

Subject CS2

2024 Study Guide

Introduction

This Study Guide has been created to help you navigate your way through Subject CS2. It contains all the information you will need before starting to study Subject CS2 for the 2024 exams and you may also find it useful to refer to throughout your studies.

The guide is split into two parts:

- Part 1 contains specific information about Subject CS2
- Part 2 contains general information about the Core Principles subjects.

Please read this Study Guide carefully before reading the Course Notes, even if you have studied for some actuarial exams before. While you may have already read (the majority of) the Part 2 material in previous subjects, the information in Part 1 is specific to this course.

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1.1 Subject CS2 – background and contents

History

The Actuarial Statistics subjects (Subjects CS1 and CS2) were introduced in the Institute and Faculty of Actuaries' 2019 Curriculum.

Subject CS2 is *Risk Modelling and Survival Analysis*.

Predecessors

The topics in the Actuarial Statistics subjects cover content previously in Subjects CT3, CT4, CT6 and a small amount from Subject ST9:

- Subject CS1 contains material from Subjects CT3 and CT6.
- Subject CS2 contains material from Subjects CT4, CT6 and ST9.

Exemptions

In order to be eligible for an exemption in Subject CS2, you will need to have met the Institute and Faculty of Actuaries' requirements based on the current curriculum.

See the Institute and Faculty of Actuaries' website for further details:

actuaries.org.uk/qualify/exam-exemptions

Links to other subjects

Associateship Qualification

This subject assumes that the student is competent with the material covered in Subject CS1 – Actuarial Statistics – and the required knowledge for that subject.

Subjects CM1 and CM2 – Actuarial Mathematics and Financial Engineering and Loss Reserving – apply the material in this subject to actuarial and financial modelling.

Fellowship Qualification

Topics in this subject are further built upon in Subject SP1 – Health and Care Principles, Subject SP7 – General Insurance Reserving and Capital Modelling Principles, Subject SP8 – General Insurance Pricing Principles and Subject SP9 – Enterprise Risk Management Principles.

Contents

There are five parts to the Subject CS2 course. The parts cover related topics and are broken down into chapters. At the end of each part there are assignments testing the material from that part.

The following table shows how the parts and chapters relate to each other. The final column shows how the chapters relate to the days of the regular tutorials. This table should help you plan your progress across the study session.

Part	Chapter	Title	No of pages	X Asst	Y Asst	Tutorial – 5 days
1	1	Stochastic processes	38	X1	Y1	1
	2	Markov chains	78			
	3	The two-state Markov model and the Poisson model	41			
	4	Time-homogeneous Markov jump processes	76			
2	5	Time-inhomogeneous Markov jump processes	60	X2	Y1	2
	6	Survival models	41			
	7	Estimating the lifetime distribution	61			
3	8	Proportional hazards models	46	X3	Y1	3
	9	Exposed to risk	36			
	10	Graduation and statistical tests	66			
	11	Methods of graduation	31			
	12	Mortality projection	63			
4	13	Time Series 1	75	X4	Y2	4
	14	Time Series 2	75			
	15	Loss distributions	57			
	16	Extreme value theory	56			
5	17	Copulas	57	X5	Y2	5
	18	Reinsurance	47			
	19	Risk models 1	39			
	20	Risk models 2	43			
	21	Machine learning	83			

1.2 Subject CS2 – Syllabus and Core Reading

Syllabus

The Syllabus for Subject CS2 is given here. To the right of each objective are the chapter numbers in which the objective is covered in the ActEd course.

Aim

The aim of Subject CS2 is to provide a grounding in mathematical and statistical modelling techniques that are of relevance to actuarial work, including stochastic processes and survival models and their application.

Topics and topic weightings

This subject covers the following topics:

1. Random variables and distributions for risk modelling (20%)
2. Time series (20%)
3. Stochastic processes (25%)
4. Survival models (25%)
5. Machine learning (10%)

The topic weighting percentage noted alongside the topics is indicative of the volume of content of a topic within the subject and therefore broadly aligned to the volume of marks allocated to this topic in the examination. For example, if a topic is 20% of the subject then you can expect that approximately 20% of the total marks available in the examination paper will be available on that topic.

Students should ensure that they are well prepared across the entire syllabus and have an understanding of the principal terms used within the course.

Objectives

1. Random variables and distributions for risk modelling (20%)

Statistical distributions suitable for modelling the variables and risks that arise within insurance contracts.

- 1.1 Loss distributions, with and without risk sharing (Chapters 15 and 18)
 - 1.1.1 Properties of the statistical distributions that are suitable for modelling individual and aggregate losses.
 - 1.1.2 Concepts of excesses (deductibles) and retention limits.
 - 1.1.3 Operation of simple forms of proportional and excess of loss reinsurance.

- 1.1.4 Calculate the distribution and corresponding moments of the claim amounts paid by the insurer and the reinsurer in the presence of excesses (deductibles) and reinsurance.
- 1.1.5 Estimate the parameters of a failure time or loss distribution when the data is complete, or when it is incomplete, using maximum likelihood and the method of moments.
- 1.1.6 Fit a statistical distribution to a data set and calculate appropriate goodness-of-fit measures.
- 1.2 Compound distributions and their applications in risk modelling (Chapters 19 and 20)
 - 1.2.1 Construct models appropriate for short-term insurance contracts in terms of the numbers of claims and the amounts of individual claims.
 - 1.2.2 Major simplifying assumptions underlying the models in 1.2.1.
 - 1.2.3 Compound Poisson distribution and apply the result that the sum of independent random variables, each having a compound Poisson distribution, also has a compound Poisson distribution.
 - 1.2.4 Mean, variance and coefficient of skewness for compound binomial, compound Poisson and compound negative binomial random variables.
 - 1.2.5 Loss distributions for both the insurer and the reinsurer after the operation of simple forms of proportional and excess of loss reinsurance where underlying losses take the forms given in 1.2.4.
- 1.3 Introduction to copulas (Chapter 17)
 - 1.3.1 Characterise a copula as a multivariate distribution function that is a function of the marginal distribution functions of its variates and explain how this allows the marginal distributions to be investigated separately from the dependency between them.
 - 1.3.2 Meaning of the terms 'dependence or concordance', 'upper and lower tail dependence', and state in general terms how tail dependence can be used to help select a copula suitable for modelling particular types of risk.
 - 1.3.3 Know the form and characteristics of the Gaussian copula and the Archimedean family of copulas.
- 1.4 Introduction to extreme value theory (Chapter 16)
 - 1.4.1 Recognise extreme value distributions, suitable for modelling the distribution of severity of loss and their relationships.
 - 1.4.2 Calculate various measures of tail weight and interpret the results to compare the tail weights.

