

# Subject A211

## 2025 Study Guide

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*Please note that Subject A211 is based on the chapters 2 to 13 of the Institute and Faculty of Actuaries' (IFoA) Subject CM1 as used for the IFoA's 2023 examinations. Therefore the majority of your study materials will refer to CM1 and not A211.*

*Please see the following page for further information explaining the course structure, why it is based on the IFoA 2023 and not 2025 examinations, and consistency with other ActEd products.*

## 0 The course structure

There are two parts to the Subject A211 course. The parts are broken down into chapters.

The following table shows how the parts, the chapters and the syllabus items relate to each other. We have also given you a broad indication of the length of each chapter. This table should help you plan your progress across the study session.

<i>Part</i>	<i>Ch</i>	<i>Title</i>	<i>No of pages</i>	<i>ASSA 2025 syllabus objectives*</i>	<i>IFoA 2023 Syllabus objectives referred to in course notes*</i>
1	1	(Chapter 1 is no longer relevant)	N/A	N/A	1.1
	2	Cashflow models	24	1.1	1.2
	3	The time value of money	27	1.2, 1.4	2.1, 2.3
	4	Interest rates	40	1.2	2.1
	5	Real and money interest rates	13	1.3	2.2
	6	Discounting and accumulating	32	1.5	2.4
	7	Level annuities	36	1.6	2.5
	8	Increasing annuities	30	1.6	2.5
	9	Equations of value	21	2.1	3.1
2	10	Loan schedules	31	2.2	3.2
	11	Project appraisal	32	2.3	3.3
	12	Bonds, equity and property	54	1.3, 2.2	2.2, 3.2
	13	Term structure of interest rates	51	1.7, 1.8	2.6, 2.7

\* The numbering of syllabus objectives in the course notes is based on the IFoA subject CM1's syllabus in 2023, rather than the syllabus published on ASSA's website. This is for reasons explained below. The wording of the syllabus objectives are consistent between the two – but the numbering differs.

### Relationship with Institute and Faculty of Actuaries (IFoA) Subject CM1 Course Structure and Consistency with Other Subject CM1 ActEd Products

Subject A211 is based on chapters 2 to 13 of the IFoA Subject CM1 as used for the IFoA's 2023 and ASSA's 2024 examinations. The IFoA updated the syllabus for Subject CM1 for the 2024 examinations which led to the removal of the first 2 chapters of the Subject CM1 Course Notes as well as some other changes. ASSA have also updated the 2025 syllabus for Subject A211 but have only removed the first of the two chapters removed from CM1. Therefore, the Course Notes for Subject A211 are based on the 2023, rather than 2025, Subject CM1 course notes, including the 2023 chapter and syllabus objective numbering, but starting from Chapter 2. The table above shows the mapping of the syllabus items given in the chapters with the newly published ASSA syllabus for 2025.

Students should also be aware of the syllabus changes if using any other Subject CM1 ActEd materials, such as Revision Notes, Flashcards or ASET. If students use the 2024 or 2025 versions of such products, they will find that any references to chapters of the Course Notes in those products will refer to the current (2025) Subject CM1 chapter structure, after the removal of chapters 1 and 2. Such products have also removed material relating to chapters 1 and 2 above, such as past examination questions, as they are no longer relevant to the Subject CM1 syllabus. The material from Chapter 2, however, does remain relevant to subject A211.

# 1 Before you start

When studying for the actuarial exams, you will need:

- a copy of the Formulae and Tables for Examinations of the Faculty of Actuaries and the Institute of Actuaries, 2nd Edition (2002) – these are often referred to as simply the Yellow Tables or the Tables
- a 'permitted' scientific calculator – you will find the list of permitted calculators on the profession's website. Please check the list carefully, since it is reviewed each year.

The tables are available from the Institute and Faculty of Actuaries' eShop. Please visit [actuaries.org.uk](http://actuaries.org.uk).

## 2 Core study material

This section explains the role of the Core Reading and how it links to the Syllabus, supplementary ActEd text and the examination.

### Syllabus

The relevant individual Syllabus Objectives are included at the start of each course chapter and a complete copy of the Syllabus is included in this Study Guide. We recommend that you use the Syllabus as an important part of your study.

### Core Reading

The Core Reading has been produced by the Institute and Faculty of Actuaries. It supports students in their learning and development of this subject by providing information and explanation of the topics and objectives in the Syllabus.

The Core Reading is updated annually to reflect any changes to the Syllabus and current practice, as well as for continuous improvement.

### Accreditation

The Institute and Faculty of Actuaries would like to thank the numerous people who have helped in the development of the material contained in the Core Reading.

### Further reading

The exam will be based on the relevant Syllabus. The ActEd course material will be the main source of tuition for students.

A list of additional resources to support candidate learning and development for this subject can be found on the Module pages on the Institute and Faculty of Actuaries' website:

[actuaries.org.uk/curriculum/](https://actuaries.org.uk/curriculum/)

## ActEd text

The Core Reading deals with each syllabus objective and covers what is needed to pass the exam, and the subject A211 Course Notes include the Core Reading in full, integrated throughout the course.

