Institute and Faculty of Actuaries

EXAMINERS' REPORT

CM1 - Actuarial Mathematics

Core Principles

Paper B

April 2023

Introduction

The Examiners' Report is written by the Chief Examiner with the aim of helping candidates, both those who are sitting the examination for the first time and using past papers as a revision aid and also those who have previously failed the subject.

The Examiners are charged by Council with examining the published syllabus. The Examiners have access to the Core Reading, which is designed to interpret the syllabus, and will generally base questions around it but are not required to examine the content of Core Reading specifically or exclusively.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report; other valid approaches are given appropriate credit. For essay-style questions, particularly the open-ended questions in the later subjects, the report may contain more points than the Examiners will expect from a solution that scores full marks.

For some candidates, this may be their first attempt at answering an examination using open books and online. The Examiners expect all candidates to have a good level of knowledge and understanding of the topics and therefore candidates should not be overly dependent on open book materials. In our experience, candidates that spend too long researching answers in their materials will not be successful either because of time management issues or because they do not properly answer the questions.

Many candidates rely on past exam papers and examiner reports. Great caution must be exercised in doing so because each exam question is unique. As with all professional examinations, it is insufficient to repeat points of principle, formula or other text book works. The examinations are designed to test "higher order" thinking including candidates' ability to apply their knowledge to the facts presented in detail, synthesise and analyse their findings, and present conclusions or advice. Successful candidates concentrate on answering the questions asked rather than repeating their knowledge without application.

The report is written based on the legislative and regulatory context pertaining to the date that the examination was set. Candidates should take into account the possibility that circumstances may have changed if using these reports for revision.

Sarah Hutchinson
Chair of the Board of Examiners
July 2023

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A. General comments on the *aims of this subject and how it is marked*

CM1 provides a grounding in the principles of modelling as applied to actuarial work focusing particularly on deterministic models which can be used to model and value known cashflows as well as those which are dependent on death, survival, or other uncertain risks.

The worksheets provided to candidates for each question give a suggested format for part or all of the solution and the methodology used in the model solutions follow these suggested formats. Candidates are not penalised for using a valid alternative approach. The worksheets are also designed so that the final numerical answers for some questions are to be shown on a specified 'Answers' sheet. Candidates are not penalised for not using these sheets if their final answers are clearly shown on their working sheets.

Candidates may not be awarded full marks where insufficient working is shown.

The exam is not designed to be a test of Excel skills. Thus, some functionality which may be preferred in a real-world work environment is not necessarily required to answer the questions. However, some good practices are useful to the candidate e.g., including variables/parameters the question states will change as inputs rather than hard coding these into formulae.

Where a question specifies a method to use or not use (e.g., *without using a scenario solving tool such as Goal Seek or Solver*) then where a candidate does not follow that instruction, they should not expect to be awarded full marks.

B. Comments on *candidate performance in this diet of the examination.*

The comments that follow concentrate on areas where candidates could have improved their performance. Where no comment is made, the question was generally well answered. The examiners look most closely at the performance of the candidates close to the pass mark and the comments therefore often relate to those candidates.

This diet there has been a slight improvement in performance. However, there still appeared to be a large number of insufficiently prepared candidates who had underestimated the quantity of study required for the subject and/or who had insufficient familiarity with Excel to make a meaningful attempt at the CM1B paper.

Candidates should pay attention to any instructions included in questions; failure to do so will inevitably lead to fewer marks being awarded.

This examination was designed to be of similar length to the previous examinations.

C. Pass Mark

The Pass Mark for this exam was 62
1,903 presented themselves and 775 passed.

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Solutions for Subject CM1B April 2023

Q1

This question was reasonably well attempted.

A common error was to produce values for a single vehicle rather than for the fleet as a whole as was required by the question. Some candidates lost marks for having calculated the cost for the fleet as a whole but included some costs per vehicle.

In part (iv) many candidates did not update their recommendation and so failed to gain some "easy" marks.

The question stated that, "the annual average mileage for each vehicle type will be 20,000 miles". The examiners intended this to be interpreted as the mileage per vehicle and the answer presented is in line with this interpretation. However, a valid alternative was to interpret this as the annual average mileage for the fleet. Where candidates made this interpretation, they were not penalised.

Q2

This question was well answered.

In part (i) some candidates did not know how the unitised fund worked and so lost marks through a variety of errors including, ignoring the last year's fund when calculating the start of year fund value; deducting the annual management charge at the start of the year; ignoring fund growth.

In part (ii) candidates who included a cost of death, maturity and/or surrender in the non-unit cashflow were penalised. These costs were fully met by the unit fund and so no non-unit cashflows should have appeared. The only cost to appear in the non-unit fund are the claims expense and the profit made on surrenders. Common errors in part (ii) included not including the claim expense for all three claim types (death, maturity and surrender) and treating the surrender profit as a loss.

The dependent rates of mortality and surrenders were listed on the "Q2 Base" sheet. Whilst the wording implied these were dependent rates, the actuarial notation implied they were independent rates. The intention of the examiners was that they should be dependent rates and the solution presented is in line with this interpretation. The examiners recognised the confusion this could have caused and did not penalise candidates who treated the rates as being independent rates.

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Q3

This question presented some difficulty for candidates.

In part (i) most candidates successfully calculated the required duration. Those who calculated the volatility (also known as the effective duration) were penalised.

Many candidates struggled to produce the required explanation for part (ii).

In part (iii)(a) the majority of candidates ignored the risk premium. Many candidates did not state a recommendation in part (iii)(b) and so failed to gain some "easy" marks.

[Paper Total 100]

END OF EXAMINERS' REPORT

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