2 Time series (20%)

Statistical concepts for modelling, fitting and forecasting data that is indexed by time.

2.1 Understand the core concepts underlying time series models (Chapters 13 and 14)

2.1.1 General properties of stationary, $I(0)$, and integrated, $I(1)$, univariate time series.

2.1.2 Stationary random series.

2.1.3 Stationary random series with a filter applied.

2.1.4 Know the notation for backwards shift operator, backwards difference operator, and the concept of roots of the characteristic equation of time series.

2.1.5 Concepts and basic properties of autoregressive (AR), moving average (MA), autoregressive moving average (ARMA) and autoregressive integrated moving average (ARIMA) time series.

2.1.6 Concepts and properties of discrete random walks and random walks with normally distributed increments, both with and without drift.

2.1.7 Basic concept of a multivariate autoregressive model.

2.1.8 Cointegrated time series.

2.1.9 Univariate time series models with the Markov property and rearranging a univariate time series model as a multivariate Markov model.

2.2 Applications of time series models (Chapters 13 and 14)

2.2.1 The processes of identification, estimation and diagnosis of a time series, the criteria for choosing between models, and the diagnostic tests that may be applied to the residuals of a time series after estimation.

2.2.2 Other non-stationary, non-linear time series models.

2.2.3 Simple applications of a time series model, including random walk, autoregressive and cointegrated models as applied to security prices and other economic variables.

2.2.4 Develop deterministic forecasts from time series data, using simple extrapolation and moving average models, applying smoothing techniques and seasonal adjustment when appropriate.

3 Stochastic processes (25%)

Application of Markov models to model time-indexed risk and claim data arising primarily in insurance and other appropriate business-related scenarios.

- 3.1 Stochastic processes. (Chapter 1)
- 3.1.1 Stochastic processes, in particular a counting process.
- 3.1.2 Understand whether a stochastic process:
- operates in continuous or discrete time
 - has a continuous or a discrete state space
 - is a mixed type
- 3.1.3 Applications of mixed processes.
- 3.1.4 The Markov property in the context of a stochastic process and in terms of filtrations.
- 3.2 Understand and apply a Markov chain. (Chapter 2)
- 3.2.1 Essential features of a Markov chain model.
- 3.2.3 Calculate the stationary distribution for a Markov chain in simple cases.
- 3.2.4 Understand and apply systems of frequency-based experience rating in terms of a Markov chain.
- 3.2.5 Time-inhomogeneous Markov chain models and simple applications.
- 3.2.6 Markov chains as a tool for modelling and how they can be simulated.
- 3.3 Define and apply a Markov process. (Chapters 4 and 5)
- 3.3.1 Essential features of a Markov process model.
- 3.3.2 Poisson process, derive the distribution of the number of events in a given time interval, derive the distribution of inter-event times, and apply these results.
- 3.3.3 Kolmogorov equations for a Markov process with time-independent and time/age-dependent transition intensities.
- 3.3.4 Kolmogorov equations in simple cases.
- 3.3.5 Simple survival models, sickness models and marriage models in terms of Markov processes and describe other simple applications.
- 3.3.6 Kolmogorov equations for a model where the transition intensities depend not only on age/time, but also on the duration of stay in one or more states.
- 3.3.7 Sickness and marriage models in terms of duration-dependent Markov processes and describe other simple applications.
- 3.3.8 Markov jump processes as a tool for modelling and how they can be simulated.

4 Survival models (25%)

Description, estimation and use of statistical models for the time until an event occurs.

4.1 Concept of survival models.

- 4.1.1 Model of lifetime or failure time from age x as a random variable. (Chapter 6)
- 4.1.2 Consistency condition between the random variable representing lifetimes from different ages. (Chapter 6)
- 4.1.3 Distribution and density functions of the random future lifetime, the survival function, the force of mortality or hazard rate, and derive relationships between them. (Chapter 6)
- 4.1.4 Understand the actuarial symbols ${}_t p_x$ and ${}_t q_x$ and derive integral formulae for them. (Chapter 6)
- 4.1.5 Gompertz and Makeham laws of mortality. (Chapter 6)
- 4.1.6 Curtate future lifetime from age x and its probability function. (Chapter 6)
- 4.1.7 Understand the symbols e_x and $\overset{\circ}{e}_x$ and derive an approximate relation between them. Define the expected value and variance of the complete and curtate future lifetimes and derive expressions for them. (Chapter 6)
- 4.1.8 Two-state model of a single decrement and comparing its assumptions with those of the random lifetime model. (Chapter 3)

4.2 Understand the estimation procedures for lifetime distributions.

- 4.2.1 The various ways in which lifetime data may be censored. (Chapter 7)
- 4.2.2 Estimation of the empirical survival function in the absence of censoring, and what problems are introduced by censoring. (Chapter 7)
- 4.2.3 The Kaplan-Meier (or product-limit) estimator of the survival function in the presence of censoring, computing it from typical data and estimating its variance. (Chapter 7)
- 4.2.4 The Nelson-Aalen estimator of the cumulative hazard rate in the presence of censoring, computing it from typical data and estimating its variance. (Chapter 7)
- 4.2.5 Models for proportional hazards and how these models can be used to estimate the impact of covariates on the hazard. (Chapter 8)
- 4.2.6 The Cox model for proportional hazards, deriving the partial likelihood estimate in the absence of ties, and the asymptotic distribution of the partial likelihood estimator. (Chapter 8)

