Probability Exam – November 2026

The Probability Exam is a three-hour exam that consists of 30 multiple-choice questions and is administered as a computer-based test (CBT). 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. An understanding of calculus, including series, differentiation, and integration is assumed. Additionally, the candidate is expected to be familiar with the concepts introduced in "Risk and Insurance."

A table of values for the normal distribution is available below for candidates to download. This information will be available in Portable Document Format (PDF) for the CBT exam candidates found under an **Exhibit** button during the exam and will be included in hard copy with the paper/pencil examination. Since the table will be included with the examination no matter which format is taken, 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.

In the learning outcomes, weights have been provided to indicate the relative emphasis on different sections. 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. Answers for some questions have been rounded.

As part of the exam, 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 this examination. 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.

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.

Unofficial pass/fail results will be sent within one hour to the email address you used to schedule your appointment.

LEARNING OUTCOMES

1. **Topic: General Probability (23-30%)**
Learning Objectives
The Candidate will understand basic concepts of probability and discrete mathematics.
Learning Outcomes
The Candidate will be able to: a) Define set functions, Venn diagrams, sample space, and events. Define probability as a set function on a collection of events and state the basic axioms of probability. b) Calculate probabilities using combinatorics, such as combinations and permutations. c) Define independence and calculate probabilities of independent events. d) Calculate probabilities of mutually exclusive events. e) Calculate probabilities using addition and multiplication rules. f) Define and calculate conditional probabilities. g) State Bayes Theorem and the law of total probability and use them to calculate conditional probabilities.

2. **Topic: Univariate Random Variables (44-50%)**

Learning Objectives

The Candidate will understand discrete univariate distributions (including binomial, geometric, hypergeometric, negative binomial, Poisson, and uniform) and continuous univariate distributions (including beta, exponential, gamma, normal, and uniform) and their applications.

Learning Outcomes

The Candidate will be able to:

a) Explain and apply the concepts of probability, random variables, probability density functions, and cumulative distribution functions.

b) Calculate conditional probabilities.

c) Explain and calculate expected values, including moments, mode, median, and percentiles.

d) Explain and calculate variance, standard deviation, and coefficient of variation.

e) Calculate the amount that an insurance company pays to a policyholder for a claim given policy information, including deductibles, coinsurance percentages, and benefit limits, as well as other factors, such as inflation.

f) Calculate the expected value, variance, and standard deviation of both the loss random variable and the corresponding payment amount random variable.

3. **Topic: Multivariate Random Variables (23-30%)**

Learning Objectives

The Candidate will understand key concepts in the discrete and continuous settings concerning multivariate distributions, the distribution of order statistics for independent random variables, and linear combinations of independent random variables, along with associated applications.

Learning Outcomes

The Candidate will be able to:

a) Determine joint probability functions and joint cumulative distribution functions for discrete random variables.

b) Determine conditional and marginal probability functions for discrete random variables.

c) Calculate moments for joint, conditional, and marginal discrete distributions.

d) Calculate variance and standard deviation for conditional and marginal probability distributions for discrete random variables.

e) Calculate the covariance and the correlation coefficient for discrete random variables.

f) Determine the joint distribution of order statistics for a set of independent random variables.

g) Calculate probabilities for linear combinations of independent discrete random variables as well as for continuous normal random variables.

h) Calculate moments for linear combinations of independent random variables.

i) Apply the Central Limit Theorem to calculate approximations of probabilities for linear combinations of independent and identically distributed random variables.

REFERENCES

Suggested Texts

There is no required text for this exam. The texts listed below may be considered as representative of the many texts available to cover the syllabus. 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.

Candidates may wish to supplement their chosen text(s) from the list below with other material of their choosing to ensure coverage of the syllabus. Earlier or later editions may also be adequate for review. Not all of the topics may be covered adequately by just one text.

