

GUIDE TO SOA EXAMS

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1. Introduction

This document replaces the *Guide to SOA Written Exams*. That document was solely devoted to exams with a written-answer component. This new *Guide* covers most all aspects of Society of Actuaries (SOA) education and assessment. Questions about the content of this document should be addressed to education@soa.org.

1.1. Purpose of this Document

The main purpose of this document is to consolidate candidate information into a single reference. In some cases more details are provided in a separate document located on the SOA's web pages.

The only change to SOA policies and procedures that is new with this document is the feedback given to candidates who do not pass exams with a written-answer component. This change is discussed in Section 8.9.1.

If there is a conflict between this *Guide* and the official rules and/or terms and conditions governing an examination or assessment, the official rules and/or terms and conditions will control.

1.2. Education Principles

At various times, the SOA Board of Directors has adopted principles for the education system. The latest version was approved in March 2018 and can be found at <https://www.soa.org/education/general-info/principles-prequalification/>. They are reproduced here:

1. **Education Principle:** Develop actuaries with a global perspective who are able to deliver a service of quality and high standards that meets the current and projected future needs of employers, clients, and the public.
2. **Attraction Principle:** Attract candidates who likely to become successful actuaries.
3. **Coverage Principle:** Ensure coverage of core topics common to all actuarial disciplines, as well as topics related to specialty requirements and to the emerging needs of the profession, so as to prepare actuaries to take on their chosen role(s) in a variety of different areas of actuarial practice and geographies.
4. **Foundation Principle:** Provide FSA candidates, regardless of geography, a globally relevant education that allows mobility in the global workplace and the ability to practice in specific jurisdictions, particularly in the US or Canada.
5. **Global Recognition Principle:** Recognize that candidates are located throughout the world and that SOA designations and credentials have worldwide respect.
6. **Competency Framework Principle:** Incorporate the elements of the SOA Competency Framework as appropriate.
7. **Learning Methods Principle:** Achieve quality learning by using the best and most appropriate methods available.
8. **Assessment Methods Principle:** Select assessment methods that are appropriate for the subject matter and effectively discriminate between candidates who have and who have not met the standards set for the material being assessed.
9. **Language Principle:** Provide pre-qualification exams only in English, except where required by law and sufficient demand exists.

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10. **International Organizations Principle:** Conform to education guidelines of the International Actuarial Association (IAA) and the Global CERA treaty, and other guidelines as directed by the SOA Board.
11. **Designations Principle:** Recognize that SOA designations and credentials are used for qualification purposes other than SOA membership.
12. **Stakeholders Principle:** Consider the perspectives of key stakeholders, including candidates, members, employers, and the public.

While all the above are important and relevant, two are expanded on in the next sections.

1.2.1. Assessment Methods Principle

When the SOA's examination system was re-designed during 2005-2007 a key change was that material was classified into several categories with regard to importance and testing methods. Currently, the following approaches are being used:

- Validation by Educational Experience (VEE) – Candidates must earn a minimum grade in approved university courses or alternative experiences. VEE is used for some of the introductory material in the ASA curriculum.
- Multiple choice – Candidates select one of (usually) five choices. Exams may be delivered by computer-based testing (CBT). CBT exams have the ability to provide instant unofficial results when the item bank is sufficiently robust. These exams are proctored and no resources beyond a calculator are available. Additional tools such as Excel and RStudio may be made available in the future. Multiple choice is used for much of the ASA curriculum.
- Written answer paper and pencil – Candidates write out answers using paper and pen/pencil. These exams are proctored and no resources beyond a calculator are available. This format has been used for ASA exam LTAM and FSA exams. It may continue in 2021 for select exams.
- Written answer computer-based testing (CBT) – Candidates provide answers in electronic documents (such as .docx, .xlsx., or .rmd files) using a computer at a testing center. No internet access is allowed. This format has been used for some exams and will be used for Exam PA and most or all of LTAM and all FSA exams beginning in 2021. In some cases it is possible that selected questions will be answered via paper and pencil.
- Written report-take home – Candidates write a report or memo, working at home with course resources and analysis tools available. While not proctored, candidates are given guidance regarding the amount of help that may be obtained from other people. This format is used for e-Learning modules.
- Seminars – Candidates attend an in-person or virtual seminar. There is no assessment at the end. Used for the Associateship Professionalism Course and the Fellowship Admissions Course.

This principle also requires that each assessment does the best possible job of discriminating between those candidates who have mastered the material at the desired level and those who have not. This requires careful construction of questions and a grading process that appropriately awards credit and employs careful and accurate grading. Much of the rest of this document explains how the SOA accomplishes this goal.

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1.2.2. International Organizations Principle

As noted in the statement of the principle, SOA education conforms to guidelines provided by two other actuarial bodies.

The International Actuarial Association (IAA) sets guidelines for a minimum syllabus for all its member organizations. The SOA is committed to meeting this syllabus through ASA education. The IAA revised its syllabus in 2017 and these revisions were reflected in the changes to the ASA exams in 2018.

The CERA Global Association sets the curriculum for organizations awarding the CERA credential. The SOA meets those objectives through the Fundamentals of Actuarial Practice course, the ERM Module, and the ERM exam.

1.3. Organizational Structure of Education

The Education Executive Group, chaired by the General Chairperson, oversees the SOA's Education system. The volunteer structure of Education comprises three separate committee groups with the constituent committees reporting to a member of the Education Executive Group.

- The Fellowship Curriculum Committees are responsible for the selection and development of the learning objectives and study materials for fellowship exams and any track-specific modules.
- The Fellowship Examination Committees are responsible for the development and grading of fellowship examinations.
- The Common Curriculum committees are responsible for curriculum and examinations for the ASA components as well as those fellowship components that span multiple tracks.

2. Overview and Definitions

2.1. Designations/Credentials

The SOA offers two designations, Associate of the Society of Actuaries (ASA) and Fellow of the Society of Actuaries (FSA). They are termed designations as that is short for "designation of membership." All who hold one of these designations are members of the SOA and all members hold one of these designations. Once earned through completion of the education requirements, a designation can be removed through (a) resignation, (b) failure to pay dues, or (c) disciplinary action.

Holding an SOA designation may not be sufficient for an actuary to practice. Practice rights are determined by the jurisdiction the actuary practices in, which may impose additional requirements or qualifications; for example, it could require membership with another local actuarial organization. The SOA does impose a set of continuing education requirements, but meeting them is not necessary to maintain a designation. However, the SOA does require that a member's compliance status be publicly available.

The SOA also offers the Chartered Enterprise Risk Analyst (CERA) credential. Those who pass specified exams and modules are awarded the CERA credential. The education requirements for this credential are set by the CERA Global Association (CGA), of which the SOA is a member. The CGA verifies that the SOA's selected requirements cover its requirements. All who earn a CERA must affiliate with a CGA member association. Candidates who do not hold the ASA designation, have met the SOA's CERA requirements, and have passed the Predictive Analytics Exam may apply for membership as an associate.

2.1.1. Meaning of the ASA

An Associate of the Society of Actuaries (ASA) has demonstrated knowledge of the fundamental concepts and techniques for modeling and managing risk. The associate has also learned the basic methods of

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applying those concepts and techniques to common problems involving uncertain future events, especially those with financial implications. The associate has also completed a professionalism course covering the professional code of conduct and the importance of adherence to recognized standards of practice. Associates who have been members of the SOA for five or more years may also vote in SOA elections.

2.1.2. Meaning of the FSA

A Fellow of the Society of Actuaries (FSA) has demonstrated a knowledge of the business environments within which financial decisions concerning pensions, life insurance, health insurance, general insurance and investments are made, including the application of mathematical concepts and other techniques to the various areas of actuarial practice. The fellow has further demonstrated an in-depth knowledge of the application of appropriate techniques to a specific area of actuarial practice. Fellows may vote in SOA elections.

2.1.3. Meaning of the CERA

A Chartered Enterprise Risk Analyst (CERA) of the SOA has demonstrated knowledge in the identification, measurement and management of risk within risk-bearing enterprises. The CERA has also completed a professionalism course covering the professional code of conduct and the importance of adherence to recognized standards of practice. CERAs who have the Application for Admission as an Associate approved by the SOA Board of Directors will be granted membership as an Associate.

2.2. Component Groupings

As noted in Section 1, components can be classified by the type of assessment used. Another breakdown is by the type of education provided and the component's position in the pathway to a designation. The following groupings will be used:

- Validation by Educational Experience – here the education and assessment align.
- Preliminary examinations – These are ASA-level components that are assessed by proctored examinations. Assessment types are currently multiple choice, a combination of multiple choice and written answer, and a project.
- Fundamentals of Actuarial Practice (FAP) course – This course uses e-Learning to provide the education and provides assessment via non-proctored projects.
- Fellowship examinations – These examinations are post-ASA and are mostly proctored, written-answer examinations. There are some proctored multiple-choice components.
- Fellowship modules – Education is provided by e-Learning and assessments are non-proctored projects.
- Seminars – These are in-person or virtual learning opportunities without a formal assessment.

3. Discipline

3.1. Introduction

This section outlines expected behavior from candidates and the discipline process related to infractions. In this section, “examination” or “exam” refers to any and all means of education or evaluation (e.g., exams, modules, exercise, assessments, validations, or courses) related to completion of a designation offered by the SOA. This section provides an overview on the disciplinary process, and is considered non-binding

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guidance. All applicable examination discipline documents can be found at <https://www.soa.org/education/general-info/default/>

3.2. Code of Conduct for Candidates

All SOA exam candidates who are not members agree to be subject to the *Code of Conduct for Candidates* (“Candidate Code”). Candidates who are members of the SOA are subject to the *Code of Professional Conduct*. This section will only discuss the *Candidate Code*.