- 4.3 Derive maximum likelihood estimators for transition intensities. (Chapters 3 and 4)
- 4.3.1 Identify an observational plan in respect of a finite number of individuals observed during a finite period of time, and define the resulting statistics, including the waiting times.
- 4.3.2 Understand the likelihood function for constant transition intensities in a Markov model of transfers between states given the statistics in 4.3.1.
- 4.3.3 Identify maximum likelihood estimators for the transition intensities in 4.3.2 and state their asymptotic joint distribution.
- 4.3.4 State the Poisson approximation to the estimator in 4.3.3 in the case of a single decrement.
- 4.4 Transition intensities dependent on age (exact or census). (Chapter 9)
- 4.4.1 Dividing the data into homogeneous classes, including subdivision by age and sex.
- 4.4.2 The principle of correspondence and its fundamental importance in the estimation procedure.
- 4.4.3 Specify the data needed for the exact calculation of a central exposed to risk (waiting time) depending on age and sex.
- 4.4.4 Calculate a central exposed to risk given the data in 4.4.3.
- 4.4.5 Understand how to obtain estimates of transition probabilities.
- 4.4.6 Identify the assumptions underlying the census approximation of waiting times.
- 4.4.7 The concept of the rate interval.
- 4.5 Graduation and graduation tests (Chapters 10 and 11)
- 4.5.1 Statistical tests of the comparison of crude estimates with a standard mortality table testing for:
- the overall fit
 - the presence of consistent bias
 - the presence of individual ages where the fit is poor
 - the consistency of the 'shape' of the crude estimates and the standard table.
- For each test describe:
- the formulation of the hypothesis
 - the test statistic
 - the distribution of the test statistic using approximations where appropriate
 - the application of the test statistic.

- 4.5.2 Reasons for graduating crude estimates of transition intensities or probabilities, and the desirable properties of a set of graduated estimates.
- 4.5.3 How to test for smoothness of a set of graduated estimates.
- 4.5.4 The process of graduation by the following methods, and the advantages and disadvantages of each:
- parametric formula
 - standard table
 - spline functions
- (The candidate will not be required to carry out a graduation.)
- 4.5.5 How the tests in 4.5.1 should be amended to compare crude and graduated sets of estimates.
- 4.5.6 How the tests in 4.5.1 should be amended to allow for the presence of duplicate policies.
- 4.5.7 Carry out a comparison of a set of crude estimates and a standard table, or of a set of crude estimates and a set of graduated estimates.
- 4.6 Mortality projection (Chapter 12)
- 4.6.1 Approaches to the forecasting of future mortality rates based on extrapolation, explanation and expectation, as well as their advantages and disadvantages.
- 4.6.2 Lee-Carter, age-period-cohort, and p -spline regression models for forecasting mortality.
- 4.6.3 Use an appropriate computer package to apply the models in 4.6.2 to a suitable mortality data set.
- 4.6.4 Identify the main sources of error in mortality forecasts.
- 5 Machine learning (10%)
- 5.1 Elementary principles of machine learning. (Chapter 21)
- 5.1.1 The bias/variance trade-off and its relationship with model complexity.
- 5.1.2 Cross-validation to evaluate models on unseen data, and to estimate hyperparameters.
- 5.1.3 Understand how regularisation can be used to reduce overfitting in highly parameterised models.
- 5.1.4 The use of software to apply supervised learning techniques to solve regression and classification problems.
- 5.1.5 The use metrics such as precision, recall, F_1 score and diagnostics such as the ROC curve and confusion matrix to evaluate the performance of a binary classifier.

- 5.1.6 Unsupervised learning techniques (principal component analysis and K -means clustering) to reduce data dimensionality, identify latent substructure and detect anomalies.

Core Reading

The Subject CS2 Course Notes include the Core Reading in full, integrated throughout the course.

Further reading

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

1.3 Subject CS2 – summary of ActEd products

The following products are available for Subject CS2:

- Course Notes
- Paper B Online Resources (PBOR), including the Y Assignments
- X Assignments – five assignments:
 - X1, X2, X3: 80-mark tests (you are allowed 2¾ hours to complete these)
 - X3, X4: 100-mark tests (you are allowed 3¾ hours to complete these)
- Y Assignments – two assignments:
 - Y1, Y2: 100-mark tests (you are allowed 1¾ hours to complete these)
- Series X Marking
- Series Y Marking
- Online Classroom – over 150 tutorial units
- Flashcards
- Revision Notes – twelve A5 booklets
- ASET (2020-23 papers) – four years of exam papers, covering the period April 2020 to September 2023
- Mini ASET – covering the April 2024 exam paper
- Mock Exam – one 100-mark test for the Paper A examination and a separate 100-mark test for the practical Paper B exam
- Additional Mock Pack (AMP) – two additional 100-mark Paper A tests and two additional 100-mark Paper B tests
- Mock Exam Marking
- Marking Vouchers.

Products are generally available in both paper and eBook format. Visit **ActEd.co.uk** for full details about available eBooks, software requirements and restrictions.

The following tutorials are typically available for Subject CS2:

- Regular Tutorials (five full days / ten half days)
- Block Tutorials (five days)
- a Preparation Day for the practical exam.

Tutorials are typically available both face-to-face and live online.

Full details are set out in our *Tuition Bulletin*, which is available on our website at **ActEd.co.uk**.

1.4 Subject CS2 – skills and assessment

Technical skills

Subjects CS1 and CS2 are very mathematical and have relatively few questions requiring wordy answers.

Exam skills

In the CS subjects, the approximate split of assessment across the three skill types is:

- Knowledge – 20%
- Application – 65%
- Higher Order skills – 15%.

These skill types are described in Section 2.4.

Assessment

Assessment is in the form of two timed, online examinations:

- Paper A is 3 hours and 20 minutes and consists of a number of questions of varying marks, for which the answers must be constructed and typed in Microsoft Word
- Paper B is 1 hour and 50 minutes and consists of a number of questions of varying marks, for which the answers must typically be constructed using R (a pre-specified software package) and typed using Microsoft Excel.

This includes reading time, as well as the time taken for students to download and/or print the question paper.

In order to pass this subject, both Paper A and Paper B must be sat within the same sitting, and a combined mark of a pass achieved.

1.5 Subject CS2 – frequently asked questions

Q: *What knowledge of earlier subjects should I have?*

A: Knowledge of Subject CS1, Actuarial Statistics, is assumed.