A First Course in Probability (Tenth Edition), 2019, by Ross, S.M., Pearson, ISBN: 978- 0134753119

Chapter 1
Chapter 2
Chapter 3
Chapter 4 (exclude 4.8.4)
Chapter 5 (exclude 5.6.2, 5.6.3, 5.6.5, 5.7)
Chapter 6 6.1, 6.2, 6.3.3, 6.3.4, 6.4, 6.6
Chapter 7 Discrete Only (exclude 7.2.1, 7.2.2, 7.3, 7.6, 7.7, 7.8, 7.9)
Chapter 8 8.1, 8.3

Mathematical Statistics with Applications (Seventh Edition), 2008, by Wackerly, D., Mendenhall III, W., Scheaffer, R., Thomson Brooks/Cole ISBN: 978-0495110811

Chapter 1
Chapter 2 (exclude 2.12)
Chapter 3 3.1-3.8, 3.9 (exclude MGF)
Chapter 4 (exclude 4.10)
Chapter 5 (exclude continuous multivariate distributions, exclude 5.10)
Chapter 6 6.7
Chapter 7 (exclude 7.4)

Probability for Risk Management, (Third Edition), 2021, by Hassett, M., Stewart, D., Milovanovic, J., ACTEX, ISBN: 978-1-64756-322-6

Chapter 1
Chapter 2
Chapter 3
Chapter 4
Chapter 5
Chapter 6 6.1, 6.2.1
Chapter 7
Chapter 8 (exclude 8.5, 8.6, 8.7)
Chapter 9 (exclude 9.2, 9.3, 9.4, 9.6)
Chapter 10 (exclude 10.2, 10.3.2, 10.3.3 continuous, 10.4.2)
Chapter 11 (exclude 11.1.4, 11.1.5, 11.2.3 continuous, 11.2.5 continuous, 11.2.8, 11.3)

Probability and Statistics with Applications: A Problem-Solving Text, (Second Edition) 2015, by Asimow, L. and Maxwell, M., ACTEX, ISBN: 978-1-62542-472-3

Chapter 1
Chapter 2
Chapter 3 (exclude 3.4.5, 3.7)
Chapter 4 (exclude 4.6.2, 4.6.3, 4.6.5)
Chapter 5 (exclude 5.6)
Chapter 6 (exclude 6.3.4, 6.4.2, 6.4.6, 6.7)
Chapter 7 (exclude 7.5, 7.6, 7.7, 7.9, 7.10)
Chapter 8 8.1.5, 8.3, 8.4 (exclude continuous), 8.6

Probability and Statistical Inference (Tenth Edition), 2020, by Hogg, R.V., Tanis, E.A., and Zimmerman, D.L., Prentice Hall, ISBN: 978-0135189399

Chapter 1
Chapter 2
Chapter 3 (exclude Chi-Square)
Chapter 4 (exclude 4.4, 4.5)
Chapter 5 5.3 (discrete only), 5.5, 5.6, 5.7

Probability (Second Edition), 2018, by Leemis, L.M., Lightning Source, ISBN: 978-0-9829174-7-3.

Chapter 1 (exclude 1.1)
Chapter 2
Chapter 3 (exclude moment generating functions in 3.4, exclude 3.5)
Chapter 4 (exclude 4.7)
Chapter 5 (include only beta distribution in 5.5)
Chapter 6 (exclude continuous, exclude moment generating functions in 6.3, exclude 6.4)
Chapter 7 (exclude 7.1, include only order statistics in 7.2, exclude 7.3)
Chapter 8 (exclude 8.1, exclude 8.2)

Other Resources

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

Tables for Exam P

Exam P Sample Questions and Solutions

Online Sample Exam P

The Society of Actuaries (SOA) is interested in supporting candidates as they prepare for the preliminary exams. To that end the SOA has launched an online sample exam for Exam P (Probability). Questions have been coded to meet the Exam P learning objectives and ensure candidates receive a balanced yet randomized set of questions each time they take the sample exam. The sample exam questions are drawn from the existing set of sample questions.