Probability Exam

The Probability Exam is called Exam P by the SOA and Exam 1 by the CAS. This three-hour exam consists of 30 multiple-choice questions. The examination is jointly sponsored and administered by the SOA, CAS, and the Canadian Institute of Actuaries (CIA). The examination is also jointly sponsored by the American Academy of Actuaries (AAA) and the Conference of Consulting Actuaries (CCA).

The Probability Exam is administered as a computer-based test. For additional details, Please refer to Exam Rules.

The purpose of the syllabus for this examination is to develop knowledge of the fundamental probability tools for quantitatively assessing risk. The application of these tools to problems encountered in actuarial science is emphasized. A thorough command of the supporting calculus is assumed. Additionally, a very basic knowledge of insurance and risk management is assumed.

A table of values for the normal distribution is available below for candidates to download and will be included with the examination. Since the table will be included with the examination, candidates will not be allowed to bring copies of the table into the examination room.

Check the Updates section on this exam's home page for any changes to the exam or syllabus.

The ranges of weights shown are intended to apply to the large majority of exams administered. On occasion, the weights of topics on an individual exam may fall outside the published range. Candidates should also recognize that some questions may cover multiple learning outcomes.

Each multiple-choice problem includes five answer choices identified by the letters A, B, C, D, and E, only one of which is correct. Candidates must indicate responses to each question on the computer.

As part of the computer-based testing process, a few pilot questions will be randomly placed in the exam (paper and pencil and computer-based forms). These pilot questions are included to judge their effectiveness for future exams, but they will not be used in the scoring of this exam. All other questions will be considered in the scoring. All unanswered questions are scored incorrect. Therefore, candidates should answer every question on the exam.   There is no set requirement for the distribution of correct answers for the SOA/CAS/CIA multiple-choice preliminary examinations. It is possible that a particular answer choice could appear many times on an examination or not at all. Candidates are advised to answer each question to the best of their ability, independently from how they have answered other questions on the examination.

Since the CBT exam will be offered over a period of a few days, each candidate will receive a test form composed of questions selected from a pool of questions. Statistical scaling methods are used to ensure within reasonable and practical limits that, during the same testing period of a few days, all forms of the

test are comparable in content and passing criteria. The methodology that has been adopted is used by many credentialing programs that give multiple forms of an exam.

LEARNING OUTCOMES

Candidates should be able to use and apply the following concepts in a risk management context:

1. General Probability (15-30%)

   - Set functions including set notation and basic elements of probability
   - Mutually exclusive events
   - Addition and multiplication rules
   - Independence of events
   - Combinatorial probability
   - Conditional probability
   - Bayes Theorem / Law of total probability

2. Univariate probability distributions (including binomial, negative binomial, geometric, hypergeometric, Poisson, uniform, exponential, gamma, and normal) (30-50%)

   - Probability functions and probability density functions
   - Cumulative distribution functions
   - Mode, median, percentiles, and moments
   - Variance and measures of dispersion
   - Moment generating functions
   - Transformations

3. Multivariate probability distributions (including the bivariate normal) (30-45%)

   - Joint probability functions and joint probability density functions
   - Joint cumulative distribution functions
   - Central Limit Theorem
   - Conditional and marginal probability distributions
   - Moments for joint, conditional, and marginal probability distributions
   - Joint moment generating functions
   - Variance and measures of dispersion for conditional and marginal probability distributions
   - Covariance and correlation coefficients
   - Transformations and order statistics
   - Probabilities and moments for linear combinations of independent random variables

REFERENCES

Suggested Texts

There is no single required text for this exam. The texts listed below may be considered as representative of the many texts available to cover material on which the candidate may be examined. Texts are added and deleted as part of a regular process to keep the list up-to-date. The addition or deletion of a textbook does not change the bank of questions available for examinations. There is no advantage to selecting a text recently added or not using a text recently removed.

Not all the topics may be covered adequately by just one text. Candidates may wish to use more than one of the following or other texts of their choosing in their preparation. Earlier or later editions may also be adequate for review.

- A First Course in Probability (Eighth Edition), 2009, by Ross, S.M., Chapters 1–8.
- Mathematical Statistics with Applications (Seventh Edition), 2008, by Wackerly, D., Mendenhall III, W., Scheaffer, R., Chapters 1-7.
- Probability for Risk Management, (Second Edition), 2006, by Hassett, M. and Stewart, D., Chapters 1–11.
- Probability and Statistical Inference (Eighth Edition), 2009, by Hogg, R.V. and Tanis, E.A., Chapters 1–5.
- Probability and Statistics with Applications: A Problem Solving Text, 2010, by Asimow, L. and Maxwell, M.
- Probability: The Science of Uncertainty with Applications to Investments, Insurance and Engineering 2009, by Bean, M.A., Chapters 1–9.

Other Resources

The candidate is expected to be familiar with the concepts introduced in "Risk and Insurance".

Tables for Exam P/1
Exam P/1 Sample Questions and Solutions (1–153)
Risk and Insurance