Exam P   Probability

This three hour multiple-choice examination is administered jointly by the SOA and the CAS and is identical to CAS Exam 1.

Exam P is administered as a computer-based test. Details on this appear in the *Computer-Based Testing* section under General Information and at http://www.beanactuary.org/exams/cbt.cfm. Check the Updates section of the SOA Web Site for any changes to the exam or *Syllabus*.

The purpose of this course of reading 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 probability topics and 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 for candidates on the SOA and CAS Web sites 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.

LEARNING OUTCOMES

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

1. General Probability

    •   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, chi-square, beta, Pareto, lognormal, gamma, Weibull, and normal)

    •   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)

    •   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

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.

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. The # indicates new or updated material.

- *A First Course in Probability* (Seventh Edition), 2005, by Ross, S.M., Chapters 1–8.
- *Fundamentals of Probability, with Stochastic Processes,* (Third Edition), 2005, by Ghahramani, S., Chapters 1–11.
- *John E. Freund's Mathematical Statistics with Applications* (Seventh Edition), 2004, by Miller, I., Miller, 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: The Science of Uncertainty with Applications to Investments, Insurance and Engineering* 2001, by Bean, M.A., Chapters 1–9.

Study Notes

Code	Title
P-11-08#	P Introductory Study Note
	Tables for Exam P
	P Sample Exam Questions and Solutions (#1–137) (09.24.08)
P-21-05	Risk and Insurance