



Certified Actuarial Analyst Resource Guide

Module 5 2017



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$$\sqrt{3)^2 + (0,7 - 4)^2} = x = \frac{m_2 x_1 + m_1 x_2}{m_1 + m_2} \quad y = \frac{m_2 y_1 + m_1 y_2}{m_1 + m_2} \quad \bar{z} \approx 11,3 \quad x = \frac{x_1}{1}$$



Welcome to Module 5 - Models and Audit Trails of the Certified Actuarial Analyst qualification

The Certified Actuarial Analyst (CAA) is a professional qualification from CAA Global.

It is designed to provide you with a technical skills qualification if you:

- work alongside actuaries – in areas such as data analysis, pricing and marketing
- work in the wider financial services area – perhaps you already have other qualifications, and would like to develop a skill set that will mark you out in a competitive environment
- work in a service centre environment – the analytical skills you'll learn can then be added to your business knowledge
- have strong maths skills, and you want to and learn on the job rather than going to university.

The aim of Module 5 is to ensure that the successful candidate can model data, including maintaining an audit trail to document the work.

Module 5 can only be taken when Modules 0, 1, 2, 3 and 4 have been passed.

This Resource guide for Module 5 gives you the syllabus you will cover for the exam, and details of some online and other resources that will help you study for the Module 5 exam. There is also a specimen exam paper giving examples of the type of questions you will be asked.

Additional information about the Module 5 exam, including:

- How to enter for the exam
- What will happen at the exam centre

can be found in the:

- Student Actuarial Analyst Handbook

If you have any further questions contact the CAA Administration Team who will be happy to help you.

Email the team at:

enquiries
@caa-global.org



$$\frac{+\lambda x_2}{+\lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2$$



The Certified Actuarial Analyst qualification

There are seven exams which you will need to complete for the qualification:

Module title	Assessed by
Fundamental Mathematics & Statistics – Module 0	2 hour Computer Based Assessment
Finance and Financial Mathematics – Module 1	2 hour Computer Based Assessment
Statistics and Models – Module 2	2 hour Computer Based Assessment
Long Term Actuarial Mathematics – Module 3	2 hour Computer Based Assessment
Short Term Actuarial Mathematics – Module 4	2 hour Computer Based Assessment of 60 questions
Models and Audit Trails – Module 5	3 hour examination
Online Professional Awareness Test (PAT)	90 minute examination

In addition to passing the above exams, you must complete at least one year of relevant work experience (Work-based skills).

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The syllabus for the Module 5 exam

The mathematical topics covered by the Module 5 exam are:

- Development of a spreadsheet model to solve a specified problem
- Production of an audit trail for use by a fellow CAA student

You can find the full Module 5 syllabus in Appendix 1 of this Resource guide.

Assessment of the Module 5 exam

The Module 5 exam is assessed by a 3 hour online exam with an additional 15 minutes reading time before the start of the exam.

Pass standards for the exam are set by CAA Global. Details of pass standards for CAA exams will be published in due course.

Studying for the Module 5 exam

Recommended study hours

We recommend that you spend 100 hours studying to prepare for the exam.

100

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Tuition

BPP
ACTUARIAL EDUCATION



BPP Actuarial Education (ActEd),
provides online study material for this exam.

Details of their training materials and services are available on their website.

Website: www.bppacted.com

Email: ActEd@bpp.com

Tel: +44 (0)1235 550 005

Please note

Education providers are listed here for information purposes. CAA Global has not assessed the quality of the services provided.

Free online resources

Listed below are samples of free web-based resources in which learning support links covering most, though not all, of the topics in Module 5 have been identified.

Please note

The content of these websites has not been quality assured by CAA Global.
The material should not be used as your primary learning resource, but may reinforce and/or supplement other sources.

There are a number of useful and free “beginners guides” available on the internet. A small sample of these are:

- ▶ http://spreadsheets.about.com/od/excel101/a/Excel_beg_guide.htm
- ▶ <http://www.skilledup.com/articles/learning-excel-guide/>
- ▶ <http://www.excel-easy.com/data-analysis/sort.html>

Google the internet to find other guides that may better fit your current expertise if those above are not suitable.

A list of Excel functions that you are required to be familiar with prior to the Module 5 exam can be found in Appendix 3.

$$\frac{2x_1 + m_1x_2}{m_1 + m_2} \quad y = \frac{m_2y_1 + m_1y_2}{m_1 + m_2} \quad \bar{z} \approx 11,3 \quad x = \frac{x_1}{1}$$



Specimen exam paper

A specimen exam paper for Module 5, with sample exam questions, is given in Appendix 3. This will show you the types of questions which will be asked in the exam.

Calculators

There is only one authorised calculator for all the CAA exams:

- **Texas Instruments TI-30 Multiview** (with or without suffix).

The TI-30 Multiview calculator is available to buy from shops or online retailers.



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Appendix 1

Syllabus: Module 5

- Models and Audit Trails

Aim

The aim of this module is to ensure that the successful candidate can model data, including maintaining an audit trail to document the work.

Module 5 can only be taken when Modules 0, 1, 2, 3 and 4 have been passed.

The candidate needs a working knowledge of spreadsheets attached in Appendix Two and word processing packages.