Q: *What level of mathematics is required?*

A: Good mathematical skills are essential for Subject CS2. Calculus and algebra (including matrices) are used extensively in this course.

If your maths is a little rusty you may wish to consider purchasing additional material to help you get up to speed. The course 'Pure Maths and Statistics for Actuarial Studies' is available from ActEd and it covers the mathematical techniques that are required for the Core Principles subjects, some of which are beyond A-Level (or Higher) standard. You do not need to work through the whole course in order – you can just refer to it when you need help on a particular topic. An initial assessment to test your mathematical skills and further details regarding the course can be found on our website.

Q: *What should I do if I discover an error in the course?*

A: If you find an error in the course, please check our website at:

[ActEd.co.uk/paper_corrections.html](https://www.acted.co.uk/paper_corrections.html)

to see if the correction has already been dealt with. Otherwise please send details via email to **CS2@bpp.com**.

Q: *Who should I send feedback to?*

A: We are always happy to receive feedback from students, particularly details concerning any errors, contradictions or unclear statements in the courses.

If you have any comments on this course in general, please email them to **CS2@bpp.com**.

If you have any comments or concerns about the Syllabus or Core Reading, these can be passed on to the Institute and Faculty of Actuaries via ActEd. Alternatively, you can send them directly to the Institute and Faculty of Actuaries' Examination Team by email to **memberservices@actuaries.org.uk**.

2.1 General information and support

Before you start

When studying for the Institute and Faculty of Actuaries' 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 referred to simply as the *Tables*
- a **scientific calculator** and/or **software package** to help with calculations.

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

Institute and Faculty of Actuaries

The Institute and Faculty of Actuaries has produced a Qualification Handbook containing important information and guidance on:

- requirements for qualifying as an Associate or Fellow
- preparing for the exams, including how to book them
- the regulations, policies and procedures to be aware of while studying
- the range of support and resources available to students when they join the Institute and Faculty of Actuaries.

The Institute and Faculty of Actuaries advises students to ensure they read through the Qualification Handbook.

The Qualification Handbook can be found at:

[actuaries.org.uk/qualify/student-and-associate-exam-news/qualification-handbook](https://www.actuaries.org.uk/qualify/student-and-associate-exam-news/qualification-handbook)

BPP learning support

BPP's Learning Support team offers a wide range of support for all students who disclose a learning difficulty or disability, including sensory difficulties, mobility difficulty, ADHD, Asperger Syndrome, mental health difficulties, dyslexia, dyspraxia and general health problems. This support is accessible to all ActEd students free of charge.

This support includes:

- accessible and inclusive learning facilities
- a dedicated team that provides information, advice, guidance and support.

Please contact the Learning Support team at LearningSupport@bpp.com for more information.

Safeguarding

Safeguarding means protecting people's health, wellbeing and human rights, and enabling them to live free from harm, abuse and neglect.

For ActEd, safeguarding is recognising when someone needs support to help them achieve their learning goals while maintaining their safety, both face-to-face and online.

We want you to feel comfortable within our learning environment and safe in the knowledge that if you ever needed support, you would know where to go.

If you need support, please contact BPP's Safeguarding team at safeguarding@bpp.com or for urgent concerns call 07464 542 636.

The Prevent Duty

As a Government-regulated training provider, we are responsible for ensuring our learners are well informed and staying safe.

The Prevent Duty is to protect people from radicalisation and being drawn into extremist views and terrorism. ActEd has a duty to ensure that our learners are well informed and stay safe, and to empower our students to know what to look for and when to report concerns.

Please be aware of:

- people sharing or accessing extremist materials
- homophobic, disability-related, religious or racist bullying
- expressions of hatred towards or incitement to harm particular groups
- use of derogatory language towards particular groups.

Please report any concerns to a tutor or email safeguarding@bpp.com.

More information is available at:

officeforstudents.org.uk/advice-and-guidance/student-wellbeing-and-protection/counter-terrorism-the-prevent-duty/

2.2 Core study material

This section explains the role of the Syllabus, Core Reading and supplementary ActEd text. It also gives guidance on how to use these materials most effectively in order to pass the exam.

Some of the information below is also contained in the introduction to the Core Reading produced by the Institute and Faculty of Actuaries.

Syllabus

The Syllabus for Subject CS2 has been produced by the Institute and Faculty of Actuaries. The relevant individual syllabus objectives are included at the start of each course chapter and a complete copy of the Syllabus is included in Section 1.2 of 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. The purpose of the Core Reading is to assist in ensuring that tutors, students and examiners have clear shared appreciation of the requirements of the Syllabus for the qualification examinations for Associateship of the Institute and Faculty of Actuaries.

The Core Reading supports coverage of the Syllabus in helping to ensure that both depth and breadth are re-enforced. It is therefore important that students have a good understanding of the concepts covered by the Core Reading.

The examinations require students to demonstrate their understanding of the concepts given in the Syllabus and described in the Core Reading; this will be based on the legislation, professional guidance, *etc* that are in force when the Core Reading is published, *ie* on 31 May in the year preceding the examinations.

Therefore the exams in April and September 2024 will be based on the Syllabus and Core Reading as at 31 May 2023. We recommend that you always use the up-to-date Core Reading to prepare for the exams.

Examiners will have this Core Reading when setting the examinations. In preparing for examinations, students are advised to work through past examination questions and will find additional tuition helpful. The Core Reading will be updated each year to reflect changes in the Syllabus, to reflect current practice, and in the interest of clarity.

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 this Core Reading.

ActEd text

Core Reading deals with each syllabus objective and covers what is needed to pass the exam. 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.**

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 .

This is ActEd text

This is Core Reading

Here is an excerpt from some ActEd Course Notes to show you how to identify Core Reading for R code.



The R code to draw a scatterplot for a bivariate data frame, <data>, is:

```
plot(<data>)
```

Further explanation on the use of R will not be provided in the Course Notes, but instead be picked up in the Paper B Online Resources (PBOR). We recommend that you refer to and use PBOR at the end of each chapter, or couple of chapters, that contains a significant number of R references.