However, the tuition material that has been written by ActEd enhances it by giving examples and further explanation of key points. Here is an excerpt from some ActEd Course Notes to show you how to identify Core Reading and the ActEd material. **Core Reading is shown in this bold font.**

Note that in the example given above, the index *will* fall if the actual share price goes below the theoretical ex-rights share price. Again, this is consistent with what would happen to an underlying portfolio.

After allowing for chain-linking, **the formula for the investment index then becomes:**

$$I(t) = \frac{\sum_i N_{i,t} P_{i,t}}{B(t)}$$

**where  $N_{i,t}$  is the number of shares issued for the  $i$ th constituent at time  $t$ ;**

**$B(t)$  is the base value, or divisor, at time  $t$ .**

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These conditions remain in force after you have finished using the course.

## 3 Skills

### Technical skills

Subject A211 is very mathematical and has relatively few questions requiring wordy answers.

### Exam skills

In each examination, students will be expected to demonstrate, through their answers, that they have knowledge of, can apply and use higher order skills in this subject:

- Knowledge will be demonstrated through answering questions that assess understanding of that knowledge as well as through questions that ask for the application of relevant knowledge to scenarios.
- Application will be demonstrated through answering questions that assess the ability to identify and apply relevant concepts and skills to solve problems (both numerical and non-numerical).
- Higher order skills will be demonstrated through questions that will assess the ability to use relevant knowledge, concepts and skills to solve problems, draw appropriate conclusions, and make meaningful and appropriate comments on those conclusions.

In subject A211, the approximate split of assessment across the three skill types is:

- Knowledge – 25%
- Application – 65%
- Higher Order skills – 10%.

Further information on study skills can be found on our website at [ActEd.co.uk](http://ActEd.co.uk).

### Some useful formulae

Formulae are explained and developed in the relevant chapters of the Course Notes. However, we have also put together a document containing some of the most commonly used formula within Subject CM1. Broadly the first 4 pages of this are relevant to Subject A211, with the rest relating to subject A213. This can be found on our website at [ActEd.co.uk](http://ActEd.co.uk), and then navigating to 'Subjects' and then 'CM1'. You may find this document helpful when starting to practice questions. Other useful formulae are given on pages 36 and 37 of the *Tables*.

## 4 Syllabus

The Syllabus for Subject A211 is given here. To the right of each objective are the chapter numbers in which the objective is covered in this course.

### *Aim*

The aim of the Financial Mathematics subject is to provide 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.

### *Competences*

On the successful completion of this subject, the candidate will be able to

1. Describe, interpret and discuss the theories of interest rates.
2. Describe, interpret and discuss mathematical techniques used to model and value known cashflows.

### *Syllabus topics*

1. Theory of interest rates (50%)
2. Equation of value and its applications (50%)

The weightings are indicative of the approximate balance of the assessment of this subject between the main syllabus topics, averaged over a number of examination sessions. The weightings also have a correspondence with the amount of learning material underlying each syllabus topic. However, this will also reflect aspects such as:

- the relative complexity of each topic, and hence the amount of explanation and support required for it
- the need to provide thorough foundation understanding on which to build the other objectives
- the extent of prior knowledge which is expected
- the degree to which each topic area is more knowledge or application based.



### *Skills level*

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question which can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document "Command verbs used in the Associate and Fellowship written examinations".

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions, and making recommendations).

In the Financial Mathematic subject, the approximate split of assessment across the three skill types is 25% Knowledge, 65% Application and 10% Higher Order skills.

### *Detailed syllabus objectives*

The numbering of syllabus objectives below is based on the 2025 ASSA Subject A211 syllabus, rather than the 2023 IFoA Subject CM1 syllabus. In the chapters that follow, the numbering of syllabus objectives instead follows that of the 2023 IFoA Subject CM1 Syllabus objectives. However, although the numbering differs, the syllabus objective wordings are consistent between the two. See page 2 of this Study Guide for further explanation.

1. Theory of interest rates
  - 1.1 Describe how to use a generalised cashflow model to describe financial transactions. (Chapter 2)
    - 1.1.1 State the inflows and outflows in each future time period and discuss whether the amount or the timing (or both) is fixed or uncertain for a given cashflow process.
    - 1.1.2 Describe in the form of a cashflow model the operation of financial instruments (like a zero-coupon bond, a fixed-interest security, an index-linked security, a current account, cash on deposit, a credit card, an equity, an interest-only loan, a repayment loan and an annuity certain) and an insurance contract (like endowment, term assurance, contingent annuity, car insurance and health cash plans).
  - 1.2 Show how interest rates may be expressed in different time periods. (Chapters 3 and 4)
    - 1.2.1 Describe the relationship between the rates of interest and discount over one effective period arithmetically and by general reasoning.

