICAL ANALYSIS**

The general scope of the applied statistical analysis section of the examination is indicated by the following topics:

- Analysis of variance; Regression analysis; Time series analysis.

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

**(b) OPERATIONS RESEARCH**

The general scope of the operations research section of the examination is indicated by the following topics:

- Linear programming; Dynamic programming; Queuing theory; Project scheduling; Integer programming; Decision Analysis; Simulation.
Hillier, F. S. and Lieberman, G. J. *Operations Research* (Third Edition). Chapters 1-3, 6 (Section 6.6 only), 7, 10 (10.1-10.6 up to but not including the Basic Model with a Finite Queue on p. 424), 18 (Section 18.1 only).

Study notes published by the Society of Actuaries:
- *An Introduction to Stochastic Simulation* (Code: 30-31.84)
- *Decision Analysis* (Chapter 4 of *A Study Manual for Operations Research* by Narragón) (Code: 30-32-84)

The emphasis is primarily on problem-solving and secondarily on theoretical considerations. Recourse is made, as needed, to methods from the calculus and classical algebra in order to present a broad perspective of both the practical and the theoretical aspects of this subject.

(c) NUMERICAL ANALYSIS

This subject encompasses various techniques for handling numerical data. Although many of the principles dealt with 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 the numerical analysis section of the examination is indicated by the following topics as covered in the recommended text:

- Iteration; Interpolation; Numerical Integration; Linear Systems.
- Burden, R. L., Faires, J. D., and Reynolds, A. C. *Numerical Analysis* (Second Edition), 1981, Chapters 1 (1.1* and 1.2), 2 (2.1-2.4), 3 (3.1-3.4 and 3.6**), 4 (4.3-4.6), 6 (6.1-6.6), and 7 (7.1 only)

*Knowledge of this section will be assumed as background material for questions on Part 3; however, questions will not be directly based on this section.

**As related background material for Cubic Splines, the student should read pages 125 and 126 up to the paragraph following page 4.1. However, Part 3 questions will not be based on these pages.

PART 4

Prior to commencing study for this Part, the candidate should read the “Recommendations for Study” section, pages 11 to 14, for study suggestions and guidance in obtaining the 1985 credibility study kit, out of print readings, past examinations, and other information important to sitting for this examination. References are listed in the suggested order for study.

Items marked with an asterisk (*) are contained in the 1985 study kit, which is available from the CAS office at a cost of $15.00. An update of the 1984 Kit is available for $5.00.

(a) MATHEMATICS OF COMPOUND INTEREST

This section represents approximately 25% of the examination. Key topics include:

- Measurement of interest, including accumulated and present value factors; annuities certain; amortization schedules and sinking funds; and bonds and related securities.


(b) LIFE AND CASUALTY CONTINGENCIES

This section represents approximately 25% of the examination.


In addition, the sections on notation and the problems at the end of the above chapters should also be reviewed.


(c) CREDIBILITY THEORY

This section represents approximately 25% of the examination.

†Van Slyke, O. E. *An Overview of Credibility*. 1984. CAS.

†Herzog, T. N. Credibility Actuarial Society Part 4 Study Note: An Introduction to Bayesian Credibility and Related Topics, Casualty Actuarial Society.


The following references are suggested as background material for this section. No specific exam questions will be drawn from these references:

*Philbrick, S. W. “An Examination of Credibility Concepts” FCAS LXXVIII, 1981.  
p. 195.

(d) LOSS DISTRIBUTIONS  
This section represents approximately 25% of the examination.

Many actuarial problems involve the analysis of incurred losses for an insured event. Often it is impossible to determine the exact distributions of certain losses. Thus in practice, the objective may be to find reasonable and usable approximations to those distributions. The recommended text describes some of the methods for doing this. Chapter 2 of the text describes a variety of mathematical distributions which may be helpful in this process. The candidate is expected to become familiar with the use of these distributions; however, the candidate will not be tested directly on the distributions themselves. Rather the emphasis will be on using these distributions in a problem solving way. Solutions to selected exercises from the text are available at no charge from the CAS office.

Chapters 1, 2, 3.1-3.4, 4.1-4.2.

*See above regarding testing of Chapter 2.

PART 5  
Prior to commencing study for this Part, the candidate should read the “Recommendations for Study” section, pages 11 to 14, for study suggestions and guidance in obtaining study notes, out-of-print readings, past examinations, and other information important to sitting for this examination.

Note: Sharing the Risk by Marks and Craigie contains a good basic introduction to insurance. Although this reference is not part of the required readings for Part 5, the candidate may find it useful to review this material as background for this examination. This reading is available from the Insurance Information Institute at a cost of $3.95.