3.2.1. The Candidate Code

The *Candidate Code* can be found at <https://www.soa.org/education/general-info/discipline/edu-code-of-conduct-cand/>. The version as of July 2019 is reproduced here. Commentary is in italics. The *Candidate Code* begins by defining who is covered:

An “Actuarial Candidate” is a person who has contacted the SOA with an intent to register for, has registered for, or completed any SOA educational or evaluative activity (e.g., exams, modules, exercises, assessments, validations or courses), but is not a member of the SOA as an Associate (ASA), Chartered Enterprise Risk Analyst (CERA) or Fellow (FSA).

RULE 1: An Actuarial Candidate shall act honestly, with courtesy, integrity, and competence, to uphold the reputation of the actuarial profession.

As with Precept 1 of the Code of Professional Conduct, this rule can be interpreted broadly. As a result, the Candidate Code extends to improper behavior not necessarily related to the exam process.

RULE 2: An Actuarial Candidate shall not engage in any professional conduct involving dishonesty, fraud, deceit, or misrepresentation or commit any act that reflects adversely on the actuarial profession.

One example where this rule has been enforced has been with respect to candidates who have misrepresented their exam record.

RULE 3: An Actuarial Candidate shall act with courtesy and professional respect in all interactions with the SOA.

Unprofessional behavior, such as threatening or abusive emails, letters, or telephone messages are not acceptable. This rule extends to those who work on behalf of the SOA, such as Prometric test center administrators.

RULE 4: An Actuarial Candidate shall perform Actuarial Services with courtesy and professional respect and shall cooperate with others in the Principal's interest.

This rule refers to the work candidates do for the employer or client.

RULE 5: An Actuarial Candidate shall strictly comply with the letter and spirit of the SOA Rules and Regulations for Examinations and Terms and Conditions Agreement for e-Learning Candidates.

This Candidate Code is not designed to replace or duplicate the specific rules related to taking examinations. This is a reminder that all those rules continue to apply.

RULE 6: Actuarial Candidates are not authorized to use, and therefore must never use membership designations of the SOA until they are admitted to membership by the SOA Board of Directors.

The SOA provides no recognition, status, or designation for candidates who are not yet members.

RULE 7: An Actuarial Candidate shall not disclose to another party any confidential information unless authorized to do so by the Principal or required to do so by law, statute, or regulation. Confidential

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information includes information of a proprietary nature and information that is legally restricted from circulation.

This covers both confidential information relating to the examinations as well as information obtained in the course of your professional work.

RULE 8: An Actuarial Candidate shall respond promptly, truthfully, and fully to any request for information by, and cooperate fully with, the appropriate disciplinary body of the SOA in connection with any disciplinary or other proceeding relating to the Candidate Code. The Actuarial Candidate's responsibility to respond shall be subject to applicable restrictions listed in Rule 7 and those imposed by law, statute, or regulation.

3.2.2. Enforcement of the *Candidate Code*

This section provides a brief overview of the process by which the *Candidate Code* is enforced. Full details are linked from the home page for the *Candidate Code*. Violations of Rule 5 are handled through the separate polices discussed in the next section. This section refers to treatment of violations of the other seven rules.

Anyone (including self-reporting by a candidate) can report a potential violation. There is a link to the infraction report form within the polices document. A review is conducted by the SOA to determine the validity of the evidence and the extent to which the candidate's actions violate the code. If it is determined that a violation occurred, the candidate is informed along with the nature of the discipline imposed. Typically, the discipline is either a

- Warning – The candidate is informed of the reported action and reminded of the importance of strict adherence to the code. No action is taken, but future violations are more likely to lead to discipline.
- Ban – The candidate is banned from making further progress in the SOA exam system for a specified period of time, which could be lifetime.

Candidates have the option to appeal a determination that the code has been violated. In addition, candidates who have been given a lifetime ban are entitled to make an appeal in person before a three-person panel.

At the SOA's discretion, it may disclose the result of any disciplinary action to other actuarial organizations.

3.3. Exam-related Discipline

This section covers discipline directly related to the all aspects of the SOA's qualification system. Unlike the *Code of Conduct for Candidates*, these rules and processes apply to all candidates, whether or not they are members. This section is a summary. Candidates should be thoroughly familiar with all the discipline documents hosted on the General Information page at the SOA's website:

<https://www.soa.org/education/general-info/default/>

3.3.1. Confidentiality of Questions

The contents of all exams are copyrighted, proprietary, and confidential. They may not be disclosed or reproduced for any purposes whatsoever unless express permission has been granted by the SOA. This is particularly important with respect to computer-based tests as questions are often drawn from an item bank and hence may be used on future exams.

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Some exams and exam questions are published by the SOA. This material remains copyrighted and that status must be respected. However, candidates are free to discuss the contents of these questions once the exam becomes publicly available.

There also may be occasions when the terms of an exam or assessment expressly allow specific levels of communication. For example, the Fundamentals of Actuarial Practice Final Assessment allows generic discussion of the topics covered, though the assessment documents themselves and your proposed submission cannot be shared.

3.3.2. Computer-based Tests

Candidates taking computer-based exams administered by a third-party entity such as Prometric are also subject to that party's terms and conditions. Violation of those terms will be reported to the SOA and SOA-enacted discipline may result.

3.3.3. Proctored Examinations

There is a set of exam rules that apply to all proctored environments, whether administered by the SOA or by a third party. Supervisors are not required to inform a candidate that improper behavior has occurred. They may choose to inform the SOA of the observed behavior and then the SOA decides if further action is warranted. If the supervisor does inform a candidate, there may be a request to remedy the situation that may allow discipline to be avoided. If the candidate refuses the request the supervisor will inform the candidate that the action will be reported and likely result in disqualification. A common example of this is bringing a nonapproved calculator to the exam. If the candidate insists on writing the exam using that calculator the supervisor will allow it, but the candidate's exam is likely to be disqualified.

While rule infractions are relatively infrequent, the following are some rules that are typically broken:

- Not bringing the letter or ticket of admission or appropriate identification (such as a driver's license or passport).
- Writing before the exam begins or after time is called. Many of the exams have a fifteen-minute read-through period during which candidates may read the exam questions but may not take notes. With regard to writing after time is called, stating that nothing of importance was written during that period is not a defense. Given that it is impossible to prove or disprove such a statement, the assumption is that the extra time spent writing provided an advantage over other candidates. The best advice is to not hold a pen or pencil during periods when writing is not allowed.
- Using a calculator that is not on the list of approved calculators.
- Attempting to take information out of the exam room, particularly questions or answers.
- Copying work from a candidate sitting nearby.

3.3.4. E-Learning Assessments

In addition to discipline regarding e-Learning assessments, there are terms and conditions regarding use of the online e-Learning system. They are not discussed here, but candidates should be aware of them. They can be found at <https://www.soa.org/legal/terms-conditions-e-learning/>. One key difference between written exams and some of the e-Learning assessments is that e-Learning assessments may be available for an extended period of time, creating an opportunity for candidates to plagiarize from others who have already submitted and passed an assessment. For example, candidate A takes and passes an assessment. Six months later, candidate B takes the same assessment, receives candidate A's solution, and plagiarizes from candidate A's solution. The SOA's plagiarism-checking software detects a potential match between the

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solutions prior to the grading of candidate B's submission. As a result, candidate B's submission is not graded and candidate B receives a ban from writing exams for a period of time. Upon verifying that candidate A was the source, the SOA may change that candidate's score to fail, remove any designations that had been awarded based on passing that assessment, and enact a ban.

The following are the most common violations related to e-Learning assessments.

- Submitting unrelated documents. For some assessments, a model solution is provided so that candidates can self-assess their work. At times, a candidate may be asked to redo that same assessment. If a candidate anticipates that outcome, they might submit a document that is unrelated to the assessment and then use the model assessment to guide that next submission. Candidates who do so are disciplined.
- Gaining inappropriate access to the model solution. A candidate might gain access to a model solution through another candidate, before they have even made an initial submission for the exercise. If the submission bears too close a relationship to the model solution, there may be cause for discipline.
- Gaining access to another candidate's solution or intentionally providing access to one's solution to another candidate. If there is evidence that a candidate's submission closely matches another candidate's, both candidates are subject to discipline.
- Loss of control of work product. It is possible that drafts or final products saved on a network drive, left to sit in the output tray of a printer, or simply lying on a desk may be appropriated by an unscrupulous colleague. The candidate who has been careless with their work can be subject to discipline.

When submitting assessments, candidates agree to have their documents scanned by sophisticated software for plagiarism detection.

3.3.5. Discipline Processes and Procedures

Most potential infractions are either reported by exam supervisors or identified through scanning of e-Learning submissions. However, anyone can report an infraction using a form provided at the SOA website. Once an infraction is reported, the following steps take place.

3.3.5.1. Investigation

SOA staff investigates the report and makes an initial determination whether there is an infraction that warrants discipline. The investigation may include interviewing supervisors, viewing surveillance video from the test center, and statistical analyses of submissions. If staff decides to recommend discipline, all materials and the recommendation are forwarded to a member of the Education Executive Group.

3.3.5.2. Action

Should a warning or penalty be recommended, the candidate is advised by a letter from the Education Executive member. The letter will state the nature of the infraction, provide relevant evidence, and indicate the specific disciplinary action to be imposed. If there is insufficient evidence to prove an infraction or the infraction is viewed as relatively minor, the candidate may be issued a warning. While no penalties are attached, the warning will be recorded and could be used should further issues arise with the candidate.