- 1.2.2 Derive the relationships between the rate of interest payable once per measurement period (effective rate of interest) and the rate of interest payable  $p$  ( $> 1$ ) times per measurement period (nominal rate of interest) and the force of interest.
- 1.2.3 Calculate the equivalent annual rate of interest implied by the accumulation of a sum of money over a specified period where the force of interest is a function of time.
- 1.3 Demonstrate a knowledge and understanding of real and money interest rates.  
(Chapters 5 and 12)
- 1.4 Describe how to take into account time value of money using the concept of compound interest and discounting.  
(Chapter 3)
- 1.4.1 Accumulate a single investment at a constant rate of interest under the operation of simple and compound interest.
- 1.4.2 Define the present value of a future payment.
- 1.4.3 Discount a single investment under the operation of a simple (commercial) discount at a constant rate of discount.
- 1.5 Calculate the present value and accumulated value for a given stream of cashflows under the following individual or combination of scenarios: (Chapter 6)
- 1.5.1 Cashflows are equal at each time period.
- 1.5.2 Cashflows vary with time which may or may not be a continuous function of time.
- 1.5.3 Some of the cashflows are deferred for a period of time.
- 1.5.4 The rate of interest or discount is constant.
- 1.5.5 The rate of interest or discount varies with time, and may or may not be a continuous function of time.
- 1.6 Define and derive the following compound interest functions (where payments can be in advance or in arrears) in terms of  $i, v, n, d, \delta, i^{(p)}$  and  $d^{(p)}$ :  
(Chapters 7 and 8)
- 1.6.1  $a_{\overline{n}|}, s_{\overline{n}|}, a_{\overline{n}|}^{(p)}, s_{\overline{n}|}^{(p)}, \ddot{a}_{\overline{n}|}, \ddot{s}_{\overline{n}|}, \ddot{a}_{\overline{n}|}^{(p)}, \ddot{s}_{\overline{n}|}^{(p)}, \bar{a}_{\overline{n}|}$  and  $\bar{s}_{\overline{n}|}$ .
- 1.6.2  $m|a_{\overline{n}|}, m|a_{\overline{n}|}^{(p)}, m|\ddot{a}_{\overline{n}|}, m|\ddot{a}_{\overline{n}|}^{(p)}$  and  $m|\bar{a}_{\overline{n}|}$ .
- 1.6.3  $(Ia)_{\overline{n}|}, (I\ddot{a})_{\overline{n}|}, (I\bar{a})_{\overline{n}|}$  and  $(\bar{I}\bar{a})_{\overline{n}|}$  and the respective deferred annuities.

- 1.7 Show an understanding of the term structure of interest rates. (Chapter 13)
  - 1.7.1 Describe the main factors influencing the term structure of interest rates.
  - 1.7.2 Explain what is meant by, derive the relationships between and evaluate:
    - discrete spot rates and forward rates.
    - continuous spot rates and forward rates.
  - 1.7.3 Explain what is meant by the par yield and yield to maturity.
- 1.8 Show an understanding of duration, convexity and immunisation of cashflows. (Chapter 13)
  - 1.8.1 Define the duration and convexity of a cashflow sequence, and illustrate how these may be used to estimate the sensitivity of the value of the cashflow sequence to a shift in interest rates.
  - 1.8.2 Evaluate the duration and convexity of a cashflow sequence.
  - 1.8.3 Explain how duration and convexity are used in the (Redington) immunisation of a portfolio of liabilities.
2. Equation of value and its applications
  - 2.1 Define an equation of value. (Chapter 9)
    - 2.1.1 Define an equation of value, where payment or receipt is certain.
    - 2.1.2 Describe how an equation of value can be adjusted to allow for uncertain receipts or payments.
    - 2.1.3 Understand the two conditions required for there to be an exact solution to an equation of value.
  - 2.2 Use the concept of equation of value to solve various practical problems. (Chapters 10 and 12)
    - 2.2.1 Apply the equation of value to loans repaid by regular instalments of interest and capital. Obtain repayments, interest and capital components, the effective interest rate (APR) and construct a schedule of repayments.
    - 2.2.2 Calculate the price of, or yield (nominal or real allowing for inflation) from, a bond (fixed-interest or index-linked) where the investor is subject to deduction of income tax on coupon payments and redemption payments are subject to deduction of capital gains tax.
    - 2.2.3 Calculate the running yield and the redemption yield for the financial instrument as described in 2.2.2.

- 2.2.4 Calculate the upper and lower bounds for the present value of the financial instrument as described in 2.2.2 when the redemption date can be a single date within a given range at the option of the borrower.
- 2.2.5 Calculate the present value or yield (nominal or real allowing for inflation) from an ordinary share or property, given constant or variable rate of growth of dividends or rents.
- 2.3 Show how discounted cashflow and equation of value techniques can be used in project appraisals. (Chapter 11)
  - 2.3.1 Calculate the net present value and accumulated profit of the receipts and payments from an investment project at given rates of interest.
  - 2.3.2 Calculate the internal rate of return, payback period and discounted payback period and discuss their suitability for assessing the suitability of an investment project.

### *Assessment*

Two hour and fifteen minutes written examination