Section (a) of this examination deals with the basic principles of economics and Section (b) with the theory of risk and insurance. Section (c) covers the insurance product, namely policy forms and coverages. Underwriting and marketing and claims function are covered in Section (d).

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

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

Samuelson, P. A. Economics. 1980. Chapters 4, 10-20, 21 (Appendix only), 30, 31 and 41. (While the candidate will not be tested on chapter 1-3 and 6, the candidate may find it useful to review these chapters as background for this examination.)

(b) THEORY OF RISK AND INSURANCE  
The candidate should know what risk is, the kinds of risk, and the ways in which they can be handled, with particular emphasis on the relation to insurance.


1983 Study note (same as 1984 Study note) (Available from the CAS office at a cost of $3.00 per copy.)


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


UNDERWRITING, MARKETING AND CLAIM FUNCTION

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

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

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


PART 6

Prior to commencing study for this Part, the candidate should read the “Recommendations for Study” section, pages 11 to 14, for study suggestions and guidance in obtaining the 1985 study kit out-of-print readings, past examinations, and other information important to sitting for this examination.

Note: Sharing the Risk by Marks and Craigie contains a basic introduction to insurance. Although this reference is not part of the required readings for Part 6, the candidate may find it useful to review this material as background for this examination. This reading is available from the Insurance Information Institute at a cost of $3.95.

References are listed in the suggested order for study. The “Study Kit on Ratemaking Developments”, listed for both Parts (a) and (b), should be studied in conjunction with several of the individual readings included in the Syllabus. For example, the Fire and Extended Coverage ratemaking sections should be read along with the Hurley paper, and the section on statistical plans should be studied before reading the individual plans.

(a) PRINCIPLES OF RATEREMAKING

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

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

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

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

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

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

2. Methods for trending and projecting losses and premiums (when appropriate):
   a. internal versus external indices,
   b. relation to loss development,
   c. claim cost projection versus current cost index approach, and
   d. impact of deductibles, coinsurance and insurance to value programs.

3. The candidate should also be prepared to discuss and apply ratemaking principles to problems which may not have generally recognized solutions.


Longley-Cook, L. H., An Introduction to Credibility Theory. 1962. (Available from CAS office at cost of $3.00)


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


†1985 Study Kit on Ratemaking Developments. (Available from the CAS office at a cost of $15.00. An update of the 1984 Kit is available for $3.00)

(b) DATA FOR RATERMAKING

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

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


Insurance Services Office. *Automobile Statistical Plan*. 6-2-60

Insurance Services Office. *Commercial Statistical Plan*. 8-3-60


NOTE: The statistical plans listed above should not be ordered directly from ISO or NCCI. Instead, if a candidate needs a copy of the plans, an excerpt of each plan is available from the CAS. The excerpt includes the pages referenced in the study note on statistical plans included in the study kit.

Study Kit on Ratemaking Developments. (This is the same study kit as required for Part (a)).

PART 7

Prior to commencing study for this Part, the candidate should read the “Recommendations for Study” section, pages 11 to 14, for study suggestions and guidance in obtaining study notes, out-of-print readings, past examinations, and other information important to sitting for this examination.

Section (a) of this examination deals with the form, content and interpretation of the two major reports an insurance company makes to regulatory authorities, and with sources of comparative data. Section (b) deals with the analytical techniques which an actuary may employ to develop certain of the data required for these reports. The candidate should be familiar with current developments in the above areas.

(a) INSURANCE ACCOUNTING, EXPENSE ANALYSIS, AND PUBLISHED FINANCIAL INFORMATION

The candidate should obtain a general knowledge of insurance accounting, including its terminology and practice. A suggested basic accounting reference for candidates is the American Institute for Property and Liability Underwriters' CPCU 8 text,
(2) Expense Analysis

1984 Insurance Expense Exhibit.


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


Year | Page | Article
--- | --- | ---
1971 | 475 | Allocation of Investment Income to Underwriting.
1971 | 614 | Investment Income Allocation.
1979 | 290 | Uniform Classification of Expenses for Property and Liability Insurance Companies


(3) Published Financial Information

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

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

Best's Insurance Reports—Property/Casualty
Best's Reproductions of Convention Statements—Property/Casualty
Best's Aggregates and Averages—Property/Casualty
Best's Executive Data Service
Best's Key Rating Guide—Property/Casualty