Copyright

All study material produced by ActEd is copyright and is sold for the exclusive use of the purchaser. The copyright is owned by Institute and Faculty Education Limited, a subsidiary of the Institute and Faculty of Actuaries. Unless prior authority is granted by ActEd, you may not hire out, lend, give out, sell, store or transmit electronically or photocopy any part of the study material. You must take care of your study material to ensure that it is not used or copied by anybody else.

Legal action will be taken if these terms are infringed. In addition, we may seek to take disciplinary action through the Institute and Faculty of Actuaries or through your employer.

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

2.3 ActEd study support

This section gives a description of the products offered by ActEd.

Successful students tend to undertake three main study activities:

1. *Learning* – initial study and understanding of subject material
2. *Revision* – learning subject material and preparing to tackle exam-style questions
3. *Rehearsal* – answering exam-style questions, culminating in answering questions at exam speed.

Different approaches suit different people. For example, you may like to revise material gradually over the months running up to the exams or you may do your revision in a shorter period just before the exams. Also, these three activities will almost certainly overlap.

We offer a flexible range of products to suit you and let you control your own learning and exam preparation. The following table shows the products that we produce. Not all products are available for all subjects.

LEARNING	LEARNING & REVISION	REVISION	REVISION & REHEARSAL	REHEARSAL
Course Notes	Assignments	Flashcards	Revision Notes	Mock Exam
Paper B Online Resources (PBOR)	Combined Materials Pack (CMP)	Sound Revision	ASET	Additional Mock Pack (AMP)
	Assignment Marking			Mock Marking
	Tutorials			
	Online Classroom			

The products and services are described in more detail below.

‘Learning’ products

Course Notes

The Course Notes will help you develop the basic knowledge and understanding of principles needed to pass the exam. They incorporate the complete Core Reading and include full explanation of all the syllabus objectives, with worked examples and questions (including some past exam questions) to test your understanding.

Each chapter includes:

- the relevant syllabus objectives
- a chapter summary
- a page of important formulae or definitions (where appropriate)
- practice questions with full solutions.

Paper B Online Resources (PBOR)

The Paper B Online Resources (PBOR) will help you prepare for the practical paper. Delivered through a virtual learning environment (VLE), you will have access to worked examples and practice questions. PBOR will also include the Y Assignments, which are two exam-style assessments.

‘Learning & revision’ products

X Assignments

The Series X Assignments are assessments that cover the material in each part of the course in turn. They can be used to develop and test your understanding of the material.

The X Assignments come with full marking schedules. We are happy to mark your scripts, but marking must be purchased separately.

Y Assignments

The Series Y Assignments are exam-style assessments that cover material across the whole course.

The Y Assignments come with full marking schedules. We are happy to mark your scripts, but marking must be purchased separately.

Combined Materials Pack (CMP)

The Combined Materials Pack (CMP) comprises the Course Notes, PBOR, the Series X Assignments and a Mock Exam.

CMP Upgrade

The purpose of the CMP Upgrade is to enable you to amend last year’s study material to make it suitable for study for this year.

Wherever possible, it lists the changes to the syllabus objectives, Core Reading, the Course Notes and the X / Y Assignments since last year that might realistically affect your chance of success in the exam. It is produced so that you can manually amend your notes. The upgrade includes replacement pages and additional pages where appropriate.

However, if a large number of changes have been made to the Course Notes and X / Y Assignments, it is not practical to produce a full upgrade, and the upgrade will only *outline* the most significant changes. In this case, we recommend that you purchase a replacement CMP (printed copy or eBook) or Course Notes at a significantly reduced price.

The CMP Upgrade can be downloaded free of charge from our website at **ActEd.co.uk**.

A separate upgrade for eBooks is not produced but a significant discount is available for retakers wishing to re-purchase the latest eBook.

X / Y Assignment Marking

We are happy to mark your attempts at the X and/or Y assignments. Marking is not included with the Assignments or the CMP and you need to order both Series X and Series Y Marking separately.

IMPORTANT NOTE: You must submit your script on our virtual learning environment, 'The Hub', in the format detailed in your assignment instructions. You will also be able to download your marked script, including marker feedback, from The Hub, as well as being given the opportunity to provide comments on the quality of the marking.

Don't underestimate the benefits of attempting and submitting assignments for marking:

- Question practice during this phase of your study gives an early focus on the end goal of answering exam-style questions.
- You're incentivised to keep up with your study plan and get a regular, realistic assessment of your progress.
- Objective, personalised feedback from a high quality marker will highlight areas on which to work and help with exam technique.

In a recent study, we found that students who attempt all the assignments and mock exams and get them marked have significantly higher pass rates.

There are two different types of marking product: Series Marking and Marking Vouchers.

Series Marking

Series Marking applies to a specified subject, session and student. If you purchase Series Marking, you will **not** be able to defer the marking to a future exam sitting or transfer it to a different subject or student.

We typically provide full solutions with the Series Assignments. However, if you order Series Marking at the same time as you order the Series Assignments, you can choose whether or not to receive a copy of the solutions in advance. If you choose not to receive them with the study material, you will be able to download the solutions from The Hub when your marked script is returned (or following the final deadline date if you do not submit a script).

If you are having your attempts at the assignments marked by ActEd, you should submit your scripts regularly throughout the session, in accordance with the schedule of recommended dates set out on our website at **ActEd.co.uk**. This will help you to pace your study throughout the session and leave an adequate amount of time for revision and question practice.

The recommended submission dates are realistic targets for the majority of students. Your scripts will be returned more quickly if you submit them well before the final deadline dates.

Any script submitted *after* the relevant final deadline date will not be marked. It is your responsibility to ensure that we receive scripts in good time.

Marking Vouchers

Marking Vouchers give the holder the right to submit a script for marking at any time, irrespective of the individual assignment deadlines, study session, subject or student.

Marking Vouchers can be used for any assignment. They are valid for four years from the date of purchase and can be refunded at any time up to the expiry date.

Although you may submit your script with a Marking Voucher at any time, you will need to adhere to the explicit Marking Voucher deadline dates to ensure that your script is returned before the date of the exam. The deadline dates are provided on our website at **ActEd.co.uk**.

Tutorials

Our tutorials are specifically designed to develop the knowledge that you will acquire from the course material into the higher-level understanding that is needed to pass the exam.

