

EDUCATION COMMITTEE OF THE SOCIETY OF ACTUARIES (SOA)

INTRODUCTORY STUDY NOTE

EXAM SESSION: **SPRING 2020**

EXAM: **LTAM – Long-Term Actuarial Mathematics**

DATE and TIME: **Friday, April 24, 8:30 a.m. – 12:45 p.m.**

The examination will consist of four hours of multiple-choice and written answer questions. A 15 minute read-through time will be given prior to the start of the exam. No writing is allowed during the read-through time. Candidates are strongly advised to avoid even holding writing instruments during this period.

1. This examination will have 96 points. Each multiple-choice question is worth 2 points. There will be 20 multiple-choice questions and 56 points for written-answer questions. All unanswered multiple-choice questions are scored incorrect. Therefore, candidates should answer every multiple-choice question on the exam. The number of written-answer questions may vary from exam to exam. Candidates are free to allocate their time between the written-answer and multiple-choice questions as they choose. The point values assigned to each question are set to be proportional to the examination committee's estimate of the time required (approximately 2.5 minutes per point). Most written-answer questions have multiple parts as illustrated in the sample written answer questions and solutions. Each of the parts is worth an indicated portion of the total points for that question. Partial credit may be awarded for an answer to a question part; (therefore candidates should write answers to each part even if they are not complete) It is expected that multiple-choice questions will be more straight-forward and thus require less time per question than in pre-2014 exams that were entirely multiple-choice.

The ranges of weights shown on the syllabus 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.

The LTAM examination will use a unique grading process. Only candidates with scores above a certain threshold on the multiple-choice portion of the exam will have their written-answer portion graded. The threshold may vary from one exam administration to another. For those papers that are fully graded, passing will depend only on the total score.

2. Recommended material to master the Learning Objectives/Outcomes includes textbooks, sample questions, and any study notes listed in the Appendix of this note. The Appendix may contain additional important information regarding this exam. The Learning Objectives/Outcomes are found via links in this exam's home page on the SOA Web site. The link to the sample questions is in the Appendix to this note.
3. Knowledge and understanding of life contingency concepts are significantly enhanced through working out problems based on those concepts, including textbook problems and other sources of sample problems.
4. Tables are provided in a link in the Appendix for the candidate and will be provided to the

candidate at the examination. These include a table of values for the standard normal distribution and standard ultimate life tables. Because the tables for Exam LTAM will be provided to the candidate at the examination, candidates will not be allowed to bring copies of the tables into the examination room.

5. Several book distributors carry some or all of the textbooks for the Society of Actuaries exams. A list appears on the SOA Web site at: <http://www.soa.org/education/exam-reg/resources/edu-txt-manuals.aspx>.
6. Any changes in the syllabus for this exam will be published under “Updates” in this exam’s home page on the SOA Web site.
7. The candidate should master the Learning Objectives/Outcomes. These Learning Objectives/Outcomes, not the recommended text sections, comprise the syllabus and also guide the examination committee when writing questions. The Learning Objectives/Outcomes also set out the cognitive level needed to pass this exam. Note that candidates are expected to “interpret,” “explain,” “compare,” “apply,” “construct,” etc. While studying the recommended text sections, candidates should refer back to the Learning Outcomes to remain focused on the goals of the exam.
8. The examination questions for this exam will be based on the notation and terminology described in the Notation and Terminology Study Note for this exam. If a conflict exists (in definitions, terminology, etc.) between this note and the readings for other exams, the questions should be answered on the basis of this note.
9. Candidates may ONLY use these battery or solar-powered Texas Instruments calculator models: BA-35, BA II Plus*, BAI Plus Professional*, TI-30Xa, TI-30X II* (IIS solar or IIB battery), and TI-30X MultiView* (XS solar or XB battery). Candidates may use more than one of the approved calculators during the examination.

Calculator instructions may not be brought into the exam room. During the exam, the calculator must be removed from its carrying case so the supervisor can confirm that it is an approved model. Candidates using a calculator other than the approved models will have their exams disqualified.

Candidates can purchase calculators directly from: Texas Instruments, Attn: Order Entry, PO Box 650311, Mail Station 3962, Dallas, TX 75265, phone 800/842-2737 or <http://epsstore.ti.com>.