Objectives

The successful candidate will be able to demonstrate:

- (i) Development of a spreadsheet model to solve a specified problem:
 - a) Summarising data using appropriate descriptive statistics and graphical representation
 - b) Performing checks on the data and results
- (ii) Production of an audit trail for use by a fellow CAA student, documenting:
 - a) the parameters given in the scenario
 - b) the methods used in the model
 - c) checks made on the data and results

END OF SYLLABUS

$$\sqrt{3^2 + (0,7 - 4)^2} = x = \frac{m_2 x_1 + m_1 x_2}{m_1 + m_2} \quad y = \frac{m_2 y_1 + m_1 y_2}{m_1 + m_2} \quad \bar{z} \approx 11,3 \quad x = \frac{x_1}{1}$$



Appendix 2

Syllabus: Module 5 - Excel knowledge

Detailed knowledge of Excel is not part of the examination requirement. As a commonly used package, Excel is used as a means to build a model and students are not assessed on their use of Excel. Hence, extensive knowledge of Excel is not necessary.

A CAA Module 5 student should have some experience of using Excel and, importantly, creating a spreadsheet from scratch. Students who have limited experience or rarely have an opportunity to create spreadsheets are encouraged to practise prior to attending the examination; the specimen exam assignments on the profession's website offer a good opportunity for such practice.

Exam assignments are constructed so as not to require advanced Excel techniques. However, students should be able to use the following Excel functions:

AVERAGE	COUNTIF
STDEV	VLOOKUP / HLOOKUP
MIN / MAX	INDEX
MEDIAN	IF
LARGE / SMALL	AND / OR
SUM	NOT
PRODUCT	ROUND
SUMPRODUCT	ABS
SUMIF	INT
COUNT	

As well as the above built-in functions, students should know how to sort data, how to use the goal seek function, and how to create and modify charts.

There are a number of Excel reference books available in addition to the Help facility provided in Excel. Students are recommended to look up the details of how to use the above features prior to the exam.

END OF EXCEL KNOWLEDGE

$$\frac{+\lambda x_2}{+\lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2 = 4$$



Appendix 3

Specimen Examination Paper: Module 5 - Models and Audit Trails

Please note

The following project is intended to show the scope of the modelling work which will be required for Module 5 exams.

Evaluating a pension fund investment

A pension fund is considering investing in a major infrastructure project. The fund has been asked to make an investment of £2m for a 1% share in revenues from building a road. No other costs will be incurred by the pension fund.

The following revenues are expected to arise from the project:

- In the first year, 40,000 vehicles a day will use the road, each paying a toll of £1.
- In the second year, 50,000 vehicles a day will use the road, each paying a toll of £1.10.
- In the third year, both the number of vehicles using the road and the level of tolls will rise by 1% from their level in the second year. They will both continue to rise by 1% per annum compound until the end of the 20th year.

At the end of the 20th year, it is assumed that the road has no value as it will have to be completely rebuilt.

You should assume that all revenue is received at the end of the year and that there are 365 days in all years.

Calculate the net present value of the investment in the road at a rate of interest of 8% per annum effective.

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Part 1

Your manager has asked you to model this project for the pension fund. You need to document all your work in an audit trail so that a fellow Analyst student (with similar experience to yourself) could check and modify the model. The audit trail can be in a worksheet within your model or in a separate word document.

- (i) Set up a spreadsheet to include worksheets for the parameters, revenues and cashflows.
- (ii) Identify the parameters for the project and set these out in the parameters worksheet.
- (iii) In the revenues worksheet, set out a table showing, for each year:
 - a) The number of vehicles
 - b) The toll each vehicle will pay
 - c) The revenue each year.
- (iv) Perform the following checks:
 - a) A check by eye that all years have been included
 - b) An independent check that the number of vehicles is correct for the final year
 - c) An independent check that the amount of the toll is correct for the final year.
- (v) Use one or two charts to illustrate how the number of vehicles and amount of the toll increases over the period.
- (vi) In the cashflows worksheet, set out a table showing, for each year, the investment made, the revenue received and hence the net revenue received.
- (vii) Use a chart to illustrate the net revenues over the period.
- (viii) Calculate the discounted net revenues for each year.
- (ix) Hence calculate the net present value of the project.
- (x) Show the sensitivity of the project by recalculating the net present value using alternative interest rates of 7% per annum and 9% per annum.
- (xi) Use a chart to illustrate the results in steps (ix) and (x).

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An alternative scenario is that the road is sold to another developer at the end of the 20th year for £300,000.

- (xii) By making a copy of the cashflows worksheet and changing as necessary:
- a) Show the revised net revenues
 - b) Calculate the revised net present value of the project using all three rates of interest.

Marks available for spreadsheet model:	
Model accuracy, completeness and good modelling techniques	20 marks
Reasonableness and auto checks	10 marks

Part 2

Produce an audit trail for your spreadsheet model which includes the following aspects:

- purpose of the model
- data and assumptions used
- data validation
- methodology, i.e. description of how each calculation stage in the model has been produced
- explanation of the checks performed.

You should ensure that your audit trail is suitable for a fellow student, who has been asked to peer review and correct your model, or to continue work on it, or to use it again for a similar purpose in the future.

Marks available for audit trail:	
Audit approach	30 marks
Audit methodology – clarity and labelling	25 marks
Audit methodology – coverage of techniques	15 marks
Total marks for paper	[100 marks]

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Additional guidance

Rounding figures

You may wish to use the ROUND function to ensure you have whole numbers of vehicles or pence each day. However, this may make it more difficult for you to apply an overall check in part (iv).

Instead, you may wish to use exact numbers, showing (say) 2 decimal places. Either approach is acceptable.

END OF SPECIMEN EXAMINATION PAPER

$$\frac{+\lambda x_2}{+\lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2 = 4$$





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