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3.3.5.3. Penalties

The lightest penalty is disqualification of the exam. The exam associated with the violation is not graded and no score is reported. This penalty is generally for lesser offences such as writing after time is called or using an improper calculator.

When the attempt to cheat is blatant, such as copying from a neighbor's paper, obtaining an e-Learning solution, or bringing formulas into the exam room, the penalty will be disqualification of that exam plus a ban on writing any exams for a period of at least one year. The length of the ban depends on the particular violation and if there have been previous violations. In extreme situations the ban can be for life.

3.3.5.4. Disclosure

The SOA may elect, at its discretion, to disclose to other actuarial organizations that have a legitimate interest in the identity of a disciplined individual and the nature of the infraction. Similarly, if the SOA is informed by another actuarial organization that their candidate has been disciplined, the SOA may enact similar discipline on that candidate.

3.3.5.5. Appeals

Candidates have 35 days from the date of the letter from the Education Executive Group member to contest the action taken. Candidates may contest the factual basis for the action taken. Candidates may not contest the penalty applied as being inappropriate for the violation committed. The letter is directed to the Board Partner for Education who may choose to reduce the penalty based on the submitted information.

Candidates may request that their case be presented in person before a three-person panel of actuaries. Such requests must come within the 35-day period and not after the Board Partner has ruled on a written explanation. Requests for an in-person hearing must be granted when a lifetime ban has been imposed. In other cases, the SOA is not required to honor such a request and is unlikely to do so.

4. Curriculum Development

4.1. Definition

The terms curriculum and syllabus are often used interchangeably. We will use the term curriculum broadly to include the learning objectives and outcomes (what candidates are to learn) and the learning resources such as modules, texts, and readings (how candidates are to learn).

4.2. Committee Structure

Fellowship curriculum development is overseen by the Curriculum Chairperson, who is a member of the Education Executive Group. Reporting to the chairperson are General Officers, one for each fellowship track plus one for professionalism (Associateship Professionalism Course and Fellowship Admissions Course). The General Officers are responsible for overseeing committees that develop and publish the curriculum.

Associateship curriculum development is overseen by the Common Curriculum Chairperson, who is a member of the Education Executive Group. There are three separate approaches used for guiding curriculum development:

- The Validation by Educational Experience Administration Committee sets the curriculum for each topic.
- The Fundamentals of Actuarial Practice General Officer oversees the committee that develops this curriculum.

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- For each preliminary examination, there is a curriculum chair who reports to the Examination General Officer

Specific responsibilities with respect to curriculum include:

- Review and update the learning objectives and course of reading at least annually.
- Identify and select new or updated study material.
- Identify study note authors and oversee study note development and review.
- Review new study material and ensure it is available to the Examination Committees when they need it.

4.3. Timing of Changes

4.3.1. Associateship Examinations

By design, associateship exams cover topics that are basic and likely to endure. As a result, changes tend to be infrequent and not on a set schedule. Small adjustments such as refining a few learning objectives or adding a small topic, are announced with the publication of the curriculum (generally four to six months in advance of the exam administration). When a new edition of a textbook is produced, the new and old versions are generally both allowed for one year after the new edition is published.

For major changes (such as those made in 2018) the goal is to provide greater advance notice.

4.3.2. Fellowship Examinations

Because actuarial practice and the external environment are continually changing, fellowship exams need to be regularly updated. Because the examination committees generally prepare two exams simultaneously, the curriculum is normally fully reviewed and revised once per year. The following schedule has been set, though the home page for a given exam should be regularly consulted for updates.

These exams have syllabi posted in November with the syllabus effective for exams the following Spring and Fall.¹

- Strategic Decision Making (CFE track)
- Quantitative Finance (QFI track)
- Life Financial Management (ILA track)
- Design and Accounting (Retirement Benefits track)
- Finance and Valuation (GH track)
- Specialty (GH track)

These exams have syllabi posted in May with the syllabus effective for exams the following Fall and Spring.

- Foundations of Corporate Finance and ERM (CFE track)
- Enterprise Risk Management (all tracks)

¹ Spring refers to exams given in late April or early May while Fall refers to exams given in late October or early November.

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- Portfolio Management (QFI track)
- Investment Risk Management (QFI track)
- Life Product Management (ILA track)
- Life ALM and Modeling (ILA track)
- Funding and Regulation (Retirement Benefits track)
- Retirement Plan Investment and Risk Management (Retirement Benefits track)
- Design and Pricing (GH track)

The exams of the General Insurance track are relatively new and an update schedule has yet to be established.

Should the need to make interim changes to the syllabus occur, for example, due to new textbook editions, changes to the case study, significant developments affecting exam topics, etc., such changes will be reflected on the curriculum applicable to the second exam administration following the full syllabus update. Our expectation is that if interim syllabus changes are made, they will be minor and will be announced well in advance of the following exam administration. If interim syllabus changes are made, all changes will be prominently noted on the Updates page when the interim syllabus is published.

The previous paragraph arises because when preparing a syllabus that covers two exams, events can transpire that require adjustments for the second administration. A thorough review and revision of the syllabus will occur only once per year. In all cases, every attempt will be made to avoid syllabus changes during the four months prior to each exam administration.

4.4. Learning Objectives and Outcomes

4.4.1. Definitions

The syllabus for each exam presents both learning objectives and learning outcomes.

Learning objectives express **what** candidates are expected to learn. They are stated broadly, and they represent the constructs of knowing and understanding, reflect the scope of a course, guide the development of examination specifications, and inform candidates about the content of the examination.

Learning outcomes describe **how** graders will know that a candidate has mastered a concept.

As presented in the syllabus, learning outcomes occur within learning objectives.

Our goal is that, by the time of the examination, candidates will have met those learning objectives and will be able to demonstrate their capabilities on the examination. Note that the outcomes are stated in terms of being able to "do" something, as opposed to "knowing" something. This is a subtle difference, but important when it comes to being successful on the examination.

4.4.2. Translation to Exam Questions

4.4.2.1. Fellowship Written Answer

In this section we go through three examples of actual exam questions and show (with the help of the model solution) how the questions relate to the learning outcomes. One is a question tied to a limited set of outcomes, one is a question based on the exam's case study and one is an integrated question that crosses several outcomes and is also based on the exam's case study. Many of the examples in this document are from older exams. They are designed to illustrate concepts, not provide information regarding curriculum

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or content. References to learning objectives, learning outcomes, and texts as well as the appropriateness of the questions and solutions are accurate as of the time of the exam.

It should be noted that the same concepts apply to the written-answer portion of the Long-Term Actuarial Mathematics exam.

A Question Tied to a Limited Set of Outcomes

This question from a retirement benefits exam has two parts:

- (a) (3 points) Describe the taxation of death benefits distributed from a qualified plan in the form of a lump-sum versus a periodic form of payment.
- (b) (2 points) Describe the situations where penalty taxes are imposed in addition to federal income taxes on qualified plan distributions.

These questions both relate to Learning Objective 2 – “The candidate will understand how the regulatory environment affects plan design and understand how to apply relevant restrictions.” Both questions are about taxes and so point to learning outcome 2d – “The candidate will be able to test for plan design restrictions intended to control the use of tax incentives.” The key resource is Chapter 31 of a required text. So these questions relate to a single learning outcome and the information comes from a single source.

A Question Based on the Case Study

This question from a retirement benefits exam is based on the exam’s case study and covers more than one learning outcome. The case study provides a lot of information about the National Oil Company (NOC) and its pension plan. In this question, NOC is acquiring the salaried workforce of a smaller competitor, ABC. As a result, NOC is reviewing its current plan. After providing some information about ABC’s programs, the question stem states the following:

NOC is considering two proposals for the ongoing retirement strategy.

Proposal 1 – All ABC salaried employees would be covered under the current NOC Salaried plan and ABC SERP participants would be covered under the current NOC SERP Plan.

Proposal 2 – After the transaction, all NOC and ABC salaried employees would be covered under ABC’s defined contribution plan. All SERP participants would also be covered under a new defined contribution SERP, with employer allocations equal to 4% of earnings.

- (a) (7 points) Discuss the advantages and disadvantages of each proposal.
- (b) (3 points) Recommend a proposal from (a) to NOC’s Board of Directors. Provide support for your recommendation.

There are two sets of objectives/outcomes covered. The first is Objective 1 – “The candidate will be able to analyze different types of registered/qualified defined benefit and defined contribution plans, as well as retiree health plans” and Outcome 1b – “Describe the process and apply the principles of conversions from one plan type to another.” The second is Objective 3 – “The candidate will be able to analyze plans designed for executives or the highly paid” and Outcome 3c – “The candidate will be able to integrate a plan for executives with the basic benefit plan.”

The source material for these questions is Chapters 3, 14 and 17 of a required text.

Because this is a case study question, answers must relate to NOC, and in particular, some of the corporate objectives. That is, the discussion of advantages and disadvantages should be done in the context of the case study situation. The model solution points out that either proposal can be advocated in part (b). Success depends on making appropriate arguments for the favored proposal.

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An Integrated Question Crossing Several Learning Outcomes

This question from a group/health exam is also based on the exam's case study.

(10 points) You receive a call from Jacob Marley of the Great Expectations' marketing department. He claims that the small group HSA rates have been too high. You only have available the experience shown in "Exhibit 1.a. Base Rate Review for Old London Market."

- (a) (5 points) List and explain how the evidence in Exhibit 1.a. supports Jacob Marley's assertion.
- (b) (3 points) Explain three of the greatest risks to Great Expectations in transitioning to substantially lower rates. Justify your response.
- (c) (2 points) Outline a message to Jacob Marley explaining the expected timing and process required to roll out a major small group HSA rate change.