The National Underwriter

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


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

(b) PREMIUM, LOSS AND EXPENSE RESERVES

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

1. The selection and evaluation of a loss reserving method appropriate to a given line of insurance:
   a. For known claims
   b. For IBNR claims
   c. For all incurred claims

2. Testing of adequacy of previous loss and loss expense reserve levels.

3. Evaluating the adequacy of current loss and loss expense reserve levels.

4. The identification of, and correction for, effects on loss reserves stemming from:
   a. Changes in the loss climate
   b. Changes in a company's handling of claims
   c. Data Problems

5. Special reserving problems in a line arising from:
   a. Catastrophe losses
   b. Reopened claims
   c. Policies on a claims-made rather than occurrence basis
   d. Fidelity and Surety IBNR
   e. Credit insurance

6. The unearned premium reserve:
   a. Improving its accuracy
   b. The reserve for retrospective returns
   c. Policies on a claims-made basis
   d. Deposit premium policies

7. Allocated loss expense reserves.

8. Unallocated loss expense reserves.


The candidate should be prepared to compare and evaluate the procedures discussed and the arguments advanced in the readings. The answers provided by the candidate will be graded based on their applicability to the specific problem presented and the professional competence evidenced by the answer. While the readings for this part provide the basic factual information necessary, practical experience has often proven helpful in successfully completing the examination.
Readings
1985 Study Kit of Current Articles (Available from the CAS office at a cost of $3.00).
This is the same study kit as referenced in section (a).
Those pages and schedules of the Association form of the 1984 Annual Statement Blank for Fire and Casualty Companies which relate to reserves.


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<thead>
<tr>
<th>Year</th>
<th>Page</th>
<th>Article</th>
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<tr>
<td>1974</td>
<td>693</td>
<td>Testing and Evaluating Loss Expense Reserves</td>
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<tr>
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<td>McClanahan, C. L. &quot;A Mathematical Model for Loss Reserve Analysis&quot;, PCAS LXII, 1975, p. 134. (The candidate will not be held responsible for notation or the development of the formulas in this paper.)</td>
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<td>Khury, C. K. &quot;Loss Reserves: Performance Standards,&quot; PCAS LXVII, 1980, p. 1. (The candidate will not be responsible for notation or development of the formulas in this paper.)</td>
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FELLOWSHIP EXAMINATIONS

PART 8

Prior to commencing study for this Part, the candidate should read the "Recommendations for Study" section, pages 11 to 14, for study suggestions and guidance in obtaining study notes, out-of-print readings, past examinations, and other information important to sitting for this examination.

(a) INSURANCE LAW, SUPERVISION AND REGULATION

Insurance Supervision and Regulation are subjects which are not strictly actuarial in nature, but which affect many areas of the actuary's work. The candidate should understand the role of the insurance business as a supplier of a significant service. As a result of the essential and highly technical nature of insurance, a system of regulatory controls has been established to require that the industry demonstate that it is providing fair and reliable service.

Since no prior legal knowledge is assumed, the first section of readings includes several general texts on business and tort law. This material should provide background and a basic understanding of contract and tort law.

Each state's Insurance Law provides the basis for insurance regulation. The New York Insurance Law is included as a typical law which has evolved over time. In both the background material and in the law itself, the candidate should concentrate on those concepts of law which relate to the insurance contract, to the conduct of the business of insurance, and to the way insurance is marketed.

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

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

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

The candidate is expected to be able to discuss current developments relating to the topics of insurance law, supervision, and regulation.

1) Background Law and Insurance

Note: Ch. 26 of Samuelson's economics text contains a discussion of antitrust law. Although this reference is not part of the required readings for Part 8, the candidate may find it useful to review the material as background for this examination.


The candidate is responsible only for the sections of the law as stated. If studying from publications such as the Consolidated Laws Service, which cite case histories as well as the law itself, the candidate is not responsible for the case histories although they may be helpful in gaining an understanding of the law. Candidates will not be tested on those sections of the New York Laws dealing exclusively with life insurance and/or annuities.

(2) Supervision and Regulation

Metz, A. C. *The First Twenty Years*.

Carlson, T. O. "Rate Regulation and the Casualty Actuary." *PCAS XXXVIII*, 1951. p. 9 (excluding Sections 4 and 5 and appendices).

Mintel, J. *Insurance Rate Litigation*. 1983. Chapters 1, 5, 8, 10, 11, 13, and 14. (Candidates will not be tested on details of cases mentioned only briefly, but will be responsible for knowledge of cases treated in some depth).


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


Post-Assessment Property and Liability Insurance Guaranty Fund—NAIC Model Act—(available from CAS office at a cost of $3.00).


