



Institute  
and Faculty  
of Actuaries

# **A Guide to CS1 and CS2 Examinations** for the 2021 examinations

July 2021

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## Introduction to Actuarial Statistics (CS1 and CS2)

This guide should help answer your questions about CS1 and CS2, including:

- the format of the online examinations;
- guidance on how to take the examinations;
- administrative information; and
- information relating to the April and September examinations

If you have any further questions that are not covered in this guide, please contact the Education Services Team: [education.services@actuaries.org.uk](mailto:education.services@actuaries.org.uk)

Specimen and past papers for CS1 and CS2 examinations are available on the

IFoA website:

<https://www.actuaries.org.uk/studying/curriculum>

<https://www.actuaries.org.uk/studying/prepare-your-exams/past-exam-papers-and-examiners-reports>

## What is covered in CS1 and CS2?

Subjects CS1 and CS2 are a fundamental part of the Core Principles subjects.

CS1 provides a grounding in mathematical and statistical methods that are of relevance to actuarial work. It will equip you with the knowledge of:

- statistical distributions,
- methods to summarise data,
- the principles of statistical inference, regression models (including generalised linear models), and
- the fundamental concepts of Bayesian statistics.

CS2 builds upon CS1. It develops knowledge of and the ability to apply:

- statistical methods for risk modelling,
- time series analysis methods,
- stochastic processes (especially Markov chains and Markov jump processes),
- survival analysis (including regression methods applied to duration data),
- graduation methods, and
- machine learning (at a high level).

Subjects CS1 and CS2 include both theory and application of the ideas using the 'R' statistical package.

## How have CS1 and CS2 been developed?

CS1 and CS2 have been influenced by external direction and guidance: the Actuarial Profession Standards (APSs), the International Standard of Actuarial Practice, the Actuaries' Code, the regulators, Sarbanes Oxley and Solvency II requirements. While these subjects were taken into consideration when developing the syllabus for the Core Principles subjects, knowledge of these standards will not be directly tested in the CS1 and CS2 examinations.

## The timing and format of the CS1 and CS2 examinations

Examination dates for the coming year can be found at:

<https://www.actuaries.org.uk/studying/my-exams/exam-dates>

Details of the syllabus for CS1 and CS2 can be found at:

<https://www.actuaries.org.uk/studying/curriculum/actuarial-statistics>

Questions for the CS1 examination and the CS2 examination will be drawn from across the syllabus.

Each of the CS1 and CS2 examination consists of two elements, referred to as Paper 'A' and Paper 'B':

- Paper A: a 3-hour and 20-minute theoretical exam. This is delivered online and can be taken at your workplace or at home, at UK times only.
- Paper B: a 1-hour and 50-minute paper. This is a problem-based assessment, using 'R' with questions requiring candidates to use data to answer questions. This is delivered online and can be taken at your workplace or at home, at UK times only.
- From September 2021, an additional 5 minutes has been added to each paper to allow for candidates to download or print, if required, their exam paper.
- The two elements of each assessment will take place over two consecutive days where possible. Where this is not possible, there will be no more than a two-day interval between sittings.
- When booking these two part examinations, your booking confirmation will show the date and time of your examinations. We will send joining instructions by email, including the link to the IFoA online exam platform, 2 weeks before your examination. Your joining instructions will include information on how to create and verify your details on the IFoA online exam platform and how to complete online exam platform equipment checks.

**Note:** With effect from the April 2019 reading time is included in the overall examination time.

Therefore, it is up to candidates to manage their time between reading through the paper and starting to answer the questions. There is guidance on this at *Hints and Tips* at:

<https://www.actuaries.org.uk/studying/prepare-your-examinationinations/revision-programme>

For the problem-based assessments, all candidates will need to be confident in the use of the statistical package 'R'. There is a handy guide on "Getting started with 'R'" at:

<https://www.actuaries.org.uk/studying/curriculum/actuarial-statistics>

For the 2021 problem-based assessments (April and September) you will need the following:

Examination	Version of R required	Version of R Studio required	Packages required	External Data Sets
<b>CS1B</b>	Any release of version 4.0	Any release of version 1.1 (32-bit operating systems)	base*, graphics, stats, utils	External data sets required for April and September examinations
<b>CS2B</b>		Any release of version 1.4 (64-bit operating systems)	base*, copula**, graphics, markovchain, rpart**, rpart.plot**, stats, survival, utils	External data sets required for April and September examinations

\*this package is loaded by default during the R installation – you are not required to install this package.

\*\*no prior knowledge of these packages is required for the examination.

It is strongly recommended that you verify your R Console or R Studio set up prior to the examinations. The IFoA can support with technical aspects of the online examination platform only and cannot offer technical support with the installation or configuration of R Console/R Studio and any associated packages.

For an overview on how to install R Console or R Studio, and how to load packages, please refer to the Getting started with 'R' guide that can be found here:

<https://www.actuaries.org.uk/studying/curriculum/actuarial-statistics>

If external data sets are required for the problem-based assessments these will be provided by the IFoA approximately two weeks prior to the assessment date. Data files will have one of the following extensions: ".txt", ".csv" or ".Rdata".

The data set(s) will need to be loaded into R prior to the examination. For instructions on how to load data to R Console or R Studio please refer to the "Getting started with 'R' Guide referenced above.

R is continually being updated and version releases can change quickly; sometimes this will happen quite shortly before the examination. Whilst the version of R stated above is required for sitting CS1 and CS2, later versions may be offered at the point of download. Students may opt to download a later version; however, it should be noted that some functionality may differ, and output could vary from the defined marking solutions. Whilst the Examination team endeavour to mark all alternative output, it cannot be guaranteed that every variance will be recognised.