Because the list of outcomes covered is large, we have not listed the objectives. The outcomes covered are:

- (1c) Identify which participants would find each coverage a valued benefit and why.
- (1e) Evaluate potential financial, legal and moral risks associated with each coverage.
- (5d) Determine the potential impact on the cost of complying with the regulation.
- (8a) Identify and evaluate sources of data needed for pricing and underwriting including the quality, appropriateness and limitations of each data source.
- (8b) Identify and evaluate the rating parameters needed to evaluate and manage a book-of-business.
- (8c) Develop experience analysis (claims cost and expenses)
 - (i) Construct the appropriate models
 - (ii) Develop the appropriate assumption, including trend, anti-selection, etc.
- (8d) Recommend appropriate actions following the study including:
 - (i) Areas for further study;
 - (ii) Changes in coverage, eligibility requirements or funding strategy.
- (8h) Modify manual rates to reflect specific plan values including benefits for which little or no data is available.
- (8i) Construct a rating model to be used for rating individual customers or plan designs.

The model solution lists eight different sources that are called upon to answer the questions. The model solution noted that candidates were expected to synthesize information provided from the case study with the readings.

4.4.2.2. Other Components

The process is different for other examination types.

Multiple-choice questions are almost always confined to a single learning objective and often to a single learning outcome within that objective. This is partly due to the nature of such question but is also due to the use of computer-based testing. Computer-generated tests require that the set of questions presented to a candidate properly span the learning objectives and outcomes. That is easier to accomplish when each question can be mapped to a single outcome.

At the opposite end, assessments that involve written reports, such as those with the Fundamentals of Actuarial Course, Fellowship Modules, and the Predictive Analytics exam often test broad learning areas.

For example, the Predictive Analytics exam may ask that an executive summary of prior work be written for a non-technical audience. This question not only tests the communication learning objective, but also requires candidates to demonstrate an understanding of many other topics such that they can be explained in non-technical terms.

5. Examination Development

5.1. Committee Structure

Fellowship examination development is overseen by the Examination Chairperson, who is a member of the Education Executive Group. Reporting to the chairperson are General Officers, one for each fellowship track plus one for translation (currently the only alternative examination language is French).

Associateship examination development is overseen by the Common Curriculum Chairperson, who is a member of the Education Executive Group. There are General Officers for each examination (with the exception that the Probability and Financial Mathematics exams are combined as are all Fundamentals of Actuarial Practice assessments).

There is a committee for each examination. The examination committees' overall goal is to test each candidate's understanding of the subject matter as defined in the Learning Objectives and Outcomes. Every effort is made to ensure that the questions fall within the scope of the syllabus. However, candidates should be aware that they may be asked to apply something from the syllabus to situations that are not explicitly covered in the syllabus, with integrated questions being such a situation. But even within a discrete topic, the ability to generalize what has been learned to new situations is one of the ways learning at higher cognitive levels can be tested.

With a few exceptions,² the SOA does not enforce pre-requisites. However, for associateship exams the home page lists specific exams for which knowledge is presumed. Similarly, there is a recommended order for fellowship exams and modules the committees can presume knowledge of components that are recommended to have been completed.

Complete coverage of all parts of the syllabus is not practical for every examination every administration, but the goal is to develop well-rounded examinations containing representative, high-quality questions that test the candidate's understanding and ability to make use of material from many parts of the syllabus.

The wording of each question is carefully considered to eliminate possible ambiguities. The committees do not try and write "trick" questions. The SOA's goal is to ensure that all qualified candidates become members; it is not to restrict membership.

As noted in the next section, preliminary versions of each examination are thoroughly reviewed in relation to all these factors before the final examination is set.

Additional tasks performed by these committees and discussed in later sections include grading of written-answer questions, recommending the pass mark, and preparing model solutions.

5.2. Steps In Exam Preparation

Following are the general steps taken to create an exam:

² Statistics for Risk Modeling is a formal pre-requisite for the Predictive Analytics Exam. Holding the ASA designation is a requirement for registering for the Decision Making and Communication Module. There are also pre-requisites for registering for the Associateship Professionalism Course and the Fellowship Admissions Course.

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1. Draft questions with outlines of the solution are written by item writers.
2. Questions are reviewed/improved by committee members.
3. Further review is undertaken by a committee's officers and key members at an in-person pre-review session. The result is a draft version of the exam.
4. The draft exam is reviewed by the General Officer (the top officer for that particular exam), examination committee leaders, and other reviewers representing the Curriculum Committee and the Education Executive Group at Central Review. Input is also obtained from an independent person who takes the draft exam under exam-like conditions. Some exams also make use of consultants who perform further reviews.
5. The final version of the exam is reviewed by the exam chair and approved by the General Officer.
6. Grading guides for written-answer questions are developed and reviewed along with the questions through each stage of the process.
7. Model solutions are developed after questions and grading guides are finalized, and further refined to add commentary after the grading process is complete.
8. The exam chair signs off on the model solutions.

5.3. Written Answer

5.3.1. Case Study

Many of the FSA exams use a case study. This is a good way to bring real-life applications into the study setting. A common misconception is that the case study is simply another study note. In fact, the case study is used to link to as much of the syllabus material as possible, and references to the case study will appear on the examination. It is a good idea to read through the case study first, or shortly after it is available, and refer to the case study as new topics are covered. As a reminder, candidates will not be permitted to bring their copy of the case study into the examination room. A copy will be made available, either in hard-copy form or as a PDF that can be opened on the computer being used.

5.3.2. Cognitive Levels

There are many systems for describing cognitive levels. They typically range from simple recall of memorized facts to synthesis of a complex set of facts. The SOA uses a four-level approach due to Marzano.³ The listing that follows is from lowest cognitive level to highest.

- Retrieval – This usually requires a list derived from a single source and mostly relies on memorization.
- Comprehension – This requires distilling or summarizing knowledge from a source (synthesis) or re-presenting information in a different form or in your own words.
- Analysis – This requires an evaluation of information and a subsequent explanation based on that evaluation, for example, comparison of whether items are alike or different, identifying strengths and weaknesses, generalization of the previous two levels to a new situation or an error analysis.
- Knowledge Utilization – This requires an analysis and comparison of information, drawing a conclusion, and the subsequent explanation/justification of one or more facets of that evaluation/comparison/conclusion. It often expects a solution, decision or recommendation, with justification.

³ A summary of these four levels (plus two that we do not use) is available at http://www.marzanoresearch.com/documents/free_resources/classroom_tools/standards_assessment/taxonomy_summary_sheet.pdf

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A single question may relate to more than one level. Exam committees are expected to focus (but not exclusively) on the higher three levels.

5.3.3. Verb List

Understanding how verbs are used may be one of the most important things you can take away from this document. When exam committees write questions, they mean what they say. If they ask you to list something, they are expecting to see a list.

The following verbs are often used by item writers when constructing questions. They are split into groups aligned with the cognitive levels described in the previous section. Note that question writers are not restricted to this list. Also note that some verbs may be appropriate for more than one cognitive level, in which case the rest of the wording of the question should make clear what cognitive level is expected. In such cases the verb is presented here at the lowest level at which it is commonly used.

Retrieval

- Define – Provide the definition, no interpretation is called for.
- List – Provide a listing of items.
- State or Write down – these are similar, both calling for a definitive expression, with no analysis.

Comprehension

- Apply – Use a specified methodology to solve a problem.
- Approximate – There is either not enough information provided to determine the exact value or there is a commonly-used approximation.
- Calculate – Generally, this is higher than retrieval as some thought will go into selecting the appropriate formula.
- Derive – Calls for providing the mathematical steps that lead to a given formula.
- Describe – This asks for some information about specific items, showing that you understand what those items mean. A description is not a list; each item needs supporting information.
- Explain – This calls for even more information than describe, showing that you can convey “why” or “how.” A connection is expected between the items and something else. Could be at the next level, depending on the complexity of the situation.
- Interpret – You are to draw conclusions that either justify an action or enhance the reader’s understanding. Can also be used to literally ask you to interpret what a graph or formula means. Could be at the next level, depending on the complexity of the situation.
- Identify – This is different from “List” as you are expected to filter the material by choosing items that are relevant to the question.
- Sketch – This means to draw a picture such as a graph or diagram.
- Summarize – Take the available information and concisely convey it to the reader.

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- Verify – Show that a statement is correct in the given context. Depending on the nature of the problem could be at the analysis level.

Analysis

- Analyze – Make some sense of and possibly draw conclusions from a collection of information.
- Assess – Differs from analyze in that it usually calls for making a conclusion, such as deciding whether a course of action should be adopted.
- Compare / Contrast – There must be at least two items being considered. Both similarities and differences are to be articulated, but no conclusion is expected.
- Critique – A critique is analysis that covers both strengths and weaknesses. It may also include listing alternatives.
- Evaluate – Calls for an opinion and may include several of the above components. It does not refer to a numerical calculation. Depending on the complexity of the situation, could be at the next level.

Knowledge Utilization

- Construct/Create/Design/Develop – In all of these cases you are to build something that can be used to answer the question. It may be a model, a decision-making framework, or a process for accomplishing a goal, among others.
- Justify – You are to provide an explanation supporting an answer, for example, a recommendation.
- Propose/Recommend – You are to make a decision regarding what to do about a situation. Note that there may be more than one reasonable choice and your grade will depend on the support you provide for your choice.
- Revise – Something has already been proposed or recommended, but based on new information or the application of a different method, there may be a new conclusion.