(b) STATUTORY INSURANCE

This section of this examination part involves a study of insurance coverages mandated by statute or required by regulation. In reviewing the recommended readings the candidate should be aware of the modifications of the tort law system with the introduction of various "First Party" compensation systems. In addition the candidate should be aware of the relationship of Financial Responsibility laws and various mechanisms for involuntary markets; e.g., assigned risk plans.

The workers' compensation and employer's liability systems are briefly introduced. The large variety of individually tailored state laws in workers' compensation makes this area particularly difficult to master, but the candidate should understand the basic concepts and structure common to the diverse state statutes.

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

Disability insurance is also treated as social insurance and, therefore, should be approached by the candidate in a manner similar to the Social Security programs. Again, the candidate is responsible for knowledge of current developments relating to statutory insurance.

(1) Statutory Automobile Insurance

   a. No-Fault Benefits (pp. 1-11)
   b. Add-On Benefits (pp. 12-15)
   c. Compulsory Liability, Financial Responsibility, and Uninsured Motorists Laws (pp. 43-61)
   d. Residual Market Plans (p. 65)
   While the candidate is not expected to memorize the details of this reading, he or she should be familiar with the contents thereof as well as able to recognize major variations in the laws between groups of states.


(2) Workers' Compensation


†Chamber of Commerce of the United States Analysis of Workers' Compensation Laws. 1984. While the candidate is not expected to memorize the details of this reading, he or she should be familiar with the contents thereof and the coverages described.

(3) Social Insurance and Allied Programs


Myers, R. J. Social Security. 1981. Chapters 4-6, 13 and 15 (Including appendices to Chapters 4 and 13)

†Myers, R. Summary of the Provisions of the OASDI System, the HI System and the SMI System. January 1984. (Available from CAS office at a cost of $3.00)

New York (State) Department of Labor, Studies in Disability Insurance. (Special Bulletin #224) Out of print. (Available from CAS Library.)


(c) NAIC

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

a) Automobile Risk Classification
b) Gender Discrimination (H. R. 100)

c) Investment Income in Ratemaking

The 1982-1984 NAIC Proceedings should be researched for material on these issues. It is suggested that the individual become familiar with the introductory portion of the Proceedings book in order to understand the structure of the books and of the NAIC itself, find the required information and trace its development through the various committees to ultimate resolution.

PART 9

Prior to commencing study for this Part, the candidate should read the "Recommendations for Study" section, pages 11 to 14, for study suggestions and guidance in obtaining study notes, out-of-print readings, past examinations, and other information important to sitting for this examination.

(a) ADVANCED RATERMAKING

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

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

The readings on credibility on Part 9 are duplicated to a limited extent on Part 4. The Syllabus Committee feels strongly that credibility is a subject that every actuary needs to study. Therefore, both Parts will include credibility for the immediate future. The emphasis, however, will be different. Part 4 students will be expected to relate to credibility mathematically while Part 9 students will be expected to understand the insurance implications as well as the mathematics.

1985 Study Kit on Advanced Ratemaking — Same as 1984 Kit. (Available from CAS office at a cost of $3.00). The information contained in this kit is to be considered background material only and will not be tested directly.


American Academy of Actuaries Committee on Risk Classification “Risk Classification Statement of Principles.” June, 1980.


(b) INDIVIDUAL RISK RATING

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

Individual risk rating consists of two principal sections:

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

2) Retrospective rating.

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

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

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

Candidates unfamiliar with the general principles underlying individual risk rating plans should review Chapter 22 of the Kulp and Hall text, or the section on Merit Rating Plans in Chapter 10 of Insurance Company Operations. Volume II, from the American Institute for Property and Liability Underwriters before studying the required readings for this part. The candidate may gain a better understanding of the application of prospective and retrospective rating plans from John R. Stafford's books,

Workers' Compensation Experience Rating and Retrospective Rating, but will not be held responsible for their contents. It is realized that parts of some technical articles cited in the recommended reading for this part are not current. However, the candidate should study all articles for their explanation of theory.

(1) Experience Rating

Seader, R. H., “Fundamentals of Individual Risk Rating and Related Topics”. Part I of Study Note (This study note is available from CAS office at a cost of $3.00. Since it represents a compilation of several articles, it should be read in conjunction with the other readings of this section.)

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

National Council on Compensation Insurance:

Experience Rating Plan $3.00 (CAS office)

Insurance Services Office: Experience and Schedule Rating Plans applicable to:

General Liability (Available from the CAS office at a cost of $3.00 per copy).
Surety Association of America:

*Experience Rating Plan — Financial Institutions.*


(2) Retrospective Rating

Snader, R. H., “Fundamentals of Individual Risk Rating and Related Topics.” Part II of Study Note (see comments in Section (1)).