It should be noted that RMarkdown and knitr are not permitted to be used during the examinations.

## **What examinations should I have passed before sitting CS1 and CS2?**

Students do not have to pass any other examination prior to attempting CS1 or CS2. However, the syllabus for CS1 lists a number of foundation topics such as summarising data sets, basic probability theory and random variables. These topics are assumed knowledge for CS1 and you may wish to ensure you are familiar with them before studying for CS1. Furthermore, because CS2 assumes that the student is competent with the material covered in CS1 and the required knowledge for that subject, you will need to ensure that you are familiar with the topics covered in CS1 before studying CS2.

Candidates are advised that Formulae and Tables books may be required for these assessments. You can purchase your copy through the e-shop at:

<https://www.actuaries.org.uk/shop>

A soft copy of the Formulae and Tables can also be found in our [website](#).

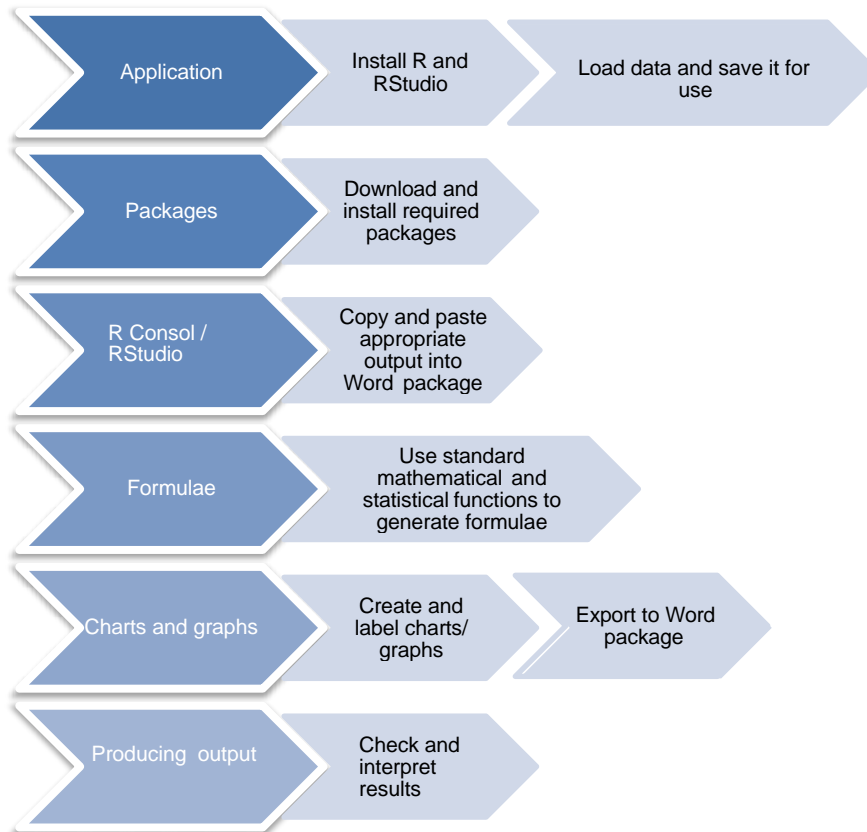
## **I want to sit the examination. What do I need to do?**

Information can be found on the IFoA website:

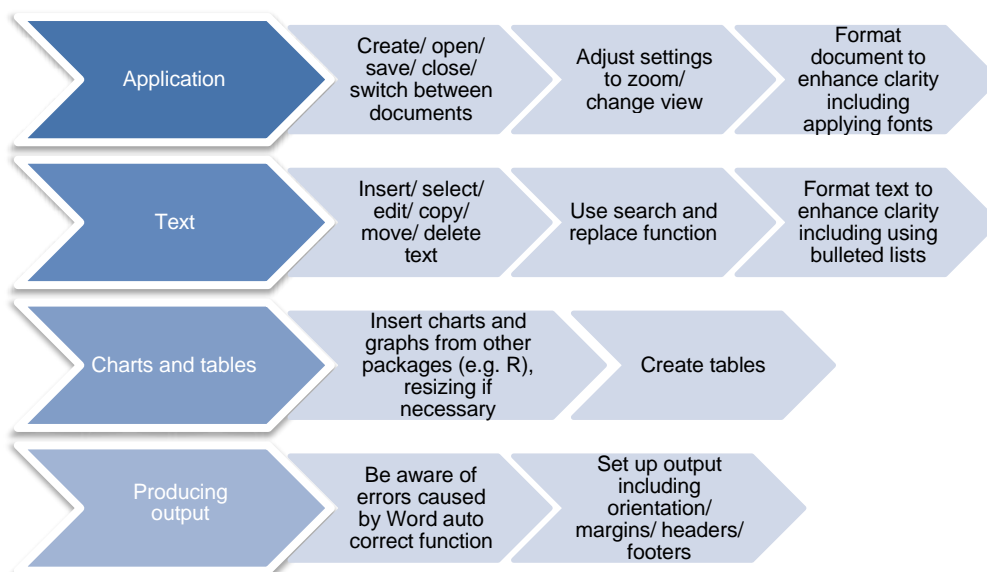
<https://www.actuaries.org.uk/studying/exam-bookings>

## What should I know before sitting CS1 and CS2?

### R and RStudio



### Word Processing



## Final grading

The CS examinations will assess a candidate's overall performance over both A and B papers for each subject. A Candidate, therefore, a candidate does not have to perform to a standard that would gain a pass for each separate paper, but does need to demonstrate an overall pass standard to gain a pass for the subject. The overall mark is determined by taking a weighted average of the marks of the two elements of assessment. Marks for the two elements of assessment for CS1 and CS2 will be combined and a single mark awarded for each subject.