The way verbs are used determines their cognitive level. For example, you might be asked to “Describe how the design would change if ...” You are not merely being asked to state something in your own words, you are being asked to draw a conclusion based on changing circumstances, so *describe* here is likely to be in the knowledge utilization category.

5.3.4. Examples of Verb Use

All these examples are taken from recent examinations. We have not repeated the entire question, just the part that employs the verb. Each question is followed by the answer from the model solution. The verb is underlined (which is not true in the actual question). At times commentary is provided, which can be identified by italic font.

5.3.4.1. Define

Define strategic risk.

Solution

The array of external events that can devastate a company’s growth trajectory and shareholder values.

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As with a dictionary definition, it is compact and to the point. It is not necessary to define each term in the definition (such as external events, growth trajectory or shareholder value). This and the next example are at the lowest cognitive level because you are asked to reproduce something that is in the syllabus material.

5.3.4.2. List and Explain

List and explain how the evidence in Exhibit 1.a. supports Jacob Marley's assertion.

Solution

- Rates are too high - The exhibit supports a rate decrease. However, in addition there are some potential issues with the exhibit.
- Loss Ratio is very low - Revenue PMPM is the second highest. For the high deductible plan, revenue should be closer to the HRA.
- Catastrophic claims are lower than expected - The expected amount is the same for all plans. For an HSA, large claims should be lower.
- Pharmacy rate is the same for all plans - For a high deductible plan, pharmacy rates should be lower.
- Trend factor - is the same for all plans.

There are two verbs in this question. The list in the solution is the item before each hyphen with the explanation coming afterward. Although "list" is often associated with a low cognitive level, here it is not a case of reproducing a memorized list but rather presenting an understanding of the problem in list format. This indicates that verbs are not always tied to a particular cognitive level.

5.3.4.3. Select and Justify

Select estimates of ultimate claims for 2008 and 2012 and justify your selections.

2008:

- Select 57,800.
- Reason: Claims are fully developed for 2008 (reported CDF = 1.0) and there is no evidence that further change will occur.

2012:

- Select BF estimate of 45,350.
- Reason: Immature so select a blended method.

Providing the two numbers is sufficient to have selected an estimate. The second bullet provides the justification.

5.3.4.4. Approximate

Approximate the 95% confidence interval for the CTE (95) estimate.

The solution shows the numerical work needed to produce this approximation.

A specific approximation recommended in one of the required textbooks is used in the model solution. A reasonable alternative approximation would be acceptable. However, candidates cannot argue that any answer they provide could be considered an approximation.

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5.3.4.5. Calculate

Calculate q , the risk neutral probability, to two decimal places.

The solution presents a formula for calculating this value and then inserts the numbers from the question.

This is a fairly simple formula and calculation. It is a good idea to present the formula in your answer just in case you make a calculator mistake or take an incorrect value from the question. In the former case, you would receive most of the credit, if the only error is in your calculation. In the latter case you would receive some credit for knowing which formula to use, but not full credit if the wrong values are extracted from the question. The instructions to candidates for each written-answer exam state "When you are asked to calculate, show all your work including any applicable formulas." If your entire answer is just a number, no credit will be given, even if the number is correct.

5.3.4.6. Derive

Derive the value of this contract at issue; define all symbols.

Solution

The value of the option at expiration is $\max(U_T, V_T)$.

It can be written as $U_T + \max(V_T - U_T, 0)$, that is, the value of U at time T plus the value of a call option on the difference with a strike price of zero. The value at time 0 is

$e^{-rT} E(U_T) + V_0 e^{-qvT} N(d_1) - U_0 e^{-quT} N(d_2)$ where $E(U_T)$ is the expected value of U_T in a risk neutral world. Because $E(U_T) = e^{(r-qu)T} U_0$ the value at time 0 becomes

$U_0 e^{-quT} + V_0 e^{-qvT} N(d_1) - U_0 e^{-quT} N(d_2)$ where $d_1 = [\ln(V_0 / U_0) + (qu - qv + s^2 / 2)T] / (sT^{0.5})$, $d_2 = d_1 - sT^{0.5}$ and $s^2 = s_u^2 + s_v^2 - 2\rho s_u s_v$. In these formulas, U_0 and V_0 are the time zero prices, qu and qv are the dividend yields, s_u and s_v are the volatilities and ρ is the correlation coefficient.

Because you were asked to derive, it is not sufficient to present the final formula. It must be obtained from some more basic formulas, with explanation.

5.3.4.7. Describe

Describe four characteristics of ideal insurance company Boards of Directors which lead to good governance.

Solution

Independence – Directors do not have significant ties to the company beforehand such that their decisions are impaired by how they will be affected. This also ensures good management.

Knowledge of Industry – Able to understand how the business works, products, risks, etc.

Committee structure set up to facilitate involvement from all board members; not insular.

Appropriate Size – Too small (5-6) is ineffective or dominated by one or 2 people; too large (18+) is unwieldy; right would be 10-12 or similar.

It is not sufficient to produce a list of characteristics; each of them must be described.

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5.3.4.8. Analyze

A suggestion has been made to set dividends using the Equivalent Single Age approach rather than the Exact Age approach. Analyze the appropriateness of this suggestion in the context of policyholder equity.

Solution

Reasons for exact age: Using an equivalent single age would have a different mortality slope than the actual mortality slopes of the two lives. Select mortality gains will be smaller and less offsetting to acquisition expenses. Reserve/cash values will be different which will impact the interest component of dividends.

Reasons for using equivalent single age: Do not need complex administration and illustration capabilities (i.e. greatly reduces expenses). Exact age assumes lives are independent which often they are not under joint products.

The model solution then notes that a recommendation regarding the appropriateness of the suggestion must be made, though a particular choice is not required.

The model solution provides arguments for each side. However, your analysis must indicate either agreement or disagreement with the suggestion.

5.3.4.9. Contrast

Contrast the pricing considerations for a single life vs. a joint last survivor product.

Solution

- Mortality will be different for a single vs. joint life policy due to joint products primarily being sold to older individuals and married individuals. With married individuals, need to consider that lives are not necessarily independent due to joint accident risk and lonely heart syndrome. Also must consider more substandard or declined lives.
- Persistency is better as clients of joint products are affluent and generally buy the product to fill a specific need.
- Expenses are higher as need to underwrite two lives and may need more complex administration and illustration systems.
- Retention limits and reinsurance rates may be higher for joint products as generally larger face amount policies.

Because you are asked to contrast, where possible, it is not enough to say they are different, an explanation of how they are different must be provided.

5.3.4.10. Critique

Critique the lapse assumption originally set for the product as shown in the following table.

Solution

- Lapses are generally lower for females than males, which is opposite of what was in the table
- It is appropriate to have a higher lapse rate once the surrender charge period is over
- Should reflect product design, i.e., a spike in lapse after year 10 when COIs increase

The lapse assumption should also vary by:

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- Age at issue
- Policy size
- Marketing method

You will notice that bullet points have been used in some of the solutions displayed. Bullets may serve to more clearly indicate when you are moving to the next point to be made. But the bullets must still contain sufficient information to respond to the level of the verb. This question is of a higher cognitive level because you must recognize what is normal and what is unusual in the provided results.

5.3.4.11. Evaluate

Identify and describe the categories of the interest rate risk. For strategy 1, evaluate the importance of each risk as high, medium, low or not applicable.

Solution

- Yield Curve Risk: Movement of the yield curve will adversely affect value of liabilities. High Risk
- Basis Risk: Risk that assets and liabilities, based on different interest rate bases, impact financial results. High Risk.
- Reinvestment Risk: Risk related to assets being shorter term than liabilities and rates being lower, forcing reinvestment into assets with lower yield. Medium to High Risk.

Each of the three parts responds to the three verbs. First the risk is identified by name. Second, a brief description is provided. Third, the risk is evaluated.

5.3.4.12. Recommend

Recommend a transition plan for the current Salaried Pension Plan members. Provide support for your recommendation.

Solution

- Freeze the final average pay benefit and begin accruing future benefits in the cash balance plan. However, as a transition, provide for the continued accrual of benefits in the old plan for the next five years if it would produce a greater accrued benefit. In this way, employees close to retirement will be protected from losing benefits for a period of time and NOC will be able to use the new design to attract new employees.
- Another advantage to this approach is that it will result in no wear-away of benefits for any employees.
- In addition, NOC should provide extensive communication and education to all affected employees so that they fully understand:
 1. The company's reasons for making the change
 2. How the change affects them

A specific plan must be recommended. It is not necessary to provide alternative plans, as you will only receive credit for your specific recommendation. It is necessary to provide support for your recommended plan. Alternative recommendations to the one given in the model solution can earn credit provided they are reasonable and supported.

5.3.5. Integrated Questions

Examination questions often ask you to integrate material from multiple sources. This means that the syllabus should not be viewed as a set of independent readings, each with its own focus and dedicated exam questions. One definition of an integrated question is that it:

- Tests multiple learning objectives from multiple sources and requires higher cognitive skills.

Integrated questions are usually assigned more points (often 8 or more). They tend to look like the questions that might come from a high-placed executive or a sophisticated client.

They tend to be built on a common stem that leads to multiple analyses that lead to recommendations. An example of an integrated question was presented in Section 4.4.2.1.

5.3.6. Point Values

Fellowship written-answer exams and the Predictive Analytics exam contain 20 points per examination hour. That translates to three minutes per point, which is a good guideline when working through an exam. It is unusual for a question to be worth less than three points and integrated questions are often in the 10-15 point range. The points assigned to the question are designed to allow time for reading the question and thinking about how to answer it. You are not expected to be writing for the entire allocated time.