The memory of the **BA II Plus, **BAII Plus Professional**, **TI-30X II**, and **TI-30X MultiView** calculators will need to be cleared by the examination supervisor upon the candidate’s entrance to the examination room.*

10. A list of various seminars/workshops and study manuals appears on the SOA Web site at: <http://www.soa.org/education/exam-reg/resources/edu-sem-workshops.aspx> and <http://www.soa.org/education/exam-reg/resources/edu-txt-manuals.aspx>.

These seminars/workshops and study manuals do not reflect any official interpretation, opinion, or endorsement of the Society of Actuaries or its Education Committee.

11. The Society of Actuaries provides study notes to persons preparing for this examination. They are intended to acquaint candidates with some of the theoretical and practical considerations involved in the various subjects. While varying opinions are presented where appropriate, limits on the length of the material and other considerations sometimes prevent the inclusion of all possible opinions. These study notes do not, however, represent any official opinion, interpretation or endorsement of the Society of Actuaries. The Society is grateful to the authors for their contributions in preparing study notes.

The American Academy of Actuaries, the Canadian Institute of Actuaries, the Conference of Consulting Actuaries, and the Society of Actuaries jointly sponsor various examinations administered by the Society of Actuaries.

APPENDIX

Recommended Textbook

Dickson, C.M.D., Hardy, M.R., and Waters, H.R. (2013), *Actuarial Mathematics for Life Contingent Risks*, **Second Edition**, Cambridge: Cambridge University Press

- Chapters 1 – 10 and Chapter 12 excluding 1.8, 3.12, 4.8, 5.14, 6.10, 7.3.5, 7.6, 7.7, 7.10, 8.14, 9.8, 10.8, and 12.9

There are two study notes for this examination:

[LTAM-21-18 Long Term Actuarial Mathematics Supplementary Note](#). Section 4.6 references Monte Carlo simulations and references Chapter 11 of *Actuarial Mathematics for Life Contingent Risks*. The student will not be expected to complete Monte Carlo simulations and does not need to review Chapter 11 of *Actuarial Mathematics for Life Contingent Risks*.

[LTAM-22-19](#) Chapters 10, 11 and 14 from *Loss Models, From Data to Decisions*, 5th edition, 2018 by Klugman, Panjer, and Willmot. Chapters 10 and 11 are provided for background reading. Chapter 14 is required reading, except for Sections 14.4 and 14.6.

You may also use the third edition of *Actuarial Mathematics for Life Contingent Risks*.

Dickson, C.M.D., Hardy, M.R., and Waters, H.R. (2020), *Actuarial Mathematics for Life Contingent Risks*, **Third Edition**, Cambridge: Cambridge University Press

- Chapters 1 – 11, Chapter 13 and Chapter 19 excluding 1.12, 2.7, 3.13, 4.8, 5.14, 6.8, 7.2.5, 7.5, 7.6, 7.9, 7.10, 8.11, 9.7, 10.8, 11.13, 13.8, 13.10 and 19.5
- The student should also exclude information on De Moivre's Law on Page 42 and the sub-section on Woolhouse's formula and state dependent annuities beginning on Page 309 and ending on Page 312.

The third edition of *Actuarial Mathematics for Life Contingent Risks* includes the material from the Long Term Actuarial Mathematics Supplementary Note so there is only one study note.

[LTAM-22-19](#) Chapters 10, 11 and 14 from *Loss Models, From Data to Decisions*, 5th edition, 2018 by Klugman, Panjer, and Willmot. Chapters 10 and 11 are provided for background reading. Chapter 14 is required reading, except for Sections 14.4 and 14.6.

Other Resources

[All released MLC and LTAM exam papers, since 2000 can be found here.](#)
[MLC tables](#) (to be used with past MLC posted exams)

Notation and Terminology used on Exam LTAM

Exam LTAM Tables

[Excel Workbook for Exam LTAM Tables](#) (These spreadsheets were used to develop the tables used for the LTAM exam and is provided for educational purposes only. The workbook will not be available at the LTAM exam.)

[Exam LTAM Sample Multiple-Choice Questions](#)

[Exam LTAM Sample Multiple-Choice Solutions](#)

[Exam LTAM Sample Written-Answer Questions](#)

[Exam LTAM Sample Written-Answer Solutions](#)