We run a range of different tutorials including face-to-face tutorials at various locations, and Live Online tutorials. Full details are set out in our *Tuition Bulletin*, which is available on our website at **ActEd.co.uk**.

Regular and Block Tutorials

In preparation for these tutorials, we expect you to have read the relevant part(s) of the Course Notes before attending the tutorial so that the group can spend time on exam-style questions and discussion to develop understanding rather than basic bookwork.

You can choose *one* of the following types of tutorial:

- **Regular Tutorials** spread over the session
- a **Block Tutorial** held two to eight weeks before the exam.

The tutorials outlined above will focus on and develop the skills required for the Paper A examination. Students wishing for some additional tutor support working through exam-style questions for Paper B may wish to attend a Preparation Day. These will be available Live Online or face-to-face, where students will need to provide their own device capable of running R.

Online Classroom

The Online Classroom acts as either a valuable add-on or a great alternative to a face-to-face or Live Online tutorial, focussing on the Paper A examination.

At the heart of the Online Classroom in each subject is a comprehensive, easily-searched collection of tutorial units. These are a mix of:

- teaching units, helping you to really get to grips with the course material, and
- guided questions, enabling you to learn the most efficient ways to answer questions and avoid common exam pitfalls.

The best way to discover the Online Classroom is to see it in action. You can watch a sample of the Online Classroom tutorial units on our website at **ActEd.co.uk**.

'Revision' products

For most subjects, there is ***a lot of material*** to revise. Finding a way to fit revision into your routine as painlessly as possible has got to be a good strategy. Flashcards and Sound Revision are inexpensive options that can provide a massive boost. They can also provide a variation in activities during a study day, and so help you to maintain concentration and effectiveness.

Flashcards

Flashcards are a set of A6-sized cards that cover the key points of the subject that most students want to commit to memory and/or have handy for reference during the examination. Each flashcard has questions on one side and the answers on the reverse. We recommend that you use the cards actively and test yourself as you go.

Sound Revision

It is reported that only 30% of information that is read is retained but this rises to 50% if the information is also heard. Sound Revision is a set of audio files, designed to help you absorb the most important aspects of the Core Reading.

The files cover the majority of the course, split into a number of manageable topics based on the chapters in the Course Notes. Each section lasts no longer than a few minutes.

Choice of revision product

Different students will have preferences for different revision products.

So, what might influence your choice between these study aids? The following questions and comments might help you to choose the revision products that are most suitable for you:

- Do you have a regular train or bus journey?

Flashcards are ideal for regular bursts of revision on the move.

- Do you want to fit more study into your routine?
Flashcards are a good option for 'dead time', eg using flashcards on your phone or sticking them on the wall in your study.
- Do you find yourself cramming for exams (even if that's not your original plan)?
Flashcards are an extremely efficient way to do your pre-exam preparation.
- Do you have some regular time where carrying other materials isn't practical, eg commuting, at the gym, walking the dog?
Sound Revision is an ideal 'hands-free' revision tool.
- Do you have a preference for auditory learning, eg do you remember conversations more easily than emails?
Sound Revision will suit your preferred style and be especially effective for you.

Choosing more than one revision product

As there is some degree of overlap between revision products, we do not necessarily recommend using them simultaneously. However, if you are retaking a subject, then you might consider using a different product than on a previous attempt to keep your revision fresh and effective.

'Revision & rehearsal' products

Revision Notes

Our Revision Notes have been designed with input from students to help you revise efficiently. They are suitable for first-time sitters who have worked through the ActEd Course Notes or for retakers (who should find them much more useful and challenging than simply reading through the course again).

The Revision Notes are a set of A5 booklets – perfect for revising in places where taking large amounts of study material with you is not practical. Each booklet covers one main theme or a set of related topics from the course and includes:

- Core Reading to develop your knowledge
- relevant past exam questions with concise solutions from the last ten years
- other useful revision aids.

ActEd Solutions with Exam Technique (ASET)

The ActEd Solutions with Exam Technique (ASET) contains our solutions to a number of past exam papers, plus comment and explanation. In particular, it highlights how questions might have been analysed and interpreted so as to produce a good solution with a wide range of relevant points. This will be valuable in approaching questions in subsequent examinations.

Choice of revision & rehearsal product

Different students will have preferences for different revision & rehearsal products, and there is some overlap in that both the Revision Notes and ASET contain past exam paper questions from recent years. However:

- ASET is designed to be educational. It aims to allow you to fully understand the solution points, and to assist you in improving your own answers through focussed explanations and tips on tackling the questions.

It is likely to be most appropriate if you are attempting the questions by producing answers in full, *eg* under exam conditions.

- The past exam question and solution sections of the Revision Notes are designed to give you a greater volume of question practice. They allow you to focus on specific topic areas one at a time.

They are likely to be most appropriate if you are using the questions to develop and practise your idea generation techniques, enabling you to work quickly through more questions than if you were producing full, detailed answers.

‘Rehearsal’ products

Mock Exam

The Mock Exam consists of two papers. There is a 100-mark mock exam for the Paper A examination and a separate mock exam for the practical Paper B exam. These provide a realistic test of your exam readiness.

It is based on the Mock Exam from last year but it has been updated to reflect any changes to the Syllabus, Core Reading and examination format.

The Mock Exam comes with a full marking schedule. We are happy to mark your scripts, but marking must be purchased separately.

Additional Mock Pack (AMP)

The Additional Mock Pack (AMP) consists of four further 100-mark mock exam papers – Mock Exam 2 (Papers A and B) and Mock Exam 3 (Papers A and B). This is ideal if you are retaking and have already sat the Mock Exam, or if you just want some extra question practice.

Mock Exam 2 and Mock Exam 3 come with full marking schedules. We are happy to mark your scripts, but marking must be purchased separately.

Mock Marking

We are happy to mark your attempts at the mock exams. The same general principles apply as for the Assignment Marking. In particular:

- Mock Exam Marking applies to a specified subject, session and student. In this subject it covers the marking of both Paper A and Paper B.
- Marking Vouchers can be used for each mock exam paper. You will need two marking vouchers in order to have both Paper A and Paper B marked. Marking vouchers have to be used for marking the AMP exam papers and can be used for marking the Mock Exam.