5.4. Multiple Choice Questions

All multiple-choice exams have five possible answers for each question. There is no “guessing correction.” A candidate’s score is based solely on the number of correct answers. Thus, every question should be answered.

5.4.1. Use of Pilot Questions

Computer-based multiple-choice tests⁴ (currently all except Long-Term Actuarial Mathematics and Introduction to General Insurance) contain a few pilot questions placed at random among the exam questions. These pilot questions are included to judge their effectiveness for future exams, but will not be used in the scoring of the exam.

5.4.2. Instant Results

Most computer-based multiple-choice exams are offered over a period of several days. Each candidate receives a test composed of questions selected from an item bank. The selections are made to ensure that the syllabus topics are covered and the overall difficulty level is consistent across candidates. Because the questions have been used previously, the difficulty level of each question is known. This allows for pre-set pass marks and for candidates to receive pass/fail results as soon as the exam ends. However, this result is unofficial. After the exam, an audit is conducted to ensure that all the processes worked as they should and that grades were correctly assigned. In extremely rare instances the initial grade is changed. The pass mark is never changed after the exam based on candidate scores.

Because there is randomness in the selection of the specific questions provided to a given candidate, there is no assurance that the answer choices will be evenly distributed among the questions. It is possible that a particular answer choice will appear many times or not at all. It is best to answer each question independently, paying no attention to the answers to other questions.

⁴ Some administrations of computer-based tests include paper-and-pencil versions at a few centers. These exams also contain pilot questions.

6. Grading and Pass Mark Setting

6.1. Guiding Principles

The key principles are:

- Answers are graded according to objective standards.
- Anonymity of candidates is fully preserved.

For written-answer questions the first principle is met using detailed grading guides that ensure different graders will take the same approach to the question. For multiple-choice questions it is met by ensuring that exactly one choice is correct and is supported by the syllabus material.

The second principle is met through the use of candidate numbers. Candidates are assigned a number that applies only to that current exam registration. A different number is assigned for the next exam taken. For written-answer exams candidates should ensure that graders only see the candidate number and not their name or other identifying information.

6.2. Written Answer

6.2.1. Process

The exam papers are sent to the graders for evaluation. Depending on the questions, the number of papers and the number of graders, some graders may grade more than one question and some questions may be distributed to two or more graders. Graders use a guide that was drafted by the examination committee. There are significant differences between a grading guide and a model solution (discussed in Section 7).

- A grading guide gives specific direction in how to allocate points.
- A grading guide indicates cases where not every item on a list or every discussion point is needed to get full credit.
- A grading guide shows alternative answers that may receive credit.

Examples of high and low scoring answers are provided in Section 9.4. Note that the SOA does not release the grading guide nor will it release how any individual paper was scored.

After all papers have been graded once, a tentative pass mark is set. Papers whose total score is well above this mark receive no further grading and have passed the exam. Papers whose score is well below this mark also receive no further grading and will fail. The remaining papers (often one-third to one-half) will be graded independently by a different grader. This is referred to as “second grading.” If there is a discrepancy in the scores, the graders have a discussion to resolve any differences.

After this step, the scores are final and all that remains is setting the pass mark.

6.2.2. Setting the Pass Mark

6.2.2.1. Content Based

Recall that one of the strategic principles is to discriminate effectively between candidates who have and who have not met the standards set for the material being assessed. Two approaches that cannot meet this principle (for written-answer exams) are having either a pass mark or a passing percentage that is constant across each exam administration. The former does not allow for variability in the difficulty of the questions

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and the latter does not allow for variability in the quality of the candidates. To meet this principle the pass mark must be based on the content of the examination.

The examinations are meant to measure the candidates' level of achievement of the required learning objectives, and their required level of capability of accomplishing specified learning outcomes.

6.2.2.2. *Written–Answer Pass Mark Setting*

Before the exam is administered, the exam committee sets a preliminary pass mark by analyzing each question and determining what a well-prepared candidate should know and be able to demonstrate to achieve a passing grade. After the exam is administered and first grading of all questions has taken place, a tentative pass mark is set where actual performance statistics are balanced against the preliminary pass mark. When second grading is completed, the actual performance statistics are recalculated to factor in any score changes.

The examination committee then determines the final pass mark by again balancing actual performance statistics against the preliminary pass mark while taking into account other factors such as time pressure that may have occurred on some questions.

6.2.2.3. *Setting the Final Pass Mark*

With the use of content-based pass marks, fluctuation in pass rates from sitting to sitting is expected. The final decision is reached by consultation between the Chairperson and Vice-Chairpersons of the individual examination committees and the executive officers of the Education committee. In the event that a proposed pass mark produces a pass rate that deviates significantly from pass rates experienced in prior exam sessions, the deviation must be supported by analysis and an explanation of the basis for the pass mark must be reported to the SOA Board of Directors.

6.3. Multiple-Choice Exams

As with written-answer exams, the final pass mark must be approved by the appropriate committee. Setting the pass mark depends on how recently the topic or exam was added to the curriculum.

6.3.1. New Topics or Exams – First Administration

For a new exam or one with significant changes, the first administration requires that the exam committee assess the difficulty of each question in advance. The difficulty is tied to the likelihood that a candidate who has minimum adequate knowledge will answer it correctly. This provides a preliminary estimate regarding how many questions such a candidate would be expected to get correct.

The actual results are reviewed for consistency with the prior estimate and appropriate adjustments made to the pass mark.

6.3.2. New Topics or Exams – Next Several Administrations

At subsequent administrations each exam includes items that appeared on previous exams. This allows the committee to compare the quality of candidates from one administration to the next. It is then possible to determine if the current exam was more difficult (and thus merits a lower pass mark) or less difficult.

6.3.3. Mature Topics or Exams

Eventually there are enough questions that have been used for a repository of items to be created. Each item has an assigned difficulty level based on prior candidate experience. This allows each future exam to be constructed to have the same overall difficulty level as others, which allows for a pre-set pass mark. This pre-set mark is set to be consistent with what was learned from the prior administrations.

6.4. E-Learning Assessments

Each of the assessment types have slightly different processes.

6.4.1. End of Module Exercises

End-of-Module Exercises refers to fellowship modules other than Decision Making and Communication (DMAC). Only submissions that candidates self-assess as passing after seeing the model solution are graded. The submitted solution is checked against the model solution and if there is substantial agreement, it is graded as passing.

6.4.2. Decision Making and Communication

Papers that do not meet minimum requirements have been graded as such by two independent graders.

6.4.3. FAP End-of-Module Assessments.

Starting in 2020, the Interim Assessment (IA) was replaced with a series of End-of-Module Assessments, or EMAs, completed at the end of Modules 1-7. EMAs can be submitted at any time and will be graded on demand, within a published timeframe.

Submissions that do not meet minimum requirements have been graded as such by two independent graders.

6.4.4. FAP Final Assessment

The FAP Final Assessment (FA) will be graded at three fixed times throughout the year. While candidates may submit the FA at any time, all submissions for a given version of the assessment will be graded after the submission deadline, and all results will be released on a published schedule.

Submissions that do not meet minimum requirements have been graded as such by two independent graders.

7. Model Solutions

7.1. Model Solution Overview

The purpose of model solutions is to help candidates prepare for subsequent exams. A secondary purpose is for candidates to assess their performance on the exam just taken. Examination committees attempt to have model solutions published within two weeks after grades are released.

A model solution represents a response that will receive the full number of points. It represents a well-constructed answer that focuses on the most important points expected to be included in the response, and it is responsive to the cognitive level indicated by the question verb. Because candidates do not always need to cover every possible aspect of the solution to receive full points, the model solution may not have every item from the grading guide. If your answer was correct, it will have received credit even if it did not appear as part of the model solution.

The model solutions for the Fundamentals of Actuarial Practice Final Assessment (FAP FA) take a slightly different approach. Because of the open-ended nature of the tasks presented and the variety of acceptable responses, the solution presented will represent a solution that covers all key points and clearly meets minimum requirements.

7.2. Additional Components of a Model Solution

Model solutions for most assessments indicate the learning objectives and the syllabus sources that provide information for answering the question. There may also be commentary that describes areas where candidates did well and where they performed poorly.

The model solutions for the FAP FA will differ from the above description. Because of the comprehensive nature of the tasks, neither the questions or the responses will be linked to learning objectives. However, there will be commentary regarding candidate performance.

8. After the Exam

8.1. Unusual Circumstances

At times candidates will encounter circumstances that prevent them from fully demonstrating what they have learned. Examples are excessive noise, computer malfunctions, and fire alarms. Notifying the supervisor that you experienced such issues is not sufficient to ensure the SOA is aware of them. Candidates should contact the SOA at education@soa.org and provide as much detail about the issue as possible. This should be done immediately after the exam, and must be within two weeks.

The SOA will investigate the report and make an appropriate determination. Regardless of circumstances, to receive a passing grade, candidates must demonstrate knowledge of the learning outcomes being tested. Candidates who were truly deprived of that opportunity may be provided a refund of the exam fee.

8.2. Lost Examinations

If a completed examination answer sheet or the written answers for an examination are inadvertently lost or destroyed, the examination fee will be refunded. The SOA and any jointly administering or sponsoring organizations assume no other obligation, and candidates must take all examinations subject to this understanding. The one exception to this policy is noted in the following paragraph.

In the case of a paper and pencil multiple-choice examination, whenever reasonably possible, the SOA will make use of a candidate's examination book to reconstruct the answers selected by the candidate. Where a candidate has clearly indicated the response selected for each question, those responses can be used to determine a grade. Therefore, candidates may want to circle or otherwise clearly indicate their answer choices in the examination books. However, additional time in the examination period will not be given for candidates to do this. If a candidate receives a passing grade as a result of the review of the examination book, the examination fee will not be refunded.

