

Associateship Examinations

Exam 1 Probability

Exam 1 is a three-hour, multiple-choice examination that is administered by Preliminary Actuarial Examinations/SOA and is identical to SOA Exam P. The examination is jointly sponsored and administered by the CAS, SOA, 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).

Exam 1 is administered as a computer-based test. For additional details, please refer to “Computer-Based Testing Rules and Procedures.”

The purpose of the syllabus for this examination is to develop a 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 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.

Please check the “Syllabus Updates” section of the CAS Web Site for any changes to the exam or syllabus. Information about Study Notes is available in the “Study Resources” section.

LEARNING OBJECTIVES

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, gamma, 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

REFERENCES

There is no single required text for this exam. Periodically the list of representative texts is updated. There is no advantage to selecting a text just added or to avoiding a text that has been deleted. 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 candidate is expected to be familiar with the concepts introduced in “Risk and Insurance.”

Text References for Exam 1

Study Notes

Anderson, J.F.; and Brown, R.L., “Risk and Insurance” (Second Printing), 2005, Society of Actuaries (SOA Study Note).	W
Exam P Sample Questions and Solutions.	W
Tables for Exam P	W

Suggested Texts

Bean, M.A., <i>Probability: The Science of Uncertainty with Applications to Investments, Insurance, and Engineering</i> , 2001, American Mathematical Society, Chapters 1-9.
Hassett, M.; and Stewart, D., <i>Probability for Risk Management</i> (Second Edition), 2006, ACTEX Publications, Chapters 1-11.
Hogg, R.V.; and Tanis, E.A., <i>Probability and Statistical Inference</i> (Eighth Edition), 2009, Pearson/Prentice Hall, Chapters 1-5.
Ross, S.M., <i>A First Course in Probability</i> (Eighth Edition), 2009, Pearson/Prentice Hall, Chapters 1-8.
Wackerly, D.; Mendenhall III, W.; and Scheaffer, R., <i>Mathematical Statistics with Applications</i> (Seventh Edition), 2008, Duxbury Press, Chapters 1-7.

Source Key

NEW Indicates new or updated material or modified citation.

W Represents material that is available at no charge under “Web Notes” in the “Study Tools” section of the CAS Web Site.

Publishers and Distributors

Contact information is furnished for those who wish to purchase the text references cited for Exam 1/P. Publishers and distributors are independent and listed for the convenience of candidates; inclusion does not constitute endorsement by the CAS.

ACTEX Publications (Mad River Books), 107 Groppo Drive, Suite A, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: retail@actexmadriver.com; Web site: www.actexmadriver.com.

Actuarial Bookstore, P.O. Box 69, Greenland, NH 03840; telephone: (800) 582-9672 (U.S. only) or (603) 430-1252; fax: (603) 430-1258; Web site: www.actuarialbookstore.com.

Anderson, J.F.; and Brown, R.L., "Risk and Insurance" (SN P-21-05), 2005, Society of Actuaries, 475 N. Martingale Road, Suite 600, Schaumburg, IL 60173-2226; telephone: (847) 706-3500; fax: (847) 706-3599; Web site: www.soa.org.

Bean, M.A., *Probability: The Science of Uncertainty with Applications to Investments, Insurance, and Engineering*, 2001, American Mathematical Society, 201 Charles Street, Providence, RI, 02904-2294; telephone: (800) 321-4267 or (401) 455-4000; Web Site: www.ams.org/bookstore.

Hassett, M.; and Stewart, D., *Probability for Risk Management* (Second Edition), 2006, ACTEX Publications, 107 Groppo Drive, Suite A, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: retail@actexmadriver.com; Web site: www.actexmadriver.com.

Hogg, R.V.; and Tanis, E.A., *Probability and Statistical Inference* (Eighth Edition), 2009, Pearson/Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: www.prenhall.com.

Ross, S.M., *A First Course in Probability* (Eighth Edition), 2009, Pearson/Prentice Hall, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675; telephone: (800) 282-0693; Web site: www.prenhall.com.

SlideRule Books, P.O. Box 69, Greenland, NH 03840; telephone: (877) 407-5433 or (603) 373-6140; fax: (877) 417-5433 or (603) 430-1258; Web site: www.sliderulebooks.com.

Society of Actuaries, 475 N. Martingale Road, Suite 600, Schaumburg, IL 60173-2226; telephone: (847) 706-3500; fax: (847) 706-3599; Web site: www.soa.org.

Wackerly, D.; Mendenhall III, W.; and Scheaffer, R., *Mathematical Statistics with Applications* (Seventh Edition), 2008, Duxbury Press; telephone: (800) 354-9706; Web site: www.duxbury.com.