Recall that:

- marking is not included with the products themselves and you need to order it separately
- you should submit your script via The Hub in the format detailed in the mock exam instructions
- you will be able to download the feedback on your marked script, the solutions if you have Mock Exam Marking, and provide comments on the quality of the marking via The Hub.

2.4 Study skills and assessment

Technical skills

The Core Reading and exam papers for these subjects tend to be very technical. The exams themselves have many calculation and manipulation questions. The emphasis in the exam will therefore be on *understanding* the mathematical techniques and applying them to various, frequently unfamiliar, situations. It is important to have a feel for what the numerical answer should be by having a deep understanding of the material and by doing reasonableness checks.

As a high level of pure mathematics and statistics is generally required for the Core Principles subjects, it is important that your mathematical skills are extremely good. If you are a little rusty you may wish to consider purchasing additional material to help you get up to speed. The course 'Pure Maths and Statistics for Actuarial Studies' is available from ActEd and it covers the mathematical techniques that are required for the Core Principles subjects, some of which are beyond A-Level (or Higher) standard. You do not need to work through the whole course in order – you can just refer to it when you need help on a particular topic. An initial assessment to test your mathematical skills and further details regarding the course can be found on our website at [ActEd.co.uk](https://www.acted.co.uk).

Study skills

Overall study plan

We suggest that you develop a realistic study plan, building in time for relaxation and allowing some time for contingencies. Be aware of busy times at work, when you may not be able to take as much study leave as you would like. Once you have set your plan, be determined to stick to it. You don't have to be too prescriptive at this stage about what precisely you do on each study day. The main thing is to be clear that you will cover all the important activities in an appropriate manner and leave plenty of time for revision and question practice.

Aim to manage your study so as to allow plenty of time for the concepts you meet in these courses to 'bed down' in your mind. Most successful students will probably aim to complete the courses at least a month before the exam, thereby leaving a sufficient amount of time for revision. By finishing the courses as quickly as possible, you will have a much clearer view of the big picture. It will also allow you to structure your revision so that you can concentrate on the important and difficult areas.

You can also try looking at our discussion forum, which can be accessed at [ActEd.co.uk/forums](https://www.acted.co.uk/forums) (or use the link from our home page at [ActEd.co.uk](https://www.acted.co.uk)). There are some good suggestions from students on how to study.

Study sessions

Only do activities that will increase your chance of passing. Try to avoid including activities for the sake of it and don't spend time reviewing material that you already understand. You will only improve your chances of passing the exam by getting on top of the material that you currently find difficult.

Ideally, each study session should have a specific purpose and be based on a specific task, *eg 'Finish reading Chapter 3 and attempt Practice Questions 3.4, 3.7 and 3.12'*, as opposed to a specific amount of time, *eg 'Three hours studying the material in Chapter 3'*.

Try to study somewhere quiet and free from distractions (*eg* an area at home dedicated to study). Find out when you operate at your peak, and endeavour to study at those times of the day. This might be between *8am* and *10am* or could be in the evening. Take short breaks during your study to remain focused – it's definitely time for a short break if you find that your brain is tired and that your concentration has started to drift from the information in front of you.

Order of study

We suggest that you work through each of the chapters in turn. To get the maximum benefit from each chapter you should proceed in the following order:

1. Read the syllabus objectives. These are set out in the box at the start of each chapter.
2. Read the Chapter Summary at the end of each chapter. This will give you a useful overview of the material that you are about to study and help you to appreciate the context of the ideas that you meet.
3. Study the Course Notes in detail, annotating them and possibly making your own notes. Try the self-assessment questions as you come to them. As you study, pay particular attention to the listing of the syllabus objectives and to the Core Reading.
4. Read the Chapter Summary again carefully. If there are any ideas that you can't remember covering in the Course Notes, read the relevant section of the notes again to refresh your memory.
5. Attempt (at least some of) the Practice Questions that appear at the end of the chapter.
6. Where relevant, work through the relevant Paper B Online Resources for the chapter(s). You will need to have a good understanding of the relevant section of the course before you attempt the corresponding section of PBOR.
7. Think about what specifically you might want to include from that chapter in the reference materials that you choose to have to hand during the exam. For example, you might want to put together some easy-reference lists of key concepts or formulae that can be referred to quickly and conveniently.

It's a fact that people are more likely to absorb something if they review it several times. So, do look over the chapters you have studied so far from time to time. It is useful to re-read the Chapter Summaries or to try the Practice Questions again a few days after reading the chapter itself. It's a good idea to annotate the questions with details of when you attempted each one. This makes it easier to ensure that you try all of the questions as part of your revision without repeating any that you got right first time.

Once you've read the relevant part of the notes and tried a selection of questions from the Practice Questions (and attended a tutorial, if appropriate) you should attempt the corresponding assignment. If you submit your assignment for marking, spend some time looking through it carefully when it is returned. It can seem a bit depressing to analyse the errors you made, but you will increase your chances of passing the exam by learning from your mistakes. The markers will try their best to provide practical comments to help you to improve.

To be really prepared for the exam, you should not only be fully familiar with and understand the Core Reading but also be aware of what the examiners will expect. Your revision programme should include plenty of question practice so that you are aware of the typical style, content and marking structure of exam questions. You should attempt as many past exam questions as you can.

Active study

Here are some techniques that may help you to study actively.

1. Don't believe everything you read. Good students tend to question everything that they read. They will ask 'why, how, what for, when?' when confronted with a new concept, and they will apply their own judgement. This contrasts with those who unquestioningly believe what they are told, learn it thoroughly, and reproduce it (unquestioningly?) in response to exam questions.
2. Another useful technique as you read the Course Notes is to think of possible questions that the examiners could ask. This will help you to understand the examiners' point of view and should mean that there are fewer nasty surprises in the exam. Use the Syllabus to help you make up questions.
3. Annotate your notes with your own ideas and questions. This will make you study more actively and will help when you come to review and revise the material. These notes may also be useful to refer to in the exam. Do not simply copy out the notes without thinking about the issues.
4. Attempt the questions in the notes as you work through the course. Produce your answer before you refer to the solution.
5. Attempt other questions and assignments on a similar basis, *ie* produce your answer before looking at the solution provided. Attempting the assignments under timed conditions has some particular benefits:
 - It forces you to think and act in a way that is similar to how you will behave in the exam.
 - When you have your assignments marked it is *much* more useful if the marker's comments can show you how to improve your performance under timed conditions than your performance when you are under no time pressure.
 - The knowledge that you are going to do an assignment under timed conditions and then submit it (however good or bad) for marking can act as a powerful incentive to make you study each part as well as possible.
 - It is also quicker than trying to produce perfect answers.