8.3. Defective Questions

8.3.1. Changing the Grading Guide

Truly defective questions rarely occur, but in the course of grading papers, graders may come across a candidate solution that appears to be correct but does not align with the grading guide. If confirmed, the guide is altered to include this alternative possibility. All other papers have the opportunity to earn points under the revised guide.

This is relevant with regard to a question candidates have often asked. What if we do it differently at work, or there have been regulatory changes since the exam was set, or I know the reading was wrong? As noted above, reasonable alternative answers will be accepted. It is in your best interest to note within your examination paper instances where you think your answer deviates from the syllabus to ensure that the grader is aware.

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Of course, if you spot errors in the reading materials, the best thing you can do is contact the SOA at education@soa.org so they can be corrected prior to the exam.

8.3.2. Truly Defective Questions

On rare occasions, a question contains an error or may have multiple interpretations. Examples might include typographical errors, ambiguities, or questions that test material no longer covered in the Course of Reading. Candidates who believe that a question is defective should write to education@soa.org within two weeks of the date the examination was administered. This letter should explain in detail why the question seems to be defective. The Examination Committee will investigate all questions brought to its attention in this way, and may make allowances in the grading process, if appropriate. The Examination Committee may make use of candidates' examination books to determine whether their scores should be adjusted. The committee makes no guarantee it can consider correspondence that does not reach the SOA office within two weeks after the examination administration.

8.4. Hand Scoring

Candidates taking paper and pencil multiple-choice exams who believe that their answers were incorrectly entered may request hand scoring of their scantron answer sheet. This request must be made within 60 days after exam results are released and there is a fee associated with this request. Hand scoring will not check answers against anything written in the examination booklet.

8.5. Grade Release Timing

The dates for releasing lists of passing candidate numbers and names are available at the SOA website: <https://www.soa.org/education/general-info/exam-results/edu-exam-results-detail/>. They are generally eight weeks after the examination for multiple-choice exams and eleven weeks for written-answer examinations.

8.6. Transcripts

Transcripts are available through the SOA web site. Candidates may print and distribute them as they wish. While most employers will accept these printed versions, if an official transcript with a watermark is needed, contact SOA Customer Service.

For exams taken from January 1, 2000 onward, the transcript shows the exam name or number as it was when the exam was taken. The transcript does not apply transition rules to show what current exams a candidate may have credit for. For exams taken prior to January 1, 2000 the transcript shows only exams passed and identifies them by transition credit as of January 1, 2000.

For some exams a grade of 11 will be recorded. In all cases that grade indicates the exam was passed, but does not indicate how well the candidate performed. There are three situations that can lead to this:

- The exam was passed prior to January 1, 2000;
- Exam credit was earned through a waiver agreement with another actuarial association; and
- The exam is graded on a pass-fail basis, such as with fellowship modules.

8.7. Confidentiality of Exam Records

The fact that a candidate has passed an examination for credit with the SOA is considered public knowledge. Any further information about the examinations taken or grades received by a candidate is available only to that candidate and to Education Committee Officers as required for Committee purposes.

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However, a candidate may request in writing to the SOA office that a designated person or institution should receive such information.

Upon registering for an examination, the candidate authorizes and consents to the Society of Actuaries using and disclosing (including, but not limited to, disclosing to the third-party contractors and service-providers of the Society) personally identifiable information about the candidate as necessary and appropriate for the purposes of registering the candidate for the exam, conducting the exam, determining the results of the exam, and communicating with the candidate regarding the results of the exam.

8.8. Interpreting Grades

For exams that produce a numerical score and are not assessed as simply pass/fail, grades are reported on a 0 to 10 scale. Passing grades range from 6 to 10; failing grades range from 0 to 5. On this scale, the interval is 10 percent of the score required to pass; for example, a grade of 5 means failing with a score of at least 90 percent but less than 100 percent of the score required to pass. A grade of 0 does not mean that the candidate received no points, but that the candidate's score was less than 50 percent of the score required to pass.

For example, if the pass mark is 65 and a candidate scores 50, that score is $50/65 = 77\%$. Because this is between 70 and 80 percent, the candidate receives a grade of 3.

8.9. Feedback for Failing Candidates

The nature of feedback differs by component.

8.9.1. Written Answer Exams

Candidates who fail a written-answer exam (this includes the Predictive Analytics exam and the written-answer portion of the Long-Term Actuarial Mathematics exam for those whose answers are graded) receive a breakdown of results by question. For each question, the candidate's percentile rank is provided. The percentile rank indicates how the candidate performed relative to other candidates. Because the percentage of passing candidates is reported, candidates have a benchmark to evaluate against.

It should be noted that a weighted average (by question point values) of percentiles will rarely reproduce the overall percentile for the examination.

8.9.2. CBT Multiple Choice Exams

Candidates receive a break-down by domain area of the syllabus. There are generally three or four such areas. Candidates are informed which of the following categories describes their performance:

- Low
- Medium
- High

8.9.3. E-Learning Assessments

8.9.3.1. Decision Making and Communication

Candidates receive personal feedback written by one of the graders.

8.9.3.2. FAP End-of-Module Assessments

The Candidates will be provided with feedback in the form of pre-defined, categorical statements highlighting the qualities of their responses in most need of improvement.

8.9.3.3. FAP Final Assessment

In lieu of specific feedback on any particular candidate's submission, a model solution will be provided after all candidate results have been released for a particular version of the FA. The model solution is intended to help candidates self-assess their submission in the event that they need to prepare for their next attempt. One model solution has been published as a tool for all future candidates to assist in their preparation.

8.9.4. Regrading of Exams and Assessments

Candidates who fail an examination are not entitled to have the grading of their submission reviewed based on a belief that the graders did not properly evaluate their work.

9. Suggestions Regarding Answering Questions

9.1. Introduction

In this section we provide some suggestions that may be helpful as you prepare for and take a written-answer exam, though there are a few suggestions for multiple-choice exams at the end.

If there is one key piece of advice we can give it is to make it as easy as possible for the grader to award you points. You can do this by:

- Numbering your pages;
- Being clear which part of the question you are answering;
- Writing clearly and legibly;
- Presenting information in a logical order (don't direct them all over the page to follow your work); and
- Writing no more than is necessary.

Graders do their best to determine what you are trying to convey, but they are not mind readers. They can only use the information you provide.

9.2. Preparing for the Examination

People have various ways to learn material and to prepare for an examination. There is no single method we can recommend that will work for all candidates. We can, however, provide some general items that we believe will work for everyone.

- Review the introductory study note to get an overview of the exam objectives and expected outcomes.
- Review the case study and refer back to it often to get a good idea of how the elements of the case study relate to the various topics.
- Read the original syllabus material. While study manuals can be helpful, item writers do not read them. Their questions are based solely on the original syllabus material.

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- Review prior exams and model solutions.
- Consider finding a mentor and joining (or creating) a study group. You can gain both by teaching others and by learning from them. Because there is no pre-set pass rate, your chance of passing is not affected by how well others do.

9.3. Writing the Examination

Here are some useful tips:

Do

- Read the questions thoroughly before you begin to write. Plan your answer in advance so your writing is more focused.
- Answer the question that was asked, not the question you expected.
- Take note of the verb(s) used and respond accordingly.
- Allocate your time according to the points assigned to each problem. Generally, it is better to give partial answers to several questions than to spend extra time providing perfect answers to a few questions.
- Use bullet and number lists when appropriate. Well-constructed sentences and paragraphs are not essential, as long as your points are made. However, there may be times when formal writing is needed, such as a question that asks you to draft a brief report.
- Be sure bullet and number lists are consistent with the verb. For example, if you are asked to explain something, lists of one or two-word items are not sufficient.
- Use as much paper as you need. Consider leaving some blank area between sections of a question so that you can easily add more points if you think of them later.
- Present both sides of the question when a discussion is expected.
- Recognize when an integrated question is asked and be sure to draw on several parts of the syllabus in your answer.
- Make a choice when asked to choose between options A and B. There is not always a uniquely correct solution, so either choice will earn points (though one may earn more) provided a strong argument is made for that choice.
- Understand that partial credit is available at most all steps. For example, if you know a formula is to be used but don't have time to calculate the result, write it down. Also, show intermediate calculations so that you can receive partial credit even if your final answer is wrong.
- Write down facts that appear too obvious to be worth points, provided they are responsive to the question asked.
- Answer case study questions in the context of the case study. For example, if asked about the advantages of a certain course of action, choose items that are advantages for this company in this setting, not general advantages of that action.

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Don't

- Perform a brain dump of everything you know. While credit is not lost for providing extraneous information, there is a good chance you will lose focus with regard to the question asked and waste time by writing too much.
- Make obscure interpretations or spend time looking for the “trick” in the question. Questions are designed to be straightforward.
- Refer to an earlier question as each question is graded separately. It is okay to refer to an earlier sub-part of a question, as the entire question will be graded by the same grader.
- Write that something is true and then write that it is false and then expect to get credit for the accurate statement and not lose it for the inaccurate statement. In such cases no credit will be given. Aside from this circumstance, no points are lost for including erroneous or extraneous information.
- Hedge your answer if a definitive statement (such as being asked for a recommendation) is called for.

9.4. Sample Candidate Responses

We present and analyze two candidate responses to a question from an ILA exam. As usual, items in italics are not part of the actual candidate response.

