

SOA/CAS Course1 - Mathematical Foundations of Actuarial Science

This four-hour multiple-choice examination is administered by Preliminary Actuarial Examinations and is identical to SOA Course 1. Webnotes are available.

Please check the **Admissions** section of the CAS Web Site for any changes to the *Syllabus*.

The purpose of this examination is to develop a knowledge of the fundamental mathematical tools for quantitatively assessing risk. The application of these tools to problems encountered in actuarial science is emphasized. A thorough command of calculus and probability topics is assumed.

The tools emphasized on Exam 1 are:

- Limits, series, sequences, and functions
- Derivatives of single and multivariate functions (maximums, minimums, constrained maximums and minimums, rate of change)
- Integrals of single and multivariate functions, simple differential equations
- Parameterized curves
- General probability (set functions, basic axioms, independence)
- Bayes' Theorem
- Univariate probability distributions (probabilities, moments, variance, mode, percentiles, transformations)
- Multivariate probability distributions (Central Limit Theorem; joint, conditional and marginal distributions-probabilities, moments, variance, covariance)

A table of values for the normal distribution will be provided to candidates at the time of the examination.

READINGS

The texts listed in Sections A and B below are considered representative of the many texts used by colleges and universities in Canada and the United States to cover material on which the candidate may be examined. Earlier or later editions of the listed texts contain essentially the same material and should be adequate for review purposes. The candidate may use any of these texts or others to review the material that will be examined.

The candidate is expected to be familiar with the concepts introduced in the Study Note in Section C.

A. Calculus

Anton, H.; Bivens, I.; and Davis, S., *Calculus, Late Transcendentals Combined Version* (Seventh Edition), 2001, John Wiley and Sons.

Edwards, C.H.; and Penney, D.E., *Calculus with Analytic Geometry* (Sixth Edition), 2002, Prentice-Hall.

Finney, R.L.; Demana, F.D.; and Waits, B.K., *Calculus: Graphic, Numerical, and Algebraic*, 1999, Addison-Wesley.

Larson, R.E.; Hostetler, R.P.; and Edwards, B.H., *Calculus* (Seventh Edition), 2002, Houghton Mifflin Company.

Stewart, J., *Calculus: Concepts and Contexts* (Second Edition), 2001, Brooks/Cole Publishing Company.

B. Probability

Bean, M.A., *Probability: The Science of Uncertainty with Applications to Investments, Insurance, and Engineering*, 2001, Brooks/Cole Publishing Company,

Chapters 1-9.
Ghahramani, S., *Fundamentals of Probability* (Second Edition), 1999, Prentice-Hall, Chapters 1-10.
Hassett, M.; and Stewart, D., *Probability for Risk Management*, 1999, ACTEX Publications, Chapters 1-11.
Hogg, R.V.; and Tanis, E.A., *Probability and Statistical Inference* (Sixth Edition), 2001, Prentice-Hall, Chapters 1-6.
Ross, S.M., *A First Course in Probability* (Sixth Edition), 2001, Prentice-Hall, Chapters 1-8.

C. Risk and Insurance

"Risk and Insurance," Society of Actuaries Study Note 1-21-00.

Publishers and Distributors

Contact information is furnished for those who wish to purchase the text references cited for Exam 1. 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), 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; e-mail: retail@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

Anton, H.; Bivens, I.; and Davis, S., *Calculus, Late Transcendentals Combined Version* (Seventh Edition), 2001, John Wiley and Sons, One Wiley Drive, Somerset, NJ 08875; telephone: (800) 225-5945 or (732) 469-4400.

Bean, M.A., *Probability: The Science of Uncertainty with Applications to Investments, Insurance, and Engineering*, 2001, Brooks/Cole Publishing Company, a division of Thomson Learning, Order Department, 7625 Empire Drive, Florence, KY 41042; telephone: (800) 354-9706; Web site:

<http://training.thomsonlearning.com>.

Edwards, C.H.; and Penney, D.E., *Calculus with Analytic Geometry* (Sixth Edition), 2002, Prentice-Hall, Inc.; telephone: (800) 374-1200 or (515) 284-6751.

Finney, R.L.; Demana, F.D.; and Waits, B.K., *Calculus: Graphic, Numerical, and Algebraic*, 1999, Addison-Wesley; telephone: (800) 922-0579.

Ghahramani, S., *Fundamentals of Probability* (Second Edition), 1999, Prentice-Hall, Inc.; telephone: (800) 374-1200 or (515) 284-6751.

Hassett, M.; and Stewart, D., *Probability for Risk Management*, 1999, ACTEX Publications, 140 Willow Street, Suite One, P.O. Box 974, Winsted, CT 06098; telephone: (800) 282-2839 or (860) 379-5470; fax: (860) 738-3152; retail@actexmadriver.com.

Hogg, R.V.; and Tanis, E.A., *Probability and Statistical Inference* (Sixth Edition), 2001, Prentice-Hall, Inc.; telephone: (800) 374-1200 or (515) 284-6751.

Larson, R.E.; Hostetler, R.P.; and Edwards, B.H., *Calculus* (Seventh Edition), 2002, Houghton Mifflin Company, Customer Service, 181 Ballardvale Street, Wilmington, MA 01887; telephone: (800) 225-1464; fax: (978) 661-1326.

"Risk and Insurance" (SN 1-21-00), 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.

Ross, S.M., *A First Course in Probability* (Sixth Edition), 2001, Prentice-Hall, Inc.; telephone: (800) 374-1200 or (515) 284-6751.

SlideRule Books, 10 First Avenue East, Mobridge, SD 57601; telephone: (877) 407-5433 or (605) 845-5580; fax: (877) 417-5433 or (605) 845-7627; Web site: www.sliderulebooks.com.

Stewart, J., *Calculus: Concepts and Contexts* (Second Edition), 2001, Brooks/Cole Publishing Company, a division of Thomson Learning, Order Department, P.O. Box 6904, Florence, KY 41022; telephone: (800) 347-7707.