6. Sit a mock exam four to six weeks before the real exam to identify your weaknesses and work to improve them. You could use a mock exam written by ActEd or a past exam paper. Ensure that you have your reference materials handy, as you plan to in the actual exam, so that you can practise finding what you need in them quickly and efficiently. (You might even be able to add to / modify your reference materials to increase their usefulness.)

You can find further information on how to study in the Institute and Faculty of Actuaries' Qualification Handbook, which you can download from their website at:

actuaries.org.uk/qualify/student-and-associate-exam-news/qualification-handbook

Revision and exam skills

Revision skills

You will have sat many exams before and will have mastered the exam and revision techniques that suit you. However it is important to note that due to the high volume of work involved in the Core Principles subjects it is not possible to leave all your revision to the last minute. Students who prepare well in advance have a better chance of passing their exams on the first sitting.

Unprepared students find that they are under time pressure in the exam. Therefore it is important to find ways of maximising your score in the shortest possible time. Part of your preparation should be to practise a large number of exam-style questions under timed conditions as soon as possible. This will:

- help you to develop the necessary understanding of the techniques required
- highlight the key topics, which crop up regularly in many different contexts and questions
- help you to practise the specific skills that you will need to pass the exam.

There are many sources of exam-style questions. You can use past exam papers, the Practice Questions at the end of each chapter (which include many past exam questions), assignments, mock exams, the Revision Notes and ASET.

Exam question skill levels

Exam questions are not designed to be of similar difficulty. The Institute and Faculty of Actuaries specifies different skill levels at which questions may be set.

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.

Command verbs

The Institute and Faculty of Actuaries use command verbs (such as 'Define', 'Discuss' and 'Explain') to help students to identify what the question requires. The examination can be composed of questions drawing from any part of the syllabus and using any command verb.

The Institute and Faculty of Actuaries has produced guidance on 'Command verbs used in the Associate and Fellowship examinations', to help students to understand what each command verb is asking them to do.

You can find the relevant document on the Institute and Faculty of Actuaries' website at:

actuaries.org.uk/qualify/prepare-for-your-exams

Past exam papers

You can download past exam papers and Examiners' Reports from the Institute and Faculty of Actuaries' website at:

actuaries.org.uk/qualify/prepare-for-your-exams

The examination

The Institute and Faculty of Actuaries has produced an:

- Examinations Handbook, which contains practical assistance on how to sit an Institute and Faculty of Actuaries' examination, including guidance around notation and possible standard keyboard notation that students could use when typing solutions in Word.
- Assessment Regulations document, which includes rules on eligibility, entry and conduct during an online assessment.

The Institute and Faculty of Actuaries advises students to ensure they read and have understood the Assessment Regulations ahead of their exam(s).

The Examinations Handbook and Assessment Regulations document, along with additional information about preparing for, booking and sitting the Institute and Faculty of Actuaries' exams can be found at:

actuaries.org.uk/qualify/my-exams/ifoa-exams

IMPORTANT NOTE: These documents may be updated and published in the weeks leading up to each exam session. It is important that you keep up-to-date with any changes and developments.

For the Paper A exam, ensure you have ready:

- your reference materials, with helpful bookmarks
- rough paper and a pen / pencil
- a calculator / Excel (or equivalent)
- a printer (if you wish to print out the exam paper)
- a copy of the *Tables*.

Please also refer to the Institute and Faculty of Actuaries' website for details about what you will need for the practical Paper B exam.

2.5 Queries and feedback

Questions and queries

From time to time you may come across something in the study material that is unclear to you. The easiest way to solve such problems is often through discussion with friends, colleagues and peers – they will probably have had similar experiences whilst studying. If there's no-one at work to talk to then use our discussion forum at **ActEd.co.uk/forums** (or use the link from our home page at **ActEd.co.uk**).

Our online forum is dedicated to actuarial students so that you can get help from fellow students on any aspect of your studies from technical issues to study advice. You could also use it to get ideas for revision or for further reading around the subject that you are studying. ActEd tutors will visit the site regularly to ensure that you are not being led astray and we also post other frequently asked questions from students on the forum as they arise.

If you are still stuck, then you can send queries by email to the relevant subject email address (see Section 1.5), but we recommend that you try the forum first. We will endeavour to contact you as soon as possible after receiving your query but you should be aware that it may take some time to reply to queries, particularly when tutors are away from the office running tutorials. At the busiest teaching times of year, it may take us more than a week to get back to you.

If you have many queries on the course material, you should raise them at a tutorial or book a personal tuition session with an ActEd tutor. Information about personal tuition is set out in our current brochure. Please email **ActEd@bpp.com** for more details.

Feedback

If you find an error in the course, please check the corrections page of our website (**ActEd.co.uk/paper_corrections.html**) to see if the correction has already been dealt with. Otherwise please send details via email to the relevant subject email address (see Section 1.5).

Each year our tutors work hard to improve the quality of the study material and to ensure that the courses are as clear as possible and free from errors. We are always happy to receive feedback from students, particularly details concerning any errors, contradictions or unclear statements in the courses. If you have any comments on this course, please email them to the relevant subject email address (see Section 1.5).

Our tutors also work with the Institute and Faculty of Actuaries to suggest developments and improvements to the Syllabus and Core Reading. If you have any comments or concerns about the Syllabus or Core Reading, these can be passed on via ActEd. Alternatively, you can send them directly to the Institute and Faculty of Actuaries' Examination Team by email to **memberservices@actuaries.org.uk**.

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Legal action will be taken if these terms are infringed. In addition, we may seek to take disciplinary action through the profession or through your employer.

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