9.4.1. The Question

(7 points) You have been asked to assist in the design and pricing of a Variable Annuity product with a Guaranteed Minimum Death Benefit (GMDB) and a Guaranteed Minimum Maturity Benefit (GMMB). The product offers a range of fund options with varying levels of investment risk.

You are given the following:

Maturity	3 months
Deposit Amount	100
Guarantee Level	100
Management Expense Ratio	3%/12 Deducted at the beginning of each month
Margin Offset	1%/12 Collected monthly in advance
Risk-Free Force of Interest	4%

The stock returns for the underlying funds were randomly generated for 10 scenarios using a Regime-Switching Lognormal model with the following liability present values under each of the first 9 scenarios.

Scenario	1	2	3	4	5	6	7	8	9
L_0	-0.36	2.15	-0.98	-1.11	0.56	0.08	-0.22	3.09	-4.45

The simulated values of the stock return process for the 10th scenario were:

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t (month)	0	1	2	3
S_t	1.00	0.98	0.99	0.94

- (a) (1 point) Explain why stochastic pricing is better suited than traditional pricing techniques for the pricing of equity-based guarantees.
- (b) (3 points) Estimate the CTE(80) present value of liability using the simulations above, assuming no deaths or withdrawals. Show all work.
- (c) (3 points) Recommend changes to the product design to reduce risk to the company. Justify your answer

9.4.2. Model Solution

- (a) Explain why stochastic pricing is better suited than traditional pricing techniques for the pricing of equity-based guarantees.

Traditional pricing is better suited for more traditional forms of insurance where benefits are fixed and guaranteed.

Sensitivity to extreme scenarios and tail risk cannot be measured with a few deterministic scenarios.

Traditional actuarial techniques for pricing utilize deterministic techniques (i.e. best estimate, PFADs, sensitivity testing) because it relies heavily on diversification and the law of large numbers.

Equity linked insurance requires a stochastic approach because:

- Volatility of outcomes is significant
- Claims occur with low frequency and high severity
- Allows consideration of the entire distribution
- Allows modeling of dynamic policyholder behavior
- Individual risks are largely non-diversifiable (i.e. dependent)
- Provides a more thorough understanding of the risks

- (b) Estimate the CTE(80) present value of liability using the simulations above, assuming no deaths or withdrawals.

$F(t)$ = Market Value of Separate Account at time t

$$F(t) = F(0) \times [S(t) \times (1-m)^t] / S(0)$$

$$F(1) = 100 \times [0.98 \times (1 - 0.03/12)^1] / 1.00 = 97.755$$

$$F(2) = 100 \times [0.99 \times (1 - 0.03/12)^2] / 1.00 = 98.5056$$

$$F(3) = 100 \times [0.94 \times (1 - 0.03/12)^3] / 1.00 = 93.2968$$

$M(t)$ = Income at time t from guaranteed risk charge for t = 0, 1, 2

$$M(t) = mc \times F(t)$$

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$C(t)$ = Liability cash flow at time t from the contract

$C(t) = -M(t)$ for $t = 0, 1, 2$

$C(t) = \text{Max}[0, G - F(t)]$ for $t = 3$

$C(0) = -0.01/12 \times 100 = -0.08333$

$C(1) = -0.01/12 \times 97.755 = -0.08146$

$C(2) = -0.01/12 \times 98.5056 = -0.08209$

$C(3) = \text{Max}[0, 100 - 93.2968] = 6.7032$

$L(0)$ = Present value of future liabilities, discounted at a constant risk free force of interest of 4%

$L(0)$ = Sum of $[C(t) \times \text{Exp}(-rt)]$ sum from $t = 0$ to 3

$L(0) = [-0.08333 \times \text{Exp}(-0.04/12 \times 0) - 0.08146 \times \text{Exp}(-0.04/12 \times 1) - 0.08209 \times \text{Exp}(-0.04/12 \times 2) + 6.7032 \times \text{Exp}(-0.04/12 \times 3)]$

$L(0) = 6.39$

Estimated CTE(α) = mean of the largest $N \times (1-\alpha)$ simulations

The two largest simulations are generated from scenarios 8 and 10.

Estimated CTE(80%) = $(3.09 + 6.39) / 2 = 4.74$

- (c) Recommend changes to the product design to reduce risk to the company.

Longer GMMB maturity period than 3 months will give time for a recovery after a large initial market drop.

Asset allocation restrictions e.g. maximum equity percentage of 80%

Age restrictions – Age caps will reduce the mortality risk associated with the GMMB

Vary charge for guarantees based on volatility of fund choice

Reduce the guarantee percentage below 100%

Remove guarantees

Increase amount charge for guarantees

Cut off tail risk – Cap the tail loss on the death and maturity benefit

9.4.3. Low Scoring Response

This was not the lowest scoring paper, scoring at about the 10th percentile. Typically, the papers that tended to score below this level had major parts of the solution missing.

As can be seen, this candidate's work was easy to read and follow. While it can't be seen, it is also true that this candidate's handwriting was clear enough that all the words could be easily identified.

- (a) Stochastic pricing may help see distribution of results
better understand risk mitigation and diversification
pinpoint scenarios to analyze
traditional pricing is hard to treat equity based guarantee since lack of credibility

hard to interpret results

not capture nature of risk

The main problem with this solution is that it is incomplete. Not only does it miss many key points, but the points made are not fully explained. For example, in what way does traditional pricing lack credibility and what risks are not captured?

(b) For the 10th scenario

$$PV = (94 \cdot (1 - 3\% / 12)^3 - 100) / (1 + 4\%)^{0.25} + \frac{100 \cdot 1\% / 12}{(1 + 4\%)^0} + \frac{100 \cdot 0.98 \cdot 1\% / 12}{(1 + 4\%)^{1/12}} + \frac{100 \cdot 0.99 \cdot 1\% / 12}{(1 + 4\%)^{2/12}}$$

$$= -6.39$$

$$CTE(80) = -6.39 - 0.36 - 0.98 - 1.11 + 0.56 + 0.08 - 0.22 - 4.45 / 8 = -1.61$$

A small error was not incorporating 4% as a force of interest. Also, the margin offset changes are based on the stock price and not on the fund value. These turn out to be small errors and in the end, the PV is accurate to two decimal places, though the sign is wrong. A major mistake was averaging eight scenarios rather than two.

(c) Limit GMMB to % of deposit amount

change PTP to average

add margin, participate rate

increase the management expense ratio

As a three-point question, the candidate should know that more than this is expected. The format is acceptable in that short responses in list form are sufficient.

9.4.4. A High-Scoring Candidate

This response was among the highest scoring papers.

(a) Losses are path dependent

- Wide distribution of profits/losses
- Low frequency, high severity losses
- Volatility of equity based returns
- Deterministic price would result in no loss and the guarantee would be out-of-the-money pricing results are therefore meaningless or hard to interpret
- Stochastic pricing acknowledges up front that expectations likely will not come to fruition
- Better risk management
- Allows for modeling of policyholder behavior (in-the-money vs. out-of-the money guaranteed options)
- Understand the tail of the distribution of losses

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The candidate made most of the points from the model solution and presented them in a clear manner.

(b) Scenario 10 – calculate Lo

Month	$F_{M_{beg}}$	M	M_{offset}	$F_{M_{end}}$	GMDB	GMMB
0	100	0.25	0.0833	99.75	0	0
1	97.755	0.244	0.0815	97.71	0	0
2	98.506	0.246	0.0821	98.2596	0	0
3	93.297	0.233	0.0777	93.064	0	6.936

$$F_{M_{beg+1}} = F_{M_{end}} (S_t / S_{t-1})$$

$$\begin{aligned} L_0 &= PV(\text{GMMB}) - PV(\text{Margin offset}) \\ &= 6.936 e^{-0.04 \cdot 3/12} - PV(\text{Margin offset}) \\ &= 6.86698 - 0.25 - 0.24 - 0.24 = 6.13698 \end{aligned}$$

CTE(80) = Avg Lo for worst 20% of scenarios

10 scenarios CTE(80) = Avg of worst 2 scenarios

Worst two are scenario 8 and 10

$$\text{CTE}(80) = (3.09 + 6.14)/2 = 4.615$$

This candidate did an excellent job of laying out the solution. There is a minor error in that while the candidate noted that the PVs should be of margin offsets, the management charges were used instead. The candidate also did not explicitly show how those values were discounted.

(c) Limit funds choices to those that are less risky

- Have charges vary by riskiness of fund, higher risk = higher charge
- Limit issue ages to younger people to reduce mortality risk of GMDB
- Set the guarantee level to something less than 100% of the deposit amount (75% for example)
- Guide policyholder investment choices

All of the suggestions were on the list provided in the model solution. While it is not known if the candidate received full points for this part, it is not always necessary to cover every point in the model solution to receive full credit.

9.5. Multiple-Choice Exams

These two points are stated earlier but are worth repeating.

- No partial credit is given for omitted items and there are no deductions for incorrect answers. It is always to your advantage to answer all the questions, even if it is a random guess.
- No attempt is made to balance the relative occurrence of (A) through (E) as correct choices. Therefore, when guessing, there is no advantage to looking for patterns in the other answers.

Numerical answers are often rounded. The degree of rounding can be inferred by the answer choices. For example, if the choices are 10, 40, 60, 80, and 110, answers have been rounded to the nearest 10. Hence, if

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your calculation leads to an answer of 8, it may be correct as it rounds to one of the answer choices. However, if your calculation leads to an answer of 32 you know there is an error in your work as the rounded value of 30 is not one of the answer choices. In general, it is best to work with several extra digits in intermediate calculations so that any rounding occurs only at the end.