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

†National Council on Compensation Insurance: (Available from the CAS office)

- Retrospective Rating Plan Manual for Workers Compensation and Employers Liability Insurance

†Insurance Services Office: (Available from the CAS office)

- Retrospective Rating Plan for Automobile, General Liability, Glass and Theft


(3) Miscellaneous Rating

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

Insurance Services Office:

- Composite Rating Plan (Automobile, General Liability, Glass and Theft.) (Available from CAS office at a cost of $3.00 per copy).

Insurance Services Office:

- Commercial Fire Rating Schedule. Copyright 1975. (Summary available from CAS office at a cost of $3.00 per copy.)

PART 10

Prior to commencing study for this Part, the candidate should read the “Recommendations for Study” section, pages 11 to 14, for study suggestions and guidance in obtaining study notes, out-of-print readings, past examinations, and other information important to sitting for this examination.

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

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

(a) FINANCIAL OPERATIONS OF INSURANCE COMPANIES

This section explores various relationships that exist between underwriting results, investment income, and taxes that arise out of the underwriting process and total operating income. The candidate is also expected to develop an appreciation of the varying standards employed in measuring overall operations from the perspective of the stockholder, the manager, the regulator and the policyholder. The candidate should be prepared to compare and evaluate the procedures discussed and the arguments advanced in the readings.

1985 Study Kit of Current Articles (Same as 1984 Kit). (Available from the CAS office at a cost of $7.00 per copy.)


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


(b) REINSURANCE AND EXCESS RATING

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


Snader, R. H., "Fundamentals of Individual Risk Rating and Related Topics". Part III of Study Note. (Available from the CAS office at a cost of $3.00.)


(c) FORECASTING

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


(d) CURRENT EVENTS AND ISSUES

This section deals with industry topics of current interest with which the candidate should be familiar.

In preparing for this subject, the candidate is expected to be familiar with major issues reported in the general press and in trade journals. The candidate should be able to define the problem involved, and to discuss both sides of the issue.

The candidate’s attention should be directed to the general trade press coverage of current events. In certain instances, however, more detailed knowledge may be required from specific related source documents in order to fully respond to a question.
INDEX TO READINGS

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

4-10 Casualty Actuarial Society, One Penn Plaza, 250 West 34th Street, New York, NY 10119.

8 Chamber of Commerce of the United States, 1615 H. Street, N. W., Washington D.C. 20062.


7 Insurance Accounting and Statistical Association, P. O. Box 8857, Durham, NC 27707.

5.6 Insurance Information Institute, 110 William St., New York, NY 10038.

5.6, 9 Insurance Services Office, 160 Water Street, New York, NY 10038.

8 Insurers' Advisory Organization of Canada, 180 Dundas St. West, Toronto, Ontario, M5G 1Z9.
Part(s)


5,8,10 Journal of Risk and Insurance (The), Brooks Hall, University of Georgia, Athens, GA 30602.


1 Liphschutz, Seymour. Linear Algebra. (Schaum's Outline Series) McGraw-Hill Book Company, Manchester Road, Manchester, MO 63011.


8 Mertz, A. C. The First Twenty Years. National Association of Independent Insurers. (Available in many property-liability insurance companies and from Casualty Actuarial Society Library. Do not write to National Association of Independent Insurers.)


Part(s)


10 Munich American Reinsurance Company. Reinsurance and Reassurance. (Available in many property-liability insurance companies and from Casualty Actuarial Society Library. Do not write to Munich Reinsurance Company.)


7,8,10 National Association of Insurance Commissioners, 1125 Grand Avenue, Kansas City, MO 64106.

5,6,9 National Council on Compensation Insurance, One Penn Plaza, 250 West 34th Street, New York, NY 10119.

5,7 National Underwriter Company (The), 420 E. Fourth Street, Cincinnati, OH 45202.


7 New York (State) Insurance Department, Agency Building 1, Empire State Plaza, Albany, NY 12257. Examination of Insurance Companies. (Available at CAS Office.) Loss and Expense Ratios. Statistical Tables from Annual Statements.

8 New York (State) Laws, Statutes, etc. New York Insurance Law. (This can be obtained from the West Publishing Company, St. Paul, MN)


May 1985 Examinations

Mail order form to:
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<tr>
<th>“Hints on Study and Exam Techniques”</th>
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